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SUMMARY OF 1994
WEED CONTROL EXPERIMENTS

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	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							62	32	60	28	73	44	69	48	84	54	64	37
2					.54		58	17	58	29	71	43	74	46	84	64	62	40
3			.04	.08	.08	.18	41	24	59	43	81	55	74	58	84	55	65	44
4			.08	.23		.15	39	20	73	36	82	54	80	59	68	48	74	52
5			.01	.01			40	16	56	27	82	56	79	54	75	46	73	47
6							47	24	56	35	79	50	68	54	88	53	77	41
7				.44	.02		55	30	55	36	74	65	60	54	68	43	85	48
8	.12		.47	.01	.01		54	32	68	49	65	50	63	48	66	38	92	53
9	.03		.49				48	24	67	36	63	50	71	44	65	48	92	52
10			.02	.43			55	27	72	37	66	52	82	56	74	55	85	64
11				.02		.07	62	32	83	42	74	50	76	58	80	56	66	50
12				.61		1.26	66	29	80	35	76	51	75	56	85	57	64	49
13			.83	.09			67	39	75	53	73	55	70	54	67	44	67	55
14		T	.59			.01	60	32	77	51	72	58	74	48	74	39	73	62
15			.01	.34		1.04	55	28	75	40	67	49	80	52	90	46	71	55
16		.35					64	35	71	36	66	52	74	52	91	60	69	48
17					.01		78	33	74	61	73	54	78	49	83	57	82	47
18				.10	.40		74	47	88	61	68	49	83	61	79	55	80	48
19		.03		.07			60	29	86	56	76	60	76	59	70	53	77	49
20		.18		.15	.01	.05	56	32	82	42	77	56	71	58	76	48	81	54
21		.16		.10		.36	61	25	88	52	84	55	74	58	83	53	60	39
22		.54			.18		71	27	72	50	75	60	84	52	84	57	58	36
23		.07					79	53	83	52	80	55	80	54	84	56	74	38
24		.26					77	37	72	52	82	57	78	54	89	52	81	47
25	.02		.08				45	33	77	51	76	60	74	45	75	54	63	40
26	1.14						38	28	77	38	75	58	76	50	79	47	66	34
27				.28			38	14	68	43	68	58	78	46	72	44	64	37
28		T					39	24	81	55	77	58	84	49	74	43	73	34
29							50	28	81	45	74	50	86	53	82	42	66	39
30		.03			.15		55	26	75	53	76	53	79	60	56	48	55	37
31									73	46			82	54	62	38		

CLIMATIC DATA-, Casselton 1994																		
	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							53	33	58	28	75	45	85	52	86	59	66	40
2							63	24	58	29	75	46	78	42	86	61	69	40
3		.36		1.24	.20		39	26	58	33	82	47	70	50	84	64	69	45
4	T	.11			.04		55	27	65	38	84	50	68	53	89	50	66	62
5			.56			.10	31	16	51	29	82	56	82	64	71	42	73	51
6				T			43	17	51	29	83	55	80	45	77	44	74	45
7				.64	2.80		48	26	48	30	84	57	79	58	84	61	78	45
8				3.45			57	33	65	30	75	45	59	55	68	50	85	46
9							48	33	72	30	73	47	70	52	65	50	85	56
10			T				53	27	72	41	73	54	76	55	77	53	89	55
11				.82			58	29	77	40	71	55	79	64	75	54	89	67
12						.37	62	29	76	36	70	53	80	55	78	52	75	56
13		.02	.04	T		1.30	66	30	74	41	78	51	75	59	84	59	73	56
14	T			1.05			69	31	84	56	82	60	74	56	67	45	69	60
15	.04					.31	59	31	77	44	90	56	78	55	74	46	77	64
16		1.17	.37	.32		.34	59	33	73	47	75	54	81	53	82	48	80	52
17			T				66	30	75	48	67	55	79	56	85	61	70	47
18							73	47	86	61	75	54	78	57	86	59	83	51
19				.12	.27		75	32	89	62	77	55	81	61	86	58	83	48
20			.73	.09			61	28	89	48	90	66	74	57	74	59	83	48
21				.28			45	26	87	59	85	56	76	60	79	49	80	55
22			.03	.08		.33	63	30	74	46	87	65	76	58	82	55	57	41
23					.12		69	48	86	52	80	60	84	58	83	56	69	37
24	T	.65			.68		87	37	87	54	81	56	83	58	78	54	70	38
25	.02	.04					58	35	78	51	85	56	80	49	89	60	79	48
26	1.40				.25		44	34	69	41	81	56	80	49	77	56	65	34
27	.38				.02		35	25	72	42	85	61	81	53	81	60	62	34
28			.11				40	28	87	47	78	58	80	53	81	44	66	37
29	.19						43	38	77	47	80	53	82	54	73	45	71	37
30			.19		.22		53	28	77	58	76	53	85	54	80	48	72	49
31					T				76	49			89	59	64	43		

CLIMATIC DATA-, Crookston 1994																		
	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						55	21	58	29	73	48	70	46	85	63	68	38
2							34	22	59	39	75	55	74	55	83	64	68	39
3		.41	.06	.07	.49		46	21	63	32	79	57	74	58	83	47	68	51
4			.18	.78		.40	25	15	43	30	82	57	78	60	70	42	66	51
5							39	19	49	28	83	53	78	57	73	51	72	42
6							46	28	53	28	80	53	76	57	83	60	77	44
7				2.69	.08		55	33	67	37	76	42	58	54	67	44	80	49
8	.03			1.47			45	33	68	39	73	53	66	52	66	44	85	56
9			.45				48	27	67	30	70	54	76	63	71	49	90	62
10			.18	.08			57	28	71	43	65	53	77	63	78	55	84	67
11			.30	.07		.24	61	28	70	33	71	48	78	55	80	61	71	55
12						.21	66	32	69	41	79	58	73	57	83	48	67	55
13		.04		.15	.07		67	29	81	52	78	62	69	51	66	45	70	59
14		.01	1.10	.05			59	35	75	37	83	85	75	53	75	44	75	63
15				.09		1.74	54	34	68	42	70	56	80	57	82	53	76	53
16		.04	.28	.26			60	26	67	50	68	53	76	54	85	60	67	45
17				.02			69	37	82	60	74	55	76	41	87	58	80	49
18					.44		65	34	88	65	75	59	80	61	83	58	82	52
19			2.98				53	26	88	49	88	64	78	60	74	50	81	52
20							54	23	87	55	80	56	73	62	77	48	81	54
21			.03			.13	61	30	69	44	82	63	77	57	80	57	59	38
22		1.13	.38		.25		69	40	85	56	80	60	84	58	84	60	59	36
23		.23			.02		84	34	78	54	82	57	80	53	73	54	69	38
24		.01					55	34	76	52	84	60	78	49	88	59	79	45
25	1.18		.59		.18		40	33	68	39	76	59	73	54	75	50	63	32
26	.55						34	20	69	43	77	62	74	49	80	57	60	34
27			.45				39	22	78	54	75	56	80	52	71	46	63	40
28	T	T	.02				39	28	85	52	74	53	82	55	70	50	62	36
29					.15		50	29	72	52	69	55	85	61	78	52	66	38
30			.11		.03		55	34	73	53	81	53	85	60	64	42	55	35
31									77	47			80	61	63	35		

CLIMATIC DATA-, Dickinson 1994																								
	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			.06	.03			61	30	52	29	60	53	67	48	90	60	63	40
2	.01		.13		.28		59	27	56	24	77	52	78	52	86	64	55	48
3			.07	.04		.10	42	20	59	33	82	44	81	59	88	60	69	50
4			.15	.13		.03	60	25	67	27	83	56	81	55	78	56	76	51
5				.20			40	12	62	34	80	54	81	54	82	56	75	48
6		.02		.43			49	17	53	38	84	48	64	56	96	58	84	39
7			.94	.38			47	22	44	28	68	56	65	52	77	55	92	53
8	.18		1.68	.03			58	26	72	40	63	49	71	49	68	46	95	49
9	.05		1.12				42	21	63	27	62	49	78	51	64	54	100	62
10			.07				54	23	72	41	68	46	90	62	80	58	77	55
11							58	24	79	46	74	46	81	56	80	61	76	54
12						.11	64	23	72	40	69	52	81	56	90	56	57	50
13		.27	.03				69	26	80	51	74	49	74	51	74	50	72	54
14	.02		.13			.39	61	30	70	38	69	40	79	45	86	40	82	58
15						.36	52	23	73	63	63	43	77	55	95	51	72	53
16		.01	.19				61	33	66	50	62	50	77	48	90	66	74	44
17							72	39	80	53	71	51	84	49	92	54	80	47
18		.32		.13			85	43	83	58	66	53	96	58	86	58	86	50
19		.25	.01	.07			67	27	67	47	77	62	77	55	78	49	85	55
20	T		.01				62	34	58	48	82	55	71	52	86	49	82	50
21						.17	64	33	70		89	58	81	55	91	57	55	36
22							64	34	73	59	78	62	94	54	87	59	68	31
23	.02		.27				79	44	84	49	84	53	83	47	85	58	83	42
24	.30						74	44	76	41	84	55	82	50	96	49	86	44
25	.13	.03	.15				49	28	77	44	68	51	78	51	85	59	68	45
26	.56						33	20	65	46	77	48	77	43	86	56	80	45
27			.01				37	14	70	46	71	50	82	47	73	49	67	42
28							37	20	82	54	79	55	93	56	79	41	84	42
29		.04					43	27	72	38	88	53	98	66	85	49	68	46
30		.07			.09	.40	46	19	70	51	78	55	90	58	58	44	54	43
31									66	45			84	62	60	35		

CLIMATIC DATA-, Fargo 1994

	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							60	29	58	31	73	46	67	51	84	61	66	41
2							36	24	57	35	74	54	76	47	86	67	60	46
3		.30		.61		.03	52	30	64	46	83	54	71	62	87	62	66	52
4			.51	.55		.04	38	20	46	35	84	59	81	61	70	50	66	62
5						.01	40	16	49	30	80	61	78	64	77	43	72	52
6					.02		49	28	47	31	81	57	78	56	85	59	76	44
7				2.18	1.38		54	36	65	30	74	58	64	56	74	54	83	49
8	.13			.90			48	34	69	44	72	50	65	56	67	48	86	58
9			.05				50	29	70	36	74	58	76	53	66	52	90	63
10			.06				57	26	77	42	72	54	79	58	77	58	87	67
11			.14	.64		.12	62	32	73	43	76	54	78	63	78	55	79	58
12						.31	65	28	71	34	78	52	74	56	81	65	72	58
13		.24	.01	.27	.01	.67	68	33	84	55	81	60	71	60	69	48	72	61
14	.03			.01		.01	62	33	74	54	92	61	76	59	73	43	78	65
15				.18		.36	55	33	70	44	74	59	82	56	81	50	80	60
16		.05	.30			.12	62	30	72	50	63	55	77	59	86	61	68	49
17			.01				73	32	85	57	72	56	77	54	84	64	81	48
18				.07	.27		71	38	90	65	76	55	81	62	83	64	83	52
19			.91	.12	.01		58	33	90	58	89	66	72	62	73	56	84	55
20				.10			49	30	88	51	83	61	76	60	76	52	76	53
21				.05		.23	62	26	72	58	86	56	76	52	80	51	62	48
22							70	37	86	48	79	67	82	59	84	60	58	41
23		.34			.40		86	51	87	56	82	60	79	60	76	63	70	36
24		.01					61	36	76	54	82	56	79	57	89	57	77	50
25	.60	.11			.23		44	38	70	50	82	59	73	50	77	60	64	43
26	.99						40	31	70	40	78	59	76	54	80	56	61	34
27	.14		.07				39	25	80	50	77	59	79	48	77	52	63	43
28	.02		.21				40	31	88	60	76	58	81	55	73	47	66	36
29	.25						50	29	77	54	72	55	86	58	80	52	72	49
30			.06		.36		56	30	75	56	82	58	87	6	63	51	57	43
31									77	50			80	60	63	45		

CLIMATIC DATA-, Minot 1994																		
	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					.91		59	30	57	28	74	45	68	48	86	57	66	42
2			.16		.35		48	19	62	28	71	54	77	52	85	67	66	37
3			.04			.08	32	24	62	35	78	50	78	55	84	59	65	51
4			.08				45	21	67	36	73	57	81	54	73	52	74	52
5			.12				32	16	55	28	78	55	80	54	78	52	73	48
6				.20	.28		44	17	56	30	78	52	66	54	91	59	80	42
7							46	22	62	37	70	55	63	54	67	46	87	47
8			1.22				56	27	74	42	60	50	69	50	63	42	94	54
9	.36		.20				38	24	65	35	58	50	76	47	63	47	99	66
10			.12				48	26	73	42	68	51	89	61	72	58	85	59
11				.04			57	36	82	49	74	51	80	59	78	55	73	51
12			.08	.16	.08	.16	64	37	82	40	74	52	71	58	84	54	59	48
13			1.22	.12			59	38	78	41	70	50	70	52	67	48	75	47
14			.08			.31	60	36	74	47	68	52	76	50	78	42	74	54
15				.04			60	29	71	40	68	48	78	56	93	52	73	53
16		.11					57	31	76	47	64	50	74	51	92	64	75	42
17							67	40	73	51	70	52	81	50	84	58	83	49
18		.49			.31		81	47	93	62	69	48	89	64	82	58	83	50
19			.83				61	29	71	53	68	59	77	60	74	54	83	51
20		2.02		.87			57	30	54	47	78	57	70	59	80	50	82	48
21		.09				.04	45	34	66	48	80	57	77	59	86	56	58	36
22		.73				.04	65	33	73	49	77	58	88	58	84	58	69	33
23			.04				75	42	76	51	82	55	80	52	86	59	84	46
24		.08					75	37	73	49	85	58	80	52	87	56	86	50
25	.11						44	30	74	49	72	57	74	46	80	54	64	38
26							39	25	74	43	75	55	77	49	78	52	74	38
27			.43				37	20	66	47	66	55	80	50	68	43	64	40
28							42	22	83	50	76	58	89	59	76	44	76	36
29		.09					57	25	77	44	81	54	90	61	78	47	66	41
30		.20			.16		51	24	73	51	73	56	81	62	60	44	54	36
31									71	48			83	55	60	40		

CLIMATIC DATA-, Olivia 1994																		
	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							56	30	53	33	79	50	87	63	87	60	67	43
2						.18	66	28	56	34	76	48	84	47	85	62	61	47
3						1.04	33	22	60	38	75	49	75	60	85	62	61	47
4						.23	55	22	61	45	82	54	72	62	88	66	71	57
5			1.29	.24		.02	35	20	63	34	87	63	84	63	74	45	63	59
6			.02	.03			37	18	53	34	83	61	87	66	74	50	71	49
7			.29	.61			39	20	52	35	86	60	86	66	76	60	75	51
8				.03		.01	50	24	62	38	62	46	79	56	86	55	82	52
9				.15			61	37	71	38	69	49	73	56	69	48	82	55
10					2.22		59	28	70	42	75	53	75	56	60	55	83	59
11		.02	.32	.03			58	28	73	59	78	54	78	64	64	57	84	60
12						.17	61	34	83	40	78	54	83	54	72	60	84	64
13	.56		.36			.13	44	33	73	45	83	55	89	59	72	58	79	67
14		.03		.10		.48	64	32	86	54	86	60	68	56	69	43	78	66
15	1.25	.05		.17		.04	64	39	71	45	97	67	78	54	70	45	90	66
16				.13			52	34	76	46	79	60	78	58	75	50	80	57
17			.03	.13			60	34	80	49	84	61	80	55	79	51	69	46
18			.37				69	40	85	56	80	63	81	61	74	57	76	47
19							83	36	88	56	80	65	74	62	73	62	81	47
20			.29				60	34	91	54	90	71	84	56	73	56	83	56
21	.75		.14			.18	40	36	91	57	82	59	83	59	77	49	85	53
22			.09			.44	60	35	91	54	84	59	83	59	77	55	76	48
23		.25	.03		.47	.04	66	37	86	61	81	61	80	57	78	59	57	49
24		.65				.02	79	54	82	59	81	58	80	55	82	57	66	51
25	.22		.04				76	46	75	54	84	60	87	53	86	60	72	54
26	.36	.06	.34		1.25		50	39	71	45	83	58	74	51	87	58	63	38
27	.20						58	34	69	46	81	60	76	53	87	58	63	35
28							44	32	79	54	76	59	79	52	87	48	65	37
29	.89						34	26	88	63	76	59	80	54	70	47	67	42
30					.24		39	29	82	62	77	54	81	55	73	54	76	46
31				.06					96	52			84	56	68	50		

CLIMATIC DATA-, Rugby 1994																		
	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							58	28	59	24	76	43	73	51	84	60	54	46
2					.11		57	25	60	27	71	40	73	51	86	63	67	39
3			.15	.10	.49	1.13	30	25	69	36	78	48	73	61	84	60	66	41
4		.01				.57	47	16	63	33	73	58	79	57	73	51	74	54
5			.82	.04		.02	45	15	57	27	80	56	80	53	76	44	72	53
6				.06			42	19	60	81	80	49	80	53	85	53	77	31
7					.09		45	29	72	34	76	54	72	56	63	55	83	44
8	.25		.05				54	33	66	46	73	53	65	51	65	42	88	50
9	.20		.65				40	24	72	35	73	50	71	42	69	47	94	57
10			.49				48	23	80	44	65	52	85	59	69	57	81	70
11			.21	.20	.03	.17	55	30	80	42	73	49	83	59	78	57	70	55
12			.02		.07	.04	62	31	77	35	76	48	77	54	82	55	64	48
13		.03	.01	.15			67	37	76	50	71	52	72	55	66	47	74	49
14			.34			.16	67	35	74	46	70	52	75	50	74	48	76	56
15				.10		.06	60	27	72	38	69	46	76	53	89	45	72	63
16		.15					56	37	72	47	65	49	76	51	83	61	73	45
17							59	35	89	55	72	49	78	46	82	56	83	42
18				.12	.27		78	44	89	64	71	47	84	61	81	58	82	47
19		1.54	1.32	.05			64	29	80	49	70	46	83	59	73	54	81	51
20		.51		.11		.11	58	28	83	46	78	59	71	59	77	45	81	50
21		.48	.07	.04		.22	56	26	77	48	78	55	79	59	84	53	58	48
22		.37			.01		62	38	81	50	79	59	86	52	85	61	64	35
23		.36			.10		71	40	74	53	80	52	80	51	85	60	81	34
24		.31					76	35	72	51	85	61	78	53	87	49	82	55
25	.04		.53		.44		56	30	67	51	85	58	79	45	80	59	64	35
26			.03				44	27	69	40	76	55	77	48	78	50	69	34
27			.46		.60		38	20	80	47	73	53	78	44	68	46	63	46
28							41	23	80	47	78	60	86	49	74	42	71	36
29							46	20	70	44	77	53	87	59	78	45	63	42
30		.15	.04		.03	T	45	20	71	51	75	59	82	59	62	50	55	42
31					.02				76	37			83	54	64	40		

CLIMATIC DATA-, Williston 1994

	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							63	36	61	32	70	51	73	49	94	64	66	40
2			.12				49	28	68	33	73	52	81	54	88	67	65	42
3		.15		.16		.08	48	21	65	41	75	48	75	56	86	59	62	52
4			.94				45	24	63	31	80	54	78	52	79	54	72	53
5			.08				49	19	57	38	75	56	78	51	88	61	74	48
6		.31		.16			49	25	55	40	79	49	67	56	95	61	81	42
7			2.20				60	25	73	37	63	54	72	53	72	54	87	48
8	.58		.67				57	24	74	44	67	56	76	46	66	46	95	52
9	.01		.31				53	26	75	37	57	49	83	53	64	53	98	57
10							64	31	78	48	68	49	90	59	80	59	75	56
11					1.93		67	31	79	45	74	49	81	53	78	58	72	52
12			.04		.04	.04	74	31	85	45	68	55	78	56	86	59	67	52
13			.12	.28			73	44	83	51	69	50	72	52	71	48	71	56
14						.24	69	38	70	41	66	49	79	49	82	46	77	57
15			.28				62	28	75	37	69	42	77	56	97	55	72	51
16		.23			.08		72	33	77	51	60	48	75	50	92	64	78	44
17		.38	.04				82	42	79	49	69	51	87	51	87	57	82	48
18			.04		.04		81	50	74	51	71	51	91	60	77	57	86	54
19		T					61	32	72	.50	77	58	77	54	77	51	81	50
20	.24	1.37				.16	61	38	61	50	78	52	74	57	82	53	81	49
21						.04	66	37	71	47	85	60	84	54	88	57	55	38
22		.07			.39		80	40	79	49	80	54	86	56	83	60	72	35
23	.03	.11					80	47	80	55	87	55	82	48	82	60	83	46
24	.36	.05					72	41	76	48	85	53	82	54	86	54	80	46
25	.22	.02					42	31	75	47	64	50	77	53	82	61	69	40
26			.04				43	24	76	43	76	12	78	45	84	60	76	43
27			.20				44	21	86	53	69	51	85	50	68	47	64	47
28		.02					46	26	86	59	80	55	95	58	76	43	79	40
29		.06					51	26	74	45	89	58	93	55	78	48	66	42
30		.13			.08		56	23	71	49	76	54	86	62	57	43	60	43
31					.04				75	41			85	59	64	35		

SOIL TEST RESULTS AT VARIOUS WEED EXPERIMENT LOCATIONS						
	Soil Texture	Organic matter	pH	lb/A N	PPM P	PPM K
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	Silty clay loam	4.6	7.8	2.75	37	300
Crookston, MN (Additives, Actio 301)	Loam	5.3	7.9	211	58	440
Crookston, MN (Broadleaf herbicides, soil applied)	Clay loam	3.8	8.0	150	8	180
Cuba, ND		7.0	8.2	3	4	100
Fargo, ND (Sec. 22)	Silty clay	6.0	7.5	190	26	1095
Fargo (new leaf removal, post Lorsban, Upbeet & insecticide)	Silty clay	4.6	7.0	118	38	385
Fargo (Tolerance to herbicides, replants, barley cover crop, herbicides and yield, late season weed control)	Silty clay	4.8	7.3	117	15	265
Fargo (Grass control experiment)	Silty clay	5.8	6.9	133	28	475
Fargo (Time of thinning, tolerance to herbicides, methanol)	Silty clay	4.5	6.9	109	35	435
Fargo (Sec. 22) 1992 Residue Expt.	Clay	5.3	7.7	84	14	430
Fargo (Sec. 22) Residue experiments	Clay	6.0	7.8	40	29	440
Hillsboro, ND	Silty clay loam	7.4	6.5	151	17	660
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	Silty clay loam	6.0	7.6	366	58	3800
Prosper, ND	Silty clay loam	3.2	7.0	90	23	315
Renville, MN	Silty clay loam	4.9	7.6	50	58	310
Robbin, MN	Clay loam	4.5	7.7	312	12	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	Loam	3.8	7.8	66	30	160
Valley City, ND	Stony loam	9.4	6.7	5	5	1415
West Fargo, ND	Silty clay	3.6	7.2	8	42	1460
Williston, ND	Loam	2.3	6.8	Fertilized by test		
A.K. Ekre Grassland Preserve	Loamy sand	2.9	6.8	3	3	70

KEY TO ABBREVIATIONS AND EVALUATIONS

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

All preplant incorporated or preemergence treatments were applied in 17 gpa water at 35 psi through 8002 nozzle tips and all postemergence treatments were applied in 8.5 gpa water at 35 psi through 8001 nozzle tips except where stated otherwise.

All treatments were applied with a bicycle wheel-type plot sprayer unless otherwise stated. Preplant incorporation was by field cultivator + harrow or as stated in table and preemergence incorporation was by harrowing twice.

Treatments with a + indicate tank mixtures, with an & indicate formulation mixtures and with a / indicate a separate application.

Species

Abww = Absinth wormwood	Foba = Foxtail barley	Rrpw = Redroot pigweed
Alfa = Alfalfa	Fomi, Ftmi = Foxtail millet	Ruth = Russian thistle
Amaz = Amaranth	Fota, fxtl = Foxtail species	Safl, Saff = Safflower
Barl, Bar = Barley	Grft = Green foxtail	Shpu = Shepard's-purse
Bdlf = Broadleaf	Gfpw = Greenflower pepperweed	Soyb, Sobe = Soybean
Biww = Biennial wormwood	Girw = Giant ragweed	Spkw = Spotted knapweed
Bubu = Buffalobur	Howe = Horseweed	Spsp = Spotted spurge
Bygr = Barnyardgrass	HRSW = Hard red spring wheat	Sugb, Sgbt = Sugarbeet
Cath = Canada thistle	KOCZ = Kochia	Sunfl, Sufl = Sunflower
Cano = Canola	Lath = Ladysthumb	Swcl = Sweet clover
Cocb = Common cocklebur	Lent = Lentils	Tabw = Tame buckwheat
Colq = Common lambsquarters	Lesp = Leafy spurge	Tamu = Tansy mustard
Coma = Common mallow	Llsa = Lanceleaf sage	Taoa = Tame oat
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	Pest = Perennial sowthistle	Wesa = Western salsify
Duru = Durum wheat	Pesw = Pennsylvania smartweed	Wibw = Wild buckwheat
Ebns = Eastern black nightshade	Pibe = Pinto bean	Wimu = Wild mustard
Fach = False chamomile	Powe = Pondweed	Wioa = Wild oat
Fibw = Field bindweed	Prle = Prickly lettuce	Wipm = Wild-proso millet
Fipc = Field pennycress	Prmi = Proso millet (tame)	Yeft = Yellow foxtail
Fisb = Field sandbur	Prpw = Prostrate pigweed	
Flwe = Flixweed	Qugr = Quackgrass	

METHODS	
PPI = Preplant incorporated	EPOST = Early Postemergence
PEI = Preemergence incorporated	P, PO, POST = Postemergence
PRE, PE = Preemergence	POSTDIR = Postemergence Directed

MISCELLANEOUS	
DF = Dry flowable	alk = alkanolamine salt
F = Fall	bee = Butoxyethyl ester
FL = F = Flowable	dea = diethanolamine salt
S = Spring	dma = Dimethylamine salt
L = Liquid	ioe = isooctyl ester
LC = Liquid concentrate	MS, MVO = methylated vegetable oil
WP = Wettable powder	PO, OC = Petroleum oil concentrate (17% emulsifier)
WDG = Water dispersible granules	SURF = S = Surfactant
G = Granules or gallon/A	NIS = nonionic surfactant
SG = Soluble granules	28N, UAN = 28% liquid nitrogen fertilizer
Inc = I = Incorporation	AMS = ammonium sulfate
%ir = inju = Percent injury rating	AMN = ammonium nitrate
%sr = %std, strd = Percent stand reduction	
HT = Plant height	
SPK = Spike stage	
Tswt = TW = Test weight	
Yld = Yield	

Adjuvants	Company
Mor-Act = Petroleum oil adjuvant	Wilbur-Ellis
Scoil = Methylated seed oil	AGSCO
Sun-It II = containing methylated seed oil	AGSCO
DASH, DASH-HC	BASF Corp.
Methoil	Farmland Industries
MSO	Loveland Industries
Class Destiny	Cenex Land-O-Lakes
MES-100	
R-11	Wilbur-Ellis
Preference	Cenex Land-O-Lakes
Li700	Loveland Industries
Class ACT	Cenex Land-O-Lakes
Silwet L-77	Loveland Industries
Spray Booster S	Cenex Land-O-Lakes
Activator 90	Loveland Industries
ASPA-80, AMWAY 80	Amway
Indicate 5 = pH reducer	
Choice	Loveland Industries
AMS Plus	Terra
Surfate	AGSCO
Cayuse	Wilbur-Ellis
X-77 = Nonionic surfactant	Valent
CL172A Surfactant	Cenex Land-O-Lakes
CL7769 MSO	Cenex Land-O-Lakes

LIST OF HERBICIDES TESTED IN 1994

Common Name or Code Name	Abbre-viation	Company	Formulation	Trade Name
AC 299,263		American Cyanamid	1 lb/gal EC	
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	3.67 lb/gal EC	Galaxy
Alachlor	Alac	Monsanto	4 lb/gal E 4 lb/gal MT, 15% G 65% WDG	Several
Atrazine	Atra	Various	80% WP, 90% DF, 4 lb/gal F	Numerous
Bentazon	Bent	BASF	4 lb/gal S	Basagran
Bromoxynil	Brox	Rhône-Poulenc	2 lb/gal E	Buctril
CGA 248757		Ciba	5% WG	
Chlorimuron	Clim	DuPont	25% DF	Classic
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	80% WP, 90% DF 4 lb/gal F	Bladex
Cycloate	Cycl	Zeneca	6 lb/gal E	Ro-Neet
Desmedipham	Desm	AgrEvo	1.3 lb/gal E	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	Difp	AgrEvo	3 lb/gal E	Hoelon
Difenzoquat	Dife	American Cyanamid	2 lb/gal S	Avenge
Endothall	Endo	Elf Atochem	3 lb/gal S	Herbicide 273

Common Name or Code Name	Abbre-viation	Company	Formulation	Trade Name
EPTC	EPTC	Zeneca	7 lb/gal E 25% G	Eptam
EPTC&Dichlormid	EPTC&Dcmd	Zeneca	6.7 lb/gal EC 25% G	Eradicane
Ethalfluralin	Etha	DowElanco	3 lb/gal E 10% G	Sonalan
Ethametsulfuron	Emsu	DuPont	75% DF	Muster
Ethofumesate	Etho	AgrEvo	4 lb/gal F 1.5 lb/gal E	Nortron
F8426		FMC	50%	None
F6285		FMC	4 lb/gal F	None
Fenoxaprop-P	Fenx	AgrEvo	0.79 lb/gal E	Option II
Fenx & 2,4-D & MCPA		AgrEvo	2.71 lb/gal E	Tiller
Fenx & MCPA		AgrEvo	0.67+4 lb/gal E	Dakota
Fenx & MCPA & Thifensulfuron & Tribenuron		AgrEvo	1.6:7.6:0.187:0.092	Cheyenne
Fluazifop-P	Flfp-P	Zeneca	1 lb/gal E	Fusilade 2000
Fluazifop-P & Fenoxaprop	Flfp+Fenx	Zeneca	2.66 lb/gal E	Fusion
Flumetsulam & Metolachlor	Flms & Meto NAF2	DowElanco	7.66 lb/gal	Broadstrike+Dual
Flumetsulam & Trifluralin	Flms & Trif XRM-5313	DowElanco	3.65 lb/gal	Broadstrike+Treflan
Flumetsulam & Clopyralid	Flms & Clpy NAF-72	DowElanco	85.6 % DF	Broadstrike plus corn Pre/PPI
Flumetsulam & Clpy & 2,4-D	Flms & Clpy & 2,4-D NAF-73	DowElanco	84.3 % DF	Broadstrike plus corn Post
Flumiclorac	Flmc	Valent	0.86 lb/gal EC	Resource
Fluroxypyr	Flox	DowElanco	1.7 lb/gal	Starane
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

Common Name or Code Name	Abbre-viation	Company	Formulation	Trade Name
Glyphosate & dicamba	Glyt & Dica	Monsanto	1.1 + 0.5 lb/gal S	Fallow Master
Imazaquin	Imqn	American Cyanamid	1.5 lb/gal	Scepter
Imazethapyr	Imep	American Cyanamid	2 lb/gal	Pursuit
Imazethapyr & Pendimethalin	Imep & Pend	American Cyanamid	2.9E	Pursuit Plns
Imazamethabenz	Immb	American Cyanamid	2.5 lb/gal E	Assert
Lactofen	Lact	Valent	2 lb/gal S	Cobra
MCPA	MCPA	Rhône-Poulenc	4 lb/gal E, S	Several
Metolachlor	Meto	Ciba	8 lb/gal E	Dual
Metolachlor & Benoxacor	Meto & Bxcr	Ciba	7.8 lb/gal E	Dual II
Metribuzin	Metr	Miles DuPont	4 lb/gal F, 75% DF 4 lb/gal F, 75% DF	Sencor Lexone
Metsulfuron	Mets	DuPont	60% DF	Ally/Escort
MON 12000	MON12037	Monsanto	75% DF	Permit
MON 12041	MON12041	Monsanto	15% DF MON12000 45% DF MON13900	Battalion
MON 13200	MON13200	Monsanto	2 lb/gal	None
Nicosulfuron	Nico	DuPont	75% DF	Accent*
Paraquat	Para	Zeneca	2.5 lb/gal S 2 lb/gal S	Gramoxone Extra Cyclone
PCC 700		UAP	15-0-0-17 (Zn)	ACA
Pendimethalin	Pend	American Cyanamid	4 lb/gal E 3.3 lb/gal E	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
Primisulfuron	Prim	Ciba	75% DF	Beacon
Propachlor	Prcl	Monsanto	4 lb/gal F	Ramrod
Propanil	Prnl	Rhom & Haas	80% DF	Stampede SDEDF
Pyrazon	Pyzn	BASF	4.2 lb/gal F	Pyramin

Common Name or Code Name	Abbre-viation	Company	Formulation	Trade Name
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, Sth	BASF	1.5 lb/gal E 1.0 lb/gal E	Poast Poast-Plus*
Sulfometuron	Sume	DuPont	75% DF	Oust
Thifensulfuron	Thif	DuPont	25% DF	Pinnacle
Thifensulfuron & Tribenuron	Thif & Trib	DuPont	75% DF (2:1)	Harmony Extra
Tribenuron	Trib	DuPont	75% DF	Express
Triallate	Tria	Monsanto	4 lb/gal E, 10% G	Far-Go
Triflusulfuron	Tfsu	DuPont	50%DF	Upbeet
Triasulfuron	Trsu	Ciba	75% DF	Amber
Triclopyr	Trcp	DowElanco	4 lb/gal	Garlon*
Trifluralin	Trif	DowElanco	4 lb/gal E 10% G	Several*
2,4-D	2,4-D	Various	Various E, S, WSP	Numerous
2,4-DB	2,4-DB	Various	2 lb/gal	Numerous

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

Leafy spurge control with glyphosate plus 2,4-D applied in late-June. 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 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 on June 29, 1994 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 93% leafy spurge control 3 months after treatment (MAT) when applied alone or with the adjuvant X-77 (Tables 1 and 2). Control with picloram or picloram plus 2,4-D averaged over application rate was 41 and 78% at Jamestown and Valley City, respectively. Grass injury only averaged 11% 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.

Glyphosate alone provided much less leafy spurge control then glyphosate plus 2,4-D at comparable rates (Tables 1 and 2). Glyphosate alone only provided 4% leafy spurge control at Jamestown with 49% grass injury 3 MAT (Table 1). Control declined rapidly at Jamestown by 12 MAT for all treatments. Glyphosate plus 2,4-D averaged 53% control compared to 5% with picloram plus 2,4-D (Table 1) .

Leafy spurge control with glyphosate plus 2,4-D still averaged 68% 12 MAT at Valley City and was much better then either picloram plus 2,4-D treatment that only averaged 37% (Table 2). Control was similar with glyphosate whether applied alone or with 2,4-D or picloram at Valley City, but grass injury tended to be higher with glyphosate plus X-77 compared to glyphosate plus 2,4-D.

The increased control at Valley City compared to Jamestown may have been due to weather conditions at the time of treatment. The temperature was 91 F with 54% relative humidity at Jamestown compared to 62 F and 60% at Valley City. The warmer conditions at Jamestown may have stressed the plants and dried the herbicide application too rapidly for good absorption and translocation.

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 3). 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).

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. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Glyphosate plus auxin herbicide combinations for leafy spurge control applied in late-June at Jamestown, North Dakota.

		Evaluation			
		3 MAT[a]		12 MAT[a]	
Treatment	Rate	Control	Grass inj.	Control	Grass inj
	lb/A	%			
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	91	8	44	0
Glyphosate+2,4-D[b]+picloram+X-77	0.3+0.45+0.19+0.5%	91	5	63	0
Glyphosate+2,4-D[b]+picloram+X-77	0.4+0.6+0.25+0.5%	84	27	32	0
Glyphosate+picloram+X-77	0.4+0.25+0.5%	93	10	63	0
Glyphosate+2,4-D[b]	0.4+0.6	94	10	64	0
Glyphosate+2,4-D[b]	0.3+0.45	88	8	60	0
Glyphosate+X-77	0.4+0.5%	7	44	29	0
Glyphosate	0.4	1	37	11	0
Glyphosate+X-77	0.3+0.5%	4	49	18	0
Picloram	0.25	34	0	19	0
Picloram+2,4-D	0.25+1	54	0	5	0
Picloram+2,4-D	0.5+1	36	0	5	0
LSD (0.05)		22	22	23	..

[a]Months after treatment.
[b]Commercial formulation LandmasterBW.

Table 2. Glyphosate plus auxin herbicide combinations for leafy spurge control applied in late-June at Valley City, North Dakota.

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

[a]Months after treatment.
[b]Commercial formulation LandmasterBW.

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

1993 Treatment	1993 Rate	1994 Treatment	1994 Rate	Evaluation 3 MAFT[a] Control	3 MAFT[a] Grass inj.	12 MAFT[a] Control	12 MAFT[a] Grass inj.	15 MAFT[a] Control	15 MAFT[a] Grass inj.
	lb/A		lb/A	%					
				Jamestown					
Gly + 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	51	0
Gly + 2,4-D[b] + X-77	0.4+0.6+0.5%	Picloram + 2,4-D	0.25+1	90	12	59	0	68	0
Gly + 2,4-D[b] + X-77	0.4+0.6+0.5%	Dicamba + X-77	2+0.5%	94	11	68	0	75	0
Picloram + 2,4-D	0.25+1	Picloram + 2,4-D	0.25+1	60	0	23	0	62	0
Dicamba + X-77	2+0.5%	Dicamba + X-77	2+0.5%	76	0	22	0	69	0
Glyphosate + 2,4-D[b] + pic[c] + X-77	0.4+0.6+0.25+0.5%	Gly + 2,4-D[b] + pic + X-77	0.4+0.6+0.25+0.5%	97	8	65	0	72	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	59	0
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	65	0
LSD (0.05)				13	7	18	...	NS	NS
				Valley City					
Gly + 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	85	12
Gly + 2,4-D[b] + X-77	0.4+0.6+0.5%	Picloram + 2,4-D	0.25+1	97	16	94	5	92	0
Gly + 2,4-D[b] + X-77	0.4+0.6+0.5%	Dicamba + X-77	2+0.5%	97	16	93	0	94	0
Picloram + 2,4-D	0.25+1	Picloram + 2,4-D	0.25+1	89	1	43	0	98	0
Dicamba + X-77	2+0.5%	Dicamba + X-77	2+0.5%	80	3	30	0	96	0
Glyphosate + 2,4-D[b] + pic[c] + X-77	0.4+0.6+0.25+0.5%	Gly +2,4-D[b] + pic + X-77	0.4+0.6+0.25+0.5%	98	11	91	0	90	2
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	90	0
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	93	0
LSD (0.05)				8	9	17	3	NS	5

[a]Months after the first treatment.
[b]Glyphosate + 2,4-D was a commercial formulation - Landmaster BW.
[c]Picloram.

Leafy spurge control with fall-applied imazethapyr, picloram, and quinclorac. Rodney G. Lym and Calvin G. Messersmith. Previous research at North Dakota State University has shown that fall-applied imazethapyr at 2 to 4 oz/A and quinclorac at 16 to 24 oz/A provide good leafy spurge control. However, treatment costs at these rates would be prohibitive. Control has occasionally been increased when these herbicides have been applied with an adjuvant. The purpose of this research was to evaluate imazethapyr and qinclorac applied at reduced rates with various spray adjuvants or other herbicides for leafy spurge control.

The experiment was established near Fort Ransom and on the Ekre Experiment Station, near Walcott, ND, on September 23, 1993. Leafy spurge was approximately 24 inches tall, branched, and the leaves were beginning to senesce and turn red. The soil was a loam at Fort Ransom and loamy sand at Ekre. Soil moisture was near field capacity, and the pH was 6.8 at both locations. Soil organic matter was much higher at Fort Ransom than Ekre at 7.0 and 2.9%. respectively. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Plots were 10 by 30 ft, and each treatment was replicated three and four times at Ekre and Fort Ransom, respectively. Visual evaluations were based on percent stand reduction as compared to the control.

Leafy spurge control was better at Ekre than Fort Ransom regardless of treatment (Table). The decreased control at Fort Ransom compared to Ekre is likely due to the high soil organic matter at Fort Ransom. Imazethapyr, quinclorac, and picloram generally have moderate to long soil residual in North Dakota soils but can be bound by organic matter which would decrease control. Leafy spurge growth stage, soil moisture, and weather conditions at treatment were similar at both locations and should not have affected initial herbicide absorption and translocation.

Picloram and quinclorac at 0.5 to 1 lb/A and imazethapyr at 0.125 to 0.25 lb/A provided better than 80% control 9 months after treatment (MAT) at Fort Ransom (Table). However, control declined rapidly and no treatment provided satisfactory control by 12 MAT. All treatments provided excellent control at Ekre 9 MAT but only picloram at 1 lb/A provided 90% or better control 12 MAT. Qinclorac plus Sun-It II (a methylated seed oil adjuvant) provided similar control regardless of herbicide rate and averaged 57% 12 MAT at Ekre, similar to picloram at 0.5 lb/A. Imazethapyr provided control averaging 49% at Ekre, whether applied with the adjuvants X-77 plus 28% N or with picloram, 2,4-D, or quinclorac.

In general, quinclorac at 0.5 to 1 lb/A and imazethapyr at 0.125 to 0.25 lb/A applied with Sun-It II plus 28% N provided similar leafy spurge control to picloram at 0.5 to 1 lb/A. Herbicides applied with adjuvants provided better control than various herbicide combination treatments. (Published with approval of the Agric. Exp. Stn., North Dakota State University, Fargo 58105)

Table. Leafy spurge control with picloram, quinclorac, and imazethapyr fall-applied at two locations in North Dakota (Lym and Messersmith).

		Location and evaluation date			
		Fort Ransom		Ekre	
Treatment	Rate	9 MAT[a]	12 MAT[a]	9 MAT[a]	12 MAT[a]
	lb/A	% control			
Picloram+2,4-D+Sun-It II	0.25+1+0.5%	61	20	95	51
Picloram+Sun-It II	0.5+0.5%	85	20	92	69
Picloram+Sun-It II	1+0.5%	97	32	99	94
Quinclorac+Sun-It II	0.5+0.5%	76	17	96	67
Quinclorac+Sun-It II	0.75+0.5%	82	14	99	48
Quinclorac+Sun-It II	1+0.5%	90	34	98	55
Picloram+quinclorac+Sun-It II	0.5+0.5+0.5%	96	25	96	69
Imazethapyr+X-77+28%N	0.25+0.25%+0.5%	88	19	98	47
Imazethapyr+picloram+X-77+28%N	0.125+0.25+0.25%+0.5%	82	11	87	61
Imazethapyr+picloram+X-77+28%N	0.25+0.25+0.25%+0.5%	96	23	99	55
Imazethapyr+picloram+X-77+28%N	0.25+0.5+0.25%+0.5%	82	7	97	50
Imazethapyr+2,4-D+X-77+28%N	0.25+1+0.25%+0.5%	69	16	100	29
Imazethapyr+quinclorac+X-77+28%N	0.25+0.5+0.25%+0.5%	79	22	95	49
LSD (0.05)		20	15	NS	30

[a]Months after treatment.

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. Previous research has shown that quinclorac provided the best leafy spurge control when fall-applied.

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

[a]Treatments applied annually in September for 3 yr.

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. Long-term control with quinclorac plus BAS-090 or Scoil was better than 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 reduced control when applied with picloram plus 2,4-D.

Quinclorac plus BAS-090 or Scoil fall-applied provided good leafy spurge control and could be an alternative to picloram plus 2,4-D. There was no grass injury with any treatment. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Comparison of liquid and powder picloram formulations applied alone or with glyphosate or adjuvants for leafy spurge control. Rodney G. Lym. Previous research at North Dakota State University has shown that the liquid picloram K-salt formulation provided better leafy spurge control than water-soluble powder (WSP) formulations. However, control from the picloram WSP formulations was improved when applied with 2,4-D or adjuvants compared to the dry formulation alone. The purpose of this research was to further evaluate various formulations of picloram alone and with additives for improved leafy spurge control compared to the picloram K-salt formulation.

A series of experiments was established in the spring or fall of 1992 at various locations in North Dakota. All treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi either in June or September when the plants were in the true-flower or fall-regrowth growth stages, respectively. The spring treatments were reapplied in June 1993. All experiments were in a randomized complete block design with four replications, and plots were 10 by 30 ft. Treatments were evaluated visually based on percent stand reduction as compared to the control.

The first experiment evaluated picloram formulated as the K-salt, an acid WSP (XRM-5255), or a K-salt WSP (XRM-5173) applied either alone or with Scoil (a methylated seed oil adjuvant) or 2,4-D. Picloram K-salt applied as a liquid formulation provided better leafy spurge control than the acid WSP and tended to be better than the K-salt WSP following one or two annual applications (Table 1). Control with the K-salt liquid averaged over rates was 71 and 80% 12 and 24 months after the first treatment (MAFT), compared to 53 and 54% for XRM-5255, respectively, and 64 and 68% for XRM-5173, respectively. The difference between picloram formulations was most pronounced when the lower rates of 0.25 and 0.5 lb/A were used. XRM-5255 or XRM-5173 at 0.5 lb/A applied either with Scoil or 2,4-D at 0.25 lb/A provided control similar to the comparable picloram K-salt liquid formulation treatment.

The second experiment evaluated the various picloram formulations applied alone or with various liquid or powder formulations of 2,4-D at two locations in North Dakota. In general, picloram liquid and powder formulations provided similar leafy spurge control at comparable rates (Table 2). However, initial leafy spurge control with picloram plus 2,4-D tended to be higher when at least one of the herbicides was a liquid formulation, compared to when both were WSP formulations.

Picloram liquid K-salt and K-salt powder (XRM-5173) applied in the late-flower to early-seed-set growth stage provided similar leafy spurge control when applied with 2,4-D LVE or 2,4-D amine or a seed-oil adjuvant (Table 3). However, control with picloram acid powder (XRM-5255) was improved when applied with 2,4-D compared to applied alone. Glyphosate plus 2,4-D applied at 4 + 7 oz/A provided the most consistent control at both locations, averaging 78 and 69% 3 and 24 MAFT applied alone or with picloram. There was no grass injury at either location.

Glyphosate plus 2,4-D at 4 + 7 oz/A applied in September did not provide satisfactory leafy spurge control the following growing season (Table 4). Control was similar with all picloram formulations, whether applied alone or with 2,4-D or a seed-oil adjuvant. No treatment provided satisfactory control 12 months after treatment.

In summary, picloram K-salt liquid formulation provided better leafy spurge control than the acid powder formulation when applied in mid-June during the true-flower growth stage. XRM-5255 or XRM-5173 provided similar leafy spurge control as liquid picloram K-salt when applied with 2,4-D or a seed-oil adjuvant. Glyphosate plus 2,4-D provided good leafy spurge control when applied in late June but not when fall-applied (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Comparison of picloram liquid and water-soluble powder formulations for leafy spurge control applied in June 1992 and 1993, established near Valley City, ND (Lym).

Treatment	Rate	Months after first treatment			
		3	12	15	24
	—— lb/A ——	—— % control ——			
Picloram[a]	0.25	67	48	68	65
XRM-5255[b]	0.25	36	45	61	33
XRM-5173[c]	0.25	51	38	52	41
Picloram[a]	0.5	96	73	85	81
XRM-5255[b]	0.5	46	37	57	44
XRM-5173[c]	0.5	85	70	71	70
Picloram[a]	1	100	92	98	94
XRM-5255[b]	1	97	78	76	85
XRM-5173[c]	1	99	84	92	93
XRM-5255[b] + Scoil	0.5 + 1 qt	98	88	75	78
XRM-5173[c] + Scoil	0.5 + 1 qt	97	88	83	79
Picloram[a] + 2,4-D	0.25 + 1	90	64	89	79
XRM-5255[b] + 2,4-D	0.25 + 1	91	57	93	79
XRM-5173[c] + 2,4-D	0.25 + 1	91	48	93	76
LSD (0.05)		17	25	13	18

[a]Picloram K-salt liquid - Tordon 22K.
[b]Picloram acid formulated as a water-soluble powder.
[c]Picloram K-salt formulated as a water-soluble powder.

Table 2. Comparison of picloram water-soluble acid powder, K-salt powder, and liquid K-salt formulations alone and with liquid and powder 2,4-D formulations for leafy spurge control when applied in June 1992 and 1993 at Valley City and West Fargo, ND (Lym).

Treatment	Rate	Months after first treatment							
		Valley City			West Fargo			Mean	
		3	12	24	3	12	24	3	24
	— lb/A —	% control							
XRM-5255[a]	0.25	69	13	51	31	8	30	50	40
XRM-5173[b]	0.25	90	24	45	38	9	25	64	35
Picloram[c]	0.25	82	19	49	28	4	8	55	28
XRM-5238[d]	1	56	6	31	44	9	8	50	19
2,4-D amine WSP[e]	1	41	3	23	45	6	8	43	15
2,4-D amine liquid[f]	1	48	5	26	46	5	15	47	20
XRM-5255[a] + XRM-5238[d]	0.25 + 1	78	23	64	52	6	14	65	39
XRM-5173[b] + XRM-5238[d]	0.25 + 1	68	17	50	60	12	27	64	38
Picloram[c] + XRM-5238[d]	0.25 + 1	90	37	66	63	9	15	76	40
Picloram[c] + 2,4-D amine WSP[e]	0.25 + 1	83	20	59	62	19	34	72	46
Picloram[c] + 2,4-D amine liquid[f]	0.25 + 1	91	26	65	77	19	38	84	51
XRM-5255[a] + 2,4-D amine WSP[e]	0.25 + 1	90	30	78	68	18	30	78	54
XRM-5173[b] + 2,4-D amine WSP[e]	0.25 + 1	93	31	70	68	15	32	80	51
LSD (0.05)		22	12	16	17	9	21	27	21

[a]Picloram acid formulated as a water-soluble powder.
[b]Picloram K-salt formulated as a water-soluble powder.
[c]Picloram K-salt liquid - Tordon 22K.
[d]2,4-D amine water-soluble powder 85%.
[e]80% WSP (Savage)
[f]Dimethylamine (Weedar 64)

Table 3. Comparison of various picloram formulations alone or with additives and glyphosate plus 2,4-D applied during the late-flower to early seed set growth stage at Sheyenne and West Fargo, ND (Lym).

		Month after first treatment							
		Sheyenne			West Fargo			Mean	
Treatment	Rate	3	12	24	3	12	24	3	24
	— oz/A —	% control							
Glyphosate + 2,4-D[a]+ X-77	4+7+0.5%	99	69	58	91	80	70	74	64
Glyphosate + 2,4-D[a] + picloram + X-77	4+7+4+0.5%	99	87	70	96	76	78	81	74
XRM-5255[b]	4	97	42	3	18	12	8	27	5
XRM-5255[b] + 2,4-D LVE	4+16	97	36	35	85	21	44	28	39
XRM-5255[b] + 2,4-D amine	4+16	99	60	53	92	13	8	36	31
XRM-5173[c]	4	96	48	17	40	7	5	28	11
XRM-5173[c] + 2,4-D LVE	4+16	99	47	44	91	19	26	33	35
XRM-5173[c] + 2,4-D amine	4+16	99	41	26	96	22	30	32	28
Picloram[d]	4	99	60	35	74	12	16	39	25
Picloram[d] + 2,4-D amine	4+16	99	53	33	92	14	27	33	30
Picloram[d] + 2,4-D LVE	4+16	100	55	77	92	13	16	34	46
Picloram[d] + BAS-090	4+1 qt	100	63	65	95	28	49	45	57
Picloram[d] + 2,4-D + BAS-090	4+16+1 qt	99	56	90	90	12	26	31	57
Picloram[d] + Scoil	4+1 qt	99	41	54	90	17	29	29	41
Picloram[d] + 2,4-D + Scoil	4+16+1 qt	99	48	81	91	23	44	35	57
LSD (0.05)		2	NS	34	16	14	27	15	39

[a]Commercial formulation - Landmaster BW.
[b]Picloram acid formulated as a water-soluble powder.
[c]Picloram K-salt formulated as a water-soluble powder.
[d]Picloram K-salt liquid - Tordon 22K.

Table 4. Comparison of various picloram formulations alone or with additives and glyphosate plus 2,4-D applied in September 1992 near Hunter, ND (Lym).

Treatment	Rate	Months after treatment 9	12
	—— oz/A ——	—— % control ——	
Glyphosate + 2,4-D[a]+ X-77	4+7+0.5%	30	0
Glyphosate + 2,4-D[a] + picloram + X-77	4+7+8+0.5%	98	32
XRM-5255[b]	8	92	15
XRM-5255[b] + 2,4-D LVE	8+16	96	33
XRM-5255[b] + 2,4-D amine	8+16	96	22
XRM-5173[c]	8	99	62
XRM-5173[c] + 2,4-D LVE	8+16	98	40
XRM-5173[c] + 2,4-D amine	8+16	95	33
Picloram[d]	8	83	11
Picloram[d] + 2,4-D amine	8+16	83	6
Picloram[d] + 2,4-D LVE	8+16	84	6
Picloram[d] + BAS-090	8+1 qt	87	20
Picloram[d] + 2,4-D + BAS-090	8+16+1 qt	90	31
Picloram[d] + Scoil	8+1 qt	86	5
Picloram[d] + 2,4-D amine + Scoil	8+16+1 qt	92	25
LSD (0.05)		14	35

[a]Commercial formulation - Landmaster BW.
[b]Picloram acid formulated as a water-soluble powder.
[c]Picloram K-salt formulated as a water-soluble powder.
[d]Picloram K-salt liquid - Tordon 22K.

Comparison of imazaquin, imazethapyr, and 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. Soon several formulations of 2,4-D will no longer be available because they will not be 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 applied alone or with other herbicides for leafy spurge control.

The first 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.

The water soluble powder CL-782 provided only 68% topgrowth control 1 month after the first treatment (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 65% control following three annual appolications, which was better leafy spurge control than for the other 2,4-D formulations evaluated. Picloram applied at 0.5 lb/A for 3 consecutive years provided 97% leafy spurge control.

A second experiment was established August 27, 1992 near Chaffee when leafy spurge was in the fall regrowth stage. Picloram plus 2,4-D dimethylamine provided better leafy spurge control than picloram plus 2,4-D mixed amine 12 MAFT and tended to provide better control 24 MAFT (Table 2). Imazaquin or imazethapyr applied at 4 oz/A with Scoil (methylated crop oil adjuvant) provided control similar to picloram plus 2,4-D 21 MAFT. However, control declined rapidly especially by 24 MAFT. Control was not improved when 2,4-D mixed amine was applied with either imazaquin or imazethapyr plus Scoil.

In general, leafy spurge control was similar with most 2,4-D formulations. 2,4-D mixed amine provided better control than other formulations evaluated but only after 3 annual applications. Control was enhanced when 2,4-D dimethylamine but not mixed amine was applied with picloram but not with imazethapyr or imazaquin. (Published with approval of the Agric. Exp. Stn., North Dakota State University, Fargo 58105).

Table 1. Comparison of various 2,4-D formulations applied in June 1992 through 1994 for leafy spurge control (Lym and Messersmith).

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

Table 2. Comparison of 2,4-D formulations applied with imazaquin or imazethapyr twice annually in the fall near Chaffee, ND (Lym and Messersmith).

Treatment	Rate	Months after first treatment			
		9	12	21	24
	— oz/A —	% control			
2,4-D mixed amine[a]	32	81	8	69	21
Picloram	8	95	27	98	22
Picloram + 2,4-D mixed amine[a]	8 + 16	98	39	98	36
Picloram + 2,4-D dimethylamine	8 + 16	99	61	95	50
Imazaquin + Scoil	2 + 1 qt	93	23	87	28
Imazethapyr + Scoil	2 + 1 qt	93	18	99	26
Imazaquin + Scoil	4 + 1 qt	98	43	88	23
Imazethapyr + Scoil	4 + 1 qt	85	50	94	8
2,4-D mixed amine[a] + imazaquin + Scoil	8 + 2 + 1 qt	97	15	87	9
2,4-D mixed amine[a] + imazethapyr + Scoil	8 + 2 + 1 qt	97	43	79	17
LSD (0.05)		14	24	16	18

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

Comparison of picloram amine, ester, and potassium salt formulations applied at three growth stages for leafy spurge control. Rodney G. Lym. Picloram formulated as the potassium (K) salt (Tordon 22K) has been the most effective herbicide for leafy spurge control. However, picloram is poorly absorbed into leafy spurge, so relatively high rates are used which means high treatment costs. The purpose of this research was to evaluate an amine and ester formulation of picloram for leafy spurge control.

The liquid picloram formulations evaluated included a triisopropanol amine, isooctyl ester, and K-salt. Picloram amine was commercially combined with 2,4-D triisopropanol amine at a ratio of 1:4 (Tordon 101) and picloram ester was commercially combined with triclopyr butoxyethyl ester at 1:2 (Access). Previous research at North Dakota State University has shown that triclopyr does not control leafy spurge so any leafy spurge control from the ester combination was assumed to be from only picloram.

A series of experiments was established during the true-flower, flower-to seed-set, and fall-regrowth growth stages of leafy spurge. Treatments were applied on June 8, 1992 near Valley City, June 26 near West Fargo, and September 9 near Hunter, ND for the true-flower, early-seed-set, and fall-regrowth growth stages, respectively. Treatments were reapplied on a similar date in 1993. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiments were in a randomized complete block design with four replications, and plots were 10 by 30 ft. Treatments were evaluated visually based on percent stand reduction as compared to the control.

Table. Comparison of picloram amine, ester, and potassium salt formulations for leafy spurge control, applied at three leafy spurge growth stages in 1992 and 1993 (Lym).

		Growth stage and Months after first treatment								
		Flower[a]				Seed-set			Fall	
Treatment	Rate	3	12	24	27	2	11	23	9	12
	— oz/A —	% control								
Picloram amine+2,4-D[b]+X-77	4+16+0.5%	96	76	90	89	96	12	39	82	2
Picloram amine+2,4-D[b]+X-77	8+32+0.5%	99	92	95	93	98	6	26	94	25
Picloram[c]+2,4-D amine+X-77	4+16+0.5%	92	69	86	82	95	9	18	87	2
Picloram[c]+2,4-D amine+X-77	8+32+0.5%	98	80	97	90	98	9	21	97	49
Picloram ester+triclopyr[d]+picloram[c]	1+2+3	93	64	93	78	93	5	13	74	2
Picloram ester+triclopyr[d]+picloram[c]	1+2+7	97	81	92	84	96	7	22	..	..
Picloram ester+triclopyr[d]+picloram[c]	2+4+6	98	83	93	93	95	3	6	97	19
Picloram ester+triclopyr[d]+picloram[c]+2,4-D amine	1+2+3+16	96	92	90	87	90	3	10	93	20
Picloram K-salt[c]	4	99	83	91	81	88	6	7	70	3
Picloram K-salt[c]	8	98	79	92	75	92	3	21	84	6
LSD (0.05)		NS	17	5	11	5	NS	NS	20	20

[a]Treatments were reapplied in June 1993.
[b]Picloram triisopropanol amine plus 2,4-D triisopropanol amine (1:4) - Tordon 101.
[c]Picloram potassium salt - Tordon 22K.
[d]Picloram isooctyl ester plus triclopyr butoxyethyl ester (1:2) - Access.

Leafy spurge control 12 months after treatment tended to be better with picloram amine plus 2,4-D than picloram K-salt plus 2,4-D when applied at the true flower growth stage (Table). However, control was similar with picloram amine or K-salt formulations when applied at the early-seed-set or fall-regrowth growth stages. Previous research at North Dakota State University has shown that picloram ester at 4 to 8 oz/A kills leafy spurge topgrowth rapidly and provides only short-term control. Picloram ester at 1 or 2 oz/A was applied with picloram K-salt in this study in an attempt to reduce initial leaf injury but still increase absorption and thus long-term control. However, leafy spurge control with treatments containing picloram ester was either similar to or less than treatments that contained picloram K-salt or amine formulations. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo).

Effect of application timing on leafy spurge control with fluroxypyr. Rodney G. Lym and Calvin G. Messersmith. Fluroxypyr is a pyridinecarboxylic acid herbicide similar to picloram but with less soil residual and a different weed control spectrum. Previous research at North Dakota State University has shown that fluroxypyr does not provide satisfactory leafy spurge control when applied in the flower or fall regrowth growth stages. The purpose of this research was to evaluate leafy spurge control with fluroxypyr applied in the vegetative growth stage.

The experiment was established in a dense stand of leafy spurge at Chaffee and Hunter ND. Treatments were applied to leafy spurge in the vegetative and flowering growth stages on May 17 and June 11, 1993, respectively, at both locations. The soil was a sandy loam and sand at Chaffee and Hunter, respectively, both with a pH 7.8. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 14 by 25 feet with 3 replications. Evaluations were based on percent stand reduction as compared to the control.

Treatment	Growth stage	Rate	Location and evaluation date					
			3 MAT[a]			12 MAT[a]		
			Chaffee	Hunter	Mean	Chaffee	Hunter	Mean
		— lb/A —	% control					
Fluroxypyr	Veg.	0.125	0	5	3	0	15	8
Fluroxypyr	Veg.	0.25	3	7	5	11	21	16
Fluroxypyr	Veg.	0.50	0	14	7	0	19	10
Fluroxypyr	Flower	0.125	29	31	30	13	30	22
Fluroxypyr	Flower	0.25	38	27	33	12	8	10
Fluroxypyr	Flower	0.50	46	11	29	35	15	25
Picloram + 2,4-D	Flower	0.25 + 1	69	62	66	28	52	49
2,4-D	Flower	2	39	6	23	17	4	10
Fluroxypyr + picloram	Veg.	0.125 + 0.25	42	71	57	20	36	28
Fluroxypyr + picloram	Flower	0.25 + 0.25	51	54	53	18	49	34
Untreated check		0	0	0	0	0	0	0
LSD (0.05)			17	28	17	NS	28	28

[a]Months after treatment.

Leafy spurge control with fluroxypyr was better when applied in the flowering compared to vegetative growth stage at both locations (Table). However, control was less then 50% 3 months after treatment (MAT) unless fluroxypyr was applied with picloram. No treatment provided satisfactory leafy spurge control 12 MAT. Fluroxypyr may be useful in a leafy spurge retreatment program, especially when applied with picloram, but does not provide satisfactory control when applied alone regardless of growth stage. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Picloram plus 2,4-D applied annually for 12 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.

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, the high cost of herbicides, potential for groundwater contamination and because of environmentally sensitive areas where herbicides cannot be used, 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 reflowering. 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 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 and the reduction was similar to the herbicide treatment with all species except 'Rodan' western wheatgrass and T-17596 mountain rye (Table 2). '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 but 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 evaluations.

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 2 and 3). The highest leafy spurge control was from 'Manska' pubescent wheatgrass and 'Arthur' Dahurian wildrye which averaged 60 and 70%, respectively (Table 3). 'Arthur' wildrye proved 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 control and yield (Table 4).

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/[a] herbicide	Stand count[b]					Total leafy spurge reduction[c]
	1990	1991	1992	1993	1994	
	no/0.25m^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 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/[a] herbicide	Yield [b] Grass			Leafy spurge			Total[c]			Proportion[d] leafy spurge		
	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 but 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]
	– lb/A –	– No./0.25m^2 –	– % –
'Rebound' smooth brome	10.5	14	40
'Rodan' western wheatgrass	18	16	25
'Bozoisky' Russian wildrye	11.3	13	40
'Arthur' Dahurian wildrye	15	9	60
'Mankota' Russian wildrye	11.3	12	45
'Reliant' intermediate wheatgrass	15	9	55
'Hycrest' crested wheatgrass	10.5	12	45
'Pryor' slender wheatgrass	9.8	11	50
'Lodorm' green needlegrass	10.7	20	10
'Manska' pubescent wheatgrass	15	6	70
Glyphosate + 2,4-D	..	20	10
Control	..	22	0
LSD (0.05)			22

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

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

Grass species/[a] herbicide	Yield[b]			
	Grass	Leafy spurge	Total[c]	Proportion[d] leafy spurge
	lb/A			%
'Rebound' smooth brome	870	5	1070	1
'Rodan' western wheatgrass	720	20	905	3
'Bozoisky' Russian wildrye	390	25	605	4
'Arthur' Dahurian wildrye	2415	5	2560	0.1
'Mankota' Russian wildrye	430	15	615	3
'Reliant' intermediate wheatgrass	1585	10	1715	0.5
'Hycrest' crested wheatgrass	1365	15	1440	1
'Pryor' slender wheatgrass	1285	20	1405	1
'Lodorm' green needlegrass	440	40	760	5
'Manska' pubescent wheatgrass	1515	10	1660	0.5
Glyphosate + 2,4-D	0	25	650	4
Control	0	205	795	26
LSD (0.05)	299	49	351	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 demonstration plots, Sheyenne National Grasslands. These plots were 10 by 50 feet and unreplicated.

Application date and treatment	Rate	Control Aug 91	June 92	Aug 92	June 93	June 94
	— lb/A —	%				
June 1991, 1992, and 1993						
Picloram	0.25	20	0	30	0	12
Picloram	0.5	30	10	88	60	50
Picloram + 2,4-D amine	0.25 + 1	65	20	90	70	60
Picloram + 2,4-D amine	0.5 + 1	80	25	87	80	80
Dicamba + X-77	2 + 0.25%	70	55	84	85	54
Picloram + 2,4-D + LI-700	0.25 + 1 + 1 qt	55	45	78	75	53
2,4-D mixed amine[a]	4	35	0	38	25	15
2,4-D amine	4	20	0	39	20	10
September 1991, 1992, and 1993						
Picloram	0.25	..	60	32	95	95
Picloram	0.5	..	99	15	95	90
Picloram + 2,4-D amine	0.25 + 1	..	60	15	98	90
Picloram + 2,4-D amine	0.5 + 1	..	85	30	98	96
Dicamba + X-77	2 + 0.25%	..	25	10	90	63
Picloram + 2,4-D + LI-700	0.25 + 1 + 1 qt	..	10	5	50	40
2,4-D mixed amine[a]	4	..	0	0	30	0
2,4-D amine	4	..	5	0	60	0
Glyphosate + 2,4-D[b]	0.4 + 0.7	..	70[c]	20[c]	65[c]	..

[a]Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine)-HiDep.
[b]Commercial formulation (Landmaster BW).
[c]Grass injury was 15% in June 92, 20% in Aug 92, and 20% in June 93. Treatment discontinued in 1993 due to presence of prairie fringed orchid.

These treatments were applied annually for 3 yr as part of the leafy spurge control education project at the Sheyenne National grassland. Leafy spurge control with all treatments was representative of long-term averages. Due to reduction of leafy spurge density and above average precipitation in 1993 and 1994, the prairie fringed orchid (*Habenaria leucophaea*) began growing at the location. Because this plant is on the endangered species list, herbicide treatments were suspended first with glyphosate treatments in 1993 and then all treatments in 1994.

Plumeless thistle (*Carduus acanthoides*) 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. Well established stands of plumeless thistle are self-renewing. Generally, there is no competition from other plant species, and old stalks catch snow insulating rosettes and increasing available moisture. Plumeless thistle infestations have been increasing in eastern North Dakota, especially along the Sheyenne River drainage. The purpose of this research was to evaluate various herbicides for control of large plumeless thistle plants.

The experiment was established in a dense plumeless thistle infestation on May 31, 1994. Most plants were in the prebud growth stage and 12 to 36 inches tall, but numerous rosettes up to 24 inches diameter also were present. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The adjuvant X-77 at 0.25% was added to all herbicide treatments. The experiment was in a randomized complete block design with four replications, and plots were 10 by 30 ft. Treatments were visually evaluated for percent control 2 and 8 weeks after treatment.

Treatment	Rate	Cost[a]	2 WAT[b]	8 WAT[b]
	— lb/A —	— $/A —	— % control	—
Dicamba + X-77	0.5+0.25%	9.28	48	84
Dicamba + X-77	1+0.25%	18.18	65	96
Dicamba + 2,4-D[c] + X-77	0.5+1.4+0.25%	11.75	58	97
2,4-D amine + X-77	2.0+0.25%	5.87	59	88
Picloram + X-77	0.25+0.25%	11.62	62	99
Picloram + X-77	0.5+0.25%	22.87	70	99
Picloram + 2,4-D + X-77	0.25+1+0.25%	14.37	63	97
Clopyralid + X-77	0.3+0.25%	44.97	60	99
Clopyralid + 2,4-D[d] + X-77	0.3+1.5+0.25%	22.88	71	100
Metsulfuron + 2,4-D + X-77	0.035+1.0+0.25%	22.95	54	98
Glyphosate + 28% N + X-77	0.4+5%+0.25%	6.75	58	81
Glyphosate + 2,4-D[e] + X-77	0.4+0.6+0.25%	8.70	57	90
LSD (0.05)			NS	8

[a]Based on average retail price throughout North Dakota in 1993, excluding application cost.
[b]Weeks after treatment.
[c]Commercial formulation - Weedmaster
[d]Commercial formulation - Curtail
[e]Commercial formulation - Landmaster BW

All treatments provided rapid topgrowth control and prevented treated plants from flowering (Table). Most treatments provided near 100% control by 8 weeks after treatment. Less-than-complete control was probably due to poor spray coverage. Some plants were only partially sprayed when taller plants covered them as the spray boom passed over. Picloram was the only herbicide evaluated that provided season long rosette control based on observations that continued after these data were obtained. The most cost effective treatments were dicamba plus 2,4-D at 0.5 + 1.4 lb/A and picloram at 0.25 lb/A with an average cost of $11.70/A and an average of 98% control. Dicamba applied at 0.5 lb/A, 2,4-D amine at 2 lb/A, and glyphosate at 0.4 lb/A plus 28% N only averaged 84% control. 2,4-D at 2 lb/A only cost $5.87/A but would need to be applied twice a season tomaintain acceptable control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo).

Canada thistle control in spring wheat with F-8426 and clopyralid. Katheryn M. Christianson, Calvin G. Messersmith, and Rodney G. Lym. Canada thistle is an important weed problem in North Dakota. Canada thistle is increasing in North Dakota following wet growing conditions in both 1992 and 1993. The purpose of this research was to evaluate F-8426 and various herbicide combinations for Canada thistle control and effect on crop yield.

The experiment was established at Fargo in a moderately dense Canada thistle stand. Fertilizer was added according to soil test and incorporated. 'Vance' hard red spring wheat was seeded on May 12, 1994. Herbicides were applied when Canada thistle plants were in the 4- to 6-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 reduction as compared to the control. Wheat was harvested on August 18, 1994.

Treatment	Rate	Days after treatment 15	30	60	Yield
	— lb/A —	——— % control		——	lb/A
F-8426	0.031	13	10	7	1290
F-8426 + X-77 + 28% N	0.031+0.25%+2%	0	0	0	1280
Clopyralid + 2,4-D[a]	0.09+0.50	76	80	72	1440
Clopyralid + 2,4-D[a]	0.13+0.67	89	94	93	1440
F-8426 + clopyralid + 2,4-D[a]	0.023+0.09+0.50	84	89	88	1460
F-8426 + clopyralid + 2,4-D[a]	0.0231+0.13+0.67	78	85	83	1415
F-8426 + clopyralid + 2,4-D[a]	0.031+0.09+0.50	76	76	69	1410
F-8426 + clopyralid + 2,4-D[a]	0.031+0.13+0.67	84	94	90	1420
F-8426 + 2,4-D ester	0.023+1	73	53	38	1290
F-8426 + 2,4-D ester	0.031+1	82	73	65	1295
2,4-D ester	1	73	73	75	1215
Control		0	0	0	1265
LSD (0.05)		16	23	25	191

[a]Commercial formulation - Curtail.

F-8426 applied alone or with an adjuvant did not control Canada thistle or increase yield compared to the untreated control (Table). F-8426 applied with clopyralid plus 2,4-D provided similar control to clopyralid plus 2,4-D alone. Treatments that included clopyralid plus 2,4-D averaged greater than 80% Canada thistle control, and wheat yield increased nearly 200 lb/A compared to the control. Canada thistle control with 2,4-D ester was not enhanced when applied with F-8426. Treatments that included 2,4-D ester averaged 67% control, but wheat yield was similar to the control. No crop injury was observed with any treatment. Wheat yield was reduced compared to the long-term average for the county due to head blight. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

NDSU perennial weed demo experiment 193.

Leafy spurge demonstration plots, Ekre station.

Application date and treatment	Cost[a]	Rate	Control	
			June 94	Sept. 94
	$/A	— lb/A —	— % —	
September 1993				
Picloram + 2,4-D amine	28	0.5+1	90	80
Picloram	25	0.5	95	70
Picloram + 2,4-D amine	14	0.25+1	98	48
2,4-D amine	6	2	10	5
Dicamba	36	2	85	20
Glyphosate + 2,4-D[b]	8	0.4+0.6	80[c]	25[c]
June 1994				
Picloram	13	0.25		20[d]
Fosamine	80	8		78[d]
Picloram + 2,4-D amine	28	0.5+1		63[d]
Picloram	25	0.5		33[d]
Picloram + 2,4-D amine	14	0.25+1		0[d]
2,4-D amine	6	2		0[d]
Dicamba	36	2		0[d]
Glyphosate + 2,4-D[b]	8	0.4+0.6		0[d]

[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.

Established	September 15, 1993	June 10, 1994
Air temperature (F)	50	69
Relative humidity (%)	74	60
Cloud cover	Clear	Overcast
Plot size (ft)	8 by 40	8 by 40
Replications	1	1
Soil pH	6.8	6.8
Soil organic matter (%)	2.9	2.9
Leafy spurge stage	Fall regrowth following a light frost	Full flower, heavy dew
Leafy spurge height (in.)	18 to 26	18 to 24

Soil applied plus postemergence herbicides, Prinsburg, 1994. Preplant incorporated herbicides were applied May 9 and incorporated with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. 'KW 2398' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 9. Preemergence treatments were applied May 9 after planting. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 3:00 pm May 9 when the air temperature was 68F, soil temperature at six inches was 55F, relative humidity was 32%, wind velocity was 22 mph, and soil moisture was good. The first half of postemergence split application treatments was applied 4:00 pm May 26 when the air temperature was 70F, soil temperature at six inches was 68F, relative humidity was 50%, wind velocity was 0-5 mph, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage, and common lambsquarters was in the cotyledon stage to 1 inch tall. The second half of split applications was applied 3:00 pm June 2 when the air temperature was 80F, soil temperature at six inches was 70F, relative humidity was 60%, wind velocity was 10 mph, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, and common lambsquarters was in the cotyledon stage to 3 inches tall. 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 and common lambsquarters control were evaluated.

Treatment*	Rate	Sgbt inj	Colq cntl
	lb/A	%	%
Dimethenamid (pre)	1	3	0
Dimethenamid (ppi)	1	18	60
Dimethenamid (pre)	1.5	5	0
Dimethenamid (ppi)	1.5	30	69
Dimethenamid+Cycloate (ppi)	1+2.5	28	73
Cycloate (ppi)	2	3	38
Cycloate (ppi)	4	5	49
Endothall (ppi)	0.5	0	0
Endothall (ppi)	1	0	0
Endothall (ppi)	2	0	0
EPTC+Cycloate (ppi)	0.75+1.25	3	43
EPTC+Cycloate (ppi)	1.5+2.5	14	63
Cycloate/Desmed&Phenmed/Desmed&Phenmed	2/0.16/0.25	13	86
Cycloate/Desmed&Phenmed/Desmed&Phenmed	4/0.16/0.25	14	85
EPTC+Cycl/Des&Phen/Des&Phen	0.75+1.25/0.16/0.25	15	79
EPTC+Cycl/Des&Phen/Des&Phen	1.5+2.5/0.16/0.25	18	90
Dime/Desmed&Phenmed/Desmed&Phenmed	1/0.16/0.25	14	88
EP+Cy/Des&Phen+Clpy/same	0.75+1.25/0.16+0.09/0.25+0.09	16	95
Desmed&Phenmed/Desmed&Phenmed	0.25/0.33	8	60
Des&Phen+Clpy/Des&Phen+Clpy	0.25+0.09/0.33+0.09	14	89
Des&Phen+Clpy+Seth/same	0.25+0.09+0.15/0.33+0.09+0.15	14	88
EPTC+Cycloate/NA-308/NA-308	0.75+1.25/0.16/0.25	15	88
EP+Cy/De&Ph+Tfsu/same	0.75+1.25/0.16+0.0156/0.25+0.0156	16	89
Des&Phen+Tfsu/Des&Phen+Tfsu	0.25+0.0156/0.33+0.0156	9	79
NA-308/NA-308	0.25/0.33	8	71
C.V. %		54	18
LSD 5%		8	15
LSD 1%		11	20
# OF REPS		4	4

* NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio

SUMMARY: Dimethenamid was more phytotoxic when applied PPI rather than PRE. Desmedipham&phenmedipham + clopyralid gave better control of common lambsquarters than desmedipham&phenmedipham. Half-rates of cycloate or EPTC + cycloate followed by reduced rates of postemergence herbicides showed promise and should be investigated further.

Soil applied and postemergence herbicides, Colfax, 1994. 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 1:30 pm May 10 when the air temperature was 72F, soil temperature at six inches was 56F, relative humidity was 39%, wind velocity was 16 mph, and soil moisture was good. 'Van der Have 66156' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 10. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of postemergence split application treatments was applied 2:00 pm May 24 when the air temperature was 77F, soil temperature at six inches was 78F, relative humidity was 53%, wind velocity was 8 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, redroot pigweed was in the 2 to 4 leaf stage, and green foxtail was emerging to 1 inch tall. The second half of split applications was applied 5:00 pm May 31 when the air temperature was 81F, soil temperature at six inches was 72F, relative humidity was 30%, wind velocity was 3 mph, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, redroot pigweed was in the 4 leaf stage to 2 inches tall, and green foxtail was 0.5 to 2 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 and green foxtail control were evaluated June 8. Redroot pigweed control was evaluated June 8 and June 28.

		June 8			June28
Treatment*	Rate	Sgbt inj	Rrpw cntl	Grft cntl	Rrpw cntl
	lb/A	%	%	%	%
EPTC+Cycloate (PPI)	1.5+2	26	74	100	66
Dimethenamid (PPI)	1	33	97	99	84
EPTC+Cycl(PPI)/Desm/Desm	1.5+2/0.16/0.25	35	100	100	97
EP+Cy(PPI)/Des+EthoSC/De+EthoSC	1.5+2/.11+.05/.17+.08	34	100	100	95
EP+Cy(PPI)/Des+Clpy/Des+Clpy	1.5+2/.16+.06/.25+.06	35	99	100	93
EP+Cy(PPI)/Des+Tfsu/Des+Tfsu	1.5+2/.16+.01/.25+.01	31	100	100	99
Desmedipham/Desmedipham	0.25/0.33	11	91	56	86
Desmedipham+Dimethenamid/Desmedipham	0.25+1.5/0.33	21	97	73	91
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	13	94	64	84
NA-308/NA-308	0.25/0.33	15	78	64	63
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	16	93	55	88
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	13	97	71	92
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	13	96	70	96
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	20	93	58	83
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	16	93	61	88
Des+Clpy+Tfsu+Scoil/same	0.16+0.06+0.01+1%/0.25+same	24	98	81	95
Des+Clpy+Tfsu+R-11/same	0.16+.06+.01+.25%/0.25+same	18	96	73	91
Des+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	23	98	76	96
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	24	78	60	64
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	16	95	75	86
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	18	86	71	86
NA308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	25	93	71	81
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.33	16	80	73	68
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	13	95	98	85
C.V. %		24	5	10	7
LSD 5%		7	6	11	9
LSD 1%		10	8	15	12
# OF REPS		4	4	4	4

* Scoil = methylated seed oil from Agsco; R-11 = non-ionic surfactant from Wilbur-Ellis; NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio.

(Experiment continued on next page.)

Soil applied and postemergence herbicides, Colfax, 1994. (continued)

Summary

Postemergence treatments over EPTC + cycloate generally gave more sugarbeet injury and better green foxtail control than postemergence treatments alone or EPTC + cycloate. NA-308 gave less redroot pigweed control than desmedipham. Desmedipham + ethofumesate gave redroot pigweed control similar to desmedipham. Desmedipham + clopyralid + triflusulfuron gave better redroot pigweed control than desmedipham on June 28. Desmedipham + Scoil gave more sugarbeet injury and similar control of redroot pigweed compared to desmedipham alone. Desmedipham + endothall gave less redroot pigweed control than desmedipham.

Soil applied plus postemergence herbicides, Crookston, 1994. 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 for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments 1:00 pm May 6 when the air temperature was 51F, soil temperature at six inches was 42F, relative humidity was 63%, wind velocity was 6 mph, and soil moisture was good. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of postemergence split application treatments was applied 3:30 pm May 20 when the air temperature was 87F, soil temperature at six inches was 71F, relative humidity was 37%, wind velocity was 22 mph, soil moisture was fair, sugarbeet was in the cotyledon stage, common mallow was in the cotyledon to 2 leaf stage, green and yellow foxtail was emerging to 1 inch tall, and redroot pigweed was in the cotyledon to 2 leaf stage. The second half of split applications was applied 12:00 pm May 27 when the air temperature was 72F, soil temperature at six inches was 62F, relative humidity was 42%, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, common mallow was in the 2 to 4 leaf stage, green and yellow foxtail was 1 to 2 inches tall, and redroot pigweed was in the 2 to 4 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Green and yellow foxtail control and sugarbeet injury were evaluated June 6. Common mallow control was evaluated June 6 and July 5. Redroot pigweed control was evaluated July 5.

Treatment*	Rate	June 6 Sgbt inj	June 6 Coma cntl	June 6 Gr&Y Fxtl cntl	July 5 Coma cntl	July 5 Rrpw cntl
	lb/A	%	%	%	%	%
Dimethenamid (pre)	1	0	0	19	1	4
Dimethenamid (ppi)	1	26	78	94	13	91
Dimethenamid (pre)	1.5	5	5	40	0	6
Dimethenamid (ppi)	1.5	34	79	91	37	95
Dimethenamid+Cycloate (ppi)	1+2.5	28	91	98	59	96
Cycloate (ppi)	2	8	55	76	1	33
Cycloate (ppi)	4	10	70	89	36	61
Endothall (ppi)	0.5	0	20	18	0	0
Endothall (ppi)	1	0	34	23	0	0
Endothall (ppi)	2	0	29	23	0	0
EPTC+Cycloate (ppi)	0.75+1.25	20	62	78	15	60
EPTC+Cycloate (ppi)	1.5+2.5	31	85	96	27	75
Cycloate/Des&Phen/Des&Phen	2/0.16/0.25	30	85	94	30	65
Cycloate/Des&Phen/Des&Phen	4/0.16/0.25	34	89	97	62	81
EPTC+Cycl/Des&Phen/Des&Phen	0.75+1.25/0.16/0.25	46	90	97	70	80
EPTC+Cycl/Des&Phen/Des&Phen	1.5+2.5/0.16/0.25	58	98	99	75	86
Dime/Des&Phen/Des&Phen	1/0.16/0.25	38	85	98	61	95
EPTC+Cycl/De&Ph+Clpy/same	.75+1.25/.16+.09/.25+.09	56	92	98	64	85
Desmed&Phenmed/Desmed&Phenmed	0.25/0.33	34	60	75	10	65
Des&Phen+Clpy/Des&Phen+Clpy	0.25+0.09/0.33+0.09	43	60	73	1	74
De&Ph+Clpy+Seth/same	0.25+0.09+0.15/0.33+0.09+0.15	46	81	97	4	75
EPTC+Cycl/NA-308/NA-308	0.75+1.25/0.16/0.25	51	93	99	45	70
EP+Cy/De&Ph+Tsfu/same	.75+1.25/.16+.0156/.25+.0156	49	99	99	90	75
Des&Phen+Tfsu/D&Ph+Tfsu	0.25+0.0156/0.33+0.0156	53	93	89	51	81
NA-308/NA-308	0.25/0.33	45	73	68	5	66

(Table continued on next page.)

Soil applied plus postemergence herbicides, Crookston, 1994. (continued)

Treatment*	Rate	June 6 Sgbt inj	June 6 Coma cntl	June 6 Gr&Y Fxtl cntl	July 5 Coma cntl	July 5 Rrpw cntl
	lb/A	%	%	%	%	%
EXP MEAN		30	68	77	30	61
C.V. %		28	16	12	57	20
LSD 5%		12	16	13	24	17
LSD 1%		16	21	17	32	22
# OF REPS		4	4	4	4	4

* NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio

Summary

Dimethenamid was more phytotoxic when applied PPI rather than PRE. EPTC + cycloate plus postemergence treatments caused unusually high level of sugarbeet injury. Treatments that included triflusulfuron generally gave the best control of common mallow but EPTC + cycloate followed by postemergence treatments also gave fair to good control. NA-308 gave weed control similar to desmedipham&phenmedipham. Preplant incorporated endothall gave poor weed control. Sethoxydim applied twice at 0.15 lb/A gave very good foxtail control even though it was applied with desmedipham&phenmedipham + clopyralid and without oil.

Soil applied and postemergence herbicides, Hillsboro, 1994. 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 10:30 am May 11 when the air temperature was 65F, soil temperature at six inches was 50F, relative humidity was 57%, wind velocity was 11 mph, and soil moisture was good. 'Van der Have 66156' 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 half of postemergence split application treatments was applied 1:00 pm May 25 when the air temperature was 72F, soil temperature at six inches was 60F, relative humidity was 50%, wind velocity was 25 mph, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage, wild buckwheat was in the cotyledon to 1 leaf stage, and yellow foxtail was emerging to 1 inch tall. The second half of split applications was applied 3:00 pm June 1 when the air temperature was 75F, soil temperature at six inches was 68F, relative humidity was 38%, wind velocity was 3 mph, soil moisture was fair, sugarbeet was in the 2 to 4 leaf stage, wild buckwheat was in the cotyledon to 3 leaf stage, and yellow foxtail was 0.5 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. Sugarbeet injury and yellow foxtail and wild buckwheat control were evaluated June 10 June 27.

		June 10			June 27		
Treatment*	Rate	Sgbt inj	Yeft cntl	Wibw cntl	Sgbt inj	Yeft cntl	Wibw cntl
	lb/A	%	%	%	%	%	%
EPTC+Cycloate (PPI)	1.5+2	16	99	53	0	100	22
Dimethenamid (PPI)	1	24	95	49	8	86	15
EPTC+Cycl(PPI)/Desm/Desm	1.5+2/0.16/0.25	33	100	97	15	100	82
EP+Cy(PPI)/Des+EthoSC/same	1.5+2/.11+.05/.17+.08	35	100	97	8	99	84
EP+Cy(PPI)/Des+Clpy/same	1.5+2/.16+.06/.25+.06	38	100	99	16	99	92
EP+Cy(PPI)/Des+Tfsu/same	1.5+2/.16+.01/.25+.01	35	100	99	13	100	86
Desmedipham/Desmedipham	0.25/0.33	16	48	63	0	20	39
Desmedipham+Dimethenamid/Desmed	0.25+1.5/0.33	33	86	80	5	64	51
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	19	63	80	0	15	60
NA-308/NA-308	0.25/0.33	26	68	87	0	28	66
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	25	51	83	0	24	81
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	27	94	78	0	65	64
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	20	81	79	3	59	78
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	21	69	83	0	20	60
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	26	66	68	0	29	49
Des+Clpy+Tfs+Scoil/same	.16+.06+.01+1%/.25+same	31	95	97	6	66	87
Des+Clp+Tfs+R-11/same	.16+.06+.01+.25%/.25+same	29	94	89	3	64	78
Des+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	31	93	93	3	70	86
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	38	59	97	3	29	94
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	34	94	95	6	63	78
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	19	93	98	0	70	89
NA308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	35	81	94	0	50	83
Desm+Endothall/Desm+Endo	0.25+0.25/0.33+0.33	25	83	92	3	69	83
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	24	96	76	3	85	59
C.V. %		16	9	7	135	15	10
LSD 5%		6	10	8	7	13	9
LSD 1%		8	13	11	10	17	12
# OF REPS		4	4	4	4	4	4

* Scoil = methylated seed oil from Agsco; R-11 = non-ionic surfactant from Wilbur-Ellis; NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio.

(Experiment continued on next page.)

Summary

EPTC + cycloate followed by postemergence herbicides gave more sugarbeet injury and better wild buckwheat control than postemergence herbicides alone or EPTC + cycloate. Visible sugarbeet injury was much less on June 27 than on June 10 indicating rapid recovery from injury. Wild buckwheat control also declined from June 10 to June 27. On June 27, only EPTC + cycloate followed by desmedipham + clopyralid and NA-308 + clopyralid gave over 90% wild buckwheat control. Desmedipham + clopyralid and desmedipham + endothall gave wild buckwheat control superior to NA-308 and NA-308 was better than desmedipham. Adding Scoil to desmedipham or desmedipham + clopyralid + triflusulfuron gave increased wild buckwheat control and sugarbeet injury.

<u>Soil applied and postemergence herbicides, Minto, 1994.</u> 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 1:45 pm May 5 when the air temperature was 48F, soil temperature at six inches was 40F, relative humidity was 60%, wind velocity was 16 mph, and soil moisture was poor. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of postemergence split application treatments was applied 1:00 pm May 31 when the air temperature was 74F, soil temperature at six inches was 61F, relative humidity was 37%, wind velocity was 20-25 mph, soil moisture was fair, sugarbeet was in the cotyledon to 2 leaf stage, wild buckwheat was in the 2 leaf stage, green foxtail was in the 2 leaf stage, and kochia was in the cotyledon stage to 1 inch tall. The second half of split applications was applied 10:40 am June 6 when the air temperature was 75F, soil temperature at six inches was 63F, relative humidity was 66%, wind velocity was 10-15 mph, soil moisture was fair, sugarbeet was in the 6 leaf stage, wild buckwheat was 2 to 5 inches tall, green foxtail was 2 to 5 inches tall, and kochia was 1 to 2 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 and wild buckwheat control were evaluated June 14 and June 30. Kochia control was evaluated June 30. Green foxtail control was evaluated July 6.

		June 14		June 30			July6
Treatment*	Rate	Sgbt inj	Wibw cntl	Sgbt inj	Kocz cntl	Wibw cntl	Grft cntl
	lb/A	%	%	%	%	%	%
EPTC+Cycloate (PPI)	1.5+2	16	55	5	13	35	99
Dimethenamid (PPI)	1	33	59	30	35	35	98
EPTC+Cycl(PPI)/Desm/Desm	1.5+2/0.16/0.25	33	89	24	54	80	98
EP+Cy(PPI)/Des+EthoSC/same	1.5+2/.11+.05/.17+.08	29	93	28	78	89	99
EP+Cy(PPI)/Des+Clpy/same	1.5+2/.16+.06/.25+.06	41	100	41	84	98	98
EP+Cy(PPI)/Des+Tfsu/same	1.5+2/.16+.01/.25+.01	35	99	39	99	81	99
Desmedipham/Desmedipham	0.25/0.33	8	31	0	33	15	28
Desmedipham+Dimethenamid/Desmed	0.25+1.5/0.33	21	68	9	39	29	39
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	19	66	3	29	44	23
NA-308/NA-308	0.25/0.33	21	80	9	40	63	36
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	18	74	5	25	78	11
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	14	69	3	99	48	71
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	10	71	8	99	78	36
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	19	71	5	40	51	15
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	10	56	3	23	28	19
Des+Clpy+Tfs+Scoil/same	.16+.06+.01+1%/.25+same	19	88	9	96	85	65
Des+Clp+Tfs+R-11/same	.16+.06+.01+.25%/.25+same	19	90	6	97	76	55
Des+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	23	88	8	97	88	56
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	29	89	13	43	90	26
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	23	91	8	94	74	76
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	9	84	0	97	86	50
NA308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	21	89	9	96	85	53
Desm+Endothall/Desm+Endo	0.25+0.25/0.33+0.33	19	78	5	26	66	53
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	13	49	0	45	35	81
C.V. %		27	13	87	16	22	22
LSD 5%		8	14	14	14	19	18
LSD 1%		10	19	18	19	26	24
# OF REPS		4	4	4	4	4	4

* Scoil = methylated seed oil from Agsco; R-11 = non-ionic surfactant from Wilbur-Ellis; NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio.

(Experiment continued on next page.)

Soil applied and postemergence herbicides, Minto, 1994. (continued)

Summary

EPTC + cycloate followed by postemergence herbicides caused more sugarbeet injury and better wild buckwheat control than postemergence herbicides alone or EPTC + cycloate. Treatments that included triflusulfuron gave the best control of kochia. NA-308 gave better wild buckwheat control than desmedipham + ethofumesate and desmedipham + ethofumesate was better than desmedipham. Desmedipham + clopyralid and desmedipham + endothall gave wild buckwheat control similar to NA-308. Wild buckwheat control from desmedipham, NA-308, and desmedipham + endothall declined from June 14 to June 30 but control from most clopyralid or clopyralid combinations increased or held steady.

Soil applied and postemergence herbicides, Robbin, 1994. 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 3:30 pm May 2 when the air temperature was 62F, soil temperature at six inches was 50F, relative humidity was 33%, wind velocity was 13 mph, and soil moisture was poor. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 2. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of postemergence split application treatments was applied 11:00 am May 31 when the air temperature was 72F, soil temperature at six inches was 60F, relative humidity was 35%, wind velocity was 20-25 mph, soil moisture was fair, sugarbeet was in the cotyledon to 2 leaf stage, and redroot pigweed was in the cotyledon to 2 leaf stage. The second half of split applications was applied 1:00 pm June 6 when the air temperature was 73F, soil temperature at six inches was 67F, relative humidity was 65%, wind velocity was 15 mph, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, and redroot pigweed was in the 2 to 4 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and redroot pigweed control were evaluated June 20.

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed control
	lb/A	%	%
EPTC+Cycloate (PPI)	1.5+2	16	73
Dimethenamid (PPI)	1	25	93
EPTC+Cycl(PPI)/Desm/Desm	1.5+2/0.16/0.25	31	99
EP+Cy(PPI)/Des+EthoSC/De+EthoSC	1.5+2/.11+.05/.17+.08	28	98
EP+Cy(PPI)/Des+Clpy/Des+Clpy	1.5+2/.16+.06/.25+.06	34	98
EP+Cy(PPI)/Des+Tfsu/Des+Tfsu	1.5+2/.16+.01/.25+.01	30	99
Desmedipham/Desmedipham	0.25/0.33	9	90
Desmedipham+Dimethenamid/Desmedipham	0.25+1.5/0.33	33	99
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	13	91
NA-308/NA-308	0.25/0.33	24	88
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	2	87
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	11	98
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	6	99
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	19	90
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	8	91
Des+Clpy+Tfsu+Scoil/same	0.16+0.06+0.01+1%/0.25+same	24	100
Des+Clpy+Tfsu+R-11/same	0.16+.06+.01+.25%/0.25+same	19	96
Des+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	18	99
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	24	87
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	16	91
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	11	96
NA308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	13	95
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.33	16	88
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	4	88
C.V. %		30	4
LSD 5%		8	6
LSD 1%		10	8
# OF REPS		4	4

* Scoil = methylated seed oil from Agsco; R-11 = non-ionic surfactant from Wilbur-Ellis; NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio

(Experiment continued on next page.)

Summary

EPTC + cycloate followed by postemergence herbicides gave more sugarbeet injury than postemergence herbicides alone or EPTC + cycloate. Adding dimethenamid to the first half of a split application of desmedipham increased sugarbeet injury from 9% to 33%. NA-308 caused more sugarbeet injury than desmedipham or desmedipham + ethofumesate. Desmedipham + Scoil gave more sugarbeet injury than desmedipham or desmedipham + R-11. The addition of Scoil did not improve redroot pigweed control. All treatments except EPTC + cycloate gave over 85% control of redroot pigweed. Desmedipham + triflusulfuron gave better redroot pigweed control than desmedipham.

Postemergence herbicides, Milan, 1994. 'KW 2010' sugarbeet was seeded April 23. The first half of split application herbicide treatments was applied 3:00 pm May 12 when the air temperature was 70F, soil temperature at six inches was 65F, relative humidity was 40%, wind velocity was 0-5 mph, soil moisture was good, and kochia was 0.5 inch rosette diameter. The second half of split applications was applied 1:00 pm May 19 when the air temperature was 85F, soil temperature at six inches was 78F, relative humidity was 50%, wind velocity was 5-10 mph, soil moisture was good, and kochia was in the cotyledon stage to 1 inch rosette diameter. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Kochia control was evaluated.

Treatment*	Rate	Kochia control
	lb/A	%
Desmedipham/Desmedipham	0.25/0.33	6
Desmed+Dimethenamid/Desmedipham	0.25+1.5/0.33	24
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	0
NA-308/NA-308	0.25/0.33	15
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	18
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	73
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	79
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	1
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	25
Desm+Clpy+Tfsu+Scoil/same	0.16+0.06+0.01+1%/0.25+same	95
Desm+Clpy+Tfsu+R-11/same	0.16+0.06+0.01+0.25%/0.25+same	89
Desm+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	98
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	15
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	99
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	100
NA-308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	98
Desm+Endo/Desm+Endothall	0.25+0.25/0.33+0.33	25
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	13
EXP MEAN		48
C.V. %		31
LSD 5%		21
LSD 1%		28
# OF REPS		4

* NA-308=desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio; R-11=non-ionic surfactant from Wilbur-Ellis; Scoil=methylated seed oil from Agsco

Summary

Treatments including triflusulfuron gave the best control of kochia.

<u>Postemergence herbicides, Prinsburg, 1994.</u> 'KW 2398' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 9. The first half of split application herbicide treatments was applied 4:00 pm May 26 when the air temperature was 70F, soil temperature at six inches was 68F, relative humidity was 50%, wind velocity was 0-5 mph, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage, and common lambsquarters was in the cotyledon stage to 1 inch tall. The second half of split applications was applied 3:00 pm June 2 when the air temperature was 80F, soil temperature at six inches was 70F, relative humidity was 60%, wind velocity was 10 mph, soil moisture was good, sugarbeet was in the 2 to 4 leaf stage, and common lambsquarters was in the cotyledon stage to 3 inches tall. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common lambsquarters control were evaluated.

Treatment*	Rate	Sugarbeet injury	Common Lambsquarters control
	lb/A	---------- %	----------
Desmedipham/Desmedipham	0.25/0.33	1	54
Desmed+Dimethenamid/Desmed	0.25+1.5/0.33	8	66
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	4	59
NA-308/NA-308	0.25/0.33	5	73
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	10	91
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	5	61
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	6	74
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	3	68
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	5	66
Desm+Clpy+Tfsu+Scoil/same	0.16+.06+.01+1%/.25+same	4	73
Desm+Clpy+Tfsu+R-11/same	.16+.06+.01+.25%/0.25+same	4	73
Desm+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	9	91
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	8	94
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	19	74
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	4	55
NA-308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	0	61
Desm+Endo/Desm+Endothall	0.25+0.25/0.33+0.33	3	53
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	4	80
EXP MEAN		5	70
C.V. %		120	21
LSD 5%		NS	20
LSD 1%		NS	27
# OF REPS		4	4

* NA-308=desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio; R-11=non-ionic surfactant from Wilbur-Ellis; Scoil=methylated seed oil from Agsco

Summary

Treatments that included desmedipham and clopyralid at 0.09 lb/A gave or tended to give the best control of common lambsquarters.

Postemergence herbicides, Renville, 1994. 'KW 2398' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 11. The first half of split application herbicide treatments was applied 1:00 pm May 25 when the air temperature was 80F, soil temperature at six inches was 70F, relative humidity was 60%, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, and common lambsquarters was in the cotyledon stage to 2 inches tall. The second half of split applications was applied 11:00 am June 1 when the air temperature was 72F, soil temperature at six inches was 67F, relative humidity was 50%, wind velocity was 10 mph, soil moisture was good, sugarbeet was in the 4 leaf stage, and common lambsquarters was in the cotyledon stage to 3 inches tall. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common lambsquarters control were evaluated.

Treatment*	Rate	Sugarbeet injury	Common Lambsquarters control
	lb/A	---------- %	----------
Desmedipham/Desmedipham	0.25/0.33	0	88
Desmed+Dimethenamid/Desmed	0.25+1.5/0.33	0	81
Desm+Etho-SC/Desm+Etho-SC	0.17+0.08/0.22+0.11	13	83
NA-308/NA-308	0.25/0.33	5	70
Desm+Clpy/Desm+Clpy	0.25+0.09/0.33+0.09	5	98
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	0	84
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	3	88
Desm+Scoil/Desm+Scoil	0.25+1%/0.33+1%	3	76
Desm+R-11/Desm+R-11	0.25+0.25%/0.33+0.25%	3	69
Desm+Clpy+Tfsu+Scoil/same	0.16+.06+.01+1%/.25+same	5	93
Desm+Clpy+Tfsu+R-11/same	.16+.06+.01+.25%/0.25+same	5	88
Desm+Clpy+Tfsu/same	0.25+0.09+0.0156/0.33+same	10	99
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	8	87
NA-308+Tfsu/NA-308+Tfsu	0.25+0.0156/0.33+0.0156	13	93
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	4	71
NA-308+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	3	90
Desm+Endo/Desm+Endothall	0.25+0.25/0.33+0.33	9	64
Desm+Clpy+Seth/same	0.25+0.025+0.07/0.33+same	0	79
EXP MEAN		5	83
C.V. %		117	12
LSD 5%		8	14
LSD 1%		NS	18
# OF REPS		4	4

* NA-308=desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio; R-11=non-ionic surfactant from Wilbur-Ellis; Scoil=methylated seed oil from Agsco

Summary

None of the treatments caused serious sugarbeet injury. NA-308 gave less control of common lambsquarters than desmedipham. NA-308 + clopyralid gave better control of common lambsquarter than NA-308. Desmedipham + ethofumesate gave common lambsquarters control similar to desmedipham but less than desmedipham + clopyralid.

Additives with postemergence herbicides, Crookston, 1994. 'KW 3291' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Temik insecticide at 1.5 lb ai/A was applied in a five inch band over the row at planting. The first half of split application treatments was applied 1:30 pm May 25 when the air temperature was 70F, soil temperature at six inches was 61F, relative humidity was 48%, wind velocity was 18 to 23 mph, soil moisture was fair, sugarbeet was in the 2 leaf stage, prostrate pigweed was in the 2 to 4 leaf stage, wild buckwheat was in the cotyledon to 2 leaf stage, and common lambsquarters was in the 2 to 4 leaf stage. The second half of split applications was applied 1:30 pm June 1 when the air temperature was 75F, soil temperature at six inches was 67F, relative humidity was 44%, wind velocity was 10 mph, soil moisture was fair, sugarbeet was in the 4 leaf stage, prostrate pigweed was in the 6 leaf stage, wild buckwheat was in the 4 leaf stage, and common lambsquarters was in the 4 to 8 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 prostrate pigweed and wild buckwheat control were evaluated June 13. Sugarbeet injury and common lambsquarters, prostrate pigweed, and wild buckwheat control were evaluated June 29.

(Experiment continued on next page.)

Additives with postemergence herbicides, Crookston, 1994. (continued)

Treatment*	Rate	June 13			June 29			
		Sgbt inj	Prpw cntl	Wibw cntl	Sgbt inj	Colq cntl	Prpw cntl	Wibw cntl
	lb/A	----------------			% ---------------			
Des&Phen/Des&Phen	0.25/0.33	0	92	66	0	95	82	74
De&Ph+Tfsu/De&Ph+Tfsu	0.25+0.0156/0.33+0.0156	0	97	68	0	97	94	80
Des&Phen+Clpy/De&Ph+Clpy	0.25+0.09/0.33+0.09	1	91	89	0	99	81	94
Triflusulfuron/Triflusulfuron	0.0156/0.0156	0	23	16	0	0	23	0
NA-308/NA-308	0.25/0.33	1	81	76	0	99	86	76
De&Ph+R-11/De&Ph+R-11	0.25+0.25%/0.33+0.25%	1	85	76	1	90	85	70
De&Ph+Tfsu+R-11/same	0.25+.0156+.25%/.33+same	1	96	71	0	99	88	75
De&Ph+Clpy+R-11/same	.25+.09+.25%/.33+same	1	81	85	0	98	91	95
Tfsu+R-11/Tfsu+R-11	0.0156+0.25%/0.0156+0.25%	0	55	30	0	13	59	8
NA-308+R-11/NA-308+R-11	0.25+0.25%/0.33+0.25%	0	85	70	0	99	81	70
De&Ph+Scoil/De&Ph+Scoil	0.25+1%/0.33+1%	1	89	81	0	96	84	83
De&Ph+Tfsu+Scoil/same	.25+.0156+1%/.33+same	5	94	87	0	95	91	90
De&Ph+Clpy+Scoil/same	0.25+0.09+1%/0.33+same	3	91	98	4	99	86	98
Tfsu+Scoil/Tfsu+Scoil	0.0156+1%/0.0156+1%	0	55	54	0	33	38	50
NA-308+Scoil/NA-308+Scoil	0.25+1%/0.33+1%	3	81	90	3	99	86	85
De&Ph+DashHC/De&Ph+DashHC	.25+.125G/.33+.125G	4	88	90	0	99	68	75
D&P+Tfsu+DashHC/same	.25+.0156+.125G/.33+same	3	96	94	0	96	86	86
De&Ph+Clpy+DashHC/same	.25+.09+.125G/.33+same	1	85	94	0	98	69	99
Tfs+DashHC/Tfs+DashHC	.0156+.125G/.0156+.125G	0	71	45	0	25	48	28
NA308+DashHC/NA308+DashHC	.25+.125G/.33+.125G	0	86	92	0	96	69	86
De&Ph+Mor-Act/De&Ph+Mor-Act	.25+.25G/.33+.25G	1	88	99	0	97	81	89
D&P+Tfsu+Mor-Act/same	.25+.0156+.25G/.33+same	8	95	95	8	99	84	92
De&Ph+Clpy+Mor-Act/same	.25+.09+.25G/.33+same	3	91	97	3	99	84	97
Tfsu+Mor-Act/Tfsu+Mor-Act	0.0156+0.25G/same	0	86	69	0	43	61	38
NA308+MorAct/NA308+MorAct	0.25+0.25G/.33+.25G	0	88	89	0	97	70	90
De&Ph+Agsco/D&P+Agsco	0.25+0.25G/0.33+0.25G	4	80	97	0	99	75	90
D&P+Tfsu+Agsco/same	0.25+0.0156+.25G/.33+same	1	93	94	0	94	86	86
De&Ph+Clpy+Agsco/same	0.25+0.09+.25G/.33+same	0	93	94	0	99	83	94
Tfsu+Agsco/Tfsu+Agsco	0.0156+0.25G/same	0	76	76	0	49	71	41
NA308+Agsco/NA308+Agsco	.25+.25G/.33+.25G	0	92	93	0	99	86	94
De&Ph+R-11+28%N/same	0.25+0.25%+1G/0.33+same	0	94	74	0	97	91	81
DP+Tf+R11+28%/same	.25+.0156+.25%+1G/.33+same	0	96	78	0	90	93	73
D&P+Clp+R11+28%/same	.25+.09+.25%+1G/.33+same	0	79	95	0	97	83	99
Tfsu+R-11+28%N/same	0.0156+0.25%+1G/same	0	66	45	0	23	59	36
NA-308+R-11+28%N/same	0.25+0.25%+1G/0.33+same	3	89	88	4	99	71	78
De&Ph+Sylgard309/same	0.25+0.25%/0.33+0.25%	1	86	84	0	98	83	74
D&P+Tfsu+Sylgard/same	.25+.0156+.25%/.33+same	0	94	81	0	99	88	60
De&Ph+Clpy+Sylgard/same	.25+.09+.25%/.33+same	1	88	90	0	99	79	85
Tfsu+Sylgard309/same	0.0156+0.25%/same	0	69	59	0	19	45	39
NA-308+Sylgard309/same	0.25+0.25%/0.33+0.25%	1	92	68	4	97	80	60
C.V. %		224	10	15	447	8	18	18
LSD 5%		NS	12	17	NS	9	19	18
LSD 1%		NS	16	22	NS	12	25	24
# OF REPS		4	4	4	4	4	4	4

* R-11 = non-ionic surfactant from Wilbur-Ellis; Sylgard 309 = silicone surfactant from Wilbur-Ellis; Agsco = experimental vegetable oil from Agsco; Mor-Act = petroleum oil concentrate from Wilbur-Ellis; Scoil = methylated seed oil from Agsco; Dash HC = adjuvant from BASF; NA-308 = desmedipham+ phenmedipham+ethofumesate, 1:1:1 ratio; 28%N = 28% nitrogen solution containing urea and NH_4NO_3

(Experiment continued on next page.)

Additives with postemergence herbicides, Crookston, 1994. (continued)

Table 2. Common lambsquarters control and two evaluations of prostrate pigweed and wild buckwheat control averaged together.

Herbicide	Additive	Weed Control
		%
Desmedipham&Phenmedipham	None	84
Desmedipham&Phenmedipham	R-11	83
Desmedipham&Phenmedipham	Scoil	88
Desmedipham&Phenmedipham	Dash HC	86
Desmedipham&Phenmedipham	Mor-Act	92
Desmedipham&Phenmedipham	Agsco	90
Desmedipham&Phenmedipham	R-11+28%N	89
Desmedipham&Phenmedipham	Sylgard	87
Desmed&Phenmed+Triflusulfuron	None	89
Desmed&Phenmed+Triflusulfuron	R-11	88
Desmed&Phenmed+Triflusulfuron	Scoil	92
Desmed&Phenmed+Triflusulfuron	Dash HC	92
Desmed&Phenmed+Triflusulfuron	Mor-Act	94
Desmed&Phenmed+Triflusulfuron	Agsco	91
Desmed&Phenmed+Triflusulfuron	R-11+28%N	86
Desmed&Phenmed+Triflusulfuron	Sylgard	87
Desmed&Phenmed+Clopyralid	None	92
Desmed&Phenmed+Clopyralid	R-11	91
Desmed&Phenmed+Clopyralid	Scoil	95
Desmed&Phenmed+Clopyralid	Dash HC	90
Desmed&Phenmed+Clopyralid	Mor-Act	94
Desmed&Phenmed+Clopyralid	Agsco	93
Desmed&Phenmed+Clopyralid	R-11+28%N	91
Desmed&Phenmed+Clopyralid	Sylgard	90
Triflusulfuron	None	10
Triflusulfuron	R-11	29
Triflusulfuron	Scoil	44
Triflusulfuron	Dash HC	40
Triflusulfuron	Mor-Act	56
Triflusulfuron	Agsco	60
Triflusulfuron	R-11+28%N	42
Triflusulfuron	Sylgard	41
NA-308	None	86
NA-308	R-11	84
NA-308	Scoil	90
NA-308	Dash HC	87
NA-308	Mor-Act	88
NA-308	Agsco	94
NA-308	R-11+28%N	87
NA-308	Sylgard	82
EXP MEAN		79
C.V. %		7
LSD 5%		8
LSD 1%		10
# OF REPS		4

Summary

None of the treatments caused significant sugarbeet injury. The greatest response to adjuvants was with triflusulfuron. Triflusulfuron alone gave less weed control than triflusulfuron plus an adjuvant. Mor-Act and Agsco gave a greater increase in weed control than other adjuvants with triflusulfuron.

Postemergence broadleaf herbicides, Crookston, 1994. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split application herbicide treatments was applied 3:30 pm May 20 when the air temperature was 87F, soil temperature at six inches was 71F, relative humidity was 37%, wind velocity was 22 mph, soil moisture was fair, sugarbeet was in the cotyledon stage, common mallow was in the cotyledon to 2 leaf stage, green foxtail was emerging to 1 inch tall, and redroot pigweed was in the cotyledon to 2 leaf stage. The second half of split applications and the early single application treatments were applied 12:00 pm May 27 when the air temperature was 72F, soil temperature at six inches was 62F, relative humidity was 42%, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, common mallow was in the 2 to 4 leaf stage, green foxtail was 1 to 2 inches tall, and redroot pigweed was in the 2 to 4 leaf stage. Late single application treatments were applied 12:00 pm June 1 when the air temperature was 75F, soil temperature at six inches was 67F, relative humidity was 44%, wind velocity was 10 mph, soil moisture was fair, sugarbeet was in the 4 leaf stage, common mallow was in the 4 to 8 leaf stage, green foxtail in the 4 leaf stage, and redroot pigweed was in the 6 leaf stage. All herbicides 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 foxtail control were evaluated June 6. Common mallow control was evaluated June 6 and July 5. Redroot pigweed control was evaluated July 5 and July 14.

		June 6			July 5		7-14
Treatment*	Rate	Sgbt inj	Coma cntl	Grft cntl	Coma cntl	Rrpw cntl	Rrpw cntl
	lb/A	------	------	------	%	------	------
Desmedipham/Desmedipham	0.25/0.33	36	60	64	0	68	66
Desmedipham/Desmedipham	0.33/0.33	34	48	55	13	57	36
Desmed&Phenmed/Desmed&Phenmed	0.25/0.33	38	58	73	5	60	58
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	45	55	73	10	57	51
Desmed&Phenmed/Desmed&Phenmed	0.33/0.4	35	49	61	8	63	66
Desmed&Phenmed/Desmed&Phenmed	0.375/0.5	48	58	75	0	62	61
NA-308/NA-308	0.25/0.33	31	58	66	13	70	51
NA-308/NA-308	0.33/0.33	38	65	70	0	62	45
NA-308/NA-308	0.33/0.4	44	58	66	8	58	61
NA-308/NA-308	0.375/0.5	40	70	74	0	40	56
Des&Phen+Etho-SC/same	0.17+0.08/0.22+0.11	35	59	75	8	48	44
De&Ph+EthoSC/De&Ph+EthoSC	0.22+0.11/.266+.133	41	65	74	8	60	55
De&Ph+EthoSC/De&Ph+EthoSC	0.25+0.125/.33+.165	48	66	73	10	56	44
NA-308/NA-308/NA-308	0.22/0.22/0.22	26	60	74	19	85	81
NA-308/NA-308/NA-308	0.292/0.292/0.292	33	68	79	33	89	90
--/--/Desmed&Phenmed	--/--/0.75	14	33	30	0	58	70
--/--/Des&Phen+Etho-SC	--/--/0.5+0.25	11	28	28	3	76	65
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	36	71	70	8	69	65
Des+Etho-SC/Des+Etho-SC	0.17+0.08/0.22+0.11	25	46	46	7	79	70
TRA-38+TRA-46/TRA-38+TRA-46	0.17+0.08/.22+.11	33	63	68	13	71	61
TRA-38/TRA-38	0.25/0.33	26	61	68	5	70	69
TRA-45/TRA-45	0.25/0.33	36	58	60	8	61	61
TRA-45+Scoil/TRA-45+Scoil	0.25+1%/0.33+1%	39	69	73	5	60	54
TRA-37/TRA-37	0.25/0.33	26	39	49	2	82	79
TRA-44/TRA-44	0.25/0.33	28	44	50	0	59	58
TRA-44+Scoil/TRA-44+Scoil	0.25+1%/0.33+1%	28	46	50	3	73	71
TRA-44/TRA-44	0.33/0.33	47	66	68	0	74	75
TRA-44+Scoil/TRA-44+Scoil	0.33+1%/0.33+1%	33	64	65	5	78	79

(Table continued on next page.)

Postemergence broadleaf herbicides, Crookston, 1994. (continued)

Treatment*	Rate	June 6 Sgbt inj	June 6 Coma cntl	June 6 Grft cntl	July 5 Coma cntl	July 5 Rrpw cntl	7-14 Rrpw cntl
	lb/A	%					
--/Endothall	--/0.33	0	15	31	0	0	0
--/Endothall	--/0.5	3	11	38	0	0	0
--/Endothall	--/0.75	9	33	50	0	0	0
--/Clopyralid	--/0.19	0	20	0	5	14	29
--/Des&Phen+Endothall	--/0.33+0.5	30	50	63	0	43	23
Des+Dimethenamid/Des	0.25+1.5/0.33	33	78	90	23	94	93
Des+Clpy/Des+Clpy	0.25+0.09/0.33+0.09	31	66	63	15	74	68
Des+Tfsu/Des+Tfsu	0.25+0.0156/0.33+0.0156	34	99	81	60	70	58
Des+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	29	99	76	78	81	76
Des+Clp+Tfs+R11/same	.16+.06+.01+.25%/.25+same	39	99	84	83	74	66
Des+Clp+Tfs+Scoil/same	.16+.06+.01+1%/.25+same	43	99	83	80	74	73
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	14	99	71	85	73	70
EXP MEAN		30	59	63	15	61	57
C.V. %		23	19	13	90	21	23
LSD 5%		10	16	12	19	18	18
LSD 1%		13	21	16	26	24	24
# OF REPS		4	4	4	4	4	4

* NA-308=desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio; R-11=non-ionic surfactant from Wilbur-Ellis; Scoil=methylated seed oil from Agsco; TRA-37=desmedipham EC from Terra; TRA-38=desmedipham+phenmedipham EC from Terra; TRA-44=desmedipham SC from Terra; TRA-45=desmedipham+phenmedipham SC from Terra; TRA-46=ethofumesate from Terra

Summary

NA-308 gave weed control and sugarbeet injury similar to desmedipham & phenmedipham at equal application rates. Adding dimethenamid to the first half of a split application of desmedipham increased redroot pigweed control without increasing sugarbeet injury compared to desmedipham alone. TRA-44 gave less control of redroot pigweed than TRA-37. The addition of Scoil improved redroot pigweed control from TRA-44. Treatments that included triflusulfuron gave the best control of common mallow.

Postemergence broadleaf herbicides, St. Thomas, 1994. 'Hilleshog 5135' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 4. Counter 15G at 12 pounds product per acre was applied in a five inch band and drag chain incorporated at planting. The first half of split application herbicide treatments was applied 11:30 am May 26 when the air temperature was 71F, soil temperature at six inches was 70F, relative humidity was 45%, wind velocity was 5 mph, soil moisture was good, sugarbeet was in the cotyledon to 2 leaf stage, and redroot pigweed was in the 2 leaf stage. The second half of split applications and the early single application treatments were applied 1:45 pm June 2 when the air temperature was 79F, soil temperature at six inches was 72F, relative humidity was 38%, wind velocity was 15-20 mph, soil moisture was fair, sugarbeet was in the 2 to 4 leaf stage, and redroot pigweed was in the 4 leaf stage. Late single application treatments were applied 2:30 pm June 6 when the air temperature was 81F, soil temperature at six inches was 78F, relative humidity was 55%, wind velocity was 10-15 mph, soil moisture was good, sugarbeet was in the 4 to 6 leaf stage, and redroot pigweed was in the 4 to 6 leaf stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury was evaluated June 9. Redroot pigweed control was evaluated July 6.

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed control
	lb/A	-------- %	-------
Desmedipham/Desmedipham	0.25/0.33	5	97
Desmedipham/Desmedipham	0.33/0.33	6	96
Desmed&Phenmed/Desmed&Phenmed	0.25/0.33	9	99
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	9	95
Desmed&Phenmed/Desmed&Phenmed	0.33/0.4	14	94
Desmed&Phenmed/Desmed&Phenmed	0.375/0.5	20	99
NA-308/NA-308	0.25/0.33	16	99
NA-308/NA-308	0.33/0.33	13	95
NA-308/NA-308	0.33/0.4	21	97
NA-308/NA-308	0.375/0.5	23	99
Des&Phen+Etho-SC/same	0.17+0.08/0.22+0.11	18	96
Des&Phen+EthoSC/Des&Phen+EthoSC	0.22+0.11/0.266+0.133	15	97
Des&Phen+EthoSC/Des&Phen+EthoSC	0.25+0.125/0.33+0.165	25	93
NA-308/NA-308/NA-308	0.22/0.22/0.22	5	88
NA-308/NA-308/NA-308	0.292/0.292/0.292	15	98
--/--/Desmed&Phenmed	--/--/0.75	0	27
--/--/Desmed&Phenmed+Etho-SC	--/--/0.5+0.25	4	37
NA-308+Clpy/NA-308+Clpy	0.25+0.09/0.33+0.09	18	96
Desmed+Etho-SC/Desmed+Etho-SC	0.17+0.08/0.22+0.11	11	99
TRA-38+TRA-46/TRA-38+TRA-46	0.17+0.08/0.22+0.11	9	90
TRA-38/TRA-38	0.25/0.33	6	94
TRA-45/TRA-45	0.25/0.33	10	91
TRA-45+Herbimax/TRA-45+Herbimax	0.25+1%/0.33+1%	13	98
TRA-37/TRA-37	0.25/0.33	6	96
TRA-44/TRA-44	0.25/0.33	4	97
TRA-44+Herbimax/TRA-44+Herbimax	0.25+1%/0.33+1%	4	98
TRA-44/TRA-44	0.33/0.33	9	99
TRA-44+Herbimax/TRA-44+Herbimax	0.33+1%/0.33+1%	9	96

(Table continued on next page.)

Postemergence broadleaf herbicides, St. Thomas, 1994. (continued)

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed control
	lb/A	-------- %	-------
--/Endothall	--/0.33	0	0
--/Endothall	--/0.5	0	0
--/Endothall	--/0.75	0	0
--/Clopyralid	--/0.19	0	0
--/Desmedipham&Phenmedipham+Endothall	--/0.33+0.5	4	60
Desmed+Dimethenamid/Desmed	0.25+1.5/0.33	8	99
Desmed+Clpy/Desmed+Clpy	0.25+0.09/0.33+0.09	10	99
Desm+Tfsu/Desm+Tfsu	0.25+0.0156/0.33+0.0156	3	99
Desm+Clpy+Tfsu/same	0.16+0.06+0.01/0.25+same	4	99
Des+Clpy+Tfsu+R-11/same	0.16+0.06+0.01+0.25%/0.25+same	10	99
Des+Clpy+Tfsu+Scoil/same	0.16+0.06+0.01+1%/0.25+same	9	99
Clpy+Tfsu+Scoil/same	0.09+0.0156+1%/same	8	81
EXP MEAN		9	82
C.V. %		58	10
LSD 5%		7	12
LSD 1%		10	15
# OF REPS		4	4

* NA-308=desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio; R-11=non-ionic surfactant from Wilbur-Ellis; Herbimax=petroleum oil from Loveland; TRA-37=desmedipham EC from Terra; TRA-38=desmedipham+phenmedipham EC from Terra; TRA-44=desmedipham SC from Terra; TRA-45=desmedipham+phenmedipham SC from Terra; TRA-46=ethofumesate from Terra

Summary

NA-308, desmedipham + ethofumesate and desmedipham&phenmedipham + ethofumesate gave or tended to give more sugarbeet injury than desmedipham or desmedipham&phenmedipham. All treatments gave over 90% control of redroot pigweed except endothall, clopyralid, clopyralid + triflusulfuron + Scoil and late, single applications of herbicides.

Actio 301 with postemergence herbicides, Crookston, 1994. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split application herbicide treatments was applied 12:00 pm May 25 when the air temperature was 70F, soil temperature at six inches was 61F, relative humidity was 48%, wind velocity was 18-23 mph, soil moisture was good, sugarbeet was in the 2 leaf stage, prostrate pigweed was in the 2 to 4 leaf stage, wild buckwheat was in the cotyledon to 2 leaf stage, and common lambsquarters was in the 2 to 4 leaf stage. The second half of split applications was applied 1:30 pm June 1 when the air temperature was 75F, soil temperature at six inches was 67F, relative humidity was 44%, wind velocity was 10 mph, soil moisture was fair, sugarbeet was in the 4 leaf stage, prostrate pigweed was in the 6 leaf stage, wild buckwheat was in the 4 to 6 leaf stage, and common lambsquarters was in the 4 to 8 leaf stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Prostrate pigweed control and sugarbeet injury were evaluated June 13 and June 29. Wild buckwheat control was evaluated June 13. Common lambsquarters control was evaluated June 29.

		June 13			June 29		
		Sgbt	Prpw	Wibw	Sgbt	Colq	Prpw
Treatment*	Rate	inj	cntl	cntl	inj	cntl	cntl
	lb/A	---	---	--- %	---	---	---
Desmed&Phenmed/Desmed&Phenmed	0.16/0.25	6	92	54	10	89	79
De&Ph+Actio/De&Ph+Actio	0.16+0.25G/0.25+0.25G	16	86	61	15	84	83
Desmed&Phenmed/Desmed&Phenmed	0.25/0.33	23	95	75	24	99	88
De&Ph+Actio/De&Ph+Actio	0.25+0.25G/0.33+0.25G	25	94	81	28	95	86
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	24	98	80	23	97	91
De&Ph+Actio/De&Ph+Actio	0.33+0.25G/0.5+0.25G	36	99	96	36	97	89
Desmed&Phenmed/Desmed&Phenmed	0.5/0.75	31	97	98	34	98	88
De&Ph+Actio/De&Ph+Actio	0.5+0.25G/0.75+0.25G	49	99	98	45	98	90
NA-308/NA-308	0.16/0.25	8	72	58	11	91	76
NA308+Actio/NA308+Actio	0.16+0.25G/0.25+0.25G	14	88	70	18	87	78
NA-308/NA-308	0.25/0.33	8	83	71	14	89	81
NA308+Actio/NA308+Actio	0.25+0.25G/0.33+0.25G	21	88	80	24	76	81
De&Ph+Tfsu/De&Ph+Tfsu	0.25+0.0156/0.33+0.0156	11	99	75	13	92	89
D&P+Tfsu+Act/same	0.25+0.0156+0.25G/0.33+same	15	97	82	24	90	92
Des&Phen+Clpy/same	0.25+0.09/0.33+0.09	15	93	98	18	98	91
D&P+Clpy+Actio/same	0.25+0.09+0.25G/0.33+same	19	96	84	26	98	91
EXP MEAN		20	92	79	23	92	86
C.V. %		28	10	13	24	7	6
LSD 5%		8	13	15	8	9	7
LSD 1%		11	17	19	10	11	10
# OF REPS		4	4	4	4	4	4

* NA-308 = desmedipham+phenmedipham+ethofumesate, 1:1:1 ratio;
Actio 301 = liquid fertilizer from Agro-Culture.

Summary

Treatments including Actio 301 caused more sugarbeet injury than the same treatments without Actio 301. Actio 301 had little effect on control of prostrate pigweed or common lambsquarters but Actio 301 increased control of wild buckwheat in some cases. However Actio 301 reduced wild buckwheat control from desmedipham&phenmedipham + clopyralid.

Sethoxydim with oil prior to desmedipham and desmedipham+ethofumesate, Fargo, 1994.

'Bush-Johnson 1320' sugarbeet was seeded 1.25 inches deep in 22 inch rows June 10. Counter 15G at 12 pounds product per acre was applied in a 2-inch band and drag chain incorporated at planting. Sethoxydim+ either Scoil or Dash HC was applied 6, 3, or 1 day prior (dp) to broadleaf herbicide application. The 6dp was applied 3:15 pm June 24 when the air temperature was 72F, soil temperature at six inches was 73F, relative humidity was 72%, wind velocity was 5 mph, soil moisture was fair, and sugarbeet was in the cotyledon to 2 leaf stage. The 3dp was applied 3:30 pm June 27 when the air temperature was 74F, soil temperature at six inches was 72F, relative humidity was 59%, wind velocity was 10 mph, soil moisture was fair, and sugarbeet was in the cotyledon to 4 leaf stage. The 1dp was applied 5:15 pm June 29 when the air temperature was 74F, soil temperature at six inches was 76F, relative humidity was 61%, wind velocity was 3 mph, soil moisture was fair, and sugarbeet was in the 2 to 4 leaf stage. The broadleaf herbicides were applied 2:30 pm June 30 when the air temperature was 84F, soil temperature at six inches was 72F, relative humidity was 68%, wind velocity was 7 mph, soil moisture was fair, and sugarbeet was in the 2 to 4 leaf stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury was evaluated July 20.

Treatment*	Rate lb/A	Sgbt injury %
Seth+Scoil / (6 day) / Desmedipham	0.2+1% / 0.50	1.25
Seth+Scoil / (6 day) / Desmedipham	0.2+1% / 1.00	1.25
Seth+Dash HC / (6 day) / Desmedipham	0.2+0.125G / 0.50	1.25
Seth+Dash HC / (6 day) / Desmedipham	0.2+0.125G / 1.00	2.50
Seth+Scoil / (6 day) / Des+Ethofumesate	0.2+1% / 0.33+0.17	0.00
Seth+Scoil / (6 day) / Des+Ethofumesate	0.2+1% / 0.66+0.34	4.25
Seth+Dash HC / (6 day) / Des+Ethofumesate	0.2+0.125G / 0.33+0.17	1.25
Seth+Dash HC / (6 day) / Des+Ethofumesate	0.2+0.125G / 0.66+0.34	6.25
Seth+Scoil / (3 day) / Desmedipham	0.2+1% / 0.50	1.25
Seth+Scoil / (3 day) / Desmedipham	0.2+1% / 1.00	5.00
Seth+Dash HC / (3 day) / Desmedipham	0.2+0.125G / 0.50	1.25
Seth+Dash HC / (3 day) / Desmedipham	0.2+0.125G / 1.00	6.25
Seth+Scoil / (3 day) / Des+Ethofumesate	0.2+1% / 0.33+0.17	4.25
Seth+Scoil / (3 day) / Des+Ethofumesate	0.2+1% / 0.66+0.34	4.50
Seth+Dash HC / (3 day) / Des+Ethofumesate	0.2+0.125G / 0.33+0.17	1.75
Seth+Dash HC / (3 day) / Des+Ethofumesate	0.2+0.125G / 0.66+0.34	0.00
Seth+Scoil / (1 day) / Desmedipham	0.2+1% / 0.50	0.00
Seth+Scoil / (1 day) / Desmedipham	0.2+1% / 1.00	3.75
Seth+Dash HC / (1 day) / Desmedipham	0.2+0.125G / 0.50	8.00
Seth+Dash HC / (1 day) / Desmedipham	0.2+0.125G / 1.00	5.25
Seth+Scoil / (1 day) / Des+Ethofumesate	0.2+1% / 0.33+0.17	1.25
Seth+Scoil / (1 day) / Des+Ethofumesate	0.2+1% / 0.66+0.34	6.75
Seth+Dash HC / (1 day) / Des+Ethofumesate	0.2+0.125G / 0.33+0.17	0.00
Seth+Dash HC / (1 day) / Des+Ethofumesate	0.2+0.125G / 0.66+0.34	15.75
Desmedipham	1.00	2.50
Desmedipham+Ethofumesate	0.66+0.34	3.25
LSD 5%		8.31

* Scoil=methylated seed oil from Agsco; Dash HC=adjuvant from BASF.

Summary

Desmedipham+ethofumesate at 0.66+0.34 lb/A 1 day after sethoxydim+Dash HC at 0.2 lb/A +0.125 G/A gave higher sugarbeet injury than other treatments. Sugarbeet injury increased when rates of desmedipham or desmedipham+ethofumesate increased. The six, three, or one day delay between sethoxydim+Scoil or sethoxydim+Dash HC and the broadleaf herbicide gave similar sugarbeet injury.

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Sugarbeet tolerance to herbicides, Fargo, 1994. Diethatyl+cycloate at 3+3 lb ai/A was applied to the entire plot area April 22. Incorporation was twice, once with a 'Kongskilde Triple K' field cultivator and once with an 'Alloway RTS' field cultivator. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split applied treatments containing desmedipham + triflusulfuron + clopyralid was 9:00 am May 23 when the air temperature was 76F, soil temperature at six inches was 60F, relative humidity was 38%, wind velocity was 8 mph, soil moisture was fair, and sugarbeet was in the cotyledon stage. The second half of split applied treatments containing desmedipham + triflusulfuron + clopyralid and the first split of treatments containing quizalofop was 3:15 pm May 30 when the air temperature was 70F, soil temperature at six inches was 62F, relative humidity was 41%, wind velocity was 16 mph, soil moisture was good, and sugarbeet was in the 2 to 4 leaf stage. The second split of treatments containing quizalofop was 2:30 pm June 13 when the air temperature was 82F, soil temperature at six inches was 70F, relative humidity was 55%, wind velocity was 10-15 mph, soil moisture was fair, and sugarbeet was in the 6 to 8 leaf stage. The third split of treatments containing quizalofop was 2:45 pm June 27 when the air temperature was 77F, soil temperature at six inches was 71F, relative humidity was 53%, wind velocity was 14 mph, soil moisture was good, and sugarbeet was in the 12 leaf stage. Treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was hand weeded May 25 and maintained weed free throughout the growing season by hand weeding. Sugarbeet was hand thinned to an 8 inch spacing May 31. Cultivation was May 31 and June 18. Super Tin WP at 5 oz/A + Benlate at 8 oz/A was applied to all plots August 15. Sugarbeet injury was evaluated June 6 and June 25. Sugarbeet from the center two rows of 35 foot plots was harvested and counted September 21.

Treatment*	Rate	6-6 Sgbt inj	6-25 Sgbt inj	9-21 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	plt/70'	%	%	ton/A		lb/A
--/Quizalofop+R-11/same/same	0.075+0.25%	0	0	118	16.3	1.6	23.7	698	6930
--/Quizalofop+Mor-Act/same/same	0.075+0.25G	0	0	122	15.7	1.6	25.7	738	7188
--/Quizalofop+R-11/same/same	0.15+0.25%	0	0	114	14.4	1.7	25.3	870	6386
--/Quizalofop+Mor-Act/same/same	0.15+0.25G	0	0	115	15.0	1.5	24.2	767	6332
Des+Tfsu+Clpy/same	0.25+0.0156+0.09/0.33+same	34	14	112	14.7	1.6	22.8	791	5898
Des+Tfsu+Clpy+R-11/same	0.25+0.0156+0.09+0.25%/0.33+same	46	18	97	14.9	1.6	21.8	805	5767
Des+Tfsu+Clpy+Scoil/same	0.25+0.0156+0.09+1%/0.33	45	15	121	16.6	1.7	23.1	745	6809
Des+Tfsu+Clpy+Scoil+28%/same	0.25+0.0156+0.09+1%+1G/0.33	40	15	107	16.7	1.6	20.6	681	6165
C.V. %		19	18	11	9.3	7.4	9.8	13	13
LSD 5%		6	2	NS	NS	NS	NS	NS	NS
LSD 1%		8	3	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4

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

SUMMARY: Addition of R-11 or Scoil to desmedipham + triflusulfuron + clopyralid increased sugarbeet injury. Sugarbeet yield was not affected by treatments.

Sugarbeet tolerance to herbicides, Fargo (airport), 1994. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 12. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split applied treatments containing desmedipham + triflusulfuron + clopyralid was 12:30 pm June 9 when the air temperature was 65F, soil temperature at six inches was 63F, relative humidity was 40%, wind velocity was 20 mph, soil moisture was fair, and sugarbeet was in the cotyledon to 4 leaf stage. The second half of split applied treatments containing desmedipham + triflusulfuron + clopyralid and the first split of treatments containing quizalofop was 11:30 am June 17 when the air temperature was 63F, soil temperature at six inches was 60F, relative humidity was 89%, wind velocity was 5-10 mph, soil moisture was good, and sugarbeet was in the 2 to 6 leaf stage. The second split of treatments containing quizalofop was 4:00 pm June 30 when the air temperature was 84F, soil temperature at six inches was 72F, relative humidity was 56%, wind velocity was 10-15 mph, soil moisture was good, and sugarbeet was in the 8 to 12 leaf stage. The third split of treatments containing quizalofop was 4:00 pm July 15 when the air temperature was 85F, soil temperature at six inches was 74F, relative humidity was 84%, wind velocity was 5 mph, soil moisture was good, and sugarbeet was in the 12 to 14 leaf stage. Treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was maintained weed free throughout the growing season by hand weeding. Sugarbeet was hand thinned to a 10 inch spacing July 15. Cultivation was June 24. Sethoxydim + Dash HC at 0.3 lb/A + 1 pt/A was applied to all plots June 15. Sugarbeet injury was evaluated July 5. Sugarbeet from the center two rows of 32 foot plots was harvested and counted September 28.

Treatment*	Rate	7-5 Sgbt inj	9-28 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	plt/64'	%	%	ton/A		lb/A
--/Quizalofop+R-11/same/same	0.075+0.25%	0	69	13.7	1.8	24.7	950	5801
--/Quizalofop+Mor-Act/same/same	0.075+0.25G	0	65	14.0	1.7	21.8	877	5286
--/Quizalofop+R-11/same/same	0.15+0.25%	0	65	14.2	1.7	23.7	864	5846
--/Quizalofop+Mor-Act/same/same	0.15+0.25G	0	67	14.4	1.6	23.7	807	5999
Des+Tfsu+Clpy/same	0.25+0.0156+0.09/0.33+same	3	68	14.2	1.7	25.3	873	6268
Des+Tfsu+Clpy+R-11/same	0.25+0.0156+0.09+0.25%/0.33+same	8	69	14.8	1.6	24.0	767	6319
Des+Tfsu+Clpy+Scoil/same	0.25+0.0156+0.09+1%/0.33	5	71	13.9	1.7	22.8	899	5504
Des+Tfsu+Clpy+Scoil+28%N/same	0.25+0.0156+0.09+1%+1G/0.33	8	67	13.9	1.8	23.1	935	5531
C.V. %		132	6	3.0	6.1	4.7	8	6
LSD 5%		5	NS	0.6	NS	1.6	100	540
LSD 1%		NS	NS	NS	NS	2.2	NS	735
# OF REPS		4	4	4	4	4	4	4

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

SUMMARY: Sugarbeet treated with desmedipham + triflusulfuron + clopyralid + Scoil yielded less extractable sucrose/A than those treated with desmedipham + triflusulfuron + clopyralid. The lower yield from quizalofop + Mor-Act at the low rate must be an artifact since the high rate caused no yield loss.

__Foliar applied insecticides plus herbicides, Fargo, 1994.__ Diethatyl+cycloate at 3+3 lb ai/A was applied April 22 and incorporated three inches deep with a 'Kongskilde Triple K'. A second incorporation was with an 'Alloway RTS' operated three inches deep. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split application treatments was applied 5:15 pm May 25 when the air temperature was 71F, soil temperature at six inches was 65F, relative humidity was 41%, wind velocity was 17 mph, soil moisture was good, and sugarbeet was in the cotyledon to 2 leaf stage. The second half of split applications was applied 11:00 am June 1 when the air temperature was 73F, soil temperature at six inches was 62F, relative humidity was 33%, wind velocity was 5 mph, soil moisture was good, and sugarbeet was in the 2 to 4 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was thinned by hand to an eight inch spacing June 8. All plots were hand weeded June 8 and maintained weed free throughout the growing season by hand weeding. Sugarbeet was row-crop cultivated May 27 and June 18. Sugarbeet injury was evaluated June 6 and June 25. Sugarbeet from the center two rows of 35 foot plots was counted and harvested September 20.

Treatment*	Rate	6-6 Sgbt inj	6-25 Sgbt inj	9-20 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	plt/70'	%	%	ton/A		lb/A
Untreated Check	0	0	0	83	14.0	1.5	28.1	816	6933
Tfsu+R-11/same	0.0156+0.25%/same	8	0	82	15.9	1.5	25.6	709	7276
Tfsu+R-11/same	0.031+0.25%/same	10	0	83	15.2	1.5	25.8	734	6952
Tfsu+De&Ph/same	0.0156+0.33/same	28	9	81	15.9	1.6	25.1	735	7095
Tfsu+Diazinon/same	0.0156+0.5/same	14	1	77	13.6	1.6	24.8	905	5982
Tfsu+Diazinon/same	0.031+0.5/same	18	3	66	13.7	1.6	21.4	881	5083
Tfs+D&P+Diaz/same	.0156+.33+.5/same	33	11	79	15.0	1.4	23.3	708	6367
Tfsu+D&P+Diaz/same	.03+.33+.5/same	40	15	75	15.5	1.4	20.2	674	5592
Tfsu+Lorsban/same	0.0156+1/same	14	0	79	14.7	1.6	27.4	799	7038
Tfsu+Lorsban/same	0.031+1/same	18	1	76	14.4	1.6	27.5	827	6966
Tfsu+D&P+Lors/same	.0156+.33+1/same	33	14	77	16.5	1.4	24.5	638	7310
Tfsu+D&P+Lors/same	.031+.33+1/same	35	11	77	14.9	1.5	22.8	741	6126
Tfsu+Asana/same	0.0156+0.05/same	11	0	79	16.2	1.5	24.4	677	7150
Tfsu+Asana/same	0.031+0.05/same	16	1	78	15.6	1.4	23.8	685	6635
Tfs+D&P+Asa/same	.0156+.33+.05/same	35	13	77	15.8	1.5	24.7	689	7007
Tfsu+D&P+Asa/same	.031+.33+.05/same	36	15	80	16.1	1.5	22.9	702	6556
Tfs+Lann+R11/same	.0156+1+.25%/same	10	1	83	15.6	1.5	25.1	702	7022
Tfs+Lann+R-11/same	.031+1+.25%/same	13	3	74	15.7	1.5	24.2	703	6809
Tfsu+D&P+Lann/same	.0156+.33+1/same	29	8	77	15.4	1.5	22.3	706	6132
Tfsu+D&P+Lann/same	.031+.33+1/same	30	10	75	13.6	1.5	22.2	844	5382
C.V. %		17	61	9	11.5	8.3	12.3	17	18
LSD 5%		5	5	NS	NS	NS	4.2	NS	NS
LSD 1%		7	7	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4

* R-11 = non-ionic surfactant from Wilbur-Ellis

Summary

Triflusulfuron + desmedipham&phenmedipham gave more sugarbeet injury than triflusulfuron. Adding Diazinon, Lorsban or Asana generally increased sugarbeet injury but Lannate did not. Extractable sucrose per acre was not significantly affected by treatments.

Lorsban plus desmedipham on sugarbeet, Fargo, 1994. Diethatyl+cycloate at 3+3 lb ai/A was applied April 22 and incorporated three inches deep with a 'Kongskilde Triple K'. A second incorporation was with an 'Alloway RTS' operated three inches deep. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split application treatments was applied 5:15 pm May 25 when the air temperature was 71F, soil temperature at six inches was 65F, relative humidity was 41%, wind velocity was 17 mph, soil moisture was good, and sugarbeet was in the cotyledon to 2 leaf stage. Single applications of Lorsban and the second half of split applications were applied 11:00 am June 1 when the air temperature was 73F, soil temperature at six inches was 62F, relative humidity was 33%, wind velocity was 5 mph, soil moisture was good, and sugarbeet was in the 2 to 4 leaf stage. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was thinned by hand to an eight inch spacing June 8. All plots were hand weeded June 8 and maintained weed free throughout the growing season by hand weeding. Sugarbeet was row-crop cultivated May 27 and June 18. Sugarbeet injury was evaluated June 6 and June 25. Sugarbeet from the center two rows of 35 foot plots was counted and harvested September 20.

Treatment	Rate	6-6 Sgbt inj	6-25 Sgbt inj	9-20 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	plt/70'	%	%	ton/A		lb/A
Untreated Check	0	0	0	76	14.4	1.5	25.2	791	6493
Lorsban-HF	1	4	0	83	15.2	1.6	26.3	795	7232
Lorsban-HF	2	11	0	80	15.6	1.6	24.6	751	6847
Lorsban-HF	3	14	0	75	16.0	1.6	24.0	730	6848
Lorsban-HF	4.5	19	3	81	15.6	1.5	24.0	696	6708
Desmed/Desmed	0.33/0.5	21	5	75	16.4	1.6	24.8	702	7310
Desm/Desm+Lorsban-HF	0.33/0.5+1	31	13	72	16.1	1.5	21.9	693	6304
Desm/Desm+Lorsban-HF	0.33/0.5+2	30	13	77	14.5	1.5	22.5	784	5600
Desm/Desm+Lorsban-HF	0.33/0.5+3	40	16	71	15.1	1.5	19.0	749	5141
Desm/Desm+Lorsban-HF	0.33/0.5+4.5	39	13	78	14.1	1.5	23.8	796	5938
EXP MEAN		21	6	77	15.3	1.5	23.6	748	6442
C.V. %		26	54	11	10.9	7.8	11.2	16	18
LSD 5%		8	5	NS	NS	NS	3.8	NS	NS
LSD 1%		11	7	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4

Summary

Lorsban plus desmedipham caused more sugarbeet injury than Lorsban alone or desmedipham alone. None of the treatments significantly affected yield.

Triflusulfuron and insecticide interaction, St. Thomas, 1993. 'Hilleshog 5135' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 4. Counter 15G, Counter 20CR, and Lorsban 15G at 12, 8.9, and 13.5 pounds product per acre respectively was applied modified in-furrow or in a five inch band and drag chain incorporated at planting. The first half of split applied postemergence herbicide treatments was applied 11:30 am May 26 when the air temperature was 71F, soil temperature at six inches was 70F, relative humidity was 45%, wind velocity was 5 mph, soil moisture was good, and sugarbeet was in the cotyledon to 2 leaf stage. The second half of split treatments was applied 12:30 pm June 2 when the air temperature was 79F, soil temperature at six inches was 72F, relative humidity was 38%, wind velocity was 15-20 mph, soil moisture was good, and sugarbeet was in the 2 to 4 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. Sugarbeet injury was evaluated June 9. Sugarbeet in the center two rows of each plot was counted June 13. Sugarbeet in the center four rows of each plot was hand thinned to an eight inch spacing and hand weeded June 13. All plots were maintained weed free throughout the remainder of the growing season by hand weeding and row crop cultivation June 21 and June 30. Ten sugarbeet from each plot were rated August 2 for root maggot damage using the following scale: 0=no damage, 1=1 to 4 small scars, 2=5 to 10 small scars or up to 3 larger scars, 3=more than 3 larger scars, 4=50 to 75% of root blackened by scars, 5=more than 75% blackened or dead beet. The mean of these ten ratings is the sugarbeet root maggot damage rating. Sugarbeet was harvested and counted from the center two rows of 35 foot long plots September 23.

(Experiment continued on next page.)

Triflusulfuron and insecticide interaction, St. Thomas, 1994. (continued)

Insect-icide	Method of Appl	Herbicide Treatment*	Rate	Sgbt injury	June 13 Sgbt popul	Root maggot damage rating
			lb/A	%	plts/70'	0-5
Counter15G	MIF	Tfsu+X-77/same	0.0156+0.25%	0	156	3.04
Counter15G	Band	Tfsu+X-77/same	0.0156+0.25%	0	159	3.21
Counter15G	MIF	None	0	0	160	3.00
Counter15G	Band	None	0	0	171	3.24
Counter15G	MIF	Tfsu+X-77/same	0.031+0.25%	1	160	3.03
Counter15G	Band	Tfsu+X-77/same	0.031+0.25%	4	165	3.20
Counter15G	MIF	Tfsu+Des&Phen/same	0.0156+0.33	16	148	3.00
Counter15G	Band	Tfsu+Des&Phen/same	0.0156+0.33	13	172	3.14
Counter20CR	MIF	Tfsu+X-77/same	0.0156+0.25%	0	169	3.00
Counter20CR	Band	Tfsu+X-77/same	0.0156+0.25%	1	163	3.18
Counter20CR	MIF	None	0	0	176	3.14
Counter20CR	Band	None	0	0	169	3.26
Counter20CR	MIF	Tfsu+X-77/same	0.031+0.25%	1	161	3.14
Counter20CR	Band	Tfsu+X-77/same	0.031+0.25%	1	168	3.26
Counter20CR	MIF	Tfsu+Des&Phen/same	0.0156+0.33	13	165	3.09
Counter20CR	Band	Tfsu+Des&Phen/same	0.0156+0.33	9	171	3.13
Lorsban15G	MIF	Tfsu+X-77/same	0.0156+0.25%	11	145	2.91
Lorsban15G	Band	Tfsu+X-77/same	0.0156+0.25%	3	172	3.14
Lorsban15G	MIF	None	0	3	138	3.10
Lorsban15G	Band	None	0	0	167	3.11
Lorsban15G	MIF	Tfsu+X-77/same	0.031+0.25%	15	135	2.79
Lorsban15G	Band	Tfsu+X-77/same	0.031+0.25%	3	170	2.98
Lorsban15G	MIF	Tfsu+Des&Phen/same	0.0156+0.33	21	146	2.89
Lorsban15G	Band	Tfsu+Des&Phen/same	0.0156+0.33	15	162	3.03
None	--	Tfsu+X-77/same	0.0156+0.25%	0	171	3.51
None	--	Tfsu+X-77/same	0.031+0.25%	0	179	3.55
None	--	Tfsu+Des&Phen/same	0.0156+0.33	6	171	3.38
None	--	None	0	0	178	3.31
EXP MEAN				5	163	3.13
C.V. %				63	8	4.68
LSD 5%				4	18	0.21
LSD 1%				6	24	0.27
# OF REPS				4	4	4

Summary

Triflusulfuron + desmedipham & phenmedipham caused more sugarbeet injury than triflusulfuron + X-77. In some cases, injury was greater when herbicides were applied over modified-in-furrow insecticide as compared to banded insecticide. Root maggot damage was or tended to be greater with band application of insecticide rather than modified-in-furrow. However, sugarbeet populations on June 13 were lower with modified-in-furrow than with band application with all Lorsban treatments and with Counter 15G followed by triflusulfuron + desmedipham & phenmedipham.

(Experiment continued on next page.)

Triflusulfuron and insecticide interaction, St. Thomas, 1994. (continued)

Insect-icide	Method of Appl	Herbicide Treatment*	Rate lb/A	Sept.23 Sgbt Popl plt/70'	Sucr %	Loss to Mol %	Root Yield ton/A	Impur Index	Extr Sucr lb/A
Counter15G	MIF	Tfsu+X-77/same	0.0156+0.25%	80	14.2	1.4	21.9	732	5584
Counter15G	Band	Tfsu+X-77/same	0.0156+0.25%	80	14.1	1.5	21.6	766	5410
Counter15G	MIF	None	0	83	13.8	1.5	22.5	799	5471
Counter15G	Band	None	0	82	14.0	1.5	19.3	751	4813
Counter15G	MIF	Tfsu+X-77/same	0.031+0.25%	87	14.5	1.5	21.9	733	5660
Counter15G	Band	Tfsu+X-77/same	0.031+0.25%	79	14.2	1.4	19.2	720	4871
Counter15G	MIF	Tfsu+De&Ph/same	0.0156+0.33	75	14.1	1.4	20.4	727	5114
Counter15G	Band	Tfsu+De&Ph/same	0.0156+0.33	74	14.5	1.4	20.1	712	5194
Count20CR	MIF	Tfsu+X-77/same	0.0156+0.25%	74	14.1	1.5	19.6	757	4908
Count20CR	Band	Tfsu+X-77/same	0.0156+0.25%	77	14.4	1.5	20.2	748	5181
Count20CR	MIF	None	0	84	14.6	1.5	21.0	733	5446
Count20CR	Band	None	0	78	14.1	1.3	20.7	686	5241
Count20CR	MIF	Tfsu+X-77/same	0.031+0.25%	73	15.0	1.3	20.2	633	5491
Count20CR	Band	Tfsu+X-77/same	0.031+0.25%	79	14.2	1.3	20.7	685	5268
Count20CR	MIF	Tfsu+De&Ph/same	0.0156+0.33	79	14.1	1.5	21.4	785	5356
Count20CR	Band	Tfsu+De&Ph/same	0.0156+0.33	73	14.1	1.5	19.2	775	4789
Lorsban15G	MIF	Tfsu+X-77/same	0.0156+0.25%	72	14.2	1.4	22.9	734	5788
Lorsban15G	Band	Tfsu+X-77/same	0.0156+0.25%	83	14.3	1.4	21.4	722	5450
Lorsban15G	MIF	None	0	67	14.4	1.4	20.9	732	5354
Lorsban15G	Band	None	0	79	14.1	1.4	19.9	702	5025
Lorsban15G	MIF	Tfsu+X-77/same	0.031+0.25%	67	14.1	1.5	22.0	782	5501
Lorsban15G	Band	Tfsu+X-77/same	0.031+0.25%	76	14.6	1.4	20.4	718	5335
Lorsban15G	MIF	Tfsu+De&Ph/same	0.0156+0.33	72	14.1	1.5	22.6	775	5612
Lorsban15G	Band	Tfsu+De&Ph/same	0.0156+0.33	81	14.4	1.4	21.7	716	5590
None	--	Tfsu+X-77/same	0.0156+0.25%	69	13.2	1.6	17.2	861	3944
None	--	Tfsu+X-77/same	0.031+0.25%	75	13.6	1.5	16.9	825	4031
None	--	Tfsu+De&Ph/same	0.0156+0.33	69	13.5	1.6	18.9	833	4458
None	--	None	0	77	14.0	1.5	20.5	771	5057
EXP MEAN				76	14.2	1.4	20.5	747	5176
C.V. %				7	3.3	7.4	9.4	9	10
LSD 5%				7	0.7	NS	2.7	96	763
LSD 1%				10	0.9	NS	3.6	128	1012
# OF REPS				4	4	4	4	4	4

* X-77=non-ionic surfactant from Valent

Summary

Sugarbeet had lower population at harvest in plots treated with modified-in-furrow Lorsban 15G as compared to banded Lorsban 15G. Plots that were not treated with insecticide or herbicide had sugarbeet populations at harvest and yields that were similar to or higher than insecticide-treated plots. This indicates that sugarbeet injury from root maggot was not severe in this experiment and sugarbeet recovered well from the injury observed. Plots treated with herbicides but no insecticide yielded less than most of the insecticide treated plots.

<u>Herbicides and sugarbeet yield, Prosper, 1994.</u> Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 8:30 am May 18 when the air temperature was 74F, soil temperature at six inches was 59F, relative humidity was 54%, wind velocity was 20-25 mph, and soil moisture was fair. Incorporation was with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for EthofumesateSC. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows at a 5 inch spacing May 18. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first portion of split application treatments was applied 12:00 pm June 14 when the air temperature was 89F, soil temperature at six inches was 73F, relative humidity was 68%, wind velocity was 10-15 mph, soil moisture was poor, sugarbeet was in the 4 to 6 leaf stage, and redroot pigweed was 2 to 4 inches tall. The second portion of split application treatments was applied 1:30 pm June 22 when the air temperature was 77F, soil temperature at six inches was 75F, relative humidity was 91%, wind velocity was 5 mph, soil moisture was good, sugarbeet was in the 8 leaf stage, and redroot pigweed was 4 to 8 inches tall. The third portion of split application treatments was applied 3:00 pm July 1 when the air temperature was 67F, relative humidity was 49%, wind velocity was 15 mph, soil moisture was good, sugarbeet was in the 6 to 10 leaf stage, and redroot pigweed was 7 to 9 inches tall. 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. Sethoxydim + Dash HC at 0.3 lb ai/A + 1 pt\A and 0.4 lb ai/A + 1 pt/A was applied to all plots June 13 and June 23 respectively. Sugarbeet injury and redroot pigweed control were evaluated June 25.

Treatment	Rate	Sugarbeet injury	Redroot Pigweed control
	lb/A	%	%
Untreated Check	0	0	0
Triflusulfuron+Des&Phen/same	0.0156+0.33/same	3	74
Triflusulfuron+Des&Phen/same	0.0238+0.33/same	2	73
Tfsu+D&P/Tfsu+D&P+Clpy	.0156+.33/.0156+.33+.09	3	73
De&Ph/De&Ph+Clpy/De&Ph+Clpy	.25/.33+.09/.5+.09	0	51
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	0	43
Cycl(ppi)/Des&Phen/Des&Phen	4/0.33/0.33	8	98
Etho-SC(ppi)/Des&Phen/Des&Phen	3/0.33/0.33	5	99
EPTC+Cycl(ppi)/Des&Phen/De&Ph	1.5+2/0.16/0.25	13	97
Cycloate (ppi)	4	0	58
De&Ph+EthoSC/D&P+EthoSC	0.25+0.125/0.33+0.165	2	60
Tfsu+D&P+Clpy/same/same	.01+.25+.06/same/same	0	74
EXP MEAN		3	67
C.V. %		101	20
LSD 5%		4	16
LSD 1%		5	21
# OF REPS		6	6

Summary

Eptc+cycloate followed by desmedipham&phenmedipham caused more sugarbeet injury than the other treatments. Desmedipham&phenmedipham+triflusulfuron gave better redroot pigweed control than desmedipham&phenmedipham. Preplant incorporated herbicides followed by postemergence herbicides gave the greatest control of redroot pigweed.

Herbicides and sugarbeet yield, Fargo, 1994. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles to the center four rows of six row plots 9:00 am May 13 when the air temperature was 66F, soil temperature at six inches was 55F, relative humidity was 53%, wind velocity was 15-30 mph, 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 EthofumesateSC. 'KW 1119' sugarbeet was seeded 1.25 inches deep in 22 inch rows at a 3 inch spacing May 13. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. The first portion of split application treatments was applied 10:30 am June 3 when the air temperature was 76F, soil temperature at six inches was 63F, relative humidity was 38%, wind velocity was 10 mph, soil moisture was fair, sugarbeet was in the cotyledon to 4 leaf stage, and redroot pigweed was in the cotyledon to 6 leaf stage. The second portion of split application treatments was applied 2:00 pm June 13 when the air temperature was 82F, soil temperature at six inches was 70F, relative humidity was 55%, wind velocity was 10-15 mph, soil moisture was fair, sugarbeet was in the 2 to 6 leaf stage, and redroot pigweed was 3 to 6 inches tall. The third portion of split application treatments was applied 3:30 pm June 23 when the air temperature was 86F, soil temperature at six inches was 78F, relative humidity was 45%, wind velocity was 5-10 mph, soil moisture was good, sugarbeet was in the 6 to 8 leaf stage, and redroot pigweed was 4 to 12 inches tall. 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. Sethoxydim + crop oil at 0.3 lb ai/A + 1 qt\A was applied to all plots May 26 and June 15. Sugarbeet injury and redroot pigweed control were evaluated June 20. Row crop cultivation was done to all plots June 23 and June 29. Sugarbeet was counted from 56 feet of the center two rows of each plot June 29. 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 July 1 and July 18. The time to weed each plot was recorded. Redroot pigweed control was evaluated July 27 in the other 28 foot plot. Sugarbeet from the center two rows of 28 foot long plots was harvested and counted September 28.

(Experiment continued on next page.)

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

Treatment	Rate	6-20 Sgbt inj	6-20 Rrpw cntl	7-27 Rrpw cntl	6-29 Sgbt popul	7-1 Time of hand weeding	7-18 Time of hand weeding	Total time
	lb/A	%	%	%	plt/56'	min/plot	min/plot	hr/A
Untreated Check	0	0	0	0	109	7.6	3.2	38.0
Triflusulfuron+Des&Phen/same	0.0156+0.33/same	7	99	93	123	1.8	1.8	12.7
Triflusulfuron+Des&Phen/same	0.0238+0.33/same	11	98	93	111	1.7	1.9	12.8
Tfsu+Des&Phen/Tfsu+Des&Phen+Clpy	0.0156+0.33/0.0156+0.33+0.09	12	99	95	122	2.3	1.8	14.5
Des&Phen/Des&Phen+Clpy/De&Ph+Clpy	0.25/0.33+0.09/0.5+0.09	7	96	91	125	1.7	1.7	12.3
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	11	88	74	122	2.5	2.1	16.4
Cycl(ppi)/Des&Phen/Des&Phen	4/0.33/0.33	18	98	90	130	1.7	1.6	11.6
Etho-SC(ppi)/Des&Phen/Des&Phen	3/0.33/0.33	21	99	98	117	1.8	1.9	13.0
EPTC+Cycl(ppi)/Des&Phen/Des&Phen	1.5+2/0.16/0.25	27	99	83	128	1.8	1.9	13.1
Cycloate (ppi)	4	4	43	35	121	3.4	2.6	21.0
Des&Phen+Etho-SC/Des&Phen+Etho-SC	0.25+0.125/0.33+0.165	18	90	80	112	1.8	2.1	13.7
Tfsu+Des&Phen+Clpy/same/same	0.01+0.25+0.06/same/same	1	99	96	122	1.7	1.6	11.9
EXP MEAN		11	84	77	120	2.5	2.0	15.9
C.V. %		52	8	12	11	56.5	28.0	31.0
LSD 5%		7	8	10	NS	1.6	0.7	5.7
LSD 1%		9	10	14	NS	2.2	0.9	7.6
# OF REPS		6	6	6	6	6	6	6

(Experiment continued on next page.)

Herbicides and sugarbeet yield, Fargo, 1994. (continued)

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

Herbicide Treatment	Rate	Hand Weed	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A		#/56'	%	%	ton/A		lb/A
Untreated Check	0	Yes	76	14.9	1.7	21.1	814	5529
Untreated Check	0	No	66	14.8	1.6	16.0	802	4182
Triflusulfuron+De&Ph/same	0.0156+0.33/same	Yes	77	15.0	1.7	20.8	841	5457
Triflusulfuron+De&Ph/same	0.0156+0.33/same	No	80	14.9	1.7	21.0	849	5442
Triflusulfuron+De&Ph/same	0.0238+0.33/same	Yes	76	15.0	1.7	19.9	811	5268
Triflusulfuron+De&Ph/same	0.0238+0.33/same	No	78	14.9	1.7	21.3	827	5571
Tfsu+D&P/same+Clpy	0.0156+.33/.0156+.33+.09	Yes	78	15.2	1.7	20.4	804	5464
Tfsu+D&P/same+Clpy	0.0156+.33/.0156+.33+.09	No	82	15.2	1.6	21.3	775	5707
De&Ph/De&Ph+Clpy/same	0.25/.33+.09/.5+.09	Yes	81	15.0	1.7	19.9	848	5214
De&Ph/De&Ph+Clpy/same	0.25/.33+.09/.5+.09	No	82	14.5	1.8	20.9	910	5235
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	Yes	80	14.8	1.6	19.4	817	5027
Desmed&Phenmed/Desmed&Phenmed	0.33/0.33	No	79	14.8	1.7	19.7	816	5117
Cycl(ppi)/Des&Phen/Des&Phen	4/0.33/0.33	Yes	84	14.6	1.6	17.8	815	4554
Cycl(ppi)/Des&Phen/Des&Phen	4/0.33/0.33	No	89	14.5	1.6	18.2	833	4620
Etho-SC(ppi)/Des&Phen/Des&Phen	3/0.33/0.33	Yes	77	14.5	1.7	17.9	843	4554
Etho-SC(ppi)/Des&Phen/Des&Phen	3/0.33/0.33	No	83	14.4	1.8	18.6	903	4627
EPTC+Cycl(ppi)/De&Ph/De&Ph	1.5+2/0.16/0.25	Yes	88	14.5	1.6	17.3	802	4409
EPTC+Cycl(ppi)/De&Ph/De&Ph	1.5+2/0.16/0.25	No	90	14.8	1.7	18.3	831	4743
Cycloate (ppi)	4	Yes	76	14.6	1.6	18.4	810	4741
Cycloate (ppi)	4	No	78	15.0	1.6	15.5	778	4094
De&Ph+EthoSC/D&P+EthoSC	0.25+.125/.33+.165	Yes	76	15.0	1.7	19.9	816	5279
De&Ph+EthoSC/D&P+EthoSC	0.25+.125/.33+.165	No	75	14.6	1.7	20.9	854	5331
Tfs+D&P+Clp/same/same	.01+.25+.06/same/same	Yes	80	15.1	1.6	20.8	773	5604
Tfs+D&P+Clp/same/same	.01+.25+.06/same/same	No	82	14.7	1.7	21.6	844	5540
C.V. %			11	3.5	7.6	8.6	10	11
LSD 5%			10	NS	NS	1.9	NS	610
# OF REPS			6	6	6	6	6	6

Summary

Triflusulfuron + desmedipham & phenmedipham gave better control of redroot pigweed than desmedipham & phenmedipham (Table 1). Desmedipham & phenmedipham + ethofumesate gave more sugarbeet injury and similar redroot pigweed control compared to desmedipham & phenmedipham. Incorporated herbicides followed by desmedipham & phenmedipham gave more sugarbeet injury than desmedipham & phenmedipham. Time required for hand weeding generally followed the level of weed control. The untreated check, cycloate and desmedipham & phenmedipham plots took more time for hand weeding than other plots.

The hand-weeded plots yielded significantly more than the non-hand-weeded plots only in the cycloate treated and untreated plots (Table 2). Sugarbeet population at harvest was less in the hand-weeded untreated plots than in the non-hand-weeded untreated plots suggesting that the competition from weeds killed some of the sugarbeet plants. None of the plots yielded significantly more than the hand-weeded untreated check. However, all plots treated with preplant incorporated herbicides yielded less than the hand-weeded untreated check plots. This suggests that the sugarbeet injury from incorporated herbicides followed by postemergence herbicides resulted in reduced sugarbeet yield. Lower yield in plots treated with cycloate alone probably was from weed competition. Hand weeding was not done until July 1 so weed competition prior to hand weeding could have caused sugarbeet yield reduction.

Sugarbeet replant after triflusulfuron, Fargo, 1994. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 12. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots one, three, and seven days before replanting sugarbeet. The first application was 10:00 am June 3 when the air temperature was 76F, soil temperature at six inches was 63F, relative humidity was 38%, wind velocity was 10 mph, soil moisture was fair, sugarbeet was in the cotyledon to 4 leaf stage, and redroot pigweed was in the cotyledon to 4 leaf stage. The second herbicide application was 9:00 am June 7 when the air temperature was 64F, soil temperature at six inches was 62F, relative humidity was 35%, wind velocity was 15 mph, soil moisture was fair, sugarbeet was in the 2 to 4 leaf stage, and redroot pigweed was in the 2 to 6 leaf stage. The third herbicide application was 12:30 pm June 9 when the air temperature was 65F, soil temperature at six inches was 63F, relative humidity was 40%, wind velocity was 20 mph, soil moisture was fair, sugarbeet was in the 2 to 6 leaf stage, and redroot pigweed was in the 2 to 8 leaf stage. A 'Kongskilde Triple K' field cultivator operated two inches deep and parallel to the herbicide plots was used to till up the first planting of sugarbeet June 10. 'Bush Johnson BJ1320' sugarbeet was seeded 1.25 inches deep in 22 inch rows June 10. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting June 10. Sugarbeet injury was evaluated July 5 and July 27. Redroot pigweed control was evaluated July 27. Sugarbeet in the center two rows of each 30 foot long plot was counted July 15.

Treatment*	Date of Application	Rate	July 5 Sgbt inj	July 15 Sgbt Popul	July 27 Sgbt inj	July 27 Rrpw cntl
		lb/A	%	plts/60ft	%	%
Triflusulfuron+R-11	June 9	0.0156+0.25%	0	149	0	0
Triflusulfuron+R-11	June 7	0.0156+0.25%	0	154	0	18
Triflusulfuron+R-11	June 3	0.0156+0.25%	0	151	0	3
Triflusulfuron+R-11	June 9	0.031+0.25%	0	131	0	29
Triflusulfuron+R-11	June 7	0.031+0.25%	0	142	0	30
Triflusulfuron+R-11	June 3	0.031+0.25%	0	147	0	20
Triflusulfuron+Des&Phen	June 9	0.0156+0.33	0	141	0	26
Triflusulfuron+Des&Phen	June 7	0.0156+0.33	0	156	0	14
Triflusulfuron+Des&Phen	June 3	0.0156+0.33	0	147	0	13
Desmedipham&Phenmedipam	June 9	0.33	0	150	0	0
Desmedipham&Phenmedipam	June 7	0.33	0	157	0	0
Desmedipham&Phenmedipam	June 3	0.33	0	155	0	0
Desmedipham&Phenmedipham	June 9	0.5	0	153	0	0
Desmedipham&Phenmedipham	June 7	0.5	0	156	0	0
Desmedipham&Phenmedipham	June 3	0.5	0	148	0	5
EXP MEAN			0	149	0	10
C.V. %			0	8	0	147
LSD 5%			NS	NS	NS	22
LSD 1%			NS	NS	NS	NS
# OF REPS			4	4	4	4

* R-11=non-ionic surfactant from Wilbur-Ellis

Summary

Seeding sugarbeet into plots previously treated with triflusulfuron or desmedipham&phenmedipham had no effect on sugarbeet injury or population.

Late season herbicides, Fargo, 1994. 'Bush Johnson BJ 1320' sugarbeet was seeded 1.25 inches deep in 22 inch rows June 10. Counter 15G at 12 lb product per acre was applied modified in-furrow at planting. The first half of split application treatments and all single application treatments were applied 9:30 am July 28 when the air temperature was 76F, soil temperature at six inches was 69F, relative humidity was 59%, wind velocity was 0-5 mph, soil moisture was fair, sugarbeet was in the 8 to 12 leaf stage, and redroot pigweed was 4 to 12 inches tall. The second half of split application treatments with one day between splits was applied 9:00 am July 29 when the air temperature was 71F, soil temperature at six inches was 66F, relative humidity was 77%, wind velocity was 0-5 mph, soil moisture was fair, sugarbeet was in the 8 to 12 leaf stage, and redroot pigweed was 4 to 12 inches tall. The second half of split application treatments with five days between splits was applied 9:15 am August 28 when the air temperature was 76F, soil temperature at six inches was 72F, relative humidity was 79%, wind velocity was 0-5 mph, soil moisture was fair, sugarbeet was in the 10 to 14 leaf stage, and redroot pigweed was 4 to 16 inches tall. Sugarbeet injury and redroot pigweed control were evaluated August 9.

Treamtent*	Date of Second Application	Rate	Sgbt inj	Rrpw cntl
		lb/A	%	%
Desmedipham/Desmedipham	(July 29)	0.5/0.5	3	23
Desmedipham/Desmedipham	(July 29)	1/1	8	21
Desmedipham/Desmedipham	(Aug. 2)	1/1	3	26
Desmed+Etho/Desmed+Etho	(July 29)	0.67+0.33/0.67+0.33	15	18
Desmed+Etho/Desmed+Etho	(Aug. 2)	0.67+0.33/0.67+0.33	14	24
Desmedipham/--		1	1	9
Desmedipham+Ethofumesate/--		0.67+0.33	4	11
Desmedipham+Ethofumesate/--		1+0.5	9	11
Desm+Etho+Scoil/--		0.67+0.33+1%	6	10
Desm+Etho+Tfsu+Scoil/--		0.67+0.33+0.031+1%	8	14
Desm+Etho+Endo/--		0.67+0.33+0.75	21	10
Desm+Etho+Endo/same	(Aug. 2)	0.67+0.33+0.75/same	35	23
Desm+Etho+Endo+Clpy/same	(Aug. 2)	0.67+0.33+0.75+0.09/same	41	51
Desm+Etho+Scoil/same	(Aug. 2)	0.67+0.33+1%/same	15	31
Desmedipham/Ethofumesate	(Aug. 2)	1+0.5	3	16
EXP MEAN			12	20
C.V. %			33	30
LSD 5%			6	9
LSD 1%			8	11
# OF REPS			4	4

* Scoil = methylated seed oil from Agsco

Summary

The very high rates of postemergence herbicides applied in this experiment gave poor control of 4 to 12 inch tall redroot pigweed.

<u>Time of sugarbeet thinning, Fargo, 1994.</u> Diethatyl+cycloate at 3+3 lb ai/A was applied to the entire plot area April 22. Incorporation was twice, once with a 'Kongskilde Triple K' field cultivator and once with an 'Alloway RTS' field cultivator. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham & phenmedipham at 0.25 lb ai/A was applied to all plots May 19. Desmedipham & phenmedipham at 0.3 lb ai/A was applied to all plots May 23. Sugarbeet was hand weeded May 25 and maintained weed free throughout the growing season by hand weeding and row-crop cultivation May 31 and June 18. Sugarbeet was hand thinned to an eight inch spacing May 25, May 31, June 8, June 17, June 22, or June 28. Super Tin WP at 5 oz/A + Benlate at 8 oz/A was applied to all plots August 15. Sugarbeet from the center two rows of each 35 foot plot was harvested and counted September 20.

Date of Thinning	Sugarbeet Growth Stage	Sgbt Popul	Sucrose	Loss to Molas	Root Yield	Impurity Index	Extract Sucrose
		plts/70ft	%	%	ton/A		lb/A
May 25	2 leaf	88	16.0	1.5	24.7	673	7125
May 31	4 leaf	91	16.8	1.4	25.7	621	7816
June 8	6 leaf	86	15.5	1.4	25.7	682	7185
June 17	8 leaf	88	16.3	1.4	26.9	643	7963
June 22	10 leaf	89	15.6	1.4	24.6	684	6894
June 28	12 leaf	86	15.8	1.4	23.9	670	6738
EXP MEAN		88	16.0	1.4	25.3	662	7287
C.V. %		5	7.5	5.5	6.9	11	12
LSD 5%		NS	NS	NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS	NS	NS
# OF REPS		6	6	6	6	6	6

Summary

Time of thinning had no significant effect on sugarbeet yield.

Fertilizer Effect on Sugarbeet Stand, Fargo, 1993-1994. A soil test of the plot area indicated 70 pounds per acre of nitrogen was the recommended rate of fertilizer for a sugarbeet crop. Ammonium nitrate and urea fertilizer at 50, 100, 200, and 300 pounds nitrogen per acre was applied August 30 and October 25, 1993 and May 9, 1994. Fall applied fertilizer was incorporated with a rototiller set two inches deep. Spring applied fertilizer was incorportated with an 'Alloway Seedbetter' set two inches deep. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 9, 1994. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. Sethoxydim + crop oil at 0.3 lb ai/A was applied to the entire plot area May 25. Desmedipham at 0.35 lb ai/A was applied to the entire plot area June 21. Sugarbeet was counted in the center two rows of 35 foot long plots June 1. Sugarbeet was hand thinned to a ten inch spacing July 1. All plots were maintained weed free throughout the growing season by hand weeding and row crop cultivation June 1 and June 28. Sugarbeet was harvested and counted from the center two rows of six row plots September 21, 1993.

Fertilizer	Rate	Date of Application	June 1 Sgbt Popl	Harvest Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb N/A		#/70ft	#/70ft	%	%	ton/A		lb/A
Ammon. Nit.	50	August 30, 1993	54	67	14.6	1.8	25.8	882	6506
Ammon. Nit.	100	August 30, 1993	86	62	15.0	1.6	26.0	763	6911
Ammon. Nit.	200	August 30, 1993	63	60	14.9	1.7	24.4	835	6371
Ammon. Nit.	300	August 30, 1993	65	61	14.6	1.9	25.0	947	6321
Ammon. Nit.	50	Oct. 25, 1992	60	67	15.2	1.7	25.8	809	6887
Ammon. Nit.	100	Oct. 25, 1992	74	71	14.8	1.7	27.4	860	7061
Ammon. Nit.	200	Oct. 25, 1992	72	66	14.7	1.9	27.3	932	6940
Ammon. Nit.	300	Oct. 25, 1992	73	62	14.6	1.8	25.9	911	6532
Ammon. Nit.	50	May 9, 1994	64	62	15.5	1.6	26.6	749	7342
Ammon. Nit.	100	May 9, 1994	76	63	14.9	1.7	25.5	844	6691
Ammon. Nit.	200	May 9, 1994	68	60	14.9	1.9	27.4	923	7044
Ammon. Nit.	300	May 9, 1994	57	60	14.4	2.0	26.5	1031	6481
Urea	50	August 30, 1993	53	66	15.4	1.6	25.1	765	6829
Urea	100	August 30, 1993	55	66	15.0	1.7	25.4	852	6649
Urea	200	August 30, 1993	67	63	15.1	1.8	27.0	877	7053
Urea	300	August 30, 1993	68	57	14.5	2.1	25.7	1058	6275
Urea	50	Oct. 25, 1993	55	60	14.6	1.7	24.9	873	6301
Urea	100	Oct. 25, 1993	83	61	15.5	1.6	27.3	776	7469
Urea	200	Oct. 25, 1993	83	66	14.8	1.8	27.0	884	6923
Urea	300	Oct. 25, 1993	73	57	14.9	2.0	26.2	965	6712
Urea	50	May 9, 1994	61	69	15.5	1.7	26.7	784	7301
Urea	100	May 9, 1994	78	69	15.5	1.6	27.7	764	7583
Urea	200	May 9, 1994	66	65	14.7	1.8	24.6	880	6299
Urea	300	May 9, 1994	66	60	14.5	1.8	25.6	928	6407
Untreated Check			63	68	15.2	1.7	25.7	828	6854
C.V. %			21	7	4.0	8.1	7.2	10	9
LSD 5%			20	6	NS	0.2	NS	124	NS
# OF REPS			4	4	4	4	4	4	4

Summary

Sugarbeet emergence was not complete on June 1, even though the plots were seeded on May 9 and this is why harvest plant populations were greater than June 1 populations for some treatments. Several of the plots treated with nitrogen fertilizer had lower plant populations at harvest than the untreated check. The reduced populations did not closely follow fertilizer rate or date of application but 300 lb/A always reduced harvest population. Treatments had no significant effect on sugarbeet yield.

Methanol on sugarbeet, Fargo, 1994. Diethatyl+cycloate at 3+3 lb ai/A was applied to the entire plot area April 22. Incorporation was twice, once with a 'Kongskilde Triple K' field cultivator and once with an 'Alloway RTS' field cultivator. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham & phenmedipham at 0.25 lb ai/A was applied to all plots May 19. Desmedipham & phenmedipham at 0.3 lb ai/A was applied to all plots May 23. Sugarbeet was hand weeded May 25 and maintained weed free by hand weeding throughout the growing season. Sugarbeet was cultivated May 31 and June 18. Sugarbeet was hand thinned to an 8 inch spacing May 31. Super Tin WP at 5 oz/A + Benlate at 8 oz/A was applied to all plots August 15. Each treatment was applied three times. The first application was 2:00 pm August 15 when the air temperature was 81F, soil temperature at six inches was 60F, relative humidity was 45%, and wind velocity was 7 mph. The second application was 12:00 pm August 18 when the air temperature was 76F, soil temperature at six inches was 63F, relative humidity was 79%, and wind velocity was 5 mph. The third application was 1:00 pm August 22 when the air temperature was 73F, soil temperature at six inches was 63F, relative humidity was 69%, and wind velocity was 8 mph. 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 35 foot plot was harvested and counted September 20.

Methanol	28%N	FE-EDTA	T-x-100	Glycine	Sgbt Popul plt/70'	Sucr %	Loss to Mol %	Root Yield ton/A	Impur Index	Extrac Sucros lb/A
0	0	0	0	0	83	15.0	1.4	25.9	717	6926
0	0.4%	0.008%	0.25%	0.1%	91	15.8	1.4	28.3	679	8068
20%	0	0	0.25%	0	95	16.5	1.5	27.2	656	8098
20%	0.4%	0.008%	0.25%	0.1%	93	16.0	1.5	27.5	676	7864
30%	0	0	0.25%	0	88	15.5	1.5	27.2	706	7580
30%	0.4%	0.008%	0.25%	0.1%	93	16.7	1.5	26.6	641	8014
EXP MEAN					90	15.9	1.5	27.1	679	7758
C.V. %					7	11.6	7.6	4.5	15	15
LSD 5%					NS	NS	NS	NS	NS	NS
LSD 1%					NS	NS	NS	NS	NS	NS
# OF REPS					4	4	4	4	4	4

Summary

None of the treatments caused a significant effect on sugarbeet yield.

Barley cover crop seeding rate and stage of control with cultivation, Fargo, 1994. 'Standard' barley at 0, 12, 24, and 48 lb/A was solid seeded in 7 inch rows across the 31 foot long by 11 feet wide cultivation plots May 13. 'KW 1119' sugarbeet was seeded 1.25 inches deep in 22 inch rows across barley blocks May 13. The whole experiment was treated in a 10 inch band with sethoxydim+Dash HC at 0.3 lb ai/A+1 pt/A May 31 when barley was in the 2 leaf stage. Row-crop cultivation to control barley between sugarbeet rows was done June 1, June 7, June 13, June 17, June 23 and June 28 when sugarbeet was in the cotyledon, cotyledon to 2 leaf, 2 to 4 leaf, 4 to 6 leaf, 6 to 8 leaf and 8 to 10 leaf stage respectively. Desmedipham at 0.35 lb ai/A and 0.5 lb ai/A was broadcast applied to the entire experiment June 21 and June 29 respectively. Sethoxydim at 0.3 lb ai/A + Dash HC at 1 pt/A was broadcast applied to the entire experiment July 1. Broadleaf weeds were removed by hand weeding throughout the growing season. All plots were cultivated June 28. Sugarbeet was thinned by hand to an eight inch spacing July 14. Sugarbeet from the center two rows of 31 foot plots was harvested and counted September 28.

Table 1. Influence of time of cultivation and barley cover crop when sethoxydim was band sprayed at two leaf stage of barley.

Barley leaves at first cultivation	Barley seeding rate lb/A	Sgbt Popul plt/62ft	Sucrose %	Loss to Molas %	Root Yield ton/A	Impurity Index	Extract Sucrose lb/A
2	0	65	14.8	1.5	23.0	753	6021
2	12	67	15.0	1.7	25.1	830	6588
2	24	67	14.9	1.6	23.7	800	6212
2	48	70	14.9	1.6	23.9	787	6277
3	0	60	15.1	1.8	23.4	882	6113
3	12	62	14.9	1.6	22.9	797	5988
3	24	66	14.8	1.7	25.1	824	6509
3	48	68	15.1	1.5	23.8	727	6406
4	0	60	14.8	1.6	24.3	819	6295
4	12	63	14.8	1.6	23.2	817	6056
4	24	65	14.8	1.9	22.5	926	5749
4	48	70	14.7	1.6	24.1	783	6222
5	0	63	14.1	1.7	22.6	863	5564
5	12	67	14.7	1.8	23.2	911	5892
5	24	67	14.7	1.7	23.4	858	5997
5	48	65	14.9	1.7	21.5	826	5597
6	0	65	14.7	1.7	22.7	837	5840
6	12	62	14.4	1.8	22.7	894	5683
6	24	63	14.7	1.7	23.0	865	5851
6	48	59	15.2	1.5	21.8	735	5893
7	0	62	15.1	1.7	22.5	808	5956
7	12	61	14.5	1.7	23.2	874	5879
7	24	65	14.5	1.7	22.4	863	5677
7	48	61	13.8	1.7	19.6	895	4669
EXP MEAN		64	14.7	1.7	23.1	832	5956
C.V. %		8	3.1	10.0	5.8	12	8
LSD 5%		NS	0.7	NS	1.9	NS	664
LSD 1%		NS	NS	NS	2.5	NS	882
# OF REPS		4	4	4	4	4	4

(Experiment continued on next page.)

Barley cover crop seeding rate and stage of control with cultivation, Fargo, 1994. (continued)

Table 2. Influence of time of first cultivation averaged over all barley cover crop seeding rates.

Barley leaves at first cultivation	Sgbt Popul	Sucrose	Loss to Molas	Root Yield	Impurity Index	Extract Sucrose
	plt/62ft	%	%	ton/A		lb/A
2	67	14.9	1.6	23.9	793	6274
3	64	15.0	1.6	23.8	807	6254
4	64	14.8	1.7	23.5	836	6080
5	66	14.6	1.7	22.7	864	5762
6	62	14.7	1.7	22.5	833	5817
7	62	14.5	1.7	21.9	860	5545
EXP MEAN	64	14.7	1.7	23.1	832	5956
C.V. %	9	3.5	10.0	4.9	12	7
LSD 5%	NS	NS	NS	0.8	NS	303
LSD 1%	NS	NS	NS	1.0	NS	401
# OF REPS	16	16	16	16	16	16

Table 3. Influence of barley cover crop seeding rate averaged over all times of first cultivation.

	Barley seeding rate	Sgbt Popul	Sucrose	Loss to Molas	Root Yield	Impurity Index	Extract Sucrose
	lb/A	plt/62ft	%	%	ton/A		lb/A
	0	63	14.8	1.7	23.1	827	5965
	12	64	14.7	1.7	23.4	854	6014
	24	66	14.7	1.7	23.4	856	5999
	48	65	14.8	1.6	22.4	792	5844
EXP MEAN		64	14.7	1.7	23.1	832	5956
C.V. %		9	3.5	10.5	2.6	12	6
LSD 5%		NS	NS	NS	0.3	NS	NS
LSD 1%		NS	NS	NS	0.5	NS	NS
# OF REPS		24	24	24	24	24	24

Summary

Time of first cultivation of barley cover crop between the sugarbeet rows had no effect on sugarbeet population, sucrose content, loss to molasses or impurity index (Table 2). However, tons per acre and extractable sucrose was reduced if cultivation was delayed until the five-leaf stage of barley. Sugarbeet yield in tons/A was less with a barley seeding rate of 48 lb/A than with 0, 12, or 24 lb/A (Table 3).

Late season new leaf removal effect on sugarbeet, Fargo, 1994. Diethatyl + cycloate at 3+3 lb ai/A was applied April 22 and incorporated three inches deep with a 'Kongskilde Triple K' field cultivator. A second incorporation was with an 'Alloway RTS' field cultivator operated three inches deep. 'Maribo 875' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 22. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham&phenmedipham at 0.25 lb ai/A and 0.3 lb ai/A was applied May 19 and May 23 respectively to the entire experiment. Super Tin WP at 5 oz/A + Benlate at 8 oz/A was applied to all plots August 15. Sugarbeet was thinned by hand to an eight inch spacing June 8. All plots were hand weeded June 8 and maintained weed free throughout the growing season by hand weeding and row-crop cultivation May 27 and June 18. Initial removal of the four newest leaves from each sugarbeet plant in the center four rows of six row plots was July 21 for the two months before harvest treatments and August 24 for the one month before harvest treatments. Following initial leaf removal, new growth was removed each week until harvest. Sugarbeet from the center two rows of 35 foot plots was counted and harvested September 20.

Leaf Removal	Sgbt Popl plt/70'	Sucrose %	Loss to Mol %	Root Yield ton/A	Impur Index	Extr Sucr lb/A
No Leaf Removal	70	15.6	1.8	28.3	834	7737
August 24 and every 10 days until harvest	65	15.4	1.8	26.7	847	7213
July 21 and every 10 days until harvest	70	16.7	1.7	25.8	755	7638
EXP MEAN	68	15.9	1.8	27.0	812	7529
C.V. %	11	8.3	5.9	9.8	6	15
LSD 5%	NS	NS	NS	NS	NS	NS
LSD 1%	NS	NS	NS	NS	NS	NS
# OF REPS	4	4	4	4	4	4

Summary

Leaf removal had no effect on sugarbeet yield.

Carryover of soybean herbicides, Fargo (NW section 22), 1990-1994. '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 and clopyralid were applied to the entire plot area in 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. Desmedipham & phenmedipham at 0.25 lb ai/A was applied to the entire plot area May 26 and June 2, 1994. Desmedipham at 0.65 and 0.75 lb ai/A was applied to the entire plot area June 23 and June 29, 1994 respectively. Sugarbeet injury was evaluated June 25, 1994.

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

Herbicide soil residual, Fargo (NW section 22), 1989-1994. 'Evans' soybeans were solid seeded at 59 lb/A June 2, 1989 to the entire plot area. Herbicides were applied 10:00 am July 7, 1989 when the air temperature was 79F, soil temperature at six inches was 74F, relative humidity was 47%, wind was 8 mph, soil moisture was poor, and soybean was in the one trifoliolate stage (2 inches tall) to the four trifoliolate stage (6 inches tall). Plots were 14 feet wide and 45 feet long with the center 10 feet treated with herbicides in 8.5 gpa water at 38 psi through 8001 nozzles. The entire experiment was treated with sethoxydim+Dash at 0.2 lb/A + 1 qt/A June 26, 1989 and acifluorfen+sethoxydim+Dash at 0.25+0.2 lb/A + 1 qt/A July 10, 1989. Clopyralid at 0.2 lb/A was spot sprayed to control thistles July 10, 1989. Fall tillage of the plot area was with a chisel plow operated six inches deep and spring tillage was with a field cultivator operated three inches deep. All tillage was done at a slow speed moving parallel with the herbicide plots. Bioassay strips of sugarbeet, corn, wheat, and oats were seeded across herbicide plots for evaluation in 1990. 'Van Der Have Puressa II' sugarbeet was seeded in two directions over entire plot area May 24, 1991. Sugarbeet injury 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 at 0.33 + 0.3 + 0.09 lb ai/A was broadcast applied to all plots June 12, 1992. Desmedipham & phenmedipham + sethoxydim + clopyralid at 0.9 + 0.3 + 0.09 lb ai/A was broadcast applied to all plots June 29, 1992. Sugarbeet injury was evaluated June 29 and July 10, 1992. 'Hilleshog 8277' sugarbeet was seeded 1.25 inches deep in 22 inch rows going two directions across 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. Desmedipham & phenmedipham at 0.25 lb ai/A was applied to the entire plot area May 26 and June 2, 1994. Desmedipham & phenmedipham + clopyralid + sethoxydim at 0.25 + 0.09 + 0.3 lb ai/A was applied to the entire experiment June 12, 1994. Desmedipham at 0.65 and 0.75 lb ai/A was applied to the entire plot area June 23 and June 29, 1994 respectively. Sugarbeet injury was evaluated June 25, 1994.

(Experiment continued on next page.)

Herbicide soil residual, Fargo (NW section 22), 1989-1994. (continued)

1989 Treatment*	Rate	July 24 1991	June 29 1992	July 10 1992	July 9 1993	June 25 1994
	lb/A	------ percent	sugarbeet	injury	-------	
Imazethapyr+X-77	0.12+0.25%	85	3	5	0	0
Imazethapyr+X-77	0.06+0.25%	58	3	0	0	0
Imazethapyr+X-77	0.03+0.25%	14	3	8	0	0
Imazethapyr+X-77	0.015+0.25%	0	0	0	0	0
Imazamethabenz	0.6	0	0	0	0	0
Imazamethabenz	0.3	3	0	0	0	0
Imazamethabenz	0.15	0	0	0	0	0
Metribuzin-DF	1	0	0	0	0	0
Metribuzin-DF	0.5	0	0	0	0	0
Metribuzin-DF	0.25	0	0	3	0	0
Nicosulfuron	0.125	3	0	0	0	0
Nicosulfuron	0.06	5	0	0	0	0
Nicosulfuron	0.03	5	0	3	0	0
Rimsulfuron+Nicosulfuron	0.062+0.062	4	0	3	0	0
Rimsulfuron+Nicosulfuron	0.03+0.03	3	0	0	0	0
Rimsulfuron+Nicosulfuron	0.015+0.015	0	0	3	0	0
Primisulfuron	0.06	91	45	40	76	5
Primisulfuron	0.03	59	36	25	35	0
Primisulfuron	0.015	24	8	3	19	0
C.V. %		31	106	207	87	503
LSD 5%		8	8	14	8	2
LSD 1%		11	10	19	11	3
# OF REPS		4	4	4	4	4

* X-77 = non-ionic surfactant from Valent

Summary

Sugarbeet seeded in 1991 were significantly injured by imazethapyr at 0.12, 0.06, and 0.03 lb/A and by primisulfuron at 0.06, 0.03, and 0.015 lb/A applied in 1989. Sugarbeet seeded in 1992 were significantly injured by primisulfuron at 0.06 and 0.03 lb/A applied in 1989. Sugarbeet injury in 1993 was greater than in 1992 and all three rates of primisulfuron caused significant sugarbeet injury. None of the herbicide treatments caused important sugarbeet injury in 1994.

Multispecies evaluation of soybean herbicide soil residual, Fargo (NW section 22), 1992-1994. '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. The entire experiment was treated with sethoxydim+Scoil at 0.3 lb ai/A + 1 qt/A July 20, 1992. 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. Sethoxydim + crop oil, desmedipham & phenmedipham, and clopyralid were applied to the entire plot area in 1994 for weed control. Sugarbeet injury was evaluated June 25 and July 18, 1994.

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

Effect of imazethapyr residue on small grain and sugarbeet follow crops, Fargo, 1992-1994. 'McCall' soybean at 45 lb/A was solid seeded May 19, 1992 to the entire plot area. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 13 feet of 18 foot wide by 60 foot long plots July 11, 1992 when the air temperature was 77F, relative humidity was 88%, wind velocity was 0 to 2 mph, and soybean was in the two to three trifoliolate stage. The entire experiment was treated with sethoxydim+Scoil at 0.3 lb ai/A + 1 qt/A July 20, 1992. Fall tillage was one pass with a chisel plow moving parallel with the herbicide plots. Spring tillage was one pass with a field cultivator. 'Marshall' hard red spring wheat, 'Vic' durum, and 'Excel' barley, were seeded in eight foot strips across the herbicide plots as bioassay strips May 6, 1993. Hard red spring wheat, durum, and barley injury was evaluated in 1993. No injury to any of the crops was observed. '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. Sethoxydim + crop oil at 0.3 lb ai/A+1 qt/A, desmedipham & phenmedipham at 0.25 lb ai/A, desmedipham & phenmedipham at 0.25 lb ai/A, desmedipham & phenmedipham + clopyralid + sethoxydim at 0.25 + 0.09 + 0.2 lb ai/A, and desmedipham & phenmedipham at 0.75 lb ai/A were applied to the entire plot area May 26, May 26, June 2, June 12, and June 29, 1994 respectively. Sugarbeet injury was evaluated June 25 and July 18, 1994.

Treatment*	Method of appliction	Rate	1993 Hrsw inj	1993 Duru inj	1993 Barl inj	1994 6-25 Sgbt inj	1994 7-18 Sgbt inj
		lb/A	----------	----------	%	----------	----------
Untreated Check	-----	0	0	0	0	0	0
Imazethapyr+Sun-ItII+28%N	broadcast	0.094+0.25G+0.5G	0	0	0	43	24
Imazethapyr+Sun-ItII+28%N	band	0.094+0.25G+0.5G	0	0	0	25	23
Imazethapyr+Sun-ItII+28%N	broadcast	0.047+0.25G+0.5G	0	0	0	21	14
Imazethapyr+Sun-ItII+28%N	band	0.047+0.25G+0.5G	0	0	0	20	14
EXP MEAN							
C.V. %			0	0	0	22	15
LSD 5%			0	0	0	56	83
LSD 1%			NS	NS	NS	19	NS
# OF REPS			NS	NS	NS	26	NS
			4	4	4	4	4

* Sun-It II = methylated seed oil from Agsco
28%N = 28% nitrogen solution containing urea and NH_4NO_3

Summary

Imazethapyr applied in 1992 caused sugarbeet injury in 1994. Injury from band and broadcast treatments was similar.

Carryover of soybean herbicides, Fargo (NW section 22), 1993-1994. '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.

		June 25, 1994					July 18, 1994				
Treatment*	Rate	Sgbt inj	Sunf inj	Wht inj	Oats inj	Cano inj	Sgbt inj	Sunf inj	Wht inj	Oats inj	Cano inj
	lb/A	%	%	%	%	%	%	%	%	%	%
Untreated Check	0	0	0	0	0	0	0	0	0	0	0
Imep+Sun-It II+28%N	0.047	85	3	0	0	30	85	0	0	0	45
Imep+Sun-It II+28%N	0.063	96	5	0	0	53	95	0	0	0	65
Imep+Sun-It II+28%N	0.125	99	18	0	5	81	99	19	5	8	84
AC299263+SunItII+28%	0.032	0	0	0	0	0	0	0	0	0	0
AC299263+SunItII+28%	0.063	0	0	0	0	0	0	0	0	0	0
AC299263+SunItII+28%	0.125	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
Flum+Meto (pre)	0.03+0.93	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
EXP MEAN		28	3	0	1	16	28	2	1	1	19
C.V. %		15	282	0	632	84	14	295	632	404	53
LSD 5%		6	10	NS	NS	20	6	8	NS	4	15
LSD 1%		8	NS	NS	NS	27	7	11	NS	NS	20
# OF REPS		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.

<u>Grass control from postemergence herbicides</u>. (Zollinger and Dexter). An experiment was conducted to evaluate grass weed control and sugarbeet and dry edible bean injury from commonly used herbicides in these crops. 'KW1119' sugarbeet, 'Standard' barley, 'New Dak' oat, and 'Agri I' navy bean were seeded May 12, 1994 near Fargo, North Dakota. Postemergence herbicides were applied to cotyledon to 6-leaf sugarbeet, 6- to 8-inch oat, 4- to 8-inch wild oat, 6- to 9-inch barley, unifoliate to 2nd trifolioliate dry bean, and 0.5- to 4-inch green and yellow foxtail on June 3, 1994 with 82 F, 46% relative humidity, 68 F soil temperature and 10 to 15 mph wind. Split postemergence herbicide were applied to 6-leaf sugarbeet, 2- to 5-inch foxtail millet, 7- to 9-inch oat, 6- to 10-inch wild oat, 6- to 10-inch barley, 2nd to 3rd trifolioliate dry bean, and 2- to 5-inch green and yellow foxtail on June 8, with 69 F, 33% relative humidity, 64 F soil temperature and 10 to 15 mph wind. Treatments were applied to the center 7.3 feet of 11 by 40 ft plots 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	Sube inj	Taoa	Wioa	Yeft	Grft	Wht	Nabe Inj
		June 29, 1994						
	lb/A	------------ % control ------------						
--/Sethoxydim+Mor-Act	--/0.3	0	96	98	90	86	96	0
--/Sethoxydim+Mor-Act	--/0.2	0	95	95	93	84	94	0
--/Seth+Mor-Act+28%UAN	--/0.2	1	95	96	87	74	92	1
--/Seth+Dash HC	--/0.1	0	93	86	85	61	80	0
--/Seth+Dash HC	--/0.2	0	93	91	84	71	87	0
--/Seth+Dash HC+28%UAN	--/0.2	0	96	96	88	83	96	0
--/Seth+Chlorpyrifos	--/0.1+1	0	25	38	34	60	18	0
--/Seth+Chlorpyrifos	--/0.2+1	0	84	91	86	75	61	0
Sethoxydim+D&P/same	0.1+0.33/same	0	30	35	75	64	43	0
Sethoxydim+D&P/same	0.2+0.33/same	0	45	64	84	73	66	5
Sethoxydim+D&P/same	0.3+0.33/same	0	68	80	91	80	88	6
Desmed&Phenmed/same	0.33/same	0	8	13	44	34	26	9
Seth+D&P+Tfsu/same	0.2+0.33+0.0156/same	0	48	68	89	75	56	55
Seth+D&P+Tfsu+Scoil/sm	0.2+0.33+0.0156/same	0	94	96	89	83	83	73
Seth+D&P+ Triflu+Clopyralid/same	0.2+0.33+ 0.0156+0.09/same	0	53	60	66	51	56	88
--/Clethodim+Sun-It II	--/0.063	0	99	96	88	88	94	0
--/Clethodim+Sun-It II	--/0.094	0	98	98	86	86	93	0
--/Clethodim+Sun-It II	--/0.125	0	98	99	91	96	98	0
--/Clethodim+D&P	--/0.063+0.75	0	30	50	51	63	30	6
--/Cleth+D&P+Sun-It II	--/0.063+0.75	0	78	83	79	63	77	14
--/Cleth+D&P	--/0.94+0.75	0	45	76	65	64	46	23
--/Clethodim+D&P	--/0.125+0.75	0	74	89	74	71	64	3
Clethodim+D&P/same	0.031+0.33/same	0	20	36	43	66	38	3
Cleth+D&P+Sun-It II/same	0.031+0.33/same	0	96	87	91	76	86	21
--/Clethodim+Desmed	--/0.063+0.75	0	28	50	20	55	31	11
--/Clethodim+Desmed	--/0.094+0.75	0	58	68	40	63	53	11
--/Clethodim+Desmed	--/0.125+0.75	0	53	85	55	68	53	13
Clethodim+Desmed/same	0.031+0.33/same	0	38	50	59	45	73	1
--/Clethodim+D&+Tfsu	--/0.063+0.33+0.0156	0	15	45	49	68	45	43
--/Clethodim+D&P+Tfsu	--/0.094+0.33+0.0156	0	45	74	51	63	74	58
--/Clethodim+D&P+Tfsu	--/0.125+0.33+0.0156	0	50	86	59	81	55	44
Cleth+D&P+Tfsu/same	0.031+0.33+0.0156/sm	0	28	50	35	75	68	44
Cl+D&P+Tfsu+Scoil/same	0.031+0.33+0.0156/sm	0	81	96	73	75	93	86
--/Seth+D&P+Tfsu	--/0.2+0.33+0.0156	0	28	61	59	65	45	51
--/Seth+Tfsu+Scoil	--/0.2+0.0156	0	73	95	80	78	58	63
--/Quizalofop+Scoil	--/0.055	0	74	99	80	66	97	0
--/Quizalofop+Scoil	--/0.083	0	96	92	81	82	99	0
Qufp+D&P+Tfsu/same	0.055+0.33+0.0156/sm	0	75	94	34	68	98	65
Qufp+D&P+Tfsu+Scoil/sm	0.055+0.33+0.0156/sm	0	86	95	60	45	98	88
--/Quiz+D&P+Tfsu	--/0.055+0.33+0.0156	0	73	86	38	58	96	49
--/Quiz+D&P+Tfsu	--/0.083+0.33+0.0156	0	73	82	23	68	97	38
--/Quiz+Tfsu+Scoil	--/0.055+0.0156	0	95	97	35	66	97	68
--/Quiz+Des&Phen	--/0.055+0.33	0	35	76	19	58	97	1
--/Quiz+D&P+Scoil	--/0.055+0.33	0	70	90	23	55	95	9
Seth+Bentazon+Scoil/sm	0.2+0.4/same	99	54	97	74	76	55	0
Cleth+Bent+Scoil/same	0.094+0.4/same	99	99	99	96	95	96	0
Quiz+Bent+Scoil/same	0.055+0.4/same	99	74	97	58	69	98	0
Untreated		0	0	0	0	0	0	0
LSD (0.05) =		1	12	19	16	21	17	14

[a]Mor-Act was applied 0.25 gal/A, Dash HC was applied at 0.125 gal/A, Scoil and Sun-It II was applied at 1% v/v and 28%UAN was applied at 1 gal/A.

Sethoxydim generally gave greater control of tame oat, wild oat and wheat than green and yellow foxtail. Substituting chlorpyrifos for Dash HC with sethoxydim at 0.1 lb/A resulted in reduced grass control. However, when the rate of sethoxydim increased to 0.2 lb/A similar control was observed with some grass species and no injury to sugarbeet. Desmedipham & phenmedipham at 0.33 lb/A plus sethoxydim at 0.1, 0.2 and 0.3 lb/A applied twice as split treatments antagonized grass control as compared to sethoxydim applied once with oil adjuvant. Greater tame and wild oat control was observed as compared to green foxtail, yellow foxtail and wheat. Further addition of triflusulfuron to sethoxydim and desmedipham & phenmedipham applied twice provided equal control as compared to sethoxydim and desmedipham & phenmedipham applied twice alone. Clopyralid in mixture with sethoxydim plus desmedipham & phenmedipham plus triflusulfuron applied twice resulted in reduced control of green and yellow foxtail only as compared to the treatment of the three herbicides applied twice together. However, when Scoil was added to sethoxydim plus desmedipham & phenmedipham plus triflusulfuron applied twice, antagonism of grass control was overcome without injury to sugarbeet and control was equal to sethoxydim plus oil adjuvant applied once. All treatments containing triflusulfuron severely injured Navy dry edible bean. Clethodim gave at least 86% grass control applied once at 0.063, 0.094, or 0.125 lb/A with Sun-It II. Substituting desmedipham & phenmedipham at 0.75 lb/A for Sun-It II resulted in severe antagonism of grass control. Sun-It II with clethodim plus desmedipham & phenmedipham applied once did not fully overcome grass antagonism. Increasing the rate of clethodim to 0.125 lb/A with desmedipham & phenmedipham or applying clethodim plus desmedipham & phenmedipham twice as split applications did not completely overcome grass antagonism. However, when the rate of clethodim and desmedipham & phenmedipham was applied twice at reduced rates of 0.031 and 0.33 lb/A, respectively with Sun-It II grass control antagonism was overcome and grass control was nearly equal to a single application of clethodim at 0.063 lb/A plus Sun-It II. Desmedipham or desmedipham & phenmedipham plus triflusulfuron in combination with clethodim at any rate applied once or as split applications of clethodim plus desmedipham at low rates antagonized and severely reduced grass control. In either combination, greater antagonism occurred with tame oat as compared to wild oat and yellow foxtail as compared to green foxtail. When Scoil was added to clethodim plus desmedipham & phenmedipham plus triflusulfuron antagonism was removed and good control was achieved for wild oat, green foxtail and wheat, but not tame oat or yellow foxtail. Desmedipham & phenmedipham plus triflusulfuron in combination with quizalofop at 0.055 lb/A severely antagonized yellow foxtail control but had little effect on tame oat, wild oat, green foxtail or wheat. Addition of Scoil either increased, decreased or had no effect on grass control. There was no difference in grass control whether quizalofop plus desmedipham & phenmedipham plus triflusulfuron was applied once or twice as split applications without Scoil. Addition of triflusulfuron or desmedipham & phenmedipham with quizalofop plus Scoil applied once resulted in severe antagonism of yellow foxtail only. No difference in control was observed with the other grass species. Scoil was able to overcome the grass antagonism and excellent control of all grass species was observed only with the clethodim plus bentazon combination applied twice when compared to sethoxydim or quizalofop applied twice with bentazon plus Scoil. No Navy bean injury was observed with any treatment containing bentazon.

Wild oat control, Fargo 1994. 'Vance' hard red spring wheat was seeded April 21. Treatments were applied to 2- to 4-leaf wheat and wild oats, cotyledon- to 6-leaf wild mustard, 0.5- to 1-inch kochia, common lambsquarters, and wild buckwheat on May 26 with 65 F, 30% RH, clear sky, and 5- to 10 mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density more than 150 plants/yd^2.

Treatment	Rate	6/14				7/30		8/11
		Wht	Wioa	Wimu	Colq	Wioa	Colq	Yield
	oz/A	%						bu/A
Diclofop	16	0	62	0	0	81	0	11
Diclofop+Sun-itII	12+0.18G	0	78	0	0	84	0	13
Diclofop+Brox	12+4	0	50	61	89	65	99	15
Imazamethabenz+X-77	5+0.25%	1	86	98	16	80	0	16
Imazamethabenz+PO+X-77	5+0.25G+0.25%	3	90	99	34	92	0	17
Imazamethabenz+Sun-itII	5+0.25G	1	93	99	46	85	0	19
Immb+Thif&Trib+Sun-itII	5+0.25+0.25G	2	90	99	99	88	99	21
Imazamethabenz+X-77	6+0.25%	1	86	99	21	83	0	18
Imazamethabenz+Activator 90	6+0.25%	0	86	98	41	80	0	17
Imazamethabenz+PO+X-77	6+0.25G+0.25%	0	94	99	43	96	0	20
Immb+Sun-itII	6+0.25G	4	94	99	43	87	0	17
Difenzoquat	12	0	86	0	0	79	0	14
Difenzoquat+Thif&Trib+X-77	12+0.25+0.25%	3	86	99	99	70	99	18
Tralkoxydim+TF 8035	2.8+0.5%	0	93	0	0	86	0	13
Tralkoxydim+Brox&MCPA+TF 8035	2.8+8+0.5%	0	97	96	99	86	99	21
Tiller	9.3	9	97	99	99	96	99	15
Tiller+Dica-dma	9.3+1	4	62	99	99	71	99	12
Tiller+Brox-gel	9.3+3	6	90	97	99	90	99	16
Cheyenne+Thif&Trib	7.3+0.22	8	94	99	99	93	99	15
Untreated	0	0	0	0	0	0	0	10
C.V. %		118	12	4	10	9		11
LSD 5%		3	14	4	7	10		3
# OF REPS		4	4	4	4	4	1	3

Summary

Diclofop generally gave greater wild oat control when applied at 12 oz/A plus Sun-it II than alone at 16 oz/A or at 12 oz/A in combination with bromoxynil. Imazamethabenz gave similar wild oat control when applied at 5 or 6 oz/A and control generally was greater when applied with an oil than with surfactant adjuvants. Difenzoquat gave similar wild oat control when applied alone or with thifensulfuron & tribenuron + X-77. Tralkoxydim alone or with bromoxynil & MCPA with TF 8035 surfactant provided excellent wild oat and broadleaf weed control. Tiller provided excellent wild oat and broadleaf weed control, but wild oat control was antagonized by the presence of dicamba in the treatment. Wheat yield was generally increased in proportion to wild oat and broadleaf weed control. Yields were low because of extensive head blight.

Wild oat control in wheat, Minot 1994. 'Amidon' hard red spring wheat was seeded June 23. Treatments were applied to 5-leaf wheat, 4-leaf wild oats, 4-inch kochia, 5-inch common lambsquarters, and 2-leaf green foxtail on June 23 with 79 F, 42% RH, cloudy 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	7/12 Wht	7/12 Wioa	7/12 Colq	7/12 Grft	8/23 Yield	Test weight
	oz/A	%	%	%	%	bu/A	lb/bu
Diclofop	16	2	59	29	83	30	62
Diclofop+Sun-itII	12+.18G	39	40	24	46	31	62
Diclofop+Brox	12+4	2	34	91	80	31	63
Imazamethabenz+X-77	5+.25%	18	45	25	54	24	62
Imazamethabenz+PO+X-77	5+.25G+.25%	0	40	48	55	28	62
Imazamethabenz+Sun-itII	5+.25G	3	59	18	38	32	62
Immb+Thif&Trib+Sun-itII	5+.25+.25G	19	56	79	17	36	62
Difenzoquat	12	1	56	41	34	30	62
Difenzoquat+Thif&Trib+X-77	12+.25+.25%	2	55	76	60	28	62
Tralkoxydim+TF8035	2.8+.5%	0	75	29	63	32	62
Tralkoxydim+Brox&MCPA+TF8035	2.8+8+.5%	1	46	98	73	28	62
Tiller	9.3	15	64	97	85	28	62
Tiller+Dica-dma	9.3+1	5	61	99	94	36	62
Tiller+Brox-gel	9.3+3	20	64	98	89	29	62
Cheyenne+Thif&Trib	7.3+.22	16	55	93	91	27	62
Untreated	0	0	0	0	0	31	62
C.V. %		212	42	28	45	31	1
LSD 5%		NS	30	24	39	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

Data were too variable for conclusive interpretation. Wheat in certain plots was injured, but injury was not in all replications. The variability indicated a possible herbicide residual in the soil. Treatments containing bromoxynil, 2,4-D, or MCPA gave 90% or more common lambsquarters control.

Wild oat control in wheat, Williston 1994. '2375' wheat was seeded April 8. Treatments were applied to 5-leaf wheat and 3.5- to 5-leaf wild oat on May 25 with 58 F, 71% RH, partly cloudy sky, and 10-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer mounted on a G-Allis Chalmers tractor 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		8/10	
		Wht	Wioa	Yield	Tswt
	oz/A	— % —		(bu/A)	(lb/bu)
Diclofop	16	1	96	38	62
Diclofop+Sun-itII	12+0.18G	7	95	37	63
Diclofop+Brox	12+4	14	93	33	63
Imazamethabenz+X-77	5+0.25%	1	71	31	62
Immb+PO+X-77	5+0.25G+0.25%	0	84	41	63
Immb+Sun-itII	5+0.25G	1	86	36	63
Immb+Thif&Trib+Sun-itII	5+0.25+0.25G	2	85	36	63
Difenzoquat	12	10	76	30	63
Difenzoquat+Thif&Trib+X-77	12+0.25+0.25%	14	85	39	62
Tralkoxydim+TF8035	2.8+0.5%	2	86	36	62
Tralkoxydim+Brox&MCPA+TF8035	2.8+8+0.5%	4	81	36	62
Tiller	9.3	5	91	39	61
Tiller+Dica-dma	9.3+1	3	68	31	63
Tiller+Brox-gel	9.3+3	5	76	32	62
Cheyenne+Thif&Trib	7.3+0.22	8	80	33	63
Untreated	0	0	0	14	61
C.V. %		200	11	34	1
LSD 5%		NS	13	22	NS
# OF REPS		4	4	4	4

Summary

None of the herbicide treatments significantly injured wheat. Wild oat control exceeded 90% for diclofop treatments and tiller applied alone. Imazamethabenz gave greater wild oat control when applied with petroleum oil + X-77, Sun-it II, or thifensulfuron & tribenuron + Sun-it II than with only X-77. Wild oats control by Tiller was reduced when applied with diclofop or bromoxynil gel. All herbicide treatments increased or tended to increase wheat yield.

Difenzoquat SG with surfactants, Fargo 1994. 'Vance' hard red spring wheat was seeded April 21. Treatments were applied to 2- to 4-leaf wheat and wild oat, 1- to 2-leaf wild buckwheat, and 0.5- to 1-inch kochia on May 26 with 65 F, 30% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. 2,4-D treatment applied to plot therefore wild mustard and common lambsquarters were not evaluated. Wild oat density at more than 150 plants/yd^2

Treatment	Rate	6/14 Wht	6/14 Wioa	8/6 Wioa	8/6 Wibu	8/6 KOCZ
	oz/A	%				
Difenzoquat	10	3	78	83	0	0
Difenzoquat-SG+X-77	10+0.5%	1	68	76	0	0
Difenzoquat-SG+Tergitol 15-S-20	10+0.5%	1	80	72	0	0
Difenzoquat-SG+28%N+X-77	10+2%+0.5%	4	87	78	0	0
Difenzoquat-SG+28%N+Tergitol 15-S-20	10+2%+0.5%	1	53	63	0	0
Difenzoquat-SG+Sun-itII	10+0.25G	2	82	79	0	0
Difenzoquat-SG+Scoil	10+0.25G	1	86	89	0	0
Difenzoquat-SG+28%N+Sun-itII	10+2%+0.25G	0	71	79	0	0
Difenzoquat-SG+28%N+Scoil	10+2%+0.25G	5	83	83	0	0
Difenzoquat-SG+ND-94-1	10+1%	1	85	80	0	0
Difenzoquat-SG+ND-94-2	10+1%	3	77	82	0	0
Difenzoquat-SG+Scoil(+)	10+0.25G	4	85	81	0	0
Difenzoquat-SG+Immb+X-77	8+4+0.5%	0	90	81	11	0
Difenzoquat-SG+Immb+Sun-itII	8+4+0.25%	3	89	82	0	0
Difenzoquat-SG+Trib+MCPA-ioe+X-77	10+0.25+4+0.5%	3	87	77	71	99
Diclofop	12	0	47	76	0	0
Untreated	0	0	0	0	0	0
C.V. %		129	14	11	122	0
LSD 5%		NS	15	11	8	0
# OF REPS		4	4	4	4	4

Summary

Difenzoquat tended to be more effective for wild oat control as a liquid alone than as a granular (SG) with X-77. Difenzoquat SG effectiveness was reduced by 28% liquid nitrogen fertilizer applied in combination with Tergitol 15-S-20 and generally was not affectd by 28% N with Scoil or Sun-it II. The data indicate that 28% N effectivenes is dependent upon the other adjuvants and that difenzoquat SG is equally as effective as the liquid when with the proper adjuvants in the spray mixture. The early ratings may represent differences in response to adjuvants better than late ratings where wild oat was lodged into the wheat not easily visable.

F8426 plus grass herbicides in wheat, Fargo 1994. 'Vance' hard red spring wheat was seeded April 21. Treatments were applied to 2- to 4-leaf wheat, wild oat, and common lambsquarters, 1- to 2-leaf wild buckwheat, and cotyledon- to 5-leaf wild mustard on May 26 with 65 F, 30% RH, clear sky and 5- to 10-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were greater than 5 plants/ft^2 at the June 8 evaluation and wild buckwheat, wild oat, and common lambsquarters at greater than 3 plants/ft^2 and wild mustard 2 plants/ft^2 at the June 15 evaluation.

Treatment	Rate	6/08 Wht	6/08 Wioa	6/08 Wibu	6/08 Wimu	6/15 Wht	6/15 Wioa	6/15 Wibu	6/15 Wimu	6/15 Colq
	oz/A	%								
F8426	0.24	0	8	18	53	0	0	0	51	71
F8426+PO	0.24+0.125G	3	11	80	87	0	0	55	64	97
F8426+Diclofop	0.24+16	6	50	15	57	1	53	35	46	96
F8426+Diclofop+PO	0.24+16+0.125G	11	74	80	86	4	72	66	69	99
F8426	0.368	0	4	39	52	0	0	25	49	81
F8426+PO	0.368+0.125G	1	18	80	84	0	0	58	76	99
F8426+Diclofop	0.368+16	10	67	40	84	1	60	35	61	94
F8426+Diclofop+PO	0.368+16+0.125G	14	73	94	90	8	65	75	76	98
F8426	0.496	1	12	33	73	0	0	30	60	86
F8426+PO	0.496+0.125G	6	36	85	92	3	0	90	91	98
F8426+Diclofop	0.496+16	11	55	62	88	0	63	60	81	97
F8426+Diclofop+PO	0.496+16+0.125G	15	83	87	94	2	80	86	89	99
Diclofop	16	0	65	0	0	0	63	0	5	0
Diclofop+PO	16+0.125G	1	73	0	0	3	74	0	0	0
F8426+Tiller	0.37+9.3	18	93	95	99	13	94	93	99	99
F8426+Immb+X-77	0.37+5+0.25%	8	84	64	98	3	88	60	97	90
F8426+Difenzoquat	0.37+12	13	71	57	71	13	88	68	50	89
Imazamethabenz+X-77	5+0.25%	9	85	80	95	6	92	60	98	20
Difenzoquat	12	4	68	0	5	4	85	0	0	0
Tiller	9.3	15	90	28	97	11	95	53	99	99
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		77	21	31	11	131	16	40	16	11
LSD 5%		7	16	21	10	6	12	26	14	11
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

F8426 in mixture with diclofop did not influence wild oat control, regardless of rate as oil adjuvant imazamethabenz and Tiller were the most effective herbicides for wild oat control, but Tiller also tended to be most injurous to wheat. F8426 in mixture with difenzoquat or imazamethabenz did not influence wild oat control, but enhanced broadleaf weed control when with difenzoquat. Petroleum oil adjuvant greatly increased and diclofop tended to increase F8426 phytotoxicity to broadleaf weeds.

Wild oat herbicide combinations, Fargo 1994. 'Vance' hard red spring wheat was seeded April 21. Treatments were applied to 2- to 4-leaf wheat, wild oat, and common lambsquarters, cotyledon- to 5-leaf wild mustard, 0.5- to 1-inch kochia, and 1- to 2-leaf wild buckwheat on May 26 with 65 F, 30% RH, clear sky, and 5- to 10 mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were wild oat 5 plants/ft^2, wild mustard 3 plants/ft^2 and common lambsquarters 3 plants/ft^2 at the June 14 evaluation.

		6/14				7/30				8/11
Treatment	Rate	Wht	Wioa	Wimu	Colq	Wioa	Colq	Wibu	KOCZ	Yield
	oz/A	%								bu/A
Tiller+Brox-gel	9.4+4	0	93	98	99	87	99	34	33	17
Diclofop+Brox-gel	16+4	0	83	28	66	86	81	53	35	16
Diclofop+Brox-gel+PO	12+4+.12G	0	80	54	79	76	74	51	11	14
Immb+Brox&MCPA+X-77	5+8+.25%	0	92	99	92	82	99	80	47	20
Difenzoquat+Brox&MCPA	12+8	4	96	94	98	92	99	74	54	18
Tiller	9.4	8	95	99	99	92	99	6	15	16
Diclofop	16	0	72	0	0	79	0	0	0	10
Imazamethabenz	5	5	76	98	0	69	0	28	5	13
Difenzoquat	12	0	92	0	0	92	0	0	0	12
Untreated	0	0	0	0	0	0	0	0	0	12
C.V. %		136	9	20	16	9	16	58	89	13
LSD 5%		3	10	16	12	9	13	27	26	3
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

Bromoxynil gel in mixture with Tiller or diclofop did not influence wild oat control compared to Tiller or diclofop alone. Imazamethabenz phytotoxicity to wild oat was increased by bromoxynil & MCPA + X-77. The increase may have been from the X-77 or the adjuvant effect from the bromoxynil & MCPA as the imazamethabenz alone was applied without a surfactant. Bromoxynil did not enhance control of broadleaf weeds when applied with Tiller, but bromoxynil & MCPA enhanced control when with imazamethabenz or difenzoquat.

SAN 582 for wild oat control in CGA-154281-treated wheat, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was established on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Preplant incorporated (PPI) treatments were applied May 12 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles when winds were light, soil moisture was good, and the seedbed was non-cloddy. All plots were double-pass (opposite directions) incorporated May 12 with a field cultivator/harrow set 2 to 3 inches deep. Grandin spring wheat (treated with CGA-154281 by Pat Fuerst, Washington State Univ., or untreated) was seeded 2 inches deep on May 13 at 90 lb/A into good soil moisture using a no-till drill with double-disc openers. Preemergence (PRE) treatments were applied May 19 with 70 F air temperature and 15 to 20 mph winds (shield used). No appreciable amounts of rain fell between planting and PRE application. On May 23, 0.31 inch of rain was received and on June 5, 1.05 inch was received. The entire experimental area was treated June 1 with clopyralid + MCPA ester at 0.19 + 0.5 lb ae/A for broadleaf weed control. The design was a randomized complete block with a split block arrangement of treatment and four replications. Main plots were seed treatment (Treated and Untreated) and herbicide treatments were applied across both main plots.

Herbicide	Rate	Wioa control Treated	Wioa control Untreated
	(lb/A)	(%)	
Weed-free check	0		
SAN582(PPI)	0.75		
SAN582(PPI)	1		
SAN582(PPI)	1.5		
SAN582(PPI)	3	*** NO DATA ***	
SAN582(PRE)	0.75		
SAN582(PRE)	1		
SAN582(PRE)	1.5		
SAN582(PRE)	3		

Comments. Wild oat populations were very dense, making it extremely difficult to distinguish between wild oat control and wheat injury early in the season. In only in a couple of plots was any decrease in vegetative growth observed at wild oat heading time. These reductions were estimated at a maximum of about 40% and were present in plots treated with SAN 582 at 3 lb/A applied PPI.

Metribuzin on spring wheat, Rugby 1994. '2375' hard red spring wheat was seeded May 21. Treatments were applied to 4- to 5-leaf wheat, 1- to 8-inch kochia, and 8 inch wild mustard June 16 with 65 F, 60% RH, mostly 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13 Wht	7/13 KOCZ	8/2 KOCZ
	oz/A	%		
Metribuzin-DF+NIS	1.0+0.125%	18	72	54
Metribuzin-DF+NIS	2.0+0.125%	29	94	91
Metribuzin-DF+NIS	3.0+0.125%	33	97	96
Metribuzin-DF+NIS	4.0+0.125%	40	98	99
Thif&Trib+Metr-DF+NIS	0.225+1.0+0.125%	20	82	60
Thif&Trib+Metr-DF+NIS	0.225+2.0+0.125%	28	90	81
Thif&Trib+2,4-Dbee+Metr-DF+NIS	0.225+4.0+1.0+0.125%	33	86	72
Thif&Trib+2,4-Dbee+Metr-DF+NIS	0.225+4.0+2.0+0.125%	38	97	83
Tribenuron+Metribuzin-DF+NIS	0.09375+1.0+0.125%	26	83	73
Tribenuron+Metribuzin-DF+NIS	0.09375+2.0+0.125%	29	97	90
Trib+2,4-Dbee+Metr-DF+NIS	0.09375+4.0+1.0+0.125%	33	81	80
Trib+2,4-Dbee+Metr-DF+NIS	0.09375+4.0+2.0+0.125%	36	97	90
Thif&Trib+2,4-Dbee+NIS	0.225+4.0+0.125%	3	79	58
Tribenuron+2,4-Dbee+NIS	0.09375+4.0+0.125%	5	70	55
Untreated	0	0	0	0
C.V. %		32	15	18
LSD 5%		11	17	18
# OF REPS		4	4	4

Summary

Metribuzin caused moderate injury to wheat 3 weeks after treatment, but injury was not visable at wheat maturity. Metribuzin at 2 oz/A or more alone or in combination with sulfonylurea herbicides gave greater than 80% control of sulfonylurea resistant kochia. Kochia control from metribuzin tended to be reduced when in combination with sulfonylurea herbicides.

Metribuzin plus sulfonylurea herbicides for weed control in wheat, Minot 1994. 'Amidon' hard red spring wheat was seeded May 11. Treatments were applied to 5-leaf wheat, 4-leaf wild oat, 2-leaf green foxtail, 5-inch common lambsquarters, and 4-inch kochia on June 23 with 74 F, cloudy sky, and 7 mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13 Wht	7/13 KOCZ	7/13 Colq	7/13 Wibu	8/13 Yield	Test weight
	oz/A	%	%	%	%	bu/A	lb/bu
Metribuzin-DF+NIS	1.0+0.125%	7	78	59	57	34	60
Metribuzin-DF+NIS	2.0+0.125%	11	86	98	61	37	61
Metribuzin-DF+NIS	3.0+0.125%	13	95	99	88	35	60
Metribuzin-DF+NIS	4.0+0.125%	22	94	99	99	35	60
Thif&Trib+Metr-DF+NIS	0.225+1.0+0.125%	7	92	99	76	37	61
Thif&Trib+Metr-DF+NIS	0.225+2.0+0.125%	20	90	96	78	31	61
Thif&Trib+2,4-Dbee+Metr-DF+NIS	0.225+4.0+1.0+0.125%	14	88	99	89	32	61
Thif&Trib+2,4-Dbee+Metr-DF+NIS	0.225+4.0+2.0+0.125%	15	90	99	99	31	61
Trib+Metr-DF+NIS	0.09375+1.0+0.125%	5	84	91	25	36	62
Trib+Metr-DF+NIS	0.09375+2.0+0.125%	14	97	99	76	35	61
Trib+2,4-Dbee+Metr-DF+NIS	0.09375+4.0+1.0+0.125%	9	94	98	83	34	61
Trib+2,4-Dbee+Metr-DF+NIS	0.09375+4.0+2.0+0.125%	16	94	99	83	38	61
Thif&Trib+2,4-Dbee+NIS	0.225+4.0+0.125%	9	69	85	86	33	62
Trib+2,4-Dbee+NIS	0.09375+4.0+0.125%	7	79	92	57	33	62
Untreated	0	0	0	0	0	37	62
C.V. %		52	20	14	29	13	2
LSD 5%		8	23	18	34	NS	NS
# OF REPS		4	4	4	3	4	4

Summary

Metribuzin gave detectable injury to wheat, but injury did not reduce grain yield. Kochia control was or tended to be greater when metribuzin at 2 oz/A or more alone or at 1 oz/A or more in combination with thifensulfuron & tribenuron or tribenuron compared to thifensulfuron & tribenuron or tribenuron with 2,4-D. Wild buckwheat control only exceeded 87% when treated with metribuzin at 2 or 3 oz/A alone or metribuzin with 2,4-D and thifensulfuron & tribenuron. Metribuzin or a treatment component appeared to contribute to kochia and wild buckwheat control.

Herbicide combinations for broadleaf weed control in wheat, Fargo, 1994. 'Vance' hard red spring wheat was seeded April 20. Treatments were applied to 3- to 4.5-leaf wheat, 0.5- to 1.5-inch kochia, 3- to 6-leaf wild mustard, 2- to 6-leaf common lambsquarters, and 1- to 2-leaf wild buckwheat on May 27 with 61 F, 51% RH, clear 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 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities on June 9 evaluation were kochia 5 plants/ft^2, wild mustard 2 plants /ft^2, common lambsquarters 1 plant/ft^2, and wild buckwheat 1 plant/M^2. August 1 weed densities were Kochia 100 plants/ft^2 and wild buckwheat greater than 10 plants/ft^2.

Treatment[a]	Rate	6/9					8/1		8/30
		Wht	KOCZ	Wimu	Colq	Wibu	KOCZ	Wibu	Yield
	oz/A	%							bu/A
Thif&Trib+2,4-Dbee+NIS	0.23+4.0	3	99	99	99	91	72	8	27
Thif&Trib+MCPA-ioe+NIS	0.23+4.0	1	99	99	99	95	85	10	17
Thif&Trib+2,4-Dbee+Dica-dma+NIS	0.23+4.0+1.0	0	99	99	99	92	94	26	20
Thif&Trib+MCPA-ioe+Dica-dma+NIS	0.23+4.0+1.0	1	99	99	99	94	97	8	29
Thif&Trib+Brox&MCPA+NIS	0.23+5.0	0	96	99	99	97	78	33	17
Thif&Trib+Brox&MCPA+NIS	0.23+6.0	1	97	99	99	96	74	36	20
Tribenuron+2,4-Dbee+NIS	0.09+4.0	4	99	99	99	88	90	0	17
Trib+MCPA-ioe+NIS	0.09+4.0	3	99	99	99	91	85	8	17
Trib+2,4-Dbee+Dica-dma+NIS	0.09+4.0+1.0	5	99	99	99	90	83	13	17
Trib+MCPA-ioe+Dica-dma+NIS	0.09+4.0+1.0	5	99	99	99	87	91	35	20
Trib+Brox&MCPA+NIS	0.09+5.0	3	97	99	99	96	70	26	15
Trib+Brox&MCPA+NIS	0.09+6.0	1	95	99	99	92	71	35	19
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.1875	3	99	99	99	87	87	51	19
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.25	3	99	99	99	87	84	28	16
2,4-Dbee+Dica-dma	4.0+1.0	0	93	94	99	86	93	22	15
MCPA-ioe+Dica-dma	4.0+1.0	3	93	92	99	86	87	33	14
2,4-Dbee+Picloram	4.0+0.1875	0	55	91	99	83	5	13	13
Brox&MCPA	5	0	53	82	97	86	33	35	13
Thif&Trib+2,4-Dbee	0.3+6.0	3	99	99	99	94	92	44	17
Bromoxynil&MCPA	8	0	56	91	97	89	30	38	12
Untreated	0	0	0	0	0	0	0	0	6
C.V. %		122	7	2	1	5	19	98	9
LSD 5%		3	9	3	2	6	19	NS	3
# OF REPS		4	4	4	4	4	4	4	3

[a]NIS = nonionic surfactant X-77 at 0.125% of the spray volume.

Summary

Wheat yield was low because of head blight and weed competition. Late season weed control ratings indicated that some weeds emerged after herbicide treatment and others may have recovered from herbicide injury. None of the herbicides gave adequate late season wild buckwheat control eventhough early control often exceeded 90%. Treatments containing dicamba gave the most consistant kochia control and when tribenuron was at 0.3 oz/A. Weed competition was severe and the non-treated wheat only yielded 6 bu/A, compared to 29 bu/A for wheat treated with thifensulfuron & tribenuron + MCPA + dicamba.

Herbicide combinations for broadleaf weed control in wheat, Carrington 1994. 'Amidon' hard red spring wheat was seeded May 6. Treatments were applied to 3- to 4-leaf wheat, 2-inch redroot pigweed, 2- to 3-inch common lambsquarters and wild buckwheat, 4-leaf wild mustard, and 1- to 2-inch prostrate pigweed on June 2 with 57 F, 41% 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 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were common lambsquarter 1 plant/ft^2, redroot pigweed 1 plant/yd^2, and Kochia less than 1 plant/yd^2.

Treatment	Rate	7/13 Wht	KOCZ	Colq	Rrpw	8/22 Yield
	oz/A	%				(bu/A)
Thif&Trib+2,4-Dbee+NIS	0.23+4.0+0.125%	0	99	99	99	56
Thif&Trib+MCPA-ioe+NIS	0.23+4.0+0.125%	0	99	99	99	54
Thif&Trib+2,4-Dbee+Dica-dma+NIS	0.23+4.0+1.0+0.125%	1	94	93	99	57
Thif&Trib+MCPA-ioe+Dica-dma+NIS	0.23+4.0+1.0+0.125%	0	99	97	99	59
Thif&Trib+Brox&MCPA+NIS	0.23+5.0+0.125%	0	99	99	97	60
Thif&Trib+Brox&MCPA+NIS	0.23+6.0+0.125%	0	99	99	99	57
Trib+2,4-Dbee+NIS	0.09+4.0+0.125%	0	99	99	99	58
Trib+MCPA-ioe+NIS	0.09+4.0+0.125%	0	99	99	99	58
Trib+2,4-Dbee+Dica-dma+NIS	0.09+4.0+1.0+0.125%	0	99	99	99	60
Trib+MCPA-ioe+Dica-dma+NIS	0.09+4.0+1.0+0.125%	0	99	99	99	59
Trib+Brox&MCPA+NIS	0.09+5.0+0.125%	0	99	99	99	61
Trib+Brox&MCPA+NIS	0.09+6.0+0.125%	0	99	99	97	59
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.19+0.125%	5	99	99	94	59
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.25+0.125%	12	99	99	99	56
2,4-Dbee+Dica-dma	4.0+1.0	0	99	99	98	59
MCPA-ioe+Dica-dma	4.0+1.0	0	99	99	99	58
2,4-Dbee+Picloram	4.0+0.19	8	99	99	97	58
Brox&MCPA	5	0	99	92	92	59
Thif&Trib+2,4-Dbee	0.3+6.0	1	99	99	99	54
Brox&MCPA	8	0	99	99	89	60
Untreated	0	0	0	0	0	56
C.V. %		243	2	4	6	8
LSD 5%		4	3	6	8	NS
# of Reps		4	4	4	4	4

Summary

All herbicide treatments gave excellent control of all broadleaf weeds in the experiment. The wheat was vigorous suppressing weed growth so yields were not increased by weed control. Weeds in nontreated plots were small and stressed from the lush wheat growth.

Herbicide combinations for broadleaf weed control in wheat, Minot 1994. 'Amidon' hard red spring wheat was seeded May 11. Treatments were applied to 5-leaf wheat, 4-leaf wild oat, 2-leaf green foxtail, 5-inch common lambsquarters, and 4-inch kochia on June 23 with 68 F, 75% RH, fog, and 6 mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 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.

Treatment	Rate	7/12 Wht	KOCZ	Colq	Rrpw	Wibw	8/23 Yield	Test weight
	oz/A	%					bu/A	lb/bu
Thif&Trib+2,4-Dbee+NIS	0.23+4.0	3	76	99	99	85	28	61
Thif&Trib+MCPA-ioe+NIS	0.23+4.0	4	81	99	99	94	31	61
Thif&Trib+2,4-Dbee+Dica-dma+NIS	0.23+4.0+1.0	7	82	89	97	95	22	61
Thif&Trib+MCPA-ioe+Dica-dma+NIS	0.23+4.0+1.0	10	87	99	99	82	30	61
Thif&Trib+Brox&MCPA+NIS	0.23+5.0	2	77	96	96	99	33	61
Thif&Trib+Brox&MCPA+NIS	0.23+6.0	3	86	98	97	99	32	62
Trib+2,4-Dbee+NIS	0.09+4.0	1	67	85	98	69	25	62
Trib+MCPA-ioe+NIS	0.09+4.0	4	75	97	98	68	27	62
Trib+2,4-Dbee+Dica-dma+NIS	0.09+4.0+1.0	6	88	99	98	94	28	62
Trib+MCPA-ioe+Dica-dma+NIS	0.09+4.0+1.0	10	90	95	92	94	28	61
Trib+Brox&MCPA+NIS	0.09+5.0	1	90	99	78	99	31	62
Trib+Brox&MCPA+NIS	0.09+6.0	1	98	99	83	99	32	61
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.1875	5	81	99	99	80	29	61
Trib+2,4-Dbee+Picloram+NIS	0.09+4.0+0.25	6	86	96	96	95	26	61
2,4-Dbee+Dica-dma	4.0+1.0	12	89	98	96	99	26	61
MCPA-ioe+Dica-dma	4.0+1.0	6	77	96	99	85	30	61
2,4-Dbee+Picloram	4.0+0.19	6	70	98	99	99	28	60
Brox&MCPA	5	2	61	96	96	85	30	62
Thif&Trib+2,4-Dbee	0.3+6.0	2	81	99	99	75	25	62
Brox&MCPA	8	1	82	99	99	99	33	61
Untreated	0	0	0	0	0	0	26	61
C.V. %		90	20	8	11	15	19.8	1.3
LSD 5%		5	22	10	14	26	NS	1.2
# OF REPS		4	4	4	4	2	4	4

Summary

Wheat was injured by treatments which contained dicamba or picloram, but was less than 13% and did not reduce wheat yield. Wheat yield was not influenced by weed control because weed density was sparse (< 10 plants/yd^2) and the wheat was competitive. Kochia control exceeded 89% for treatment with tribenuron plus 2,4-D or MCPA and dicamba; tribenuron; plus bromoxynil and MCPA. Kochia control was greater from bromoxynil & MCPA applied with tribenuron than bromoxynil & MCPA alone. Kochia control greater from bromoxynil & MCPA at 6 oz/A tended to be more effective for kochia than bromoxynil & MCPA at 5 oz/A, regardless of other herbicides in the mixture. Redroot pigweed control generally was less for tribenuron plus bromoxynil & MCPA than for any other herbicide treatment. Wild buckwheat control was generally less for tribenuron plus 2,4-D or MCPA than for most other treatments.

Herbicide combinations for broadleaf weed control in wheat, Dickinson 1994. 'Stoa' hard red spring wheat was seeded April 13. Treatments were applied to 5- to 6-leaf wheat, 1- to 2-inch wild buckwheat, 2-inch redroot pigweed, 2- to 4-inch common lambsquarters, and 2- to 3-inch Russian thistle on May 26 with 60 F, clear sky, and 0- to 5-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi throught 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were wild buckwheat 5 plants/M^2, redroot pigweed 11 plants/ft^2, common lambsquarters 1 plant/ft^2, and Russian thistle less than 1 plant/M^2.

Treatment	Rate	7/14 Wht	Wibw	Rrpw	Colq	Ruth	8/12 Yield	Test weight
	oz/A	%	%	%	%	%	(bu/A)	(lb/bu)
Metsulfuron+2,4-Dbee+NIS	0.0625+4.0+0.125%	0	73	95	99	99	52	59
Mets+MCPA-ioe+NIS	0.0625+4.0+0.125%	0	61	99	99	99	55	59
Mets+2,4-Dbee+Dica-dma+NIS	0.0625+4.0+1.0+0.125%	2	65	99	99	99	51	59
Mets+MCPA-ioe+Dica-dma+NIS	0.0625+4.0+1.0+0.125%	1	66	99	99	98	51	59
Tribenuron+2,4-Dbee+NIS	0.09375+4.0+0.125%	0	54	92	97	99	52	59
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	3	49	74	99	65	46	59
Trib+2,4-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	1	61	89	99	97	46	59
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	1	57	77	97	96	49	59
Tribenuron+Brox&MCPA+NIS	0.09375+5.0+0.125%	1	70	90	99	94	49	59
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	71	84	96	79	49	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	1	87	88	99	99	47	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	91	98	99	99	47	59
2,4-Dbee+Dicamba-dma	4.0+1.0	0	58	86	99	98	46	59
MCPA-ioe+Dica-dma	4.0+1.0	3	61	86	97	55	47	59
2,4-Ddma+Picloram	4.0+0.1875	1	83	80	97	99	46	59
Brox&MCPA	5	1	64	70	92	86	47	59
Metsulfuron+2,4-Dbee	0.0625+6.0	0	69	97	98	98	48	59
Mets+2,4-Dbee+Picloram+NIS	0.0625+4.0+0.1875+0.125%	0	58	97	99	99	50	59
Mets+2,4-Dbee+Picloram+NIS	0.0625+4.0+0.25+0.125%	0	88	93	99	99	46	59
Brox&MCPA	8	0	73	90	99	95	52	59
Untreated	0	0	0	0	0	0	44	59
C.V. %		237	29	12	4	15	11	1
LSD 5%		NS	26	14	6	18	NS	NS
# OF REPS		4	4	4	4	4	4	4

Summary

Wheat yield was not significantly increased by herbicide treatments, but tended to be greater than for nontreated wheat. The lack of a yield response probably reflected a low weed density and vigorous wheat growth. Herbicide treatments gave greater than 90% control of most weeds, except wild buckwheat. Wild buckwheat control only exceeded 88% when picloram at 0.25% oz/A was a component of the herbicide treatment. MCPA with tribenuron or bromoxynil tended to be less effective than the other treatments in controlling redroot pigweed. MCPA with dicamba or tribenuron only gave 55 and 65% Russian thistle control, respectively. The data indicate that combinations of various herbicides can provide excellent broadspectrum broadleaf weed control without injury to wheat.

Herbicide combinations for broadleaf weed conrrol in wheat, Williston 1994. 'Amidon' hard red spring wheat was seeded May 2. Treatments were applied to 5-leaf wheat, 1- to 6-inch kochia, and 0.5- to 4-inch Russian thistle on May 31 with 63 F, 52% RH, clear sky, 5-mph wind, dry soil and plant surfaces, and with a soil temperature of 58 F at a depth of 4 inches. Treatments were 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 25 ft plots. The experiment was a randomized complete block design with four replicates.

		Williston				
		7/13			8/19	
Treatment	Rate	Wht	KOCZ	Ruth	Yield	Tswt
	oz/A		%		(bu/A)	(lb/bu)
Mets+2,4-Dbee+NIS	0.0625+4.0+0.125%	1	71	99	33	57
Mets+MCPA-ioe+NIS	0.0625+4.0+0.125%	1	73	99	36	58
Mets+2,4-Dbee+Dica-dma+NIS	0.0625+4.0+1.0+0.125%	0	94	99	34	57
Mets+MCPA-ioe+Dica-dma+NIS	0.0625+4.0+1.0+0.125%	0	91	99	38	58
Trib+2,4-Dbee+NIS	0.09375+4.0+0.125%	0	56	99	37	58
Trib+MCPA-ioe+NIS	0.09375+4.0+0.125%	0	39	99	37	59
Trib+2,4-Dbee+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	85	99	39	59
Trib+MCPA-ioe+Dica-dma+NIS	0.09375+4.0+1.0+0.125%	0	95	99	36	58
Trib+Brox&MCPA+NIS	0.09375+5.0+0.125%	0	85	99	39	59
Trib+Brox&MCPA+NIS	0.09375+6.0+0.125%	0	94	99	38	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.1875+0.125%	0	76	99	35	59
Trib+2,4-Dbee+Picloram+NIS	0.09375+4.0+0.25+0.125%	0	63	99	36	59
2,4-Dbee+Dica-dma	4.0+1.0	0	94	96	39	58
MCPA-ioe+Dica-dma	4.0+1.0	1	92	68	37	59
2,4-Ddma+Picloram	4.0+0.1875	0	34	96	34	58
Brox&MCPA	5	0	74	99	40	59
Mets+2,4-Dbee	0.0625+6.0	0	42	99	36	58
Mets+2,4-Dbee+Picloram+NIS	0.0625+4.0+0.1875+0.125%	0	54	99	40	59
Mets+2,4-Dbee+Picloram+NIS	0.0625+4.0+0.25+0.125%	1	53	99	35	59
Brox&MCPA	8	0	86	99	43	59
Untreated	0	0	0	0	32	59
C.V. %		462	22	5	11	1
LSD 5%		NS	22	7	6	NS
# OF REPS		4	4	4	4	2

Summary

None of the herbicide treatments injured wheat. Russian thistle was controlled 95% or more by all but the MCPA + dicamba treatment. Kochia control was 85% or more by all treatments containing dicamba or bromoxynil & MCPA, except bromoxynil & MCPA alone at 5 oz/A. All herbicide treatments tended or increased wheat yield compared to the non-treated wheat.

F8426 for weed control in wheat efficacy enhancement with NIS, Fargo 1994. 'Vance' hard red spring wheat was seeded April 20. Treatments were applied to 4- to 5-leaf wheat, 3- to 4-leaf wild mustard, 2- to 5-leaf wild buckwheat, and 1- to 3-inch kochia on June 1 with 72 F, 28% RH, partly cloudy sky, and 5- to 20-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Density of all weeds were greater than 5 plants/ft^2 at the June 8 evaluation.

Treatment	Rate	6/8					8/1		8/30
		Wht	Wimu	Wibu	KOCZ	Colq	KOCZ	Wibu	Yield
	oz/A	%							bu/A
F8426+X-77	0.496+0.25%	5	96	41	95	93	98	10	29
F8426+2,4-Dbee	0.496+4	5	99	61	99	99	99	0	30
F8426+2,4-Dbee+X-77	0.496+4+0.125%	16	99	77	99	99	99	0	28
F8426+2,4-Dbee+X-77	0.496+4+0.25%	9	98	74	99	99	98	0	26
F8426+2,4-Dbee+PO	0.496+4+.5%	21	99	93	99	99	98	0	26
F8426+2,4-Dbee+28%N	0.496+4+0.125%	6	99	77	99	99	99	16	28
F8426+2,4-Dbee+X-77+28%N	0.496+4+0.125%+2%	10	99	78	97	99	98	15	25
F8426+2,4-Dbee+X-77+28%N	0.496+4+0.25%+2%	8	99	91	99	99	96	18	28
F8426+2,4-Dbee+PO+28%N	0.496+4+.5%+2%	29	99	95	99	99	95	36	26
2,4-Dbee+X-77	4+0.25%	0	93	14	31	99	19	0	18
Untreated	0	0	0	0	0	0	0	0	16
C.V. %		48	2	15	6	4	6	146	11
LSD 5%		7	3	14	7	5	7	18	4
# OF REPS		4	4	4	4	4	4	4	4

Summary

F8426 alone or in mixture with 2,4-D gave greater than 90% kochia control. Wheat grain yield was nearly increased two fold when kochia was controlled, from 16 to 25-30 bu/A. F8426 + 2,4-D phytotoxicity to wild buckwheat was increased more by petroleum oil adjuvant than X-77 nonionic surfactant. 28% nitrogen fertilizer increased or tended to increase F8426 phytotoxicity to wild buckwheat when without an adjuvant and when with X-77 at 0.25%. Early season wild buckwheat control did not relate to late season control with the wet environment which probably promoted emergence and recovery from treatment. F8426 applied with petroleum oil adjuvant injured wheat, but the injury was not expressed in yield. F8426 has potential for control of sulfonylurea resistant kochia.

2,4-D formulations in wheat, Fargo 1994. 'Vance' hard red spring wheat was seeded April 20. Treatments were applied to 3- to 4.5-leaf wheat, 2- to 5-leaf wild mustard, 0.5- to 1-inch kochia, and 2- to 4-leaf kochia on May 26 with 70 F, 25% RH, clear sky, and 9 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 split plot arrangement but analysis presented is for a randomized complete block design with four replicates. Weed densities were all weeds greater than 5 plants/ft^2 except common lambsquarters 5 plants/M^2.

Treatment	Rate	6/15				7/30		
		Wht	Wimu	KOCZ	Colq	Wht	KOCZ	Cath
	oz/A				%			
2,4-Dbee(3-4lf)	0.25	3	99	43	99	1	54	15
2,4-Dbee(3-4lf)	0.5	0	99	71	99	1	17	21
2,4-Dbee(3-4)	0.75	6	99	90	99	1	50	36
NAF-88(3-4lf)	0.25	3	99	45	99	0	28	22
NAF-88(3-4lf)	0.5	0	99	78	99	1	33	39
NAF-88(3-4lf)	0.75	0	99	84	99	0	35	50
NAF-52(3-4lf)	0.25	0	98	41	99	0	8	17
NAF-52(3-4lf)	0.5	3	99	68	98	0	13	22
NAF-52(3-4lf)	0.75	1	99	49	99	0	17	35
Dica-dma(3-4lf)	0.125	1	94	95	98	0	89	54
Dica-dma(3-4lf)	0.25	6	99	97	99	6	94	71
Untreated	0	0	0	0	0	0	0	0
2,4-Dbee(F.tillered)	0.25	0	78	36	87	0	28	-
2,4-Dbee(F.tillered)	0.5	1	85	63	94	0	26	-
2,4-Dbee(F.tillered)	0.75	6	93	85	98	3	51	-
NAF-88(F.tillered)	0.25	0	73	29	90	0	15	-
NAF-88(F.tillered)	0.5	4	81	54	96	1	29	-
NAF-88(F.tillered)	0.75	3	82	72	95	3	38	-
NAF-52(F.tillered)	0.25	1	76	30	79	3	35	-
NAF-52(F.tillered)	0.5	0	81	30	87	1	9	-
NAF-52(F.tillered)	0.75	0	77	39	81	0	16	-
Dica-dma(F.tillered)	0.125	0	39	70	96	6	88	-
Dica-dma(F.tillered)	0.25	1	55	78	92	8	92	-
Untreated(F.tillered)	0	0	0	0	0	0	5	-
C.V. %		145	9	27	5	193	43	48
LSD 5%		3	10	21	7	4	22	22
# OF REPS		4	4	4	4	4	4	4

Summary

An infestation of Canada thistle in the plot area made evaluation difficult as thistle supressed other weeds, especially at the late evaluation. 2,4-D bee and NAF-88 were similarly effective for kochia control at both application times. None of the herbicide treatments injured wheat regardless of stage at application. NAF-52 generally was less effective than 2,4-D bee or NAF-88 for kochia control.

Tralkoxydim for foxtail control in Durum, Fargo 1994. 'Monroe' durum wheat was seeded May 19. Treatments were applied to 3- to 4-leaf tillering wheat, 0.5- to 3-inch foxtail spp., and 0.5- to 4-inch wild mustard on June 15 with 72 F, 34% RH, partly sunny 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 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed density at the June 6 evaluation was green and yellow foxtail at 30 plants/ft^2.

Treatment	Rate	6/23 Wht	6/23 Fxtl	6/23 Wimu	7/31 Wht	7/31 Yeft
	oz/A			%		
Tralkoxydim+TF8035	3+0.5%	0	93	0	0	99
Tralkoxydim+TF8035	4+0.5%	0	94	0	3	99
Tralkoxydim+TF8035	3+1%	0	96	0	2	99
Tralkoxydim+TF8035	4+1%	0	97	0	0	99
Tralkoxydim+Brox&MCPA+TF8035	3+6+0.5%	0	99	99	3	99
Tralkoxydim+Scoil	3+1%	0	96	0	1	99
Tralkoxydim+ND-94-1	3+1%	0	75	0	0	58
Tralkoxydim+ND-94-2	3+1%	0	76	0	0	44
Tralkoxydim+Surfate	3+1%	0	39	0	0	35
Diclofop	12	0	86	0	1	96
Propanil-df+MCPA-ioe+PO	17+4+.25%	17	87	99	16	55
Untreated	0	0	0	0	0	0
C.V. %		49	11	0	144	10
LSD 5%		1	13	NS	4	10
# OF REPS		4	4	4	4	4

Summary

Tralkoxydim at 3 or 4 oz/A gave greater than 90% foxtail control when applied with TF8035 or Scoil adjuvant. Bromoxynil applied with tralkoxydim provided wild mustard control without influencing foxtail control. Foxtail emerged later than the wheat so was not competitive, but produced seed for reinfestation in subsequent years.

Foxtail control in wheat with ACCase herbicides, Fargo 1994. 'Monroe' durum wheat was seeded May 19. Treatments were applied to 3- to 4-leaf tillering wheat, 0.5- to 3-inch yellow foxtail, 0.5- to 4-inch wild mustard on June 15 with 72 F, 34% RH, partly sunny 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 28 ft plots. The experiment was a randomized complete block design with four replicates. At the August 1 evaluation yellow foxtail was spikes above the wheat.

Treatment	Rate	6/23			8/01	
		Wht	Grft/ yeft	Wimu	Wht	Yeft
	oz/A	%				
Dakota	5.9	83	99	99	84	90
Dakota+Dicamba-dma	5.9+1	58	96	99	42	93
Dakota+Bromoxynil	8.0+3	83	98	99	84	40
Dakota+Triasulfuron	8+.21	45	82	99	14	79
Dakota+Tribenuron	8+.12	23	91	96	8	99
Dakota+Dicamba-dma+Tribenuron	7+.75+.094	13	87	99	2	99
Tiller+Tribenuron	6.6+.12	13	87	99	0	99
Tiller+Dicamba-dma	5.4+1	76	99	99	58	99
Tralkoxydim+TF8035	4+.5%	0	94	0	1	99
Untreated	0	0	0	0	0	0
C.V. %		15	3	3	21	11
LSD 5%		8	4	3	9	12
# OF REPS		4	4	4	4	4

Summary

Dakota applied alone or with dicamba, bromoxynil, or triasulfuron severely injured durum wheat. However, Dakota applied with tribenuron or dicamba plus tribenuron caused moderate (13-to 23-%) injury to durum wheat, without an important loss in foxtail control. Dicamba increased Tiller phytotoxicity to durum wheat and increased foxtail control at the early evaluation. Tralkoxydim gave 94% or more foxtail control without injury to durum wheat. Durum wheat yield was not obtained because of excessive head blight in all plots.

Phenoxy formulations on broadleaf weeds in wheat, Fargo 1994. 'Vance' hard red spring wheat was seeded April 20. Treatments were applied to 4- to 5-leaf tillering wheat, 1- to 3-inch kochia and wild buckwheat, and 2- to 5-leaf wild mustard on June 1 with 72 F, 28% RH, partly cloudy sky, and 5- to 10-mph wind. Plot was retreated with phenoxy herbicides at a rate of 8 oz/A on June 10 with 59 F, 67% RH, cloudy sky, 17 mph wind and rainfall less than 0.25 inch occurring 5 h after treatment. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were kochia greater than 5 plants/ft^2, wild buckwheat greater than 2 plants/ft^2, wild mustard 3 plants/M^2, and common lambsquarters 1 plant/ft^2 on the June 9 evaluation.

Treatment	Rate[a]	6/9 Wht	6/9 KOCZ	6/9 Wibu	6/9 Wimu	6/9 Colq	6/29 Wht	6/29 KOCZ
	oz/A	%						
2,4-DSavage	4	0	6	10	91	83	2	19
2,4-DSavage+Act-90	4+.25%	0	45	25	91	95	3	74
MCPA-PCC 126	4	0	8	9	83	75	0	15
MCPA-PCC 126+Act-90	4+.25%	0	14	11	85	92	1	40
2,4-Ddma	4	0	16	13	89	93	0	49
2,4-Ddma+Act-90	4+.25%	0	39	25	90	96	1	75
MCPA-dma	4	0	10	18	88	90	1	29
MCPA-dma+Act-90	4+.25%	0	15	18	91	95	1	45
MCPA-EH1162	4	0	1	6	86	84	0	15
MCPA-EH1162+Act-90	4+.25%	0	17	13	89	94	0	36
2,4-D-EL1122	4	0	11	15	83	70	0	0
C.V. %		0	52	58	6	11	212	38
LSD 5%		NS	12	NS	NS	14	NS	20
# OF REPS		4	4	4	4	4	4	4

[a]A second application was at 8 oz/A to the same plots because of poor kochia control at June 9 evaluation.

Summary

Adjuvant, Activator 90, increased phytotoxicity to kochia from all 2,4-D and MCPA formulations. 2,4-D was more phytotoxic than MCPA to kochia, regardless of formulation. Formulation generally did not influeunce MCPA or 2,4-D phytotoxicity to kochia.

Broadleaf weed control in wheat, Fargo 1994. 'Vance' hard red spring wheat was seeded May 12. Treatments were applied to 4- to 5-leaf wheat and 2- to 6-inch kochia, wild buckwheat, redroot pigweed, common lambsquarters, and yellow foxtail on June 11 with 60 F, 50% RH, partly cloudy sky, and 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 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were 1- to 3-plants/M^2.

Treatment[a]	Rate[a]	6/23					8/01			
		Wht	KOCZ	Wibu	Rrpw	Colq	Wht	Yeft	KOCZ	Colq
	oz/A					%				
Bromoxynil&MCPA-gel	6	0	69	88	70	95	1	10	84	99
Bromoxynil&MCPA	6	0	90	99	83	99	1	4	94	99
Bromoxynil&MCPA	8	1	93	99	88	99	2	0	94	99
Bromoxynil+Triasulfuron+X-77	3+0.21	2	98	99	94	93	0	29	99	99
Bromoxynil+Triasulfuron+X-77	2+0.21	0	99	99	98	94	1	15	99	98
Bromoxynil&MCPA+Mets+X-77	6+0.06	4	99	98	99	99	0	56	99	99
Bromoxynil&MCPA+Mets+X-77	6+0.03	3	99	99	99	99	0	61	99	99
Bromoxynil&MCPA+Mets+X-77	4+0.03	1	99	99	99	99	0	49	97	99
Bromoxynil&MCPA+Trib	6+0.06	2	99	99	92	99	5	15	99	99
F8426+X-77	0.37	15	99	99	99	97	5	0	99	99
F8426+X-77+28%N	0.37+2%	19	99	95	99	99	6	3	99	99
F8426+X-77	0.5+	19	99	92	99	99	4	5	99	97
F8426+X-77+28%N	0.5+2%	23	99	99	99	99	10	0	99	99
F8426+2,4-Dbee+X-77	0.37+2	18	99	99	99	99	5	0	99	99
F8426+2,4-Dbee+X-77+28%N	0.37+2+2%	16	99	99	99	99	5	0	99	99
F8426+2,4-Dbee+X-77	0.37+4	19	99	99	99	99	8	8	99	99
F8426+2,4-Dbee+X-77+28%N	0.37+4+2%	23	99	99	99	99	16	0	99	99
Dica-dma+2,4-Dbee+Trib+X-77	1.5+4+0.12	6	99	93	99	99	4	32	99	99
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		41	5	4	6	3	117	67	4	1
LSD 5%		5	6	8	7	4	6	14	5	2
# OF REPS		4	4	2	4	4	4	4	4	4

[a]X-77 is a nonionic surfactant and was at 0.25% of the spray volume.

Summary

F8426 at all rates with or without adjuvants gave nearly complete control of Kochia, wild buckwheat, redroot pigweed, and common lambsquarters, but caused 15 to 23% injury to the wheat on the June 23 evaluation. The injury prior to the first evaluation was quite severe and showed recovery at the June 23 evaluation, with only minor injury to wheat by August 1 evaluation. The bromoxynil & MCPA gel formulation was less effective than the standard formulation for kochia control. Treatments that contained triasulfuron, metsulfuron, tribenuron or dicamba supressed yellow foxtail spikes from over-topping the wheat. Treatments were applied at 9 AM with moist soil conditions which apparently were conclusive to herbicide phytotoxicity so that differences among treatments were minor.

Phenoxy herbicide benefit, Fargo 1994. 'Vance' hard red spring wheat was seeded April 20. Treatments were applied to 3- to 4.5-leaf wheat, 0.5- to 1.5-inch kochia, 0.5- to 1-inch wild buckwheat and common lambsquarters, and 2- to 4-inch wild mustard on May 27 with 63 F, 51% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densitites were kochia 5 plants/ft^2, wild buckwheat less than 2 plants/ft^2, wild mustard 3 plants/M^2, common lambsquarters 1 plant/ft^2 on the June 9 evaluation.

Treatment	Rate	6/9					8/1		8/30
		Wht	KOCZ	Wibu	Wimu	Colq	KOCZ	Wibu	Yield
	oz/A	%							bu/A
Bromoxynil	4	0	65	79	89	91	65	77	31
2,4-Ddma	6	0	46	20	98	99	18	16	27
MCPA-dma	6	0	20	5	92	63	33	0	28
MCPA-dma+Dica-dma	4+1.5	0	89	60	95	98	97	43	30
Dicamba-dma	2	0	90	61	88	95	98	81	29
F8426+X-77	0.37+0.25%	5	83	43	81	88	94	8	31
F8426+24-Dbee+X-77	0.37+4+0.25%	8	93	86	99	99	91	48	30
Bromoxynil&MCPA	8	1	87	85	95	99	80	80	33
Untreated	0	0	0	0	0	0	0	0	29
C.V. %		79	16	22	8	23	24	40	13
LSD 5%		2	15	15	9	32	22	23	NS
# OF REPS		4	4	4	4	3	4	4	4

Summary

Yield was low because of head blight and competition from weeds. Weed densities varied in the experiment area causing variability in the data. 2,4-D generally was more effective than MCPA for controlling all weeds. MCPA was an important component with either dicamba, bromoxynil, or F8426 to increase the spectrum of weed control.

Phenoxy herbicide combinations for weed control in wheat, Carrington 1994. 'Amidon' hard red spring wheat was seeded May 6. Treatments were applied to 3- to 4-leaf wheat, 2- to 3-inch common lambsquarters, 1- to 2-inch prostrate pigweed, and 2-inch redroot pigweed on June 2 with 57 F, 41% 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 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were common lambsquarters and prostrate pigweed 1 plant/ft^2 and redroot pigweed less than 1 plant/yd^2.

Treatment	Rate	7/13				8/22
		Wht	Colq	Prpw	Rrpw	Yield
	oz/A	%				(bu/A)
Bromoxynil	4	0	99	96	93	56
2,4-D-dma	6	0	99	97	87	61
MCPA-dma	6	0	98	91	94	54
MCPA-dma+dicamba-dma	4+1.5	0	99	95	96	59
Dicamba-dma	2	0	99	97	95	58
F8426+X-77	0.37+0.25%	0	99	95	97	54
F8426+2,4-D-bee+X-77	0.37+4+0.25%	1	99	99	97	57
Bromoxynilx&MCPA	8	0	99	97	97	57
Untreated	0	0	0	0	0	54
C.V. %		589	1	5	10	6
LSD 5%		NS	1	6	12	NS
# OF REPS		4	4	4	4	4

Summary

Herbicide treatments did not increase wheat yields as the wheat appeared highly competitive with the weeds. Weeds were present in nontreated plots, but were suppressed by the vigorous wheat. All herbicides were similarly effective with excellent competition from the wheat.

Phenoxy herbicide benefit in wheat, Minot 1994. 'Amidon' hard red spring wheat was seeded May 11. Treatments were applied to 5-leaf wheat, 4-leaf wild oat, 2-leaf green foxtail, 5-inch common lambsquarters, and 4-inch kochia on June 23 with 77 F, 44% RH, cloudy sky, and 7 mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were common lambsquarters 5 plants/ft^2, kochia less than 1 plant/m^2, wild buckwheat less than 1 plant/m^2, and redroot pigweed 5 plants/ft^2.

Treatment	Rate	7/13 Wht	7/13 KOCZ	7/13 Colq	7/13 Rrpw	8/23 Yield	Test weight
	oz/A	%	%	%	%	bu/A	lb/bu
Bromoxynil	4	1	87	97	61	39	62
2,4-Ddma	6	1	89	98	91	40	62
MCPA-dma	6	1	67	99	55	40	62
MCPA-dma+Dica-dma	4+1.5	10	99	98	96	38	61
Dicamba-dma	2	7	99	89	99	36	61
F8426+X-77	0.37+0.25%	4	99	93	99	35	62
F8426+2,4-Dbee+X-77	0.37+4+0.25%	7	99	98	99	40	61
Bromoxynil&MCPA	8	1	99	99	75	39	62
Untreated	0	0	0	0	0	37	62
C.V. %		80	11	2	12	8	1
LSD 5%		4	13	3	13	NS	1
# OF REPS		4	4	4	4	4	4

Summary

Dicamba and F8476 injured wheat, but did not exceed 10% and injury did not reduce yield. Kochia was complete for treatments containing dicamba or F8426, and bromoxynil & MCPA. Kochia control tended to be increased by the inclusion of MCPA with bromoxynil. MCPA or bromoxynil applied alone were more effective than any other treatment in controlling redroot pigweed.

Phenoxy herbicide combinations for weed control in wheat, Dickinson 1994. 'Stoa' hard red spring wheat was seeded April 13. Treatments were applied to 5- to 6-leaf wheat, 1- to 2-inch wild buckwheat, 2-inch redroot pigweed and Russian thistle, and 2- to 4-inch common lambsquarters on May 26 with 60 F, clear sky, and 0- to 5-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi throught 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were wild buckwheat 5 plants/m^2, redroot pigweed 11 plants/ft^2, and common lambsquarters 1 plant/ft^2.

		7/14					8/22	
Treatment	Rate	Wht	Wibw	Rrpw	Colq	Ruth	Yield	Tswt
		%					(bu/A)	(lb/bu)
Bromoxynil	4	0	87	72	89	90	54	59
2,4-D-dma	6	0	87	75	97	94	57	59
MCPA-dma	6	0	38	76	99	20	55	59
MCPA-dma+Dica-dma	4+1.5	0	93	94	99	99	58	59
Dicamba-dma	2	0	81	87	94	88	55	59
F8426+X-77	0.37+0.25%	0	38	64	81	65	55	59
F8426+2,4-D-bee+X-77	0.37+4+0.25%	1	62	93	99	99	55	59
Brox&MCPA	8	1	75	98	99	86	54	59
Untreated	0	0	0	0	0	0	54	59
C.V. %		441	37	20	15	28	7	1
LSD 5%		NS	33	21	18	35	NS	NS
No. OF REPS		4	4	4	4	3	4	4

Summary

The research was to determine the benefits from 2,4-D and MCPA applied alone or in combination with other herbicides. Common lambsquarters was controlled by both MCPA and 2,4-D. 2,4-D gave adequate (94%) Russian thistle control. MCPA in combination with dicamba generally gave greater wild buckwheat, redroot pigweed, and Russian thistle control than either herbicide applied alone. 2,4-D in combination with F8426 enhanced control of all weeds compared to F8426 alone and compared to 2,4-D alone for redroot pigweed and Russian thistle. Redroot pigweed, common lambsquarters, and Russian thistle control tended to be greater with bromoxynil in combination with MCPA than bromoxynil alone. Weed infestations were sparse and wheat grew vigorously so yields were not increased by herbicide treatments. These data indicate that 2,4-D and MCPA are important as economical treatments to control certain weeds and as components of mixtures with other herbicides for broadspectrum weed control.

Phenoxy herbicide benefit in wheat, Williston 1994. 'Amidon' hard red spring wheat was seeded May 2. Treatments were applied to 5-leaf wheat, 1- to 6-inch kochia, and 0.5- to 4-inch Russian thistle on May 31 with 58 F, 59% RH, clear sky, 6-mph wind, dry soil and plant surfaces and a soil temperature of 56 F at a depth of 4-inches. Treatments were applied with a bicycle-wheel-type plot sprayer mounted on a G-Allis Chalmers tractor 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 Wht	7/13 KOCZ	7/13 Ruth	8/19 Yield	8/19 Tswt
	oz/A	%	%	%	(bu/A)	(lb/bu)
Bromoxynil	4	0	89	99	39	59
2,4-Ddma	6	0	40	84	38	59
MCPA-dma	6	0	30	24	40	59
MCPA-dma+Dicamba-dma	4+1.5	0	83	51	39	59
Dicamba-dma	2	0	91	72	40	59
F8426+X-77	0.37+0.25%	0	90	85	38	59
F8426+2,4-Dbee+X-77	0.37+4+0.25%	0	93	99	38	59
Bromoxynil&MCPA	8	0	98	99	40	59
Untreated	0	0	0	0	38	59
C.V. %		0	17	17	6	1
LSD 5%		NS	17	17	NS	NS
No. of Reps		4	4	4	4	2

Summary

2,4-D or MCPA did not adequately control kochia, but when in mixture with bromoxynil or F8426 tended to increase kochia control compared to the herbicides alone. 2,4-D alone gave 84% Russian thistle control and in mixture with F8426 enhanced control compared to F8426 alone. 2,4-D alone or as a component in mixture with other herbicides is important to Russian thistle control and as a mixture component for kochia control. MCPA was not important to control of the species present. Weed density was sparse as yields were not influenced by herbicide treatment.

Competition of treated resistant kochia, Rugby 1994. '2375' wheat was seeded May 21. Treatments were applied to 4- to 5-leaf wheat and 1- to 8-inch kochia on June 16 with 65 F, 60% RH, mostly 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13 KOCZ	8/02 KOCZ	8/16 Yield
	oz/A	%	%	bu/A
Untreated	0	0	0	30
Bromoxynil&MCPA(+weedy)	8	97	99	37
Thifensulfuron&Tribenuron+X-77	0.25+0.25%	45	50	29
Tribenuron+X-77	0.25+0.25%	57	61	36
Thifensulfuron&Tribenuron+2,4-D+X-77	0.25+4+0.25%	80	66	31
C.V. %		14	14	
LSD 5%		10	9	6
# OF REPS		6	6	6

Summary

Bromoxynil & MCPA effectively controlled sulfonylurea resistant kochia. Tribenuron was more effective than thifensulfuron & tribenuron for kochia control. 2,4-D in combination with thifensulfuron & tribenuron increased control of sulfonylurea resistant kochia, but was not adequate to prevent competition with wheat or prevent kochia seed production. Wheat yield was or tended to be greater when treated with tribenuron than thifensulfruon & tribenuron alone or with 2,4-D. Kochia control from sulfonylurea did not relate to yield.

Competition of treated resistant kochia, Minto 1994. '2375' hard red spring wheat was seeded May 2. Treatments were applied to 2- to 4-leaf tillering wheat, and 0.5- to 5-inch kochia on June 3 with 72 F, 30% RH, partly cloudy 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13 KOCZ	8/02 KOCZ
	oz/A	%	%
Untreated	0	0	0
Bromoxynil&MCPA(+weedy)	8	97	96
Thifensulfuron&Tribenuron+X-77	0.25+0.25%	45	27
Tribenuron+X-77	0.25+0.25%	57	29
Thifensulfuron&Tribenuron+2,4-D+X-77	25+4+0.25%	80	36
C.V. %		14	28
LSD 5%		10	12
# OF REPS		6	6

Summary

Sulfonylurea resistant kochia was controlled more by tribenuron than thifensulfuron & tribenuron, at the early evaluation. The inclusion of 2,4-D with thifensulfuron & tribenuron increased kochia control. But at the late evaluation kochia control was similarly inadequate with all sulfonylurea treatments. Wheat was not harvested because of excessive kochia growth.

Propanil for foxtail control in wheat, Fargo 1994. 'Monroe' durum wheat was seeded May 19. Treatments were applied to 3- to 4-leaf tillering wheat, cotyledon- to 3-leaf foxtail, 0.5- to 3-inch common lambsquarters, and 0.5- to 4-inch wild mustard on June 14 with 78 F, 76% 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	6/22				7/31	
			Grft/				
		Wht	Yeft	Colq	Wimu	Wht	Yeft
	oz/A	%					
Propanil+PO	16+.12G	11	83	99	97	5	50
Propanil+Activator 90	16+0.25%	12	82	98	99	6	65
Propanil	16	8	83	99	99	4	60
Propanil+MCPA-ioe+PO	16+4+.12G	24	94	99	99	10	69
Propanil+MCPA-ioe+AG-11	16+4+0.25%	13	94	99	99	4	68
Propanil+MCPA-ioe	16+4	18	94	99	99	12	61
Propanil+MCPA-dma+PO	16+4+.12G	21	97	99	99	12	69
Propanil+MCPA-dma+AG-11	16+4+0.25%	14	90	99	99	8	49
Propanil+MCPA-dma	16+4	14	89	99	99	5	50
Propanil+24-Dbee+AG-11	16+8+0.25%	22	94	99	99	11	52
Propanil+24-Ddma+AG-11	16+8+0.25%	21	93	99	99	13	61
Tiller	6.6	84	99	99	99	88	99
Propanil+MCPA-ioe+Brox	16+4+0.5	15	94	99	99	5	72
Untreated	0	0	0	0	0	0	0
C.V. %		27	5	1	1	38	27
LSD 5%		8	5	1	2	7	22
# OF REPS		4	4	4	4	4	4

Summary

The various propanil treatments only caused slight injury to durum wheat which tended to be greater when propanil was with petroleum oil (PO) adjuvant or 2,4-D. Tiller severly injured durum wheat. Propanil generally gave greater foxtail control when applied with MCPA or 2, 4-D than alone. Wheat yield was not taken because of excessive head blight and flooding of some plots.

SAN 582 for foxtail control in CGA-154281-treated wheat, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was established on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Preplant incorporated (PPI) treatments were applied May 12 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles when winds were light, soil moisture was good, and the seedbed was non-cloddy. All plots were double-pass (opposite directions) incorporated May 12 with a field cultivator/harrow set 2 to 3 inches deep. Grandin spring wheat (treated with CGA-154281 by Pat Fuerst, Washington State Univ., or untreated) was seeded 2 inches deep on May 13 at 90 lb/A into good soil moisture using a no-till drill with double-disc openers. Preemergence (PRE) treatments were applied May 19 with 70 F air temperature and 15 to 20 mph winds (shield used). No appreciable amounts of rain fell between planting and PRE application. On May 23, 0.31 inch of rain was received and on June 5, 1.05 inch was received. The entire experimental area was treated June 1 with 0.33 oz ai/A of Harmony Extra plus MCPA ester at 0.5 lb ae/A for broadleaf weed control, and again on June 17 with imazamethabenz at 0.8 pt/A for wild mustard control. Visual estimates of percentage foxtail (80% yellow, 20% green foxtail) control were taken August 9. Wheat grain yields were taken Aug. 18 with a small plot combine, adjusted to 12% moisture. The design was a randomized complete block with a split block arrangement of treatment and four replications. Main plots were seed treatment (Treated and Untreated) and herbicide treatments were applied across both main plots.

Herbicide	Rate	Fxtl control 8/9		Wheat grain yield	
		Treated	Untreated	Treated	Untreated
	(lb/A)	(%)		(bu/A)	
Weed-free check	0	0	0	15.7	14.4
SAN582(PPI)	0.75	38	44	15.0	13.0
SAN582(PPI)	1	57	45	17.4	14.8
SAN582(PPI)	1.25	52	50	14.4	16.5
SAN582(PPI)	1.5	57	67	14.0	15.9
SAN582(PRE)	0.75	11	20	13.7	15.2
SAN582(PRE)	1	0	21	14.5	16.7
SAN582(PRE)	1.25	23	20	15.4	16.3
SAN582(PRE)	1.5	33	22	15.9	14.7
C.V.(%)		----- 53 -----		---- 16.8 ----	
LSD(0.05)		----- 24 -----		---- NS ----	

Comments. Wheat yields were low because of excessive moisture in June and July. This yield depression may have masked differences between treated and untreated seed. Foxtail populations were somewhat variable and insufficiently dense for a reliable evaluation early in the experiment. The foxtail evaluation taken Aug. 9 soon before harvest probably involved a lot of late-germinating foxtail whose growth was encouraged by poor wheat growth and potential herbicide leaching due to the heavy mid-season rains. Observations of foxtail control made early in the season (about 4 weeks after seeding) suggested that 1 to 1.25 lb/A was providing an adequate level of control for wheat (about 80-90%).

Wheat injury with SAN 582 using CGA-154281-treated seed, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was established on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Preplant incorporated (PPI) treatments were applied May 12 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles when winds were light, soil moisture was good, and the seedbed was non-cloddy. All plots were double-pass (opposite directions) incorporated May 12 with a field cultivator/harrow set at 2 to 3 inches deep. Grandin spring wheat (treated with CGA-154281 by Pat Fuerst, Washington State Univ., or untreated) was seeded 2 inches deep on May 13 at 90 lb/A into good soil moisture using a no-till drill with double-disc openers. Preemergence (PRE) treatments were applied May 19 with 70 F air temperature and 15 to 20 mph winds (shield used). No appreciable amounts of rain fell between planting and PRE application. On May 23, 0.31 inch of rain was received and on June 5, 1.05 inch was received. The entire experimental area was treated June 7 with 0.33 oz ai/A of Harmony Extra plus MCPA ester at 0.5 lb ae/A for broadleaf weed control. Wheat stands were determined May 27 by counting the number of plants per m of row, 3 subsamples per plot. Wheat injury was determined May 27 and estimated percentage biomass reduction. The design was a randomized complete block with a split block arrangement of treatment and four replications. Main plots were seed treatment (Treated and Untreated) and herbicide treatments were applied across both main plots.

Herbicide	Rate	Wheat injury 5/27		Wheat stand 5/27		Wheat grain yield	
		Treated	Untreated	Treated	Untreated	Treated	Untreated
	(lb/A)	(%)		(plants/m)		(bu/A)	
Weed-free check	0	0	0	21.4	27.3	25.0	27.0
SAN582(PPI)	0.75	0	3	23.9	26.5	24.4	24.7
SAN582(PPI)	1.5	2	21	23.3	18.3	25.0	18.9
SAN582(PPI)	2.5	2	26	22.4	15.3	24.3	18.8
SAN582(PPI)	4	3	55	20.9	13.4	23.7	14.4
SAN582(PRE)	0.75	0	0	22.9	25.2	27.0	27.2
SAN582(PRE)	1.5	0	0	26.4	31.3	24.4	24.7
SAN582(PRE)	2.5	0	0	25.4	26.3	23.7	26.0
SAN582(PRE)	4	0	0	25.2	28.7	25.4	25.1
LSD(0.05)		----- 7 -----		----- 4.8 -----		----- 2.7 -----	

Summary. SAN 582 applied PRE did not injure wheat, but also did not control foxtail (in an adjacent experiment established the same day) presumably because of dry weather following application. Observable injury, wheat stand reductions, and grain yield reductions of non-seed-treated wheat increased as PPI-applied SAN 582 rate increased. SAN 582 applied PPI at 0.75 lb ai did not appear to injure wheat not treated with CGA-154281 safener. CGA-154281 effectively safened wheat from PPI applications of SAN 582.

Hard red spring wheat cultivar response to difenzoquat. (Zollinger and Spilde). Difenzoquat is an important herbicide for wild oat control. New hard red spring wheat (HRSW) cultivars recently released have not been labeled for difenzoquat use because tolerance or susceptibility has not been determined. HRSW cultivars soon to be released have not been tested for response to difenzoquat.

An experiment was conducted to determine HRSW cultivar response to difenzoquat in North Dakota. Wheat cultivars were seeded at Prosper, ND and Casselton, ND in the spring of 1993 and 1994. Difenzoquat was applied to 4- to 5-leaf wheat on June 1, 1993 with 58 F, 30% RH, 20% cloudy sky, and 3 to 5 mph wind. Difenzoquat was applied to 4- to 5-leaf wheat on June 2, 1994 with 72 F, 30% RH, 0% cloudy sky, and 3 to 5 mph wind and at Casselton, ND to 4- to 5-leaf wheat on May 23, 1994 with 75 F, 45% RH, 10% cloudy sky, and 5 to 10 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.

Table 1. Yield of hard red spring wheat varieties treated with difenzoquat at the 4- to 5-leaf stage at two locations in North Dakota, 1993.

HRSW Variety	Rate	Prosper		Casselton		Average	
		Yield	Test wt	Yield	Test wt	Yield	Test wt
	lb/A	bu/A	lb/bu	bu/A	lb/bu	bu/A	lb/bu
XW398	0	26	47	22	48	24	47
XW398	1	30	47	25	47	27	47
XW398	1.5	26	48	26	48	23	48
ND671	0	38	53	36	54	37	53
ND671	1	36	53	32	52	34	52
ND671	1.5	34	53	32	50	33	52
Marshall	0	23	46	25	48	24	47
Marshall	1	23	48	22	48	23	48
Marshall	1.5	23	48	25	49	24	48
2371	0	28	48	24	47	26	48
2371	1	23	47	22	47	23	47
2371	1.5	26	47	23	45	25	46
2375	0	35	54	30	51	32	52
2375	1	33	52	26	49	29	50
2375	1.5	36	53	28	49	32	51
Norm	0	22	45	24	44	23	45
Norm	1	23	45	24	46	24	46
Norm	1.5	26	48	20	46	23	47
Bergen	0	33	49	30	48	31	49
Bergen	1	33	49	26	46	29	47
Bergen	1.5	32	50	24	48	29	49
Prospect	0	23	47	23	46	23	47
Prospect	1	21	46	21	47	21	46
Prospect	1.5	27	47	22	42	25	45
Sharp	0	35	53	35	53	35	53
Sharp	1	36	53	27	51	32	52
Sharp	1.5	38	54	36	54	37	54
Sonja	0	24	46	26	47	25	46
Sonja	1	27	47	21	45	24	46
Sonja	1.5	25	47	28	48	27	47
Gus	0	27	49	20	46	24	48
Gus	1	22	48	26	50	24	49
Gus	1.5	27	49	19	48	23	48
Grandin	0	24	48	25	47	24	47
Grandin	1	24	48	22	47	23	48
Grandin	1.5	22	49	19	47	21	48
LSD (0.05)		2	6	2	6	2	6

Table 2. Visual injury ratings and yield of hard red spring wheat varieties treated with difenzoquat at the 4- to 5-leaf stage at two locations in North Dakota, 1994.

HRSW variety	Rate	Prosper Injury	Prosper Yield	Prosper Test wt	Casselton Injury	Casselton Yield	Casselton Test wt
	lb/A	%	bu/A	lb/bu	%	bu/A	lb/bu
Marshall	0	0	21	49.0	0	53	55.7
Marshall	1	19	23	48.4	16	52	56.4
Marshall	1.5	20	17	45.8	18	48	54.8
Waldron	0	0	31	50.6	0	50	58.1
Waldron	1	15	28	50.0	14	53	58.2
Waldron	1.5	18	31	51.0	15	46	57.6
Norm	0	0	17	44.1	0	47	54.9
Norm	1	19	17	44.7	18	47	53.9
Norm	1.5	24	17	44.0	18	44	53.5
2375	0	0	37	53.2	0	53	58.9
2375	1	16	36	53.5	18	50	57.4
2375	1.5	29	36	52.2	19	48	56.7
Sonja	0	0	16	45.3	0	47	56.3
Sonja	1	13	17	45.5	9	53	56.4
Sonja	1.5	19	17	45.5	15	45	55.3
Sharp	0	0	26	51.2	0	52	60.1
Sharp	1	13	30	52.9	16	53	59.7
Sharp	1.4	18	32	52.7	20	46	56.3
Kulm	0	0	30	52.5	0	53	59.5
Kulm	1	13	28	52.5	16	55	58.4
Kulm	1.5	20	29	52.9	21	48	57.1
SBE0437	0	0	23	49.0	0	53	57.0
SBE0437	1	51	21	46.8	56	46	57.9
SBE0437	1.5	67	23	48.8	61	44	56.2
SD8073	0	0	27	47.4	0	54	57.1
SD8073	1	24	26	48.0	24	54	57.6
SD8073	1.5	44	30	50.7	40	48	56.5
XW 398A	0	0	25	45.3	0	51	55.6
XW 398A	1	10	24	45.6	18	51	55.4
XW 398A	1.5	16	25	45.9	19	49	55.2
ND 673	0	0	20	49.4	0	49	57.0
ND 673	1	40	19	47.5	49	46	57.7
ND 673	1.5	59	20	48.6	51	44	57.7
ND 677	0	0	13	47.2	0	48	57.5
ND 677	1	14	18	47.3	18	53	57.4
ND 677	1.5	23	15	46.5	19	45	57.2
LSD (0.05)		5	5	1.8	4	2	2.7

Visual injury ratings were not included in 1993 because of injury from difenzoquat could not be differentiated from injury caused by excessive precipitation. Difenzoquat at 1 or 1.5 lb/A did not greatly reduce grain yield of any wheat cultivar. However, grain yield was reduced by difenzoquat treatment of Grandin and ND671 HRSW cultivars at both Prosper and Casselton; 2371 at Prosper, and 2375 and Bergen at Casselton. Excellent small grain growing conditions probably limited difenzoquat phytotoxicity and also promoted rapid recovery from injury.

SBE0437, ND 677, and SD 8037 will be released in 1995 as new HRSW cultivars in North and South Dakota and Minnesota. XW398A may not be released in 1995 because of short seed supply. Results varied between locations due primarily to excessive precipitation at Prosper. Both locations received surplus moisture at seeding, but planting was delayed 2 weeks at Prosper because of excessive water. At Prosper, rainfall exceeded 9.4 inches during late June and July. The moist conditions caused a sever scab infection at Prosper. Therefore, the data from Casselton is more representative a normal response of difenzoquat without influence from excessive moisture.

Summary is based on Casselton data. Difenzoquat injury to cultivars ranged from 14% to 61%. SBE0437, SD8073 and ND 673 were the most susceptible to difenzoquat based on visible injury ratings. Grain yield was not reduced in proportion with injury rating. However, recovery from injury may be better in other environmental conditions. The remaining varieties were injured between 14% to 21%. Yield and seed weight were similar with little difference in response to difenzoquat between 0 and 1.0 lb/A. However, difenzoquat at 1.5 lb/A, reduced grain yield of all cultivars compared to difenzoquat at 1 lb/A. Excellent small grain growing conditions of extended cool and wet was probably a factor for limited effect and probably promoted wheat growth and recovery from difenzoquat injury. Thus, even though plants were injured yields were not greatly reduced. 2375 is a variety popular among North Dakota wheat growers because of yield potential and greater resistance to scab infection. Minimal yield loss was observed from treatment with difenzoquat at 1.0 to 1.5 lb/A. Labeling difenzoquat on 2375 would be an asset to North Dakota wheat growers.

AC-299263 POST in soybean, Casselton 1994. The experiment was conducted to evaluate AC-299263 for POST weed control in soybean in 1994. 'McCall' soybeans were seeded May 17. Treatments were applied to 2- to 3-trifoliolate soybeans, 3- to 6.5-leaf foxtail spp., 4- to 8-leaf common lambsquarters, and 5- to 10-inch kochia on June 13 with 74 F, 68% RH, partly cloudy sky, and 10- to 20-mph wind. Treatments after (/) were applied to the soybeans and weeds in the same growth stages as previously described on June 14 with 72 F, 35% RH, partly cloudy 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment[a]	Rate[a]	6/30						8/2	
		Sobe	Yeft/grft	Wimu	Colq	KOCZ	Rrpw	Yeft	Colq
	oz/A	%							
AC-299263+X-77+28N	0.38+0.25%+0.25G	0	87	99	76	87	99	85	66
AC-299263+X-77+28N	0.51+0.25%+0.25G	2	94	99	90	98	99	88	71
AC-299263+X-77+28N	0.64+.25%+0.25G	2	94	99	88	99	99	89	78
AC-299263+X-77+28N	0.77+0.25%+0.25G	7	97	99	90	94	99	92	85
Imazethapyr+X-77+28N	0.75+0.25%+0.25G	21	84	95	64	93	99	88	54
Bent+Acif+X-77/Seth+Scoil	12+4+0.25%/3+0.18G	10	97	99	58	83	83	90	51
AC-299263+X-77	0.38+0.25%	2	83	99	73	97	99	82	61
AC-299263+Sun-itII	0.38+0.18G	2	93	98	94	99	99	89	85
AC-299263+Sun-itII+X-77	0.38+0.18G+0.25G	2	90	99	93	98	99	86	80
AC-299263+Scoil	0.38+0.18G	5	92	99	92	99	98	86	79
AC-299263+Scoil+28N	0.38+0.18G+0.18G	5	90	99	91	99	99	87	85
AC-299263+Armablend 600	0.38+0.25%	1	84	99	81	99	99	83	76
LSD 5%		NS	3	3	8	8	7	6	12
# OF REPS		4	4	4	4	4	4	4	4

[a] X-77=nonionic surfactant from Loveland Industries, Greeley, CO.;Sun-it II=product of American Cyanamid, Wayne, NJ; Scoil=surfactant from AGSCO, Grand Forks, ND; Armablend 600 from Akzo Chemical Inc., Dobbs Ferry, NY.; 28% N=liquid fertilizer consisting of approximately equal amounts of ammonium nitrate and urea; G in the rate column represents gallons per acre.

Summary

AC-299263 at 0.38 oz/A and imazethapyr at 0.75 oz/A, with X-77 and 28% nitrogen fertilizer, equally controlled all weeds present in the experiment. Common lambsquarters and foxtail control (6/30) was greater with AC-299263 at 0.51 oz/A than imazethapyr at 0.75 oz/A Common lambsquarters was the most tolerant to AC-299263, of species present. The 28% nitrogen liquid fertilizer generally only tended to enhance AC-299263 plus X-77 phytotoxicity to species present. Sun-it II or Scoil adjuvants generally enhanced AC-299263 phytotoxicity to all species, compared to toxicity when applied with X-77 and 28% liquid nitorgen fertilizer. The inclusion of X-77 or 28% liquid nitrogen fertilizer did not increase AC-299263 phytotoxicity beyond that with Sun-it II or Scoil. Armablend 600 was similar to X-77 plus 28% liquid nitrogen fertilizer as an adjuvant to AC-299263, except Armablend was more effective for kochia control. These data indicate that AC-299263 has excellent potential of POST weed control in soybean and that efficacy was influenced by adjuvants.

POST Bentazon for weed control in soybeans, Casselton 1994. 'McCall' soybean was seeded May 17 Treatments were applied to 2- to 3-trifoliolate soybean, 3- to 6.5-leaf foxtail, 2- to 7-leaf wild mustard, 4- to 8-leaf common lambsquarters, and 4- to 6-leaf redroot pigweed on June 13 with 74 F, 68% RH, mostly cloudy sky, and 10- to 20-mph wind. Second sethoxydim split (/) treatment was applied June 15 with 73 F, 35% RH, mostly cloudy 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 nozzle to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design.

Treatment	Rate	6/30						8/02	
		Sobe	Fxtl	Wimu	Colq	KOCZ	Rrpw	Yeft	Colq
	oz/A				%				
Bentazon+PO/Seth+PO	12+.25G/3+.25G	1	99	87	71	65	59	95	56
Bentazon+Seth+PO	12+3+.25G	1	93	93	64	61	55	83	54
Bentazon+Seth+PO+28%N	12+3+.25G+2%	5	94	93	55	54	37	89	51
Bentazon+Seth+ND-94-1	12+3+1%	1	63	91	56	48	51	36	63
Bentazon+Seth+ND-94-1a	12+3+1%	1	64	93	58	60	43	58	63
Bentazon+Seth+Scoil	12+3+.18G	1	95	97	51	74	48	84	55
Bentazon+Seth+Surfate	12+3+1%	3	51	90	65	66	67	46	73
Bent+Thif+Seth+X-77+28%N	8+.06+3+.25%+4%	6	68	99	89	87	99	50	86
Bent+Thif+Seth+X-77+ND-94-1	8+.06+3+.25%+1%	5	83	96	91	92	99	69	79
Bent+Thif+Seth+X-77+Surfate	8+.06+3+.25%+1%	5	53	97	93	93	99	48	78
Bentazon+Lact+Seth+PO	8+1.5+3+.25G	13	92	92	47	80	97	79	53
Bentazon+Lact+Seth+ND-94-1a	8+1.5+3+1%	8	75	92	44	69	95	66	50
Bentazon+Lact+Seth+Surfate	8+1.5+3+1%	4	34	92	56	76	81	36	64
C.V. %		85	15	8	20	24	15	18	22
LSD 5%		5	16	NS	19	25	15	17	20
# OF REPS		4	4	4	4	4	4	4	4

Summary

Sethoxydim control of foxtail only exceeded 90%, at the early evaluation, and 88% at the late evaluation when applied with petroleum oil (PO) or methylated seed oil (Scoil). Foxtail control tended to be greater when sethoxydim + PO was a separate application from bentazon and when with 28% N. Kochia and common lambsquarters control was the greatest when the treatment contained thifensulfuron. Redroot pigweed control was the greatest with thifensulfuron and lactofen containing treatment.

POST weed control in soybeans, Casselton 1994. 'McCall' soybean was seeded May 17. Treatments were applied to 2- to 3-trifoliolate soybean, 3- to 6.5-leaf foxtail, 2- to 7-leaf wild mustard, 4- to 8-leaf common lambsquarters, and 4- to 6-leaf common cocklebur on June 13 with 74 F, 68% RH, mostly cloudy sky, and 10- to 20-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/30					8/02	
		Sobe	Fxtl	Wimu	Colq	Cobu	Yeft	Colq
	oz/A	%						
Imazethapyr+X-77+28%N	0.4+.25%+2%	0	82	99	68	99	84	70
Imazethapyr+Sun-itII	0.4+.18G	1	85	99	79	99	87	61
Imazethapyr+Scoil	0.4+.18G	0	85	99	84	99	89	73
Imazethapyr+Scoil(+)	0.4+.18G	2	84	99	82	99	89	78
Imazethapyr+Scoil II	0.4+.18G	2	84	99	81	99	87	85
Imazethapyr+ND-94-1	0.4+1%	0	80	99	80	99	81	66
Imazethapyr+ND-94-2	0.4+1%	0	87	99	78	99	86	76
Imazethapyr+Surfate	0.4+1%	0	55	99	50	99	65	64
Acifluorfen+Seth+PO	2+3+.25G	5	96	99	80	76	94	70
Acifluorfen+Seth+PO+28%N	2+3+.25G+2%	7	97	99	88	93	87	70
Acifluorfen+Seth+ND-94-1a	2+3+1%	2	89	98	72	75	85	65
Acifluorfen+Seth+ND-94-3	2+3+1%	4	91	99	83	78	89	68
Acifluorfen+Seth+Scoil	2+3+1%	5	97	99	81	83	92	66
Acifluorfen+Seth+Surfate	2+3+1%	0	48	98	62	72	40	63
C.V. %		92	6	1	10	5	8	17
LSD 5%		3	7	NS	10	7	9	NS
# OF REPS		4	4	4	4	4	4	4

Summary

Imazethapyr gave similar weed control regardless of adjuvant, except weed control was generally less when applied with Surfate. Weed control was generally similar from imazethapyr or acifluorfen + sethoxydim, except common cocklebur control was greater from imazethapyr. Surfate usually was less effective than the other adjuvants with both imazethapyr or acifluorfen + sethoxydim.

Regional imazethapyr adjuvant experiment, Casselton 1994. 'McCall' soybean was seeded May 17. Treatments were applied to 2- to 3-trifoliolate, 3- to 6.5-leaf foxtail, 4- to 8-leaf common lambsquarters, and 2- to 7-leaf wild mustard on June 13 with 74 F, 68% RH, mostly cloudy sky, and 10- to 20-mph wind. Split treatments (/) were applied June 14 with 72 F, 35% RH, mostly cloudy 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

		6/28				7/13				8/2		Average[b]	
Adjuvant[a]	Imep[a]	Sobe	Fxtl	Colq	Wimu	Sobe	Fxtl	Colq	Wimu	Yeft	Colq	Fxtl	Colq
	oz	%											
Imep+Activate Plus+28%N	0.37	0	59	43	97	0	54	45	89	62	48	58	45
Imep+Actvate Plus+28%N	0.75	2	76	68	98	1	70	56	98	85	72	77	65
Imep+Activator 90+28%N	0.37	1	65	49	96	0	53	50	86	69	53	62	51
Imep+Activator 90+28%	0.75	4	77	69	99	1	75	60	97	86	73	79	67
Imep+American Brand+28%N	0.37	1	63	50	98	0	49	44	88	63	53	58	49
Imep+American Brand+28%N	0.75	4	80	71	98	1	66	58	96	84	74	77	67
Imep+Aquagene 90+28%N	0.37	1	63	43	96	0	56	46	88	60	49	60	46
Imep+Aquagene 90+28%N	0.75	5	85	78	99	3	75	66	97	89	86	83	77
Imep+Chemsurf+28%N	0.37	3	66	44	94	0	55	41	84	64	46	62	44
Imep+Chemsurf+28%N	0.75	3	80	69	99	0	74	56	98	89	77	81	67
Imep+Inspray 90+28%N	0.37	1	55	45	94	1	55	46	85	60	36	57	43
Imep+Inspray 90+.28%N	0.75	3	79	66	99	1	71	58	98	88	79	79	68
Imep+Preference+28%N	0.37	1	64	54	96	3	56	46	91	67	46	62	49
Imep+Preference+28%N	0.75	4	84	78	99	3	79	61	98	90	76	84	72
Imep+Premier 90+28%N	0.37	0	58	41	97	0	59	49	88	65	53	60	48
Imep+Premier 90+28%N	0.75	3	83	79	99	1	75	64	97	91	88	83	77
Imep+RO11+28%N	0.37	1	55	33	95	0	54	44	92	62	44	57	40
Imep+RO11+28%N	0.75	1	73	54	97	1	59	55	94	71	61	68	57
Imep+Surfact 820+28%N	0.37	0	70	45	97	1	60	40	90	67	42	65	42
Imep+Surfact 820+28%N	0.75	3	80	74	99	5	78	64	97	86	77	81	72
Imep+Surf 80-20+28%N	0.37	4	61	45	96	0	55	48	84	55	28	57	40
Imep+Surf 80-20+28%N	0.75	3	79	71	99	3	71	61	95	83	71	78	68
Imep+X-77+28%N	0.37	2	67	44	97	1	61	50	86	68	49	66	48
Imep+X-77+28%N	0.75	2	75	70	99	3	71	65	95	84	77	76	70
Imep+MES-100+28%N	0.37	1	72	53	95	2	66	50	93	85	75	74	59
Imep+MES-100+28%N	0.75	1	79	72	98	0	78	63	95	87	75	81	70
Imep+Superb+28%N	0.37	1	67	45	96	1	60	50	91	75	62	67	52
Imep+Superb+28%N	0.75	5	87	77	99	4	83	65	97	92	88	87	77
Imep+Sunit II+28%N	0.37	2	74	58	99	0	63	53	88	78	59	72	56
Imep+Sunit II+28%N	0.75	4	85	82	99	3	89	76	99	92	85	89	81
Untreated		0	0	0	0	0	0	0	0	0	0	0	0
C.V. %		83	10	15	2	195	12	13	5	14	22		
LSD 5%		2	9	11	3	NS	10	10	6	14	18		
# OF REPS		4	4	4	4	4	4	4	4	4	4		

[a]All treatments applied with 2% (v/v) 28% liquid fertilizer and surfactants were of 0.25% (v/v) and oils at 1 qt/A.

[b]Imazethapyr average LSDs at 5% were 5.9 for foxtail and 10.3 for common lamsquarters at 0.37 oz/A and 4.5 for foxtail and 5.5 for common lambsquarters at 0.75 oz/A.

Summary

The three methylated seed oils (MES-100, Superb, Sunit II) generally were more effective adjuvants than the surfactants. Among the surfactants RO11 was the least effective and the rest quite similar when considering the average control of foxtail and common lambsquarters. Eventhough control ratings appear low the soybeans would have produced well compared to not treated soybeans.

Sethoxydim with adjuvants, Fargo 1994. 'Siberian' foxtail millet, 'Valley' oat, and 'McCall' soybean were seeded in adjacent strips as bioassay species on May 20. Treatments were applied to 3- to 5-leaf foxtail millet and oats, 1- to 2-trifoliolate soybean, 1- to 3-leaf green foxtail, and 2- to 5-leaf yellow foxtail on June 15 with 73 F, 35% RH, mostly cloudy 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 x 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7/13 Oat	7/13 Fomi
	oz/A	%	%
Sethoxydim+DASH	1+0.18G	99	99
Sethoxydim+DASH	1+0.12G	98	99
Sethoxydim+DASH+28%N	1+0.12G+2%	99	99
Sethoxydim+DashHC	1+0.12G	98	99
Sethoxydim+DASH HC+28%N	1+0.12G+2%	98	99
Sethoxydim+Scoil	1+0.12G	97	99
Sethoxydim+Scoil+28%N	1+0.12G+2%	99	99
Sethoxydim+Methoil	1+0.12G	98	99
Sethoxydim+Methoil+28%N	1+0.12G+2%	99	99
Sethoxydim+MSO	1+0.12G	97	99
Sethoxydim+MSO+28%N	1+0.12G+2%	99	99
Sethoxydim+MES-100	1+0.12G	98	99
Sethoxydim+MES-100+28%N	1+0.12G+2%	99	99
Sethoxydim+Class Destiny	1+0.12G	97	99
Sethoxydim+Class Destiny+28%N	1+0.12G+2%	99	99
C.V. %		1	0
LSD 5%		NS	NS
# OF REPS		4	4

Summary

Sethoxydim at 1 oz/A gave essentially complete control of both oats and foxtail millet regardless of adjuvant. Environmental conditions were extremely moist at and following treatment which probably accounted for the high phytotoxicity.

Trifluralin and ethalfluralin granules in no-till soybeans, Minot 1994. W. H. Ahrens and M. G.Ciernia. The experiment was established in standing wheat stubble averaging 5870 lb/A (6575 kg/ha) aboveground residue and 89% cover by the line transect method. Soil was a loam with 3.8% organic matter and pH 6.6. "Tilled" plots (see table below) were rototilled Oct. 27, 1993 to bury wheat residue and simulate conventional tillage. Trifluralin and ethalfluralin granules were applied Nov. 9 with a Gandy airflow applicator, when air temperature was 40-50 F, wind was 3 to 6 mph, and skies were partly cloudy. Granules were left unincorporated or were incorporated during the day of application with a Haybuster undercutter (11 ft wide) operated 2 to 2.5 inches deep, a Phoenix harrow operated at 4 to 6 mph (1 pass, 45 degree angle), a rotary hoe operated at 5 to 7 mph, a John Deere Mulch Master operated 6 to 7 mph and 2 to 4 inches deep, or a field cultivator operated 3 to 4 inches deep. The entire experiment was treated May 13, 1994 with glyphosate at 0.56 lb ae/A to control emerged vegetation. Visual estimates of volunteer winter wheat control were taken before seeding on May 16. Plots were split at soybean planting: half was seeded May 16 at 200,000 seeds/A with a John Deere 750 single-disc no-till drill set on 7.5-inch spacings and the other half on May 17 at 200,000 seeds/A with a Concord air seeder featuring 12-inch sweeps (10-inch row spacing). "Tilled" plots received a second field cultivator pass immediately before seeding. Visual estimates of post-plant residue cover were taken May 17. Visual estimates of percentage vol. wheat and Russian thistle control were taken June 21. The experiment was randomized complete block design with four replications and a split block arrangement of treatments. Plot size was 15 by 35 ft, but each plot was split at planting into a 15 by 17.5-ft subplot.

Herbicide[a]	Rate	Residue at application	Incorporation implement	Eval. 5/17 Vowh	Evaluated 6/21 Residue[a] CAS	Residue[a] JD7	Vowh CAS	Vowh JD7	Ruth CAS	Ruth JD7
	(lb ai/A)			(%)						
Trif-10G	1	tilled	field cultivator	46	20	20	82	66	95	82
Trif-10G	1	stubble	no incorporation	2	50	86	76	82	75	72
Trif-10G	1.25	stubble	no incorporation	7	-	-	75	81	63	79
Trif-10G	1	stubble	Haybuster undercutter	80	48	66	77	82	89	82
Trif-10G	1.25	stubble	Haybuster undercutter	87	-	-	86	79	92	83
Trif-10G	1	stubble	rotary hoe	2	48	88	88	88	83	80
Trif-10G	1.25	stubble	rotary hoe	1	-	-	85	88	87	88
Trif-10G	1	stubble	John Deere Mulch Master	91	37	41	89	51	90	76
Trif-10G	1.25	stubble	John Deere Mulch Master	93	-	-	71	82	94	95
Trif-10G	1	stubble	Phoenix harrow	15	45	73	72	89	82	89
Trif-10G	1.25	stubble	Phoenix harrow	20	-	-	84	87	93	91
Etha-10G	1	tilled	field cultivator	59	-	-	92	80	98	91
Etha-10G	1	stubble	no incorporation	0	-	-	80	65	86	87
Etha-10G	1	stubble	Haybuster undercutter	81	-	-	83	42	83	81
Etha-10G	1	stubble	rotary hoe	0	-	-	79	85	78	91
Etha-10G	1	stubble	John Deere Mulch Master	97	-	-	80	72	91	86
Etha-10G	1	stubble	Phoenix harrow	30	-	-	77	85	82	89
Untreated	0	tilled	field cultivator	46	-	-	0	0	0	0
Untreated	0	stubble	Haybuster undercutter	57	-	-	0	0	0	0
C.V.(%)				29	--12--		--14--		--12--	
LSD(5%)				18	-- 9--		--NS--		--15--	

[a]Trif-10G = Treflan 10G granules; Etha-10G = Sonalan 10G granules; Residue = estimated post-plant cover; CAS = Concord air seeder; JD7 = John Deere 750 drill.

Summary. Post-plant residues were 42% for the Concord air seeder and 62% for the John Deere MaxEmerge when averaged across herbicide incorporation methods. When averaged across planters, residues were 20, 68, 68, 59, 57, and 39% for field cultivator (conventional tillage), no incorporation, rotary hoe, Phoenix harrow, Haybuster undercutter, and John Deere Mulch Master, respectively.

Trifluralin and ethalfluralin granules in no-till soybeans, Carrington 1994. W. H. Ahrens and M. G. Ciernia. The experiment was established in standing wheat stubble that had been baled (4120 lb/A residue measured April 21). Soil was a Heimdahl loam with 3.5% organic matter and pH 7.4. "Tilled" plots (see table below) were roto-tilled Oct. 29, 1993 to bury wheat residue and simulate conventional tillage. Trifluralin and ethalfluralin granules were applied April 20 with a Gandy airflow applicator, when air temperature was 38-45 F, wind was 2 to 6 mph, and skies were cloudy. Granules were left unincorporated or were incorporated during the day of application with a Haybuster undercutter (11 ft wide) set 2 to 2.5 inches deep, a Phoenix harrow run at 4 to 6 mph (2 passes, opposite directions; 45 degree angle), a rotary hoe run at 5 to 7 mph, or a field cultivator. John Deere Mulch Master plots were treated with herbicide on April 21 (instead of Apr. 20) when temperature was 43 F, skies were sunny, and wind was 0 to 3 mph. Mulch Master plots were incorporated April 21 with the machine run 2 to 3 inches deep and at 4 to 5 mph. Plots were split at soybean planting: half the plot was seeded May 17 at 200,000 seeds/A with a Concord air seeder fea-turing 12-inch sweeps (10-inch spacing between rows) and the other half on May 21 at 188,000 seeds/A with a John Deere MaxEmerge row crop planter set on 30-inch rows. "Tilled" plots received a second field cultivator pass immediately before seeding. The entire experiment was treated May 21 with glyphosate at 0.56 lb ae/A + Harmony Extra at 0.25 oz product/A to control emerged vegetation. Visual estimates of percentage foxtail (mixture of yellow and green foxtail) control were taken June 20. The experiment was randomized complete block design with four replications and a split block arrangement of treatments. Plot size was 15 by 35 ft, but each plot was split at planting into a 15 by 17.5-ft subplot.

Herbicide (granules)	Rate	Residue at application	Incorporation implement	Foxtail control: Concord air seeder	Foxtail control: John Deere MaxEmerge
	(lb ai/A)			(%)	(%)
Trifluralin	1	tilled	field cultivator	95	93
Trifluralin	1	stubble	no incorporation	90	88
Trifluralin	1.25	stubble	no incorporation	90	91
Trifluralin	1	stubble	Haybuster undercutter	92	89
Trifluralin	1.25	stubble	Haybuster undercutter	95	93
Trifluralin	1	stubble	rotary hoe	91	86
Trifluralin	1.25	stubble	rotary hoe	94	92
Trifluralin	1	stubble	John Deere Mulch Master	94	88
Trifluralin	1.25	stubble	John Deere Mulch Master	93	93
Trifluralin	1	stubble	Phoenix harrow	91	88
Trifluralin	1.25	stubble	Phoenix harrow	94	90
Ethalfluralin	1	tilled	field cultivator	96	95
Ethalfluralin	1	stubble	no incorporation	81	74
Ethalfluralin	1	stubble	Haybuster undercutter	92	88
Ethalfluralin	1	stubble	rotary hoe	85	79
Ethalfluralin	1	stubble	John Deere Mulch Master	91	86
Ethalfluralin	1	stubble	Phoenix harrow	82	76
C.V.%				---- 4.1 ----	
LSD(0.05)				----- 5 -----	
Planter effect: Not significant					

Summary: When granules were applied in standing stubble and incorporated by conservation tillage implements (i.e. rotary hoe, Phoenix harrow, undercutter), trifluralin outperformed ethalfluralin. However, ethalfluralin appeared to provide the highest foxtail control when incorporated in conventionally prepared soil. Foxtail control generally was better when plots were seeded with the Concord air seeder.

Foxtail and redroot pigweed control with imazethapyr plus adjuvants, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was conducted on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Treatments were applied July 1 using a 4-nozzle bicycle wheel sprayer with 8001 tips delivering 8.5 gal/A at 40 psi. Conditions at application were as follows: wind 15 to 20 mph (shield used); air temperature 62 F; relative humidity 35%; soil surface dry; sky mostly sunny; redroot pigweed 4- to 7-leaf and 1 to 5 inches tall; foxtail (75% yellow, 25% green foxtail) 5- to 6-leaf, 5 to 8 inches tall, 1 to 3 tillers. Visual estimates of percentage weed control were taken July 21 [20 days after treatment (DAT)] and August 17 (51 DAT). Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

		Weed control			
		20 DAT		51 DAT	
Treatment[a]	Rate[a]	Fxtl	Rrpw	Fxtl	Rrpw
	(oz ai/A)	(%)			
Imazethapyr	0.43	9	4	9	20
Imazethapyr+Activator90	0.43+0.25%	6	5	6	36
Imazethapyr+Herbimax	0.43+2pt	51	27	83	65
Imazethapyr+BioVeg	0.43+2pt	61	16	82	48
Imazethapyr+LI700	0.43+0.5%	12	8	32	41
Imazethapyr+Scoil	0.43+1.5pt	43	18	36	47
Imazethapyr+PenetratorPlus	0.43+1%	52	34	81	55
Imazethapyr+DyneAmic	0.43+0.5%	24	14	42	51
Imazethapyr+SilowetL77	0.43+0.5%	37	30	46	71
Imazethapyr+Activator90+AN	0.43+0.25%+1.5#/A	59	41	79	65
C.V. %		51	47	42	52
LSD 5%		26	13	30	NS

[a]AN = ammonium nitrate; pt = pints/A; #/A = lbs/A.

Imazethapyr plus adjuvants for foxtail control, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was conducted on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Treatments were applied July 1 using a 4-nozzle bicycle wheel sprayer with 8001 tips delivering 8.5 gal/A at 40 psi. Environmental conditions were as follows: wind 15-20 mph (shield used); air temperature 62 F; relative humidity 35%; soil surface dry; sky mostly sunny; redroot pigweed 4- to 7-leaf and 1 to 5 inches tall; foxtail (80% yellow, and 20% green foxtail) 5- to 6-leaf, 5 to 8 inches tall, 1 to 3 tillers. Visual estimates of percentage weed control were taken July 21 [20 days after treatment (DAT)] and August 17 (51 DAT). Plot size was 10 by 30 ft and the experiment was a randomized complete block design with three replications.

		Weed control			
		20 DAT		51 DAT	
Treatment[a]	Rate[a]	Fxtl	Rrpw	Fxtl	Rrpw
	(oz ai/ha)	(%)			
Imazethapyr	0.5	15	3	27	84
Imazethapyr+Activator90	0.5+0.25%	15	18	28	64
Imazethapyr+Herbimax	0.5+2pt	57	58	78	81
Imazethapyr+BioVeg	0.5+2pt	62	39	90	82
Imazethapyr+LI700	0.5+0.5%	14	22	16	84
Imazethapyr+Scoil	0.5+1.5pt	52	47	89	47
Imazethapyr+PenetratorPlus	0.5+1%	70	56	74	74
Imazethapyr+DyneAmic	0.5+0.5%	46	33	66	55
Imazethapyr+SilowetL77	0.5+0.5%	66	48	91	85
Imazethapyr+Activator90+AN	0.5+0.25%+1.5#/A	64	60	79	100
C.V. %		38	37	32	12
LSD 5%		30	24	35	16

[a]AN = ammonium nitrate; pt = pints/A; #/A = lbs/A.

Weed control in soybean from PPI herbicides, Casselton. (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 18. Soil applied treatments were applied on May 17 with 68 F, 20% RH, 20% cloudy sky and 20 to 30 mph wind with gusts up to 40 mph. Postemergence herbicides (Galaxy + Prime Oil) was applied June 13 with 73 F, 70% H, 50% clouds, and 10 to 15 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for the postemergence treatment. All plots were roto-tilled immediately after soil applied herbicide application with a small tractor mounted roto-tiller set at 1.5 to 2 inches. The experiment was a randomized complete block design with four replicates/treatment.

		June 22							
Treatment[a]	Rate	Sobn Inj	Fxtl	Wimu	Colq	Cocb	Wibw	Rrpw	Vema
	lb/A	%control							
PPI/POST									
Trifluralin/Acif&Bent+Prime Oil	0.75/0.92	0	95	94	71	82	85	99	96
PPI									
F-6285	0.31	0	33	28	45	5	60	99	90
F-6285	0.375	0	23	25	40	0	74	99	96
F-6285+Trifluralin	0.31+0.75	10	98	35	98	20	68	99	80
Flumetsulam&Trifluralin	0.46	14	90	84	63	3	80	99	79
Flumetsulam&Trifluralin	0.57	19	89	84	85	23	84	99	79
Flumetsulam&Trifluralin	0.69	23	90	90	93	25	94	99	90
Flumetsulam&Metolachlor	1.2	21	66	66	40	5	23	99	76
Flumetsulam&Metolachlor	1.44	24	63	71	68	20	31	99	83
Untreated		0	0	0	0	0	0	0	0
LSD 5%		3	20	24	40	20	8	0	6
C.V. %		21	22	27	47	91	11	0	6

[a]Trific brand of trifluralin was used in the first treatment. Prime Oil was applied at 1.5 pt/A. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

F-6285 did not control most weed except redroot pigweed and Venice mallow. Flumetsualm & trifluralin generally provided excellent grass and broadleaf weed control, except for common cocklebur. Treatments containing flumetsulam exhibited visible soybean injury. Rates of flumetsulam & trifluralin used in this experiment were significantly below label rate. For a fine textured, clay loam soil with greater than 3% organic matter the labeled rate is 1 lb/A. Rates used in this study were 50% to 75% of the labeled rate. Due to the moisture requirement of flumetsulam reduced rates according to soil type ARE NOT recommended even though results show adequate weed control. Particularly comparing weed control with flumetsulam & metolachlor. For a fine textured, clay loam soil with greater than 3% organic matter flumetsulam & metolachlor should be applied at 2.4 lb/A. Rates used in this study were 40% to 60% of the labeled rate. However, little moisture occurred after application which reduced weed control. This study shows that metolachlor does not enhance weed control from flumetsulam as trifluralin does.

Weed control in soybean from PRE herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides under development for use in soybean. 'McCall' soybean was seeded May 17. Preemergence treatments were applied on May 20 with 72 F, 55% RH, 100% cloudy sky and 3 to 5 mph wind. Postemergence treatments were applied to V3 corn, 1-4 inch foxtail, 2-12 inch rosette wild mustard, 0.5-4 inch common lambsquarters, 2-6 inch common cocklebur, 1-3 inch kochia, and 1-3 inch wild buckwheat on June 13 with 73 F, 70% RH, 50% cloudy sky and 10 to 15 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles 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	Sobe Inj	Fxtl	Wimu	Colq	Cocb	KOCZ	Wibw
		June 22						
	lb/A	% control						
PRE								
Alachlor	3	0	33	5	0	0	0	0
Metolachlor&Benoxacor	2.5	0	15	0	20	0	0	0
Dimethenamid	1.5	0	28	10	0	0	0	0
F-6285	0.31	0	35	43	81	0	0	0
F-6285	0.375	0	30	40	88	0	0	0
F-6285 + Dimethenamid	0.31 + 0.7	0	50	28	88	0	0	0
Flumetsulam&Metolachlor	0.96	9	15	58	8	0	0	0
Flumetsulam&Metolachlor	1.2	14	33	76	8	0	10	0
Flumetsulam&Metolachlor	1.44	15	43	90	25	0	41	0
PRE/POST								
Metolachlor&Benoxacor/ CGA 248757 + PO	2/ 0.043oz	0	24	51	20	0	0	0
Metolachlor&Benoxacor/ CGA 248757 + PO	2/ 0.071oz	0	28	61	33	13	0	0
Untreated		0	0	0	0	0	0	0
LSD 5%		3	18	21	23	6	6	0
C.V. %		62	43	36	52	41	10	0

[a]Petroleum oil (PO) was applied at 1.5 pt/A. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations used and trade names or premix names that corresponds to common names used.

All treatments provided complete redroot pigweed control. Limited rainfall after application resulted in poor weed control. These results confirm the need for moisture for soil applied herbicides to become activated and provide adequate control. Treatments containing flumetsulam were applied at 40% to 60% of the labeled rate. These data also confirm the necessity to use labeled rates. Flumetsulam requires rainfall.

Weed control in soybean from POST herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from imazethapyr with adjuvants and with various rates of Scoil with 28%UAN to determine if the rate of Scoil can be reduced and still achieve imazethapyr enhancement and adaquate weed control with the addition of fertilizer. Testing was also performed with imazethapyr and various tankmix combinations of broadleaf herbicides that are labeled or are in development for use in soybean. 'McCall' soybean was seeded May 17. Treatments were applied on June 13 to 1st trifolioliate soybean, 1-4 inch foxtail, rosette 2-12 inch wild mustard, 1-3 inch redroot pigweed, 0.5 to 4 inch common lambsquarters, 2-6 inch common cocklebur, rosette 4-10 inch Canada thistle, and 1-3 inch Venice mallow with 73 F, 70% RH, 50% cloudy sky and 10 to 15 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.

		July 12						
Treatment[a]	Rate	Sobe Inj	Fxtl	Wimu	Rrpw	Colq	Cocb	Vema
	oz/A	% control						
Imazethapyr + X-77	0.5	0	70	99	99	30	93	19
Imazethapyr + CL172A	0.5	0	79	99	99	33	99	53
Imazethapyr + PO	0.5	0	84	99	99	33	99	50
Imazethapyr + Sun-It II	0.5	0	90	99	99	53	97	59
Imazethapyr + CL7769	0.5	0	82	84	99	60	97	51
Imep + PCC-700 + X-77 + UAN	0.5	0	58	77	99	33	77	0
Imep + Lactofen + Sun-It II	0.5 + 1	3	70	99	99	43	97	31
Imep + Lactofen + Sun-It II	0.5 + 1.5	9	65	99	99	38	99	56
Imep + Lactofen + Sun-It II	0.75 + 1	14	71	99	99	40	99	65
Imep + Lactofen + Sun-It II	0.75 + 1.5	16	69	99	99	40	99	71
Imep + Lactofen + Sun-It II	1 + 1	18	89	99	99	80	99	88
Imep + Lactofen + Sun-It II	1 + 1.5	23	76	99	99	84	99	83
Imep + Lact + Clethodim + Sun-It II	0.5 + 1 + 1	18	76	99	99	71	99	60
Flumiclorac + Sun-It II	0.42	0	24	44	99	76	99	51
CGA-248757 + Sun-It II	0.043	0	0	76	99	73	99	56
CGA-248757 + Sun-It II	0.071	0	20	88	99	79	99	69
Flumiclorac + Lactofen + PO	0.42 + 1.5	11	0	92	99	66	99	49
Imep + Flumiclorac + Sun-It II	0.5 + 0.42	15	74	87	99	60	99	45
Imep + Dimethenamid + X-77	0.5 + 0.47	6	90	99	99	38	99	75
Imep + Dimethenamid + X-77	0.5 + 0.7	3	81	99	99	68	99	74
AC 299,263 + X-77	0.38	1	95	99	99	55	92	48
AC 299,263 + PO	0.38	1	94	99	99	87	96	55
AC 299,263 + Sun-It II	0.38	4	94	99	99	97	99	68
AC 299,263 + X-77	0.58	6	98	99	99	97	97	55
AC 299,263 + PO	0.58	4	97	99	99	96	94	58
AC 299,263 + Sun-It II	0.58	6	99	99	99	97	96	83
Untreated		0	0	0	0	0	0	0
LSD 5%		4	21	13	0	24	7	24
C.V. %		45	21	10	0	28	4	31

[a]X-77, CL172A, was applied at 0.25% v/v, petroleum oil (PO), CL7769, Scoil, was applied at 1.5 pt/A, and 28% UAN was applied at 2% v/v. Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that corresponds to common names used.

Overall weed control from imazethapyr was greatest with MSO type adjuvants compared to other adjuvant types. PCC-700 antagonized imazethapyr. Lactofen antagonized foxtail control from imazethapyr and did not increase lambsquarters or Venice mallow control. Flumichlorac did not increase colq control alone or in combination with other herbicides. ACC 299,263 provided excellent weed control except for Venice mallow.

Weed control in soybean, Colfax. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides in development for use in soybean. 'McCall' soybean was seeded May 23. PPI treatments were applied on May 10 with 65 F, 40% RH, 100% cloudy sky and 15 to 20 mph wind and incorporated immediately after application with a small tractor mounted roto-tiller set at 1.5 to 2 inches. PRE treatments were applied on May 24 with 70 F, 80% H, 65% clouds, and 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 equipped 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	Sobe Inj	Fxtl	Rrpw	Colq	Ebns	Wimu	Vowh
		June 28						
	lb/A	% control						
PPI								
F-6285	0.31	1	69	90	99	99	23	0
F-6285	0.375	5	99	99	99	99	23	0
F-6285 + Trifluralin	0.31 + 0.75	21	99	99	99	99	35	0
Flumetsulam&Trifluralin	0.46	9	99	99	99	99	99	0
Flumetsulam&Trifluralin	0.57	4	99	98	99	99	99	0
Flumetsulam&Trifluralin	0.69	13	99	99	99	99	99	23
PRE								
Alachlor	2.5	4	85	71	54	75	31	30
Dimethenamid	1.38	5	84	68	60	66	31	10
F-6285	0.31	0	43	55	92	91	0	0
F-6285	0.375	1	69	58	88	84	0	0
F-6285 + Dimethenamid	0.31 + 0.7	3	86	62	89	94	25	0
Flumetsulam&Metolachlor	0.96	8	56	58	55	69	99	0
Flumetsulam&Metolachlor	1.2	3	84	54	65	84	99	0
Flumetsulam&Metolachlor	1.44	6	89	75	85	85	99	19
Untreated		0	0	0	0	0	0	0
LSD 5%		8	12	18	19	8	9	3
C.V. %		14	10	17	16	7	12	44

[a]Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that corresponds to common names used.

Generally F-6285 and Broadstrike + Treflan provided excellent grass and broadleaf weed control. F-6285 did not control wild mustard. The high rate of both herbicides caused visible soybean injury. Rates used of flumetsulam & trifluralin used in this experiment were significantly below label rate. For a fine textured, clay loam soil with greater than 3% organic matter the labeled rate is 1 lb/A. Rates used in this study were 50% to 75% of the labeled rate. Due to the moisture requirement of flumetsulam reduced rates according to soil type ARE NOT recommended even though results show adequate weed control. Particularly comparing weed control with flumetsulam & metolachlor applied PRE. For a fine textured, clay loam soil with greater than 3% organic matter flumetsulam & metolachlor should be applied at 2.4 lb/A. Rates used in this study were 40% to 60% of the labeled rate. However, little moisture occurred after application which reduced weed control and metolachlor does not enhance weed control from flumetsulam as trifluralin does. F-6285 gives poor redroot pigweed control and no wild mustard control applied PRE.

Common ragweed in soybean, Wahpeton. (Zollinger) An experiment was conducted to evaluate common ragweed control from labeled herbicides in soybean. 'McCall' soybean was seeded May 19. Soil applied treatments were applied on May 19 with 73 F, 50% RH, 20% cloudy sky and 15 to 25 mph wind with gusts up to 25 mph. Postemergence herbicides were applied to V2-V3 soybean, 1-5 inch common ragweed, and 3-9% common cocklebur on June 22 with 70 F, 55% RH, 100% clouds, and 5 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 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 the postemergence treatment. All plots were 2-pass incorporated with a triple-K tool immediately after soil applied herbicide application. The experiment was a randomized complete block design with four replicates/treatment.

		July 15	
Treatment[a]	Rate	Corw	Sobe Inj
	oz/A	% control	%
PPI			
Imazethapyr&Pendimethalin	0.94lb	74	0
Flumetsulam&Trifluralin	0.91lb	83	0
PPI/POST			
Pendimethalin/Imazethapyr + Sun-It II	1lb/0.75	90	3
Pendimethalin/Imazethapyr + Sun-It II	1lb/1	87	5
Pendimethalin/Imazethapyr + Lactofen + X-77	1lb/0.75 + 1	93	8
Pendimethalin/Imazethapyr + Lactofen + X-77	1lb/0.75 + 1.5	94	8
Pendimethalin/Imazethapyr + Lactofen + X-77	1lb/0.75 + 1.75	92	10
Pendimethalin/Imazethapyr + Lactofen + X-77	1lb/0.75 + 2	93	11
Pendimethalin/Imazethapyr + Lactofen + X-77	1lb/1 + 1	94	14
Pendimethalin/Imazethapyr + Lactofen + Sun-It II	1lb/0.5 + 1.5	93	11
Pendimethalin/Bentazon + Sun-It II	1lb/0.75lb	71	0
Untreated		0	0
LSD 5%		8	4
C.V. %		6	12

[a]X-77 was applied at 0.25% v/v and Sun-It II was applied at 1.5 pt/A. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

PPI treatments of pendimethalin provided more common ragweed control than anticipated. Few ragweed plants emerged the soil applied treatments were incorporated. Lack of ragweed germination may have resulted from limited rainfall after soil applied treatments were established. All treatments containing imzethapyr gave approximately 90% control or greater.

No-till early preplant weed control, Wells county. (Endres and Zollinger) An experiment was conducted to evaluate weed control in no-till soybean from labeled herbicides. Previous crop was barley in a no-till production system. Soil had pH of 7.4 with 4% OM. Soil applied treatments were applied on April 19 with 46 F, 33% RH, sunny sky and 17 mph wind. Treatments were applied to an 5 ft wide area the length of 7.5 by 20 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 three replicates/treatment.

Treatment[a]	Rate	June 8 Fxtl	July 5 Fxtl
	lb/A	------- % control-------	
Untreated		0	0
Alachlor	2.5	49	51
Metolachlor&Benoxacor	2.5	77	75
Dimethenamid	1.2	61	70
Acetachlor&Dichlormid	1.6	48	49
Acetochlor&MON4660	1.6	52	51
Flumetsulam&Metolachlor	2.1	61	42
Flumetsulam&Metolachlor	2.4	76	41
LSD 5%		16	15
C.V. %		38	42

[a]Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

Recent label changes allow metolachlor to be applied as a fall treatment in North Dakota. Winter moisture may activate metolachlor and result in greater and more consistent grass and broadleaf weed control. This experiment was conducted to determine if early spring precipitation would satisfy the moisture requirement but still give residual weed control into the summer until crop canopy occurs. Precipitation did occur after application. Rates were based on soil type. Foxtail was not controlled with any treatment. However, metolachlor did provide the greatest control.

Multiple bentazon applications in drybeans, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was conducted on a conventionally tilled silty clay with 4.5% organic matter and pH 7.8. Agri 1 navy beans were seeded May 26 at 1.5 inches deep in 30-inch rows at 90,000 seeds/A. Plots were treated from 1 to 4 times with a total bentazon application rate of 1 lb/A (or with 0.75 lb/A). Application details were as follows: June 7 for plots treated 1 wk after planting (1WAP) with air temperature 74 F, wind 15 to 20 mph (shield used), relative humidity 45%, sky partly sunny, soil surface dry, drybeans unifoliolate and 1.5 inches tall, wild mustard 2-leaf and 0.5 inch tall, kochia 0.25 to 0.5 inch tall, redroot pigweed 2-leaf and 0.5 inch tall, and common lambsquarters cotyledon to 2-leaf and 0.25 to 0.5 inch tall; June 13 for plots treated 2WAP with air temperature 74 F, wind 7 to 12 mph (shield used), relative humidity 40%, sky partly cloudy, dry soil surface, drybeans 2 inches tall with the first trifoliolate about 1/3 expanded; June 21 for plots treated 3WAP with air temperature 82 F, wind 0 to 5 mph, relative humidity 40%, sunny sky, dry soil surface, drybeans 2-trifoliolate and 5 inches tall, kochia 2.5 to 5 inches tall, pigweed 3- to 5-leaf and 1 to 1.5 inches tall, wild mustard 3 to 6 inches tall, and lambsquarters 4- to 6-leaf and 1 to 3 inches tall; June 27 for plots treated 4WAP with air temperature 78 F, wind 8 to 12 mph (shield used), relative humidity 45%, sky mostly cloudy, soil surface dry, and drybeans 3 to 4 trifoliolate and 5 to 6 inches tall. All treatments were applied with a 4-nozzle bicycle wheel sprayer with 8001 tips and delivering 8.5 gal/A at 40 psi. The entire experimental area was treated June 23 with sethoxydim at 0.28 lb/A plus Scoil at 1.5 pt/A for grass control. Visual estimates of crop injury and weed control were taken July 6 and weed control was estimated again on Aug. 15. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate[a]	DB	Evaluated July 6				Evaluate Aug. 15			
	(lb/A)	inj	Wimu	Rrpw	Colq	KOCZ	Wimu	Rrpw	Colq	KOCZ
		(%)								
Bent+POC(1W)/Bent+POC(2W)/ Bent+POC(3W)/Bent+POC(4W)	0.25+1pt/0.25+1pt/ 0.25+1pt/0.25+1pt	2	100	97	93	96	100	69	59	90
Bent+POC(2W)/Bent+POC(3W)/ Bent+POC(4WAP)	0.33+1qt/0.33+1pt/ 0.33+1pt	2	100	97	96	97	100	75	71	94
Bent+POC(2W)/Bent+POC(4W)	0.5+1qt/0.5+1qt	2	100	95	92	95	100	65	83	91
Bentazon+POC(3WAP)	1+1qt	2	100	55	75	67	98	6	78	40
Bent+Dsh(1W)/Bent+Dsh(2W)/ Bent+Dsh(3W)/Bent+Dsh(4W)	0.25+1pt/0.25+1pt/ 0.25+1pt/0.25+1pt	2	100	87	94	97	99	3	37	91
Bent+Dsh(2W)/Bent+Dsh(3W)/ Bent+Dash(4WAP)	0.33+1pt/0.33+1pt/ 0.33+1pt	3	100	91	86	89	99	15	9	78
Bent+Dash(2W)/Bent+Dsh(4W)	0.5+1pt/0.5+1pt	3	100	88	91	94	100	11	63	85
Bentazon+Dash(3WAP)	1+1pt	3	100	47	55	59	100	0	28	33
Bent+Sc(1W)/Bent+Sc(2W)/ Bent+Sc(3W)/Bent+Sc(4W)	0.19+1pt/0.19+1pt/ 0.19+1pt/0.19+1pt	2	100	89	94	96	100	36	69	82
Bent+Sc(2W)/Bent+Sc(3W)/ Bent+Scoil(4WAP)	0.25+1pt/0.25+1pt/ 0.25+1pt	2	100	88	88	89	100	48	57	70
Bent+Sc(2W)/Bent+Sc(4W)	0.38+1pt/0.38+1pt	2	100	94	91	94	100	42	64	84
Bentazon+Scoil(3WAP)	0.75+0.5pt	2	100	34	50	59	95	0	35	31
C.V. %		58	0	8	9	11	3	83	60	21
LSD 5%		NS	NS	9	10	13	NS	37	NS	22

[a]Bent = bentazon; POC = petroleum oil adjuvant containing 17% emulsifier; Dash = proprietary adjuvant by BASF; Scoil or Sc = vegetable oil adjuvant containing emulsifier; Dsh = Dash adjuvant; W = wks after planting; qt = quart/A; pt = pt/A.

Summary. Split applications of bentazon at total bentazon rates of 0.75 to 1 lb/A controlled common lambsquarters and redroot pigweed.

Split applications with bentazon in drybeans, Fargo 1994. W. H. Ahrens and M. G. Ciernia. This experiment was conducted on a silty clay with pH 7.8 and 4.5% organic matter. Agri 1 navy beans were planted 1.5 inches deep on May 25 in 30-inch rows and at 90,000 seeds/A. Initial treatments (Uni) were applied June 9 using a 4-nozzle bicycle wheel sprayer with 8001 tips and delivering 8.5 gal/A at 40 psi. Conditions at application were: wind 15 to 20 mph (shield used); air temperature 63 F; relative humidity 45%; sky cloudy; soil surface dry; navy beans unifoliolate, 2 inches tall; wild mustard 4-leaf, 0.5 inch tall; redroot pigweed 3-leaf, 0.5 inch tall; kochia 1 inch tall; common lambsquarters 4-leaf, 0.5 to 1 inch tall. The second postemergence treatments (1Tri) were applied June 21 with the following conditions: wind 9 mph; air temperature 82 F; 40% relative humidity; sunny sky; dry soil surface; drybeans 3- to 4-trifoliolate, 5 inches tall; wild mustard 3 to 6 inches tall; redroot pigweed 3- to 5-leaf, 1.5 inches tall; kochia 2.5 to 5 inches tall; common lambsquarters 1 to 3 inches tall. The entire experimental area was sprayed June 23 with 0.28 lb/A sethoxydim plus 1.5 pt/A Scoil for grass control. Visual estimates of crop injury were taken June 29 and July 12 and of weed control July 12 and July 22. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate[a]	Eval. 6/29	Weed control								
			Eval. July 12					Eval. July 22			
		Inj	Inj	KOCZ	Colq	Rrpw	Wimu	KOCZ	Colq	Rrpw	Wimu
	(lb/A)	(%)									
Bentazon+POC(Uni)/ Bentazon+POC(1Tri)	0.5+1Q/ 0.5+1Q	0	11	100	98	68	100	99	96	78	100
Bentazon+Scoil(Uni)/ Bent+Scoil(1Tri)	0.38+1.5pt/ 0.38+1.5pt	1	10	100	98	59	100	98	91	74	100
Bent+Acif+POC(Uni)/ Bentazon+POC(1Tri)	0.5+0.06+1pt/ 0.5+1Q	1	5	100	96	94	100	99	96	92	100
Bentazon+POC(Uni)/ Bent+Acif+POC(1Tri)	0.5+1Q/ 0.5+0.06+1pt	10	7	100	94	99	100	99	81	95	100
Bentazon+POC(Uni)/ Bent&Acif+POC(1Tri)	0.5+1Q/ 0.46+1pt	7	4	99	90	99	100	99	86	98	100
Bent+Imep+POC(Uni)/ Bentazon+POC(1Tri)	0.5+0.016+1Q/ 0.5+1Q	0	4	100	99	98	100	100	98	97	100
Bent+Imep+Scoil(Uni)/ Bent+Scoil(1Tri)	0.38+0.016+1.5pt/ 0.5+1.5pt	2	5	100	68	58	100	100	92	73	100
Bent+Imep+28%+X77(Uni) Bentazon+POC(1Tri)	0.5+0.016+2Q+0.13% 0.5+1Q	2	3	100	99	98	100	100	96	97	100
Bentazon+POC(1Tri)	1+1Q	3	11	98	83	9	100	93	67	8	100
Bent+Scoil(1Tri)	0.75+1.5pt	2	10	91	33	3	100	83	19	0	100
Bent+Acif+Scoil(1Tri)	0.75+0.13+1.5pt	42	14	99	0	90	100	99	0	43	100
Bent+Imep+28%+X77(Uni)/ Bent+Imep+28%+X7(1Tri)	0.5+0.016+2Q+0.13%/ 0.5+0.016+2Q+0.13%	2	9	100	98	100	100	100	97	100	100
Bent+Imep+28%+X77(Uni)/ Bentazon+POC(1Tri)	0.5+0.03+2Q+0.13% 0.5+1Q	1	0	100	99	98	100	100	99	97	100
Bentazon+POC(Uni)/ Bent+Imep+28%+X7(1Tri)	0.5+1Q/ 0.5+0.03+2Q+0.13%	2	8	100	99	100	100	100	98	100	100
Imep+28%+X77(1Tri)	0.03+2Q+0.13%	7	3	100	2	99	100	98	0	99	100
Imep+28%+Scoil(1Tri)	0.03+2Q+1pt	6	23	100	10	99	100	100	0	99	100
Imep+Scoil(1Tri)	0.03+1pt	4	5	100	3	99	100	100	2	98	100
Imep+28%+X77(1Tri)	0.047+2Q+0.13%	15	5	100	2	99	100	100	0	99	100
Imep+Scoil(1Tri)	0.047+1.5pt	12	5	100	2	100	100	100	2	100	100
C.V. %		37	34	1	26	17	0	2	17	15	0
LSD5%		4	NS	2	25	22	NS	3	16	19	0

[a] Bent = bentazon; POC = petroleum oil adjuvant containing 17% emulsifier; Acif = acifluorfen; Imep = imazethapyr; 28% = 28% urea ammonium nitrate; X77 = nonionic surfactant by Valent; Q = quart/A; pt = pint/A.

Total POST weed control in drybeans, Fargo 1994. 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. Agri 1 navy beans were planted May 25 at 1.5 inches deep in 30-inch rows at 90,000 seeds/A. All imazethapyr treatments were applied June 21 using a 4-nozzle bicycle wheel sprayer with 8001 tips and delivering 8.5 gal/A at 40 psi. At time of treatment, air temperature was 82 F, wind was 5 mph, relative humidity was 40%, the sky was sunny, and the soil surface was dry. Drybeans were 2-trifoliolate and 5 inches tall, kochia was 2.5 to 5 inches tall, redroot pigweed was 3- to 5-leaf and 1 to 1.5 inches tall, wild mustard was 3 to 6 inches tall, common lambsquarters was 4- to 6-leaf and 1 to 3 inches tall, and yellow foxtail was 4-leaf, 6 to 8 inches tall, and had 1 to 3 tillers. Treatments involving sethoxydim alone were ap-plied July 1 with wind 10 to 15 mph (shield used), air temperature 61 F, relative humidity 35%, the sky sunny, and soil surface dry. The crop had 3 to 4 trifoliolate leaves and was 5 to 8 inches tall. Visual estimates of drybean injury were taken June 29 and July 6, and for weed control on July 6 and July 20. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

		Drybean injury		Weed control									
				Evaluated July 6					Evaluated July 20				
Treatment[a]	Rate[a]	6/29	7/6	Wimu	Rrpw	Colq	KOCZ	Yeft	Wimu	Rrpw	Colq	KOCZ	Yeft
	(lb/A)	(%)											
Bent+Imep+X77/ Sethoxydim	0.75+0.016+0.25%/ 0.19	4	2	99	92	63	98	77	100	80	42	97	100
Bent+Imep+Scoil/ Sethoxydim	0.75+0.016+1pt/ 0.19	5	0	100	91	46	100	81	99	90	18	100	99
Bent+Imep+Scoil/ Sethoxydim	0.5+0.016+1pt/ 0.14	6	5	100	93	47	99	80	99	89	35	100	99
Bent+Imep+Seth	0.75+0.016+0.19	7	4	99	92	51	98	81	98	95	20	96	2
Bent+Imep+Seth	0.75+0.016+0.14	3	1	99	91	39	99	71	99	90	14	100	0
Bent+Imep+X77/ Sethoxydim	0.75+0.031+0.25%/ 0.19	2	1	100	96	83	99	78	100	92	92	100	100
Bent+Imep+Scoil/ Sethoxydim	0.75+0.031+1pt/ 0.19	7	4	100	94	41	99	83	99	97	32	100	100
Bent+Imep+Scoil/ Sethoxydim	0.5+0.031+1pt/ 0.14	9	2	99	93	52	99	82	100	99	73	100	100
Bent+Imep+Seth	0.75+0.031+0.19	6	2	100	94	48	100	79	100	94	39	100	27
Bent+Imep+Seth	0.5+0.031+0.14	9	2	99	93	62	100	83	99	96	59	100	28
Imep+Sethoxydim	0.031+0.19	16	1	99	93	10	100	83	100	99	8	100	27
Imep+Sethoxydim	0.031+0.14	16	1	98	92	28	100	81	100	99	13	100	35
Imazethapyr+X77	0.047+0.25%	16	2	99	95	28	100	88	100	100	6	100	36
Imep+Scoil	0.047+1pt	17	1	99	93	42	100	84	100	100	21	100	22
C.V. %		48	140	2	3	31	1	10	1	8	76	2	45
LSD 5%		6	NS	2	4	19	2	11	1	10	34	2	33

[a]All imazethapyr treatments included 28% urea ammonium nitrate fertilizer solution at 2 quarts/A. All sethoxydim treatments included Scoil at 0.5 pint/A. Bent = bentazon; Imep = imazethapyr; Seth = sethoxydim; pt = pint/A.

Summary. Bentazon reduced drybean injury caused by imazethapyr. Drybean injury was greater with Scoil than with X-77 surfactant. Sethoxydim mixed with imazethapyr does not appear to provide additional foxtail control compared with imazethapyr applied without sethoxydim.

Weed control in dry bean, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides under development for use in dry bean. 'Agri 1' navy bean was seeded May 17. Preemergence treatments were applied on May 21 with 68 F, 90% RH, 100% cloudy sky and 3 mph wind. Postemergence treatments were applied to V1-V2 dry bean, 1-4 inch foxtail, 2-12 inch rosette wild mustard, 0.5-4 inch common lambsquarters, 2-6 inch common cocklebur, 1-2 inch Venice mallow, 1-3 inch kochia, and 1-3 inch redroot pigweed on June 13 with 73 F, 70% RH, 50% cloudy sky and 10 to 15 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles 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	June 22							
		Fxtl	Wimu	Colq	Cocb	Rrpw	Vema	KOCZ	Nabe
	lb/A	% control							
PRE									
Lactofen	0.2	33	38	51	38	70	13	77	0
Lactofen	0.25	50	59	70	53	85	29	88	0
Lactofen	0.3	50	82	82	71	98	43	99	0
Dimethenamid	1.5	71	20	23	3	97	43	0	0
PRE/POST									
Dimethenamid/Bent+PO	1.5/0.75	80	99	93	99	99	99	61	3
Dime/Imazethapyr+X-77	1.5/0.5oz	96	99	97	99	99	49	99	13
POST									
Imazethapyr + X-77	0.5oz	75	99	65	78	99	58	83	6
Imep+X-77+PCC-700	0.5oz	69	96	59	77	99	43	63	0
Imazethapyr+Scoil	0.5oz	89	99	94	99	99	50	99	11
Imazethapyr+X-77	0.75oz	93	99	89	92	99	45	94	10
Imep+X-77+PCC-700	0.75oz	80	99	75	99	99	25	64	1
Imazethapyr+Scoil	0.75oz	91	99	96	97	99	63	99	19
Untreated		0	0	0	0	0	0	0	4
LSD 5%		18	24	30	32	21	9	9	6
C.V. %		18	22	29	31	16	13	8	52

[a]X-77 was applied at 0.25% v/v, petroleum oil (PO) and Scoil was applied at 1.5 pt/A, and PCC-700 was applied at 0.67 pt/A. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

Adequate rainfall occurred after lactofen application for activation but no visible dry bean injury. Lactofen at 0.3 lb/A provided good to 71% to 99% broadleaf weed control, except Venice mallow. 71% common cocklebur control was observed from lactofen. Nearly complete weed control resulted from PRE/POST applications of dimethenamid/bentazon or imazethapyr. Bentazon gave poor kochia but excellent Venice mallow control. Kochia and mallow control with imazethapyr were opposite. Weed control from imazethapyr with Scoil was greater than with surfactant. Addition of PCC-700 antagonized weed control from imazethapyr but safened imazethapyr on navy bean.

Weed control in dry bean, Minto. (Zollinger) An experiment was conducted to evaluate weed control dry bean. 'Othello' dry bean was seeded May 18. PPI treatments were applied on May 5 with 55 F, 20% RH, 30% cloudy sky and 15 mph wind with dry top soil and moist subsoil. PRE treatments were applied on May 20 with 60 F, 75% RH, 10% clouds, and 5 to 10 mph wind and incorporated immediately after application with a small tractor mounted rottiller set at 1.5 to 2 inches. Soil surface was wet and moist subsoil. POST treatments were applied to V1 drbe, 4 to 10 inch bygr, rosette 8-16 inch wimu, 2-8 inch fxtl, 1-8 inch rrpw, 1-10 inch colq, 1-10 inch coma, 0.5 to 1.5 inch KOCZ, and 1-5 inch wibw on June 13 with 73 F, 85% RH, 5% 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 delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

		July 6								
Treatment[a]	Rate	Drbe Inj	Bygr	Fxtl	Wimu	KOCZ	Rrpw	Colq	Wibw	Coma
	lb/A	% control								
PPI										
F-6285	0.31	11	34	53	24	41	77	85	50	74
F-6285	0.375	12	50	70	36	54	70	89	57	74
F-6285 + Trifluralin	0.31 + 0.75	0	90	90	46	88	84	94	23	99
Flumetsulam&Trifluralin	0.46	10	80	83	94	76	90	99	34	66
Flumetsulam&Trifluralin	0.57	10	89	92	99	83	99	99	48	94
Flumetsulam&Trifluralin	0.69	8	89	91	99	89	98	97	63	96
PRE										
Alachlor	2.5	0	13	45	8	8	28	10	0	0
Dimethenamid	1.38	0	5	46	13	15	40	13	0	0
F-6285	0.31	0	0	59	34	99	69	99	43	74
F-6285	0.375	4	26	54	35	99	75	99	50	75
F-6285 + Dimethenamid	0.31 + 0.7	0	57	81	61	99	89	99	75	94
Flumetsulam&Metolachlor	0.96	14	11	38	49	21	43	20	13	65
Flumetsulam&Metolachlor	1.2	15	8	59	76	35	58	31	16	74
Flumetsulam&Metolachlor	1.44	20	11	69	91	70	79	36	13	85
Dime/CGA 248757 + PO	0.7/0.043oz	14	34	74	39	41	79	34	15	0
POST										
Imep + Lactofen + Sun-It II	0.5oz + 1.5oz	38	36	90	99	99	99	34	55	43
Imep + Lactofen + Sun-It II	0.75oz + 1.5oz	31	36	89	99	99	99	33	65	63
Imep + Lactofen + Sun-It II	1oz + 1.5oz	34	44	94	99	99	99	63	75	70
Imep + Lact + Clet + Sun-ItII	0.5oz + 1oz + 1oz	29	92	86	99	99	87	40	75	81
Flumiclorac + Sun-It II	0.42oz	14	0	0	25	54	48	89	0	0
CGA-248757 + Sun-In II	0.071oz	23	0	0	20	34	31	60	15	0
Imep + Flumiclorac + SnItII	0.5oz + 0.42oz	49	43	80	99	99	71	56	66	81
Imep + CGA248757 + SnItII	0.5oz + 0.043oz	24	0	80	99	99	71	49	49	70
Imazethapyr + Dime + X-77	0.38oz + 0.7	0	0	76	99	75	59	33	0	46
Imazethapyr + Dime + X-77	0.5oz + 0.47	5	29	74	99	71	59	33	44	54
Imezethapyr + Dime + X-77	0.5oz + 0.7	15	30	84	99	77	68	66	60	48
AC 299,263 + X-77	0.58oz	6	56	75	99	92	79	79	55	70
AC 299,263 + PO	0.58oz	5	99	99	99	99	99	99	76	96
AC 299,263 + Sun-It II	0.58oz	4	99	99	99	99	99	99	89	99
Untreated		0	0	0	0	0	0	0	0	0
LSD 5%		8	22	16	29	23	23	16	26	23
C.V. %		24	29	16	29	22	22	17	21	20

[a]X-77 was applied at 0.25% v/v, petroleum oil (PO) and Sun-It II was applied at 1.5 pt/A. Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that correspond to common names used.

Flumetsulam rates used were significantly below label rate, 40% to 75% of the labeled rate. Due to the moisture requirement of flumetsulam, reducing rates below label according to soil type ARE NOT recommended. Compare PPI vs PRE application and Flmc & Trif vs Flmc & Meto. DO NOT apply less than labeled rate.

Control of established alfalfa, Fargo. (Zollinger and Meyer) An experiment was conducted to evaluate alfalfa control from normally recommended herbicides. 'Vernal' alfalfa was seeded and established in 1993. Herbicides were applied to 8 inch tall alfalfa on May 20, 1994 with 60 F, 50% RH, 10% cloudy sky and 5 to 10 mph wind. Treatments were applied to an 16 ft wide area the length of 20 by 20 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. Half of each plot was tilled with a cutivator 10 days after application. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	Alfalfa control			
		June 8		June 29	
		Spray only	Spray+Till	Spray only	Spray+Till
	lb/A	% control			
Glyphosate + NIS + AMS	0.75	95	99	88	94
2,4-D ioe	1	84	95	89	96
2,4-D ioe	2	87	95	97	98
Glyphosate + 2,4-D[b] + AMS	1	92	97	93	96
Dicamba	0.25	75	91	78	88
Dicamba + Glyphosate[c] + AMS	0.65	90	95	89	92
Clopyralid + 2,4-D[d]	1.2	89	97	97	99
Untreated		0	63	0	11
LSD 5%		3	4	3	3
C.V. %		3	3	3	3

[a]NIS was applied at 0.25% v/v, AMS was applied at 17 lb/A.
[b]Applied in the premix form of Landmaster BW at the equivalent rate of 54 fl oz/A.
[c]Applied in the premix form of Fallow Master at the equivalent rate of 3.25 pt/A.
[d]Applied in the premix form of Curtail at the equivalent rate of 4 pt/A.

All treatments gave at least 80% control except dicamba in the sprayed only plots. In plot were alfalfa control was not adaquate, tillage provided additional and adaquate control.

Weed control in Flax, Fargo 1994. 'Omega' flax was seeded May 12. Treatments were applied to 3- to 7-inch flax, 4- to 7-leaf foxtail, 3- to 5-inch wild buckwheat, 1- to 4-inch common lambsquarters, and 1- to 8-inch kochia on June 10 with 63 F, 65% RH, cloudy sky, and 12- 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 28 ft plots. The experiment was a randomized comlete block design with four replicates.

Treatment	Rate	Flax	Yeft Grft	Wimu	Colq	Wibu	KOCZ	9/15 Yield
		6/22						
	oz/A	%						bu/A
Seth+MCPA-ioe+Scoil	3+4+.18G	0	98	97	97	54	44	12
Seth+Brox+Scoil	3+4+.18G	1	99	97	94	99	95	16
Seth+Brox&MCPA+Scoil	3+8+.18G	3	97	99	99	98	95	18
Seth+Brox&MCPA	3+8	7	96	99	99	96	92	17
Thif+MCPA-ioe+Seth+Scoil	0.06+4+3+.18G	25	87	99	99	96	97	20
Thif+MCPA-ioe+Seth+Scoil	0.03+4+3+.18G	24	93	99	99	94	97	19
Thif+MCPA-ioe+Seth+ND-94-1	0.06+4+3+1%	28	83	98	99	96	99	17
Thif+MCPA-ioe+Seth+ND-94-1	0.03+4+3+1%	26	89	99	97	97	97	18
Thif+MCPA-ioe+Seth+ND-94-1	0.015+4+3+1%	23	87	99	98	94	96	17
Untreated	0	0	0	0	0	0	0	6
C.V. %		26	6	2	2	6	4	16
LSD 5%		5	7	3	3	7	5	4
# OF REPS		4	4	4	4	4	4	4

Summary

Weed control increased flax yield 6 to 14 bu/A. Treatments containing thifensulfuron caused about 25% injury to flax, but flax treatments with thifensulfruon was among the highest yielding. Flax yield generally related to weed control. Thifensulfuron at the highest rate was antagonistic to foxtail control by sethoxydim.

Broadspectrum POST weed control in corn, Casselton 1994. 'Interstate 353' corn was seeded May 17. Treatments were applied to 4- to 5-leaf corn, 3- to 6-leaf foxtail, 4- to 6-leaf common cocklebur, and 4- to 8-leaf common lambsquarters on June 13 with 74 F, 68% RH, partly cloudy sky, and 10- to 20-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/30				8/05		
		Corn	Fxtl	Coco	Colq	Yeft	Coco	Colq
	oz/A	%						
Nicosulfuron+Scoil	0.25+1%	0	80	13	72	83	29	45
Nicosulfuron+X-77+28%N	0.25+0.25%+4%	0	75	4	40	85	6	6
Nicosulfuron+ND-94-1	0.25+1%	0	66	23	10	70	0	0
Nicosulfuron+Atra-DF+Scoil	0.25+6+1%	0	80	31	98	84	21	99
Nico+Atra-DF+X-77+28%N	0.25+6+0.25%+4%	0	58	46	96	66	23	99
Nico+Atra-DF+ND-94-1	0.25+6+1%	0	77	27	99	91	19	99
Nico+Dica-dma+Scoil	0.25+2+1%	1	83	94	99	82	99	99
Nico+Dica-dma+X-77+28%N	0.25+2+0.25%+4%	1	71	92	99	56	99	99
Nico+Dica-dma+ND-94-1	0.25+2+1%	0	83	92	99	82	99	99
Nico+24-Ddma+Scoil	0.25+4+1%	0	85	93	99	85	98	99
Nico+24-Ddma+X-77+28%N	0.25+4+0.25%+4%	0	73	93	99	58	99	99
Nico+24-Ddma+ND-94-1	0.25+4+1%	0	80	93	99	82	98	99
Nicosulfuron+Brox+Scoil	0.25+4+1%	0	76	91	99	74	92	99
Nicosulfuron+Brox+X-77+28%N	0.25+4+0.25%+4%	0	82	95	99	80	95	99
Nicosulfuron+Brox+Scoil	0.25+4+1%	0	78	93	96	77	94	99
C.V. %		528	7	12	13	6	24	12
LSD 5%		NS	7	11	16	6	22	14
# OF REPS		4	4	4	4	4	4	4

Summary

Nicosulfuron at 0.25 oz/A did not completely control foxtail species, regardless of adjuvant. The late season rating for foxtail indicated post-treatment weed emergence as yellow foxtail was quite uniform in all plots, but did not appear to influence the corn which had excessive moisture all season. Adjuvants were similarly effective, except ND-94-1 was less effective than the other with nicosulfuron alone and X-77 + 28% nitrogen fertilizer less effective than the others when with nicosulfuron + atrazine, dicamba, or 2,4-D. Nicosulfuron in mixture with 6 oz/A atrazine did not control common cockelbur, but in mixture with dicamba, 2,4-D, or bromoxynil gave excellent common lambsquarters and common cocklebur control. These data indicate that Scoil adjuvant was more consistant than other adjuvants for foxtail control with nicosulfuron regardless of the associated herbicides.

Nicosulfuron with MS adjuvants, Fargo 1994. 'Interstate 353' corn was seeded May 20. Treatments were applied to 5- to 6-leaf corn, 2- to 7.5-leaf yellow foxtail, 4- to 10-inch proso millet, and 2- to 15-leaf common lambsquarters on June 22 with 78 F, 65% RH, cloudy sky, and 5- to 10-mph wind. Treatments were applied with a bicycle-wheel-type-plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates.

		7/15				8/11	
Treatment	Rate	Corn	Yeft	Prmi	Colq	Yeft	Prmi
	oz/A			%			
Nicosulfuron+X-77+28%N	0.25+0.25%+4%	0	89	89	53	86	94
Nicosulfuron+Scoil	0.25+1%	0	83	87	39	87	95
Nicosulfuron+Scoil+28%N	0.25+1%+4%	0	87	91	67	91	99
Nicosulfuron+Methoil	0.25+1%	0	74	78	30	88	92
Nicosulfuron+Methoil+28%N	0.25%+1%+4%	0	88	88	80	90	96
Nicosulfuron+MSO	0.25+1%	0	84	85	68	89	98
Nicosulfuron+MSO+28%N	0.25+1%+4%	0	87	88	63	93	98
Nicosulfuron+MES 100	0.25+1%	0	87	89	66	91	97
Nicosulfuron+MES 100+28%N	0.25+1%+4%	0	80	83	62	90	95
Nicosulfuron+Class Destiny	0.25+1%	0	80	85	50	90	93
Nicosulfuron+Class Destiny+28%N	0.25+1%+4%	0	79	82	50	88	96
Nicosulfuron+ND-94-1	0.25+1%	0	80	77	27	89	94
Nicosulfuron+ND-94-2	0.25+1%	0	92	88	75	89	95
C.V. %		0	7	9	22	4	3
LSD 5%		NS	10	NS	21	NS	NS
# OF REPS		3	3	3	3	4	4

Summary

Conditions were excessively wet and common lambsquarters infestation was variable. Nonionic surfactant X-77 plus 28% liquid nitrogen fertilizer was equally more effective than methylated seed oil adjuvant with nicosulfuron. The moist conditions may have accounted for the high effectiveness from the nonionic surfactant. At the early evaluation, nicosulfuron applied with methoil generally gave less yellow foxtail control than when applied with the other adjuvants. The difference among adjuvants did not occur at the late evaluation. All late ratings for yellow foxtail were similar because new yellow foxtail emerged in plots when the original stand was controlled. However, when original plants were not controlled they recovered and apparently prevented subsequent plant emergence.

Eradicane granules in no-till corn, Minot 1994. W. H. Ahrens. The experiment was established October 27, 1993 on a loam soil with standing winter wheat stubble (ave. 5871 lb/A dry residue, and 89% cover by the line transect method). Tilled plots were rototilled to bury the residue. Herbicide granules were applied November 3 (10:00-11:00 am) with a Gandy airflow applicator when air temperature was 45-50 C. Herbicide incorporation was completed by 2:30 pm as follows: Haybuster undercutter (11-ft wide) was operated 1.5-3 inches deep at 2 mph; rotary hoe was operated 6-7 mph; John Deere Mulch Master (12-ft wide) tilled 2-4 inches deep and was operated 6-7 mph; Phoenix harrow was operated at a 45 degree angle, one pass per plot; field cultivator (13-ft wide) tilled 3 inches deep. The entire experiment was treated May 13, 1994 with glyphosate at 0.375 lb ae/A to control existing vegetation. Estimates of volunteer winter wheat control were taken May 16 followed by tillage (one-pass) in the tilled plots using a field cultivator/harrow. Corn was seeded May 17 at 18,600 seeds/A and 2 inches deep using a Buffalo Till no-till planter set on 30-inch rows. Soil was somewhat dry at planting. Volunteer wheat control was taken June 21. No other weeds were present in densities sufficient for evaluation so the experiment was subsequently abandoned. Plot size was 15 by 35 ft and the experiment was a randomized complete block design with four replications.

Herbicide[a]	Rate	Tillage system	Herbicide incorporation method	Volunteer winter wheat control	
				May 16	June 21
	(lb/A)			(%)	
Eradicane-10G	4	tilled	field cultivator	92	63
Eradicane-10G	6	tilled	field cultivator	95	89
Eradicane-10G	4	stubble	none	74	76
Eradicane-10G	6	stubble	none	89	82
Eradicane-10G	4	stubble	Haybuster undercutter	99	83
Eradicane-10G	6	stubble	Haybuster undercutter	99	86
Eradicane-10G	4	stubble	rotary hoe	85	58
Eradicane-10G	6	stubble	rotary hoe	97	79
Eradicane-10G	4	stubble	John Deere Mulch Master	99	87
Eradicane-10G	6	stubble	John Deere Mulch Master	100	91
Eradicane-10G	4	stubble	Phoenix harrow	91	86
Eradicane-10G	6	stubble	Phoenix harrow	98	79
Untreated	0	tilled	field cultivator	18	0
Untreated	0	stubble	Haybuster undercutter	34	0
C.V. %				12	22
LSD 5%				15	22

[a]Eradicane-10G = granules (10% ai EPTC) containing EPTC + dichlormid safener.

Summary. The fall of 1993 was quite dry and no volunteer winter wheat was observed at the time of fall fieldwork in early November; thus the volunteer wheat present in 1994 likely germinated in the spring, well after fall application of Eradicane granules. At planting time, best control from Eradicane appeared to occur when granules were incorporated by methods yielding significant soil disturbance (i.e. undercutter, Mulch Master, and field cultivator).

Imazethapyr-based sequential treatments with IT corn, Fargo 1994. W. H. Ahrens and M. G. Ciernia. This experiment was conducted on a conventionally tilled silty clay with pH 7.8 and 4.5% organic matter. Cenex 322PT (imidazolinone tolerant) corn was planted June 7 using a 4-row Hiniker no-till planter set on 30-inch rows. Preemergence (PRE) treatments were applied June 10 with a 4-nozzle bicycle wheel sprayer with 8002 tips, 40 psi, and 17 gal/A, while environmental conditions were as follows: wind 15-20 mph (shield used), 67 F air temperature, 65% relative humidity, a cloudy sky, and dry soil surface. Postemergence (PO) treatments were applied June 24 with 8001 tips, 40 psi, and 8.5 gal/A. Air temperature was 80 F, wind was 4-5 mph, relative humidity was 51%, the sky was mostly sunny, the soil surface was dry, corn was 4.5-leaf and 5 inches tall, redroot pigweed was 4- to 5-leaf and 2 inches tall, kochia was 1 to 3 inches tall, and foxtail was 5-leaf and 2 to 4 inches tall. Visual estimates of weed control were taken July 15 and August 15. Plot size was 10 by 30 ft and the experiment was a randomized complete block with three replications.

		Weed control					
		Eval. July 15			Eval. Aug. 15		
Treatment[a]	Rate	Fxtl	Rrpw	Vowh	Fxtl	Rrpw	Vowh
	(lb/A)	(%)					
SAN582(PRE)	0.75	30	41	0	0	17	9
Metolachlor(PRE)	1.5	45	30	17	18	0	0
SAN582(PRE)/Imazethapyr(PO)	0.75/0.063	99	99	92	99	100	75
SAN582(PRE)/Imazethapyr(PO)	0.75/0.047	70	100	88	87	100	32
SAN582(PRE)/Imep+Dica-SGF(PO)	0.75/0.063+0.19	99	100	40	99	100	60
SAN582(PRE)/Imep+Dica-SGF(PO)	0.75/0.047+0.19	96	100	48	100	100	42
SAN582(PRE)/Imep+Bromoxynil(PO)	0.75/0.063+0.19	99	100	65	100	100	47
SAN582(PRE)/Imep+Bromoxynil(PO)	0.75/0.047+0.19	95	100	57	99	100	15
SAN582(PRE)/Imep+Atrazine(PO)	0.75/0.063+0.5	92	100	88	99	100	94
Pend(PRE)/Imep+Dica-SGF(PO)	1/0.063+0.19	98	100	57	99	100	25
Cyanazine(PRE)/Imazethapyr(PO)	0.9/0.063	99	100	91	100	100	85
Cyanazine(PRE)/Imep+Dica-SGF(PO)	0.9/0.063+0.19	99	100	83	99	100	94
Meto&Atra(PRE)/Imazethapyr(PO)	1.04&0.84/0.063	75	100	96	100	99	94
Meto&Atra(PRE)/Imep+Dica-SGF(PO)	1.04&0.84/0.063+0.19	99	100	69	99	100	91
Cyan&Atra(PRE)/Imazethapyr(PO)	1&0.35/0.063	97	100	74	100	100	98
Cyan&Atra(PRE)/Imep+Dica-SGF(PO)	1&0.35/0.063+0.19	99	100	27	100	100	73
Metolachlor+Dicamba&Atrazine(PRE)	2+0.48&0.92	75	100	45	69	99	50
C.V. %		24	17	43	12	8	43
LSD 5%		35	26	43	17	12	42

[a]All POST treatments included 0.25% by vol Activator 90 surfactant and 1 qt/A 28% urea ammonium nitrate; SAN582 = Frontier 7.5E; Imep = Imazethapyr; Dica-SGF = the sodium salt formulation of dicamba; Meto&Atra = metolachlor and atrazine packaged as Bicep 6L; Cyan&Atra = cyanazine and atrazine packaged as Extrazine II DF; Dicamba&Atrazine = Marksman herbicide.

Comments. No crop injury from imazethapyr was observed. Mixing dicamba-SGF with imazethapyr appeared to enhance foxtail control compared to imazethapyr alone.

EPP and PRE treatments in no-till corn, Fargo 1994. W. H. Ahrens and M. G. Ciernia. The experiment was established in standing wheat stubble (2600 lb/A measured on May 18) on a silty clay with 4.5% organic matter and pH 7.8. Granular herbicides were applied April 20 with a Gandy air-flow applicator when air temperature was 45 F. Other early preplant (EPP) treatments were applied April 22 with a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi, and with 48 F air temperature, 42% RH, sunny skies, and a dry soil surface. At-planting estimates of percentage weed control were taken May 17. Interstate 353 corn was seeded May 18 in 30-inch rows at 22,000 seeds/A and 2 inches deep with a Hiniker no-till planter. The entire experimental area was treated May 20 with glyphosate at 1.125 lb ae/A to control emerged weeds. The site was fertilized May 20 with ammonium nitrate at 87 lb N/A to supplement the 33 lb N/A available according to soil test. PRE treatments were applied May 23 using the sprayer described above and with 77 F, 47% RH, dry soil surface, sunny skies, and 5-10 mph wind. Visual estimates of percentage weed control were taken June 29. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with four replications.

Treatment	Rate	May 17			June 29			
		Dand	Vowh	KOCZ	Fxtl	KOCZ	Colq	Rrpw
	(lb/A)	(%)						
ICIA5676(EPP)	1.6	33	88	1	0	4	25	41
ICIA5676(EPP)	2.25	35	96	-	16	4	23	23
ICIA5676+Cyan-DF(EPP)	1.6+1.5	97	97	100	1	94	0	35
ICIA5676+Cyan-DF(EPP)	2.25+1.5	98	97	100	5	57	3	35
ICIA5676(PRE)	1.6	-	-	-	43	4	45	55
ICIA5676(PRE)	2.25	-	-	-	82	31	77	100
ICIA5676+Cyan-DF(PRE)	1.6+1.5	-	-	-	83	80	58	100
ICIA5676+Cyan-DF(PRE)	2.25+1.5	-	-	-	97	96	82	100
SAN582(EPP)	1.5	5	63	1	3	10	3	2
SAN582+Cyan-DF(EPP)	1.25+1.5	98	97	99	0	23	3	8
SAN582+Cyan-DF(EPP)	1.5+1.5	99	99	100	0	31	22	23
SAN582+Cyan-DF(PRE)	1.25+1.5	-	-	-	44	79	72	85
SAN582+Cyan-DF(PRE)	1.5+1.5	-	-	-	57	68	44	84
MetolachlorII+Cyan-DF(EPP)	2.5+1.5	98	100	97	11	50	3	0
MetolachlorII+Cyan-DF(EPP)	3+1.5	99	97	100	29	36	7	28
MetolachlorII+Cyan-DF(PRE)	2.5+1.5	-	-	-	51	91	17	64
MetolachlorII+Cyan-DF(PRE)	3+1.5	-	-	-	51	57	3	60
Alachlor-MT+Cyan-DF(EPP)	2.5+1.5	94	97	98	0	91	6	89
Alachlor-MT+Cyan-DF(EPP)	3+1.5	97	93	100	8	56	0	0
Alachlor-MT+Cyan-DF(PRE)	2.5+1.5	-	-	-	43	66	52	100
Alachlor-MT+Cyan-DF(PRE)	3+1.5	-	-	-	71	84	22	100
ICIA5676+Cyan-DF(EPP)/ ICIA5676+Cyan-DF(PRE)	1.07+1/ 0.53+0.5	99	100	100	3	86	30	69
SAN582+Cyan-DF(EPP)/ SAN582+Cyan-DF(PRE)	0.83+1/ 0.42+0.5	98	73	100	0	63	0	73
MetolachlorII+Cyan-DF(EPP)/ MetolachlorII+Cyan-DF(PRE)	1.67+1/ 0.83+0.5	85	72	100	26	48	5	27
Alachlor-MT+Cyan-DF(EPP)/ Alachlor-MT+Cyan-DF(PRE)	1.67+1/ 0.83+0.5	84	25	100	8	57	0	43
Flumetsulam&Meto(EPP)	2.64	49	35	98	49	97	97	100
Flumetsulam&Meto(PRE)	2.4	-	-	-	98	100	100	100
MetolachlorII-G+Cyan-DF(EPP)	2.5+1.5	91	100	100	70	67	43	25
Alachlor-G+Cyan-DF(EPP)	2.5+1.5	98	87	66	15	60	2	25
C.V.%		22	29	13	57	52	95	56
LSD 5%		25	34	16	26	43	39	43

Weed control in corn from PPI herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides in development for use in corn. 'Interstate 353A' corn was seeded May 18. Treatments were applied on May 17 with 68 F, 20% RH, 20% cloudy sky and 20 to 30 mph wind with gusts up to 40 mph. 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 1.5 to 2 inches. The experiment was a randomized complete block design with four replicates/treatment.

Treatment[a]	Rate	June 21 Fxtl	Wimu	Rrpw	Colq	KOCZ	Cocb	Wibw	Cath
	lb/A	% control							
EPTC & Diclormid	4	94	35	99	77	65	18	10	0
EPTC & Diclormid	3.35	71	35	99	61	87	8	13	15
EPTC & Diclormid	4.2	78	53	99	68	47	20	14	15
EPTC & Dclr + Acetochlor & Dclr	4	95	70	99	99	89	24	28	19
EPTC & Dclr + Acetochlor & Dclr	3.35 + 0.6	94	63	77	71	77	25	24	18
Acetochlor & Dclr	1.8	85	61	89	60	90	20	29	0
Acetochlor & Dclr + Cyanazine	1.8 + 1.5	88	74	99	92	91	37	51	26
Acetochlor & MON 4660	1.8	88	74	99	77	99	23	58	0
Acetochlor & MON 4660 + Cyanazine	1.8 + 1.5	92	92	99	93	99	38	51	33
Metochlor & Benoxacor (Safener)	2.5	75	33	99	46	35	10	0	0
Metolachlor & Benoxacor + Cyanazine	2.5 + 1.5	77	88	99	79	82	30	18	18
Alachlor	3	79	65	99	61	92	8	0	0
Alachlor + Cyanazine	3 + 1.5	84	91	99	91	99	28	16	16
Dimethenamid	1.5	94	64	99	87	67	20	35	0
Dimethenamid + Cyanazine	1.5 + 1.5	94	90	99	89	99	30	25	30
Dimethenamid + Flumetsulam&Clopyralid	1 + 0.17	74	89	99	73	99	64	71	80
Dimethenamid + Flumetsulam&Clopyralid	1 + 0.21	86	97	99	85	99	64	75	88
Untreated		0	0	0	0	0	0	0	0
LSD 5%		19	24	16	23	33	26	16	5
C.V. %		16	25	12	22	29	70	38	18

[a]Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

Conditions existed for total herbicide failure. Treatments were applied during wind velocity of 20 to 30 mph with gusts up to 40 mph. Little rainfall occurred until 6 to 8 weeks after application. The label rate of acetochlor based on soil type and organic matter is 2 to 3 lb/A rather than 1.8 lb/A. These conditions provided an 'acid test' and the high level of weed control with some herbicides is a true credit to the herbicide in these adverse conditions. Cyanazine was required with chloro-acetamide herbicides for adequate broadleaf weed control. Foxtail control greater than 90% was observed from herbicides applied at the highest rate or applied in combination with another herbicide provided greater than 90% foxtail control. Treatments containing cyanazine or flumetsulam provided greater than 90% wild mustard control. Metolachlor generally gave less weed control and acetachlor gave the greatest weed control compared to the other chloro-acetamide herbicides. Common cocklebur, wild buckwheat and Canada thistle were not controlled. However, flumetsulam and clopyralid provided the greatest control.

Weed control in corn from PRE and POST applied herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides under development for use in corn. 'Interstate 353A' corn was seeded May 17. Preemergence treatments were applied on May 20 with 72 F, 55% RH, 100% cloudy sky and 3 to 5 mph wind. Postemergence treatments were applied to V3 corn, 1-4 inch foxtail, 2-12 inch rosette wild mustard, 0.5-4 inch common lambsquarters, 2-6 inch common cocklebur, and 1-3 inch redrot pigweed on June 13 with 73 F, 70% RH, 50% cloudy sky and 10 to 15 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 12					
		Corn	Fxtl	Wimu	Colq	Cocb	Rrpw
	lb/A	% control					
PRE							
Metolachlor&Benoxacor	2.5	0	23	5	5	5	99
Metolachlor&Benoxacor + Cyanazine	2.5 + 1.5	0	35	48	18	3	99
Alachlor	3	0	18	0	0	0	99
Alachlor + Cyanazine	3 + 1.5	0	58	38	23	5	99
Acetochlor&MON 4660	1.8	0	60	10	18	3	99
Acetochlor&MON 4660 + Cyanazine	1.8 + 1.5	0	70	54	21	5	99
Acetochlor&Diclormid	1.2	0	50	13	5	0	99
Acetochlor&Diclormid + Cyanazine	1.2 + 1.5	0	48	69	10	5	99
Acetochlor&Safener	1.8	0	61	5	0	0	99
Acetochlor&Safener + Cyanazine	1.8 + 1.5	0	45	48	10	3	99
Dimethenamid	1.5	0	40	0	0	0	99
Dimethenamid + Cyanazine	1.5 + 1.5	0	54	55	21	5	99
PRE/POST							
Dime/Flumetsulam&Clopyralid	1/0.17	0	36	90	59	71	99
Dime/Flumetsulam&Clopyralid	1/0.21	0	38	95	68	84	99
Dime/Metribuzin + Savage	1/1.5oz + 5.33oz	0	63	99	99	99	99
Dime/Metribuzin + Salvo	1/1.5oz + 3oz	0	58	99	99	99	99
Dime/Metribuzin + Dicamba	1/1.5oz + 4oz	0	64	99	99	99	99
Dime/Metribuzin + Bromoxynil	1/ + 1.125oz + 4oz	10	69	99	99	99	99
Dime/Metribuzin + Bromoxynil	1/1.5oz + 4oz	23	69	99	99	99	99
Untreated		0	0	0	0	0	0
LSD 5%		2	26	30	17	9	0
C.V.%		10	37	41	32	18	0

[a]Savage is a dry amine formulation of 2,4-D, Salvo is a ester formulation of 2,4-D. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations used and trade names or premix names that corresponds to common names used.

Poor weed control is attributed to little precipitation for 6 to 8 weeks after application. This demonstrates the need to incorporation soil applied herbicides for adaquate weed control (compare weed control evaluations with the previous experiment with PPI applied herbicides). Treatments containing flumetsulam & clopyralid provided the greatest broadleaf weed control of all soil applied treatments. POST applied treatments containing metribuzin, Savage, Salvo, or bromoxynil gave complete broadleaf weed control. Cost for metribuzin + Savage = $4.25, metribuzin + Salvo = $6.25, metribuzin + dicamba = $7.70, metribuzin + bromoxynil = $9 to $10.

Weed control in corn from POST herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from nicosulfuron with adjuvants and with various rates of Scoil with 28%UAN to determine if the rate of Scoil can be reduced and still achieve nicosulfuron enhancement and adaquate weed control with the addition of fertilizer. Testing was also performed with nicosulfuron and various tankmix combinations of broadleaf herbicides that are labeled or are in development for use in corn. 'Interstate 353A' corn was seeded May 17. Treatments were applied on June 13 to V3 corn, 1-4 inch foxtail, rosette 2-12 inch wild mustard, 1-3 inch redroot pigweed, 0.5 to 4 inch common lambsquarters, 2-6 inch common cocklebur, rosette 4-10 inch Canada thistle, and 1-3 inch Venice mallow with 73 F, 70% RH, 50% cloudy sky and 10 to 15 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 12						
		Fxtl	Wimu	Rrpw	Colq	Cocb	Cath	Vema
	oz/A	% control						
Nicosulfuron + X-77	0.25	40	99	81	31	13	0	0
Nicosulfuron + CL172A	0.25	40	99	75	28	14	0	0
Nicosulfuron + PO	0.25	70	99	87	38	15	0	0
Nicosulfuron + CL7769	0.25	66	99	87	50	14	0	0
Nicosulfuron + Scoil	0.25	86	99	99	53	39	20	0
Nico + Scoil + UAN	0.25+1.5pt	75	99	99	40	54	30	36
Nico + Scoil + UAN	0.25+1pt	79	99	99	35	53	21	14
Nico + Scoil + UAN	0.25+0.5pt	73	99	87	25	45	10	6
Nico + Atrazine + Scoil	0.25+6	89	99	99	86	48	23	83
Nico + Bromoxynil (Gel) + Scoil	0.25+4	83	99	97	93	94	6	99
Nico + Bromox(Gel) + Atra + Scoil	0.19+2+4	87	99	97	93	93	25	99
Nico + Dicamba + Scoil	0.25+4	88	99	99	99	99	59	99
Nicos + CGA 248757 + PO	0.19+0.07	76	99	99	70	64	6	84
Nico+CGA248757+Dicamba+PO	0.19+0.06+4	45	99	99	99	99	55	99
Nicosulfuron+Flumiclorac+PO	0.19+0.42	41	99	99	56	75	0	86
Nico+Flumiclorac+Atra+PO	0.19+0.42+6	68	99	99	99	89	16	99
Nico+Flumiclorac+Dicamba+PO	0.19+0.42+4	65	99	99	53	5	68	99
Nico+Flumetsulam&Clpy+X-77	0.19+3.35	33	99	99	94	99	80	99
Nico+Flms&Clpy+X-77+UAN	0.19+3.35	58	99	99	99	99	84	99
Nico+ NAF-73 + Scoil	0.19+3.35	75	99	97	97	99	95	99
Untreated		0	0	0	0	0	0	0
LSD 5%		20	0	16	24	21	10	5
C.V. %		22	0	12	26	26	23	6

[a]X-77, CL172A, was applied at 0.25% v/v, petroleum oil (PO), CL7769, Scoil, was applied at 1.5 pt/A, and 28% UAN was applied at 4% v/v. Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that corresponds to common names used.

No crop injury was observed with any treatment. Nicosulfuron at 0.25 oz/A is half the labeled rate and at 0.19 oz/A is 38% of the labeled rate. Nicosulfuron with methylated seed oil additives generally provided greater weed control than with surfactants. Decreasing amount of MSO type adjuvant with nicosulfuron tended to lower foxtail control regardless of UAN added. Reducing the MSO rate and adding fertilizer also resulted in lower common lambsquarters control but common cocklebur and Venice mallow control was greater. Nicosulfuron + atrazine continued to provide the most economical annual weed control except for common cocklebur. This result is consistent with testing in previous years. Some treatments of nicosulfuron with flumiclorac or CGA 248757 resulted in lower foxtail control than nicosulfuron with adjuvant. CGA 248757 in combination with nicosulfuron and dicamba resulted in lower broadleaf weed control than nicosulfuron + dicamba alone. All treatments containing clopyralid gave greater than 80% Canada thistle control.

Weed control in corn, Carrington. (Zollinger) An experiment was conducted to evaluate weed control from established, recently registered, and herbicides in development for use in corn. Nicosulfuron was tested to determine enhancement of weed control from tankmix application with soil active herbicides, enhancement from adjuvant types, is Scoil rate can be reduced if UAN is added for reduced cost of treatment, and to determine weed control from nicosulfuron in tankmix combination with several broadleaf herbicides. 'AgriPro 082' corn was seeded and Eradicane was applied on May 12. PRE treatments were applied on May 13 with 63 F. POST treatments were applied to V2-V3 corn, 1-4" foxtail, rosette 6-12 inch wild mustard, 0.5-4 inch redroot pigweed, 0.5-3 inch prostrate pigweed, 1-4 inch common lambsquarters, 1-3 inch Russian thistle, 1-5 inch kochia, 1-6 inch wild buckwheat, 5-6-leaf wheat, 1-2 inch Venice mallow, 2-6 inch cutleaf nightshade, rosette 6-10 inch perennial sowthistle, rosette 4-10 inch dandelion, and prebud 4-16 inch Canada thistle on June 15 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.

Treatment[a]	Rate	July 28										
		Crop Inj	Fxtl	Wht	Colq	Wimu	Wibw	Prpw	KOCZ	Rrpw	Ruth	Cath
	oz/A	%control										
EPTC & Diclormid	4lb		0	98	92	87	81	53	77	25	99	50
EPTC&Dcmd + Acet&Dcmd	3.35lb + 0.6lb	0	95	94	94	75	58	77	28	99	10	0
Alachlor + Cyanazine	3lb + 1.5lb	0	70	18	61	94	41	51	79	77	43	13
Dimethenamid + Cyanazine	1.38lb + 1.5lb	0	85	26	33	80	18	25	63	57	15	0
Dime + Flumetsulam&Clopyralid	1lb + 0.17	0	76	11	84	99	92	95	75	94	87	78
Dime + Flumetsulam&Clopyralid	1lb + 0.21	0	83	13	91	96	96	92	96	99	97	81
Acetochlor + Cyanazine	1.6lb + 1.5lb	0	88	13	78	98	25	53	82	79	23	0
Acet&MON4660 + Cyanazine	1.6lb + 1.5lb	0	81	16	61	93	47	55	84	74	33	0
Nicosulfuron + Dime + X-77	0.25 + 0.72lb	3	92	91	39	99	43	99	60	99	45	31
Nico + Acet&Dcmd + X-77	0.25 + 0.8lb	9	89	94	36	99	35	99	67	99	53	45
Nico + Acet&MON4660 + X-77	0.25 + 0.8lb	5	82	86	29	99	38	98	77	99	69	55
Nico + Pendimethalin + X-77	0.25 + 1lb	6	85	90	53	99	43	99	77	99	83	56
Nicosulfuron + X-77	0.25	1	68	69	19	99	23	99	53	99	43	15
Nicosulfuron + CL172A	0.25	4	79	91	29	99	44	99	40	99	33	10
Nico + CL7769	0.25	1	83	87	45	99	55	95	53	99	58	33
Nicosulfuron + Scoil	0.25	0	89	95	48	97	55	99	84	99	55	39
Nicosulfuron + Scoil + UAN	0.25	0	89	89	79	99	51	97	96	99	76	54
Nico + Atrazine + Scoil	0.25 + 6	0	93	93	92	99	75	99	90	96	88	23
Nico + CGA 248757 + PO	0.25 + 0.07	0	73	94	73	99	69	96	60	99	53	0
Nico + Flumiclorac + PO	0.25 + 0.42	0	71	95	55	99	83	99	48	99	59	36
Nico + NAF-73 + X-77	0.25 + 3.35	0	88	88	97	99	91	98	94	99	91	84
Nico + NAF-73 + X-77 + UAN	0.25 + 3.35	0	89	91	97	99	97	99	99	99	99	89
Nico + NAF-73 + Scoil	0.25 + 3.35	3	97	90	98	99	97	99	99	99	98	95
Untreated		0	0	0	0	0	0	0	0	0	0	0
LSD 5%		6	12	12	21	10	28	18	21	24	20	16
C.V. %		31	10	12	24	7	35	15	21	19	25	32

[a]X-77, CL172A was applied at 0.25% v/v, CL7769, Scoil and petroleum oil (PO) was applied at 1.5 pt/A, 28% UAN was applied at 4% v/v. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade or premix names that corresponds to common names used.

Precipitation occured after soil applied treatments which resulted in greater than 70% foxtail control. Cyanazine with chloro-acetamide herbicides provided control of wild mustard only. Soil applied treatments containing flumetsulam & clopyralid provided excellent broadleaf weed control. Nicosulfuron with soil active herbicides gave greater control than nicosulfuron with surfactant. Nicosulfuron + Atrazine + Scoil gave the most economical weed control. All treatments containing clopyralid gave G to E Canada thistle control.

Weed control from nicosulfuron with soil active herbicides, Casselton. (Zollinger) An experiment was conducted to evaluate weed control from nicosulfuron applied with several chloro-acetamide herbicides to provide existing weed burn down and residual control from the soil active herbicide. 'Interstate 353A' corn was seeded May 17. Treatments were applied on June 13 to V3 corn, 1-4 inch foxtail, rosette 2-12 inch wild mustard, 1-3 inch redroot pigweed, 0.5 to 4 inch common lambsquarters, and 2-6 inch common cocklebur with 73 F, 70% RH, 50% cloudy sky and 10 to 15 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with four replicates/treatment.

		July 12				
Treatment[a]	Rate	Fxtl	Wimu	Rrpw	Colq	Cocb
	oz/A	% control				
Nicosulfuron + X-77	0.19	50	99	99	24	0
Nico + Dimethenamid + X-77	0.19 + 0.47lb	38	99	99	10	5
Nico + Dimethenamid + X-77	0.19 + 0.7lb	60	99	99	25	8
Nico + Acetochlor&Dclr + X-77	0.19 + 0.8lb	33	99	99	8	0
Nico + Acetochlor&Dclr + X-77	0.19 + 1.2lb	49	99	99	23	5
Nico + Acet&MON4660 + X-77	0.19 + 0.8lb	40	99	99	33	0
Nico + Acet&MON4660 + X-77	0.19 + 1.2lb	68	99	99	18	0
Nico + Pendimethalin + X-77	0.19 + 0.75lb	55	99	99	43	0
Nico + Pendimethalin + X-77	0.19 + 1lb	61	99	99	43	0
Nicosulfuron + Scoil	0.19	78	99	99	48	0
Nicosulfuron + X-77	0.25	78	99	99	23	5
Nico + Dimethenamid + X-77	0.25 + 0.47lb	55	99	99	25	5
Nico + Dimethenamid + X-77	0.25 + 0.7lb	68	99	99	33	10
Nico + Acetochlor&Dclr + X-77	0.25 + 0.8lb	33	99	99	8	0
Nico + Acetochlor&Dclr + X-77	0.25 + 1.2lb	55	99	99	30	0
Nico + Acet&MON4660 + X-77	0.25 + 0.8lb	44	99	99	20	5
Nico + Acet&MON4660 + X-77	0.25 + 1.2lb	43	99	99	23	3
Nico + Pendimethalin + X-77	0.25 + 0.75lb	58	99	99	38	0
Nico + Pendimethalin + X-77	0.25 + 1lb	63	99	99	40	0
Nicosulfuron + Scoil	0.25	93	99	99	53	0
Untreated		0	0	0	0	0
LSD 5%		18	0	0	20	9
C.V. %		23	0	0	51	28

[a]X-77 was applied at 0.25% v/v, Scoil was applied at 1.5 pt/A. Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that corresponds to common names used.

From initial data in 1993, it was thought that emulsifiers and formulants in Frontier may aid in nicosulfuron enhancement similar to MSO adjuvants. Recent labeling allows nicosulfuron to be applied with soil active herbicides for existing weed burn down and residual control. Results from this study demonstrate erratic foxtail and common lambsquarters control. Little precipitation occurred in the critical period of herbicide activation after application which may have caused the inconsistent weed control. Foxtail control was lower, the same, or greater with the addition of soil active herbicides with nicosulfuron and surfactant. Complete wild mustard and redroot pigweed control occurred with all treatments. One conclusion is obvious - nicosulfuron + Scoil provided greater foxtail and the same or greater common lambsquarters control than nicosulfuron with chloro-acetamide herbicides plus surfactant. This is particularly important when considering economics. Cost for herbicides at rates used in this study is: X-77 = $0.43/A, Frontier = $6.50 to $10/A, Surpass = $7.50 to $11.25/A, Harness = $8 to $12/A, Prowl = $6 to $8/A, and **Scoil is $2.80/A.** This study indicates there is more weed control for the money in Scoil than adding a soil active herbicide. No soil residual from Accent was not considered in the conclusion.

Wild oat control from nicosulfuron with soil active herbicides, NW-22. (Zollinger) An experiment was conducted to evaluate wild oat control from nicosulfuron applied with several soil active herbicides to provide existing weed burn down and residual control. 'Interstate 353A' corn was seeded May 17. Preemergence treatment (Acetochlor&Diclormid + Cyanazine) was applied to 1-leaf wild oat (30-50 plants per sq. ft.), cotyledon wild mustard (1-3 plants/sq. ft.), cotyledon wild buckwheat (1 plant/sq. ft.) on May 12 with 73 F, 55% H, 0% clouds, and no wind. Postemergence treatments were applied on May 20 to 1-4-leaf wild oat, (20-40 plants/sq. ft.), cotyledon-4 leaf wild mustard (3-6 plants sq. ft.), 0.5-1 inch kochia (1 plant/sq. yard), 0.5-1 inch common lambsquarters (1 plant/sq. yard), 1-1.5 inch and 3 leaf wild buckwheat (3 plants/sq. yard) with 70 F, 35% RH, 80% cloudy sky and 15 to 25 mph wind with gusts up to 30 mph and 30% previous crop residue. All 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 12	
		Wioa	Wioa
	oz/A	% control	Plants/sq. ft.
PRE			
Acetochlor&Diclormid + Cyanazine	1.2lb + 1.5lb	5	18
POST			
Nicosulfuron + Dimethenamid + X-77	0.25 + 0.47lb	44	10
Nicosulfuron + Dimethenamid + X-77	0.25 + 0.7lb	43	12
Nico + Acetochlor&Dcmd + X-77	0.25 + 0.8lb	45	14
Nico + Acetochlor&Dcmd + X-77	0.25 + 1.2lb	44	9
Nico + Acetochlor&MON4660 + X-77	0.19 + 1.2lb	51	13
Nico + Acetochlor&MON4660 + X-77	0.25 + 0.8lb	48	13
Nico + Acetochlor&MON4660 + X-77	0.25 + 1.2lb	50	13
Nico + Pendimethalin + X-77	0.25 + 1lb	33	14
Nicosulfuron + Scoil	0.25	93	0.25
Untreated		0	0
LSD 5%		22	5
C.V. %		41	28

[a]X-77 was applied at 0.25% v/v. Refer to 'Table of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade and premix names that corresponds to common names used.

This experiment was established to determine if nicosulfuron applied with soil active herbicides could provide existing wild oat burn down and residual control. The utility of these treatments could be used as an alternative to an Eradicane + Surpass treatment if less soil tillage is desired. The PRE treatment was applied later than desired. The POST treatments were applied later than would normally be applied. Little precipitation occurred after both applications which may have resulted in poor weed control. Wild oat in the untreated plots were headed out at time of evaluation. Wild oat plants in the treated were plots ranged from full tillered to jointing stage. Nicosulfuron + Scoil provided the greatest weed control and no other flushes occurred probably due to limited rainfall.

Imazethapyr on sweet clover, Fargo. (Zollinger and Meyer) An experiment was conducted to evaluate effect of imazethapyr on sweet clover. Sweet clover was seeded in the spring of 1994. Early POST treatments were applied to 1 to 2 trifolioliate sweet clover on June 23 with 65 F, 50% RH, 30% cloudy sky and 5-10 mph wind. POST treatments were applied to 5 to 6 trifolioliate sweet clover 6 to 7 inches tall on July 14 with 68 F, 80% RH, 100% cloudy sky, and 5 to 10 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 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	June 8 Swcl Inj	June 29 Swcl Inj
	oz/A	% control	
EPOST			
Imazethapyr + X-77	0.75	10	0
Imazethapyr + PO	0.75	18	0
Imazethapyr + Sun-It II	0.75	15	0
Imazethapyr + Sun-It II	0.5	9	0
POST			
Imazethapyr + X-77	0.75	16	45
Imazethapyr + PO	0.75	15	49
Imazethapyr + Sun-It II	0.75	19	45
Imazethapyr + Sun-It II	0.5	16	45
Untreated		0	0
LSD 5%		7	5
C.V. %		24	16

[a]X-77 was applied at 0.25% v/v, petroleum oil (PO) and Scoil was applied at 1.5 pt/A. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

Several weeds were present at time of application but complete control was observed at time of evaluation. Injury rating on June 8 was only reduction in height. Greater injury occurred when application was delayed until June 14. Some initial stunting occured from the early postemergence application but soon recovered.

Grass weed control in potato, Grand Forks. (Zollinger) An experiment was conducted at the Potato Research Farm to evaluate grass weed control and crop safety in potaot from labeled and potentially labeled herbicides. Herbicides were applied to 2 to 6 inch potato, full tillered volunteer wheat, 2-5 inch foxtail, and 4 to 12 inch wild oat on June 23 with 75 F, 55% RH, 30% cloudy sky and 3-5 mph wind. Treatments were applied to an 5 ft wide area the length of 7.5 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment was a randomized complete block design with three replicates/treatment.

		July 26			
Treatment[a]	Rate	Potato Inj	Fxtl	Wioa	Vowh
	lb/A	% control			
Clethodim + PO	0.094	0	83	70	63
Clethodim + PO	0.125	0	95	93	85
Sethoxydim + DASH	0.188	0	94	85	40
Untreated		0	0	0	0
LSD 5%		0	6	8	5
C.V. %		0	14	22	11

[a]Petroleum oil (PO) and Dash was applied at 1% v/v. Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

No visible potato injury occurred from any herbicide treatment. However, no attempt was made to control Colorado Potato Beetle which caused significant defoliation and injury to potato. All treatments gave complete foxtail and wild oat control. However, other flushes of these two grasses emerged due to the cool, wet weather conditions. Evaluation listed consider infestation of emerged grass flushes.

Canada thistle control in potato, Grand Forks. (Zollinger) An experiment was conducted at the Potato Research Farm to evaluate Canada thistle control and potato safety from labeled and potentially registered herbicides. Potato were seeded in the spring of 1994. Herbicides were applied to 2 to 6 inch potato, rosette 3 to 6 inch diameter to 3 to 30 inch bolted Canada thistle on June 23 with 75 F, 55% RH, 30% cloudy sky and 3-5 mph wind. Sequential treatments were applied to 8 to 15 inch potato and rosette 3 to 6 inch diameter to 3 to 30 inch bolted Canada thistle on July 5 with 78 F, 80% RH, 100% cloudy sky, and 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 equipped 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.

		July 26	
Treatment[a]	Rate	Potato Inj	Cath
	oz/A	% control	
POST			
Rimsulfuron + X-77 + UAN	0.18+0.25%+2%	0	
Rimsulfuron + ND-94-3	0.18+1%	0	
Rimsulfuron + Scoil	0.18+0.18G	0	
Bentazon + PO	160+0.25G	0	
Bentazon + ND-941a	16+1%	0	
Bentazon + Scoil	16+0.18G	0	
POST/POST			
Bentazon + PO/Bentazon + PO	16+0.25G/16+0.25G	0	
Rimsulfuron + Scoil/Bentazon + Scoil	0.12+0.18G/0.12+0.18G	0	
Untreated		0	
LSD 5%		0	
C.V. %		0	

[a]Refer to 'List of Herbicides Tested' in the white section of this book for an explanation of abbreviations and trade names or premix names that corresponds to common names used.

No visible potato injury occurred from any herbicide treatment.

Evaluation of Canada thistle control was not possible because plots were tilled by mistake.

Glyphosate with commercial adjuvants, Fargo 1994. 'Valley' oats, 'McCall' soybeans, and 'Siberian' foxtail millet were seeded May 20. Treatments were applied to 6- to 7-leaf oats, 1- to 3 trifoliolate soybeans, and 4- to 7-leaf foxtail millet on June 21 with 85 F, 40% RH, clear sky, and 0- to 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 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/27		
		Oat	Sobe	Fomi
	oz/A		%	
Glyphosate	1	68	34	79
Glyphosate+X-77	1+0.5%	83	36	81
Glyphosate+R-11	1+0.5%	87	33	76
Glyphosate+Preference	1+0.5%	77	36	80
Glyphosate+Li 700	1+0.5%	85	37	80
Glyphosate+Activator Plus	1+0.5%	88	42	81
Glyphosate+Spray booster S	1+0.5%	86	37	67
Glyphosate+Activator 90	1+0.5%	81	30	85
Glyphosate+Dry Surf(Act)	1+0.5%	86	36	81
Glyphosate+AMWAY 80	1+0.5%	87	36	90
Glyphosate+CZ	1+1%	93	40	72
Glyphosate+Cayuse+R-11	1+0.5%+0.5%	92	39	91
Glyphosate+Dispatch	1+2%	89	36	84
Glyphosate+Class ACT	1+2%	96	35	92
Glyphosate+Choice+Li 700	1+.75%+0.5%	94	38	85
Glyphosate+Surfate	1+1%	97	37	89
Glyphosate+Surfate	1+2%	96	35	82
Glyphosate+AD-100+Activator Plus	1+0.5%+0.5%	91	41	82
Glyphosate+AMS Plus	1+2%	92	38	84
Glyphosate+AMS+Activator plus	1+2%+0.5%	95	44	91
Glyphosate(INDICATE 5 (red/purple))	1	84	36	75
C.V. %		6	13	11
LSD 5%		7	NS	12
# OF REPS		4	4	4

Summary

Conditions at and after herbicide application were moist giving glyphosate at only 1 oz/A high phytotoxicity. Oat was most diffinitive of glyphosate phytotoxicity requiring only 7% difference for significance at the 95% probablility. All adjuvants enhanced glyphosate phytotoxicity to oats. Roundup was the formulation, but at the 1 oz/A rate provided only a small amount of surfactant. Glyphosate gave more than 80% oat control with all surfactants, except Preference. Oat control exceeded 90% with all salt adjuvants, except with Dispatch. Glyphosate with Indicate 5, a pH reducer, gave oat control of 84% which was similar with glyphosate applied with surfactants.

Glyphosate with commercial adjuvant, Carrington 1994. 'Paul' oat and 'Sunup' proso millet were seeded in adjacent strips as bioassay species on May 18. Treatments were applied to 4- to 5-leaf oat and 3- to 4-leaf proso millet on June 14 with 67 F, 91% RH, cloudy 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 28 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6/29 Oat	6/29 Prmi	7/12 Oat	7/12 Prmi
	oz/A	%			
Glyphosate	1	85	83	81	82
Glyphosate+X-77	1+0.5%	97	94	83	87
Glyphosate+R-11	1+0.5%	95	93	85	83
Glyphosate+Preference	1+0.5%	97	92	87	79
Glyphosate+Li 700	1+0.5%	97	93	83	78
Glyphosate+Activate Plus	1+0.5%	95	90	82	80
Glyphosate+Spray booster S	1+0.5%	99	97	83	74
Glyphosate+Activator 90	1+0.5%	98	97	92	86
Glyphosate+AMWAY 80	1+0.5%	94	91	83	76
Glyphosate+CZ	1+1%	97	96	82	80
Glyphosate+Cayuse+R-11	1+0.5%+0.5%	97	97	91	82
Glyphosate+Dispatch	1+2%	99	98	95	86
Glyphosate+Class ACT	1+2%	97	96	91	77
Glyphosate+Choice+Li 700	1+0.75%+0.5%	95	94	88	77
Glyphosate+Surfate	1+1%	97	93	83	76
Glyphosate+Surfate	1+2%	99	99	91	85
Glyphosate+AMS Plus	1+2%	98	96	89	82
C.V. %		4	5	8	11
LSD 5%		6	7	NS	NS
# OF REPS		4	4	4	4

Summary

Glyphosate (Roundup) was highly phytotoxic with the environmental condition for the experiment. All adjuvants tended to similarly enhance glyphosate phytotoxicity at the July 12 evaluation. Differences among adjuvants was not detectable because of the high phytotoxicity. Glyphosate at 1 oz/A would have only a small amount of surfactant from the formulation accounting for the enhancement by all adjuvants.

Economics of Detectspray in full season fallow, Fargo Airport 1994. W. H. Ahrens and M. G. Ciernia. Detectspray[1] sprayer technology consists of sensors that measure infrared light reflected from green plant canopies and, with associated circuitry and a computer microprocessor, trigger solenoid valves to turn on allowing delivery of spray to nozzles on a spray boom. Each nozzle on the boom is fitted with a sensor mounted several inches ahead and facing downward. Nozzles are turned on and off individually with solenoid valves positioned immediately above each nozzle. When sufficient infrared light is reflected from green plant leaves and is detected by a particular sensor, the information is processed (using an ambient light reading taken from a sensor facing upward) and an electric signal is sent to that solenoid valve causing it to open and spray to flow through the nozzle. The sensors respond to all green tissue, so Detectspray has application as a fallow sprayer.

Detectspray hardware was mounted on an all-terrain vehicle (ATV) with 6 nozzles spaced 20 inches apart (10 ft effective spray swath). All Detectspray treatments were applied at 10 gal spray solution per acre at 7 mph with 8003 extended range (XR) flat fan nozzles and 25 psi spray pressure. Standard broadcast treatments were applied at 5 gal/A at 7 mph with 80015 XR tips and 25 psi. Plots were arranged in a randomized complete block design with four replications.

The experiment was established on a silty clay soil with pH 6.6 and 5.4% organic matter. Soybean stubble had been chisel plowed once in the fall of 1993 and the area was worked again in early spring 1994. Plot size was 20 by 220 feet with 10-ft alleys between plots as a buffer against spray drift. Plots were treated with two adjacent 10-ft-wide passes with the ATV sprayer, either broadcast or using the "selective" mode of Detectspray.

General treatment descriptions are given in Table 1. Triasulfuron and atrazine were applied May 12 using an ATV-mounted sprayer delivering 10 gpa with 8002 tips and 28 psi at 5 mph. A few cotyledonary wild mustard were emerged at time of treatment. The postemergence herbicides to be used and the rates needed were determined by the investigator for each individual treatment at time of application. Postemergence herbicide rates, dates, and mode of application are given in the tables. All glyphosate applications included nonionic surfactant at 0.5% by vol plus ammonium sulfate at 1.5 lb/A, except that ammonium sulfate was omitted when glyphosate was mixed with 2,4-D amine at rates exceeding 1 lb ae/A. The double boom

Table 1. General description of planned treatments for full-season fallow experiment at Fargo Airport in 1994.

Treatment[a]
1. Postemergence herbicides, broadcast as needed
2. Postemergence herbicides, Detectspray as needed
3. Postemergence herbicides, broadcast once followed by Detectspray as needed
4. Postemergence herbicides, broadcast once followed by double boom as needed
5. PRE Trsu + Atra (0.0131 + 0.375 lb/A), POST herbicides broadcast as needed
6. PRE Trsu + Atra (0.0131 + 0.375 lb/A), POST herbicides Detectspray as needed

[a]Trsu = triasulfuron (Amber) by Ciba; Atra = atrazine.

[1]Detectspray is a trademark of Detectspray Limited, 215 Mann St., PO Box 84, Armidale NSW 2350, Australia.

of treatment 4 involves broadcast application of a low rate of herbicide (usually glyphosate) required to kill smaller, more abundant weeds, together with a Detectspray application of a higher rate of herbicide to kill large weeds. A commercial Detectspray operator would have both booms operating on one sprayer. Experimentally, the double boom application was simulated by two separate applications.

At the time of each Detectspray (selective mode) application, a 20- by 60-cm quadrat was used to take 100 estimates of percentage cover from each plot. These readings sampled the entire length of each 220-ft plot.

<u>Assumptions used in the economic calculations</u>

1994 herbicide prices from Ostlund Chemical in Fargo:
- Glyphosate costs $38.00/gal as Roundup RT (3 lb ae/gal)
- Dicamba costs $71.25/gal as Banvel (4 lb ae/gal)
- 2,4-D costs $11.75/gal as dimethylamine salt (3.8 lb ae/gal)
- Glyt&2,4-D costs $20.00/gal as Landmaster BW
- Glyt&Dicamba costs $23.00/gal as Fallowmaster
- Triasulfuron costs $10.50/oz product as Amber (75DF)
- Atrazine costs $2.80/lb product as atrazine (90DF)
- Nonionic surfactant costs $17.25/gal as X-77
- Ammonium sulfate costs $0.25/lb

Detectspray application done by a custom operator estimated at $3.23/A.
Includes custom broadcast price of $2.48/A (U. of Minn. costs estimates) plus $0.75/A premium for Detectspray application (figure supplied by Kelly Johnson, Saskatchewan custom applicator, adjusted for U.S.-Canada exchange rate of approximately $1.00:$0.75).

Standard broadcast application:
*1. Sprayer owned and operated by the farmer: $0.76/A (this figure used in the calculations below unless otherwise stated)
2. Sprayer owned by farmer, operated by hired labor: $1.28/A
3. Custom application: $2.48/A
(Estimates supplied by University of Minnesota)

Herbicides were applied in 3-L plastic bottles, one bottle per plot. After filling the spray boom with each treatment, a mark was placed on the bottle at inital fluid level, thus enabling a measurement of spray volume required to treat each plot. At the time of each Detectspray application, volume use was measured on four plots treated using continuous spray and the same pressure and travel speed as was used for Detectspray. These continuous-spray results were used to calculate volume reduction by Detectspray.

<u>Comments</u>. 1994 was extremely wet during June and July and this probably stimulated greater than normal amounts of weed germination and growth. The site had been in a soybean-wheat rotation for several years and had been managed for good weed control. Thus, weed densities at time of application were somewhat low.

Table 2. Herbicide and application costs during the first postemergence application at Fargo Airport in 1994. Broadcast application cost assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a] PRE	POST	Herbicide treatment applied: Herbicides	Rate (lb/A)	Date	Mode	Spray vol. red. (%)	Cost: Herbicide ($/A)	Application ($/A)	Total ($/A)
None	Brcst	Gly&24D+24D	0.28&0.5+0.13	6/15	Brcst	-	7.36	0.76	8.12
None	DS	Gly&24D+24D	0.28&0.5+0.13	6/15	DS	33.1	4.92	3.23	8.15
None	BC/DS	Gly&24D+24D	0.28&0.5+0.13	6/15	Brcst	-	7.36	0.76	8.12
None	BC/DB	Gly&24D+24D	0.28&0.5+0.13	6/15	Brcst	-	7.36	0.76	8.12
Trs+Atr	Brcst	Gly&Dic+Dic	0.28&0.13+0.12	6/22	Brcst	-	8.83	0.76	9.59
Trs+Atr	DS	Gly&Dic+Dic	0.28&0.13+0.12	6/22	DS	30.0	6.18	3.23	9.41
C.V.(%)						43.1			
LSD(0.1)						NS			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by selective mode of Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atr = atrazine; Gly&24D = Glyphosate + 2,4-D package mix sold as Landmaster BW.

Table 3. Percentage weed cover by quadrat estimates and the line transect method, and percentage quadrats with 3% or greater cover for the first postemergence application at Fargo Airport in 1994.

Herbicide treatment plan PRE	POST	Treatment appl.	Date	Estimated cover (%)	Line transect (%)	3% or more cover (%)	Weeds present (size)
None	Brcst	Brcst	6/15	-	-	-	Yeft (2-6"); Vowh (6-10"); Prsp (2-4" diam); Vosb (2-4 trifoliolate); Wibw (2-5" diam); KOCZ (to 1.5"); Cath (4-10").
None	DS	DS	6/15	10	10	68	Same as previous treatment.
None	BC/DS	Brcst	6/15	-	-	-	Same as previous treatment.
None	BC/DB	Brcst	6/15	-	-	-	Same as previous treatment.
Trsu+Atra	Brcst	Brcst	6/22	-	-	-	Yeft (2-8"); Vowh (10-18"); Prsp (6-8" diam); Vosb (4-6 trifoliolate); Wibw (6-12" diam); KOCZ (2-4"); Cath (6-16").
Trsu+Atra	DS	DS	6/22	9	7	62	Same as previous treatment.
C.V.(%)				22	140	12	
LSD(0.1)				NS	NS	NS	

[a]Brdcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC1/DS = one broadcast application followed by selective mode of Detectspray as needed; BC1/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine; Prsp = prostrate spurge; Yeft = foxtail; Vowh = volunteer wheat; Vosb = volunteer soybeans; Wibw = wild buckwheat; Cath = Canada thistle; KOCZ = kochia.

Table 4. Herbicide and application costs during the second postemergence application at Fargo Airport in 1994. Broadcast application assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a] PRE	POST	Herbicide treatment applied: Herbicides	Rate (lb/A)	Date	Mode	Spray vol. red. (%)	Cost: Herbicide ($/A)	Application ($/A)	Total ($/A)
None	Brcst	Gly&Dic+Dic	0.28&0.13+0.06	7/28	Brcst	-	7.72	0.76	8.48
None	DS	Glyt&Dica	0.32&0.14	7/28	DS	34.7	4.86	3.23	8.09
None	BC/DS	Glyt&Dica	0.32&0.14	7/28	DS	53.5	3.46	3.23	6.69
None	BC/DB	Glyphosate	0.14	7/28	Brcst	-	2.95	-	-
		Glyt&Dic+Dic	0.14&0.06+0.13	7/28	DS	50.5	2.92	3.23	9.10
Trs+Atr	Brcst	Glyphosate	0.23	8/3	Brcst	-	4.09	0.76	4.85
Trs+Atr	DS	Glyt&Dica	0.28&0.13	7/28	DS	72.2	1.84	3.23	5.07
C.V.(%)						16.1			
LSD(0.1)						7.4			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by selective mode of Detectspray as needed; BC/DS = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atra = atrazine; Glyt&Dic or Gly&Dic = Fallowmaster.

Table 5. Percentage weed cover by quadrat estimates and the line transect method, and percentage quadrats with 3% or greater cover for the second postemergence application at Fargo Airport in 1994.

Herbicide treatment plan[a] PRE	POST	Treatment applied	Date	Estimated cover (%)	Line transect (%)	3% or more cover (%)	Weeds present (size)
None	Brcst	Brcst	7/28	-	-	-	Yeft (2-10"); Wibw (8-20"); Biww (6-12"); Cath (4-20"); Vosb (6-12"); Corw (6-12"); Rrpw (8-12").
None	DS	DS	7/28	10.7	8	58	Similar to previous treatment, but with higher weed populations, larger Yeft and Wibw, and KOCZ (8-16").
None	BC/DS	DS	7/28	8.0	4	48	Same as previous treatment.
None	BC/DB	DB	7/28	-	-	-	Same as previous treatment.
Trsu+Atra	Brcst	Brcst	8/3	-	-	-	Very light weed populations; a few Yeft (6-12"), Wibw (8-16"), and Cath (6-12").
Trsu+Atra	DS	DS	7/28	3.3	2	28	Similar to previous treatment, but with slightly larger weeds and slightly higher populations, along with Vosb (6-12").
C.V.(%)				44.6	78	17	
LSD(0.1)				4.5	3	10	

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine.

Table 6. Herbicide and application costs during the third postemergence application at Fargo Airport in 1994. Broadcast application assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a]		Herbicide treatment applied				Spray vol. red.	Cost		
PRE	POST	Herbicides	Rate	Date	Mode		Herbicide	Application	Total
			(lb/A)			(%)	($/A)		
None	Brcst	Glyt&Dica	0.38&0.17	9/9	Brcst	-	8.66	0.76	2.35[b]
None	DS	Glyt&Dica	0.38&0.17	9/9	DS	69.8	2.62	3.23	5.85
None	BC/DS	Glyt&Dica	0.38&0.17	9/9	DS	69.2	2.67	3.23	5.90
None	BC/DB	Glyt&Dica	0.38&0.17	9/9	DS	87.0	1.13	3.23	2.18[c]
Trs+Atr	Brcst	Glyt&Dica	0.38&0.17	9/9	Brcst	-	8.66	0.76	2.35[b]
Trs+Atr	DS	Glyt&Dica	0.38&0.17	9/9	DS	73.6	2.29	3.23	5.52
C.V.(%)						6.1			
LSD(0.1)						NS			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atr = atrazine.

[b]Only 1 plot of 4 required treatment and the application was considered a "spot treatment. Thus, only 1/4 of the cost was assessed in the "Total cost" column.

[c]Only 2 plots of 4 required treatment and the application was considered a "spot treatment. Thus, only 1/2 of the cost was assessed in the "Total cost" column.

Table 7. Total (full-season) costs at Fargo Airport in 1994.

Herbicide treatment plan[b]		PRE and POST applications	Full season costs[a]					
			Broadcasting by farmer				Brdcst by hired labor	Brdcst by custom applicator
PRE	POST	(no.)	PRE herbicide	POST herbicide	Application	Total	Total	Total
			($/A)					
None	Brdcst	2.25	0	17.25	1.71	18.96	20.13	22.83
None	DS	3	0	12.40	9.69	22.09	22.09	22.09
None	BC1/DS	3	0	13.49	7.22	20.71	21.23	22.43
None	BC1/DB	2.5	0	13.80	5.61	19.41	19.93	21.13
Trsu+Atra	Brdcst	3.25	4.61	15.09	2.47	22.17	23.86	27.76
Trsu+Atra	DS	4	4.61	10.31	10.45	25.37	25.89	27.09

[a]Full season costs were calculated three ways: Broadcasting by farmer assumes the farmer owns his sprayer and operates it (labor is "free"); Broadcast by hired labor assumes the farmer owns his sprayer but pays someone to operate it; Broadcast by custom applicator assumes the farmer hires a commercial applicator to do all broadcasting.

[b]Brdcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC1/DS = one broadcast application followed by Detectspray as needed; BC1/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine.

Table 8. Correlation coefficients for the relationship between spray volume reduction and three weed density variables measured at time of Detectspray application at Fargo Airport in 1994.

Variable[a]	Datum points (no.)	Mean	Minimum value	Maximum value	P value	Correlation coefficient (r)
Line transect (%)	20	6.0	1	24	0.0127	-0.55
Average cover (%)	20	8.3	2	19	0.0003	-0.72
Frequency of >3% cover (%)	20	52.7	16	83	0.0001	-0.89

[a]Line transect = vegetation density measured by determining the frequency of intersection of green leaf material with 100 points on a line stretched across the plot; Average cover = estimated percentage ground covered by greenvegetationinside10020-by60-cmquadrats;Frequencyof>3%cover= number of quadrats out of 100 in which percentage ground cover was estimated above 3%.

[b]P value = probability of accepting the null hypothesis that the slope of the correlation is not different from zero. Thus, if the P value is less than 0.05, the relationship probably (95% probability) has a slope different from zero.

Economics of Detectspray in full season fallow, Fargo NW22 1994. W. H. Ahrens and M. G. Ciernia. Detectspray[1] sprayer technology consists of sensors that measure infrared light reflected from green plant canopies and, with associated circuitry and a computer microprocessor, trigger solenoid valves to turn on allowing delivery of spray to nozzles on a spray boom. Each nozzle on the boom is fitted with a sensor mounted several inches ahead and facing downward. Nozzles are turned on and off individually with solenoid valves positioned immediately above each nozzle. When sufficient infrared light is reflected from green plant leaves and is detected by a particular sensor, the information is processed (using an ambient light reading taken from a sensor facing upward) and an electric signal is sent to that solenoid valve causing it to open and spray to flow through the nozzle. The sensors respond to all green tissue, so Detectspray has application as a fallow sprayer.

Detectspray hardware was mounted on an all-terrain vehicle (ATV) with 6 nozzles spaced 20 inches apart (10 ft effective spray swath). All Detectspray treatments were applied at 10 gal spray solution per acre at 7 mph with 8003 extended range (XR) flat fan nozzles and 25 psi spray pressure. Standard broadcast treatments were applied at 5 gal/A at 7 mph with 80015 XR tips and 25 psi. Plots were arranged in a randomized complete block design with four replications.

The experiment was established in standing wheat stubble on a silty clay soil with pH 7.8 and 4.5% organic matter. Plot size was 20 by 220 feet with 10-ft alleys between plots as a buffer against spray drift. Plots were treated with two adjacent 10-ft-wide passes with the ATV sprayer, either broadcast or using the "selective" mode of Detectspray.

General treatment descriptions are given in Table 1. Triasulfuron and atrazine were applied May 11 using an ATV-mounted sprayer delivering 10 gpa with 8002 tips and 28 psi at 5 mph. A few Canada thistle and dandelion had emerged, so 0.25% v/v X-77 surfactant was added. The postemergence herbicides to be used and the rates needed were determined by the investigator for each individual treatment at time of application. Postemergence herbicide rates, dates, and mode of application are given in the tables. All glyphosate applications included nonionic surfactant at 0.5% by vol plus ammonium sulfate at 1.5 lb/A, except that ammonium sulfate was omitted when glyphosate was mixed with 2,4-D amine at rates exceeding 1 lb ae/A. The double boom of treatment 4 involves broadcast application of a low rate of

Table 1. General description of planned treatments for full-season fallow experiment at Fargo NW22 in 1994.

Treatment[a]
1. Postemergence herbicides, broadcast as needed
2. Postemergence herbicides, Detectspray as needed
3. Postemergence herbicides, broadcast once followed by Detectspray as needed
4. Postemergence herbicides, broadcast once followed by double boom as needed
5. PRE Trsu + Atra (0.0131 + 0.375 lb/A), POST herbicides broadcast as needed
6. PRE Trsu + Atra (0.0131 + 0.375 lb/A), POST herbicides Detectspray as needed

[a]Trsu = triasulfuron (Amber) by Ciba; Atra = atrazine.

[1]Detectspray is a trademark of Detectspray Limited, 215 Mann St., PO Box 84, Armidale NSW 2350, Australia.

herbicide (usually glyphosate) required to kill smaller, more abundant weeds, together with a Detectspray application of a higher rate of herbicide to kill large weeds. A commercial Detectspray operator would have both booms operating on one sprayer. Experimentally, the double boom application was simulated by two separate applications.

At the time of each Detectspray (selective mode) application, a 20- by 60-cm quadrat was used to take 100 estimates of percentage cover from each plot. These readings sampled the entire length of each 220-ft plot.

Assumptions used in the economic calculations

1994 herbicide prices from Ostlund Chemical in Fargo:
- Glyphosate costs $38.00/gal as Roundup RT (3 lb ae/gal)
- Dicamba costs $71.25/gal as Banvel (4 lb ae/gal)
- 2,4-D costs $11.75/gal as dimethylamine salt (3.8 lb ae/gal)
- Glyt&2,4-D costs $20.00/gal as Landmaster BW
- Triasulfuron costs $10.50/oz product as Amber (75DF)
- Atrazine costs $2.80/lb product as atrazine (90DF)
- Nonionic surfactant costs $17.25/gal as X-77
- Ammonium sulfate costs $0.25/lb

Detectspray application done by a custom operator estimated at $3.23/A. Includes custom broadcast price of $2.48/A (U. of Minn. costs estimates) plus $0.75/A premium for Detectspray application (figure supplied by Kelly Johnson, Saskatchewan custom applicator, adjusted for U.S.-Canada exchange rate of approximately $1.00:$0.75).

Standard broadcast application:
*1. Sprayer owned and operated by the farmer: $0.76/A (this figure used in the calculations below unless otherwise stated)
2. Sprayer owned by farmer, operated by hired labor: $1.28/A
3. Custom application: $2.48/A
(Estimates supplied by University of Minnesota)

Herbicides were applied in 3-L plastic bottles, one bottle per plot. After filling the spray boom with each treatment, a mark was placed on the bottle at inital fluid level, thus enabling a measurement of spray volume required to treat each plot. At the time of each Detectspray application, volume use was measured on four plots treated using continuous spray and the same pressure and travel speed as was used for Detectspray. These continuous-spray results were used to calculate volume reduction by Detectspray.

Comments. 1994 was extremely wet during June and July and this probably stimulated excessive amounts of weed germination and growth. The site has been managed for weed control experiments for several years and had high levels of weed seeds along with infestations of perennial weeds. Abundant dandelion in particular required the use of high rates of 2,4-D.

Table 2. Herbicide and application costs during the first postemergence application at Fargo NW22 in 1994. Broadcast application cost assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a]		Herbicide treatment applied				Spray vol. red.	Cost		
PRE	POST	Herbicides	Rate	Date	Mode		Herbi-cide	Appli-cation	Total
			(lb/A)			(%)	($/A)		
None	Brcst	Gly&24D+24D	0.28&0.5+1.25	6/2	Brcst	-	10.09	0.76	10.85
None	DS	Gly&24D+24D	0.28&0.5+1.25	6/2	DS	5.2	9.57	3.23	12.80
None	BC/DS	Gly&24D+24D	0.28&0.5+1.25	6/2	Brcst	-	10.09	0.76	10.85
None	BC/DB	Gly&24D+24D	0.28&0.5+1.25	6/2	Brcst	-	10.09	0.76	10.85
Trs+Atr	Brcst	Glyt+Dica	0.28+0.19	6/18	Brcst	-	10.09	0.76	10.85
Trs+Atr	DS	Glyt+Dica	0.28+0.19	6/18	DS	20.7	8.00	3.23	11.23
C.V.(%)						47.1			
LSD(0.1)						9.3			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by selective mode of Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atr = atrazine; Gly&24D = Glyphosate + 2,4-D package mix sold as Landmaster BW.

Table 3. Percentage weed cover by quadrat estimates and the line transect method, and percentage quadrats with 3% or greater cover for the first postemergence application at Fargo NW22 in 1994.

Herbicide treatment plan		Treat-ment appl.	Date	Esti-mated cover	Line tran-sect	3% or more cover	Weeds present (size)
PRE	POST			(%)			
None	Brcst	Brcst	6/2	-	-	-	Dand (to 8"); KOCZ (1-2"); Vowh (6"; Colq (2-4"); Cudo (to 10"); Wibw (2-5"); Wimu (2-4"); Fxtl (1-2"); Cath (to 8").
None	DS	DS	6/2	16.4	14	85	Same as previous treatment.
None	BC/DS	Brcst	6/2	-	-	-	Same as previous treatment.
None	BC/DB	Brcst	6/2	-	-	-	Same as previous treatment.
Trsu+Atra	Brcst	Brcst	6/18	-	-	-	Fxtl (to 6"); Vowh (10-12"); Cudo (12-18"); Cath (to 12"); Dand (to 8"); Wibw (to 12").
Trsu+Atra	DS	DS	6/18	33.8	19	96	Same as previous treatment.
C.V.(%)				24.3	23	8	
LSD(0.1)				10.2	NS	NS	

[a]Brdcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC1/DS = one broadcast application followed by selective mode of Detectspray as needed; BC1/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine; Cudo = curly dock; Fxtl = 80% yellow, 20% green foxtail; Dand = dandelion; Vowh = volunteer wheat; Wibw = wild buckwheat; Cath = Canada thistle; KOCZ = kochia; Wimu = wild mustard.

Table 4. Herbicide and application costs during the second postemergence application at Fargo NW22 in 1994. Broadcast application assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a] PRE	POST	Herbicide treatment applied Herbicides	Rate (lb/A)	Date	Mode	Spray vol. red. (%)	Cost Herbi- cide ($/A)	Appli- cation ($/A)	Total ($/A)
None	Brcst	Glyt&2,4-D	0.28&0.5	7/27	Brcst	-	6.60	0.76	7.36
None	DS	Glyt&2,4-D	0.28&0.5	7/27	DS	0	6.60	3.23	9.83
None	BC/DS	Glyt&2,4-D	0.28&0.5	7/27	DS	0	6.60	3.23	9.83
None	BC/DB	Glyphosate	0.14	7/27	Brcst	-	2.58	-	-
		Glyt&24D+24D	0.14&0.12+0.19	7/27	DS	0	4.07	3.23	9.88
Trs+Atr	Brcst	Glyt&2,4-D	0.23&0.42	8/3	Brcst	-	5.58	0.76	6.34
Trs+Atr	DS	Glyt&2,4-D	0.23&0.42	8/3	DS	4.8	5.31	3.23	8.54
C.V.(%)						355.5			
LSD(0.1)						NS			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by selective mode of Detectspray as needed; BC/DS = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atra = atrazine; Glyt&2,4-D = Landmaster BW.

Table 5. Percentage weed cover by quadrat estimates and the line transect method, and percentage quadrats with 3% or greater cover for the second postemergence application at Fargo NW22 in 1994.

Herbicide treatment plan[a] PRE	POST	Treat- ment applied	Date	Esti- mated cover (%)	Line tran- sect (%)	3% or more cover (%)	Weeds present (size)
None	Brcst	Brcst	7/27	-	-	-	Fxtl and Bygr (6-12"); Rrpw (4-10"); KOCZ (8-10"); Colq (8"); Cath (6-15"); Wimu (6-12"); Biww (6-8"); Dand (4").
None	DS	DS	7/27	60.7	35	99	Same as previous treatment.
None	BC/DS	DS	7/27	63.9	34	100	Same as previous treatment.
None	BC/DB	DB	7/27	-	-	-	Same as previous treatment.
Trsu+Atra	Brcst	Brcst	8/3	-	-	-	Fxtl and Bygr (8-12"); Dand (4-6"); Cath (6-10").
Trsu+Atra	DS	DS	8/3	33.1	26	97	Same as previous treatment.
C.V.(%)				10.9	24	3	
LSD(0.1)				7.9	NS	NS	

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine.

Table 6. Herbicide and application costs during the third postemergence application at Fargo NW22 in 1994. Broadcast application assumes the sprayer is farmer owned and operated.

Herbicide treatment plan[a] PRE	POST	Herbicide treatment applied: Herbicides	Rate (lb/A)	Date	Mode	Spray vol. red. (%)	Cost: Herbi-cide ($/A)	Appli-cation ($/A)	Total ($/A)
None	Brcst	Gly&24D+24D	0.19&0.33+1.17	9/7	Brcst	-	7.79	0.76	8.55
None	DS	Gly&24D+24D	0.19&0.33+1.17	9/7	DS	35.3	5.04	3.23	8.27
None	BC/DS	2,4-D	1.5	9/7	DS	55.5	2.45	3.23	5.68
None	BC/DB	Glyphosate	0.1875	9/7	Brcst	-	3.56		
		2,4-D	1.5	9/7	DS	38.4	3.38	3.23	10.17
Trs+Atr	Brcst	Gly&24D+24D	0.19&0.33+1.17	9/7	Brcst	-	7.79	0.76	2.14[b]
Trs+Atr	DS	Gly&24D+24D	0.19&0.33+1.17	9/7	DS	83.8	1.26	3.23	1.12[b]
C.V.(%)						25.1			
LSD(0.1)						6.8			

[a]Brcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC/DS = one broadcast application followed by Detectspray as needed; BC/DB = one broadcast application followed by double boom as needed; Trs = triasulfuron; Atr = atrazine.

[b]Only 1 plot of 4 required treatment and the application was considered a "spot treatment. Thus, only 1/4 of the cost was assessed in the "Total cost" column.

Table 7. Total (full-season) costs at Fargo NW22 in 1994.

Herbicide treatment plan[b] PRE	POST	PRE and POST appli-cations (no.)	Full season costs[a]: Broadcasting by farmer: PRE herbicide ($/A)	POST herbicide ($/A)	Appli-cation ($/A)	Total ($/A)	Brdcst by hired labor Total ($/A)	Brdcst by custom ap-plicator Total ($/A)
None	Brdcst	3	0	24.48	2.28	26.76	28.32	31.92
None	DS	3	0	21.21	9.69	30.90	30.90	30.90
None	BC1/DS	3	0	19.14	7.22	26.36	26.88	28.08
None	BC1/DB	3	0	23.68	7.22	30.90	31.42	32.62
Trsu+Atra	Brdcst	3.25	4.61	23.46	2.47	30.54	32.10	36.13
Trsu+Atra	DS	3.25	4.61	14.57	8.03	27.21	27.73	28.93

[a]Full season costs were calculated three ways: Broadcasting by farmer assumes the farmer owns his sprayer and operates it (labor is "free"); Broadcast by hired labor assumes the farmer owns his sprayer but pays someone to operate it; Broadcast by custom applicator assumes the farmer hires a commercial applicator to do all broadcasting.

[b]Brdcst = standard broadcast application as needed; DS = "selective mode" of Detectspray as needed; BC1/DS = one broadcast application followed by Detectspray as needed; BC1/DB = one broadcast application followed by double boom as needed; Trsu = triasulfuron; Atra = atrazine.

Table 8. Correlation coefficients for the relationship between spray volume reduction and three weed density variables measured at time of Detectspray application at Fargo NW22 in 1994.

Variable[a]	Datum points (no.)	Mean	Minimum value	Maximum value	P value	Correlation coefficient (r)
Line transect	20	25.7	6	42	0.0074	-0.58
Average cover	20	41.6	10	67	0.0332	-0.48
Frequency of >3% cover	20	95.5	75	100	0.1198	-0.36

[a]Line transect = vegetation density measured by determining the frequency of intersection of green leaf material with 100 points on a line stretched across the plot; Average cover = estimated percentage ground covered by green vegetation inside 100 20-by 60-cm quadrats; Frequency of >3% cover = number of quadrats out of 100 in which percentage ground cover was estimated above 3%.

[b]P value = probability of accepting the null hypothesis that the slope of the correlation is not different from zero. Thus, if the P value is less than 0.05, the relationship probably (95% probability) has a slope different from zero.

Post-harvest kochia control. Hillsboro 1994. W. H. Ahrens and M. G. Ciernia. This experiment was conducted in a harvested spring wheat field with a high kochia population. The crop was harvested about August 15 with the grain and kochia cut 8 inches above the soil surface. Treatments were applied August 29 using a 6-nozzle bicycle wheel sprayer with 8001 tips delivering 8.5 gal/A at 40 psi. Environmental conditions were: air temperature 77 F, wind 4 to 7 mph, relative humidity 45%, sky partly sunny, and soil surface dry. Visual estimates of kochia control were made September 15 and 30. Plot size was 10 by 30 ft and the experiment was a randomized complete block design with three replications.

		Kochia control	
Treatment[a]	Rate	Evaluated Sept. 15	Evaluated Sept. 30
	(lb/A)	(%)	
Glyphosate&Dicamba	0.36&0.17	76	100
Glyphosate+AS	0.375+1%	90	100
Glyphosate	0.46	53	100
Glyphosate+AS	0.46+1%	71	100
Glyphosate	0.51	68	100
Glyphosate	0.56	39	100
Paraquat+X77	0.25+0.25%	99	100
Paraquat+X77	0.375+0.25%	99	100
Paraquat+X77	0.5+0.25%	99	100
C.V. %		21	1
LSD 5%		26	NS

[a]Glyphosate&dicamba = Fallowmaster herbicide; Glyphosate = Roundup; Paraquat = Cyclone herbicide; AS = ammonium sulfate.

Summary. All treatments provided excellent control. No frost had occurred before the September 30 evaluation.

Crop Management Systems at Dickinson, North Dakota in 1994. 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 first 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. 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 with sweetclover.

Soil core samples were taken in the fall of 1993 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (2-foot depth), and soil phosphorus (6-inch depth) were reduced in the fallow year for the sustainable system compared to the conventional and the no-till systems (data not shown). Sweetclover grown in the silage corn and fallow years probably utilized soil water for its growth and tied up the nitrogen and phosphorus when the sampling occurred in fall 1993. However, a 75 lb N/A credit was given for the green manured sweetclover in the spring of 1994. The soil moisture or fertility characteristics were similar for the three management systems in wheat or silage corn.

Surface residue was determined using the Soil Conservation Service string-bead method. Tillage was not done postharvest in wheat and silage corn management systems in 1993, so fall residue values are similar for those crops regardless of management system (Table 1). The sustainable fallow had more surface residue than conventional fallow system due to the high sweetclover residue postharvest. Wheat residue was greater than 90% in the fall and ranged from 81 to 90% in early spring preplant. Silage corn and fallow residue was reduced almost in half between fall and early spring preplant to values less than 20% ground cover.

Seedbeds for wheat and silage corn in the conventional and sustainable systems were prepared with one pass of a tandem disk at the 4-inch depth, which reduced surface residue measured after planting (Table 1). The planting operation for the no-till treatment only caused a small reduction of cover. Postharvest residue results in 1994 were similar to 1993's except for two treatments, no-till silage corn and sustainable fallow. The no-till silage corn grown on 1993 wheat maintained high wheat residue plus silage corn residue from 1994 was added. The sustainable fallow had less surface residue at the postharvest 1994 sampling due to better control of the biennial sweetclover in 1994 than 1993 when sweetclover, to start the experiment, was disked under same season as planted.

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 most abundant weed species in the field were barnyardgrass, redroot pigweed, volunteer wheat, Russian thistle, and field bindweed at time of preharvest counts.

Wheat yield in the sustainable system tended to decline compared to the conventional system (Table 2). However, wheat kernel moisture was higher for the sustainable system compared to the conventional and no-till which tends to indicate delayed crop maturity (data not shown). Wheat yield reduction and delayed crop maturity may have been affected by soil effects associated with high sweetclover residue at planting or competition from volunteer sweetclover.

Weed density did not correlate with wheat yield. Weeds were not detected before planting wheat in mid-April. Weed density in wheat tended to be less before herbicide treatment and was lower before harvest in no-till wheat compared to conventional or sustainable management systems.

Silage corn yield was less in the no-till than sustainable systems, and both systems produced less silage corn than the conventional system. These results probably were due to high surface residue that reduced soil temperature in spring and weed competition. The low silage corn yield may have resulted from the high wheat residue that gave poor corn seed-to-soil contact that delayed corn emergence and/or cooler soil temperatures that delayed corn development.

Weed density prior to planting corn and preharvest were similar for the three management systems. However, the herbicide burndown treatment for the no-till system that was planned between planting and corn emergence could not be applied, so weeds were more abundant after crop emergence than in the other systems which caused early season competition. Russian thistle in silage corn preharvest was more abundant in no-till ($12/yd^2$) than conventional ($4/yd^2$) or sustainable ($1/yd^2$) systems at pretreatment. Redroot pigweed was only observed in the sustainable system for silage corn. Volunteer wheat was present in all silage corn systems.

Weed density before herbicide treatment in no-till fallow was less than before the first tillage in conventional or sustainable management systems, 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 a good crop in 1994. However, the sweetclover did not establish in the row crop in 1994, probably because of inadequate rainfall after planting. Consideration is being given to using an annual legume with large seeds that might establish early during the fallow season for the sustainable system in the often dry environment of the Dickinson area.

Table 1. Effects of crop management practices on surface residue for three crops in Dickinson, ND in 1993 and 1994.

Time of residue sample 1993 crop	1994 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Postharvest 1993:					
Wheat		93	95	93	NS
Silage corn		35	35	44	NS
Fallow		7	33	53	27
Overwinter - Preplant 1994:					
Wheat stubble -	Silage corn	81	86	90	NS
Silage corn -	Fallow	14	14	13	NS
Fallow -	Wheat	2	19	18	NS
Postplant 1994:	Silage corn	15	86	20	14
	Fallow	3	13	-	NS
	Wheat	1	12	13	9
Postharvest 1994:	Silage corn	56	97	49	24
	Fallow	6	17	6	NS
	Wheat	71	82	77	NS

[a]The sustainable system has sweetclover interseeded in silage corn rows, and the sweetclover overwinters for green manure in the fallow season.

Table 2. Effects of crop management practices on weed density and crop dry yield for three crops in Dickinson, ND in 1994.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	0	0	0	NS
	Pretreatment -	109	38	76	NS
	Preharvest -	23	13	34	16
Silage corn	Preplant -	77	59	60	NS
	Pretreatment -	472	184	567	164
	Preharvest -	63	89	98	NS
Fallow	Preplant -	-	-	-	-
	Pretreatment -	564	86	967	615
	Preharvest -	9	12	13	NS
Dry yield:					
Wheat (bu/A)		45.3	43.8	40.4	NS
Silage corn (ton/A)		4.3	2.6	3.3	0.9
Clover (ton/A)		-	-	2.4	-

[a]The sustainable system has sweetclover interseeded in silage corn rows, and the sweetclover overwinters for green manure in the fallow season.

Crop Management Systems at Fargo, North Dakota in 1994. Cathy A. Morton, John D. Nalewaja, Calvin G. Messersmith, and Erick G. 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 first 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 was allowed to grow into the early part of the following year before it 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.

Soil core samples were taken in the fall of 1993 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (2-foot depth), soil phosphorus (6-inch depth), and soil potassium (6-inch depth) were similar for the three management systems in wheat and soybean (data not shown). A 75 lb N/A credit was given for the green manured sweetclover in the spring of 1994.

Surface residue was determined using the Soil Conservation Service string-bead method. Surface residue was not able to be determined due to early snowfall in 1993 after crop harvest and tillage. 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 (Table 1). However, the sustainable soybean crop in 1993 tended to have higher surface residue prior to seeding wheat in 1994, which may be due to the extremely high foxtail species residue from 1993 season, than in the conventional and no-till systems (data not shown). The wheat and soybean planting operations and herbicide applications to the no-till treatment reduced cover 15% (Table 1). No-till had more wheat stubble than conventional and sustainable systems after planting soybeans. The 16-inch V-blade undercutting operation of rye stubble in the sustainable system retained more surface residue than the chisel plowed wheat conventional system. However, undercut wheat residue in the sustainable system was comparable to conventional wheat and both had less surface residue than no-till wheat straw. Sweetclover and rye in the sustainable system were established at time of mid-spring surface residue counts, thus those treatment values were not measured. Postharvest residue results in 1994 were similar for the three management systems in wheat and soybean.

Wheat and soybean yields were similar for the three management systems (Table 2). Wheat and soybean yields tend to reduced for the sustainable system compared to the conventional and no-till yields. Similarly, wheat kernel moisture tended to be greater and soybean seed moisture was greater for the sustainable system compared to the conventional and no-till systems which tends to indicate delayed crop maturity (data not shown). Trends for reduced yields and increased crop moisture of wheat and soybean in the sustainable management system may correspond to weed density, especially the high density of green and yellow foxtail at pretreatment and preharvest (Table 2). Wheat and rye yields for all management systems may have been reduced by excessively wet conditions at Fargo in 1994.

An undercutter was used in wheat stubble of the sustainable system in the fall of 1993 to maintain high surface residue and to control weeds before drilling sweetclover. However, the sweetclover did not establish in the fall 1993, probably due to the rough and dry seedbed. Sweetclover was replanted after disking field in early spring and later disked under for green manure. In the fall of 1994, sweetclover had established in the disked wheat stubble seedbed, but the fall surface residue is only 4% (Table 1). The unpredictability of sweetclover establishment after wheat harvest may limit it as a major component of the sustainable system. Consideration is being given to using an annual legume with larger seeds that might establish in early spring for the sustainable system.

Table 1. Effects of farm management practices on surface residue for four crops in Fargo, ND in 1993 and 1994.

Time of residue sample 1993 crop	1994 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Overwinter - Preplant 1994:					
Wheat or rye -	Soybean	51	96	72	8
Clover -	Rye	-	-	32	-
Wheat -	Clover	-	-	58	-
Soybean -	Wheat	21	21	35	NS
Postplant 1994:					
	Soybean	31	82	36	40
	Rye	-	-	-	-
	Clover	-	-	31	-
	Wheat	2	6	5	NS
Postharvest 1994:					
	Soybean	77	88	84	NS
	Rye	-	-	25	-
	Clover	-	-	4	-
	Wheat	48	73	42	NS

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

Table 2. Effects of farm management practices on weed density and crop dry yield for four crops in Fargo, ND in 1994.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	42	20	427	NS
	Pretreatment -	135	80	653	229
	Preharvest -	55	53	171	19
Clover	Preplant -	-	-	92	-
	Pretreatment -	-	-	182	-
	Preharvest -	-	-	0	-
Rye	Preplant -	-	-	58	-
	Pretreatment -	-	-	268	-
	Preharvest -	-	-	191	-
Soybean	Preplant -	41	46	125	18
	Pretreatment -	38	137	214	NS
	Preharvest -	26	39	88	10
Preharvest foxtail species density (no./yd^2):					
Wheat		33	17	158	24
Clover		-	-	0	-
Rye		-	-	145	-
Soybean		1	1	49	20
Dry yield:					
Wheat (bu/A)		27.2	26.5	21.3	NS
Clover (ton/A)		-	-	2.6	-
Rye (bu/A)		-	-	24.5	-
Soybean (bu/A)		35.4	33.5	30.2	NS
Crop moisture (%):					
Wheat		10.3	10.0	15.3	NS
Clover		-	-	79.5	-
Rye		-	-	20.3	-
Soybean		8.1	8.0	12.2	2.3

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

Crop Management Systems at Minot, North Dakota in 1994. Cathy A. Morton, John D. Nalewaja, Calvin G. Messersmith, and Michael J. Miller. 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 first 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. 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.

Soil core samples were taken in the fall of 1993 for moisture and fertility (N, P, and K) analysis. Soil moisture (4-foot depth), soil nitrogen (2-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). A 75 lb N/A credit was given for the green manured sweetclover in the spring of 1994.

Surface residue was determined using the Soil Conservation Service string-bead method. Tillage was not done in wheat and sunflower management systems postharvest in 1993, so fall residue values are similar for those crops regardless of management system (Table 1). The sustainable fallow had more surface residue than conventional fallow system at postharvest 1993 and preplant 1994 due to the high sweetclover residue. The no-till fallow system in 1993 had barley stubble from the 1992 crop. Wheat residue was greater than 90% in the fall and in the early spring.

Seedbed for wheat in the conventional system was field cultivated at the 2-3 inch depth followed by a drag harrow and sustainable system was prepared with one pass of a tandem disk at the 2-3 inch depth, which reduced surface residue measured after planting (Table 1). The wheat and sunflower planting operations and herbicide applications to the no-till treatment only caused a small reduction of cover. Seedbed for sunflower in the conventional system was disked at the 2-3 inch depth, then treated with Sonalan 10G granules (ethalfluralin at 1 lb ai/A) and incorporated twice at the 2-3 inch depth. Seedbed for sunflower in the sustainable system was treated with Sonalan 10G granules (ethalfluralin 1 lb ai/A) and incorporated once with a 32 inch V-blade undercutter at the 2 inch depth. Seedbed preparation for sunflower reduced surface residue more in the conventional than the sustainable system, and both systems had less surface residue than the no-till system.

Postharvest residue results in 1994 were similar to 1993's except for two treatments, no-till sunflower and sustainable fallow. The no-till sunflower grown on 1993 wheat maintained high wheat residue plus sunflower residue from 1994 was added. The sustainable fallow had less surface residue at the postharvest 1994 sampling due to better control of the biennial sweetclover in 1994 than 1993 when sweetclover, to start the experiment, was disked under the same season as planted.

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 most abundant weed species were shepherdspurse, prostrate pigweed, western ragweed, Russian thistle, and kochia at time of preharvest counts.

Wheat and sunflower yields were greater in the conventional system than the no-till and sustainable systems (Table 2). The reduced yields may be due to the combination of surface residue and weed species/density. These results probably were due to high surface residue that reduced soil temperature in spring and crop competition with weeds. The low crop yields may have resulted from the high wheat, sweetclover, or barley residue that gave poor seed-to-soil contact that delayed crop emergence and/or cooler soil temperatures that delayed crop development.

The reduced wheat yield in the sustainable system may have been due to competition from volunteer sweetclover that overwintered from the 1993 green-manure fallow. Volunteer sweetclover population was 22/yd^2 and was 10-14 inches tall which was twice the wheat height at time of herbicide application (data not shown).

It is uncertain why the wheat yield in the no-till system was similar to the sustainable system, and both were less than the conventional system. The old barley stubble may have reduced herbicide contact with emerged weeds at time of herbicide burndown treatment applied between planting and wheat emergence in the no-till system. Weeds in the conventional and sustainable systems were tilled under. Both conventional and no-till wheat systems were sprayed with 0.5 oz/A Harmony Extra 75DF plus 0.54 pt/A MCPA ester 3.7L plus 0.125% R-11 (0.25 oz ai/A thifensulfuron + 0.125 oz ai/A tribenuron + 0.25 lb ae/A MCPA). Dandelion and wild buckwheat densities were higher in no-till than conventional or sustainable systems at preharvest counts. More western ragweed seedlings tended to be present in the no-till wheat system than conventional or sustainable systems at pretreatment and preharvest counts.

The low sunflower yield in the no-till and sustainable systems may have affected by weed density. Weed density in sunflower tended to be greater pretreatment and was greater preharvest in no-till than in conventional and sustainable systems. Volunteer wheat was present in all sunflower systems preharvest except the wheat density was greater and plants were more mature in the no-till system than conventional or sustainable systems which received two row cultivations after the pretreatment counts to kill weeds (data not shown).

Weed densities before herbicide treatment and postharvest in no-till fallow tended to be less than before tillage in conventional or sustainable systems, which corresponds to the shepherdspurse density, one of the top two weeds (data not shown).

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 a good crop in 1994. However, the sweetclover did not establish in the row crop in 1994, probably because of inadequate rainfall after planting. Consideration is being given to using an annual legume with large seeds that might establish early during the fallow season for the sustainable system in the often dry environment of the Minot area.

Table 1. Effects of farm management practices on surface residue for three crops in Minot, ND in 1993 and 1994.

Time of residue sample 1993 crop	1994 crop	Conventional	No-till	Sustainable[a]	LSD 5%
		% cover			
Postharvest 1993:					
Wheat		94	93	92	NS
Sunflower		52	61	66	NS
Fallow		12	79	73	15
Overwinter - Preplant 1994:					
Wheat stubble -	Sunflower	93	91	92	NS
Sunflower -	Fallow	46	60	53	NS
Fallow -	Wheat	6	35	72	13
Postplant 1994:	Sunflower	12	74	56	13
	Fallow	2	52	-	13
	Wheat	1	33	25	5
Postharvest 1994:	Sunflower	38	93	57	10
	Fallow	18	43	37	16
	Wheat	52	78	63	9

[a]The sustainable system has sweetclover interseeded in sunflower rows, and the sweetclover overwinters for green manure in the fallow season.

Table 2. Effects of farm management practices on weed density and crop dry yield for three crops in Minot, ND in 1994.

Crop	Time	Conventional	No-till	Sustainable[a]	LSD 5%
Weed density (no./yd^2):					
Wheat	Preplant -	36	37	55	NS
	Pretreatment -	497	558	231	NS
	Preharvest -	41	103	53	NS
Sunflower	Preplant -	56	21	19	NS
	Pretreatment -	91	116	76	NS
	Preharvest -	45	69	26	17
Fallow	Preplant -	-	-	-	-
	Pretreatment -	932	514	874	NS
	Preharvest -	50	32	56	NS
Dry yield:					
Wheat (bu/A)		53.2	48.9	48.7	3.1
Sunflower (ton/A)		1.2	0.8	0.7	0.2
Clover (ton/A)		-	-	2.6	-

[a]The sustainable system has sweetclover interseeded in sunflower rows, and the sweetclover overwinters for green manure in the fallow season.