1986
NORTH DAKOTA WEED CONTROL RESEARCH

WEED SCIENCE

BIOLOGICAL

CULTURAL

CHEMICAL

NDSU

Weed Research Projects, Department of Agronomy
NORTH DAKOTA STATE UNIVERSITY
Fargo, N. D. 58105

NOT FOR PUBLICATION

SUMMARY OF 1986
WEED CONTROL EXPERIMENTS

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Table of Contents

White Section: Experiment titles, climatic, edaphic and general information.

Green Section: General Weed Control in Crops

Yellow Section: Grass Control Herbicides

Pink Section: Perennial Weed Control

Blue Section: Weed Control in Reduced Tillage Systems

CLIMATIC DATA - FARGO

Date	Precipitation April	May	June	July	Aug.	Temperature April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	August Max.	August Min.
1		T		T	T	57	30	44	29	71	54	80	57	75	54
2	.14				T	55	39	53	26	81	53	80	52	74	53
3	.03		T	.97		45	37	66	38	92	62	87	62	83	51
4	.14			.15		50	34	84	52	73	55	83	65	87	59
5	.29	T		.01	.02	44	39	77	44	78	40	81	58	85	63
6		.03	.69	T	.72	71	39	48	40	78	60	81	56	84	58
7		T	.01	.03	.02	61	36	52	38	75	54	83	59	78	60
8		.63		.13		54	32	50	44	73	48	75	61	86	55
9		T			.08	60	27	73	46	84	60	82	56	76	56
10		T	.29	.91		66	33	68	53	72	62	77	65	68	48
11	.05			T		68	31	74	58	65	52	72	62	75	46
12	T	.02		.12		31	21	67	51	77	51	75	61	79	57
13	.10		.12	T	.24	40	24	71	46	81	46	77	60	76	64
14	1.78	T		.12	.09	37	29	75	46	76	51	83	63	82	61
15	T		.26	.07		37	27	69	41	82	53	86	68	90	57
16				.11	T	56	25	59	43	68	47	81	71	77	56
17	T		1.85	T		53	42	62	35	77	50	87	70	74	48
18	.68		.05	T	.04	51	46	65	35	93	63	88	63	80	59
19	.18				T	57	40	67	44	93	68	82	61	89	65
20	T		.35	.11	T	44	30	69	45	84	68	77	56	80	50
21			.03			44	26	72	45	83	67	83	57	71	43
22			.32		.37	60	32	73	46	82	57	88	58	62	54
23	T	.24	T			77	47	60	50	70	50	91	71	76	53
24		.05		.08	.07	55	43	64	50	77	45	87	62	67	59
25	.76	.02	T		.06	47	38	66	45	93	65	81	55	82	55
26	.43		T	1.50	T	45	36	80	46	92	68	85	62	63	43
27	.54		T	.01		42	38	86	51	80	63	81	61	67	43
28	.01					54	37	87	53	80	60	83	62	71	38
29	T		.01	.22		70	38	88	55	68	54	87	63	74	48
30	.15		T	.24		62	43	92	56	71	54	79	62	81	55
31		.01			.01			93	60			77	54	79	62

CLIMATIC DATA - CASSELTON SEED FARM

	Precipitation					Temperature									
						April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	.06	.04				67	31	63	33	90	55	69	55	78	54
2						59	36	42	35	68	47	83	60	76	53
3	.36					53	37	59	34	72	52	80	52	77	48
4	T		T	.85		46	32	66	38	90	59	89	56	85	47
5	.62				.25	47	37	87	42	80	43	83	58	88	50
6		T			.06	46	34	77	40	76	57	83	52	85	54
7			.64	.03	.49	71	38	48	40	77	59	82	55	83	58
8		.36		.12		61	33	53	37	78	47	85	61	79	55
9		.57		.14		57	28	53	43	76	53	77	53	87	58
10			.31	.34	.12	62	31	74	49	65	51	83	56	74	48
11				3.80		67	34	72	50	70	51	78	59	68	46
12	.15	.07		.50		67	21	76	55	68	51	78	60	74	46
13				.30		36	22	67	44	77	44	78	57	77	58
14	1.45		.15	.05	1.07	32	24	72	48	80	51	80	62	78	61
15	.96		.36		.22	32	24	78	40	77	59	85	65	85	55
16			.01	.13		38	23	72	45	82	46	85	70	88	58
17				.14		53	31	57	38	71	49	83	71	76	48
18	.75		.09	T	.10	52	45	63	35	77	50	87	64	74	58
19	.58			.01		48	39	68	35	93	56	86	63	79	60
20					.02	57	36	71	35	92	65	78	60	89	62
21	T			.18		47	26	72	35	82	62	87	58	75	43
22			.05		.35	46	30	74	35	85	56	84	56	70	53
23			.02			65	30	76	49	84	55	87	56	67	50
24		.39		.08	T	82	45	74	50	70	58	91	67	75	57
25	T	.19			.19	58	42	70	49	79	42	86	54	69	53
26	1.40			.82	.12	46	35	78	47	93	67	84	60	61	46
27	.37					45	38	82	50	94	62	83	58	63	44
28	.82					40	36	89	55	84	53	81	60	69	37
29				.56		65	35	89	54	80	55	86	58	71	43
30	.31		.20	T		71	36	80	57	65	56	81	54	74	47
31								92	61			78	54	68	60

CLIMATIC DATA - CROOKSTON

	Precipitation					Temperature									
						April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1		.01		.02		52	32	35	29	73	46	77	53	72	53
2	.07		.23			48	36	51	31	81	56	79	58	74	46
3			T	.70		49	32	65	40	81	54	86	63	83	55
4	.15				.10	52	38	83	51	70	42	82	66	87	62
5		.15				44	39	78	40	77	61	81	57	85	56
6		.05	.58		.27	66	40	46	35	88	57	80	54	83	60
7		.07	.24			57	31	52	40	72	48	84	60	78	51
8		.16		.04	.05	52	28	50	41	72	53	77	57	85	59
9		.28			.26	58	31	70	50	83	63	83	63	72	46
10				.06		66	35	65	53	71	56	72	61	68	42
11	.02	.77				66	18	72	55	68	53	72	56	75	50
12				.41		28	18	65	47	72	48	72	58	81	60
13	.21		T	.37	.05	35	25	70	49	77	43	74	57	75	62
14	1.16		.08	.02		35	26	75	39	77	59	81	58	84	58
15		.02	T			47	28	69	43	76	44	84	66	89	53
16				.15		57	37	58	38	67	48	76	68	73	45
17	.04					55	42	57	34	79	58	86	60	75	48
18	.54			.06		47	39	63	38	87	67	86	62	80	60
19	.32		.12	.17		55	35	69	45	94	61	80	56	89	62
20	.02		.02	.06		38	25	68	38	76	61	77	56	73	37
21			.03		.17	44	29	74	42	83	59	82	55	71	48
22				.30	.05	57	36	76	48	82	59	86	62	63	53
23		.20	T	.50		73	41	63	50	67	40	87	67	75	55
24		.05				55	41	69	51	74	55	81	53	72	56
25	1.12	.23			.28	45	34	71	53	90	64	80	57	79	47
26	.35			.46		42	35	84	55	87	60	84	61	61	34
27	.54			.02		39	34	89	56	81	56	82	62	65	33
28						44	32	90	72	81	48	84	62	71	44
29	.10			.13		68	40	91	73	68	54	88	62	75	50
30	.37		.03			55	31	93	71	75	54	79	56	81	52
31					.39			95	57			77	57	77	56

CLIMATIC DATA - CARRINGTON 4N

Date	Precipitation April	May	June	July	Aug.	Temperature April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	August Max.	August Min.
1				.05	.11	58	26	56	31	92	47	75	51	73	51
2	T					56	38	58	27	89	45	81	48	76	48
3	.47					45	33	74	38	87	61	90	59	84	49
4	T			.06		44	31	91	50	75	52	90	59	89	54
5	.24			.54	.07	46	36	89	49	75	42	72	54	87	62
6		.06	.03		.25	67	36	50	33	71	57	79	50	84	56
7		.03			.19	63	36	48	29	76	50	82	51	79	55
8		.29		.08		56	30	42	41	75	43	78	58	86	52
9		.36	.06		.10	63	29	62	32	78	50	82	54	85	57
10				1.83		68	32	68	42	74	59	80	60	71	51
11		.80				65	32	82	41	77	54	79	56	76	42
12	.02	.10		.65		36	16	64	40	77	48	73	56	80	53
13	T		T		.75	31	16	72	42	78	43	79	51	80	54
14	2.04		.45		1.01	24	16	69	48	78	44	83	57	82	60
15				.09		35	20	64	38	79	57	85	57	93	59
16	T			.14	.06	36	11	58	34	71	42	86	68	90	49
17	T					41	31	59	32	76	52	85	68	76	42
18	.73					44	36	65	39	96	60	84	55	80	54
19	.20				.10	50	34	72	44	97	63	77	50	89	61
20			.45			43	32	75	48	94	61	80	48	87	56
21			.10	.03		46	21	75	49	82	53	83	53	71	41
22					.18	72	32	75	46	80	53	88	53	69	51
23		.15		.09		75	42	72	49	82	53	93	64	76	42
24		.21		.02	.12	61	40	60	44	82	46	89	61	86	57
25	.40					53	33	77	40	93	59	83	50	83	49
26	.05			.38	.18	45	33	80	44	93	66	85	57	72	44
27	.41					42	34	88	49	89	57	79	59	66	40
28	.04			.17		57	31	89	53	81	57	85	55	71	36
29	.04		.34			65	36	88	55	80	48	91	62	79	45
30	.23		.04	.57		58	40	92	60	66	51	82	59	83	49
31								97	60			76	51	76	56

CLIMATIC DATA - LANGDON

Date	Precipitation April	Precipitation May	Precipitation June	Precipitation July	Precipitation Aug.	April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	August Max.	August Min.
1		.15			.23	52	29	49	26	93	45	68	56	73	52
2					.06	52	33	41	26	65	45	72	50	72	48
3	.10		.53			41	30	49	30	87	59	76	58	74	50
4			.03	.87		45	29	65	37	75	45	87	60	80	55
5	.01	.55		.33	.07	47	32	75	47	66	42	78	61	82	57
6		.14				43	31	64	31	72	52	70	52	81	56
7		.04	.35			63	34	43	30	74	48	69	56	75	56
8					T	55	30	51	35	69	40	78	53	75	50
9		.23			.32	54	28	48	39	70	52	79	55	78	58
10		.03	.07	.29	.07	61	33	65	41	73	57	79	58	67	45
11				.75		68	38	61	41	71	50	67	56	67	43
12	.11	.68		.04		59	10	75	45	71	51	68	54	72	49
13				.23		24	12	75	43	69	43	58	44	78	55
14	.32		.02	.78		23	16	66	48	69	41	70	55	77	57
15	.08					25	15	70	37	71	47	77	53	81	56
16		.01	.27			36	22	62	35	62	39	78	64	90	46
17				.02		54	34	52	30	65	47	78	65	75	41
18	.42			.28		48	38	54	31	78	56	79	55	72	48
19	.75					39	34	64	41	86	63	78	54	80	55
20	.02		2.33	.10		50	31	70	41	88	60	74	49	92	52
21			.19	.27		33	20	71	40	72	62	71	53	67	40
22					.16	43	27	73	41	78	55	79	56	70	48
23	.10		.04	.09	.01	64	37	74	41	76	52	82	61	61	38
24		T				68	34	65	45	60	41	86	58	73	44
25						52	37	67	45	78	53	74	51	76	54
26	.13			.23	.21	43	31	81	51	84	62	77	58	69	41
27	T		.02	.28		41	31	83	54	82	55	80	56	59	35
28	.15		.04	.26		40	31	86	58	76	57	75	57	61	35
29	.04					51	30	89	57	75	47	78	59	70	42
30	.46			.62		65	36	91	59	65	52	84	55	77	50
31				T				92	52			73	52	79	54

CLIMATIC DATA --MINOT

Date	Precipitation April	Precipitation May	Precipitation June	Precipitation July	Precipitation Aug.	April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	August Max.	August Min.
1				.58	.10	54	24	57	28	96	45	71	53	77	50
2				T		61	32	53	31	72	49	76	53	73	47
3	.69	.01	.15			47	30	62	32	92	59	80	55	78	50
4						48	29	76	43	78	51	85	57	85	54
5	.04			.20	.06	47	31	84	49	76	51	80	55	89	59
6	T	.85		T		47	37	52	32	75	54	70	50	88	59
7		T	T		.03	67	33	51	30	75	50	75	51	82	54
8		.02				59	28	51	30	78	48	82	49	81	54
9		.52	.06		T	58	32	49	39	75	53	82	54	89	57
10		.04	.07	.37		68	40	64	37	73	54	81	59	72	40
11				T		69		72	47	77	46	75	57	69	45
12	.02		T	.55		47	14	74	41	83	52	70	52	78	51
13	T			.25		32	15	65	40	73	48	62	52	85	59
14	.43	.01		.16	.51	24	13	72	42	75	44	80	56	85	58
15	.10		.68	.22		25	12	61	41	77	50	81	57	83	59
16			.03	.67		38	15	60	34	68	40	84	59	92	54
17				.71		52	30	52	29	72	43	80	63	76	41
18	.93			.11	T	45	38	67	31	79	55	84	57	75	52
19	.55					44	36	72	51	88	58	83	57	85	59
20	.01	T	.01			54	32	69	50	95	53	73	52	90	50
21			.13	.04		44	25	77	47	77	54	78	55	71	46
22					.11	53	30	75	50	74	53	83	57	72	49
23		.03		T	.02	79	45	67	47	80	53	87	61	72	51
24		.10			.03	66	33	60	42	76	51	87	61	82	59
25	.19	T	.03			55	35	68	41	88	55	77	55	87	53
26	.05				.20	46	35	78	45	84	67	83	59	75	46
27	T					44	33	80	50	89	54	78	60	63	44
28			T	.21		39	26	87	55	78	53	80	52	69	42
29	T					63	29	86	54	79	54	82	56	75	50
30	.61		.14	.09		62	36	88	59	59	52	87	49	86	55
31								90	61			77	49	85	61

CLIMATIC DATA - WILLISTON

Date	Precipitation					Temperature									
	April	May	June	July	Aug.	April Max.	April Min.	May Max.	May Min.	June Max.	June Min.	July Max.	July Min.	August Max.	August Min.
1				.17		65	27	59	27	90	51	76	55	77	52
2						60	41	68	38	92	50	85	53	80	50
3	T					47	32	84	42	91	61	85	65	86	52
4				.10		52	32	83	55	77	49	81	55	90	56
5	T	.73		.39		60	36	83	32	75	61	75	53	89	58
6		.37	.15		.02	67	39	51	32	74	55	74	50	85	62
7						65	31	52	32	76	47	77	51	82	53
8		.06	.04			61	29	48	39	77	55	83	52	91	54
9		1.27	.30	.30	.02	73	32	58	39	71	56	82	58	90	57
10		.17				71	36	66	37	78	55	79	56	72	45
11	.17			.51		70	25	65	47	87	52	78	54	82	49
12	T					36	13	65	40	86	51	71	55	91	57
13	1.38				.77	34	15	72	38	75	49	80	59	88	61
14	.12				.13	22	12	73	43	83	46	82	53	81	57
15			.57	.16		29	-1	59	37	85	47	82	60	85	61
16				.70		45	23	51	33	75	47	84	58	82	54
17	.01			2.08		51	30	68	30	83	57	77	61	72	44
18						56	38	74	47	90	62	78	54	92	55
19						55	36	79	53	91	66	79	54	92	60
20	T			.27		52	33	80	43	80	51	79	55	91	49
21			.37			64	32	79	53	81	55	82	55	79	48
22		.38				80	42	77	53	80	49	87	55	76	51
23	T	.73			.10	79	48	58	46	78	53	88	61	89	52
24		.02				52	30	70	43	95	59	87	60	88	51
25	.33					46	35	70	47	96	62	88	58	88	56
26			.04	.25		45	31	75	48	89	62	88	62	69	41
27			.06			46	34	80	50	85	58	81	59	72	44
28			.14	.07		65	28	82	53	86	50	82	53	80	46
29			.49	T		66	36	83	55	70	56	90	59	89	52
30	.03		.12	T		56	33	83	55	75	53	90	50	91	55
31								92	55			78	48	90	60

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 of water and all postemergence treatments were applied in 8.5 gpa of water at 35 psi, 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

Abwo = Absinth wormwood
Barl (Bar) = Barley
Bdlf = Broadleaf
Bygr = Barnyardgrass
Cath = Canada thistle
Cobu = Common cocklebur
Colq = Common lambsquarters
Copu = Common purslane
Cosf = Volunteer sunflower
Dobr = Downy brome
Fach = False chamomile
Fibw = Field bindweed
Fipc = Field pennycress
Flwe (Flix) = Flixweed
Foba = Foxtail barley
Fxtl = Foxtail species
Grft = Green foxtail
Grpw (Gfpw) = Greenflower pepperweed
Howe = Horseweed
KOCZ = Kochia
Lent = Lentils
Lesp = Leafy spurge
Mael = Marshelder
Mesa = Meadow salsify
Mil (Fomi) = Foxtail millet
Nabe = Navy beans
Nfcf = Nightflowering catchfly
Pest = Perennial sowthistle
Pesw = Pennsylvania smartweed
Powe = Pondweed
Prlt = Prickly lettuce
Prpw = Prostrate pigweed
Qugr = Quackgrass
Rrpw = Redroot pigweed
Ruth = Russian thistle
Soyb (Sobe) = Soybean
Spkw = Spotted knapweed
Sugb (Sube) = Sugarbeet
Sunfl (Sufl, Cosf) = Sunflower
Tamu = Tansy mustard
Taoa = Tame oats
Tumu = Tumble mustard
Tymu = Tame yellow mustard
Vowh = Volunteer wheat
Wesa = Western salsify
Wht = Wheat
Wibw = Wild buckwheat
Wimu = Wild mustard
Wioa = Wild oats
Yeft = Yellow foxtail

Methods

PPI = Preplant incorporated
PEI = Preemergence incorporated
PE = Preemergence
P, PO, POST = Postemergence

Miscellaneous

DF = Dry flowable
F = Fall
FL (F) = Flowable
S = Spring
L = Liquid
G = Granules or gallon/A
Inc (I) = Incorporation
%ir (inju) = Percent injury rating
%sr (%std,strd) = Percent stand reduction
HT = Plant height
dma = Dimethylamine
bee = Butoxyethyl ester
UC = Union Carbide
RH = Rohm and Haas
RP = Rhone-Poulenc
POSS, PO, OC = Petroleum oil concentrate (17% emulsifier)
SPK = Spike stage
SURF, S = Surfactant
Tswt (TW) = Test weight
WP = Wettable power
WK = surfactant by DuPont
X-77 = Surfactant by Ortho
Yld = Yield

LIST OF HERBICIDES TESTED IN 1986

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
AC-222,293	AC293	methyl 6-(4-isopropyl-4-methyl-5-oxo-2-2-imidazolin-2-yl)-m-toluate + methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-z-yl)-p-toluate	Assert
AC-263,499	AC-499	5-ethyl-2-(4-isopropyl-4-methyl-5-oxy-2-imidazolin-2-yl)-nicotinic acid	Pursuit
Acifluorfen	Acif	5-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoic acid	Blazer Tackle
Alachlor	Alac	2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide	Lasso
Amitrole	Amit	3-amino-s-triazole + ammonium thiocyanate methyl sulfanilycarbamate	Amitrole
Atrazine	Atra	2-chloro-4-(ethylamino)-6-(isopropyl)-amino)-s-triazine	AAtrex
BAS 51400H	BAS514	3,7-dichloro-8-quinolinecarboxylic acid	None
BAS 51702H	BAS517	2[1-(ethoxyimino)butyl]-3-hydroxy-5-(2H-tetrahydrothicopyran-3-yl)-2-cyclohexen-1-one	None
Benazolin	Bena	4-chloro-2-oxo-3-benzothiazoline acetic acid	None
Bentazon	Bent	3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide	Basagran
Bromoxynil	Brox	3,5-dibromo-4-hydroxybenzonitrile	Brominal, Buctril
Butylate	Buty	S-ethyl diisobutylthiocarbamate	Sutan
CGA-131036	CGA131	N-(6-methoxy-y-methyl-1,3,5-triazin-2-yl-aminocarbonyl)-2-(2-chloroethoxy)-benzenesulfonamide	Amber
Chloramben	Clam	3-amino-2,5-dichlorobenzoic acid	Amiben
Chlorsulfuron	Clsu	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazine-2-yl)amino]carbonyl] benzene-sulfonamide	Glean

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Cinmethylin	Cinm	exo-1-methyl-4-(111-methyl-ethyl)-2-[(2-methylphenyl)methoxy]-7-oxa bicyclo	Cinch
Clopropoxydim	Clop	(E,E)-2-1[111[1-[[(3-chloro-2-propanyl)oxy]imino]butyl]-5-[2-ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	Selectone
Clopyralid	Clpy	3,6-dichloro-2-pyridinecarboxylic acid	Lontrel
Cyanazine	Cyan	2-[[4-chloro-6-(ethylamino)-s-triazine-2-yl]amino]-2-methylpropionitrile	Bladex
Cycloate	Cycl	S-ethyl N-ehtylthiocyclohexane-carbamate	Ro-Neet
Dalapon	Dala	2,2-dichloropropionic acid	Dowpon
Desmidipham	Desm	ethyl m-hydroxycarbanilate carbanilate (ester)	Betanex
Diallate	Dial	S(2,3-dichloroally)diisopropylthiocarbamate	Avadex
Dicamba	Dica	3,6-dichloro-o-anisic acid	Banvel
Dichlorprop		2-(2,4-dichlorophenoxy)propionic acid	Weedone 2,4-DP
Diclofop	Dicl	2-[4-(2,4-dichlorophenoxy)phenoxy] propanoic acid	Hoelon
Diethatyl	Diet	N-(chloroacetyl)-N-(2,6-diethylophenyl)-glycine	Antor
Difenzoquat	Dife	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium	Avenge
Dinoseb	Dino	2-sec-butyl-4,6-dinitrophenol	Dow General, Premerge
DPX-A7881	None	Not released	None
DPX-F6025		Ethyl-2-[[[[4-chloro-6-methyl-oxypyridmidin-2-yl]amino]carbonyl] amino]sulfonyl]benzoate	Classic

Common Name or Code Name	Abbre-viation[a]	Chemical Name	Trade Name
DPX-L5300		Methyl 2-[[[[N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)methylamino]carbonyl]amino]sulfonyl]benzoate	Express
DPX-R9674		Not released	Matrix
DPX-E8698		" "	None
DPX-R9521		" "	None
DPX-Y6202(-31)		2-[4-(6-chloro-2-quinoxalinyl)oxy] phenoxy propionic acid ethyl ester	Assure
DPX-M6316	DPX-M6	Methyl-3-[[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophenecarboxylate	Harmony
Endothall	Endo	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	Herbicide 273
EPTC	None	S-ethyl dipropylthiocarbamate	Eptam
Ethalfluralin	Etha	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluromethyl) benzenamine	Sonalan
Ethofumesate	Etho	(±)2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate	Nortron
Fenoxaprop	Feno	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propionic acid	Whip
Fluazifop-P	Flua-P	butyl(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid	Fusilade 2000
Fluorochloridone	Fluo	3-chlor-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone	Racer
Fluroxypyr	Flox	4 amino-3,5-dichloro-6-fluro-2-pyridloxyacetic acid	Starane
FMC-57020		2-(2-chlorophenyl)methyl-4,4-dimethyl-3-isoxozalidinone	Command
Fomesafen	Fome	5-[2-chloro-4-(trifluormethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide	Reflex
Glyphosate	Glyp	N-(phosphonomethyl)glycine	Roundup

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Haloxyfop	Halo	2-[4-[[3-chloro-5-(trifluoromethyl) -2-pyridinly]oxy]phenoxy]propanic acid	Verdict
Hexazinone	Hexa	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione	Velpar
Imazaquin	Imaq	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid	Scepter
Isoxaben	Isox	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dimethoxybenzamide	--
LAB 175659	LAB175	Not released	None
Lactofen	Lact	1'-(carboxyethexy)ethyl 5-3-chloro-4-(trifluoromethyl)phenoxy-2-nitrobenzoate	Cobra
Linuron	Linu	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	Lorox
MCPA	None	[(4-chloro-o-tolyl)oxy]acetic acid	Numerous
MCPP	None	2-[(4-chloro-o-tolyl)oxy]propionic acid	Numerous
Metolachlor	Meto	2-chloro-N-(2-ethyl-6-methylphenyl) -N-(2-methoxy-1-methylethyl)acetamide	Dual
Metribuzin	Metr	4-amino-6-tert-butyl-3-(methylthio)-as-triazine-5(4H)one	Sencor Lexone
Metsulfuron	Mets	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid	Ally/ Escort
Naptalam	Natp	N-1-napthylphtalamic acid	Alanap
Oryazlin	Oryz	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide	Surflan
Paraquat	Para	1,1'-dimethyl-4,4'-bipyridinium ion	Paraquat, Gramoxone
Pendimethalin	Pend	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dimitrobenzenamine	Prowl
Phenmedipham	Phen	methyl m-hydroxycarbanilate m-methylcarbanilate	Betanal

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Picloram	Picl	4-amino-3,5,6-trichlor-2-pyridine carboxylic acid	Tordon
PPG 1013	None	Not released	None
PPG 1259	None	Not released	None
Prometryn	Prom	2,4-bis(isopropylamino)-6-(methylthio)-s-triazine	Caparol
Propachlor	Prcl	2-chloro-N-isopropylacetanilide	Ramrod
Propanil	Prnl	3',4'-dichloropropionanilide	Stampede
Pyrazon	Pyra	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	Pyramin
R-25788, Dichlormid		2,2-dichloro-N,N-di-2-proycryl-acetamide	None
R-33865, Dietholate	Ext	O,O-diethyl-O-phenyl	None
RE-40885	None	Not released	None
RE-45601	None	Not released	None
SC-0051	None	Not released	None
SC-0098	None	Not released	None
SC-0224, sulphosate	Sulp	trimethylsulfarium carbonymethyl-aminomethyl phosphosate	Touchdown
SC-0735	None	Not released	None
Sethoxydim	Seth	2-(N-ethoxybutyrimidoyl)-5-(2-ethylthiopropyl)-3-hydroxy-2-cyclohexen-1-one	Poast
Sulfometuron		2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]benzoic acid	Oust
TCA	None	trichloroacetic acid	None
Terbutryn	Terb	2-(tert-butylamino)-4-(ethylamino)-6-(methylthio)-s-triazine	Igran
Triallate	Tria	S-(2,3,3-trichloroallyl)diisopropyl-thiocarbamate	Far-go
Tridiphane	Trid	2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxiane	Tandem

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Triclopyr	Tric	[(3,5,6-trichloro-2-pyridiryl)oxy] acetic acid	Garlon
Trifluralin	Trif	α,α,-trifluoro-2,6-dinitro-N-N-dipropyl-p-toluide	Treflan
2.4-D	None	(2,4-dichlorophenoxy)acetic acid	Numerous
2,4-DB		(2,4-dichlorophenoxy)butanoic acid	Several
2,4-DP	None	2-(2,4-dichlorphenoxy)propionic acid	None
Vernolate	Vern	S-propyl dipropythiocarbamate	Vernam

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 varies with available space, but usually was the first letters and numbers.

SOIL TEST RESULTS AT VARIOUS WEED EXPERIMENT LOCATIONS

	Soil Texture	Organic Matter	pH	N (lb/A)	P (lb/A)	K (lb/A)
Section 22 Fargo	Silty clay	6.5	7.5	Applied 70 lb/A N		
Mainstation Fargo	Silty clay	6.7	7.5	Applied 70 lb/A N		
Sugarbeet weed free	Silty clay	5.8	7.1	357	67	1200
Sugarbeet wild oat	Silty clay	4.8	7.9	268	26	650
Casselton, ND	Silty clay	4.0	7.9	Applied 80 lb/A N		
Glyndon, MN	Loam	3.1	7.9	122	40	1795
Crookston, MN	Silt loam	4.3	7.8	135	28	285
St. Thomas, ND	Silt loam	3.6	7.9	65	11	380
Argyle, MN	Silty clay loam	3.8	7.8	60	69	720
Clara City, MN	Loam	4.2	7.7	194	19	270
Hillsboro, ND	Silty clay	3.6	7.8	112	23	440
Colfax, ND	Silt loam	6.4	7.6	407	145	4600
Langdon, ND	Clay loam	4.6	7.8	Fertilized by test		
Minot, ND	Loam	2.7	7.0	Fertilized by test		
Williston, ND	Loam	2.3	6.8	Fertilized by test		
Carrington, ND	Loam	3.6	7.2	Fertilized by test		
Dickinson, ND Ranch HQ	Clay loam	4.4	6.0			
Chaffee, ND	Fine sandy loam	6.7	7.4			
New England, ND	Clay loam	5.8	6.7			
Valley City, ND	Stony loam	9.4	6.7			

Soil applied herbicides, Colfax, 1986. Herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots May 15 when the air temp. was 74F, soil temp. at six inches was 62F, wind was northwest at 0-3 mph, and the soil surface was dry with wet soil from 1 to 4 inches. Preplant incorporated herbicides were incorporated with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for all other treatments. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 15. Common lambsquarters and yellow foxtail control and sugarbeet injury were evaluated June 25. Wild mustard, common lambsquarters, redroot pigweed, and yellow foxtail control were evaluated July 7. Sugarbeets were counted in 60 feet of treated row from each plot and 60 feet of untreated row adjacent to each plot June 18 to determine sugarbeet stand reduction.

Treatment	Rate (lb/A)	6-25 Sgbt inj ratg	--- 7-7 --- Wimu cntl ratg	Rrpw cntl ratg	-- Average -- Colq cntl ratg	YeFxtl cntl ratg	6-18 Sgbt stand reduc
		(%)					
Metolachlor (Pre)	2	0	0	29	33	65	-20
Metolachlor (Pre)	3	3	0	48	50	65	-3
Metolachlor (PPI)	2	1	53	95	83	95	-11
Metolachlor (PPI)	3	9	55	99	90	96	-2
EPTC+Cycloate (PPI)	2+2	21	50	96	98	96	-4
EPTC+Cycloate (PPI)	1.5+2.5	9	66	95	99	96	-9
Diethatyl (Pre)	4	0	3	76	3	54	-8
Diethatyl (Pre)	6	1	0	33	8	64	-11
Diethatyl (PPI)	4	0	28	98	40	70	-3
Diethatyl (PPI)	6	3	33	93	52	87	-7
Ethofumesate (Pre)	3.75	0	8	81	52	65	-8
Ethofumesate (PPI)	3.75	0	86	99	95	97	-24
EPTC (PPI)	2.5	11	56	92	94	93	-7
Cycloate (PPI)	4	0	21	91	97	93	-2
Diethatyl+Cycloate (PPI)	4+3	9	70	98	95	97	-1
Diethatyl+Diallate (PPI)	4+2	8	40	96	93	92	-15
Diethatyl+EPTC (PPI)	4+1.5	19	61	99	96	96	6
Mean		5	37	83	69	83	-8
High mean		21	86	99	99	97	6
Low mean		0	0	29	3	54	-24
Coeff. of variation		102	47	17	15	13	-171
LSD(1 Percent)		10	33	26	20	20	24
LSD(5 Percent)		8	25	20	15	15	18
No. of reps		4	4	4	4	4	4

Summary

Metolachlor, diethatyl, and ethofumesate gave or tended to give better weed control when incorporated than when applied preemergence. All incorporated treatments gave 90% or greater control of common lambsquarters, redroot pigweed, and foxtail except diethatyl on common lambsquarters and foxtail and metolachlor at 2 lb/A on common lambsquarters. Sugarbeet stand reductions are negative because the treated four rows had more sugarbeets than adjacent untreated rows. EPTC+cycloate at 2+2 lb/A gave more sugarbeet injury than EPTC+cycloate at 1.5+2.5 lb/A. Based on visual injury ratings and sugarbeet stands, the following treatments tended to be injurious to sugarbeets: diethatyl+EPTC, diethatyl+cycloate, EPTC+cycloate at 2+2 lb/A, and metolachlor at 3 lb/A PPI.

Soil applied herbicides, Hillsboro, 1986. Preplant incorporated herbicides were applied and rototiller incorporated May 27 when the sky was sunny, air temp. was 88F, soil temp. at six inches was 69F, wind was 10-15 mph from the east, soil was dry on the surface, moist at 1-2 in., and wet at 3-4 in. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. Hilleshog Mono 5135 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 27 followed by application of preemergence treatments. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Wild mustard and green and yellow foxtail control and sugarbeet injury were evaluated July 22.

Treatment	Rate (lb/A)	Sugarbeet injury rating (%)	Wild Mustard control rating (%)	Gr & Ye Foxtail control rating (%)
Metolachlor (Pre)	2	0	8	16
Metolachlor (Pre)	3	0	0	35
Metolachlor (PPI)	2	0	7	91
Metolachlor (PPI)	3	0	54	95
EPTC+Cycloate (PPI)	2+2	0	20	96
EPTC+Cycloate (PPI)	1.5+2.5	0	16	98
Diethatyl (Pre)	4	0	0	10
Diethatyl (Pre)	6	0	0	96
Diethatyl (PPI)	4	0	13	85
Diethatyl (PPI)	6	0	10	91
Ethofumesate (Pre)	3.75	0	17	33
Ethofumesate (PPI)	3.75	0	78	91
EPTC (PPI)	2.5	0	0	99
Cycloate (PPI)	4	0	6	98
Diethatyl+Cycloate (PPI)	4+3	0	22	99
Diethatyl+Diallate (PPI)	4+2	0	17	99
Diethatyl+EPTC (PPI)	4+1.5	0	17	96
Mean		0	17	78
High mean		0	78	99
Low mean		0	0	10
Coeff. of variation		0	62	9
LSD(1 Percent)		0	23	16
LSD(5 Percent)		0	17	12
No. of reps		2	3	3

Summary

Metolachlor, diethatyl, and ethofumesate generally gave better weed control when incorporated than when surface applied. None of the treatments gave good wild mustard control or caused sugarbeet injury.

Simulated soil residue, Sabin, 1986. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots and incorporated with a rototiller set two inches deep 9:00 am May 23 when the air temperature was 57F, sky was cloudy, and wind was southeast at 12 mph. Rain showers throughout the day and night after herbicide incorporation delayed seeding until May 26 when Beta 3394 sugarbeet was seeded 1.25 inches deep in 22 inch rows. Sugarbeets were maintained weed free by hand weeding throughout the growing season and hand thinned to an 8 inch spacing June 27. Sugarbeets were harvested from 72 feet of the center two rows of each plot September 26. Sugarbeet injury was evaluated June 26.

Treatment	Rate (lb/A)	Sgbt inj ratg (%)	Sucrose (%)	Root Yield (ton/A)	Impurity Index	Loss to Molass (%)	Extract Sucrose (lb/A)
Metolachlor	2	5	14.9	21.3	964	1.9	5402
Metolachlor	3	16	15.0	19.3	990	2.0	4936
Metolachlor	4	21	14.2	20.0	1116	2.2	4737
Untreated Check	.	0	15.5	18.8	920	1.9	5044
Trifluralin	.05	1	14.1	19.2	1169	2.2	4461
Trifluralin	.1	1	14.5	20.1	1037	2.0	4922
Trifluralin	.15	10	14.6	20.3	999	2.0	5068
Trifluralin	.2	28	13.7	19.5	1241	2.3	4314
Trifluralin	.3	28	14.3	17.6	1040	2.0	4277
Trifluralin	.4	46	14.7	18.5	1047	2.1	4619
Ethalfluralin	.05	0	14.6	19.2	1086	2.1	4670
Ethalfluralin	.1	3	15.1	20.1	926	1.9	5204
Ethalfluralin	.15	11	14.7	19.1	1037	2.0	4623
Ethalfluralin	.2	28	14.6	17.6	991	1.9	4351
Ethalfluralin	.3	39	14.4	16.6	1051	2.0	4014
Ethalfluralin	.4	56	13.9	15.2	1310	2.5	3372
Pendimethalin	.05	3	14.8	20.8	1070	2.1	5171
Pendimethalin	.1	5	13.9	19.6	1128	2.1	4472
Pendimethalin	.15	11	13.9	21.9	1036	2.0	5120
Pendimethalin	.2	18	14.2	19.6	1125	2.1	4573
Pendimethalin	.3	30	14.8	20.2	1022	2.0	4987
Pendimethalin	.4	35	13.8	20.4	1218	2.3	4557
Diethatyl	4	6	14.1	22.6	1080	2.0	5243
Diethatyl	6	14	14.1	21.9	1157	2.2	5164
Mean		17	14.4	19.6	1073	2.1	4721
High mean		56	15.5	22.6	1310	2.5	5402
Low mean		0	13.7	15.2	920	1.9	3372
Coeff. of variation		37	6.1	10.4	16	11.8	12
LSD(1 Percent)		12	1.6	3.8	320	0.5	1013
LSD(5 Percent)		9	1.2	2.9	242	0.3	766
No. of reps		4	4.0	4.0	4	4.0	4

Summary

Only those plots treated with trifluralin at 0.3 lb/A, and ethalfluralin at 0.3 or 0.4 lb/A yielded significantly less extractable sucrose than the untreated check.

EPTC and cycloate conditioning, Fargo (NW section 22), 1986. An experiment with EPTC was conducted adjacent to an experiment with cycloate on a Fargo silty clay with 3.5% organic matter. Herbicide treatments are described in the tables. Spring 1 = herbicide application in the spring of 1982, spring 2 = spring of 1983, spring 3 = spring of 1984. Treatments were applied in 1982, 1983, 1984, 1982+1983, or 1982+1983+1984. Also, two treatments in each experiment were applied in the fall and spring of 1982+1983+1984 (total of six applications). No herbicide was applied in 1985. EPTC at 4.0 lb/A was broadcast over both experiments May 30, 1986. Dietholate was added to EPTC and cycloate to inhibit microbial breakdown of the herbicide. Herbicides were incorporated with a rototiller set 4 inches deep in 1982, 1983, and 1984. EPTC was incorporated by double tandem disking in 1986. Oats were seeded as a bioassay species May 30 and June 13, 1986. Oats control was evaluated July 22, 1986.

Table 1. Cycloate conditioning experiment, Fargo (NW section 22), 1986. Cycloate was applied in 1982 (1), 1983 (2), and 1984 (3). EPTC at 4.0 lb/A was applied over all treatments May 30, 1986.

Treatment	Rate (lb/A)	Seeded May 30, 1986 ------- Oats	Seeded June 13, 1986 Control -------
		------------	(%) ------------
Untreated in 1982, 1983, 1984.	.	92	93
Cycloate Spring 1	4	97	98
Cycloate+dietholate Spring 1	4	97	98
Cycloate Spring 1	8	97	95
Cycloate+dietholate Spring 1	8	98	98
Cycloate Spring 1&2	4	97	98
Cycloate+dietholate Spring 1&2	4	97	97
Cycloate Spring 1&2	8	99	95
Cycloate+dietholate Spring 1&2	8	97	98
Cycloate Spring 1&2&3	4	100	97
Cycloate+dietholate Spring 1&2&3	4	99	96
Cycloate Spring 1&2&3	8	98	99
Cycloate+dietholate Spring 1&2&3	8	99	99
Cycloate Spring 2	4	98	99
Cycloate+dietholate Spring 2	4	97	97
Cycloate Spring 2	8	99	97
Cycloate+dietholate Spring 2	8	99	98
Cycloate Spring 3	4	89	96
Cycloate+dietholate Spring 3	4	96	98
Cycloate Spring 3	8	99	96
Cycloate+dietholate Spring 3	8	94	96
Cycloate Fall and Spring 1&2&3	8	89	99
Cyclo+dietholate Fall and Spr 1&2&3	8	100	96
Mean		97	97
High mean		100	99
Low mean		89	93
Coeff. of variation		4	3
LSD(1 Percent)		7	4
LSD(5 Percent)		5	3
No. of reps		4	4

Experiment continued on next page.

Table 2. EPTC conditioning experiment, Fargo (NW section 22), 1986. EPTC was applied in 1982 (1), 1983 (2), and 1984 (3). EPTC at 4 lb/A was applied over all treatments May 30, 1986.

Treatment	Rate (lb/A)	Seeded May 30, 1986	Seeded June 13, 1986
		-------- Oats Control (%)	--------
Untreated in 1982, 1983, or 1984.	.	98	86
EPTC Spring 1	3	100	79
EPTC+dietholate Spring 1	3	98	61
EPTC Spring 1	6	98	50
EPTC+dietholate Spring 1	6	97	50
EPTC Spring 1	12	100	69
EPTC+dietholate Spring 1	12	97	58
EPTC Spring 1&2	3	98	76
EPTC+dietholate Spring 1&2	3	99	69
EPTC Spring 1&2	6	97	53
EPTC+dietholate Spring 1&2	6	99	65
EPTC Spring 1&2	12	97	44
EPTC+dietholate Spring 1&2	12	97	58
EPTC Spring 1&2&3	3	97	33
EPTC+dietholate Spring 1&2&3	3	94	40
EPTC Spring 1&2&3	6	96	13
EPTC+dietholate Spring 1&2&3	6	97	11
EPTC Spring 1&2&3	12	90	9
EPTC+dietholate Spring 1&2&3	12	95	34
EPTC Spring 2	3	97	56
EPTC+dietholate Spring 2	3	97	75
EPTC Spring 2	6	99	54
EPTC+dietholate Spring 2	6	97	65
EPTC Spring 2	12	95	59
EPTC+dietholate Spring 2	12	96	62
EPTC Spring 3	3	98	44
EPTC+dietholate Spring 3	3	99	19
EPTC Spring 3	6	99	10
EPTC+dietholate Spring 3	6	97	19
EPTC Spring 3	12	97	0
EPTC+dietholate Spring 3	12	98	30
EPTC Fall and Spring 1&2&3	8	92	55
EPTC+dietholate Fall and Spr 1&2&3	8	96	60
Mean		97	47
High mean		100	86
Low mean		90	0
Coeff. of variation		4	39
LSD(1 Percent)		6	34
LSD(5 Percent)		5	26
No. of reps		4	4

Summary

Previous treatment with cycloate did not reduce oats control from EPTC in 1986 (Table 1). Previous treatment with EPTC generally did not reduce control of the first oats planting from EPTC in 1986 (Table 2). However, EPTC applied in 1986 gave or tended to give less control of the second oats planting where EPTC was previously applied than where EPTC was not applied. Oats control in 1986 generally was less in plots that were previously treated with EPTC in 1984 than in plots not treated previously in 1984.

Soil applied plus postemergence herbicides, Argyle, 1986. Preplant incorporated herbicides were applied and rototiller incorporated 1:00pm May 19 when the air temp. was 72F, soil temp. at six inches was 62F, sky was mostly sunny, wind was south 10-15 mph, soil was dry on surface, and wet at 1-4 inches. The rototiller was operated four inches deep for EPTC+cycloate and two inches deep for metolachlor. Beta 3394 sugarbeet was seeded 1.25 inches deep in rows 1,2, and 3 and Mitsui Monohikari was seeded in rows 4,5, and 6. Preemergence herbicides were applied after seeding May 19. The first portion of split application postemergence herbicides were applied June 10 when sugarbeets were 2-4 leaf, redroot pigweed were 2-6 leaf (1 inch tall), and barnyard grass were 1-3 inches tall. All single application postemergence treatments and the second portion of split application treatments were applied June 17 when sugarbeets were cotyledon to 6 leaf, redroot pigweed were 4 leaf to 2.5 inches tall, and barnyard grass were 2-5 inches tall. The final portion of split applications were applied June 26.

Date	Time	Air Temp.	Soil Temp. at 6 inches	Relative Humidity	Wind Speed	Wind Direction
June 10	1:00 pm	71 F	66 F	64%	10-15 mph	North
June 17	11:30 am	75 F	63 F	48%	8-12 mph	South
June 26	10:00 am	79 F	79 F	64%	5 mph	Northeast

June 10 and June 17 the soil was dry on the surface and wet at 1-4 inches. June 26 the soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. All treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Barnyard grass and redroot pigweed control and sugarbeet injury were evaluated July 23.

Treatment*	Rate (lb/A)	Sugarbeet injury rating	Redroot Pigweed control rating (%)	Barnyard Grass control rating
EPTC+Cycloate (PPI)	2+2	0	73	98
Diethatyl (Pre)	5	0	8	38
Ethofumesate (Pre)	3.5	0	10	9
Metolachlor (Pre)	2	0	2	2
Metolachlor (Pre)	3	0	18	36
Metolachlor (PPI)	2	0	82	91
Metolachlor (PPI)	3	0	86	96
Desmed&Phenmed/Desmed&Phenmed	.5/.5	0	86	31
Desmed&Phenmed/Desmed&Phenmed	.33/.5	0	84	40
Desmed&Phenmed/Desmed&Phenmed	.5/.75	0	93	43
Des&Phen/Des&Phen/Des&Phen	.5/.75/1	0	99	73
Des&Phen/Des&Phen/Des&Phen	.33/.5/.75	0	99	76
Des&Phen/Des&Phen+Dalapon	.5/.5+1	5	84	51
De&Ph/De&Ph/De&Ph+Dalapon	.5/.5/1+2	13	99	83
De&Ph/De&Ph/De&Ph+Etho	.5/.5/.75+1.5	14	99	78
D&P/D&P/D&P+Seth+OC	.5/.5/1+.2+.25G	13	99	97
Clopyralid	.19	0	0	0
Clopyralid	.25	0	0	0
Des&Phen/Des&Phen+Clopyr	.5/.5+.19	0	93	39
De&Ph/De&Ph+Clopyralid	.5/.5+.25	0	98	55
De&Ph+Clopy/De&Ph+Clopy	.5+.12/.5+.12	0	93	31

Table continued on next page.

Soil applied plus postemergence herbicides, Argyle, 1986. (continued)

Treatment*	Rate (lb/A)	Sugarbeet injury rating	Redroot Pigweed control rating (%)	Barnyard Grass control rating
EPTC+Cycl/De&Ph/De&Ph	2+2/.5/.5	19	94	97
EP+Cy/D&P/D&P/D&P+Dal	2+2/.5/.5/.75+2	41	99	95
Diet/Des&Phen/Des&Phen	5/.5/.5	3	95	90
Diet/D&P/D&P/D&P+Dala	5/.5/.5/1+2	11	99	87
Meto (Pre)/Des&Phen/Des&Phen	3/.5/.5	3	92	74
Meto(Pre)/D&P/D&P/D&P+Dal	3/.5/.5/1+2	23	99	91
Etho/Des&Phen/Des&Phen	3.5/.5/.5	0	97	69
Etho/D&P/D&P/D&P+Dala	3.5/.5/.5/1+2	16	99	59
Et/DP/DP/DP+Se+O	3.5/.5/.5/.5+.2+.25G	3	99	98
Diet/De&Ph/De&Ph+Clopy	5/.5/.5+.19	0	98	84
Diet/DP+Clop/DP+Clop	5/.5+.12/.5+.12	3	98	68
Mean		5	77	62
High mean		41	99	98
Low mean		0	0	0
Coeff. of variation		128	9	25
LSD(1 Percent)		12	13	28
LSD(5 Percent)		9	10	22
No. of reps		4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Beta 3394 and Mitsui Monohikari responded similarly to the herbicide treatments so sugarbeet injury was evaluated over both varieties. Sugarbeets were much slower to emerge in plots which had been rototilled than in other plots even though a Brillion packer was used on the plots after incorporation and before seeding. The incorporation caused a lumpy seedbed which packing could not correct. Many sugarbeets emerged between June 10 and June 17. Thus, the sugarbeets in plots treated with EPTC+cycloate generally were smaller than sugarbeets in other plots where postemergence herbicides followed soil applied herbicides. These smaller sugarbeets were injured more than the larger sugarbeets and that is why the sugarbeet injury was greater from post herbicides over EPTC + cycloate than from post herbicides over preemergence diethatyl, metolachlor, and ethofumesate. Three applications of desmedipham plus phenmedipham (Betamix) gave nearly total control of redroot pigweed while two applications did not. Two applications of desmedipham+phenmedipham following a soil applied herbicide gave better redroot pigweed control than when applied to previously untreated plots. Incorporated metolachlor gave better weed control than when surface applied.

Soil applied plus postemergence herbicides, Clara City, 1986. Preplant incorporated herbicides were applied and rototiller incorporated May 22 when the air temp. was 75F, soil temp. at six inches was 56F, wind was east at 10-15 mph, sky was sunny, and the soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. The rototiller was set 4 inches deep for treatments containing EPTC or cycloate and 2 inches deep for other PPI treatments. Great Western Mono-Hy R103 sugarbeet was seeded 1.25 inches deep in rows 1, 2, and 3 of a six row planter with 22 inch row spacing. Mitsui Monohikari sugarbeet was seeded in rows 4, 5, and 6. Preemergence herbicides were applied May 22. Soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first half of split application postemergence treatments was applied 4:00 pm June 6 when the air temp. was 78F, soil temp. at six inches was 67F, relative humidity was 59%, wind was south at 10-15 mph, soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. Sugarbeets were cotyledon to 2 leaf and green foxtail were 1-3 leaf (emerging to 2 inches tall) June 6. The second half of postemergence split treatments and all single application postemergence treatments were applied 12:30 pm June 18 when the air temp. was 90F, soil temp. at six inches was 68F, relative humidity was 53%, wind was south at 20-25 mph, soil was dry on the surface and wet below the surface. Sugarbeets were 6 leaf and green foxtail were 4-5 leaf (4-6 in. tall) June 18. All postemergence herbicide treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet injury and green foxtail control were evaluated July 1.

Treatment*	Rate (lb/A)	Green Foxtail control rating (%)	Sugarbeet injury rating (%)
Metolachlor (PPI)	2	70	0
Metolachlor (PPI)	3	88	0
Metolachlor (Pre)	2	50	0
Metolachlor (Pre)	3	74	0
Diethatyl (PPI)	5	51	0
Diethatyl (Pre)	5	50	0
Ethofumesate (Pre)	3.5	21	0
EPTC+Cycloate (PPI)	2+2	92	0
EPTC (PPI)	3	88	0
EPTC+Diethatyl (PPI)	2+4	88	0
EPTC+Metolachlor (PPI)	2+2	93	0
Sethoxydim+OC	.2+.25G	96	0
Fluazifop-P+OC	.156+.25G	86	0
Fluazifop-P+OC	.188+.25G	90	0
Desmedipham&Phenmedipham	1	15	0
Desmed&Phenmed/Desmed&Phenmed	.5/.5	75	0
Desmed&Phenmed/Desmed&Phenmed	.5/.75	78	0
De&Ph/De&Ph+Sethoxy+OC	.5/.5+.2+.25G	91	9
De&Ph/De&Ph+Flua-P+OC	.5/.5+.156+.25G	91	0
De&Ph/De&Ph+Flua-P+OC	.5/.5+.188+.25G	91	8

Table continued on next page.

Soil applied plus postemergence herbicides, Clara City, 1986. (continued)

Treatment*	Rate (lb/A)	Green Foxtail control rating (%)	Sugarbeet injury rating (%)
Des&Phen/Des&Phen+Dalapon	.5/.5+1	80	5
De&Ph/De&Ph+Ethofumesate	.5/.5+1	75	4
De&Ph/De&Ph+Endothall	.5/.5+.5	75	0
De&Ph/De&Ph+Clopyralid	.5/.5+.2	69	0
Clopyralid	.2	0	0
Des&Phen+Clopy+Seth+OC	.5+.2+.2+.25G	90	0
EPTC+Cycl/Des&Phen/Des&Phen	2+2/.5/.5	97	6
EP+Cy/DP/DP+Seth+OC	2+2/.5/.5+.2+.25G	98	9
Diet(Pre)/Des&Phen/Des&Phen	5/.5/.5	89	0
Diet(Pre)/DP/DP+Se+OC	5/.5/.5+.2+.25G	98	3
Diet(Pre)/De&Ph/De&Ph+Dala	5/.5/.5+1	94	11
Diet(Pre)/De&Ph/D&P+Clopy	5/.5/.5+.2	91	3
Mean		76	2
High mean		98	11
Low mean		0	0
Coeff. of variation		10	301
LSD(1 Percent)		14	10
LSD(5 Percent)		10	7
No. of reps		4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Metolachlor incorporated at 2 lb/A gave better foxtail control than diethatyl incorporated at 5 lb/A. Metolachlor incorporated at 3 lb/A gave foxtail control similar to treatments including EPTC. Sethoxydim at 0.2 lb/A gave better green foxtail control than fluazifop-P at 0.156 lb/A. The two sugarbeet varieties responded similarly to herbicides so sugarbeet injury was reported as a single rating.

Soil applied and postemergence herbicides, Crookston, 1986. Soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots May 16. Preplant incorporated herbicides were incorporated with a rototiller set four inches deep for EPTC+cycloate and two inches deep for diethatyl and metolachlor. Soil was dry on the surface and moist at 1 to 4 inches. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. The first portion of split application postemergence herbicides was applied June 9 when wild mustard were in the 2-6 leaf stage (0.5 to 2 inches tall), green and yellow foxtail were emerging to 2 inches tall, wild oats were 4-6 inches tall, and sugarbeets had 2-4 leaves. All single application postemergence treatments and the second portion of split applied treatments were applied June 16 when wild mustard had 4-8 leaves (2 inches tall), green and yellow foxtail were 0.5 to 4 inches tall, wild oats were 8-14 inches tall, and sugarbeets were in the 6 leaf stage. The third portion of split applied postemergence treatments was applied June 26 when sugarbeets were in the 8-10 leaf stage.

Date	Time of day	Air Temp.	Soil Temp. at 6 inch.	Relative Humidity	Wind Direct	Wind Speed
May 16	1:00 pm	60 F	52 F	----	West	10-15 mph
June 9	10:30 am	80 F	67 F	44%	South	15-20 mph
June 16	11:00 am	68 F	68 F	43%	North	15-20 mph
June 26	7:45 am	77 F	73 F	83%	West	0-2 mph

All postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches on June 9, June 16, and June 26. Wild mustard, green and yellow foxtail, and wild oats control and sugarbeet injury were evaluated July 11. Sugarbeets were hand thinned to an 8 inch spacing July 14. Sugarbeets were harvested from 68 feet of the center two rows of each plot September 25.

Treatment*	Rate (lb/A)	Sucrose (%)	Root Yield (ton/A)	Impurity Index	Loss to Mol (%)	Extract Sucrose (lb/A)
Hand Weeded Check	.	17.7	12.9	542	1.3	4198
EPTC+Cycloate (PPI)	2+2	17.6	12.6	547	1.3	4077
Diethatyl (Pre)	5	16.7	5.0	596	1.3	1531
Ethofumesate (Pre)	3.5	16.9	5.4	638	1.4	1669
Desmed&Phenmed/Desmed&Phenmed	.5/.5	16.4	7.7	708	1.6	2244
Desmed&Phenmed/Desmed&Phenmed	.5/.75	16.3	9.0	709	1.6	2619
Des&Phen/Des&Phen+Dalapon	.5/.5+1	16.7	8.2	698	1.5	2462
De&Ph/De&Ph+Sethoxy+OC	.5/.5+.2+.25G	17.3	12.5	614	1.4	3945
De&Ph/De&Ph+Flua-P+OC	.5/.5+.188+.25G	17.7	11.5	556	1.3	3727
Des&Phen/Des&Phen/Des&Phen	.33/.5/.75	17.2	11.6	615	1.4	3636
D&P/D&P/D&P+Seth+OC	.5/.5/.75+.2+.25G	17.2	11.1	644	1.5	3432
De&Ph/De&Ph/De&Ph+Dalapon	.5/.5/1+1	17.1	11.5	642	1.5	3566
EPTC+Cyc/Des&Phen/Des&Phen	2+2/.5/.5	17.5	12.7	623	1.5	4027
EPTC+Cyc/De&Ph/De&Ph+Dala	2+2/.5/.5+1	18.0	12.8	541	1.3	4247
EP+Cy/DP/DP+Seth+OC	2+2/.5/.5+.2+.25G	17.5	13.4	560	1.3	4300
Diet(Pre)/Des&Phen/Des&Phen	5/.5/.5	17.5	11.0	525	1.3	3552
Diet(Pre)/De&Ph/De&Ph+Dala	5/.5/.5+1	17.2	10.7	608	1.4	3351
Diet Pre/DP/DP+Seth+O	5/.5/.5+.2+.25G	16.9	12.2	649	1.5	3746
Diet(Pre)/DP/DP/D&P+Dala	5/.5/.5/1+1	16.7	12.1	641	1.5	3663
Etho(Pre)/Des&Phen/Des&Phen	3.5/.5/.5	16.7	12.9	708	1.6	3844

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Soil applied and postemergence herbicides, Crookston, 1986. (continued)

Treatment*	Rate (lb/A)	Sucrose (%)	Root Yield (ton/A)	Impurity Index	Loss to Mol (%)	Extract Sucrose (lb/A)
Mean		17.1	10.8	618	1.4	3392
High mean		18.0	13.4	709	1.6	4300
Low mean		16.3	5.0	525	1.3	1531
Coeff. of variation		3.6	9.3	16	12.2	10
LSD(1 Percent)		1.2	1.9	181	0.3	627
LSD(5 Percent)		0.9	1.4	136	0.2	471
No. of reps		4.0	4.0	4	4.0	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Plots treated with only postemergence herbicides yielded less extractable sucrose than the hand weeded check. Plots treated with EPTC+cycloate alone or plus postemergence herbicides yielded similarly to the hand weeded check.

Soil applied and postemergence herbicides, Crookston, 1986. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	G&Y Fxtl cntl ratg	Wioa cntl ratg	Wimu cntl ratg
		-------	------- (%)	-------	-------
Hand Weeded Check	.	0	99	99	99
EPTC+Cycloate (PPI)	2+2	15	98	94	45
Diethatyl (Pre)	5	0	73	39	10
Diethatyl (PPI)	5	0	86	76	1
Metolachlor (Pre)	2	0	66	6	10
Metolachlor (Pre)	3	0	83	15	13
Metolachlor (PPI)	2	0	94	59	60
Metolachlor (PPI)	3	10	98	60	28
Ethofumesate (Pre)	3.5	0	73	60	43
Desmed&Phenmed/Desmed&Phenmed	.5/.5	0	80	66	99
Desmed&Phenmed/Desmed&Phenmed	.5/.75	0	61	60	99
Des&Phen/Des&Phen+Dalapon	.5/.5+1	3	82	73	99
Des&Phen/Des&Phen+Ethofume	.5/.5+1	3	85	66	99
De&Ph/De&Ph+Sethoxy+OC	.5/.5+.2+.25G	5	98	93	99
De&Ph/De&Ph+Flua-P+OC	.5/.5+.188+.25G	3	93	95	99
De&Ph/De&Ph+Clopyralid	.5/.5+.2	0	68	60	99
Des&Phen/Des&Phen/Des&Phen	.33/.5/.75	3	89	81	99
D&P/D&P/D&P+Seth+OC	.5/.5/.75+.2+.25G	0	98	95	99
De&Ph/De&Ph/De&Ph+Dalapon	.5/.5/1+1	3	95	87	99

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Soil applied and postemergence herbicides, Crookston, 1986. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	G&Y Fxtl cntl ratg	Wioa cntl ratg	Wimu cntl ratg
		------------	------------ (%)	------------	------------
Clopyralid	.2	0	0	0	0
Sethoxydim+OC	.2+.25G	0	99	99	0
Fluazifop-P+OC	.156+.25G	0	96	97	0
Fluazifop-P+OC	.188+.25G	0	97	99	0
EPTC+Cyc/Des&Phen/Des&Phen	2+2/.5/.5	25	99	97	99
EPTC+Cyc/De&Ph/De&Ph+Dala	2+2/.5/.5+1	33	99	96	99
EP+Cy/DP/DP+Seth+OC	2+2/.5/.5+.2+.25G	23	99	98	99
Diet(Pre)/Des&Phen/Des&Phen	5/.5/.5	5	90	66	99
Diet(Pre)/De&Ph/De&Ph+Dala	5/.5/.5+1	10	95	77	99
Diet Pre/DP/DP+Seth+O	5/.5/.5+.2+.25G	3	98	89	99
Diet(Pre)/DP/DP/D&P+Dala	5/.5/.5/1+1	3	98	80	99
Etho(Pre)/Des&Phen/Des&Phen	3.5/.5/.5	3	92	88	99
Mean		5	86	73	67
High mean		33	99	99	99
Low mean		0	0	0	0
Coeff. of variation		93	7	17	12
LSD(1 Percent)		8	11	23	15
LSD(5 Percent)		6	9	17	11
No. of reps		4	4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Desmedipham+phenmedipham (Betamix) gave excellent control of wild mustard. Plots treated with EPTC+cycloate alone or plus postemergence herbicides had the greatest sugarbeet injury but also had the best yields.

Soil applied plus postemergence herbicides, East Grand Forks, 1986. Preplant incorporated herbicides were applied and rototiller incorporated May 20 when the air temp. was 70F, soil temp. at six inches was 62F, sky was sunny, wind was south at 15-20 mph, soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. The rototiller was operated 4 inches deep for EPTC+cycloate and 2 inches deep for metolachlor. Beta 3394 sugarbeet was seeded 1.25 inches deep in rows 1, 2, and 3 and Mitsui Monohikari in rows 4, 5, and 6. Row width was 22 inches. Preemergence herbicide treatments were applied May 20 after seeding. The first portion of split application postemergence herbicides were applied June 9 when sugarbeets were 2-4 leaf, green and yellow foxtail were emerging to 3 inches tall, and wild oats were 4-6 inches tall. All single application treatments and the second portion of split treatments were applied June 14 when sugarbeets were cotyledon to 6 leaf, green and yellow foxtail were 2-4 inches tall, and wild oats was 4-10 inches tall. The final portion of split applications were applied June 26.

Date	Time	Air Temp.	Soil Temp. at 6 inches	Relative Humidity	Wind Speed	Wind Direction
June 9	2:00 pm	82 F	68 F	40%	15-20 mph	South
June 14	10:30 am	72 F	63 F	46%	5-10 mph	South
June 26	11:45 am	83 F	79 F	---	5-8 mph	East

The soil surface June 9 and June 14 was dry, moist at 1-2 inches, and wet at 3-4 inches. On June 26 the soil surface was dry and moist at 1-4 inches. All treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Wild oats and green and yellow foxtail control and sugarbeet injury were evaluated July 11. Sugarbeets were counted in 60 feet of treated row from each plot and 60 feet of untreated row adjacent to each plot June 20 to determine sugarbeet stand reduction.

Treatment*	Rate (lb/A)	Sgbt injury rating	G&YFxtl control rating	Wioa control rating	Sgbt stand reduction
		(%)			
EPTC+Cycloate (PPI)	2+2	0	92	84	-10
Diethatyl (Pre)	5	0	43	5	-33
Ethofumesate (Pre)	3.5	0	10	0	-22
Metolachlor (Pre)	2	0	18	0	-30
Metolachlor (Pre)	3	0	23	13	-35
Metolachlor (PPI)	2	0	92	48	-13
Metolachlor (PPI)	3	0	93	46	-17
Desmed&Phenmed/Desmed&Phenmed	.5/.5	5	69	50	-17
Desmed&Phenmed/Desmed&Phenmed	.33/.5	0	65	22	-30
Desmed&Phenmed/Desmed&Phenmed	.5/.75	8	75	17	-12
Des&Phen/Des&Phen/Des&Phen	.5/.75/1	25	93	63	-12
Des&Phen/Des&Phen/Des&Phen	.33/.5/.75	3	84	68	-28
Des&Phen/Des&Phen+Dalapon	.5/.5+1	8	59	31	-2
De&Ph/De&Ph/De&Ph+Dalapon	.5/.5/1+2	26	94	75	-22
De&Ph/De&Ph/De&Ph+Etho	.5/.5/.75+1.5	29	90	77	-21
D&P/D&P/D&P+Seth+OC	.5/.5/1+.2+.25G	20	98	93	-14

Table continued on next page.

Soil applied plus postemergence herbicides, East Grand Forks, 1986. (cont.)

Treatment*	Rate (lb/A)	Sgbt injury rating	G&YFxtl control rating	Wioa control rating	Sgbt stand reduction
		-------	-------	(%) -------	-------
Clopyralid	.19	0	0	0	-22
Clopyralid	.25	0	0	0	-19
Des&Phen/Des&Phen+Clopyr	.5/.5+.19	9	58	35	-16
De&Ph/De&Ph+Clopyralid	.5/.5+.25	8	51	14	-21
De&Ph+Clopy/De&Ph+Clopy	.5+.12/.5+.12	4	59	20	-12
EPTC+Cycl/De&Ph/De&Ph	2+2/.5/.5	23	94	95	-1
EP+Cy/D&P/D&P/D&P+Dal	2+2/.5/.5/.75+2	44	99	99	-4
Diet/Des&Phen/Des&Phen	5/.5/.5	0	92	39	-40
Diet/D&P/D&P/D&P+Dala	5/.5/.5/1+2	25	97	89	-28
Meto (Pre)/Des&Phen/Des&Phen	3/.5/.5	4	81	45	-18
Meto(Pre)/D&P/D&P/D&P+Dal	3/.5/.5/1+2	24	93	82	-52
Etho/Des&Phen/Des&Phen	3.5/.5/.5	5	50	67	-38
Etho/D&P/D&P/D&P+Dala	3.5/.5/.5/1+2	26	88	75	-4
Et/DP/DP/DP+Se+O	3.5/.5/.5/.5+.2+.25G	9	99	96	-35
Diet/De&Ph/De&Ph+Clopy	5/.5/.5+.19	8	84	40	-25
Diet/DP+Clop/DP+Clop	5/.5+.12/.5+.12	3	69	40	-20
Mean		10	69	48	-21
High mean		44	99	99	0
Low mean		0	0	0	-52
Coeff. of variation		61	18	28	-90
LSD(1 Percent)		11	23	25	35
LSD(5 Percent)		8	17	19	26
No. of reps		4	4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Beta 3394 and Monohikari sugarbeet responded similarly to the herbicides so sugarbeet injury ratings and stand counts were made over both varieties. Sugarbeet stand reductions were negative because the treated four rows had more sugarbeets than the adjacent untreated rows. Based on sugarbeet injury ratings and stand reductions, EPTC + cycloate followed by postemergence herbicides and ethofumesate followed by desmedipham+phenmedipham twice at 0.5 lb/A+desmedipham+phenmedipham(Betamix)+dalapon at 1+2 lb/A were more injurious than other treatments. Treatments including sethoxydim and treatments with EPTC+cycloate followed by postemergence herbicides gave over 90% control of foxtail and wild oats.

Wild oats control with diallate plus fluazifop-P and sethoxydim, Fargo (NW section 22), 1986. Diallate was applied in 17 gpa water at 40 psi to the center four rows of six row plots and rototiller incorporated two inches deep 1:30 pm May 28 when the air temp. was 86F, soil temp. at six inches was 60F, and the wind was south at 6 mph. Hilleshog Mono 5135 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 28. Postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots 11:00 am June 24 when the air temp. was 69F, soil temp. at six inches was 64F, relative humidity was 51%, wind was southeast at 5-10 mph, and the soil was very wet on the surface and below. Wild oats and green and yellow foxtail were 2 leaf to tillering (4-8 inches tall) June 24. Wild oats and green and yellow fo control were evaluated July 18.

Treatment*	Rate (lb/A)	Wild Oats control rating (%)	Gr & Ye Foxtail control rating (%)
Untreated Check	.	0	0
Diallate (PPI)	2	97	90
Diallate (PPI)	4	99	97
Dial(PPI)/Sethoxy+OC(Post)	2/.3+.25G	99	99
Dial(PPI)/Flua-P+OC(POST)	2/.188+.25G	99	99
Sethoxydim+OC (POST)	.3+.25G	99	97
Fluazifop-P+OC (POST)	.188+.25G	99	97
Mean		85	83
High mean		99	99
Low mean		0	0
Coeff. of variation		1	3
LSD(1 Percent)		2	5
LSD(5 Percent)		1	4
No. of reps		3	3

* OC = BASF petroleum oil with 17% emulsifier

Summary

Diallate at 2 lb/A gave less wild oats and foxtail control than the other treatments.

Pyrazon formulation comparison, Colfax, 1986. Preplant incorporated herbicides were applied and rototiller incorporated May 15 when the air temp. was 74F, soil temp. at six inches was 62F, wind was northeast at 0-3mph, sky was sunny, soil was dry on the surface, and wet at 1-4 inches. The rototiller was set to operate four inches deep for EPTC+cycloate and two inches deep for all other treatments. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 15. Postemergence herbicides were applied 9:00 am June 23 (air temp.=69F, soil temp. at six inches was 68F, relative humidity=68%, no wind, soil surface was dry, 1-2 inches was moist, 3-4 inches was wet) when sugarbeets were in the 8-10 leaf stage, wild mustard was 6 leaf (1 inch tall) to 7 inches tall, common lambsquarters was 4 leaf (1 inch tall) to 12 inches tall, redroot pigweed was 2 leaf(1 inch tall) to 8 inches tall, and green and yellow foxtail was 4-8 inches tall. All treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Wild mustard, common lambsquarters, redroot pigweed, and green and yellow foxtail control and sugarbeet injury were evaluated July 7. Sugarbeets were counted in 60 feet of treated row in each plot and 60 feet of untreated row adjacent to each plot to determine sugarbeet stand reduction.

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Colq cntl ratg	Rrpw cntl ratg	G&Y Fxtl cntl ratg	Sgbt stand reduc
		(%)					
Untreated Check	.	0	0	0	0	0	-24
Pyrazon-FL (PPI)	3.5	0	97	98	87	72	-7
Pyrazon-DF (PPI)	3.5	0	90	97	93	65	-31
Pyrazon-FL+TCA (PPI)	3.5+6	0	95	96	94	97	-29
Pyrazon-DF+TCA (PPI)	3.5+6	0	98	98	96	97	-25
Pyrazon-FL+TCA (PPI)	7.6+6	3	99	98	98	98	-19
Pyrazon-DF+TCA (PPI)	7.6+6	0	99	99	96	95	-31
Pyrazon-FL+Diethatyl (PPI)	3+3	0	91	95	97	95	-26
Pyrazon-DF+Diethatyl (PPI)	3+3	0	93	96	94	86	-35
Pyrazon-FL+Ethofumesate (PPI)	3+3	0	84	95	99	98	-5
Pyrazon-DF+Ethofumesate (PPI)	3+3	6	95	99	99	97	-33
Pyrazon-FL (Post)	3.5	0	94	24	24	21	-20
Pyrazon-DF (Post)	3.5	0	75	44	51	50	-18
Pyrazon-FL+OC (Post)	3.5+.25G	0	80	44	45	45	-34
Pyrazon-DF+OC (Post)	3.5+.25G	0	85	43	36	45	-36
Pyrazon-FL+Dalapon (Post)	3.5+2	0	90	61	38	84	-28
Pyrazon-DF+Dalapon (Post)	3.5+2	3	97	81	43	85	-47
Pyrazon-FL+Des&Phen (Post)	3+1	0	99	80	71	64	-23
Pyrazon-DF+Des&Phen (Post)	3+1	0	97	84	68	55	-27
EPTC+Cycloate (PPI)	2+2	4	75	96	98	99	-42
Diethatyl (PPI)	5	0	58	68	99	91	-23
Ethofumesate (PPI)	3.5	0	89	95	99	96	-34
Desmedipham&Phenmedipham (Post)	1	0	99	75	80	51	-17

Table continued on next page.

Pyrazon formulation comparison, Colfax, 1986. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Colq cntl ratg	Rrpw cntl ratg	G&Y Fxtl cntl ratg	Sgbt stand reduc
		(%)					
Mean		1	86	77	74	73	-27
High mean		6	99	99	99	99	0
Low mean		0	0	0	0	0	-47
Coeff. of variation		523	11	13	13	11	-75
LSD(1 Percent)		6	17	19	17	15	37
LSD(5 Percent)		5	13	14	13	12	28
No. of reps		4	4	4	4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

The pyrazon dry flowable (DF) formulation gave weed control similar to the pyrazon flowable (FL) formulation except pyrazon-FL postemergence gave better control of wild mustard and less control of common lambsquarters, redroot pigweed, and foxtail. Also, pyrazon-DF+dalapon gave better common lambsquarters control than pyrazon-FL+dalapon. Desmedipham+phenmedipham (Betamix) gave weed control similar to pyrazon+desmedipham+phenmedipham. Pyrazon+dalapon gave better control of common lambsquarters and foxtail than pyrazon or pyrazon plus oil concentrate. Pyrazon at 3.5 lb/A PPI gave better control of wild mustard than diethatyl or EPTC+cycloate, better control of common lambsquarters than diethatyl, and less control of foxtail than EPTC+cycloate, diethatyl, or ethofumesate. Sugarbeet stand reductions were negative because the treated four rows had more sugarbeets than adjacent untreated rows. Variation in sugarbeet stand was probably not due to herbicide treatment.

Pyrazon formulation comparison, Glyndon, 1986. Preplant incorporated herbicides were applied and rototiller incorporated 6:00 pm May 6 when the air temp. was 45F, soil temp. at six inches was 49F, wind was west at 10-15 mph, soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. The rototiller was set to operate 4 inches deep for treatments containing EPTC or cycloate and 2 inches deep for all other PPI treatments. Maribo Ultramono sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Postemergence herbicides were applied 5:00 am June 5 when the air temp. was 45F, soil temp. at six inches was 64F, relative humidity was 78%, and the wind was north at 0-2 mph. Sugarbeets were 4-6 leaf, common lambsquarters were 4 leaf (.5 in. tall) to 3 inches tall, and redroot pigweed were 4 leaf (.5 in. tall) to 2 inches tall. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet injury was evaluated June 21 and June 23. Redroot pigweed and common lambsquarters control were evaluated June 21, June 23, and July 2. The mean of the separate evaluations is reported here.

Treatment*	Rate (lb/A)	Sugarbeet injury rating	Redroot Pigweed control rating	Common Lambsquarters control rating
		----------------	(%)	----------------
Untreated Check	.	0	0	0
Pyrazon-FL (PPI)	3.5	0	36	86
Pyrazon-DF (PPI)	3.5	1	68	93
Pyrazon-FL+TCA (PPI)	3.5+6	0	48	87
Pyrazon-DF+TCA (PPI)	3.5+6	2	83	88
Pyrazon-FL+TCA (PPI)	7.6+6	2	79	98
Pyrazon-DF+TCA (PPI)	7.6+6	3	92	98
Pyrazon-FL+Diethatyl (PPI)	3+3	2	58	54
Pyrazon-DF+Diethatyl (PPI)	3+3	7	81	70
Pyrazon-FL+Ethofumesate (PPI)	3+3	1	90	91
Pyrazon-DF+Ethofumesate (PPI)	3+3	6	97	90
Pyrazon-FL (Post)	3.5	0	2	0
Pyrazon-DF (Post)	3.5	1	1	0
Pyrazon-FL+OC (Post)	3.5+.25G	0	6	6
Pyrazon-DF+OC (Post)	3.5+.25G	2	12	4
Pyrazon-FL+Dalapon (Post)	3.5+2	0	7	6
Pyrazon-DF+Dalapon (Post)	3.5+2	3	11	9
Pyrazon-FL+Des&Phen (Post)	3+1	1	28	33
Pyrazon-DF+Des&Phen (Post)	3+1	0	31	30
EPTC+Cycloate (PPI)	2+2	22	92	90
Diethatyl (PPI)	5	5	89	26
Ethofumesate (PPI)	3.5	1	93	73
Desmedipham&Phenmedipham (Post)	1	2	33	49

Table continued on next page.

Pyrazon formulation comparison, Glyndon, 1986. (continued)

Treatment*	Rate (lb/A)	Sugarbeet injury rating	Redroot Pigweed control rating	Common Lambsquarters control rating
			(%)	
Mean		3	49	51
High mean		22	97	98
Low mean		0	0	0
Coeff. of variation		85	16	15
LSD(1 Percent)		5	18	17
LSD(5 Percent)		4	13	13
No. of reps		3	3	3

* OC = BASF petroleum oil with 17% emulsifier

Summary

Only EPTC+cycloate caused sugarbeet injury greater than 10%. Pyrazon dry flowable (DF) gave better control of redroot pigweed than pyrazon flowable (FL) when applied PPI alone or in combination with TCA or diethatyl. All postemergence treatments gave poor weed control. Only pyrazon DF + TCA at 7.6+6 lb/A, pyrazon DF or FL + ethofumesate at 3+3 lb/A, and EPTC+cycloate at 2+2 lb/A gave 90% or greater control of redroot pigweed and common lambsquarters.

Demonstration of herbicide injury on sugarbeets, Sabin, 1986. Preplant incorporated herbicides were applied 9:00 am May 23 when the air temp. was 57F, sky was cloudy, and the wind was southeast at 12 mph. Rain began immediately after herbicide application so incorporation was not possible. Beta 3394 sugarbeet was planted 1.25 inches deep in 22 inch rows May 26. Postemergence treatments were applied 4:00 pm July 9 when the air temp. was 83F, soil temp. at six inches was 80F, relative humidity was 49%, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets were in the 10-12 leaf stage. The direct layby trifluralin treatment was applied directly to the crown of the sugarbeets. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Sugarbeets were hand thinned to an eight inch spacing July 8 and maintained weed free by hand weeding throughout the growing season. Sugarbeets were harvested from 72 feet of the center two rows of each plot September 25.

Treatment	Rate (lb/A)	Sucrose (%)	Root Yield (ton/A)	Impurity Index	Loss to Mol (%)	Extract Sucrose (lb/A)	Sgbt per 72ft
Atrazine-L (PPI)	0.15	13.3	20.8	1270	2.3	4463	67
Atrazine-L (PPI)	0.25	12.4	21.0	1592	2.7	3990	54
Atrazine-L (PPI)	0.35	13.4	19.9	1247	2.3	4325	68
Dicamba (POST)	0.06	12.7	18.8	1424	2.5	3767	87
Dicamba (POST)	0.125	11.4	17.0	1831	2.8	2837	66
2,4-D (POST)	0.06	12.8	18.3	1422	2.5	3708	62
2,4-D (POST)	0.125	12.0	15.0	1857	3.0	2597	60
Glyphosate (POST)	0.18	12.8	5.6	1243	2.1	1143	24
Glyphosate (POST)	0.06	14.3	15.8	1118	2.1	3767	55
Glyphosate (POST)	0.12	13.9	12.9	1072	2.1	3019	44
Paraquat (POST)	0.03	14.9	9.8	872	1.8	2545	44
Paraquat (POST)	0.06	13.4	7.6	1121	2.1	1740	31
Paraquat (POST)	0.12	12.0	0.8	1401	2.3	143	4
FMC-57020 (PPI)	0.5	14.0	20.4	1129	2.1	4708	76
FMC-57020 (PPI)	1.0	14.3	21.6	1168	2.3	5062	55
Trifluralin (Direct-Layby)	0.75	14.8	18.7	979	2.0	4680	62
Untreated Check	.	15.1	22.4	985	2.1	5769	61
Mean		13.4	15.7	1278	2.3	3427	54
High mean		15.1	22.4	1857	3.0	5769	87
Low mean		11.4	0.8	872	1.8	143	4
Coeff. of variation		5.9	11.2	15	9.5	10	15
LSD(1 Percent)		2.3	5.1	554	0.6	1044	23
LSD(5 Percent)		1.7	3.7	402	0.5	758	17
No. of reps		2.0	2.0	2	2.0	2	2

Summary

All treatments except FMC-57020 at 1.0 lb/A reduced yield compared to the hand weeded check. However, only two replications were harvested so data should be viewed with caution.

Postemergence herbicides, Colfax, 1986. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. The first half of split application treatments was applied 12:30 pm June 12 (air temp.=80F, soil temp. at six inches was 64F, relative humidity=35%, wind was northwest at 10-15 mph, soil was dry on the surface, moist at 1-4 in., sunny sky) when sugarbeets had 4-6 leaves, green and yellow foxtail were 1-2.5 inches tall, commom lambsquarters were 4 leaf (1 inch tall) to 2.5 inches tall, redroot pigweed were 4 leaf (1 inch tall) to 8 leaf (1.5 inches tall), and wild mustard were 2 leaf to 4 inches tall. The second half of split application treatments and all single application treatments were applied 8:00 am June 23 (air temp.=69F, soil temp. at six inches was 68F, relative humidity=68%, wind was northwest at 0-5 mph, soil was dry on the surface, moist at 1-2 in., wet at 3-4 in.) when sugarbeets had 8-10 leaves, green and yellow foxtail were 4-8 inches tall, commom lambsquarters were 4 leaf (1 inch tall) to 12 inches tall, redroot pigweed were 2 leaf (1 inch tall) to 8 inches tall, and wild mustard were 6 leaf(1 inch tall) to 7 inches tall. All treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Wild mustard, common lambsquarters, green and yellow foxtail, and redroot pigweed control and sugarbeet injury were evaluated July 7.

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Colq cntl ratg	Rrpw cntl ratg	G&Y Fxtl cntl ratg
		(%)				
Desmedipham&Phenmedipham	1	0	97	90	98	59
Desmedipham&Phenmedipham 2X	.5	5	99	98	98	68
Desmed&Phenmed+Endothall 2X	.5+.25	0	99	99	97	92
Desmed&Phenmed+Dalapon 2X	.5+1	21	99	99	99	95
Des&Phen/Des&Phen+Dalapon	.5/.5+1	3	99	99	97	87
Des&Phen/Des&Phen+Ethofume	.5/.5+1	13	99	99	99	80
Sethoxydim+OC	.2+.25G	0	0	0	0	99
Fenoxaprop+OC	.15+.25G	0	0	0	0	99
Fluazifop-P+OC	.156+.25G	0	0	0	0	93
Fluazifop-P+OC	.188+.25G	0	0	0	0	98
DPX-Y6202-31+OC	.05+.25G	0	0	0	0	99
DPX-Y6202-31+OC	.038+.25G	0	0	0	0	99
DPX-Y6202+OC	.1+.25G	0	0	0	0	99
DPX-Y6202+OC	.075+.25G	0	0	0	0	99
BAS-51702+OC	.05+.25G	0	0	0	0	99
BAS-51702+OC	.1+.25G	0	0	0	0	99
De&Ph/Des&Phen+Seth+OC	.5/.5+.2+.25G	0	99	99	96	92
De&Ph/De&Ph+Fenox+OC	.5/.5+.15+.25G	0	99	99	94	90
De&Ph/De&Ph+Flua-P+OC	.5/.5+.188+.25G	3	99	98	94	87
D&P/De&Ph+DPX-Y6202-31	.5/.5+.05+.25G	5	99	99	99	87
D&P/De&Ph+DPX-Y6202+OC	.5/.5+.1+.25G	5	99	99	98	87
D&P/De&Ph+BAS-51702+OC	.5/.5+.1+.25G	3	99	99	97	98
Des&Phen+Clopyralid 2X	.5+.1	3	99	99	98	53
Des&Phen/Des&Phen+Clopyralid	.5/.5+.2	5	99	99	93	58
Clopyralid	.2	0	0	23	18	0

Table continued on next page.

Postemergence herbicides, Colfax, 1986. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Colq cntl ratg	Rrpw cntl ratg	G&Y Fxtl cntl ratg
		----------------	----------------	(%)	----------------	----------------
Mean		3	55	56	55	84
High mean		21	99	99	99	99
Low mean		0	0	0	0	0
Coeff. of variation		169	1	3	7	6
LSD(1 Percent)		8	1	3	7	10
LSD(5 Percent)		6	1	2	5	8
No. of reps		4	4	4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

All treatments containing desmedipham+phenmedipham (Betamix) gave excellent wild mustard, redroot pigweed, and common lambsquarters control. All postemergence grass herbicides plus oil gave excellent foxtail control. Addition of desmedipham+phenmedipham to fenoxaprop, fluazifop-P, DPX-Y6202, and DPX-Y6202-31 reduced foxtail control compared to the grass herbicides alone. The least antagonism was with BAS-51702. Clopyralid gave little control of redroot pigweed or common lambsquarters.

Postemergence herbicides, Hillsboro, 1986. Hilleshog 5135 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 27. The first half of split application treatments was applied 9:30am June 25 (air temp.=68F, soil temp. at six inches was 68F, relative humidity=85%, wind was south at 15-20 mph, soil was dry on the surface, wet at 1-4 inches) when sugarbeets had 2-6 leaves, wild mustard were cotyledon to 8 inches tall, green and yellow foxtail were 4 leaf (1.5 in. tall) to 5 inches tall, redroot pigweed were cotyledon to 8 leaf (3 inches tall), and volunteer sunflower were 5-7 inches tall. The second half of split treatments and all single application treatments were applied 1:30 pm July 1 (air temp.=79F, soil temp. at six inches was 76F, relative humidity=57%, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, wind was north at 10-15 mph) when sugarbeets had 4-10 leaves, wild mustard were 4 leaf to 14 inches tall, green and yellow foxtail were 3-10 inches tall, redroot pigweed were 4 leaf to 5 inches tall, and volunteer sunflower were 8-12 inches tall. All herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Wild mustard, green and yellow foxtail, redroot pigweed, and volunteer sunflower control and sugarbeet injury were evaluated July 22.

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Gr&Yel Fxtl cntl ratg (%)	Rrpw cntl ratg	Volun Sunfl cntl ratg
Desmedipham&Phenmedipham	1	0	82	34	33	9
Desmedipham&Phenmedipham 2X	.5	0	96	61	59	9
Desmed&Phenmed+Endothall 2X	.5+.25	0	82	54	16	33
Desmed&Phenmed+Dalapon 2X	.5+1	0	98	80	66	33
Des&Phen/Des&Phen+Dalapon	.5/.5+1	0	99	78	48	21
Des&Phen/Des&Phen+Ethofume	.5/.5+1	0	98	73	51	22
Sethoxydim+OC	.2+.25G	0	0	99	0	0
Fenoxaprop+OC	.15+.25G	0	0	99	0	0
Fluazifop-P+OC	.156+.25G	0	0	99	0	0
Fluazifop-P+OC	.188+.25G	0	0	99	0	0
DPX-Y6202-31+OC	.05+.25G	0	0	99	0	0
DPX-Y6202-31+OC	.038+.25G	0	0	99	0	0
DPX-Y6202+OC	.1+.25G	0	0	99	0	0
DPX-Y6202+OC	.075+.25G	0	0	99	0	0
BAS-51702+OC	.05+.25G	0	0	99	0	0
BAS-51702+OC	.1+.25G	0	0	99	0	0
De&Ph/Des&Phen+Seth+OC	.5/.5+.2+.25G	0	97	99	56	23
De&Ph/De&Ph+Fenox+OC	.5/.5+.15+.25G	0	99	98	50	8
De&Ph/De&Ph+Flua-P+OC	.5/.5+.188+.25G	0	99	94	40	12
D&P/De&Ph+DPX-Y6202-31	.5/.5+.05+.25G	0	98	92	39	11
D&P/De&Ph+DPX-Y6202+OC	.5/.5+.1+.25G	0	99	94	60	15
D&P/De&Ph+BAS-51702+OC	.5/.5+.1+.25G	0	99	99	53	10
Des&Phen+Clopyralid 2X	.5+.1	0	97	36	44	99
Des&Phen/Des&Phen+Clopyralid	.5/.5+.2	0	99	50	34	99
Clopyralid	.2	0	6	0	6	99

Table continued on next page.

Postemergence herbicides, Hillsboro, 1986. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	Wimu cntl ratg	Gr&Yel Fxtl cntl ratg	Rrpw cntl ratg	Volun Sunfl cntl ratg
		----------	----------	(%)	----------	----------
Mean		0	54	81	26	20
High mean		0	99	99	66	99
Low mean		0	0	0	0	0
Coeff. of variation		0	9	9	47	33
LSD(1 Percent)		0	9	14	23	12
LSD(5 Percent)		0	7	10	17	9
No. of reps		4	4	4	4	4

* OC = BASF petroleum oil with 17% emulsifier

Summary

Clopyralid gave excellent volunteer sunflower control but no control of wild mustard or redroot pigweed. Redroot pigweed were variable in size when treated, from cotyledon to 8 leaves. The small pigweed were controlled by treatments including desmedipham+phenmedipham (Betamix) but the large pigweed were not controlled. Addition of endothall to desmedipham+phenmedipham reduced control of redroot pigweed and wild mustard compared to desmedipham+phenmedipham alone. Addition of desmedipham+phenmedipham to fluazifop-P, DPX-Y6202, and DPX-Y6202-31 tended to reduce foxtail control compared to the grass herbicides used alone.

Desmedipham & phenmedipham plus dalapon, Crookston, 1986. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. The first half of split application treatments were applied 10:30 am June 9 (air temp.=80F, soil temp. at six inches was 67F, relative humidity=44%, wind was south at 15-20mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches) when sugarbeets had 2-4 leaves, green and yellow foxtail was emerging to 2 inches tall, redroot pigweed was 2-6 leaf (0.5 inch tall), prostrate pigweed was 4 leaf to 1 inch tall (2 inch diameter), and wild mustard was 2 leaf (0.5 inch tall) to 6 leaf (2 inches tall). Single application treatments and the second half of split treatments were applied 1:00 pm June 16 (air temp.=68F, soil temp. at six inches was 68F, wind was north at 15-20 mph, relative humidity=43%, soil was dry on the surface, moist at 1-2 in., wet at 3-4 in.) when sugarbeets had 6 leaves, green and yellow foxtail were 0.5 to 4 inches tall, redroot pigweed was 4-8 leaf (1.5 inches tall), prostrate pigweed was 1.5 to 4 inches tall, and wild mustard was 4-8 leaf (2 inches tall). All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Green and yellow foxtail, redroot pigweed, and prostrate pigweed control and sugarbeet injury were evaluated July 3.

Treatment	Rate (lb/A)	Sgbt inj ratg	G&Y Fxtl cntl ratg	Rrpw cntl ratg	Prpw cntl ratg
		(%)			
Desmedipham&Phenmedipham	.25	0	34	45	50
Desmedipham&Phenmedipham	.33	0	41	50	55
Desmedipham&Phenmedipham	.5	0	41	63	75
Desmedipham&Phenmedipham	.75	0	30	71	79
Desmedipham&Phenmedipham	1	3	49	75	88
Desmedipham&Phenmedipham 2X	.125	0	41	38	64
Desmedipham&Phenmedipham 2X	.25	0	55	77	85
Desmedipham&Phenmedipham 2X	.33	0	70	87	91
Desmedipham&Phenmedipham 2X	.5	0	71	92	95
Desmed&Phenmed+Dalapon	.25+.5	0	53	63	68
Desmed&Phenmed+Dalapon	.25+1	3	77	63	69
Desmed&Phenmed+Dalapon	.25+2	5	96	70	71
Desmed&Phenmed+Dalapon	.33+.5	0	56	55	65
Desmed&Phenmed+Dalapon	.33+1	3	85	55	68
Desmed&Phenmed+Dalapon	.33+2	5	93	70	75
Desmed&Phenmed+Dalapon	.5+.5	0	56	63	71
Desmed&Phenmed+Dalapon	.5+1	3	76	71	74
Desmed&Phenmed+Dalapon	.5+2	3	95	73	79
Desmed&Phenmed+Dalapon	.75+.5	3	50	69	76
Desmed&Phenmed+Dalapon	.75+1	3	81	74	78
Desmed&Phenmed+Dalapon	.75+2	8	94	79	84
Desmed&Phenmed+Dalapon	1+.5	8	63	81	83
Desmed&Phenmed+Dalapon	1+1	4	71	74	78
Desmed&Phenmed+Dalapon	1+2	15	93	83	88
Desmed&Phenmed+Dalapon 2X	.125+.5	0	80	75	76
Desmed&Phenmed+Dalapon 2X	.125+1	0	94	76	80
Desmed&Phenmed+Dalapon 2X	.25+.5	3	73	76	80
Desmed&Phenmed+Dalapon 2X	.25+1	3	92	88	92
Desmed&Phenmed+Dalapon 2X	.33+.5	0	77	85	84
Desmed&Phenmed+Dalapon 2X	.33+1	0	91	91	91
Desmed&Phenmed+Dalapon 2X	.5+.5	0	66	89	91
Desmed&Phenmed+Dalapon 2X	.5+1	8	92	90	96

Table continued on next page.

Desmedipham & phenmedipham plus dalapon, Crookston, 1986. (continued)

Treatment	Rate (lb/A)	Sgbt inj ratg	G&Y Fxtl cntl ratg	Rrpw cntl ratg	Prpw cntl ratg
		(%)			
Mean		2	70	72	78
High mean		15	96	92	96
Low mean		0	30	38	50
Coeff. of variation		149	14	13	11
LSD(1 Percent)		6	18	17	15
LSD(5 Percent)		5	14	13	12
No. of reps		4	4	4	4

Summary

The addition of dalapon improved pigweed control from low rates of desmedipham plus phenmedipham more than from high rates. Dalapon at 2 lb/A in combination with desmedipham plus phenmedipham gave better foxtail control and tended to give better pigweed control than dalapon at 0.5 lb/A.

Desmedipham & phenmedipham plus dalapon, Glyndon, 1986. Maribo Ultramono sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. The first half of split application treatments were applied 3:00 pm May 29 (air temp.=90F, soil temp. at six inches was 71F, rel. hum.=37%, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches) when sugarbeets were 2-4 leaf, common lambsquarters were 0.5-2 in. tall, and redroot pigweed were 2-6 leaf (0.5 in. tall). Single application treatments and the second half of split treatments were applied 10:00 am June 4 (air temp.=72F, soil temp. at six inches was 67F, wind was north at 15-20 mph, rel. hum.=35%, soil was dry on the surface, dry at 1-2 inches, moist at 3-4 inches) when sugarbeets had 4-6 leaves, common lambsquarters were 0.5-4 inches tall, and redroot pigweed were 4 leaf to 2 inches tall. All treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Common lambsquarters and redroot pigweed control were evaluated June 23 and July 2. The mean of the two evaluations is reported here. Sugarbeet injury was evaluated June 23.

Treatment	Rate (lb/A)	Sugarbeet injury rating	Common Lambsquarters control rating	Redroot Pigweed control rating
		(%)		
Desmedipham&Phenmedipham	.25	0	31	17
Desmedipham&Phenmedipham	.33	0	43	35
Desmedipham&Phenmedipham	.5	1	51	39
Desmedipham&Phenmedipham	.75	5	73	63
Desmedipham&Phenmedipham	1	11	82	63
Desmedipham&Phenmedipham 2X	.125	4	66	50
Desmedipham&Phenmedipham 2X	.25	5	84	62
Desmedipham&Phenmedipham 2X	.33	4	92	78
Desmedipham&Phenmedipham 2X	.5	13	95	77
Desmed&Phenmed+Dalapon	.25+.5	0	43	34
Desmed&Phenmed+Dalapon	.25+1	0	47	28
Desmed&Phenmed+Dalapon	.25+2	9	50	38
Desmed&Phenmed+Dalapon	.33+.5	0	52	30
Desmed&Phenmed+Dalapon	.33+1	4	47	24
Desmed&Phenmed+Dalapon	.33+2	15	80	53
Desmed&Phenmed+Dalapon	.5+.5	0	62	54
Desmed&Phenmed+Dalapon	.5+1	6	71	58
Desmed&Phenmed+Dalapon	.5+2	11	73	48
Desmed&Phenmed+Dalapon	.75+.5	10	62	42
Desmed&Phenmed+Dalapon	.75+1	11	75	54
Desmed&Phenmed+Dalapon	.75+2	25	80	54
Desmed&Phenmed+Dalapon	1+.5	13	76	51
Desmed&Phenmed+Dalapon	1+1	16	82	46
Desmed&Phenmed+Dalapon	1+2	21	82	70
Desmed&Phenmed+Dalapon 2X	.125+.5	8	69	47
Desmed&Phenmed+Dalapon 2X	.125+1	1	71	36
Desmed&Phenmed+Dalapon 2X	.25+.5	9	88	73
Desmed&Phenmed+Dalapon 2X	.25+1	10	91	72
Desmed&Phenmed+Dalapon 2X	.33+.5	11	94	81
Desmed&Phenmed+Dalapon 2X	.33+1	15	94	77
Desmed&Phenmed+Dalapon 2X	.5+.5	25	96	85
Desmed&Phenmed+Dalapon 2X	.5+1	29	98	93

Table continued on next page.

Desmedipham&phenmedipham plus dalapon, Glyndon, 1986. (continued)

Treatment	Rate (lb/A)	Sugarbeet injury rating	Common Lambsquarters control rating	Redroot Pigweed control rating
			(%)	
Mean		9	72	54
High mean		29	98	93
Low mean		0	31	17
Coeff. of variation		55	12	18
LSD(1 Percent)		9	16	18
LSD(5 Percent)		7	12	13
No. of reps		4	4	4

Summary

Single application treatments that included dalapon at 2 lb/A gave more sugarbeet injury than those that included dalapon at 0.0, 0.5, or 1.0 lb/A. Common lambsquarters control and redroot pigweed control were improved by the addition of dalapon to desmedipham&phenmedipham only when the treatments were applied once and only at the lower rates of desmedipham&phenmedipham. Split applications of desmedipham&phenmedipham gave weed control similar to split applications of desmedipham&phenmedipham+dalapon.

Wild oats control in sugarbeets, Fargo (NW section 22), 1986. Hilleshog 5135 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 28. Stage one herbicide treatments were applied 9:45 am June 24 (air temp.=69F, soil temp. at six inches was 64F, relative humidity=51%, wind was southeast 5-10 mph, soil was dry on the surface, wet at 1-4 inches) when sugarbeets were 2-6 leaf and wild oats were 2 leaf to tillering (4-8 inches tall). Stage two treatments were applied 11:00 am July 9 (air temp.=81F, soil temp. at six inches was 81F, relative humidity=61%, soil surface was dry, wet at 1-4 inches) when sugarbeets were 6-12 leaf and wild oats were 6-18 inches tall. All treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Wild oats control was evaluated July 25.

Treatment*	Rate (lb/A)	Wild Oats control rating -- (%) --
Fenoxaprop+OC Stage 1	.15+.25G	99
Sethoxydim+OC Stage 1	.2+.25G	99
Sethoxydim+OC Stage 1	.3+.25G	99
Fluazifop-P+OC Stage 1	.156+.25G	99
Fluazifop-P+OC Stage 1	.188+.25G	99
BAS-51702+OC Stage 1	.075+.25G	99
BAS-51702+OC Stage 1	.1+.25G	99
BAS-51702+OC Stage 1	.15+.25G	99
DPX-Y6202+OC Stage 1	.075+.25G	99
DPX-Y6202+OC Stage 1	.1+.25G	99
DPX-Y6202+OC Stage 1	.15+.25G	98
DPX-Y6202-31+OC Stage 1	.038+.25G	99
DPX-Y6202-31+OC Stage 1	.05+.25G	99
DPX-Y6202-31+OC Stage 1	.075+.25G	99
RE-45601+OC Stage 1	.06+.25G	99
RE-45601+OC Stage 1	.125+.25G	99
RE-45601+OC Stage 1	.25+.25G	99
Fenoxaprop+OC+Des&Phen S1	.15+.25G+1	60
Sethoxydim+OC+Des&Phen S1	.2+.25G+1	75
Fluazifop-P+OC+De&Ph S1	.188+.25G+1	85
BAS-51702+OC+Des&Phen S1	.075+.25G+1	89
BAS-51702+OC+Des&Phen S1	.1+.25G+1	93
DPX-Y6202+OC+Des&Phen S1	.075+.25G+1	53
DPX-Y6202+OC+Des&Phen S1	.1+.25G+1	55
DPX-Y6202-31+OC+De&Ph S1	.038+.25G+1	48
DPX-Y6202-31+OC+De&Ph S1	.05+.25G+1	61
RE-45601+OC+Des&Phen S1	.06+.25G+1	78
RE-45601+OC+Des&Phen S1	.125+.25G+1	87

Table continued on next page.

Wild oats control in sugarbeets, Fargo (NW section 22), 1986. (continued)

Treatment*	Rate (lb/A)	Wild Oats control rating -- (%) --
Fenoxaprop+OC Stage 2	.15+.25G	94
Sethoxydim+OC Stage 2	.2+.25G	98
Sethoxydim+OC Stage 2	.3+.25G	98
Fluazifop-P+OC Stage 2	.156+.25G	99
Fluazifop-P+OC Stage 2	.188+.25G	98
BAS-51702+OC Stage 2	.075+.25G	99
BAS-51702+OC Stage 2	.1+.25G	98
BAS-51702+OC Stage 2	.15+.25G	99
DPX-Y6202+OC Stage 2	.075+.25G	99
DPX-Y6202+OC Stage 2	.1+.25G	99
DPX-Y6202+OC Stage 2	.15+.25G	98
DPX-Y6202-31+OC Stage 2	.038+.25G	99
DPX-Y6202-31+OC Stage 2	.05+.25G	99
DPX-Y6202-31+OC Stage 2	.075+.25G	99
RE-45601+OC Stage 2	.06+.25G	99
RE-45601+OC Stage 2	.125+.25G	99
RE-45601+OC Stage 2	.25+.25G	99
Mean		92
High mean		99
Low mean		48
Coeff. of variation		7
LSD(1 Percent)		12
LSD(5 Percent)		9
No. of reps		4

* OC = BASF petroleum oil with 17% emulsifier

Summary

All postemergence grass herbicides plus oil gave excellent wild oats control when used alone. Addition of desmedipham+phenmedipham (Betamix) reduced wild oats control compared to the grass herbicides plus oil alone. Fenoxaprop, DPX-Y6202, and DPX-Y6202-31 were antagonized more than the other herbicides.

Cocklebur control with postemergence herbicides, Bird Island, 1986. Maribo Ultramono sugarbeet was seeded in 22 inch rows May 25. All single application treatments and the first half of split application treatments were applied 1:30 pm June 6 when the air temp. was 76F, soil temp. at six inches was 65F, relative humidity was 59%, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, wind was south at 10-15 mph, sugarbeets were 2 leaf, and cocklebur were 2-4 leaf (1-3 inches tall). The air temperature on June 7 reached 100 F. The second half of split treatments was applied 4:00 pm June 18 when the air temp. was 90F, soil temp. at six inches was 69F, relative humidity was 53%, wind was southwest at 15-20 mph, soil was moist on the surface and wet below the surface, sugarbeets were in the 4 leaf stage, and cocklebur were 1-3 inches tall. Phytotoxicity from the June 6 treatments inhibited sugarbeet and cocklebur growth. All treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet injury and cocklebur control were evaluated July 1.

Treatment	Rate (lb/A)	Cocklebur control rating (%)	Sugarbeet injury rating (%)
Endothall	.75	80	21
Endothall	1.5	95	29
Desmed&Phenmed/Desmed&Phenmed	.5/.75	96	47
Desmedipham/Desmedipham	.5/.75	90	33
De&Ph+Endo/De&Ph+Endo	.5+.25/.75+.25	94	35
De&Ph+Endo/De&Ph+Endo	.5+.5/.75+.5	97	49
Desm+Endo/Desm+Endo	.5+.25/.75+.25	89	33
Des&Phen+Ethofumesate	.75+1.5	91	41
De&Ph+Etho/De&Ph+Etho	.38+.75/.5+1	97	48
Desm+Etho/Desm+Etho	.38+.75/.5+1	96	49
Desmed&Phenmed+Dalapon	1+2	95	84
De&Ph+Dala/De&Ph+Dala	.5+1/.75+1	97	58
Desmed+Dala/Desmed+Dala	.5+1/.75+1	97	63
De&Ph+Clopy/De&Ph+Clopy	.5+.1/.75+.1	99	51
D&P+Clopy/D&P+Clopy	.5+.15/.75+.15	99	48
Mean		94	46
High mean		99	84
Low mean		80	21
Coeff. of variation		5	27
LSD(1 Percent)		10	23
LSD(5 Percent)		7	17
No. of reps		4	4

Summary

The relatively high rates of herbicides, the small sugarbeets, and relatively high temperature the day following the first application combined to cause severe sugarbeet injury and unusually good control of cocklebur. Clopyralid was very effective against cocklebur.

Effect of acifluorfen on sugarbeet yield, Sabin, 1986. Beta 3394 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 26. Herbicide treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots 8:30 am July 23 when the air temp. was 78F, soil temp. at six inches was 82F, relative humidity was 75%, wind was southeast at 10-15 mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets varied from 12 to 20 leaves. Sugarbeets were maintained weed free throughout the growing season by hand weeding and were hand thinned to an 8 inch spacing June 27. Sugarbeets were harvested from 84 feet of the center two rows of each plot September 26.

Treatment	Rate (lb/A)	Sucrose (%)	Root Yield (ton/A)	Impurity Index	Loss to Molass (%)	Extract Sucrose (lb/A)
Acifluorfen+X-77	0.06+0.5%	14.9	21.2	872	1.8	5480
Acifluorfen+X-77	0.12+0.5%	15.3	18.0	819	1.7	4792
Acifluorfen+X-77	0.25+0.5%	15.3	16.9	817	1.7	4519
Acifluorfen+X-77	0.38+0.5%	14.9	16.2	873	1.8	4154
Acifluorfen+X-77	0.50+0.5%	14.6	13.8	960	1.9	3490
Untreated Check		15.1	17.4	917	1.8	4578
Mean		15.0	17.3	876	1.8	4502
High mean		15.3	21.2	960	1.9	5480
Low mean		14.6	13.8	817	1.7	3490
Coeff. of variation		4.7	13.4	17	13.2	16
LSD(1 Percent)		1.5	4.8	308	0.5	1531
LSD(5 Percent)		1.1	3.5	223	0.4	1107
No. of reps		4.0	4.0	4	4.0	4

Summary

Acifluorfen did not cause significant yield loss compared to the untreated check. However, plots treated with acifluorfen at 0.38 or 0.5 lb/A yielded less extractable sucrose than plots treated with acifluorfen at 0.06 lb/A. This suggests that an unknown problem reduced the yield of the untreated check since the untreated check plots should have yielded as much as plots treated with acifluorfen at 0.06 lb/A.

Sugarbeet injury from simulated 2,4-D drift as influenced by sethoxydim and fluazifop-P, Glyndon, 1986. Maribo Ultramono sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Day one (D1) herbicide treatments were applied 7:30 pm June 12 when the air temp. was 68F, soil temp. at six inches was 72F, relative humidity was 69%, sky was clear, wind was northwest at 8-12 mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets had 6-8 leaves. Day 14 (D14) treatments were applied 3:30 pm June 26 when the air temp. was 87F, soil temp. at six inches was 83F, relative humidity was 70%, wind was northwest at 10 mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets had 10-12 leaves. Day 28 (D28) treatments were applied 2:30 pm July 9 when the air temp. was 83F, soil temp. at six inches was 83F, relative humidity was 49%, wind was southeast at 0-5 mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets had 14-18 leaves. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Sugarbeets were cultivated June 3 and June 26 and maintained weed free by hand weeding throughout the growing season. Sugarbeets were hand thinned to an 8 inch spacing June 11. Sugarbeets were harvested from 72 feet of the center two rows of each plot September 25.

Treatment*	Rate (lb/A)	Sucro (%)	Root Yield (ton/A)	Impur Index	Loss to Molas (%)	Extrac Sucros (lb/A)
2,4-D (D1)	.05	14.6	20.2	981	1.9	5047
2,4-D (D1)	.1	14.6	18.3	905	1.8	4598
2,4-D (D1)	.2	14.1	8.2	946	1.8	1990
2,4-D (D14)	.05	15.1	24.6	896	1.8	6426
2,4-D (D14)	.1	14.4	19.0	958	1.9	4673
2,4-D (D14)	.2	13.1	10.9	1183	2.1	2344
2,4-D (D28)	.05	14.7	23.5	1010	2.0	5826
2,4-D (D28)	.1	13.0	18.4	1416	2.5	3632
2,4-D (D28)	.2	12.9	14.0	1405	2.4	2831
Sethoxydim+OC (D1)	.2+.25G	15.0	22.7	825	1.7	5961
Fluazifop-P+OC (D1)	.188+.25G	15.8	24.1	760	1.6	6738
Seth+OC (D1)/2,4-D (D28)	.2+.25G/.05	14.4	24.1	1024	2.0	5832
Seth+OC (D1)/2,4-D (D28)	.2+.25G/.1	13.8	19.5	1176	2.2	4418
Seth+OC (D1)/2,4-D (D28)	.2+.25G/.2	12.8	15.8	1402	2.4	3175
FluaP+OC(D1)/2,4-D(D28)	.188+.25G/.05	14.9	24.8	936	1.9	6300
Flua-P+OC(D1)/2,4-D(D28)	.188+.25G/.1	14.3	22.0	1123	2.2	5176
Flua-P+OC(D1)/2,4-D(D28)	.188+.25G/.2	12.4	15.3	1527	2.5	2959
Seth+OC (D1)/2,4-D (D14)	.2+.25G/.05	14.8	24.5	901	1.8	6177
Seth+OC (D1)/2,4-D (D14)	.2+.25G/.1	14.2	20.6	1002	1.9	4892
Seth+OC (D1)/2,4-D (D14)	.2+.25G/.2	13.8	11.0	1091	2.0	2497
FluaP+OC(D1)/2,4-D(D14)	.188+.25G/.05	15.1	20.2	882	1.8	5266
Flua-P+OC(D1)/2,4-D(D14)	.188+.25G/.1	14.5	21.5	939	1.8	5249
Flua-P+OC(D1)/2,4-D(D14)	.188+.25G/.2	13.6	8.1	1137	2.1	1838
2,4-D (D1)/Seth+OC (D14)	.05/.2+.25G	15.4	21.9	856	1.8	5838
2,4-D (D1)/Seth+OC (D14)	.1/.2+.25G	14.7	15.2	903	1.8	3832
2,4-D (D1)/Seth+OC (D14)	.2/.2+.25G	14.7	9.5	919	1.8	2371
2,4-D(D1)/FluaP+OC(D14)	.05/.188+.25G	15.4	20.4	889	1.8	5393
2,4-D(D1)/Flua-P+OC(D14)	.1/.188+.25G	15.1	16.9	898	1.8	4391
2,4-D(D1)/Flua-P+OC(D14)	.2/.188+.25G	14.1	11.0	1022	2.0	2556

Table continued on next page.

Sugarbeet injury from simulated 2,4-D drift as influenced by sethoxydim and fluazifop-P, Glyndon, 1986. (continued)

Treatment*	Rate (lb/A)	Sucro (%)	Root Yield (ton/A)	Impur Index	Loss to Molas (%)	Extrac Sucros (lb/A)
Mean		14.3	18.1	1031	2.0	4422
High mean		15.8	24.8	1527	2.5	6738
Low mean		12.4	8.1	760	1.6	1838
Coeff. of variation		4.4	14.3	13	8.0	15
LSD(1 Percent)		1.4	5.6	288	0.3	1472
LSD(5 Percent)		1.0	4.2	216	0.3	1107
No. of reps		3.0	3.0	3	3.0	3

* OC = BASF petroleum oil with 17% emulsifier

Summary

Sethoxydim and fluazifop-P applied before or after simulated 2,4-D drift had no effect on 2,4-D damage to sugarbeets.

Layby herbicides with various incorporation methods, St. Thomas, 1986. Beta 3394 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 12. Temik insecticide was applied at 1.5 lbs. active ingredient per acre June 2. Stage one herbicide and incorporation treatments were applied 11:30 am July 17 when the air temp. was 84F, soil temp. at six inches was 74F, relative humidity was 82%, wind was south at 16 mph, soil was dry on the surface, moist at 1-2 in., wet at 3-4 inches, and sugarbeets were in the 6-12 leaf stage. Stage two treatments were applied 11:30 am August 1 when the air temp. was 71F, soil temp. at six inches was 77F, wind was northwest at 10 mph, relative humidity was 60%, soil was dry on the surface, moist at 1-2 inches, moist at 3-4 in., and sugarbeets were in th 10-18 leaf stage. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. A John Deere two bar rotary hoe, a Melroe five bar spring tooth harrow, or an Alloway Guidemaster 6-row cultivator operated at 6, 4, and 2.5 mph respectively were used to incorporate the layby herbicides. Sugarbeets were hand thinned to an eight inch spacing July 8 and maintained weed free by hand weeding throughout the growing season. Sugarbeets were harvested from 72 feet of the center two rows of each plot September 23.

Treatment	Rate (lb/A)	Sucrose (%)	Root Yield (ton/A)	Impur Index	Loss to Molass (%)	Extrac Sucros (lb/A)	Sgbt Popul 72ft.
Hand Weeded Check/Cultivate/S1	.	15.2	10.2	769	1.6	2748	82
Trifluralin/Cultivate/S1	.75	15.2	9.1	767	1.6	2461	76
Metolachlor/Cultivate/S1	3	15.1	9.9	812	1.7	2648	82
Diethatyl/Cultivate/S1	6	14.7	9.3	861	1.7	2405	73
Hand Weeded Check/Hoe/S1	.	15.4	9.9	794	1.6	2681	70
Trifluralin/Hoe/S1	.75	15.1	9.5	823	1.7	2531	68
Metolachlor/Hoe/S1	3	14.8	10.0	860	1.8	2600	73
Diethatyl/Hoe/S1	6	15.2	9.2	816	1.7	2465	73
Hand Weeded Check/Harrow/S1	.	15.1	10.2	835	1.7	2708	68
Trifluralin/Harrow/S1	.75	14.7	9.1	883	1.8	2337	59
Metolachlor/Harrow/S1	3	15.0	9.8	864	1.8	2546	65
Diethatyl/Harrow/S1	6	15.0	9.0	850	1.7	2361	64
Hand Weeded Check/Cultivate/S2	.	15.2	9.5	780	1.6	2565	73
Trifluralin/Cultivate/S2	.75	14.9	9.7	837	1.7	2523	73
Metolachlor/Cultivate/S2	3	14.9	9.5	874	1.7	2450	73
Diethatyl/Cultivate/S2	6	14.7	8.7	859	1.7	2227	73
Hand Weeded Check/Hoe/S2	.	15.0	9.1	803	1.6	2393	72
Trifluralin/Hoe/S2	.75	14.8	8.3	844	1.7	2152	73
Metolachlor/Hoe/S2	3	14.6	8.1	886	1.8	2042	80
Diethatyl/Hoe/S2	6	14.6	8.7	868	1.7	2211	74
Hand Weeded Check/Harrow/S2	.	15.1	8.0	822	1.7	2132	69
Trifluralin/Harrow/S2	.75	15.1	8.7	770	1.6	2335	73
Metolachlor/Harrow/S2	3	14.7	7.9	855	1.7	2021	74
Diethatyl/Harrow/S2	6	14.6	7.9	841	1.7	2023	70
Mean		15.0	9.1	832	1.7	2398	72
High mean		15.4	10.2	886	1.8	2748	82
Low mean		14.6	7.9	767	1.6	2021	59
Coeff. of variation		3.0	9.9	8	6.1	11	8
LSD(1 Percent)		0.8	1.7	120	0.2	500	11
LSD(5 Percent)		0.6	1.3	91	0.1	378	8
No. of reps		4.0	4.0	4	4.0	4	4

Summary

Root maggot caused considerable injury to sugarbeets and yields were reduced by this injury. Extractable sucrose per acre was similar from all treatments. Harrowing when the sugarbeets had 6 to 12 leaves (S1) tended to give lower sugarbeet populations than the other treatments.

<u>Herbicides on several crop and weed species, 1986, Fargo, ND</u>. Dexter, A. G. and J. D. Nalewaja. The objective of this experiment was to evaluate weed control and crop injury from several non-registered herbicides and compare them to registered herbicides. The experiment was established on a Fargo silty clay with 3.5% organic matter, pH 7.9, 180 lb/A N in the top 2 ft, and high levels of P and K approximately 5 miles north of Fargo, ND. Plots were 10 by 35 ft arranged in a randomized complete block with three replications. The center 8 ft of each plot were treated with herbicide. Preplant incorporated herbicides were applied in 17 gpa at 40 psi through 8002 nozzles May 29 when air temperature was 82 F, soil temperature 6 inches deep was 60 F, and the wind was nil. Incorporation was with a rototiller operated 4 inches deep. 'Marshall' Hard Red Spring wheat, 'Steele' oats, 'Park' barley, 'Pioneer 9353' corn, 'C-20' navy beans, 'McCall' soybean, 'Seed-Tec 301' sunflower, 'Siberian' foxtail millet, 'Culbert 79' flax, 'Cando' Durum wheat, 'Beta 2443' sugarbeets, tame yellow mustard, safflower, and common lambsquarters were seeded across the plots May 29. Preemergence herbicides were applied in 17 gpa at 40 psi through 8002 nozzles May 30 when air temperature was 65 F, soil temperature 6 inches deep was 62 F, herbicides were applied in 8.5 pga at 40 psi through 8002 nozzles June 24 starting at 8:00 am when air temperature was 69 F, soil temperature 6 inches deep was 64 F, relative humidity was 51%, sky was clear, and wind was southeast at 5 to 10 mph. Spring wheat, oats, and barley were 6 to 8 inches tall, Durum wheat was 3 inches tall, safflower was 1 to 4 inches tall with 4 to 6 leaves, sunflower was 2 to 3 inches tall with 4 leaves, common lambsquarters had 2 to 6 leaves, flax was 2 to 5 inches tall, sugarbeets had 2 leaves, tame mustard was 2 to 4 inches tall, foxtail millet was 2 to 5 inches tall, navy beans and soybeans were 3 to 5 inches tall with 1 to 2 trifoliolates, and corn was 5 to 8 inches tall. Significant rain was 0.69 inch June 6, 0.29 inch June 10, 0.12 inch June 13, 0.26 inch June 15, 1.85 inches June 17, and 0.7 inch June 21 to 23. Weed control and crop injury were evaluated July 6 and 25 for preplant incorporated treatments, July 6 and 29 for preemergence treatments, and July 14 and 26 for postemergence herbicides.

Rain following preemergence application of herbicides was adequate to activate the herbicides. No rain fell during the first week after postemergence applications.

AC 222,293 is normally used as a postemergence herbicide but was included as a preplant incorporated (PPI) treatment in this experiment. Other research has shown that AC 222,293 can have sufficient soil residual to carry over into the next year and use of AC222,293 as a PPI treatment was to obtain information on relative tolerance of several species. Oats, foxtail millet, flax, tame mustard, sugarbeets, and common lambsquarters were severely damaged by PPI AC 222,293. PPI RE-40885 damaged barley less than wheat and oats. PPI metolachlor damaged sugarbeets less than alachlor. PPI AC 263,499 at 0.125 lb/A gave over 90% control of all species except soybean and navy bean. Safflower was tolerant of several of the PPI treatments. Navy bean was more susceptible to cyanazine and RE-40885 but less susceptible to butylate, cycloate, and EPTC than soybean.

Preemergence (pre) pendimethalin, SC-0735, and SC-0051 gave over 95% control of common lambsquarters. Cinmethylin was more phytotoxic as a PPI treatment than as a pre. Navy bean was more susceptible to BAS-51400 than soybean. Wheat, barley, and oats were injured less by SC-0735 than by SC-0051.

Postemergence bromoxynil, propanil, SC-0051, SC-0735, and SC-0098 gave over 90% control of common lambsquarters. BAS-51400 at 0.5 lb/A used with petroleum oil or methylated sunflower oil at 1 qt/A generally was more phytotoxic than BAS-51400 at 1 lb/A without an additive. Methylated sunflower oil was or tended to be more effective than petroleum oil. Flax, tame mustard, and sugarbeets were injured more by fluroxypyr than by clopyralid. Lactofen gave greater injury to safflower and flax than acifluorfen, bentazon, or fomesafen. Bentazon gave better control of tame mustard and sunflower than acifluorfen or fomesafen and control similar to lactofen. Navy beans were injured more by SC-0735, SC-0098, and BAS-51400 than soybean. AC 222,293 gave over 95% control of oats and tame mustard with no injury to wheat, barley, corn, safflower, and sunflower. Wheat, barley, oats and safflower were injured less by SC-0735 than by SC-0051 or SC-0098. (Dept. of Agron., published with the approval of the Agric. Exp. Sta., North Dakota State Univ., Fargo.)

Table. **Herbicides on several crop and weed species.** (Dexter and Nalewaja).

Treatments	Rate	HRS wheat	Durum wheat	Barley	Oats	Foxtail millet	Corn	Saf-flower	Sun-flower	Flax	Tame mustard	Soy-bean	Navy bean	Sugar-beets	Colq
	(lb/A)	Weed control or crop injury (%)													
Preplant incorporated treatments															
Isoxaben	0.1	0	5	0	0	12	0	0	0	45	94	0	10	83	59
Isoxaben	0.13	0	0	0	0	12	10	0	0	52	86	8	18	90	61
Trifluralin	1.0	93	89	68	93	99	70	0	0	30	0	8	17	97	97
Ethalfluralin	0.94	97	95	97	98	99	82	0	0	57	17	17	15	99	99
RE-40885	0.5	51	97	23	92	67	65	0	0	33	82	64	81	99	94
RE-40885	1.0	83	99	26	99	94	92	0	0	77	97	91	98	99	98
Cycloate	4	95	96	83	90	97	0	0	0	65	75	57	33	17	88
EPTC	4	98	99	97	99	98	27	18	0	60	95	32	19	52	74
Butylate	4	97	98	91	85	97	0	0	0	11	66	37	20	33	0
FMC-57020	0.3	66	41	61	63	63	40	3	45	60	33	0	6	15	12
FMC-57020	1.0	98	98	98	99	98	94	65	94	99	93	4	31	65	87
Cyanazine	3.0	86	94	93	94	84	0	79	94	95	98	38	92	99	99
Metolachlor	3.0	69	89	60	61	98	0	0	0	2	75	14	23	25	78
Alachlor	3.0	46	63	45	50	87	0	5	0	19	45	0	20	52	65
AC 263,499	0.06	78	88	89	94	97	87	94	92	98	99	4	13	99	99
AC 263,499	0.125	90	95	96	99	99	96	96	99	99	99	20	35	99	99
Cinmethylin	1.25	98	98	97	97	99	96	66	56	74	93	42	43	93	92
AC 222,293	0.12	0	0	0	53	10	0	0	0	30	84	6	3	98	13
AC 222,293	0.25	3	10	5	87	51	0	0	0	83	95	15	29	96	66
AC 222,293	0.5	8	20	8	97	75	13	0	0	97	98	25	25	98	90
Mean		57	62	51	70	70	35	19	21	54	69	22	29	69	67
LSD 5%		17	13	16	16	12	19	16	9	20	19	13	17	16	17
Preemergence treatments															
Isoxaben	0.1	0	0	0	0	0	0	0	0	0	36	0	0	21	0
Isoxaben	0.13	0	0	0	0	3	3	0	0	35	71	3	4	29	17
LAB 175659	0.5	0	0	0	0	0	0	44	5	27	17	0	5	34	5
LAB 175659	1.0	0	0	0	0	7	0	35	54	45	12	3	4	44	3
FMC-57020	1.0	68	24	63	91	99	24	25	79	98	70	3	10	19	68
Metolachlor	3.0	31	33	28	21	95	0	9	0	20	47	3	8	20	54
Alachlor	3.0	23	36	37	28	99	0	9	0	60	68	0	9	69	60
Propachlor	5.0	0	3	0	0	98	0	7	0	0	31	3	24	40	40
Chloramben	3.0	4	5	31	41	95	19	29	0	53	79	0	19	98	88
Pendimethalin	1.5	7	9	9	18	88	0	0	0	63	40	0	5	79	96
Linuron	3.0	0	0	0	0	48	0	3	17	0	88	0	9	61	0
SC-0735	0.5	0	0	0	2	96	2	29	71	91	96	58	99	99	98
SC-0735	1.0	6	18	9	29	98	0	77	94	95	99	95	99	99	99
SC-0051	1.0	56	70	62	83	99	8	99	99	78	99	99	99	99	99
SC-0051	2.0	84	79	70	82	99	24	99	99	73	99	99	99	99	99
BAS-51400	0.5	0	0	0	0	91	4	42	13	77	28	5	87	50	40
BAS-51400	1.0	0	0	3	9	95	0	83	34	76	36	0	89	37	74
Cinmethylin	1.25	4	7	4	5	97	12	6	2	10	20	3	7	35	30
Mean		16	16	18	23	73	5	33	32	50	58	21	38	58	54
LSD 5%		15	17	17	19	8	15	24	20	25	24	8	16	25	21
Postemergence treatments															
DPX-M6316	0.15	0	0	3	0	0	0	0	34	5	93	2	10	75	4
Clopyralid	0.2	0	0	0	0	0	0	98	95	6	2	97	96	13	4
Fluroxypyr	0.2	0	0	0	0	0	0	97	96	98	77	96	93	82	0
LAB 175659	0.5	0	0	0	0	0	0	36	0	3	0	0	6	0	0
LAB 175659	1.0	0	0	0	0	0	0	39	10	0	4	0	3	13	3
Acifluorfen + X-77[a]	0.375+0.25%	5	7	12	9	13	0	47	10	72	71	2	9	45	47
Bentazon+PO[b]	0.75+1Q	3	0	2	0	0	0	58	60	3	98	2	9	94	63
Fomesafen+X-77[a]	0.25+0.25%	0	0	0	0	3	0	14	30	30	77	5	4	53	9
Lactofen+X-77[a]	0.25+0.25%	0	0	3	2	5	2	93	68	96	91	3	16	85	23
Bromoxynil	0.25	0	0	0	0	0	0	94	99	27	99	44	31	99	98
Propanil	1.5	4	3	8	6	0	21	23	55	22	88	24	30	88	93
Dicamba	0.12	0	0	0	0	0	0	96	93	3	8	78	88	78	75
Diclofop	1.0	0	0	0	66	82	99	0	0	0	0	2	3	0	0
Fluazifop-P+PO[b]	0.188+1Q	99	99	99	99	89	99	0	0	0	0	0	0	0	0
2,4-DB	0.5	2	0	0	2	0	2	3	67	6	3	15	21	62	75
AC 222,293	0.25	3	0	3	96	0	3	0	0	51	98	25	8	80	25
SC-0051+Tween 20[a]	0.25+0.5%	12	8	11	17	22	7	29	89	23	88	93	95	99	99
SC-0051+Tween 20[a]	0.5+0.5%	27	34	31	49	32	9	67	98	37	87	98	98	98	99
SC-0735+Tween 20[a]	0.125+0.5%	0	0	0	0	20	0	3	47	17	94	78	90	93	96
SC-0735+Tween 20[a]	0.25+0.5%	0	0	0	7	20	0	12	65	44	98	82	96	98	98
SC-0098+Tween 20[a]	0.03+0.5%	24	11	18	28	10	8	30	45	58	45	4	17	90	75
SC-0098+Tween 20[a]	0.06+0.5%	34	22	23	35	10	5	38	58	60	58	14	79	88	96
BAS-51400	0.5	0	0	0	0	7	0	84	23	41	3	20	69	25	8
BAS-51400	1.0	0	0	0	2	20	0	89	72	63	16	15	86	23	38
BAS-51400+PO[b]	0.5+1Q	0	0	0	0	43	0	96	95	74	17	24	77	37	77
BAS-51400+MSU[b]	0.5+1Q	7	7	13	14	92	6	97	98	94	17	43	86	60	73
Mean		9	7	9	17	18	10	48	54	36	51	33	47	61	49
LSD 5%		8	6	8	8	16	7	15	24	19	20	9	14	15	21

[a] X-77 and Tween 20 were surfactants.
[b] PO = petroleum oil additive with 17% emulsifier. MSU = methylated sunflower oil with 15% IGEPAL CO-630 emulsifier.
Q = quarts/A.

Spray volume and grass control herbicides, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 ft wide strips as bioassay species on May 29. Treatments were applied to 6 leaf species on June 26 with 85 F, 70% relative humidity and sunny sky. Spray volume was obtained by various nozzles and spray passes; 1, 2, and 4 passes with 8001 nozzles gave 8.5, 17, and 34 gpa, one pass with 8002 gave 17 gpa, and one pass with 8004 gave 34 gpa. Petroleum oil (PO) was with 17% Atplus 300F and methylated soybean oil (MSO) was with 15% IGEPAL CO-630 emulsifier. Sethoxydim was at 1.5 oz/A and fluazifop at 1.25 oz/A. Evaluations were on July 17 and 29, and data was combined for analysis. Each set of treatments was a separate RCBD experiment with three replications.

		Fluazifop+PO			Sethoxydim+PO			Sethoxydim+MSO		
Nozzle	Oil	Wht	Oats	Mill	Wht	Oats	Mill	Wht	Oats	Mill
	(%)	--(% control)--			--(% control)--			--(% control)--		
8001X1	0	96	93	43	44	48	91	43	49	91
8001X2	0	99	98	48	70	55	91	83	74	97
8001X4	0	99	99	74	69	65	95	96	91	98
8002X1	0	96	94	42	57	54	90	85	68	94
8004X1	0	95	91	32	60	48	84	75	71	94
Average		97	95	47	60	54	90	76	71	95
8001X1	0.5	98	98	51	94	87	96	88	71	95
8001X2	0.5	98	98	49	81	80	96	96	87	98
8001X4	0.5	99	99	73	95	95	99	92	87	96
8002X1	0.5	98	96	38	87	78	96	96	94	99
8004X1	0.5	99	95	45	84	73	93	95	87	97
Average		98	97	51	88	82	96	93	85	97
8001X1	1	99	99	68	96	80	95	96	91	98
8001X2	1	98	99	53	82	91	95	97	96	98
8001X4	1	98	99	68	95	93	98	98	94	98
8002X1	1	98	96	43	93	86	96	97	96	98
8004X1	1	98	94	46	93	80	96	96	86	96
Average		98	97	55	90	86	96	97	93	98
8001X1	2	99	99	70	92	89	97	97	95	98
8001X2	2	99	99	63	89	84	96	98	96	99
8001X4	2	99	99	66	97	96	98	98	97	99
8002X1	2	98	95	48	88	83	94	97	94	99
8004X1	2	99	97	58	81	71	93	98	92	98
Average		98	98	61	89	85	96	98	95	98
8001X1	4	99	99	59	95	91	98	90	84	94
8001X2	4	99	99	61	92	85	97	98	96	99
8001X4	4	99	99	60	96	96	97	98	98	98
8002X1	4	97	96	49	90	86	95	98	96	99
8004X1	4	96	93	43	91	83	97	98	94	98
Average		98	97	54	93	88	97	96	94	97
LSD (5%)		2	1	8	10	6	2	12	5	2
LSD (5%)-Average		1	1	5	7	8	2	3	4	2

Summary

Wheat and oats control with fluazifop was nearly complete with all treatments regardless of oil or spray volume. Thus, any possible difference from the treatments were not detectable. Foxtail millet control with fluazifop generally was highest with four spray passes from an 8001 nozzle, especially when without or only 0.5% oil in the spray. Millet control generally increased as oil was increased to 2% of the fluazifop spray. Fluazifop applied with one pass from 8001 nozzle tended to give higher foxtail millet control than one pass from an 8002 or 8004 nozzle. Wheat and oats control with sethoxydim tended to increase as percent petroleum oil in the spray increased. Nozzle type did not appear to influence species control with sethoxydim, except multiple passes with 8001 nozzle tended to increase control compared to one pass. Species control was too high in the experiment with sethoxydim and methylated soybean oil to detect differences among various treatments. Control tended to be higher for both herbicides when applied with 8001 than 8002 or 8004 nozzles regardless of oil percent, when considering species where control was not complete.

Volume of additives with grass control herbicides, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 feet wide strips as bioassay species on June 5. Treatments were applied to 5 leaf species on July 1 with 70 F, 60% relative humidity, and sunny sky. Petroleum oil (POAT), once refined sunflower oil (SFAT), and methylated sunflower oil (MSAT), all containing 15% Atplus 300F emulsifier, and methylated sunflower oil with 15% IGEPAL CO-630 (MSCO) were applied at 0 to 2 pints per acre. The sethoxydim was at 1 oz/A and fluazifop at 0.75 oz/A. The experiment was a split plot with herbicides as the main plots and additives the subplots and contained three replications. The data are an average of two evaluations on July 7 and 17.

Additive	Species	Sethoxydim Oil volume (pt/A) 0	1.5	1.0	2.0	Fluazifop Oil volume (pt/A) 0	1.5	1.0	2.0
		-------(%)-------				-------(%)-------			
POAT	Wheat	33	89	95	97	96	98	98	98
POAT	Oats	19	60	80	88	89	97	97	98
POAT	Millet	82	94	97	97	42	67	69	61
Average		45	81	91	94	76	87	88	86
SFAT	Wheat	58	85	91	94	97	97	97	98
SFAT	Oats	29	58	68	79	90	90	95	90
SFAT	Millet	89	95	95	95	52	52	50	48
Average		59	79	85	89	80	80	81	79
MSAT	Wheat	84	95	97	97	96	98	98	98
MSAT	Oats	38	86	93	93	91	98	98	98
MSAT	Millet	88	96	98	98	50	62	68	65
Average		70	92	96	96	79	86	88	87
MSCO	Wheat	61	90	94	89	95	95	95	95
MSCO	Oats	26	53	66	67	89	83	80	78
MSCO	Millet	85	92	94	93	39	29	38	19
Average		57	78	85	83	74	69	71	64

LSD 5% Averaged over dates: Wheat = 9, Oat = 9, Millet = 10
LSD 5% Averaged over dates and species: 6
(Pooled error: wheat = 62, oats = 68, millet = 77)

Summary

Species control was not increased by increasing the volume of the adjuvants in the fluazifop spray, except for methylated sunflower oil with CO-630 emulsifier. Methylated sunflower oil tended to reduce oats and millet control with fluazifop, especially at the high (2 pt/A) volume. Even though volume of the oil additives did not increase species control with fluazifop, control of oats and millet was increased by petroleum oil or methylated sunflower oil with Atplus 300F compared to fluazifop alone. The once refined sunflower oil additive did not enhance species control with fluazifop. Species control with sethoxydim increased or tended to increase as the volume of petroleum or once refined sunflower oil increased from 0.5 to 2 pt/A. Control generally increased as the volume of methylated sunflower oil increased from 0.5 to 1 pt/A, but with no further increase from 2 pt/A. The values for the no additive control treatment for the MSAT treatments was higher than some of the other control treatments with sethoxydim indicating a possible error in application. However, this would influence only the magnitude of control and not the response to oil volume. Thus, these data indicate that a lower volume of methylated sunflower oil than petroleum oil was needed to maximize species control with sethoxydim. Methylated sunflower oil with CO-630 emulsifier was generally less effective than with Atplus 300F emulsifier as an additive to both sethoxydim and fluazifop for grass species control.

Oils and methyl esters of various seed as adjuvants, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' millet were seeded in adjacent 6 ft wide strips as bioassay species on June 5. Treatments were applied to 5 leaf species on July 1 with 70 F, 60% relative humidity, and a sunny sky in one experiment and to jointing stage species on July 14 with 80 F and partly cloudy sky in the second experiment. All seed oils were once-refined, all treatments containing 15% ATplus 300F emulsifier (except MSAT), and all were applied at 1 qt/A. The experiments were a split-plot design with herbicides as the main plot and seed oils as the subplot, and contained four replications. Evaluations were on July 17 and August 12 for the first experiment and on July 31 and August 5 for experiment 2. Sethoyxdim was applied at 1 and fluazifop at 0.75 oz/A. Petroleum oil (PO), soybean oil (SO), sunflower oil (SF), safflower oil (SAF), cotton oil (CO), methylated soybean oil with 5.5% ATplus 300F (MSAT), linseed oil (LO), rapeseed oil (RA), high oleic sunflower oil (SSF). The M prefix indicates a methylated oil.

		Experiment 1			Experiment 2			Exp 1&2 Comb.		
Herbicide	Additive	Wht	Oat	Mil	Wht	Oat	Mil	Wht	Oat	Mil
		-(% control)-			-(% control)-			-(% control)-		
Sethoxydim	PO	95	74	98	77	87	81	86	81	90
Sethoxydim	SO	93	81	98	75	81	83	84	81	90
Sethoxydim	SF	90	76	98	77	83	81	83	79	89
Sethoxydim	SAF	92	79	98	77	85	81	84	82	89
Sethoxydim	CO	90	71	96	75	81	79	82	76	88
Sethoxydim	LI	82	53	96	77	81	80	79	67	88
Sethoxydim	RA	93	86	98	75	78	78	85	82	88
Sethoxydim	SSF	85	67	95	78	81	79	81	74	87
Sethoxydim	MSO	97	92	98	76	85	78	87	89	88
Sethoxydim	MSF	97	93	98	78	84	80	88	89	89
Sethoxydim	MSAF	97	93	98	78	87	84	88	90	91
Sethoxydim	MSAT	93	86	97	76	77	78	85	82	88
Sethoxydim	MCO	95	88	98	77	85	83	86	86	91
Sethoxydim	MLI	97	93	98	77	81	81	87	87	89
Sethoxydim	MRA	95	86	98	76	77	74	86	81	86
Sethoxydim	MSSF	97	92	98	77	88	83	87	90	90
Fluazifop	PO	98	91	42	91	95	77	95	93	59
Fluazifop	SO	96	82	32	91	92	79	93	87	55
Fluazifop	SF	96	82	32	90	97	78	93	89	55
Fluazifop	SAF	96	84	34	92	97	79	94	91	56
Fluazifop	CO	94	76	31	91	97	75	93	86	53
Fluazifop	LI	93	63	23	89	93	71	91	78	47
Fluazifop	RA	99	96	38	93	97	77	96	96	57
Fluazifop	SSF	95	78	28	92	96	78	93	87	53
Fluazifop	MSO	99	96	42	92	96	75	95	96	58
Fluazifop	MSF	99	97	36	94	97	74	96	97	55
Fluazifop	MSAF	99	95	36	94	99	78	96	97	57
Fluazifop	MSAT	93	86	24	95	98	80	94	92	52
Fluazifop	MCO	98	89	32	93	97	77	96	93	54
Fluazifop	MLI	98	94	33	92	94	72	95	94	52
Fluazifop	MRA	97	91	33	94	98	77	96	95	55
Fluazifop	MSSF	98	93	28	95	97	76	96	95	52
LSD 5%		4	9	6	3	3	4	5	6	6

Summary

Once-refined linseed oil and oleic sunflower oil were or tended to be less effective than the other oils as additives to sethoxydim and fluazifop for grass species control in experiment 1. Methylation of the seed oil overcame any differences among the seed oils as additives with either sethoxydim or fluazifop. The differences among treatments were less in experiment 2 than 1, indicating that possibly detection of differences is more difficult for plants treated at a late growth stage. The control of species was generally higher with fluazifop in the second experiment, but higher with sethoxydim in the first experiment. Thus, susceptibility appeared to increase at the late growth stage for fluazifop, but decrease for sethoxydim.

Seed oil refinement and adjuvant efficacy, Fargo, 1986. 'Marshall' wheat, 'Steele' oats and 'Siberian' millet were seeded in adjacent 6 ft wide strips as bioassay species on June 5. Treatments were applied to 5 leaf species on July 1 with 70F, 60% relative humidity and a sunny sky for experiment 1 and to jointing stage species on July 14 with 80F and partly cloudy sky. The treatments were petroleum (PO); crude (LOCR), degummed (LODG), degummed filtered (LODGF), and once-refined linseed oil (LOIR); crude (SOCR), degummed (SODG), and once-refined soybean oil (SOIR); crude (SFCR), degummed (SFDG), and once-refined sunflower oil (SFIR); and the above seed oil methylated (M prefix). All additives were at 1 qt/A and contained 15% ATplus 300F emulsifier. Sethoxydim was at 1.5 and fluazifop at 1 oz/A. Evaluations were on July 17 and August 12 for experiment 1 and on July 25 and August 12 for experiment 2. The experiments were split plot design with herbicides as the main plot and additives as the sub-plot and contained three replications.

(See table of data on next page.)

Summary

The summary will be based upon the values obtained for oats which appeared to express differences better than the other species. The lowest error mean squares were also obtained for the oats ratings. No important consistent differences occurred among seed oil types or their degree of refinement for use as adjuvants with sethoxydim and fluazifop. The methyl esters of all seed oils, regardless of original refinement, were more effective than the parent seed oils as additives to enhance oats control with sethoxydim and fluazifop.

Herbicide	Additive	Experiment 1 Wht	Oats	Mill	Experiment 2 Wht	Oats	Mill	Exp 1&2 Comb Wht	Oats	Mill
		-----(%)-----			-----(%)-----			-----(%)-----		
Sethoxydim	None	53	35	90	63	62	78	58	48	84
Sethoxydim	PO	97	91	97	77	83	88	87	87	93
Sethoxydim	LOCR	95	85	97	69	72	84	82	79	91
Sethoxydim	LODG	94	87	97	71	78	84	83	83	90
Sethoxydim	LODGF	94	83	97	69	75	84	82	79	90
Sethoxydim	LOIR	95	84	97	73	78	87	84	81	92
Sethoxydim	SOCR	96	87	98	76	76	84	86	81	91
Sethoxydim	SODG	89	81	96	71	81	84	80	81	90
Sethoxydim	SOIR	92	82	95	72	83	91	82	82	93
Sethoxydim	SFCR	95	84	97	75	80	85	85	82	91
Sethoxydim	SFDG	95	84	95	75	82	88	85	83	91
Sethoxydim	SFIR	93	81	95	72	80	84	83	80	90
Sethoxydim	MLOCR	98	97	98	81	89	93	89	93	96
Sethoxydim	MLODG	98	97	98	81	88	93	89	93	95
Sethoxydim	MLODGF	97	97	96	79	87	90	88	92	93
Sethoxydim	MLOIR	96	94	99	76	84	90	86	89	95
Sethoxydim	MSOCR	96	97	98	79	89	94	88	93	96
Sethoxydim	MSODG	98	97	99	75	87	85	86	92	92
Sethoxydim	MSOIR	97	97	98	75	83	89	96	90	93
Sethoxydim	MSFCR	97	95	97	82	87	89	89	91	93
Sethoxydim	MSFDG	97	97	97	80	87	89	89	92	93
Sethoxydim	MSFIR	97	97	97	78	89	92	87	93	95
Fluazifop	None	96	86	34	81	94	73	89	90	53
Fluazifop	PO	98	98	60	91	98	69	95	98	64
Fluazifop	LOCR	98	91	61	85	94	70	91	92	66
Fluazifop	LODG	95	88	38	80	94	73	87	91	56
Fluazifop	LODGF	97	87	37	79	94	72	88	90	55
Fluazifop	LOIR	97	91	55	80	95	73	88	93	64
Fluazifop	SOCR	98	92	32	81	91	73	89	92	52
Fluazifop	SODG	98	91	48	81	93	69	90	92	59
Fluazifop	SOIR	97	89	47	85	95	73	91	92	61
Fluazifop	SFCR	98	93	51	82	95	79	90	94	65
Fluazifop	SFDG	97	92	57	85	95	73	91	94	65
Fluazifop	SFIR	94	79	57	87	95	76	91	87	66
Fluazifop	MLOCR	98	98	71	89	97	82	94	98	76
Fluazifop	MLODG	99	97	65	94	98	81	96	98	73
Fluazifop	MLODGF	99	99	63	81	96	74	90	98	69
Fluazifop	MLOIR	99	99	73	85	96	72	92	97	72
Fluazifop	MSOCR	98	99	71	92	96	77	95	97	94
Fluazifop	MSODG	99	98	60	85	95	75	92	97	67
Fluazifop	MSOIR	98	99	61	83	97	77	91	98	69
Fluazifop	MSFCR	98	98	53	87	95	72	93	97	63
Fluazifop	MSFDG	98	99	73	91	98	77	95	99	75
Fluazifop	MSFIR	99	98	66	85	97	73	92	97	70
LSD 5%		5	4	9	11	3	6	8	7	14

Various adjuvants with sethoxydim and fluazifop, Fargo, 1986. 'Marshall' wheat, 'Steele' oats and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on May 29. Treatments were applied to 5 leaf species on June 24 with 90 F and wet conditions. Adjuvants were applied at 1 qt/A with sethoxydim at 1.5 and fluazifop-P at 1 oz/A. MSO15CO was methylated soybean oil with 15% IGEPAL CO-630 emulsifier, and PO17AT was phytobland petroleum oil with 17% Atplus 300F emulsifier. The experimental design was a split plot with four replications. Grass control was evaluated July 15 and July 28.

Treatment	July 15 Wht	July 15 Oat	July 15 Mil	July 28 Wht	July 28 Oat	Combined Wht	Combined Oat
	(% control)						
Sethoxydim+Bioveg	97	96	96	99	95	98	96
Sethoxydim+MSO15CO	96	97	97	99	96	97	97
Sethoxydim+PO17AT	97	97	97	98	96	98	97
Sethoxydim+LI 700	94	97	97	99	96	97	96
Sethoxydim+Herbimax	95	97	97	99	95	97	96
Sethoxydim+PO11E	94	93	96	99	92	96	92
Sethoxydim+Trans Bas 1	92	88	93	98	84	95	86
Sethoxydim+Trans Bas	90	88	94	95	87	93	87
Fluazifop+Bioveg	98	98	39	99	97	98	98
Fluazifop+MSO15CO	98	99	35	99	99	98	99
Fluazifop+PO17AT	98	97	36	99	98	98	98
Fluazifop+LI 700	99	99	45	99	98	99	99
Fluazifop+Herbimax	98	98	36	99	98	98	98
Fluazifop+PO11E	95	93	26	98	90	97	92
Fluazifop+Trans Bas 1	98	98	34	99	98	98	98
Fluazifop+Trans Bas	98	98	41	99	98	99	98
LSD 5%	2.4	2.6	7.1	1.6	3.6	1.5	2.2

Summary

All additives appeared to be similar in enhancing sethoxydim and fluazifop, except for petroleum oil 11E (low percent emulsifier) with both herbicides and Trans Bas with sethoxydim. LI 700 also tended to be less effective than Bioveg or PO17AT with sethoxydim. The control obtained with the herbicides at the rates used was too high for determining differnces among most of the adjuvants.

<u>Percent emulsifier with various oil additives, Fargo, 1986.</u> 'Marshall' wheat, 'Steele' oats and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on June 5. Treatments were applied to 5 leaf species July 1 with 70 F, 60% relative humidity, sunny sky, and 0 to 5 mph wind. Petroleum oil (PO), methylated sunflower oil (MS), and once refined sunflower oil (SF) each with 2.5, 5, 10, or 15% Atplus 300F (AT), TMULZ-VO (TM), and IGEPAL CO-630 (CO) were applied at 1 quart/A. Evaluations were on July 18 and August 12 and were combined for the analysis. The experiment was a split plot with herbicides as the main effects, emulsifiers as the subplot, and contained three replications.

(See table of data on next page.)

Summary

The effectiveness of an oil adjuvant was influenced by specific emulsifier, emulsifier concentration, and the herbicide, averaged over species. Species control with sethoxydim generally was higher with AT than TM or CO with petroleum oil, but control with fluazifop was higher with AT and TM than CO. Emulsifier concentration with petroleum oil generally did not influence the effectiveness of the adjuvant, except for TM with sethoxydim. Increasing the amount of TM from 10 to 15% of the petroleum oil decreased its effectivenesss with sethoxydim. The emulsifiers generally were similiarly effective with methylated sunflower oil with both sethoxydim and fluazifop, except that effectiveness tended to increase if AT was increased from 2.5 to 5% for both herbicides and TM effectiveness decreased as concentration increased from 10 to 15% with sethoxydim. The data with once refined sunflower oil were variable, but species control with sethoxydim increased when the concentration of AT in the oil increased from 2.5 to 5%. The data indicates that increasing the concentration of an emulsifier in an oil adjuvant may reduce or increase its effectiveness depending upon the oil and the herbicide.

		Sethoxydim				Fluazifop			
		Percent emulsifier							
Additive	Spp.	2.5	5.0	10.0	15.0	2.5	5.0	10.0	15.0
		---------------(% control)---------------							
POAT	Wheat	96	95	95	91	98	98	98	98
POAT	Oats	81	79	80	79	98	98	99	99
POAT	Millet	97	96	97	97	84	76	86	87
Average		91	90	91	89	93	91	94	95
POCO	Wheat	81	84	86	92	97	96	97	96
POCO	Oats	64	49	66	63	91	89	97	86
POCO	Millet	96	93	95	93	71	64	83	60
Average		80	75	82	83	86	83	92	81
POTM	Wheat	91	92	92	81	98	97	98	98
POTM	Oats	73	73	80	55	98	97	99	99
POTM	Millet	96	95	96	84	85	83	78	81
Average		87	89	89	73	94	92	92	93
MSAT	Wheat	96	97	97	97	97	98	98	98
MSAT	Oats	82	91	93	94	98	98	99	99
MSAT	Millet	97	97	99	97	45	77	73	83
Average		92	95	96	96	80	91	90	93
MSCO	Wheat	95	96	95	96	98	98	98	98
MSCO	Oats	89	93	88	86	99	97	99	98
MSCO	Millet	96	94	96	97	82	65	76	75
Average		93	94	93	93	93	87	91	90
MSTM	Wheat	95	97	95	93	98	98	98	98
MSTM	Oats	89	91	90	73	99	99	99	98
MSTM	Millet	98	98	99	93	78	83	84	84
Average		94	95	95	86	92	93	94	93
SFAT	Wheat	79	87	88	92	97	97	98	98
SFAT	Oats	53	72	81	78	95	96	95	97
SFAT	Millet	94	94	93	95	70	72	73	71
Average		75	84	87	88	87	88	89	89
SFCO	Wheat	77	79	89	79	97	96	97	97
SFCO	Oats	55	58	75	61	93	84	93	93
SFCO	Millet	93	91	93	92	66	53	77	71
Average		75	76	86	77	85	78	89	87
SFTM	Wheat	89	92	92	79	97	96	97	98
SFTM	Oats	74	73	69	51	95	92	96	97
SFTM	Millet	93	93	93	92	64	77	67	69
Average		85	86	85	74	85	88	87	88

LSD 5% All treatments: Wheat = 6.2, Oats = 11.5, Millet = 13.3

LSD 5% Averaged over species = 6.2
(pooled error: wheat = 29.6, oats = 100.4, millet = 133.2)

Various oil additives with grass herbicides, Fargo, 1985. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on May 17. Treatments were applied to 6 to 7 leaf species on June 23 with 70 F, 60% relative humidity and wet soil. Once refined soybean (SO), sunflower (SF), and linseed oil (LO), the respective methyl esters (ME), and petroleum oil (PO) were applied at 1 qt/A. X-77 was applied at 0.25% of the 8.5 gpa spray volume. All oils contained Atplus 300F emulsifier. Petroleum oil was 11N. Evaluations were on July 7 and 18. Data presented is an average of the two evaluations.

(See table of data on next page.)

Summary

Methylated soybean, sunflower, and linseed oil were all similar in enhancing species control with the various graminicides, except methylated sunflower oil caused less enhancement than the other two methylated oils with fluazifiop and fenoxyprop. The reduced effectiveness of methylated sunflower oil may have been a chance occurance as variation among replicationss was high for those treatments. The methylated seed oil enhanced species control more than petroleum oil or the parent seed oil when with BAS-51702H, RE-45601, and sethoxydim; equal to petroleum oil when with fluazifop (disregarding the sunflower oil), haloxyfop, and diclofop; and less than petroleum oil when with DPX-Y6202 or fenoxyprop. The graminicides generally were enhanced less by unesterified seed oils than petroleum oil, except seed oils were equal to petroleum oil with BAS-51702H and RE-45601. The response to the adjuvants was less than that obtained in previous years. The 1986 growing season was exceptionally wet which may have reduced the need for an adjuvant.

Herbicide	Rate	Spp.	Additive								
			X-77	PO	SO	MESO	SF	MESF	LO	MELO	None
	(oz/A)		(% control)								
BAS-51702H	0.75	Wht	79	88	85	90	81	90	83	91	39
BAS-51702H	0.75	Oat	92	98	98	99	96	97	97	99	76
BAS-51702H	0.75	Mil	90	95	92	96	88	94	91	96	73
Average			87	94	92	95	88	94	90	95	63
RE-45601	0.75	Wht	78	90	87	93	79	94	89	93	43
RE-45601	0.75	Oat	79	95	96	98	86	98	95	98	52
RE-45601	0.75	Mil	76	88	88	91	82	93	91	95	68
Average			78	91	90	94	82	95	92	95	54
Sethoxydim	1.5	Wht	61	82	78	86	62	87	68	87	40
Sethoxydim	1.5	Oat	47	89	86	92	71	94	72	93	38
Sethoxydim	1.5	Mil	74	92	91	91	86	94	91	89	70
Average			61	88	85	90	73	92	77	90	49
Fluazifop-P	1.5	Wht	90	91	89	91	88	86	86	89	87
Fluazifop-P	1.5	Oat	92	95	91	96	91	87	85	90	87
Fluazifop-P	1.5	Mil	67	71	67	72	67	61	59	89	62
Average			83	86	82	86	82	78	77	89	79
DPX-Y6202-31	0.5	Wht	95	96	88	95	85	94	83	95	92
DPX-Y6292-31	0.5	Oat	91	95	62	93	51	90	36	87	80
DPX-Y6202-31	0.5	Mil	91	95	80	91	70	90	61	91	79
Average			92	95	77	93	69	91	60	91	84
Fenoxaprop	0.75	Wht	3	23	5	19	5	10	7	12	2
Fenoxaprop	0.75	Oat	49	80	56	78	31	66	47	73	44
Fenoxaprop	0.75	Mil	86	94	88	93	88	93	92	92	88
Average			46	66	50	63	41	56	49	59	45
Haloxyfop	0.75	Wht	89	94	90	95	87	94	90	93	82
Haloxyfop	0.75	Oat	95	98	96	99	93	98	95	98	90
Haloxyfop	0.75	Mil	82	91	88	92	85	91	85	90	78
Average			89	94	91	95	88	94	90	94	83
Diclofop	12	Wht	0	0	0	0	0	0	0	2	0
Diclofop	12	Oat	55	41	53	46	56	45	49	46	48
Diclofop	12	Mil	77	83	85	81	81	78	79	82	74
Average(Oat&Mil)			72	82	76	83	71	80	72	81	62
Herbicide average			72	82	76	83	71	80	72	81	62

LSD 5% Additive*Herbicide: Wheat = 5.2, Oats = 7.4, Millet = 7.0
LSD 5% Additive*Herbicide (averaged over species) = 3.8
(Pooled error: wheat = 28, oats = 54, millet = 49)
LSD 5% Additives (averaged over species and herbicides) = 1.3

Various esters of seed oils with sethoxydim and fluazifop, Fargo, 1986. 'Steele' oats, 'Marshall' wheat, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on May 29 for experiment 1 and June 5 for experiment 2. Treatments were applied to 5 leaf species on June 24 in the first experiment, and to jointing stage species on July 14 in the second experiment. Growing conditions were moist at time of treatment with both experiments. The soybean and sunflower oils with and without esterification were once refined, contained 15% Atplus 300F emulsifier, and were applied at 1 qt/A in 8.5 gpa. Evaluation was on July 16 and 28 for the first experiment, and July 30 and August 12 for the second experiment. The data for the two evaluations were conbined for analysis.

(See table of data on next page.)

Summary

The non-esterified sunfower oil generally tended to enhance sethoxydim more than the non-esterified soybean oil in experiment one, but not in experiment 2. Soybean and sunflower oil with and without esterification were similar when used with fluazifop, except for oats control in experiment one where non-esterified sunflower oil was more effective than soybean oil. Esterification increased the effectiveness of soybean and sunflower oil as adjuvants and the increase was greater when with sethoxydim than fluazifop. However, the level of control was higher with fluazifop which may have limited the expression of the adjuvants. Esterification of the oils overcame the difference between soybean and sunflower oil. The type of ester (methyl, ethyl, or butyl) did not influence the effectiveness of the seed oil adjuvant with either herbicide.

Exp	Herbicide	Oil	Spp.	Esterification None	Methyl	Ethyl	Butyl
1	Sethoxydim	SO	Wheat	49	82	82	78
1	Sethoxydim	SO	Oats	51	88	91	80
1	Fluazifop	SO	Wheat	96	99	98	98
1	Fluazifop	SO	Oats	79	99	97	97
1	Sethoxydim	SF	Wheat	76	--	83	84
1	Sethoxydim	SF	Oats	60	--	89	89
1	Fluazifop	SF	Wheat	97	--	98	99
1	Fluazifop	SF	Oats	92	--	95	98
2	Sethoxydim	SO	Wheat	70	83	79	83
2	Sethoxydim	SO	Oats	69	84	82	85
2	Sethoxydim	SO	Millet	78	80	82	84
2	Fluazifop	SO	Wheat	90	93	91	91
2	Fluazifop	SO	Oats	95	95	97	95
2	Fluazifop	SO	Millet	72	67	69	70
2	Sethoxydim	SF	Wheat	70	83	80	83
2	Sethoxydim	SF	Oats	71	85	82	86
2	Sethoxydim	SF	Millet	79	79	80	80
2	Fluazifop	SF	Wheat	86	91	91	92
2	Fluazifop	SF	Oats	89	93	96	95
2	Fluazifop	SF	Millet	74	75	78	75
C	Sethoxydim	SO	Wheat	60	83	80	80
C	Sethoxydim	SO	Oats	60	86	86	83
Average				60	84	83	82
C	Fluazifop	SO	Wheat	93	96	94	95
C	Fluazifop	SO	Oats	87	97	97	96
Average				90	97	96	96
C	Sethoxydim	SF	Wheat	73	--	82	88
C	Sethoxydim	SF	Oats	65	--	86	88
Average				69	--	84	88
C	Fluazifop	SF	Wheat	92	--	95	95
C	Fluazifop	SF	Oats	91	--	96	97
Average				92	--	96	96

LSD 5% Exp 1 Herb&Oil*esters: wheat = 7.7, oats = 6.2
LSD 5% Exp 2 Herb&Oil*esters: wheat = 3.7, oats = 3.9, millet = 5.2
LSD 5% Comb. Herb&Oil*esters: wheat = 4.3, oats = 3.6
LSD 5% Avg. Herb*esters(averaged over species) = 2.8
(Pooled error: wheat = 37, oats = 27)

Postemergence grass control in corn, Fargo, 1986. 'Pioneer 9353' corn, 'Marshall' Hard Red Spring wheat, Siberian foxtail millet, and yellow tame mustard were seeded May 29. Treatments were applied to 12 inch corn, 5 leaf wheat, 5 leaf foxtail millet, and 5 to 8 inch tame mustard June 25 with 90F, 50% relative humidity and clear skies. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with three replications. Control ratings were taken on July 15.

Treatment	Rate	Corn	Wheat	Foxtail millet	Tame mustard
	(oz/A)	---------(% control)-------			
BAS-51400H	0.25	8	3	80	25
BAS-51400H	0.5	13	8	88	37
BAS-51400H	1	18	10	89	57
BAS-51400H+SO	0.25+0.25G	10	2	80	23
BAS-51400H+SO	0.5+0.25G	35	8	91	20
BAS-51400H+SO	1+0.25G	53	13	96	53
BAS-51400H+PO	0.25+0.25G	20	2	74	23
BAS-51400H+PO	0.5+0.25G	23	3	83	32
BAS-51400H+PO	1+0.25G	47	5	91	50
BAS-51400H+MSO	0.25+0.25G	38	0	88	15
BAS-51400H+MSO	0.5+0.25G	60	3	94	45
BAS-51400H+MSO	1+0.25G	87	12	98	65
LAB-175659H	0.5	0	0	0	8
LAB-175659H+SO	0.5+0.25G	0	5	0	3
LAB-175659H+PO	0.5+0.25G	0	0	0	13
LAB-175659H+MSO	0.5+0.25G	0	0	0	7
Cyanazine-W	0.75	7	3	22	87
Cyanazine-W	1.5	8	5	37	98
Cyanazine-W+SO	0.75+0.25G	22	13	20	96
Cyanazine-W+SO	1.5+0.25G	22	23	27	99
Cyanazine-W+PO	0.75+0.25G	22	13	23	96
Cyanazine-W+PO	1.5+0.25G	25	22	57	99
Cyanazine-W+MSO	0.75+0.25G	13	3	22	84
Cyanazine-W+MSO	1.5+0.25G	20	18	53	99
Cyanazine-W+BAS-51400H	0.75+0.5	12	2	89	97
Cyan-W+BAS-51400H+PO	0.75+0.5+0.25G	32	13	93	95
Cyan-W+BAS-51400H+SO	0.75+0.5+0.25G	47	20	94	97
Cyan-W+BAS-51400H+MS	0.75+0.5+0.25G	73	22	93	89
C.V. %		39	84	14	17
LSD 5%		16	12	14	16

SO = once refined soybean oil with 15% Atplus 300F emulsifier; PO = petroleum oil with 17% Atplus 300F emulsifier; MSO = methylated soybean oil with 15% IGEPAL CO-630 emulsifier.

Summary

The phytotoxicity of BAS-51400H was enhanced the most by application with methylated soybean oil, and the least with petroleum oil. Once refined soybean oil was intermediate to petroleum oil and methylated soybean oil in enhancing phytotoxicity of BAS-51400H. The enhancement of phytotoxicity by adjuvants was generally more to corn than to the other species. The adjuvants all similarly enhanced species control with cyanazine, except once refined soybean oil did not enhance foxtail millet control.

Diclofop and fluazifop antagonism by 2,4-D with additives, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot strips on May 29 at Fargo, NW22. Treatments were applied to 5 leaf species on June 24. Growing conditions were moist. POAT was petroleum oil with 17% Atplus 300F, AMSU was ammonium sulfate at 2.5 lb/A, MSCO was methylated soybean oil with 15% CO-630 emulsifier, 2,4-D was at 8 oz/A as the dimethylamine formulation, diclofop was at 1 lb/A, fluazifop at 1 oz/A, and all oils were at 1 qt/A. Species control was evaluated on July 17 and 28. The experiment was a randomized complete block with three replications.

Treatment	July 17			July 28		Combined	
	Wht	Oat	Mil	Wht	Oat	Wht	Oat
	(% control)						
Diclofop+POAT	0	49	83	0	73	0	61
Diclofop+2,4-D+POAT	0	27	36	0	26	0	27
Diclofop+2,4-D+MSCO	0	37	45	0	17	0	27
Diclofop+2,4-D+AMSU	0	34	40	0	2	0	18
Diclofop+2,4-D+POAT+AMSU	0	28	33	0	9	0	18
Diclofop+2,4-D+MSCO+AMSU	0	30	36	0	10	0	20
Fluazifop+POAT	99	98	29	99	98	99	98
Fluazifop+2,4-D+POAT	80	76	34	83	58	82	67
Fluazifop+2,4-D+MSCO	79	62	29	65	52	72	57
Fluazifop+2,4-D+AMSU	83	81	20	84	73	84	77
Fluazifop+2,4-D+POAT+AMSU	92	78	34	94	71	93	74
Fluazifop+2,4-D+MSCO+AMSU	83	63	34	83	53	83	57
LSD 5%	8	9	10	16	16	10	9

Summary

Diclofop control of oats was antagonized by 2,4-D regardless of adjuvants in the spray mixture. Ammonium sulfate in the spray generally reduced oats control from diclofop with 2.4-D compared to treatments without ammonium sulfate. Petroleum oil and methylated sunflower oil were similarly effective additives to diclofop plus 2,4-D. Wheat and oats control with fluazifop was reduced when applied with 2,4-D, regardless of the other additives. The inclusion of ammonium sulfate generally reduced the antagonism of fluazifop by 2,4-D. The control of wheat and oats with fluazifop plus 2,4-D generally was lower when with methylated sunflower oil than with petroleum oil. The data varied among replications for certain treatments indicating possible phase separation. Methylated sunflower oil with CO-630 emulsifier was found to produce unstable emulsions with certain herbicides and inorganic adjuvants.

Antagonism of grass control herbicides, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on May 29. Treatments were applied to 5 leaf species on July 1 with 70 F, 60% relative humidity, sunny sky, and 0 to 5 mph wind. The various adjuvants were: petroleum oil with 17% Atplus 300F emulsifier (POAT), methylated soybean oil with 15% IGEPAL CO-630 emulsifier (MSCO), ammonium sulfate at 2.5 lb/A (AMSU), and 28% nitrogen liquid fertilizer at 1 gpa (N). The oil adjuvants were at 1 qt/A. The experiment was a split plot with grass control herbicides the main plots, herbicide rate the subplot, and three replication. Evaluations were on July 18 and August 12. The two evaluations were combined for data analysis. The bentazon (Bent) was at 12, acifluorfen (Acif) at 6, and desmedipham (Desm) at 8 oz/A.

	Sethoxydim					Fluazifop				
Additive	Rrpwl	Wht	Oats	Mill	Grass Avg	Rrpwl	Wht	Oats	Mill	Grass Avg
	(% control)									
MSCO	0	95	85	98	93	0	98	98	70	89
POAT	0	96	86	98	93	8	98	98	75	90
AMSU	0	88	67	96	84	0	96	92	36	75
AMSU+MSCO	45	85	61	93	80	0	98	98	44	80
AMSU+POAT	0	98	96	98	97	0	98	99	54	84
28% N	17	80	65	97	81	0	97	87	32	72
Bentazon+MSCO	62	41	23	61	42	53	98	94	22	71
Bentazon+POAT	60	64	32	88	61	74	98	98	32	76
Bentazon+AMSU	82	20	11	25	19	63	90	80	17	62
Bent+AMSU+MSCO	67	85	35	91	70	62	98	94	18	70
Bent+AMSU+POAT	78	83	37	98	73	76	98	99	23	73
Acifluorfen+MSCO	99	93	79	93	88	97	98	90	45	78
Acifluorfen+POAT	96	92	79	95	89	97	97	90	56	81
Acifluorfen+AMSU	96	38	34	42	38	98	88	65	54	69
Acif+AMSU+MSCO	99	97	88	95	93	99	98	88	65	84
Acif+AMSU+POAT	99	89	73	81	81	99	99	96	63	86
Desmedipham+MSCO	75	91	70	90	84	78	95	79	28	67
Desmedipham+POAT	63	89	68	91	83	82	98	91	29	73
Desmedipham+AMSU	50	88	60	83	77	52	95	81	20	66
Desm+AMSU+MSCO	65	95	77	98	90	60	94	69	25	63
Desm+AMSU+POAT	58	93	72	93	86	43	97	80	28	68
LSD 5%	19	8	9	12	6	19	8	9	12	6

1 Redroot pigweed was only evaluated on July 18.

Summary

The addition of ammonium sulfate to a spray mixture with methylated sunflower oil with CO-630 gave less or tended to give less species control than in a mixture with petroleum oil when with sethoxydim alone or with bentazon. The addition of ammonium sulfate generally reduced the antagonism caused by bentazon to grass control with sethoxydim. The emulsifier IGEPAL CO-630 with methylated sunflower oil produced a less stable emulsion than that of the petroleum oil when with ammonium sulfate, which may account for the reduced control. In other experiments methylated sunflower oil with Atplus 300F tended to be more effective than petroleum oil in overcoming bentazon antagonism. Acifluorfen and desmedipham applied with sethoxydim antagonized or tended to antagonize grass species control. However, the antagonism was overcome when applied with methylated sunflower oil and ammonium sulfate. Fluazifop control of the grass species was antagonized by acifluorfen and desmedipham regardless of the adjuvants in the spray.

Antagonism of grass control herbicides-2, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on May 17. Treatments were applied to 3 to 4 leaf species on June 13 with 75 F, 80% relative humidity, and 10 to 15 mph wind. The petroleum oil was with 17% Atplus 300F emulsifier (POAT) and the methylated seed oil was soybean with IGEPAL CO-630 at 15% (MSCO). Ammonium sulfate (AMSU) was applied at 40, bentazon at 12, acifluorfen at 6, sethoxydim at 1, and fluazifop at 0.75 oz/A. The oil adjuvants were at 1 qt/A. Species control was evaluated on June 26.

	Sethoxydim				Fluazifop			
Additives	Wht	Oat	Mil	Avg	Wht	Oat	Mil	Avg
	(% control)							
Bentazon+POAT	10	5	87	34	97	98	27	74
Bentazon+MSCO	32	37	94	54	36	44	10	30
Bentazon+AMSU	2	8	18	9	43	42	17	34
Bentazon+POAT+AMSU	18	17	90	42	67	42	15	41
Bentazon+MSCO+AMSU	68	62	94	75	94	67	20	60
Acifluorfen+POAT	68	55	98	74	95	93	83	90
Acifluorfen+MSCO	94	93	99	95	97	92	97	95
Acifluorfen+AMSU	12	29	81	41	42	30	56	43
Acifluorfen+POAT+AMSU	93	85	98	92	96	90	94	93
Acifluorfen+MSCO+AMSU	97	98	99	98	45	47	63	52
LSD 5%	31	31	16	--	31	31	16	--
LSD 5% (pooled error)	--	--	--	8	--	--	--	8

Summary

The data with sethoxydim indicated that grass species control was higher or tended to be higher when sethoxydim was applied with methylated soybean oil than with petroleum oil, regardless of the other additives present. Ammonium sulfate added to oil plus bentazon or acifluorfen generally increased grass species control with sethoxydim. The data with fluazifop were variable among replications indicating inadequate emulsification and phase separation. Emulsifier CO-630 which was in the methylated soybean oil produced an unstable emulsion when with certain chemicals, in other experiments. The grass control herbicides alone without bentazon or acifluorfen were not included in this experiment. However the data indicated that with sethoxydim plus bentazon or acifluorfen and an oil, grass control was generally increased by the addition of ammonium sulfate to the spray mixture.

Bentazon antagonism of sethoxydim, Fargo, 1986. 'Marshall' wheat, 'Steele' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on June 5. Treatments were applied with a hand held boom sprayer to jointing stage species on July 18. The oil adjuvants were all applied at 1 qt/A and POAT was petroleum oil with 17% and MSFAT was methylated sunflower oil with 15% Atplus 300F emuslifier. AMSU was ammonium sulfate applied at 2.5 lb/A. Sethoxydim was applied at 1.5 oz/A and bentazon at 12 oz/A. The experiment contained four replications and the data are an average of three evaluations approximately 2, 3, and 4 weeks after treatment.

Treatment	Wheat	Oats	Millet	Average
	------(%	control)-----		
Sethoxydim+MSFAT	77	82	82	80
Sethoxydim+POAT	73	74	69	72
Sethoxydim+AMSU	70	67	61	66
Sethoxydim+AMSU+MSFAT	79	85	80	81
Sethoxydim+AMSU+POAT	76	79	81	79
Sethoxydim+MSFAT+bentazon	73	69	65	69
Sethoxydim+POAT+bentazon	60	54	55	56
Sethoxydim+AMSU+bentazon	17	17	31	22
Sethoxydim+AMSU+MSFAT+bentazon	70	68	65	68
Sethoxydim+AMSU+POAT+bentazon	62	36	42	47
LSD 5%	6	9	10	5

Pooled error of wheat (48), oats (133), and millet (155) were used to compute LSD for the average.

Summary

Methylated sunflower oil as an adjuvant generally enhanced grass species control with sethoxydim more than petroleum oil, regardless if ammonium sulfate or bentazon was also included in the mixture. The antagonism of grass species control with sethoxydim applied in combination with bentazon was less when the spray mixture also contained methylated sunflower oil rather than petroleum oil. Ammonium sulfate in the spray mixture in addition to methylated sunflower or petroleum oil did not reduce the antagonism from bentazon with sethoxydim.

Three species evaluation of broadleaf herbicide rate effect on antagonism, Fargo (NW section 22), 1986. Siberian foxtail millet, Steele oats, and Marshall wheat where seeded across herbicide plots in 6 foot strips May 28. Treatments were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of each 10 foot plot and across the three grass species 8:00 am June 27 when the air temp. was 78F, soil temp. at six inches was 78F, relative humidity was 57%, wind was north at 8-12 mph, soil was dry on the surface, and wet at 1-4 inches. Foxtail millet was 2-9 inches tall, oats was 4-10 inches tall, and wheat was 4-9 inches tall on June 27. Foxtail millet, oats, and wheat control were evaluated July 18. Average grass control rating is the mean of the three control ratings for each treatment.

Treatment*	Rate (lb/A)	Foxtail Millet control rating	Oats control rating	Wheat control rating	Average control rating
		(%)			
Sethoxydim+OC	.1+.25G	98	96	89	94
Sethoxydim+OC+Desmedipham	.1+.25G+.25	89	60	80	76
Sethoxydim+OC+Desmedipham	.1+.25G+.5	91	62	78	77
Sethoxydim+OC+Desmedipham	.1+.25G+1	90	67	91	83
Sethoxydim+OC+Bentazon	.1+.25G+.25	85	25	30	47
Sethoxydim+OC+Bentazon	.1+.25G+.5	88	32	48	56
Sethoxydim+OC+Bentazon	.1+.25G+1	67	20	35	41
Sethoxydim+OC+Acifluorfen	.1+.25G+.12	93	82	78	85
Sethoxydim+OC+Acifluorfen	.1+.25G+.25	94	91	88	91
Sethoxydim+OC+Acifluorfen	.1+.25G+.5	95	88	87	90
Sethoxydim+OC	.2+.25G	99	99	99	99
Sethoxydim+OC+Desmedipham	.2+.25G+.25	93	87	89	89
Sethoxydim+OC+Desmedipham	.2+.25G+.5	95	80	93	89
Sethoxydim+OC+Desmedipham	.2+.25G+1	96	80	92	89
Sethoxydim+OC+Bentazon	.2+.25G+.25	93	80	88	87
Sethoxydim+OC+Bentazon	.2+.25G+.5	93	35	45	58
Sethoxydim+OC+Bentazon	.2+.25G+1	73	37	65	58
Sethoxydim+OC+Acifluorfen	.2+.25G+.12	99	99	98	99
Sethoxydim+OC+Acifluorfen	.2+.25G+.25	97	97	97	97
Sethoxydim+OC+Acifluorfen	.2+.25G+.5	91	95	91	92
Fluazifop-P+OC	.09+.25G	90	99	98	96
Fluazifop-P+OC+Desmed	.09+.25G+.25	78	98	98	91
Fluazifop-P+OC+Desmed	.09+.25G+.5	77	95	97	90
Fluazifop-P+OC+Desmedipham	.09+.25G+1	77	94	98	89
Fluazifop-P+OC+Bentazon	.09+.25G+.25	24	89	91	68
Fluazifop-P+OC+Bentazon	.09+.25G+.5	25	96	98	73
Fluazifop-P+OC+Bentazon	.09+.25G+1	28	95	92	72
Fluazifop-P+OC+Acifluor	.09+.25G+.12	63	99	99	87
Fluazifop-P+OC+Acifluor	.09+.25G+.25	78	99	98	91
Fluazifop-P+OC+Acifluor	.09+.25G+.5	83	98	99	93
Fluazifop-P+OC	.188+.25G	95	99	99	98
Fluazifop-P+OC+Desmed	.188+.25G+.25	85	99	99	94
Fluazifop-P+OC+Desmed	.188+.25G+.5	87	99	99	95
Fluazifop-P+OC+Desmed	.188+.25G+1	87	99	99	95
Fluazifop-P+OC+Bentazon	.188+.25G+.25	77	99	99	91
Fluazifop-P+OC+Bentazon	.188+.25G+.5	89	98	99	96
Fluazifop-P+OC+Bentazon	.188+.25G+1	70	99	99	89
Fluazifop-P+OC+Acifluor	.188+.25G+.12	80	99	99	93
Fluazifop-P+OC+Acifluor	.188+.25G+.25	92	99	99	97
Fluazifop-P+OC+Acifluor	.188+.25G+.5	91	99	99	96

Table continued on the next page.

Three species evaluation of broadleaf herbicide rate effect on antagonism, Fargo (NW section 22), 1986. (continued)

Treatment*	Rate (lb/A)	Foxtail Millet control rating	Oats control rating	Wheat control rating	Average control rating
		----------------	---------------- (%)	----------------	----------------
DPX-Y6202+OC	.05+.25G	98	97	99	98
DPX-Y6202+OC+Desmedipham	.05+.25G+.25	80	65	99	81
DPX-Y6202+OC+Desmedipham	.05+.25G+.5	53	43	99	65
DPX-Y6202+OC+Desmedipham	.05+.25G+1	65	40	98	68
DPX-Y6202+OC+Bentazon	.05+.25G+.25	90	98	99	95
DPX-Y6202+OC+Bentazon	.05+.25G+.5	85	89	98	91
DPX-Y6202+OC+Bentazon	.05+.25G+1	32	79	98	69
DPX-Y6202+OC+Acifluorfen	.05+.25G+.12	70	91	99	87
DPX-Y6202+OC+Acifluorfen	.05+.25G+.25	69	82	99	83
DPX-Y6202+OC+Acifluorfen	.05+.25G+.5	73	70	99	81
DPX-Y6202+OC	.1+.25G	99	99	99	99
DPX-Y6202+OC+Desmedipham	.1+.25G+.25	85	88	99	91
DPX-Y6202+OC+Desmedipham	.1+.25G+.5	83	75	99	86
DPX-Y6202+OC+Desmedipham	.1+.25G+1	71	68	99	80
DPX-Y6202+OC+Bentazon	.1+.25G+.25	98	98	99	99
DPX-Y6202+OC+Bentazon	.1+.25G+.5	95	99	99	97
DPX-Y6202+OC+Bentazon	.1+.25G+1	87	99	99	95
DPX-Y6202+OC+Acifluorfen	.1+.25G+.12	84	99	99	94
DPX-Y6202+OC+Acifluorfen	.1+.25G+.25	87	97	99	94
DPX-Y6202+OC+Acifluorfen	.1+.25G+.5	78	97	99	92
Mean		81	84	92	86
High mean		99	99	99	99
Low mean		24	20	30	41
Coeff. of variation		10	7	7	6
LSD(1 Percent)		17	12	14	11
LSD(5 Percent)		13	9	11	8
No. of reps		3	3	3	3

* OC = BASF petroleum oil with 17% emulsifier

Summary

Increased rates of bentazon increased or tended to increase antagonism of grass control from sethoxydim and DPX-Y6202. Increased rates of desmedipham increased or tended to increase antagonism of grass control from DPX-Y6202. Increased rates of acifluorfen increased or tended to increase antagonism of grass control from sethoxydim and DPX-Y6202.

Three species evaluation of the timing effect on broadleaf and grass herbicides, Fargo (NW section 22), 1986. Marshall wheat, Steele oats, and Siberian foxtail millet were seeded in six foot strips across the herbicide plots June 5. Herbicides were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of each 10 foot plot and across each grass species. Day one (D1) was June 28 and day seven (D7) was July 4. Treatments divided by "2 hours" had the first half of the treatments applied 2 hours prior to the second half of the treatments. Soil was dry on the surface and wet at 1-4

Date	Day	Air Temp.	Soil Temp.	Relative Humidity	Wind Direction	Wind Speed	Time of day
June 28	D1	69 F	77 F	76%	North	2-3 mph	7:30 am
June 30	D3	65 F	73 F	75%	East	5-10 mph	8:30 am
July 1	D4	76 F	75 F	59%	North	12-18 mph	5:00 pm
July 2	D5	70 F	78 F	77%	Northwest	4-8 mph	8:30 am
July 3	D6	74 F	78 F	70%	South	15-20 mph	8:00 am
July 4	D7	75 F	80 F	82%	Northeast	4-6 mph	8:00 pm

inches June 28 through July 4. Wheat was 3-6 inches tall, oats was 6-9 inches tall, and foxtail millet was 2-5 inches tall June 28. Wheat, oats, and foxtail millet control were evaluated July 25. The grass control rating is the mean of the three control ratings for each treatement.

Treatment*	Rate (lb/A)	Wheat control rating	Oats control rating	FxtMil control rating	Average control rating
		(%)			
Sethoxydim D6	.1	99	99	99	99
Sethoxydim D6	.2	99	99	99	99
Fluazifop-P D6	.09	98	99	53	83
Fluazifop-P D6	.188	99	99	89	96
Sethoxydim+Desmedipham D6	.1+.75	68	48	82	66
Sethoxydim+Desmedipham D6	.2+.75	77	63	93	78
Fluazifop-P+Desmedipham D6	.09+.75	94	84	17	65
Fluazifop-P+Desmedipham D6	.188+.75	99	99	35	78
Sethoxydim+Bentazon D6	.1+1	61	38	80	60
Sethoxydim+Bentazon D6	.2+1	73	50	96	73
Fluazifop-P+Bentazon D6	.09+1	99	99	28	75
Fluazifop-P+Bentazon D6	.188+1	99	99	42	80
Sethoxydim+Acifluorfen D6	.1+.5	88	73	90	84
Sethoxydim+Acifluorfen D6	.2+.5	97	96	98	97
Fluazifop-P+Acifluorfen D6	.09+.5	99	99	78	92
Fluazifop-P+Acifluorfen D6	.188+.5	99	99	89	96
Sethoxydim D6/Desmedipham D7	.1/.75	99	99	99	99
Sethoxydim D6/Desmedipham D7	.2/.75	99	99	99	99
Fluazifop-P D6/Desmedipham D7	.09/.75	99	99	78	92
Fluazifop-P D6/Desmed D7	.188/.75	99	99	97	98
Sethoxydim D6/Bentazon D7	.1/1	99	91	99	96
Sethoxydim D6/Bentazon D7	.2/1	99	99	99	99
Fluazifop-P D6/Bentazon D7	.09/1	98	99	60	85
Fluazifop-P D6/Bentazon D7	.188/1	99	99	89	96
Sethoxydim D6/Acifluorfen D7	.1/.5	99	99	99	99
Sethoxydim D6/Acifluorfen D7	.2/.5	99	99	99	99
Fluazifop-P D6/Acifluorfen D7	.09/.5	99	99	96	98
Fluazifop-P D6/Acifluorfen D7	.188/.5	99	99	99	99

Table continued on next page.

Three species evaluation of the timing effect on broadleaf and grass herbicides, Fargo (NW section 22), 1986. (continued)

Treatment*	Rate (lb/A)	Wheat control rating	Oats control rating	FxtMil control rating	Average control rating
		(%)			
Sethoxydim/2 hours/Desmed D6	.1/.75	82	53	87	74
Sethoxydim/2 hours/Desmed D6	.2/.75	94	89	96	93
Fluazifop-P/2 hours/Desmed D6	.09/.75	99	98	55	84
Flua-P/2 hours/Desmed D6	.188/.75	99	99	83	94
Sethoxydim/2 hours/Bentazon D6	.1/1	99	87	99	95
Sethoxydim/2 hours/Bentazon D6	.2/1	99	99	99	99
Fluazifop-P/2 hours/Bentazon D6	.09/1	99	99	40	79
Flua-P/2 hours/Bentazon D6	.188/1	99	99	77	91
Sethoxydim/2 hours/Acifluor D6	.1/.5	99	94	98	97
Sethoxydim/2 hours/Acifluor D6	.2/.5	99	99	99	99
Flua-P/2 hours/Acifluorfen D6	.09/.5	99	99	75	91
Flua-P/2 hours/Acifluorfen D6	.188/.5	99	99	91	96
Desmedipham D1/Sethoxydim D6	.75/.1	95	86	99	93
Desmedipham D1/Sethoxydim D6	.75/.2	98	98	99	98
Desmedipham D1/Fluazifop-P D6	.75/.09	99	99	77	92
Desmed D1/Fluazifop-P D6	.75/.188	99	99	92	97
Bentazon D1/Sethoxydim D6	1/.1	99	96	99	98
Bentazon D1/Sethoxydim D6	1/.2	99	99	99	99
Bentazon D1/Fluazifop-P D6	1/.09	99	99	77	92
Bentazon D1/Fluazifop-P D6	1/.188	99	99	88	95
Acifluorfen D1/Sethoxydim D6	.5/.1	99	92	97	96
Acifluorfen D1/Sethoxydim D6	.5/.2	99	99	99	99
Acifluorfen D1/Fluazifop-P D6	.5/.09	99	99	85	94
Acifluorfen D1/Fluazifop-P D6	.5/.188	99	98	89	95
Desmedipham D3/Sethoxydim D6	.75/.1	88	73	96	86
Desmedipham D3/Sethoxydim D6	.75/.2	99	98	99	99
Desmedipham D3/Fluazifop-P D6	.75/.09	99	98	63	87
Desmed D3/Fluazifop-P D6	.75/.188	99	99	91	96
Bentazon D3/Sethoxydim D6	1/.1	99	97	99	98
Bentazon D3/Sethoxydim D6	1/.2	99	99	99	99
Bentazon D3/Fluazifop-P D6	1/.09	99	99	79	92
Bentazon D3/Fluazifop-P D6	1/.188	99	99	92	97
Acifluorfen D3/Sethoxydim D6	.5/.1	98	95	98	97
Acifluorfen D3/Sethoxydim D6	.5/.2	99	99	99	99
Acifluorfen D3/Fluazifop-P D6	.5/.09	99	99	70	89
Acifluorfen D3/Fluazifop-P D6	.5/.188	99	99	86	95
Desmedipham D4/Sethoxydim D6	.75/.1	78	53	96	76
Desmedipham D4/Sethoxydim D6	.75/.2	95	78	99	91
Desmedipham D4/Fluazifop-P D6	.75/.09	99	98	58	85
Desmed D4/Fluazifop-P D6	.75/.188	99	99	80	93
Bentazon D4/Sethoxydim D6	1/.1	97	87	98	94
Bentazon D4/Sethoxydim D6	1/.2	99	99	99	99
Bentazon D4/Fluazifop-P D6	1/.09	99	99	63	87
Bentazon D4/Fluazifop-P D6	1/.188	99	99	77	92
Acifluorfen D4/Sethoxydim D6	.5/.1	91	93	98	94
Acifluorfen D4/Sethoxydim D6	.5/.2	99	99	99	99
Acifluorfen D4/Fluazifop-P D6	.5/.09	99	99	78	92
Acifluorfen D4/Fluazifop-P D6	.5/.188	99	99	84	94

Table continued on next page.

Three species evaluation of the timing effect on broadleaf and grass herbicides, Fargo (NW section 22), 1986. (continued)

Treatment*	Rate (lb/A)	Wheat control rating	Oats control rating	FxtMil control rating	Average control rating
		----------	----------	(%) ----------	----------
Desmedipham D5/Sethoxydim D6	.75/.1	78	63	93	78
Desmedipham D5/Sethoxydim D6	.75/.2	87	87	97	90
Desmedipham D5/Fluazifop-P D6	.75/.09	99	98	42	80
Desmed D5/Fluazifop-P D6	.75/.188	99	99	72	90
Bentazon D5/Sethoxydim D6	1/.1	98	88	99	95
Bentazon D5/Sethoxydim D6	1/.2	99	98	99	99
Bentazon D5/Fluazifop-P D6	1/.09	99	99	40	79
Bentazon D5/Fluazifop-P D6	1/.188	99	99	72	90
Acifluorfen D5/Sethoxydim D6	.5/.1	93	92	99	95
Acifluorfen D5/Sethoxydim D6	.5/.2	99	99	99	99
Acifluorfen D5/Fluazifop-P D6	.5/.09	99	99	72	90
Acifluorfen D5/Fluazifop-P D6	.5/.188	99	99	83	93
Mean		96	93	85	91
High mean		99	99	99	99
Low mean		61	38	17	60
Coeff. of variation		4	5	8	3
LSD(1 Percent)		9	10	14	6
LSD(5 Percent)		6	7	11	5
No. of reps		3	3	3	3

* BASF petroleum oil with 17% emulsifier was applied at 1 quart per acre with all treatments containing sethoxydim or fluazifop-P.

Summary

Desmedipham, bentazon, and acifluorfen, when tank mixed with sethoxydim, significantly antagonized the control of one or more of the three bioassay species, except acifluorfen mixed with sethoxydim at 0.2 lb/A. Application of sethoxydim 2 hours prior to acifluorfen eliminated antagonism. Application of sethoxydim 2 hours prior to desmedipham reduced but did not eliminate antagonism. Application of sethoxydim 2 hours prior to bentazon eliminated antagonism when sethoxydim was at 0.2 lb/A but oats control was still antagonized at 0.1 lb/A. Application of sethoxydim 1 day prior to desmedipham and acifluorfen eliminated antagonism. Sethoxydim applied 1 day prior to bentazon eliminated antagonism except for oats control at 0.1 lb/A of sethoxydim. Application of acifluorfen 1 or more days prior to sethoxydim eliminated antagonism. Application of bentazon 1 or 2 days prior to sethoxydim reduced but did not eliminate antagonism. Bentazon applied 3 or 5 days prior to sethoxydim caused no antagonism. Antagonism from desmedipham was reduced but not eliminated even when desmedipham was applied 5 days prior to sethoxydim.

Acifluorfen did not antagonize grass control from fluazifop-P. Desmedipham and bentazon, when tank mixed with fluazifop-P, significantly antagonized control of one or more bioassay species. Application of fluazifop-P 2 hours prior to desmedipham eliminated antagonism but 2 hours prior to bentazon did not eliminate antagonism of foxtail millet control. Application of fluazifop-P one day before bentazon eliminated antagonism. Applying desmedipham or bentazon 3 days or more prior to fluazifop-P eliminated antagonism.

Three species evaluation of broadleaf and grass herbicide combinations, Fargo (NW section 22), 1986. Siberian foxtail millet, Steele oats, and Marshall wheat were seeded across herbicide plots in 6 foot strips May 28. Treatments were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of each 10 foot plot and across the three grass species 10:00 am June 30 when the air temp. was 70F, soil temp. at six inches was 73F, relative humidity was 68%, wind was south at 5-10 mph, soil was dry on the surface, moist at 1-2 inches, and wet at 3-4 inches. Foxtail millet was 6-12 inches tall, oats was 10-14 inches tall, and wheat was 8-12 inches tall on June 30. Foxtail millet, oats, and wheat control were evaluated July 19. Average grass control rating is the mean of the three control ratings for each treatment.

Treatment*	Rate (lb/A)	Fxt. Mill. control rating	Oats control rating	Wheat control rating	Average control rating
		(%)			
RE-45601+OC	.125+.25G	99	99	99	99
RE-45601+OC+Bentazon	.125+.25G+1	90	86	86	87
RE-45601+OC+Desmedipham	.125+.25G+1	92	96	97	95
RE-45601+OC+Acifluor	.125+.25G+.375	99	98	97	98
RE-45601+OC+Fomesafen	.125+.25G+.25	94	97	91	94
RE-45601+OC+Lactofen	.125+.25G+.25	96	99	98	98
RE-45601+OC+Bromoxynil	.125+.25G+.25	99	99	98	99
RE-45601+OC+DPX-M6316	.125+.25G+.015	94	99	99	97
RE-45601+OC+MCPA(amine)	.125+.25G+.25	99	99	98	99
RE-45601+OC+MCPA(ester)	.125+.25G+.25	99	99	99	99
RE-45601+OC+AC 263,499	.125+.25G+.06	94	99	98	97
Sethoxydim+OC	.1+.25G	98	88	93	93
Sethoxydim+OC+Bentazon	.1+.25G+1	27	17	23	22
Sethoxydim+OC+Desmedipham	.1+.25G+1	72	52	88	70
Sethoxydim+OC+Acifluor	.1+.25G+.375	67	58	62	62
Sethoxydim+OC+Fomesafen	.1+.25G+.25	75	57	63	65
Sethoxydim+OC+Lactofen	.1+.25G+.25	70	70	78	73
Sethoxydim+OC+Bromoxynil	.1+.25G+.25	86	57	82	75
Sethoxydim+OC+DPX-M6316	.1+.25G+.015	68	78	72	73
Sethoxydim+OC+MCPA(amine)	.1+.25G+.25	94	62	73	76
Sethoxydim+OC+MCPA(ester)	.1+.25G+.25	96	86	92	91
Sethoxydim+OC+AC 263,499	.1+.25G+.06	88	94	92	91
Fluazifop-P+OC	.1+.25G	89	99	99	95
Fluazifop-P+OC+Bentazon	.1+.25G+1	33	99	99	77
Fluazifop-P+OC+Desmedipham	.1+.25G+1	65	91	97	85
Fluazifop-P+OC+Acifluor	.1+.25G+.375	73	99	99	90
Fluazifop-P+OC+Fomesafen	.1+.25G+.25	62	96	99	86
Fluazifop-P+OC+Lactofen	.1+.25G+.25	52	96	98	82
Fluazifop-P+OC+Bromoxynil	.1+.25G+.25	48	99	96	81
Fluazifop-P+OC+DPX-M6316	.1+.25G+.015	48	98	99	82
Flua-P+OC+MCPA (amine)	.1+.25G+.25	47	95	99	80
Flua-P+OC+MCPA (ester)	.1+.25G+.25	68	99	98	89
Fluazifop-P+OC+AC 263,499	.1+.25G+.06	91	96	97	94
DPX-Y6202-31+OC	.05+.25G	99	99	99	99
DPX-Y6202-31+OC+Bentazon	.05+.25G+1	89	92	99	93
DPX-Y6202-31+OC+Desmed	.05+.25G+1	75	55	99	76
DPX-Y6202-31+OC+Acifl	.05+.25G+.375	72	88	99	86
DPX-Y6202-31+OC+Fomesaf	.05+.25G+.25	86	59	99	81
DPX-Y6202-31+OC+Lactofen	.05+.25G+.25	71	70	99	80
DPX-Y6202-31+OC+Bromoxy	.05+.25G+.25	72	85	99	85

Table continued on next page.

Three species evaluation of broadleaf and grass herbicide combinations, Fargo (NW section 22), 1986. (continued)

Treatment*	Rate (lb/A)	Fxt. Mill. control rating	Oats control rating (%)	Wheat control rating	Average control rating
DPX-Y-31+OC+DPX-M6316	.05+.25G+.015	74	98	99	90
DPX-Y-31+OC+MCPA (amine)	.05+.25G+.25	83	48	99	77
DPX-Y-31+OC+MCPA (ester)	.05+.25G+.25	95	70	99	88
DPX-Y-31+OC+AC 263,499	.05+.25G+.06	98	74	98	90
Fenoxaprop+OC	.1+.25G	95	93	50	79
Fenoxaprop+OC+Bentazon	.1+.25G+1	83	43	10	45
Fenoxaprop+OC+Desmedipham	.1+.25G+1	79	42	32	51
Fenoxaprop+OC+Acifluor	.1+.25G+.375	73	27	25	42
Fenoxaprop+OC+Fomesafen	.1+.25G+.25	78	32	25	45
Fenoxaprop+OC+Lactofen	.1+.25G+.25	65	42	30	45
Fenoxaprop+OC+Bromoxynil	.1+.25G+.25	78	65	35	59
Fenoxaprop+OC+DPX-M6316	.1+.25G+.015	92	85	22	66
Fenoxaprop+OC+MCPA(amine)	.1+.25G+.25	95	27	7	43
Fenoxaprop+OC+MCPA(ester)	.1+.25G+.25	97	68	3	56
Fenoxaprop+OC+AC 263,499	.1+.25G+.06	92	85	89	89
BAS-51702+OC	.05+.25G	98	99	99	99
BAS-51702+OC+Bentazon	.05+.25G+1	68	60	62	63
BAS-51702+OC+Desmedipham	.05+.25G+1	83	80	83	82
BAS-51702+OC+Acifluor	.05+.25G+.375	67	75	60	67
BAS-51702+OC+Fomesafen	.05+.25G+.25	82	82	62	75
BAS-51702+OC+Lactofen	.05+.25G+.25	70	92	84	82
BAS-51702+OC+Bromoxynil	.05+.25G+.25	91	99	97	95
BAS-51702+OC+DPX-M6316	.05+.25G+.015	73	99	96	89
BAS-51702+OC+MCPA(amine)	.05+.25G+.25	89	96	84	90
BAS-51702+OC+MCPA(ester)	.05+.25G+.25	99	99	99	99
BAS-51702+OC+AC 263,499	.05+.25G+.06	90	99	96	95
Mean		81	80	80	80
High mean		99	99	99	99
Low mean		27	17	3	22
Coeff. of variation		13	10	9	8
LSD(1 Percent)		22	17	16	13
LSD(5 Percent)		17	13	12	10
No. of reps		3	3	3	3

* OC = BASF petroleum oil with 17% emulsifier

Summary

The grass control herbicides were significantly antagonized by the broadleaf control herbicides for control of one or more of the three bioassay species as follows. RE-45601 was antagonized by bentazon. Sethoxydim was antagonized by all tested herbicides except MCPA ester and AC 263,499. Fluazifop-P was antagonized by all tested herbicides except acifluorfen and AC 263,499. Fenoxaprop was antagonized by all tested herbicides except AC 263,499. BAS-51702 was antagonized by all tested herbicides except bromoxynil, MCPA ester, and AC 263,499. DPX-Y6202-31 was antagonized by all tested herbicides except bentazon. MCPA amine was more antagonistic than MCPA ester to all grass control herbicides except RE-45601.

Preemergence weed control in wheat, Fargo, 1986. Fall incorporated (FI) treatments were applied and incorporated October 29. Preplant incorporated spring (PPIS) treatments were applied, field cultivator incorporated twice, and 'Marshall' Hard Red Spring wheat seeded May 15. Preemergence incorporated (PEIS) treatments were applied and harrow incorporated twice immediately after wheat seeding. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi. The experimental design was a randomized comlete block with four replications. Crop injury and weed control were evaluated June 12 and July 29.

		June 12				July 29		
Treatment	Rate	Wheat Strd	KOCZ	Rrpw	Wimu	Wheat inju	Yeft	Wheat yield
	(oz/A)	(%)	-(%	control)--		(%)	(%)	(Bu/A)
Triallate-G(FI)	20	10	11	20	0	0	5	45
Tria-G+Trifluralin-G(FI)	20+8	9	39	66	5	0	59	53
Isoxaben-G+Tria-G(FI)	1.6+20	5	85	80	95	0	15	56
Fluo+Tria-G(FI)	8+20	7	49	56	71	0	36	43
Fluo+Tria-G+Trif-G(FI)	8+20+8	10	70	73	30	0	61	47
Isox-G+Tria-G+Trif-G(FI)	1.6+20+8	7	83	77	91	0	65	57
Isoxaben-G(FI)	1.1	1	85	68	81	0	18	52
Isoxaben-G(FI)	1.6	1	69	57	78	0	23	48
Isoxaben-G(FI)	2.1	1	56	66	95	0	8	51
Isoxaben(FI)	1.6	0	63	54	83	1	24	52
Isoxaben-G+Trif-G(FI)	1.1+8	6	71	70	91	0	76	54
Isoxaben-G+Trif-G(FI)	1.6+8	6	81	84	91	0	58	56
Isoxaben-G+Trif-G(FI)	2.1+8	7	84	80	98	0	56	56
Isoxaben+Trif(FI)	1.6+8	6	79	78	89	0	69	54
Fluo+Trif(FI)	8+8	3	55	65	60	0	74	57
Trifluralin-G(FI)	8	9	53	38	1	0	71	58
Trifluralin(FI)	8	2	41	52	9	0	50	46
Triallate(PPIS)	20	16	8	1	0	0	0	33
Triallate(PEIS)	20	3	18	13	13	0	6	38
Trifluralin(PEIS)	8	4	26	53	3	0	30	38
Isox+Triallate(PPIS)	1.6+20	24	72	76	91	0	6	45
Fluo+Triallate(PPIS)	8+20	15	69	60	92	0	0	36
Isoxaben+Trif(PEIS)	1.6+8	7	58	89	69	0	48	53
Fluo+Trif(PEIS)	8+8	8	44	51	63	0	39	45
Isox+Tria+Trif(PEIS)	1.6+20+8	11	53	36	66	1	31	46
Fluo+Tria+Trif(PEIS)	8+20+8	2	11	20	19	0	36	42
No control	0	0	0	0	0	0	0	45
C.V. %		75	34	25	27	725	56	16
LSD 5%		7	26	19	21	NS	28	11

Fluo=fuorochloridone; G=granular formulation; Strd=stand reduction.

Summary

Wheat stand was reduced mainly from the preplant spring applied treatments. Isoxaben gave good wild mustard control. Redroot pigweed control was less than 90% with all treatments. Kochia populations were variable making interpretation of the data inconclusive. Wheat yields generally related to weed control and/or wheat stand reduction.

Preemergence weed control in wheat, Minot, 1986. Fall incorporated (FI) treatments were applied and incorporated with a field cultivator October 4. Preplant incorporated spring (PPIS) treatments were applied, field cultivator incorporated , and 'Len' Hard Red Spring wheat seeded May 14. Preemergence incorporated (PEIS) treatments were applied and harrow incorporated twice immediately following wheat seeding. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi. Rainfall within two weeks following wheat seeding was 0.13 inches. The experimental design was a randomized complete block with four replications. Wheat stand reduction was evaluated June 16. Weed control was not evaluated due to low weed populations.

Treatment	Rate	Wheat	
		Strd	Yield
	(oz/A)	(%)	(Bu/A)
Triallate-G(FI)	20	9	50
Triallate-G+trifluralin-G(FI)	20+8	12	46
Isoxaben-G+triallate-G(FI)	1.6+20	9	49
Fluorochloridone+triallate-G(FI)	8+20	12	51
Fluorochloridone+triallate-G+trifluralin-G(FI)	8+20+8	12	50
Isoxaben-G+triallate-G+trifluralin-G(FI)	1.6+20+8	11	49
Isoxaben-G(FI)	1.1	8	49
Isoxaben-G(FI)	1.6	10	50
Isoxaben-G(FI)	2.1	8	49
Isoxaben(FI)	1.6	10	46
Isoxaben-G+trifluralin-G(FI)	1.1+8	13	48
Isoxaben-G+trifluralin-G(FI)	1.6+8	12	48
Isoxaben-G+trifluralin-G(FI)	2.1+8	15	47
Isoxaben+trifluralin(FI)	1.6+8	12	45
Fluorochloridone+trifluralin(FI)	8+8	11	52
Trifluralin-G(FI)	8	11	51
Trifluralin(FI)	8	13	50
Triallate(PPIS)	20	12	49
Triallate(PEIS)	20	9	50
Trifluralin(PEIS)	8	10	52
Isoxaben+triallate(PPIS)	1.6+20	13	50
Fluorochloridone+triallate(PPIS)	8+20	13	47
Isoxaben+trifluralin(PEIS)	1.6+8	9	47
Fluorochloridone+trifluralin(PEIS)	8+8	9	53
Isoxaben+triallate+trifluralin(PEIS)	1.6+20+8	12	51
Fluorochloridone+triallate+trifluralin(PEIS)	8+20+8	13	48
No control	0	7	47
C.V. %		29	9
LSD 5%		NS	NS

G = granular formulation; Strd = stand reduction.

Summary

No significant wheat stand reductions occurred with any of the treatments. Wheat yields were not influenced by any of the herbicide treatments.

Preemergence weed control in wheat, Williston, 1986. Fall incorporated (FI) treatments were applied and incorporated October 3. Preplant incorporated spring (PPIS) treatments were applied field cultivator incorporated, and 'Stoa' Hard Red Spring wheat seeded May 13. Preemergence incorporated (PEIS) treatments were applied and harrow incorporated twice May 14. All treatments were applied in 17 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 10.

Treatment	Rate	Wheat inju	Wioa	Grft	Wimu	Rrpw	Wheat yield	Tswt
	(oz/A)	(%)	----(%	control)----			(Bu/A)	
Triallate-G(FI)	20	2	85	8	0	0	28	60.9
Tria-G+Trifluralin-G(FI)	20+8	1	96	17	0	10	31	60.7
Isoxaben-G+Tria-G(FI)	1.6+20	0	91	0	97	25	35	60.3
Fluorochloridone+Tria-G(FI)	8+20	2	97	0	80	15	35	61.3
Fluo+Tria-G+Trif-G(FI)	8+20+8	6	86	38	75	21	34	61.2
Isox-G+Tria-G+Trif-G(FI)	1.6+20+8	3	88	63	86	23	36	60.8
Isoxaben-G(FI)	1.1	1	0	0	97	40	31	61.1
Isoxaben-G(FI)	1.6	0	0	10	87	16	34	60.9
Isoxaben-G(FI)	2.1	3	0	0	98	46	33	60.9
Isoxaben(FI)	1.6	1	0	0	99	20	35	61.0
Isoxaben-G+Trif-G(FI)	1.1+8	2	40	84	92	46	35	61.4
Isoxaben-G+Trif-G(FI)	1.6+8	2	61	82	90	56	36	61.0
Isoxaben-G+Trif-G(FI)	2.1+8	0	46	85	97	60	37	61.0
Isoxaben+Trif(FI)	1.6+8	1	13	58	98	43	35	61.3
Fluo+Trif(FI)	8+8	1	11	48	94	24	32	61.4
Trifluralin-G(FI)	8	4	44	77	0	38	30	61.3
Trifluralin(FI)	8	4	16	47	6	48	28	60.8
Triallate(PPIS)	20	6	91	10	0	8	29	60.7
Triallate(PEIS)	20	3	94	17	5	0	28	60.5
Trifluralin(PEIS)	8	2	63	65	9	26	31	60.4
Isoxaben+Triallate(PPIS)	1.6+20	8	98	0	97	15	36	60.6
Fluo+Triallate(PPIS)	8+20	5	97	0	28	15	27	60.7
Isoxaben+Trif(PEIS)	1.6+8	5	71	82	39	29	31	60.8
Fluo+Trif(PEIS)	8+8	3	63	78	90	15	38	61.2
Isoxaben+Tria+Trif(PEIS)	1.6+20+8	13	96	99	30	19	22	60.3
Fluo+Tria+Trif(PEIS)	8+20+8	11	98	99	80	25	22	59.4
No control	0	0	0	0	0	0	28	61.0
C.V. %		114	23	51	24	103	16	--
LSD 5%		5	19	33	20	37	7	--
# OF REPS		4	4	3	4	4	4	1

Summary

Isoxaben plus triallate plus trifluralin and fluorochloridone plus triallate plus trifluralin applied preemergence incorporate caused greater than 10% wheat injury. Treatments including triallate provided 85% or greater wild oats control. The preemergence incorporated trifluralin treatments tended to give higher green foxtail control than the PPI or FI treatments. Isoxaben provided good wild mustard control. Redroot pigweed control was 60% or less with all treatments. Wheat yields were not influenced by weed control because weed densities were sparse.

Wheat variety response to difenzoquat, Carrinton, 1986. Hard Red Spring wheat varieties were seeded April 29 and Durum wheat varieties May 1. Difenzoquat was applied at 1.5 lb/A across the variety strips on June 13. Wheat injury was evaluated June 25 and July 18 with a rating scale of 0 to 9, with 0 equal to no injury and 9 equal to severe stunting.

Hard Red Spring Wheat.

Variety	Wheat injury June 25	Wheat injury July 18	Test Weight Trt	Test Weight Untr	Wheat Yield Trt	Wheat Yield Untr	Wheat Yield Trt/Untr
	(1 to 9 rating)		--(lb/Bu)--		---(Bu/A)----		(%)
Baart	2	2	44	46	23.6	26.0	91
Waldron	6	8	50	52	27.6	38.2	72
Butte	4	5	58	59	48.3	43.0	112
Coteau	5	7	55	57	45.6	55.8	82
Len	7	7	54	56	31.6	46.0	69
Alex	5	7	52	55	26.9	46.8	57
Marshall	3	3	56	58	50.3	50.9	99
2369	3	3	58	59	52.7	45.9	115
Columbus	1	5	55	56	44.3	35.5	125
Guard	5	6	56	56	29.3	30.2	97
Challenger	4	2	57	57	36.5	47.6	77
Wheaton	6	7	54	57	38.7	63.4	61
Stoa	3	5	55	57	50.9	60.4	84
Katepwa	4	8	55	56	52.2	54.9	95
Apex 83	6	4	55	56	45.3	46.6	97
Success	2	4	57	58	69.5	64.4	108
Norak	4	5	56	58	54.4	64.0	85
Leif	4	6	59	60	58.3	72.2	81
Norseman	6	9	51	54	36.9	58.6	63
HY320	5	6	55	54	55.9	63.1	89
747	8	9	48	54	22.2	50.4	44
Celtic	7	9	53	58	32.7	61.5	53
Butte 86	5	5	58	60	58.3	70.4	83
Oslo	6	7	52	55	45.5	65.2	70
Cutless	4	2	60	60	73.3	79.0	93
Lancer	4	5	58	57	59.5	51.8	115
ND606	6	9	56	59	54.0	66.4	81
ND617	3	6	56	59	67.4	64.4	105
ND618	5	8	52	56	46.1	52.0	89
ND624	2	4	56	59	78.0	90.9	86
ND625	0	0	53	58	72.3	60.6	119
ND626	8	6	48	59	40.6	59.6	68
ND627	2	4	53	56	61.2	61.6	99
ND628	4	3	47	52	53.5	64.8	83
ND629	4	6	43	50	36.9	55.4	67
SD8026	5	4	58	59	69.9	78.5	89
Nordic	4	3	52	55	50.9	67.0	76
Telemark	3	0	53	53	55.4	60.9	91

Durum wheat varieties.

Variety	Wheat injury June 25	Wheat injury July 18	Test Weight Trt	Test Weight Untr	Wheat Yield Trt	Wheat Yield Untr	Wheat Yield Trt/Untr
	(1 to 9 rating)		--(lb/Bu)--		----(Bu/A)---		(%)
Ward	3	4	58	59	61.0	69.8	87
Rugby	3	3	59	59	68.7	62.4	110
Vic	7	8	54	58	21.2	62.3	34
Lloyd	3	3	55	55	69.9	60.0	117
Medora	3	6	58	58	64.0	49.2	130
Monroe	3	5	55	55	46.2	33.9	136
Laker	8	9	51	57	31.8	51.0	62
Rolette	5	4	58	58	51.2	52.4	98
Crosby	4	2	54	56	53.6	45.1	119
Cando	5	5	54	55	47.2	43.7	108
D79168	8	9	53	57	23.6	51.9	46
D79209	7	6	56	56	35.5	43.6	81
D8012	6	6	54	53	30.9	40.2	77
D8016	5	9	48	56	23.3	47.9	49
D8019	6	9	49	53	21.1	35.0	60
Stockholm	6	6	55	56	40.8	41.3	99
Fjord	7	9	52	55	17.7	31.4	56
D8172	5	6	52	52	23.1	39.7	58
D8191	6	6	55	56	30.8	45.0	68
D8193	5	7	53	53	36.8	49.6	74
D8194	6	9	55	55	7.8	56.7	14
D81151	4	7	56	56	43.0	55.3	78
D81154	5	9	52	57	12.5	59.9	21
D81183	6	6	56	56	55.3	76.7	72
D8261	7	8	53	57	26.3	45.8	57
D8263	6	9	50	55	12.6	25.8	49
D8269	6	3	56	56	53.9	58.3	92
D8279	7	8	48	54	17.8	49.7	36
D8291	8	6	53	51	48.0	51.5	93
D82136	7	8	53	56	30.4	50.8	60
FA883-323	9	8	42	57	13.5	49.5	27

Summary

'Len', 'Alex', 'Wheaton', '747', 'Celtic', 'Oslo', 'ND626', and 'ND629' were injured and yield reduced 30% or more by difenzoquat. 'Vic', 'Laker', 'Fjord', and several numbered durum varieties received a 7 or greater injury rating from treatment with difenzoquat and were reduced in yield by 30% or greater.

Barley response to diclofop, Langdon, 1986. Barley variety strips were seeded May 21. Diclofop was applied at 15 and 31 oz/A June 17 in 8.5 gpa at 40 psi. Barley was harvested from the untreated and 31 oz/A plots for each variety, but not from the 15 oz/A plots. The experiment had two replications and was analyzed as a randomized complete block.

Variety	Wheat Yield			Test Weight		Kernel plumpness	
	Untr	Trt	Trt/Untr	Untr	Trt	Untr	Trt
	---(Bu/A)---		(%)	---(lb/Bu)---		-------(%)------	
Azure	64.2	77.3	122	41.5	42.5	94	92
Bowman	54.2	61.0	113	45.0	44.5	94	94
Concord	57.1	60.8	106	45.0	44.5	91	89
Ellice	48.0	52.3	109	46.0	44.5	93	92
Gallatin	44.1	40.1	91	46.5	44.5	93	86
Glenn	50.7	41.6	82	41.5	40.0	90	87
Hazen	47.5	44.6	94	43.5	41.0	95	93
Lewis	50.2	44.5	89	46.0	43.5	94	89
Morex	30.1	32.0	106	43.0	40.0	95	87
Robust	51.3	54.7	107	44.0	44.0	95	94
B-1601	40.7	44.9	110	40.0	37.5	91	87
ND6989	54.7	51.2	94	45.5	45.0	93	92
ND7265	38.6	40.8	106	41.0	41.5	93	90
ND7309	43.3	46.7	108	40.0	41.0	94	92
ND8152	50.2	46.4	92	39.5	37.5	91	90
LSD (5%)		NS					

Summary

No injury was evident from diclofop at either rate with any barley variety. Diclofop at 31 oz/A tended to reduce 'Gallatin', 'Glenn', 'Hazen', 'Lewis', 'ND6989', and 'ND8152' barley yields. Barley test weight and kernel plumpness generally tended to be reduced by diclofop at 31 oz/A.

Hard Red Spring and Durum wheat response to difenzoquat and triallate, Minot and Williston, 1986. Hard Red Spring and durum wheat variety strips were seeded May 1 at Williston, and May 13 at Minot. Triallate was applied at 1 lb/A and rototiller incorporated prior to wheat seeding May 13 at Minot. Difenzoquat at 1 lb/A was applied to 5 leaf wheat June 13 with 70 F and partly cloudy skies at Minot, and to 4 leaf wheat May 31 with 80 F and 48% relative humidity at Williston. Wheat stand reductions from triallate were evaluated June 5 at Minot, and wheat injury from difenzoquat was evaluated July 16 at Minot and July 8 at Williston.

(See table of data on next page.)

Summary

Triallate reduced 'Alex', Columbus', 'Katepwa', 'Nordic', 'ND606', and 'ND625' stands by 20% or more. Durum wheat stand reductions from triallate ded not exceed 10% for any variety. Difenzoquat caused 50% or greater injury to 'Celtic', 'Guard', 'Lew', 'Thatcher', 'Waldron', and '747' Hard Red Spring Wheat varieties. Durum varieties generally were more susceptible to difenzoquat than HRSW varieties. Several durum varieties were severely injured by difenzoquat.

HRSW Variety	Minot Tria Strd	Minot Dife Inju	Williston Dife Inju
	--------(%)--------		
Alex	5	25	35
Apex 83	0	0	0
Baart	5	0	5
Butte	-	-	15
Butte 86	5	0	5
Celtic	60	0	15
Challenger	10	0	15
Columbus	0	25	0
Coteau	0	0	0
Cutless	25	0	10
Glenman	5	0	5
Guard	75	0	90
Katepwa	5	25	5
Lancer	0	0	0
Leader	-	-	0
Leif	0	0	10
Len	30	0	50
Lew	70	5	70
Marshall	10	10	0
Newana	-	-	0
Norak	5	0	10
Nordic	10	20	10
Norseman	30	0	30
Stoa	15	5	15
Success	0	0	0
Telemark	20	0	0
Thatcher	-	-	90
Waldron	60	0	50
Wheaton	5	0	5
747	80	0	90
2369	0	0	0
HY-320	5	10	5
ND606	20	30	5
ND617	0	0	10
ND618	10	0	40
ND622	10	0	0
ND623	0	0	10
ND624	15	10	10
ND625	0	20	5
ND626	25	0	60
ND627	10	0	10
ND628	35	0	15
ND629	5	10	20
SD8026	30	10	5

Durum Variety	Minot Tria Strd	Minot Dife Inju	Williston Dife Inju
	--------(%)--------		
Arcola	5	10	5
Cando	0	0	15
Crosby	-	-	1
Fjord	35	0	70
Kyle	20	5	90
Laker	85	5	40
Lloyd	5	10	20
Medora	5	0	5
Monroe	5	0	10
Rolette	-	-	5
Rugby	5	0	5
Sceptre	10	0	-
Stockholm	15	0	5
Vic	40	5	75
Ward	5	10	5
D79168	75	5	95
D79209	5	0	10
D8012	15	0	5
D8016	45	0	90
D8019	30	0	75
D81151	5	0	80
D81154	30	0	80
D81183	5	0	5
D8172	20	0	30
D8191	10	0	40
D8193	40	0	5
D8194	10	5	75
D82136	5	0	15
D8261	35	0	75
D8263	85	0	75
D8269	0	0	0
D8279	80	0	85
D8291	0	5	10
FA883-323	15	0	50

Nordic = HS82-175, Telemark = HS82-288, Stockholm = NAHD81-466, Fjord = NAHD81-485.

Wild oats control in Hard Red Spring wheat, Fargo, 1986. 'Marshall' wheat was seeded May 16. Stage 1 (S1) treatments were applied to 2 to 3 leaf wheat and wild oats, and 2 to 4 leaf wild mustard June 9 with 72 F and 45% relative humidity. Stage 2 (S2) treatments were applied to 4 leaf wheat, 1 to 4 leaf wild oats, and cotyledon to 6 leaf wild mustard June 17 with 75 F and 45% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 25 feet plots. Wild oats and wild mustard densities averaged 2 and 10 plants per square meter, respectively. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wioa	Wimu	Wheat yield
	(oz/A)	(%)	(% control)		(Bu/A)
Barban (S1)	4	0	75	0	40
Barban+N (S1)	4+1G	0	87	0	41
Barban (S1)	6	0	83	0	39
Diclofop (S1)	12	0	92	0	43
Diclofop (S1)	16	0	93	0	41
Diclofop+PO (S1)	12+0.125G	0	95	0	44
Diclofop+MS (S1)	12+0.125G	1	91	0	44
AC 222,293 (S1)	4	0	99	97	46
AC 222,293 (S1)	6	0	99	98	44
Barban (S2)	6	0	43	0	37
Diclofop (S2)	16	0	73	0	40
Diclofop+PO (S2)	16+0.125G	0	80	0	42
Diclofop+MS (S2)	16+0.125G	0	78	0	40
AC 222,293 (S2)	6	0	98	98	38
AC 222,293 (S2)	8	1	99	99	46
Difenzoquat (S2)	10	0	88	0	45
Difenzoquat (S2)	12	0	92	0	40
No control	0	0	0	0	33
C.V. %		606	8	6	8
LSD 5%		NS	9	2	5

N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; G in the rate column represents gallons per acre.

Summary

None of the herbicide treatments caused wheat injury or stand reduction (data not presented). AC 222,293 gave or tended to give the greatest wild oats control at both application dates. Diclofop provided better wild oats control with the early application than the late application. None of the herbicides controlled wild mustard except AC 222,293, which gave 97% or greater control. Wheat yields generally related to weed control.

Wild oats control in Hard Red Spring wheat, Minot, 1986. 'Len' wheat was seeded May 14. Stage 1 (S1) treatments were applied to 2 leaf wheat and wild oats May 28 with 70 F and 50% relative humidity. Stage 2 (S2) treatments were applied to 4 to 5 leaf wheat and wild oats June 11 with 75 F and 60% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 25 feet plots. Wild oats densities averaged 2000 plants per square meter. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 10.

Treatment	Rate	Wheat injury	Wild oats	Wheat yield
	(oz/A)	(%)	(% control)	(Bu/A)
Barban (S1)	4	0	48	15
Barban+N (S1)	4+1G	0	77	20
Barban (S1)	6	0	80	21
Diclofop (S1)	12	0	75	18
Diclofop (S1)	16	0	74	16
Diclofop+PO (S1)	12+0.125G	0	64	15
Diclofop+MS (S1)	12+0.125G	0	84	26
AC 222,293 (S1)	4	0	96	25
AC 222,293 (S1)	6	0	99	28
Barban (S2)	6	1	74	15
Diclofop (S2)	16	0	79	16
Diclofop+PO (S2)	16+0.125G	0	85	19
Diclofop+MS (S2)	16+0.125G	0	81	17
AC 222,293 (S2)	6	0	98	19
AC 222,293 (S2)	8	0	98	17
Difenzoquat (S2)	10	0	82	19
Difenzoquat (S2)	12	0	85	16
No control	0	0	0	12
C.V. %		849	15	25
LSD 5%		NS	16	7

N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; G in the rate column represents gallons per acre.

Summary

None of the herbicide treatments caused wheat stand reduction (data not presented) or injury. AC 222,293 gave or tended to give the greatest wild oats control at both application dates. The addition of 28% nitrogen fertilizer enhanced wild oats control with barban. Methylated seed oil tended to enhance wild oats control with diclorop at the early application stage and resulted in increased wheat yields. Wheat yields generally related to level and time of wild oats control. Early wild oats control reduced wild oats competition more than the late control due to the high wild oats populations and the extended period of competition with late control.

Wild oats control in Hard Red Spring wheat, Williston, 1986. 'Stoa' wheat was seeded May 13. Stage 1 (S1) treatments were applied to 2 to 3 leaf wheat and wild oats, and 1 inch Russian thistle May 31 with 57 F and 60% relative humidity. Stage 2 (S2) treatments were applied to 4 to 6 leaf wheat and wild oats, and 2 to 3 inch Russian thistle June 10 with 70 F and 60% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to and 8 feet wide strip the length of the 10 by 25 feet plots. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 10.

Treatment	Rate	Wheat injury	Wioa	Ruth	Wheat yield	Wheat Tswt
	(oz/A)	(%)	(% control)		(Bu/A)	(lb/Bu)
Barban (S1)	4	0	53	0	31.4	61.5
Barban+N (S1)	4+1G	0	68	0	33.6	61.6
Barban (S1)	6	1	80	0	34.1	61.4
Diclofop (S1)	12	0	70	0	34.2	61.4
Diclofop (S1)	16	0	76	0	31.1	61.3
Diclofop+PO (S1)	12+0.125G	0	83	0	33.5	61.3
Diclofop+MS (S1)	12+0.125G	1	89	0	33.9	61.1
AC 222,293 (S1)	4	0	95	63	36.8	61.5
AC 222,293 (S1)	6	0	98	73	36.6	61.6
Barban (S2)	6	0	58	0	29.1	61.6
Diclofop (S2)	16	0	88	0	32.9	62.0
Diclofop+PO (S2)	16+0.125G	1	91	0	34.2	61.5
Diclofop+MS (S2)	16+0.125G	0	93	0	29.9	61.8
AC 222,293 (S2)	6	3	96	44	34.8	61.7
AC 222,293 (S2)	8	5	99	69	32.5	61.6
Difenzoquat (S2)	10	5	89	0	32.5	61.9
Difenzoquat (S2)	12	14	95	0	31.6	61.8
No control	0	0	0	0	29.3	61.8
C.V. %		128	7	73	10.8	--
LSD 5%		3	8	14	NS	--
Reps		4	4	4	4	1

N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; G in the rate column represents gallons per acre.

Summary

None of the herbicides caused wheat stand reduction (data not presented). Difenzoquat at 12 oz/A caused 14% wheat injury. AC 222,293 tended to give the best wild oats control. Addition of 28% nitrogen fertilizer enhanced wild oats control with barban. Wild oats control with diclofop was better with the late application than the early application. Petroleum oil and methylated seed oil tended to enhance wild oats control with diclofop. AC 222,293 was the only herbicide to provide any Russian thistle control. Wheat yields tended to relate to weed control.

Wild oats control in Hard Red Spring wheat, Langdon, 1986. 'Coteau' wheat was seeded May 29. Treatments were applied to 4.5 leaf wheat and wild oats June 26 with 70 F and 50% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 25 feet plots. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 27.

Treatment	Rate	Wheat injury	July 24 Wioa	July 24 Coma	July 24 Wibw	Aug 27 Wioa
	(oz/A)	(%)	-------(% control)-------			
Barban	4	0	71	7	58	40
Barban+N	4+1G	1	80	10	17	55
Barban	6	1	69	17	53	59
Diclofop	12	1	88	0	0	96
Diclofop	16	1	88	0	0	99
Diclofop+PO	12+0.125G	0	85	0	0	99
Diclofop+MS	12+0.125G	1	91	13	0	99
Diclofop+PO	16+0.125G	4	89	0	0	99
Diclofop+MS	16+0.125G	1	90	0	0	97
AC 222,293	4	0	85	60	53	99
AC 222,293	6	1	94	72	68	99
AC 222,293	8	0	96	78	70	99
Difenzoquat	10	0	81	0	0	89
Difenzoquat	12	8	90	0	0	94
C.V. %		197	12	59	63	15
LSD 5%		3	14	19	26	17
# OF REPS		4	4	3	3	4

N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; G in the rate column represents gallons per acre.

Summary

None of the herbicides caused wheat stand reduction (data not presented). Difenzoquat at 12 oz/A caused 8% wheat injury. Addition of 28% nitrogen fertilizer to barban enhanced wild oats control, but reduced wild buckwheat control. AC 222,293 provided 60 to 78% common mallow control. Barban and AC 222,293 were the only herbicides to provide any wild buckwheat control.

Postemergence wild oats control in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded in rows 6 inches apart May 16. Treatments were applied to 4 leaf wheat, 2 to 4 leaf wild oats, and cotyledon to 4 leaf wild mustard June 13 with 70 F, 60% relative humidity, and clear skies. Moisture and temperature were favorable for plant growth. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 24 feet plots. Wild oats densities averaged 2 plants per square meter and wild mustard densities averaged 10 plants per square meter. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wioa	Wimu	Wheat yield
	(oz/A)	(%)	-(% control)-		(Bu/A)
Fenoxaprop	0.5	0	43	0	39
Fenoxaprop	1.0	0	60	0	47
Diclofop	8	0	51	0	37
Diclofop	12	0	74	0	42
Diclofop	16	0	82	5	43
AC 222,293	2	0	86	94	46
AC 222,293	4	0	98	99	45
AC 222,293	6	0	99	99	43
Difenzoquat	10	0	81	23	49
Difenzoquat	12	0	76	8	45
Diclofop+AC 222,293	8+2	1	85	96	49
Diclofop+AC 222,293	12+2	9	84	99	45
Diclofop+AC 222,293	8+4	0	95	99	46
Diclofop+AC 222,293	12+4	0	99	99	48
Diclofop+fenoxaprop	8+0.5	1	71	0	37
AC 222,293+fenoxaprop	4+0.5	0	95	99	45
AC 222,293+fenoxaprop	6+0.5	0	99	98	43
Difenzoquat+fenoxaprop	10+0.5	0	60	5	37
No control	0	0	0	0	39
C.V. %		171	12	20	9
LSD 5%		1	13	15	6

Summary

None of the herbicide treatments caused wheat stand reductions (data not presented) or important injury. AC 222,293 applied at 4 or 6 oz/A provided 95% or greater wild oats control, which was better than diclofop, difenzoquat, or fenoxaprop at any rate. Diclofop or fenoxaprop in combination with AC 222,293 did not enhance wild oats control compared to AC 222,293 applied alone. AC 222,293 provide 95% or greater wild mustard control at all rates. Wheat yields generally related to weed control.

Antagonism of wild oats control, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 leaf wheat, and cotyledon to 4 leaf wild mustard plants June 13 with 70 F, 60% relative humidity, and clear skies. All treatments were applied in 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 24 feet plots. The experimental design was a randomized complete block with four replications. The average wild oats density was 2 plants per square meter, and the average wild mustard density was 10 plants per square meter. Wheat injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wioa	Wimu	Wheat Yield
	(oz/A)	(%)	(% control)		(Bu/A)
Diclofop	12	0	63	0	37
Diclofop+PO	12+0.12G	0	69	9	38
Diclofop+bromoxynil-UC	12+4	0	84	99	45
Diclofop+bromoxynil-RP	12+4	0	83	98	45
Diclofop+bromoxynil-UC	12+6	0	90	99	44
Diclofop+bromoxynil-RP	12+6	1	92	99	47
Diclofop+clopyralid+bromoxynil-RP	12+1.5+4	0	65	99	45
Diclofop+clopyralid+bromoxynil-RP	12+2+4	0	60	99	44
Diclofop&bromoxynil&MCPA	12.8+4+0.7	0	80	98	44
Diclofop+bromoxynil&MCPA-UC	12+2+2	0	39	99	43
Diclofop+bromoxynil-UC+chlorsulfuron	12+4+0.01	0	78	99	45
Diclofop+bromoxynil-UC+DPX-M6316	12+4+0.125	3	81	99	42
Diclofop+bromoxynil-UC+DPX-M6316	12+4+0.25	1	87	99	44
Diclofop+bromoxynil&MCPA-UC	12+3+3	1	66	98	41
Difenzoquat	12	0	96	0	42
Difenzoquat+bromoxynil-RP	12+4	3	95	99	41
Difenzoquat+bromoxynil-RP	12+6	0	97	98	42
Difenzoquat+clopyralid&MCPA	12+1.4+8	1	97	99	46
Difenzoquat+clopyralid&2,4-D	12+1.4+8	3	97	99	46
Difenzoquat+clopyralid&MCPA	12+1.25+7	1	97	99	42
Difenzoquat+clopyralid&2,4-D	12+1.25+7	0	99	99	46
Clopyralid&MCPA	1.25+7	0	16	99	41
Clopyralid&2,4-D	1.25+7	0	16	99	42
Control	0	0	0	0	36
C.V. %		301	19	4	10
LSD 5%		NS	19	5	6

UC = Union Carbide; RP = Rhone Poulenc; & = formulated mixture which was 13:4:0.7 for diclofop&bromoxynil&MCPA, 1:1 for bromoxynil&MCPA, 1:5.6 for clopyralid&MCPA(XRM-4813), and 1:5.6 for clopyralid&2,4-D(XRM-4816); P = petroleum oil with 17% emulsifier.

Summary

None of the herbicides caused wheat stand reduction (data not presented), or important injury. Difenzoquat provided 95% or greater wild oats control, and was not antagonized by any of the broadleaf control herbicides. Bromoxynil tended to enhance wild oats control with diclofop. Wild oats control with diclofop plus bromoxynil plus clopyralid was or tended to be less than with diclofop plus bromoxynil, but equal to diclofop alone. Wild oats control with diclofop was not antagonized by MCPA at 0.7 oz/A plus bromoxynil at 4 oz/A, but was antagonized by MCPA at 2 oz/A plus bromoxynil at 2 oz/A. Wild mustard control was nearly complete with all treatments except for diclofop or difenzoquat applied alone. Wheat yields generally related to weed control.

AC 222,293 and broadleaf herbicide combinations, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 leaf wheat, and 2 to 4 leaf wild oats June 13 with 70 F and 60% relative humidity. The experimental design was a randomized complete block with four replications. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. Wild oats and kochia densities were light and variable. Wheat injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wioa	KOCZ	Wheat yield
	(oz/A)	(%)	(% control)		(Bu/A)
AC 222,293	6	0	97	91	49
AC 222,293	8	0	99	84	45
AC 222,293+MCPA-dma	6+4	0	94	91	47
AC 222,293+MCPA-dma	6+8	0	95	92	48
AC 222,293+MCPA-dma	8+4	0	98	97	48
AC 222,293+MCPA-dma	8+8	0	98	97	47
AC 222,293+MCPA-bee	6+4	1	97	99	49
AC 222,293+MCPA-bee	6+8	0	97	99	50
AC 222,293+MCPA-bee	8+4	0	99	99	49
AC 222,293+MCPA-bee	8+8	0	98	96	49
AC 222,293+2,4-D-dma	6+4	0	98	99	51
AC 222,293+2,4-D-dma	6+8	3	91	99	49
AC 222,293+2,4-D-dma	8+4	0	99	100	48
AC 222,293+2,4-D-dma	8+8	0	93	98	49
AC 222,293+2,4-D-bee	6+4	0	95	100	47
AC 222,293+2,4-D-bee	6+8	0	96	100	48
AC 222,293+2,4-D-bee	8+4	2	99	89	48
AC 222,293+2,4-D-bee	8+8	0	95	99	47
AC 222,293+propanil	6+20	0	83	99	46
AC 222,293+propanil	8+20	1	88	97	47
AC 222,293+picloram	6+0.5	0	95	41	47
AC 222,293+picloram	8+0.5	4	97	84	46
AC 222,293+clopyralid	6+2	0	97	90	50
AC 222,293+clopyralid	8+2	0	99	70	47
No control	0	0	0	0	35
C.V. %		295	3	11	7
LSD 5%		2	4	13	5

Summary

Wheat had good tolerance to all herbicide treatments. Propanil antagonized wild oats control with AC 222,293. The dimethylamine formulations of 2,4-D antagonized wild oats control with AC 222,293 when 2,4-D was applied at the 8 oz/A rate. All treatments except AC 222,293 at 6 oz/A plus picloram provided 70% or greater kochia control . Wheat yields were not increased by weed control because of sparse weed populations.

<u>AC 222,293 and broadleaf herbicide combinations, Minot, 1986.</u> 'Len' Hard Red Spring wheat was seeded May 14. Treatments were applied to 4 to 5 leaf wheat and wild oats June 11 with 75 F and 60% relative humidity. The experimental design was a randomized complete block with four replications. All treatments were applied with a bicycle wheel type plot sprayere delivering 8.5 gpa at 35 psi. Wheat stands were thin due to heavy wild oats populations which exceeded 2000 plants per square meter. Wheat injury and weed control were evaluated July 10.

Treatment	Rate	Wheat injury	Wild oats
	(oz/A)	(%)	% control
AC 222,293	6	0	90
AC 222,293	8	0	92
AC 222,293+MCPA-dma	6+4	0	79
AC 222,293+MCPA-dma	6+8	0	77
AC 222,293+MCPA-dma	8+4	0	89
AC 222,293+MCPA-dma	8+8	0	87
AC 222,293+MCPA-bee	6+4	0	86
AC 222,293+MCPA-bee	6+8	0	85
AC 222,293+MCPA-bee	8+4	0	91
AC 222,293+MCPA-bee	8+8	0	91
AC 222,293+2,4-D-dma	6+4	0	76
AC 222,293+2,4-D-dma	6+8	0	68
AC 222,293+2,4-D-dma	8+4	0	88
AC 222,293+2,4-D-dma	8+8	0	81
AC 222,293+2,4-D-bee	6+4	0	81
AC 222,293+2,4-D-bee	6+8	0	83
AC 222,293+2,4-D-bee	8+4	0	89
AC 222,293+2,4-D-bee	8+8	0	93
AC 222,293+propanil	6+20	0	31
AC 222,293+propanil	8+20	0	33
AC 222,293+picloram	6+0.5	0	78
AC 222,293+picloram	8+0.5	0	90
AC 222,293+clopyralid	6+2	0	85
AC 222,293+clopyralid	8+2	0	90
C.V. %		1	6
LSD 5%		NS	7

Summary

Wheat had good tolerance to all herbicide treatments. Propanil antagonized wild oats control with AC 222,293. Wild oats control with AC 222,293 tended to be antagonized by picloram and the dimethylamine formulations of MCPA and 2,4-D.

AC 222,293 and broadleaf herbicide combinations, Williston, 1986. 'Stoa' Hard Red Spring wheat was seeded May 13. Treatments were applied to 3.5 to 4 leaf wheat, 3 leaf wild oats, and 1 to 3 inch Russian thistle June 4 with 65 F and 27% relative humidity. The experimental design was a randomized complete block with four replications. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. Wheat injury and weed control were evaluated July 10.

Treatment	Rate	Wheat injury	Wioa	Ruth	Wheat yield	Wheat Tswt
	(oz/A)	(%)	(% control)		(Bu/A)	(lb/Bu)
AC 222,293	6	0	98	45	29.8	61.5
AC 222,293	8	0	99	64	32.8	61.2
AC 222,293+MCPA-dma	6+4	1	90	34	31.7	61.9
AC 222,293+MCPA-dma	6+8	1	89	24	30.1	61.7
AC 222,293+MCPA-dma	8+4	3	90	25	31.4	61.7
AC 222,293+MCPA-dma	8+8	3	89	30	30.1	61.6
AC 222,293+MCPA-bee	6+4	0	82	48	33.0	61.2
AC 222,293+MCPA-bee	6+8	1	96	81	30.8	61.1
AC 222,293+MCPA-bee	8+4	0	97	58	31.8	61.3
AC 222,293+MCPA-bee	8+8	1	99	84	32.9	61.3
AC 222,293+2,4-D-dma	6+4	1	92	78	32.6	61.4
AC 222,293+2,4-D-dma	6+8	1	89	93	30.5	61.2
AC 222,293+2,4-D-dma	8+4	3	96	88	32.0	61.6
AC 222,293+2,4-D-dma	8+8	5	94	96	31.7	61.3
AC 222,293+2,4-D-bee	6+4	3	99	98	31.4	61.3
AC 222,293+2,4-D-bee	6+8	5	99	98	30.0	61.4
AC 222,293+2,4-D-bee	8+4	0	97	96	33.4	61.3
AC 222,293+2,4-D-bee	8+8	3	99	99	30.5	61.0
AC 222,293+propanil	6+20	0	85	71	29.0	61.3
AC 222,293+propanil	8+20	1	91	61	39.5	61.3
AC 222,293+picloram	6+0.5	4	83	64	28.1	61.0
AC 222,293+picloram	8+0.5	8	97	89	27.8	61.0
AC 222,293+clopyralid	6+2	3	98	90	31.3	61.7
AC 222,293+clopyralid	8+2	3	99	91	30.1	61.5
No control	0	0	0	0	28.6	60.9
C.V. %		139	10	34	7.0	--
LSD 5%		4	13	30	3.0	--
Reps		4	4	4	4	1

Tswt = test weight (lb/Bu).

Summary

Wheat had good tolerance to all herbicide treatments. Wild oats control with AC 222,293 tended to be antagonized by propanil, picloram, and the dimethylamine formulations of MCPA and 2,4-D. AC 222,293 plus 2,4-D-bee gave or tended to give the greatest Russian thistle control. MCPA-dma tended to decrease Russian thistle control with AC 222,293. Wheat yields were generally related to weed control.

Wild oats control herbicides with various additives, Minot, 1986. 'Len' Hard Red Spring wheat was seeded May 14. Treatments were applied to 4 leaf wheat and 4 to 5 leaf wild oats June 10 with 66 F and 60% relative humidity. The experimental design was a randomized complete block with three replications. Wheat injury and wild oats control were evaluated on July 10. Wheat stands were thin due to heavy wild oats densities that exceeded 2000 plants per square meter.

Treatment	Rate	Wild oats control
	(oz/A)	(%)
Barban	6	52
Barban+petroleum oil	6+0.25G	68
Barban+soybean oil	6+0.25G	56
Barban+methylated soybean oil	6+0.25G	67
Barban+LI-700	6+0.25G	37
Barban+28% liquid N	6+1G	63
Barban+10-34-0 fertilizer	6+1G	48
Barban+28% liquid N+petroleum oil	6+1G+0.25G	70
Barban+28% liquid N+soybean oil	6+1G+0.25G	53
Barban+28% liquid N+methylated soybean oil	6+1G+0.25G	70
AC 222,293	4	88
AC 222,293+petroleum oil	4+0.25G	89
AC 222,293+soybean oil	4+0.25G	86
AC 222,293+methylated soybean oil	4+0.25G	91
AC 222,293+LI-700	4+0.25G	92
AC 222,293+10-34-0 fertilizer	4+1G	78
AC 222,293+28% liquid N+petroleum oil	4+1G+0.25G	90
AC 222,293+28% liquid N+soybean oil	4+1G+0.25G	87
AC 222,293+28% liquid N+methylated soybean oil	4+1G+0.25G	91
Difenzoquat	10	67
Difenzoquat+petroleum oil	10+0.25G	72
Difenzoquat+soybean oil	10+0.25G	76
Difenzoquat+methylated soybean oil	10+0.25G	82
Difenzoquat+LI-700	10+0.25G	80
Difenzoquat+28% liquid N	10+1G	75
Difenzoquat+10-34-0 fertilizer	10+1G	40
Difenzoquat+28% liquid N+petroleum oil	10+1G+0.25G	72
Difenzoquat+28% liquid N+soybean oil	10+1G+0.25G	78
Difenzoquat+28% liquid N+methylated soybean oil	10+1G+0.25G	78
C.V. %		12
LSD 5%		13

Petroleum oil contained 17% and soybean oil 15% Atplus 300F emulsifier; methylated soybean oil contained 15% IGEPAL CO-630 emulsifier.

Summary

None of the herbicide treatments caused stand reduction or injury to the wheat (data not presented). Wild oats control with barban was enhanced by petroleum oil and methylated soybean oil adjuvants, but was not enhanced further by the addition of 28% liquid N. LI-700 decreased wild oats control with barban. Additives had little influence on wild oats control with AC 222,293. All additives tended to increase wild oats control with difenzoquat except 10-34-0 fertilizer which decreased control. Methylated soybean oil and LI-700 tended to increase wild oats control with difenzoquat more than the other adjuvants. 10-34-0 fertilizer tended to antagonize all wild oats control herbicides.

Sulfonylurea and wild oats herbicide combinations, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 to 5 leaf wheat and wild oats, and cotyledon to 6 leaf wild mustard June 16 with 70 F and 40% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wioa	KOCZ	Cath	Wheat yield
	(oz/A)	(%)	---(%	control)	--	(Bu/A)
DPX-M6316+X-77	0.25+0.25%	0	0	99	13	37
DPX-L5300+X-77	0.25+0.25%	0	5	99	97	36
DPX-R9674+X-77	0.25+0.25%	0	0	99	91	36
Barban	6	0	41	0	10	33
Barban+DPX-M6316	6+0.25	0	43	99	33	39
Barban+DPX-L5300	6+0.25	0	24	99	91	39
Diclofop	12	0	83	0	5	35
Diclofop+DPX-M6316	12+0.25	1	76	99	30	35
Diclofop+DPX-M6316	12+0.50	0	76	99	63	39
Diclofop+DPX-L5300	12+0.25	0	68	99	66	41
Diclofop+DPX-L5300	12+0.50	0	68	99	95	43
Diclofop+DPX-R9674	12+0.25	0	81	99	89	38
Diclofop+DPX-R9674	12+0.50	0	69	99	83	37
AC 222,293	5	0	93	43	15	33
AC 222,293+DPX-M6316	5+0.25	1	93	99	23	38
AC 222,293+DPX-M6316	5+0.50	1	95	97	18	37
AC 222,293+DPX-L5300	5+0.25	6	94	99	90	40
AC 222,293+DPX-L5300	5+0.50	4	95	99	93	42
AC 222,293+DPX-R9674	5+0.25	0	94	99	83	46
AC 222,293+DPX-R9674	5+0.50	3	93	99	85	41
Difenzoquat	12	3	93	0	0	39
Difenzoquat+DPX-M6316	12+0.25	1	94	99	58	43
Difenzoquat+DPX-M6316	12+0.50	3	92	99	38	44
Difenzoquat+DPX-L5300	12+0.25	1	90	99	74	45
Difenzoquat+DPX-L5300	12+0.50	3	91	99	94	44
Difenzoquat+DPX-R9674	12+0.25	3	93	99	63	43
Difenzoquat+DPX-R9674	12+0.50	0	91	99	83	44
Control	0	0	0	0	0	33
C.V. %		239	13	10	35	11
LSD 5%		NS	12	13	40	6
# OF REPS		4	4	3	2	4

Summary

None of the treatments caused stand reduction (data Not presented) or important injury to wheat. AC 222,293 and difenzoquat provided 90% or greater wild oats control with all combinations and were not antagonized by the sulfonylurea herbicides. Wild oats control with barban and diclofop was antagonized by DPX-L5300 . All sulfonylurea herbicides gave excellent kochia control. DPX-L5300 and DPX-R9674 provided better Canada thistle control than DPX-M6316. Wheat yields generally related to weed control.

Sulfonylurea and wild oats herbicide combinations, Minot, 1986. 'Len' Hard Red Spring wheat was seeded May 14. All treatments were applied to 4.5 leaf wheat and wild oats June 10 with 65 F and 65% relative humididty. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Crop injury and wild oats control were evaluated July 11.

Treatment		Wheat injury (%)	Wild oats (% control)
Barban	6	0	29
Barban+DPX-M6316	6+0.25	0	36
Barban+DPX-L5300	6+0.25	0	28
Diclofop	12	0	64
Diclofop+DPX-M6316	12+0.25	0	60
Diclofop+DPX-M6316	12+0.50	0	53
Diclofop+DPX-L5300	12+0.25	0	49
Diclofop+DPX-L5300	12+0.50	0	34
Diclofop+DPX-R9674	12+0.25	0	57
Diclofop+DPX-R9674	12+0.50	0	51
Diclofop+chlorsulfuron	12+0.25	0	58
Diclofop+metsulfuron	12+0.06	0	30
Diclofop+CGA-131036	12+0.25	0	52
AC 222,293	5	0	87
AC 222,293+DPX-M6316	5+0.25	0	88
AC 222,293+DPX-M6316	5+0.50	0	89
AC 222,293+DPX-L5300	5+0.25	0	90
AC 222,293+DPX-L5300	5+0.50	0	88
AC 222,293+DPX-R9674	5+0.25	0	89
AC 222,293+DPX-R9674	5+0.50	0	89
AC 222,293+chlorsulfuron	5+0.25	0	88
AC 222,293+metsulfuron	12+0.06	2	98
AC 222,293+CGA-131036	12+0.25	0	97
Difenzoquat	12	0	74
Difenzoquat+DPX-M6316	12+0.25	0	73
Difenzoquat+DPX-M6316	12+0.50	0	77
Difenzoquat+DPX-L5300	12+0.25	0	73
Difenzoquat+DPX-L5300	12+0.50	0	74
Difenzoquat+DPX-R9674	12+0.25	0	68
Difenzoquat+DPX-R9674	12+0.50	0	70
Difenzoquat+chlorsulfuron	12+0.25	0	71
Difenzoquat+metsulfuron	12+0.06	0	71
Difenzoquat+CGA-131036	12+0.25	0	61
C.V. %		1166	14
LSD 5%		NS	12

Summary

None of the treatments caused stand reduction (data not presented) or important wheat injury. Wild oats control was highest with AC 222,293 and lowest with barban. Wild oats control with AC 222,293, barban, and difenzoquat generally was not antagonized by the sulfonylurea herbicides. Diclofop was antagonized by the addition of DPX-L5300 and metsulfuron.

Sulfoynylurea and wild oats herbicide combinations, Williston, 1986. 'Stoa' Hard Red Spring wheat was seeded May 13. Barban and diclofop treatments were applied to 2 to 3 leaf wheat and wild oats, and emerging broadleaves May 31 with 57 F and 60% relative humidity. AC 222,293 treatments were applied to 3 to 4 leaf wheat and wild oats June 4 with 75 F and 23% relative humidity. Difenzoquat treatments were applied to 5 to 6 leaf wheat and wild oats June 10 with 70 F and 40% relative humidity. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 17.

Treatment	Rate	Wheat inju	Wioa	Ruth	Colq	Grft	Wheat Yield	Wheat Tswt
	(oz/A)	(%)	----(%	control)----			(Bu/A)	
Barban	6	0	75	0	0	0	31	61.0
Barban+DPX-M6316	6+0.25	0	80	98	99	19	36	61.2
Barban+DPX-L5300	6+0.25	0	55	98	99	23	37	61.4
Diclofop	12	0	58	0	0	66	35	60.9
Diclofop+DPX-M6316	12+0.25	0	53	90	98	83	35	61.2
Diclofop+DPX-M6316	12+0.50	1	73	94	99	90	32	61.0
Diclofop+DPX-L5300	12+0.25	0	25	93	99	80	31	61.0
Diclofop+DPX-L5300	12+0.50	0	31	93	98	78	33	61.2
Diclofop+DPX-R9674	12+0.25	1	60	95	99	89	32	61.1
Diclofop+DPX-R9674	12+0.50	0	51	98	99	91	35	61.1
Diclofop+chlorsulfuron	12+0.25	0	49	98	99	93	33	61.1
Diclofop+metsulfuron	12+0.06	0	50	98	98	83	34	61.2
Diclofop+CGA-131036	12+0.25	1	40	70	73	59	35	61.2
AC 222,293	5	0	95	39	13	20	37	61.4
AC 222,293+DPX-M6316	5+0.25	0	94	78	69	49	35	61.3
AC 222,293+DPX-M6316	5+0.50	0	94	91	99	25	34	61.1
AC 222,293+DPX-L5300	5+0.25	1	95	83	98	55	34	61.3
AC 222,293+DPX-L5300	5+0.50	3	95	94	99	61	31	61.2
AC 222,293+DPX-R9674	5+0.25	0	94	98	99	64	32	61.3
AC 222,293+DPX-R9674	5+0.50	1	95	97	99	84	36	61.3
AC 222,293+chlorsulfuron	5+0.25	3	95	95	99	85	34	61.3
AC 222,293+metsulfuron	5+0.06	3	96	96	99	85	35	61.5
AC 222,293+CGA-131036	5+0.25	1	97	98	99	68	33	61.4
Difenzoquat	12	9	88	0	0	0	31	61.3
Difenzoquat+DPX-M6316	12+0.25	8	86	98	99	28	33	61.6
Difenzoquat+DPX-M6316	12+0.50	6	84	91	99	54	33	61.1
Difenzoquat+DPX-L5300	12+0.25	6	85	99	99	26	35	61.3
Difenzoquat+DPX-L5300	12+0.50	5	85	97	99	56	36	61.4
Difenzoquat+DPX-R9674	12+0.25	8	90	97	99	34	33	61.6
Difenzoquat+DPX-R9674	12+0.50	6	83	96	99	64	33	61.5
Difenzoquat+chlorsulfuron	12+0.25	6	86	98	99	85	33	61.5
Difenzoquat+metsulfuron	12+0.06	8	90	99	75	73	37	61.6
Difenzoquat+CGA-131036	12+0.25	13	92	96	99	51	33	61.6
No control	0	0	0	0	0	0	33	61.3
C.V. %		90	13	14	16	49	12	--
LSD 5%		3	14	16	19	39	NS	--
Reps		4	4	4	4	4	4	1

Summary

None of the treatments caused any stand reduction (data not presented) or important wheat injury. AC 222,293 and difenzoquat were not antagonized by any of the sulfonylurea herbicides. Wild oats control with barban and diclofop was antagonized by DPX-L5300. All sulfonylurea herbicides gave good Russian thistle and common lambsquarters control. The sulfonylurea herbicides tended to enhance green foxtail control with the wild oats herbicides.

Weed control in spring wheat, Carrington, 1986. 'Stoa' Hard Red Spring wheat was seeded May 28. Treatments were applied to 4 to 5 leaf wheat June 23 with 65 F and 60% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 foot wide strip the length of the 10 by 20 foot plots. The experimental design was a randomized complete block with four replicaitons. Wheat injury and weed control were evaluated July 11.

Treatment	Rate	Grft	Rrpw	Colq	Wibw
	(oz/A)	------(% control)-----			
MCPA-dma	6	0	73	83	41
2,4-D-dma	6	0	85	97	65
Bromoxynil&MCPA	3+3	10	86	96	83
Bromoxynil&MCPA	4+4	0	75	93	77
Bromoxynil+2,4-D-bee	3.2+4.8	0	59	94	85
Dicamba+MCPA-dma	1.5+4	0	88	99	92
Picloram+2,4-D-dma	0.25+6	0	96	97	93
Picloram+2,4-D-dma+fluroxypyr	0.25+6+2	0	88	99	94
Clopyralid&2,4-D	1.5+6	0	83	97	90
Clopyralid&2,4-D(XRM-4816)	1.25+7	0	89	98	93
Clopyralid&MCPA&bromoxynil	0.38+1.5+6.7	0	80	99	97
Clopyralid&2,4-D+bromoxynil	1+5.8+2.5	0	88	99	96
Fluroxypyr	2	0	71	69	89
Fluroxypyr+MCPA-bee	1.5+6	0	83	98	94
Fluroxypyr+MCPA-bee+bromoxynil	1.5+6+2.5	8	86	98	96
DPX-M6316+X-77	0.25+0.25%	0	93	91	94
DPX-L5300+X-77	0.12+0.25%	0	93	95	89
DPX-R9674+X-77	0.25+0.25%	0	95	95	93
Metsulfuron+X-77	0.06+0.25%	0	91	79	85
Propanil&MCPA	15+4	56	93	96	86
Diclofop+bromoxynil	12+4	63	65	86	73
C.V. %		122	14	8	10
LSD 5%		11	16	11	12

& = formulated mixture which was 1:1 for bromoxynil&MCPA, 1:4 for clopyralid&2,4-D, 1:5.6 for clopyralid&2,4-D(XRM-4816); 1:4:17.5 for clopyralid&MCPA&bromoxynil, and 1:0.26 for propanil&MCPA; dma = dimethylamine; bee = butoxyethanol ester.

Summary

None of the herbicides caused stand reduction or visible injury to wheat (data not presented). None of the treatments provided more 65% control of green foxtail. The treatments containing sulfonylurea herbicides, propanil plus MCPA, and picloram plus 2,4-D gave greater than 90% redroot pigweed control. All treatments provided 79% or greater common lambsquarters control. Several treatments gave good wild buckwheat control. DPX-M6316 and DPX-R9674 were the only treatments to provide greater than 90% control of all broadleaf weeds evaluated.

Weed control in spring wheat, Minot, 1986. 'Len' Hard Red Spring wheat was seeded June 13. Treatments were applied to 4.5 to 5 leaf wheat, 2 to 4 inch volunteer flax (Vofl), 1 to 3 inch wild buckwheat, and 2 to 4 inch prostrate pigweed June 13 with 70 F and 50% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 foot wide strip the length of the 10 by 25 foot plots. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 11.

Treatment	Rate	Vofl	Ruth	Wibw	Prpw
	(oz/A)	------(% control)-----			
MCPA-dma	6	0	0	10	33
2,4-D-dma	6	0	82	36	46
Bromoxynil&MCPA	3+3	0	59	65	70
Bromoxynil&MCPA	4+4	0	69	60	70
Bromoxynil+2,4-D-bee	3.2+4.8	0	96	93	94
Dicamba+MCPA-dma	1.5+4	0	71	76	79
Picloram+2,4-D-dma	0.25+6	0	88	97	84
Picloram+2,4-D-dma+fluroxypyr	0.25+6+2	3	93	93	95
Clopyralid&2,4-D	1.5+6	0	68	92	68
Clopyralid&2,4-D(XRM-4816)	1.25+7	0	93	90	79
Clopyralid&MCPA&bromoxynil	0.38+1.5+6.7	0	79	95	78
Clopyralid&2,4-D+bromoxynil	1+5.8+2.5	0	95	97	80
Fluroxypyr	2	0	74	68	35
Fluroxypyr+MCPA-bee	1.5+6	1	81	74	66
Fluroxypyr+MCPA-bee+bromoxynil	1.5+6+2.5	0	90	94	90
DPX-M6316+X-77	0.25+0.25%	0	95	90	93
DPX-L5300+X-77	0.12+0.25%	1	96	56	88
DPX-R9674+X-77	0.25+0.25%	0	96	85	97
Metsulfuron+X-77	0.06+0.25%	1	89	86	97
Propanil&MCPA	15+4	2	28	43	85
Diclofop+bromoxynil	12+4	0	79	75	83
C.V. %		347	18	18	19
LSD 5%		NS	19	19	20

& = formulated mixture which was 1:1 for bromoxynil&MCPA, 1:4 for clopyralid&2,4-D, 1:5.6 for clopyralid&2,4-D(XRM-4816); 1:4:17.5 for clopyralid&MCPA&bromoxynil, and 1:0.26 for propanil&MCPA; dma = dimethylamine; bee = butoxyethanol ester.

Summary

None of the herbicides caused stand reduction or visible injury to wheat (data not presented). 2,4-D was more effective than MCPA for broadleaf weed control. None of the herbicides controlled volunteer flax. DPX-M6316 was more effective than DPX-L5300 for wild buckwheat control. Bromoxynil plus MCPA, picloram plus 2,4-D plus fluroxypyr, fluroxypyr plus MCPA plus bromoxynil, and DPX-M6316 were the only treatments to provide 90% or greater control of all broadleaf weeds except volunteer flax.

Weed control in spring wheat, Langdon, 1986. 'Cando' durum wheat was seeded May 28. Treatments were applied to 4 to 5 leaf wheat June 26 to 75 F and 40% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 foot wide strip the length of the 10 by 25 foot plots. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 24.

Treatment	Rate	Grft	Coma	Wibw
	(oz/A)	---(%	control)	--
MCPA-dma	6	0	41	15
2,4-D-dma	6	0	45	43
Bromoxynil&MCPA	3+3	0	69	96
Bromoxynil&MCPA	4+4	0	76	80
Bromoxynil+2,4-D-bee	3.2+4.8	0	90	87
Dicamba+MCPA-dma	1.5+4	0	65	90
Picloram+2,4-D-dma	0.25+6	0	77	98
Picloram+2,4-D-dma+fluroxypyr	0.25+6+2	13	99	99
Clopyralid&2,4-D	1.5+6	0	88	98
Clopyralid&2,4-D(XRM-4816)	1.25+7	0	92	97
Clopyralid&MCPA&bromoxynil	0.38+1.5+6.7	0	92	99
Clopyralid&2,4-D+bromoxynil	1+5.8+2.5	10	96	98
Fluroxypyr	2	0	90	98
Fluroxypyr+MCPA-bee	1.5+6	3	96	98
Fluroxypyr+MCPA-bee+bromoxynil	1.5+6+2.5	0	97	95
DPX-M6316+X-77	0.25+0.25%	0	96	83
DPX-L5300+X-77	0.12+0.25%	0	91	50
DPX-R9674+X-77	0.25+0.25%	0	99	99
Metsulfuron+X-77	0.06+0.25%	0	96	85
Propanil&MCPA	15+4	65	83	77
Diclofop+bromoxynil	12+4	92	82	97
C.V. %		60	11	14
LSD 5%		7	13	18
# OF REPS		4	4	3

& = formulated mixture which was 1:1 for bromoxynil&MCPA, 1:4 for clopyralid&2,4-D, 1:5.6 for clopyralid&2,4-D(XRM-4816); 1:4:17.5 for clopyralid&MCPA&bromoxynil, and 1:0.26 for propanil&MCPA; dma = dimethylamine; bee = butoxyethanol ester.

Summary

None of the herbicides caused stand reduction or visible injury to wheat (data not presented). Diclofop plus bromoxynil was the only treatment to provide greater than 70% green foxtail control. Treatments containing fluroxypyr, clopyralid, or a sulfonylurea herbicide gave 88% or greater common mallow control. Several treatments provided more than 90% wild buckwheat control. DPX-M6316 was more effective than DPX-L5300 for wild buckwheat control.

<u>Weed control in spring wheat, Williston, 1986.</u> 'Len' Hard Red Spring wheat was seeded May 13. Treatments were applied to 4.5 leaf wheat, 2 to 6 leaf green foxtail, 3 to 4 inch Russian thistle, 2 to 4 leaf redroot pigweed, and 4 to 6 leaf wild mustard June 11 with 60 F and 80% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 17.

Treatment	Rate	Grft	Ruth	Rrpw	Wimu
	(oz/A)	------(% control)-----			
MCPA-dma	6	0	10	54	99
2,4-D-dma	6	0	93	80	99
Bromoxynil&MCPA	3+3	3	93	83	99
Bromoxynil&MCPA	4+4	10	99	87	99
Bromoxynil+2,4-D-bee	3.2+4.8	0	96	81	99
Dicamba+MCPA-dma	1.5+4	0	99	97	99
Picloram+2,4-D-dma	0.25+6	5	93	93	99
Picloram+2,4-D-dma+fluroxypyr	0.25+6+2	0	98	99	99
Clopyralid&2,4-D	1.5+6	0	99	99	99
Clopyralid&2,4-D(XRM-4816)	1.25+7	18	96	97	99
Clopyralid&MCPA&bromoxynil	0.38+1.5+6.7	5	94	85	99
Clopyralid&2,4-D+bromoxynil	1+5.8+2.5	13	96	55	99
Fluroxypyr	2	0	56	69	91
Fluroxypyr+MCPA-bee	1.5+6	0	60	79	99
Fluroxypyr+MCPA-bee+bromoxynil	1.5+6+2.5	0	98	91	99
DPX-M6316+X-77	0.25+0.25%	0	98	98	94
DPX-L5300+X-77	0.12+0.25%	0	98	97	99
DPX-R9674+X-77	0.25+0.25%	25	99	98	99
Metsulfuron+X-77	0.06+0.25%	15	98	99	99
Propanil&MCPA	15+4	0	19	97	99
Diclofop+bromoxynil	12+4	55	91	70	85
C.V. %		177	8	21	6
LSD 5%		17	9	24	8

& = formulated mixture which was 1:1 for bromoxynil&MCPA, 1:4 for clopyralid&2,4-D, 1:5.6 for clopyralid&2,4-D(XRM-4816); 1:4:17.5 for clopyralid&MCPA&bromoxynil, and 1:0.26 for propanil&MCPA; dma = dimethylamine; bee = butoxyethanol ester.

Summary

None of the herbicides caused stand reduction or visible injury to wheat (data not presented). None of the treatments provided more than 55% green foxtail control. 2,4-D was more effective than MCPA for controlling Russian thistle and redroot pigweed. All treatments except MCPA, fluroxypyr, fluroxypyr plus MCPA, and propanil&MCPA gave greater than 90% Russian thistle control. Several treatments provided good redroot pigweed control. All treatments gave 85% or greater wild mustard control.

Postemergence grass control in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 23. Treatments were applied to 3.5 leaf wheat, 2 to 4 leaf yellow foxtail, 2 to 4 leaf redroot pigweed, and 1 to 2 inch kochia June 12 with 70 F and 50% relative humidity. All treatments were in 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. The experimental design was a randomized complete block with four replications. Yellow foxtail densities averaged 20 plants per square foot. Kochia and redroot pigweed densities were light and variable. Wheat injury and weed control were evaluated June 25 and July 28.

		June 25				July 28		
Treatment	Rate	Wheat inju	Yeft	KOCZ	Rrpw	Wheat inju	Yeft	Wheat yield
	(oz/A)	(%)	-(%	control)--		(%)	(%)	(Bu/A)
Propanil&MCPA	19	14	82	97	98	8	73	23
Diclofop+bromoxynil	8+4	4	73	97	96	1	76	26
Diclofop+bromoxynil	12+4	8	93	98	93	0	89	27
AC 222,293+seth+MSO	6+0.25+0.25G	13	74	54	41	4	14	21
AC 222,293+prop&MCPA	6+19	9	85	97	97	6	74	23
AC 222,293+feno+PO	6+1+0.25G	13	85	59	58	6	78	27
AC 222,293+BAS-51400	6+4+0.25G	4	71	79	76	2	73	28
AC 222,293+LAB 175659+MSO	6+4+0.25G	1	44	68	64	0	25	24
Fenoxaprop+PO	1+0.25G	38	96	0	0	25	76	20
AC 222,293	6	0	0	55	13	0	0	24
SC-0051+oxysorbic	0.37+0.5%	1	6	81	64	0	5	21
SC-0051+oxysorbic	0.74+0.5%	3	33	73	81	3	11	19
SC-0051+oxysorbic	1.5+0.5%	21	64	98	93	3	31	22
BAS-51400+MSO	4+0.25G	8	71	89	80	1	94	29
LAB 175659+MSO	4+0.25G	0	19	33	25	0	9	23
BAS-51400+LI 700	4+0.25G	4	60	39	50	1	88	30
SC-0098+oxysorbic	0.5+0.5%	79	70	99	98	78	15	8
SC-0098+oxysorbic	1+0.5%	92	88	99	98	96	20	4
SC-0098+oxysorbic	2+0.5%	98	94	99	99	99	25	2
No control	0	0	0	0	0	0	5	23
C.V. %		30	23	15	17	38	28	19
LSD 5%		9	20	15	16	9	17	6

PO = petroleum oil with 17% emulsifier; MSO = methylated soybean oil with 15% IGEPAL CO-630 emulsifier; & = formulated mixture which was 1:0.26 for propanil&MCPA; oxysorbic = Tween20.

Summary

SC-0098 caused 78% or greater wheat injury with the rates applied. In addition, fenoxaprop at 1 oz/A and SC-0051 at 1.5 oz/A caused more than 20% injury to wheat. Yellow foxtail control exceeded 70% with several treatments. Yellow foxtail control with BAS-51400 was greater at the late evaluation than at the early evaluation, while control with the other treatments generally was lower at the later evaluation. BAS-51400 apparently provided residual control of late emerging foxtail, or was slow acting with control not fully expressed at the first evaluation. Treatments including bromoxynil, propanil, SC-0098 at all rates, or SC-0051 at 1.5 oz/A provided greater than 90% kochia and redroot pigweed control. Wheat yields generally related to wheat injury and/or weed control.

<u>Foxtail control in wheat, Fargo, 1986.</u> An experiment was conducted to evaluate foxtail control in 'Marshall' Hard Red Spring wheat seeded May 23. Treatments were applied to 3.5 leaf wheat, 2 to 4 leaf yellow foxtail, 2 to 4 leaf redroot pigweed, and 1 to 2 inch kochia June 12 with 70 F and 50% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 25 ft plots. The experimental design was a randomized complete block with four replications. Redroot pigweed and kochia densities were light and variable. Yellow foxtail densities averaged 20 plants/ft2. Wheat injury and weed control were evaluated June 25 and July 28.

Treatment	Rate	June 25, 1986 Wheat inju	Yeft	KOCZ	Rrpw	July 28,1986 Wheat inju	Yeft	KOCZ	Wheat yield
	(oz/A)	(%)	-(%	control)--		(%)	(% control)		(B/A)
BAS-51400+PO	4+0.25G	18	64	45	25	1	77	60	21
BAS-51400+MSO	4+0.25G	28	74	81	51	5	75	85	24
BAS-51400+SBO	4+0.25G	2	60	68	64	3	84	80	23
BAS-51400+PO	8+0.25G	11	71	81	63	5	85	80	21
BAS-51400+MSO	8+0.25G	14	89	86	85	4	95	90	22
BAS-51400+SBO	8+0.25G	9	86	86	78	7	93	85	22
BAS-51400	4	0	21	8	38	0	54	20	21
BAS-51400	8	0	50	26	50	1	79	40	21
LAB 175659+PO	2+0.25G	0	24	16	9	0	8	30	21
LAB 175659+MSO	2+0.25G	0	24	26	20	0	5	60	20
LAB 175659+SBO	2+0.25G	1	29	10	0	0	13	40	19
LAB 175659+PO	4+0.25G	1	39	15	33	0	8	15	16
LAB 175659+MSO	4+0.25G	0	35	28	34	0	15	10	14
LAB 175659+SBO	4+0.25G	0	48	18	23	0	6	0	18
LAB 175659	4	0	0	5	0	0	3	0	19
Diclofop+bromoxynil	12+4	3	93	98	93	0	84	80	21
BAS-51400+brox+MSO	4+4+0.25G	11	91	96	91	3	83	98	26
No control	0	0	0	0	0	0	0	0	16
C.V. %		228	32	35	31	167	22	--	24
LSD 5%		NS	22	22	19	4	15	--	NS
# of REPS		4	4	4	4	4	4	1	4

PO = petroleum oil with 17% emulsifier; MSO = methylated soybean oil with 15% IPEPAL CO-630 emulsifier; SBO = once refined soybean oil with 15% T-MULZ-VO emulsifier; Brox = bromoxynil; G = gallons per acre.

Summary

Injury to wheat was evident from some of the BAS-51400 treatments at the first evaluation date, but was 7% or less at the second evaluation date. Yellow foxtail, kochia, and redroot pigweed control with BAS-51400 was or tended to be greater when applied with soybean oil or methylated soybean oil than with petroleum oil. BAS-51400 injury to wheat decreased and weed control increased from the early to late evaluation. Weed control with LAB 175659 was low at the rates evaluated. Wheat yields generally related to weed control.

AC 222,293 antagonism in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 leaf wheat, 2 to 4 leaf wild oats, and 2 to 4 inch kochia June 13 with 70 F, and 60% relative humidity. All treatments were applied in 8.5 gpa at 35 psi to an 8 feet wide strip the length of the 10 by 24 feet plots. Kochia and wild oats densities averaged 1 plant per square meter. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 25.

Treatment	Rate	Wheat injury	Wild oats	Kochia	Wheat yield
	(oz/A)	(%)	(% control)		(Bu/A)
AC 222,293	5	1	98	34	45
AC 222,293+bromoxynil-UC	5+2	0	97	99	47
AC 222,293+bromoxynil-UC	5+4	0	90	99	47
AC 222,293+bromoxynil-RP	5+2	3	95	99	44
AC 222,293+bromoxynil-RP	5+4	0	92	99	46
AC 222,293+bromoxynil&MCPA-UC	5+2+2	0	97	99	44
AC 222,293+bromoxynil&MCPA-UC	5+4+4	1	95	99	47
AC 222,293+bromoxynil&MCPA-RP	5+2+2	1	93	99	46
AC 222,293+bromoxynil&MCPA-RP	5+4+4	0	94	99	47
AC 222,293	7.2	0	99	75	46
AC 222,293+bromoxynil-UC	7.2+2	2	97	99	45
AC 222,293+bromoxynil-UC	7.2+4	0	97	99	49
AC 222,293+bromoxynil-RP	7.2+2	1	98	99	48
AC 222,293+bromoxynil-RP	7.2+4	2	96	99	47
AC 222,293+bromoxynil&MCPA-UC	7.2+2+2	0	99	99	50
AC 222,293+bromoxynil&MCPA-UC	7.2+4+4	1	98	99	49
AC 222,293+bromoxynil&MCPA-RP	7.2+2+2	0	98	99	48
AC 222,293+bromoxynil&MCPA-RP	7.2+4+4	0	98	99	50
Bromoxynil-UC	2	0	0	99	45
Bromoxynil-UC	4	0	0	99	43
Bromoxynil-RP	2	0	0	97	41
Bromoxynil-RP	4	0	0	99	42
Bromoxynil&MCPA-UC	4	0	0	99	44
Bromoxynil&MCPA-UC	8	0	0	99	43
Bromoxynil&MCPA-RP	4	0	0	99	42
Bromoxynil&MCPA-RP	8	0	0	99	41
No control	0	0	0	0	37
C.V. %		291	3	11	7
LSD 5%		NS	3	14	4

RP = Rhone Poulenc, UC = Union Carbide, & = formulated mixture which was 1:1 for bromoxynil&MCPA.

Summary

None of the herbicide treatments caused stand reduction (data not presented) or important wheat injury. All treatments which included AC 222,293 provided 90% or greater wild oats control. Wild oats control with AC 222,293 tended to be antagonized when applied in a tank mixture with bromoxynil. The high wild oats control may have been because of the moist growing environment and the low density of wild oats. Kochia control was 97% or greater with all treatments except AC 222,293 applied alone. AC 222,293 did not appear to antagonize kochia control from bromoxynil or bromoxynil&MCPA. Wheat yields generally related to the level of kochia and/or wild oats control.

CGA-131036 in wheat, Williston, 1986. 'Stoa' Hard Red Spring wheat was seeded on fallow soil May 13. Treatments were applied to 5 to 5.5 leaf wheat, 4 to 5 leaf wild oats, 2 to 4 leaf green foxtail, and 2 to 3 inch Russian thistle June 10 with 60 F and 55% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 17.

Treatment	Rate	Wheat injury	Wioa	Grft	Ruth	Wheat Yield	Wheat Tswt
	(oz/A)	(%)	--(%	control)---		(Bu/A)	(lb/Bu)
Bromoxynil&MCPA	4+4	0	0	25	95	31.4	61.9
DPX-M6316+X-77	0.28+0.25%	0	5	10	99	34.6	61.9
CGA-131036+X-77	0.14+0.25%	0	13	5	98	31.6	61.8
CGA-131036+X-77	0.28+0.25%	0	19	23	97	31.3	62.1
CGA-131036+X-77	0.48+0.25%	0	24	21	99	28.3	61.7
Chlorosulfuron+X-77	0.28+0.25%	0	11	64	99	32.9	62.1
No treatment	0	0	0	0	0	33.1	61.9
C.V. %		0	97	97	3	10.4	--
LSD 5%		NS	15	32	4	NS	--
Reps		4	4	4	4	4	1

& = formulated mixture which was 1:1 for bromoxynil&MCPA; Tswt = test weight.

Summary

None of the treatments caused wheat injury or stand reduction (data not presented). Wild oats control was less than 25% with all treatments. Chlorosulfuron provided the best green foxtail control. All treatments gave 95% or greater Russian thistle control. Wheat yields were not significantly different among treatments, as Russian thistle and green foxtail density were sparse.

CGA-131036 in wheat, Minot, 1986. 'Len' Hard Red Spring wheat was seeded June 13. Treatments were applied to 4.5 to 5 leaf wheat, 2 to 4 inch volunteer flax (Vofl), 1 to 3 inch wild buckwheat, and 2 to 4 inch prostrate and redroot pigweed June 13 with 70 F and 50% relative humidity. The experimental design was a randomized comlete block with four replications. Wheat injury and weed control were evaluated July 11.

Treatment	Rate	Wheat injury	Vofl	Ruth	Wibw	Prpw	Rrpw
	(oz/A)	(%)	-----------(% control)----------				
Bromoxynil&MCPA	4+4	0	0	79	71	65	83
DPX-M6316+X-77	0.28+0.25%	0	5	98	91	96	99
CGA-131036+X-77	0.14+0.25%	0	18	74	70	68	91
CGA-131036+X-77	0.28+0.25%	0	26	97	93	92	99
CGA-131036+X-77	0.48+0.25%	0	60	98	95	97	99
Chlorsulfuron+X-77	0.28+0.25%	0	0	98	93	98	99
C.V. %		0	44	13	13	12	8
LSD 5%		NS	10	15	14	13	10

Summary

None of the treatments caused wheat injury or stand reduction (data not presented). CGA-131036 gave the best volunteer flax (Vofl) control with 60% control at the 0.48 oz/A rate. All treatments except bromoxynil& MCPA or CGA-131036 at 0.14 oz/A provided 92% or greater Russian thistle, wild buckwheat, and Russian thistle control. Redroot pigweed control was less or tended to be lower with bromoxynil&MCPA or CGA-131036 than with the other treatments.

CGA-131036 in wheat, Langdon, 1986. 'Cando' Durum wheat was seeded May 28. Treatments were applied to 4 to 5 leaf wheat June 26 with 75 F and 40% relative humidity. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 24.

Treatment	Rate	Wheat injury	Green foxtail	Common mallow
	(oz/A)	(%)	---(% control)----	
Bromoxynil&MCPA	4+4	0	15	88
DPX-M6316+X-77	0.28+0.25%	0	0	99
CGA-131036+X-77	0.14+0.25%	0	13	98
CGA-131036+X-77	0.28+0.25%	0	21	99
CGA-131036+X-77	0.48+0.25%	0	18	99
Chlorsulfuron+X-77	0.28+0.25%	0	68	99
C.V. %		0	72	4
LSD 5%		NS	20	5

Summary

None of the treatments caused wheat injury of stand reduction (data not presented). Chlorosulfuron was the only treatment to provide more than 21% green foxtail control. All treatments except bromoxynil&MCPA gave 98% or greater common mallow control.

Broadleaf weed control in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 17. Treatments were applied to 4 leaf wheat, 1 to 4 inch kochia, cotyledon to 4 leaf wild mustard, and 2 to 4 leaf redroot pigweed June 13 with 70 F, 60% relative humidity, and clear skies. All treatments were applied in 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. Kochia densities averaged 10 plants per square ft. Wild mustard and redroot pigweed densities were light and variable. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated June 27.

Treatment	Rate	Wheat inju	KOCZ	Wimu	Rrpw	Wheat yield
	(oz/A)	(%)	-(%	control)-	-	(Bu/A)
2,4-D-dma	6	1	93	99	95	39
Bromoxynil&MCPA-bee	4+4	0	99	99	99	45
Dicamba-dma	1	0	78	83	89	42
Dicamba-dma	2	0	82	82	78	42
Dicamba-dma+MCPA-dma	1.5+4	0	77	89	80	45
Picloram+2,4-D-dma+dicamba-dma	0.25+6+1	1	94	99	99	47
Picloram+2,4-D-dma+dicamba-dma	0.38+6+1	2	99	99	99	48
Picloram+2,4-D-dma+fluroxypyr	0.25+6+2	1	99	99	90	44
Picloram+2,4-D-dma+fluroxypyr	0.38+6+2	1	99	99	95	46
Clopyralid&2,4-D-ester	2+8	3	98	99	99	44
Clopyralid&MCPA&bromoxynil	0.38+1.5+6.7	0	97	99	97	44
Clopyralid&MCPA&bromoxynil	0.43+1.9+7.5	0	99	99	99	45
Fluroxypyr	1	0	89	95	97	42
Fluroxypyr	2	0	96	99	87	43
Fluroxypyr	3	1	99	99	99	41
Fluroxypyr	4	0	98	99	90	48
Fluroxypyr+MCPA-bee+bromoxynil-bee	1.5+6+2.5	0	99	99	90	44
Fluroxypyr+MCPA-bee+bromoxynil-bee	2+6+2.5	0	99	99	99	49
Fluroxypyr+2,4-D-bee+dicamba-dma	1.5+6+1	3	97	99	92	45
Fluroxypyr+2,4-D-bee+dicamba-dma	2+6+1	2	97	99	99	46
Clopyralid&2,4-D-ester(XRM-4816)	1+5.8	1	99	99	92	43
Clopyralid&2,4-D-ester(XRM-4816)	1.3+7	0	99	99	99	40
Clop&2,4-D(XRM-4816)+brox-bee	1+5.8+2.5	1	99	99	99	43
Clop&2,4-D(XRM-4816)+dicamba-dma	1+5.8+1	5	97	99	92	45
Control	0	0	0	0	0	37
C.V. %		181	6	8	10	9
LSD 5%		2	8	13	18	6
# OF REPS		4	4	3	2	4

& = formulated mixture which was 1:1 for bromoxynil&MCPA, 1:4 for clopyralid&2,4-D, 1:5.6 for clopyralid&2,4-D(XRM-4816), 1:4:17.5 for clopyralid&MCPA&bromoxynil(XRM-4896); dma = dimethylamine; bee = butoxyethanol ester; clop = clopyralid; brox = bromoxynil.

Summary

No wheat stand reduction (data not presented) or important injury was caused by any of the herbicide treatments. All treatments provided 77% or greater kochia, wild mustard, and redroot pigweed control. Weed control with dicamba or dicamba plus MCPA generally was less than with the other treatments. Wheat yields generally related to weed control, except yields tended to be lower for wheat treated with only 2,4-D than with other herbicides or herbicide combinations, even though weed control exceeded 92%.

Weed control in wheat with sulfonylurea herbicides, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 17. Treatments were applied to 4 to 5 leaf wheat, 3 to 8 inch kochia, cotyledon to 6 leaf wild mustard, and 2 to 4 leaf yellow foxtail June 16 with 72 F and 50% relative humidity. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated June 27 and August 18. Weed densities averaged 10, 1, and 10 plants per square meter for kochia, wild mustard and yellow foxtail, respectively.

Treatment	Rate	Wheat injury	June 27 KOCZ	June 27 Wimu	August 18 KOCZ	August 18 Yeft	Wheat yield
	(oz/A)	(%)	------(% control)-----				(Bu/A)
2,4-D-dma	6	2	84	99	95	0	37
Propanil&MCPA	15+4	4	92	99	97	40	41
Bromoxynil&MCPA-bee	4+4	0	95	99	99	13	39
Dicamba-dma+MCPA-dma	1.5+4	10	83	98	99	0	39
DPX-M6316	0.25	4	89	99	99	76	42
DPX-M6316	0.50	4	92	99	99	78	38
DPX-M6316+X-77	0.12+0.25%	3	97	99	99	78	38
DPX-M6316+X-77	0.25+0.25%	3	95	99	99	78	45
DPX-M6316+X-77	0.38+0.25%	5	99	99	99	77	45
DPX-M6316+X-77	0.50+0.25%	5	98	99	99	85	41
DPX-M6316+2,4-D-dma	0.12+4	3	90	99	98	35	39
DPX-M6316+Dicamba-dma	0.12+2	7	87	99	99	3	39
DPX-L5300+X-77	0.06+0.25%	4	99	99	99	65	39
DPX-L5300+X-77	0.12+0.25%	2	99	99	99	68	43
DPX-L5300+X-77	0.25+0.25%	5	99	99	99	89	42
DPX-R9674+X-77	0.12+0.25%	4	99	99	99	76	42
DPX-R9674+X-77	0.25+0.25%	4	99	99	99	88	43
DPX-R9674+X-77	0.38+0.25%	7	99	99	99	93	41
Control	0	0	0	0	0	0	35
C.V. %		79	5	0	2	14	10
LSD 5%		4	7	1	3	13	NS
# OF REPS		4	4	4	4	3	4

dma = dimethylamine; bee = butoxyethanol ester; & = formulated mixture which was 1:1 for bromoxynil&MCPA, and 1:0.26 for propanil&MCPA.

Summary

None of the herbicides caused stand reduction (data not presented). Wheat had good tolerance to all the herbicide treatments at both locations. All treatments provided 80% or greater control of wild mustard and kochia. Yellow foxtail control with the sulfonylurea herbicides ranged from 65 to 93%. Dicamba and 2,4-D appeared to antagonize yellow foxtail control with DPX-M6316. However, completely comparable treatments were not included in the experiment. Wheat yield generally related to weed control.

Weed control in wheat with sulfonylurea herbicides, Casselton, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 leaf wheat, 3 to 8 inch kochia, cotyledon to 6 leaf wild mustard, and 2 to 6 leaf volunteer sunflower(Cosf) June 13 with 70 F and 45% relative humidity. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 32 ft plots. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated June 25 at Casselton. Weed densities averaged 1, 20, and 3 plants per square meter for kochia, wild mustard, and volunteer sunflower, respectively.

Treatment	Rate	Wheat injury	KOCZ	Wimu	Cosf
	(oz/A)	(%)	---(%	control)--	
2,4-D-dma	6	0	86	99	92
Propanil&MCPA	15+4	1	97	99	76
Bromoxynil&MCPA-bee	4+4	0	98	99	91
Dicamba-dma+MCPA-dma	1.5+4	0	84	95	84
DPX-M6316	0.25	0	33	80	73
DPX-M6316	0.50	0	33	89	88
DPX-M6316+X-77	0.12+0.25%	0	97	98	91
DPX-M6316+X-77	0.25+0.25%	0	94	99	96
DPX-M6316+X-77	0.38+0.25%	0	92	98	98
DPX-M6316+X-77	0.50+0.25%	0	95	97	97
DPX-M6316+2,4-D-dma	0.12+4	0	75	96	83
DPX-M6316+Dicamba-dma	0.12+2	0	68	95	83
DPX-L5300+X-77	0.06+0.25%	0	91	97	62
DPX-L5300+X-77	0.12+0.25%	0	98	98	67
DPX-L5300+X-77	0.25+0.25%	0	98	98	81
DPX-R9674+X-77	0.12+0.25%	0	94	96	78
DPX-R9674+X-77	0.25+0.25%	0	98	98	78
DPX-R9674+X-77	0.38+0.25%	0	97	98	89
C.V. %		872	12	5	11
LSD 5%		NS	14	6	12

dma = dimethylamine; bee = butoxyethanol ester; & = formulated mixture which was 1:1 for bromoxynil&MCPA, and 1:0.26 for propanil&MCPA.

Summary

None of the herbicides caused stand reduction (data not presented). Wheat had good tolerance to all the herbicide treatments. All treatments provided 80% or greater wild mustard control. All treatments except DPX-M6316 alone and in combination with 2,4-D or dicamba gave greater than 84% control of kochia. DPX-M6316 plus X-77 provided greater than 90% volunteer sunflower control which was more or tended to be more than with DPX-L5300 or DPX-R9674.

Weed control in wheat with sulfonylurea herbicides, Minot, 1986. 'Len' Hard Red Spring wheat was seeded May 16 to soil seeded to flax the previous year. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi on June 17 to 5 leaf wheat, 1 to 4 inch Russian thistle, 1 to 3 inch wild buckwheat, 1 to 5 inch volunteer flax, and redroot and prostrate pigweed. The experimental design was a randomized complete block with four replications. Weed control and wheat injury were evaluated July 7.

Treatment	Rate	Wheat injury	Ruth	Wibw	Rrpw	Prpw	Vofl
	(oz/A)	(%)	-----------(% control)----------				
DPX-L5300+X-77	0.06+0.25%	0	61	35	35	38	35
DPX-L5300+X-77	0.13+0.25%	0	84	69	75	66	45
DPX-L5300+X-77	0.25+0.25%	3	91	68	92	71	60
DPX-L5300+X-77	0.38+0.25%	0	94	74	86	80	58
DPX-M6316+X-77	0.13+0.25%	0	89	88	91	85	33
DPX-M6316+X-77	0.25+0.25%	0	91	90	93	86	28
DPX-M6316+X-77	0.38+0.25%	0	93	88	89	85	23
DPX-M6316+X-77	0.50+0.25%	0	95	94	96	90	50
DPX-R9674+X-77	0.13+0.25%	0	89	83	93	88	58
DPX-R9674+X-77	0.25+0.25%	0	94	85	91	83	55
DPX-R9674+X-77	0.38+0.25%	0	95	95	96	90	78
DPX-R9674+X-77	0.50+0.25%	0	96	96	96	95	73
Bromoxynil&MCPA	4+4	0	76	54	66	53	5
C.V.		721	7	14	15	13	26
LSD 5%		NS	9	16	18	15	17

& = formulated mixture which was 1:1 for Bromoxynil&MCPA.

Summary

DPX-M6316 and DPX-R9674 gave good control of broadleaf weeds at all rates. Volunteer flax was not adequately controlled by any of the treatments. DPX-L5300 at 0.06 oz/A gave inadequate control of all broadleaf weeds, however, the 0.25 oz/A gave good control of Russian thistle and redroot pigweed.

Postemergence broadleaf weed control in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 17. Treatments were applied to 4 to 5 leaf wheat, 3 to 8 inch kochia, and cotyledon to 6 leaf wild mustard June 16 with 72 F, 50% relative humidity, and clear skies. All treatments were in 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. The experimental design was a randomized complete block with four replications. Kochia densities averaged 10 plants per square foot. Wild mustard densities were light and variable. Crop injury and weed control were evaluated June 27, and August 18.

Treatment	Rate	Wheat injury	June 27 KOCZ	June 27 Wimu	Aug 18 KOCZ	Wheat yield
	(oz/A)	(%)	----(% control)---			(Bu/A)
2,4-D-dma	6	2	83	99	92	41
Dicamba+MCPA-dma	1.5+4	10	87	99	98	47
Bromoxynil-RP	4	0	99	99	97	45
Bromoxynil&MCPA-UC	8	0	99	99	99	48
Bromoxynil&MCPA-RP	8	0	95	99	97	46
Bromoxynil&MCPA-RP	4	0	86	99	91	45
Bromoxynil&MCPA-RP	6	0	91	99	94	44
Bromoxynil-RP+2,4-D-bee	2+2	1	99	99	98	44
Bromoxynil-RP+2,4-D-bee	3+3	4	99	99	98	48
Bromoxynil-UC+2,4-D-bee	3.2+4.8	3	94	99	97	49
Bromoxynil-RP+2,4-D-bee	4+4	8	99	99	99	49
Bromoxynil-RP+DPX-M6316	3+0.12	1	97	99	99	47
Bromoxynil-UC+DPX-M6316	3.2+0.25	0	99	99	99	44
Bromoxynil-RP+DPX-R9674	3+0.12	1	99	99	99	48
BAS-51400	4	0	3	13	8	40
BAS-51400+MSO	4+0.25G	15	54	21	90	46
BAS-51400+PO	4+0.25G	5	25	6	46	43
BAS-51400	8	0	4	0	5	40
LAB 175659	8	0	0	0	5	39
LAB 175659+MSO	8+0.25G	0	31	6	61	42
PPG-1013+bromoxynil	0.08+4	16	99	99	99	51
PPG-1013+2,4-D	0.08+4	6	93	99	92	48
PPG-1013+PPG-1259	0.08+1.3	4	90	99	80	47
PPG-1259+MCPA	1.6+4	4	75	99	82	47
PPG-1259+bromoxynil	1.6+4	23	99	99	96	47
PPG-1259+lactofen	1.6+0.8	12	95	98	91	51
No Control	0	0	0	0	0	35
C.V. %		104	11	8	9	12
LSD 5%		6	11	8	9	7

RP = Rhone Poulenc; UC = Union Carbide; dma = dimethylamine; bee = butoxyethanol ester; PO = petroleum oil with 17% emulsifier; MSO = methylated soybean oil with 15% IGEPAL CO-630 emulsifier; & = formulated mixture which was 1:1 for bromoxynil&MCPA.

Summary

None of the treatments caused visible stand reductions (data not presented). Injury to wheat was less than 20% for all treatments except for PPG-1259 plus bromoxynil. Kochia and wild mustard control was 75% or greater with all treatments except BAS-51400 or LAB 175659. Kochia control with BAS-51400 was greatly enhanced by oil adjuvants and methylated soybean oil caused more enhancement than petroleum oil. Wheat yields generally related to weed control, and apparently were not influenced by wheat injury.

Clopyralid in wheat, Fargo, 1986. 'Marshall' Hard Red Spring wheat was seeded May 23. Treatments were applied to 4 to 5 leaf wheat and cotyledon to 4 inch kochia June 13 with 70 F and 60% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Wheat injury and kochia control were evaluated July 25.

Treatment	Rate	Wheat injury	Kochia	Wheat yield
	(oz/A)	(%)	(% control)	(Bu/A)
Clopyralid	1.25	0	0	21.9
Clopyralid	1.5	0	14	21.1
Clopyralid+2,4-D-bee	1.25+7	4	95	22.4
Clopyralid+2,4-D-bee	1.5+8	8	95	23.1
No treatment	0	0	0	20.0
C.V. %		64	13	12.2
LSD 5%		2	8	NS

Summary

Addition of 2,4-D to clopyralid resulted in some wheat injury. Clopyralid plus 2,4-D controlled kochia while clopyralid alone did not. Wheat yield tended to relate to weed control. Yields were low for all treatments because of a dense foxtail infestation.

Clopyralid in wheat, Casselton, 1986. 'Marshall' Hard Red Spring wheat was seeded May 16. Treatments were applied to 4 leaf wheat , 4 to 8 inch Canada thistle, and cotyledon to 6 leaf wild mustard June 13 with 70 F and 45% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Wheat injury and weed control were evaluated June 25.

Treatment	Rate	Wheat injury	Wild mustard	Canada thistle
	(oz/A)	(%)	------(% control)-----	
Clopyralid	1.25	0	9	51
Clopyralid	1.5	0	0	53
Clopyralid+2,4-D-bee	1.25+7	5	92	88
Clopyralid+2,4-D-bee	1.5+8	5	89	94
Control	0	0	0	0
C.V. %		137	25	14
LSD 5%		4	14	12

Summary

Addition of 2,4-D to clopyralid caused 5% injury to the wheat. Clopyralid plus 2,4-D provided 89% or greater wild mustard control, but clopyralid alone gave less than 10% control. Canada thistle control with clopyralid plus 2,4-D was higher than with clopyralid alone at the time of evaluation.

Pre-harvest weed control in wheat, Fargo, 1986. Burndown of kochia and redroot pigweed in wheat with 2,4-D ester and additives was evaluated. The experimental design was a randomized complete block with three replications and plots were 10 by 30 ft. Herbicide treatments were applied on August 5 and evaluated two weeks later. Kochia and redroot pigweed were mature at the time of treatment with mature seeds present, wheat was in the soft dough stage. Wind was 8 mph and air temperature was 80 F.

		% IR	
Treatment	(lb/A)	KOCZ	RRPW
2,4-D	1.0	10	20
2,4-D + X-77	1.0 + 1.3 qt	21	26
2,4-D + PO	1.0 + 1.3 qt	27	33
2,4-D	2.0	23	35
2,4-D + X-77	2.0 + 1.3 qt	25	40
2,4-D + PO	2.0 + 1.3 qt	38	35
2,4-D	4.0	26	41
2,4-D + X-77	4.0 + 1.3 qt	40	60
2,4-D + PO	4.0 + 1.3 qt	33	55
LSD (0.05)		10	10

Summary

Burndown of both kochia and redroot pigweed was unacceptable. The addition of X-77 or petroleum oil tended to increase the effectiveness of the treatment. There was also a trend towards more acceptable burndown as the rate of the herbicide was increased.

<u>Preemergence weed control in sunflower.</u> Preplant incorporated (PPI) treatments were applied and incorporated twice, 'Seedtech 315' sunflower was seeded, and preemergence treatments applied May 21 with 70 F and 40% relative humidity. Postemergence (P) treatments were applied to 6 to 8 leaf sunflower, 3 to 5 leaf green foxtail, and cotyledon to 8 leaf wild mustard, June 19 with 70 F and 40% relative humidity. The experiment was a randomized complete block with four replications, evaluated 6-18-86.

Treatment	Rate	Sunflower injury	Sunflower yield	Grft	Wimu
	(lb/A)	(%)	(Bu/A)	(% control)	
Pendimethalin(PPI)	1.25	0	1390	96	16
Trifluralin(PPI)	1	0	1128	98	0
Ethalfluralin(PPI)	1	0	1233	97	21
EPTC(PPI)	3	0	1253	93	31
EPTC+AC 222,293(PPI)	3+0.37	0	1373	94	95
EPTC+chloramben(PPI)	2.5+2	0	1336	94	98
Trifluralin+chloramben(PPI)	0.75+2	0	1204	98	99
Trifluralin+EPTC(PPI)	0.75+2	0	1183	95	19
Cycloate(PPI)	4	0	1386	87	6
Trifluralin+fluorochloridone(PPI)	1+0.5	0	1379	97	98
Trifluralin+prometryn(PPI)	1+2	0	1265	97	93
Trifluralin+prometryn(PPI)	1+4	3	1540	97	60
Trifluralin(PPI)+prometryn(PE)	1+2	0	1418	97	66
Trifluralin(PPI)+prometryn(PE)	1+4	0	1226	97	78
Pendimethalin+AC 222,293(PPI)	1.25+0.25	0	1425	96	93
Pendimethalin+AC 222,293(PPI)	1+0.37	0	1454	96	98
Trifluralin+isoxaben(PPI)	1+0.07	0	1317	97	99
Trifluralin+isoxaben(PPI)	1+0.1	3	1325	97	99
Trifluralin+isoxaben(PPI)	1+0.13	1	1348	98	99
Ethalfluralin+isoxaben(PPI)	1+0.07	1	1387	98	99
Ethalfluralin+isoxaben(PPI)	1+0.1	0	1195	97	99
Ethalfluralin+isoxaben(PPI)	1+0.13	0	1032	98	99
Isoxaben(PPI)	0.1	0	780	0	99
Isoxaben(PPI)	0.2	0	1211	10	98
RE-40885(PPI)	0.5	0	1175	44	97
RE-40885(PPI)	1	0	1160	78	99
Cycloate(PPI)	3	0	937	97	78
Cycloate(PPI)	4	0	1415	94	34
RE-40885(PE)	0.5	0	1161	3	54
RE-40885(PE)	0.8	0	1232	11	85
Cycloate(PPI)	6	0	1434	84	10
Cycloate(PPI)	8	0	1243	68	0
Pendimethalin(PPI)+AC 222,293(P)	1.25+0.12	0	1385	95	97
Pendimethalin(PPI)+AC 222,293(P)	1.25+0.18	0	1369	92	99
Pendimethalin(PPI)+AC 222,293(P)	1.25+0.25	0	1294	96	99
Alachlor(PE)	3	0	1177	38	8
No control	0	0	1138	0	0
C.V. %		637	12	8	26
LSD 5%		NS	320	9	26
Reps		4	2	4	4

Summary

Chloramben, isoxaben, AC 222,293, RE-40885, and fluorochloridone preplant incorporated, and AC 222,293 postemergence, all gave more than 90% control of wild mustard. The prometryn at 4 lb/A plus trifluralin tank mixture apparently had compatibility problems as the wild mustard control varied among replications.

Weed control in sunflower, Langdon, 1986. Preplant incorporated (PPI) treatments were applied and incorporated twice at right angles with a field cultivator, and 'Cargill 206' sunflower seeded June 9. Preemergence (PE) treatments were applied June 10. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi to two of the four 30 inch spaced rows the length of the 10 by 25 feet plots. Precipitation for two weeks following sunflower seeding was 2.92 inches. The experimental design was a randomized complete block with four replications. Sunflower injury and weed control were evaluated July 24.

Treatment	Rate	Sunflower injury	Wimu	Colq
	(lb/A)	(%)	(% control)	
Pendimethalin(PPI)	1.25	0	8	95
Trifluralin(PPI)	0.75	8	0	96
Ethalfluralin(PPI)	0.75	0	10	96
EPTC(PPI)	2.5	0	0	73
EPTC+chloramben(PPI)	2.2+2	3	81	97
Trifluralin+chloramben(PPI)	0.75+2	0	74	95
Cycloate(PPI)	3	0	0	49
Trifluralin+fluorochloridone(PPI)	0.75+0.5	0	96	96
Trifluralin+prometryn(PPI)	0.75+2	8	84	96
Trifluralin+prometryn(PPI)	0.75+4	6	89	96
Pendimethalin+AC 222,293(PPI)	1.25+0.25	0	73	89
Trifluralin+isoxaben(PPI)	0.75+0.1	6	96	94
Ethalfluralin+isoxaben(PPI)	0.75+0.1	5	93	94
RE-40885+Trifluralin(PPI)	0.50+0.75	0	96	97
Alachlor(PE)	2.5	0	59	93
C.V. %		291	28	12
LSD 5%		NS	20	13

Summary

None of the treatments caused significant sunflower injury or stand reduction (data not presented). Fluorochloridone, isoxaben, and RE-40885 provided greater than 90% wild mustard control. All treatments except cycloate or EPTC gave 89% or greater common lambsquarters control. Trifluralin with fluorochloridone, isoxaben, or RE-40885, and ethalfluralin plus isoxaben were the only treatments to provide 90% or greater control of both wild mustard and common lambsquarters.

Weed control in sunflower, Carrington, 1986. Preplant incorporated (PPI) treatments were applied and roto-tiller incorporated, and 'Seedtech 894' sunflower seeded June 3. Preemergence (PE) treatments were applied June 5. Postemergence (P) treatments were applied to 4 to 6 leaf sunflower June 30. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi for soil applied treatments and 8.5 gpa at 35 psi for postemergence treatments to two of the 30 inch spaced rows the length of the 10 by 25 feet plots. The experimental design was a randomized complete block with four replications. Sunflower injury and weed control were evaluated July 22.

Treatment	Rate	Sunflower injury	Grft	Wimu	Colq	Rrpw	Prpw
	(lb/A)	(%)	---------(% control)--------				
Pendimethalin(PPI)	1.25	0	96	8	53	74	50
Trifluralin(PPI)	0.75	0	92	0	80	79	60
Ethalfluralin(PPI)	0.75	0	91	0	51	71	60
EPTC(PPI)	2.5	1	90	45	58	64	60
EPTC+chloramben(PPI)	2.2+2	4	95	74	88	87	90
Trif+chloramben(PPI)	0.75+2	0	93	68	64	88	90
Cycloate(PPI)	3	0	89	8	68	54	60
Trif+fluo(PPI)	0.75+0.5	3	85	84	70	73	70
Trif+prometryn(PPI)	0.75+2	1	86	46	68	71	60
Trif+prometryn(PPI)	0.75+4	6	86	70	74	75	60
Pend+AC 222,293(PPI)	1.25+0.25	1	95	90	56	74	60
Trif+isoxaben(PPI)	0.75+0.1	0	90	73	80	79	65
Etha+isoxaben(PPI)	0.75+0.1	0	95	90	69	74	65
RE-40885+trif(PPI)	0.50+0.75	0	88	72	83	84	70
Pend(PPI)/AC293(P)	1.25/0.25	0	91	97	76	78	80
Alachlor(PE)	2.5	0	88	0	39	69	65
C.V. %		293	7	29	32	14	--
LSD 5%		NS	8	20	29	14	--
# of reps		4	4	4	4	4	1

Trif = trifluralin; Etha = ethalfluralin; Fluo = fluorochloridone; Pend = pendimethalin; AC293 = AC 222,293.

Summary

No important sunflower injury occurred from any of the treatments. All treatments gave more than 85% green foxtail control. Treatments containing AC 222,293 or isoxaben at 0.13 lb/A provided 90% or greater wild mustard control. EPTC plus chloramben, and trifluralin applied alone or in combination with isoxaben or RE-40885 were the only treatments to provide 80% or greater common lambsquarters control. Treatments containing chloramben tended to give the highest redroot or prostrate pigweed control.

Weed control in sunflower, Williston, 1986. Preplant incorporated (PPI) treatments were applied and field cultivator incorporated twice May 28. 'Cargill 204' sunflower were seeded May 29, and preemergence (PE) treatments were applied May 30. The postemergence (P) treatment was applied June 25 with 65 F and 80% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi for soil applied treatments and 8.5 gpa at 35 psi for the postemergence treatment to two of the four 30 inch spaced rows the length of the 10 by 25 feet plots. The experimental design was a randomized complete block with four replications. Sunflower injury (Inju) and stand reduction (Strd) were evaluated July 10.

Treatment	Rate	Sunflower Inju	Sunflower Strd	Grft	Wimu	Ruth
	(lb/A)	----(%)---		---(% control)--		
Pendimethalin(PPI)	1.25	0	0	80	0	25
Trifluralin(PPI)	0.75	0	0	53	0	33
Ethalfluralin(PPI)	0.75	0	0	97	3	74
EPTC(PPI)	2.5	6	0	92	81	0
EPTC+chloramben(PPI)	2.2+2	0	0	82	85	83
Trif+chloramben(PPI)	0.75+2	0	0	73	68	71
Cycloate(PPI)	3	5	0	61	8	0
Trif+fluo(PPI)	0.75+0.5	0	0	60	65	61
Trif+prometryn(PPI)	0.75+2	0	0	64	30	87
Trif+prometryn(PPI)	0.75+4	4	9	58	32	78
Pend+AC 222,293(PPI)	1.25+0.25	3	0	77	96	43
Trif+isoxaben(PPI)	0.75+0.07	0	0	68	91	39
Trif+isoxaben(PPI)	0.75+0.1	0	0	64	95	75
Trif+isoxaben(PPI)	0.75+0.13	3	6	63	97	73
Etha+isoxaben(PPI)	0.75+0.07	0	0	87	96	46
Etha+isoxaben(PPI)	0.75+0.1	0	0	87	95	54
Etha+isoxaben(PPI)	0.75+0.13	0	5	90	97	63
Isoxaben(PPI)	0.1	0	0	0	99	28
Isoxaben(PPI)	0.2	0	0	0	99	28
RE-40885+trif(PPI)	0.50+0.75	0	0	63	38	84
Pend(PPI)/AC293(P)	1.25/0.25	5	0	91	94	73
Alachlor(PE)	2.5	8	0	43	0	0
C.V. %		366	577	20	26	45
LSD 5%		NS	NS	17	22	30

Trif = trifluralin; Etha = ethalfluralin; Fluo = fluorochloridone; Pend = pendimethalin; AC293 = AC 222,293.

Summary

No significant sunflower injury or stand reduction occurred with any of the treatments. Several treatments provided good green foxtail control. Ethalfluralin provided greater green foxtail control than trifluralin. Treatments containing AC 222,293 or isoxaben gave greater than 90% wild mustard control. EPTC plus chloramben, trifluralin plus prometryn, and RE-40885 plus trifluralin were the only treatments to provide 78% or greater Russian thistle control.

Weed control in sunflower, Minot, 1986. Preplant incorporated (PPI) treatments were applied and field cultivator incorporated twice May 27. 'Cargill 207' sunflower were seeded and preemergence (PE) treatments applied May 28. The postemergence (P) treatment was applied June 16 to 4 leaf sunflower, 2 to 4 leaf green foxtail, and cotyledon to 4 leaf tame mustard June 16 with 70 F and 50% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi for soil applied treatments and 8.5 gpa at 35 psi for the postemergence treatment to two of the four 30 inch spaced rows the length of the 10 by 25 feet plots. The experimental design was a randomized complete block with four replications. Sunflower injury and weed control were evaluated July 11.

Treatment	Rate	Sunflower injury	Grft	Tamu
	(lb/A)	(%)	(% control)	
Pendimethalin(PPI)	1.25	0	93	36
Trifluralin(PPI)	0.75	0	91	14
Ethalfluralin(PPI)	0.75	0	95	26
EPTC(PPI)	2.5	0	82	57
EPTC+chloramben(PPI)	2.2+2	0	94	94
Trifluralin+chloramben(PPI)	0.75+2	0	96	87
Cycloate(PPI)	3	1	83	55
Trifluralin+fluorochloridone(PPI)	0.75+0.5	0	91	65
Trifluralin+prometryn(PPI)	0.75+2	0	85	69
Trifluralin+prometryn(PPI)	0.75+4	0	88	83
Pendimethalin+AC 222,293(PPI)	1.25+0.25	3	87	54
Trifluralin+isoxaben(PPI)	0.75+0.07	0	97	78
Trifluralin+isoxaben(PPI)	0.75+0.1	0	95	77
Trifluralin+isoxaben(PPI)	0.75+0.13	0	90	95
Ethalfluralin+isoxaben(PPI)	0.75+0.07	0	95	88
Ethalfluralin+isoxaben(PPI)	0.75+0.1	0	96	93
Ethalfluralin+isoxaben(PPI)	0.75+0.13	0	93	92
Isoxaben(PPI)	0.1	0	0	93
Isoxaben(PPI)	0.2	0	0	95
RE-40885+Trifluralin(PPI)	0.50+0.75	0	82	87
Pendimethalin(PPI)/AC 222,293(P)	1.25/0.25	0	90	63
Alachlor(PE)	2.5	0	55	0
C.V. %		702	10	26
LSD 5%		NS	12	24
# of reps		4	3	4

Summary

None of the treatments caused significant sunflower injury or stand reductions (data not presented). All treatments except alachlor provided 82% or greater green foxtail control. Treatments containing chloramben, RE-40885, or isoxaben gave 77% or greater tame mustard control.

Additives with AC 222,293 for wild mustard control in sunflowers, Casselton, 1986. 'Seedtech 315' sunflower were seeded May 21. Stage 1 (S1) treatments were applied to 4 to 6 leaf sunflower and cotyledon to 6 leaf wild mustard June 16 with 70 F and 40% relative humidity. Stage 2 (S2) treatments were applied to 8 leaf sunflower and 2 leaf to bud stage wild mustard June 23 with 70 F and 40% relative humidity. All treatments were applied with a bicyle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Crop injury and wild mustard control were evaluated July 14.

Treatment	Rate (oz/A)	Wild mustard (% control)
AC 222,293(S1)	1	98
AC 222,293(S1)	2	97
AC 222,293(S1)	3	98
AC 222,293(S1)	4	99
AC 222,293+PO(S1)	1+0.25G	99
AC 222,293+PO(S1)	2+0.25G	99
AC 222,293+PO(S1)	3+0.25G	99
AC 222,293+PO(S1)	4+0.25G	99
AC 222,293+MS(S1)	1+0.25G	94
AC 222,293+MS(S1)	2+0.25G	99
AC 222,293+MS(S1)	3+0.25G	98
AC 222,293+MS(S1)	4+0.25G	98
AC 222,293(S2)	1	77
AC 222,293(S2)	2	82
AC 222,293(S2)	3	89
AC 222,293(S2)	4	89
AC 222,293+PO(S2)	1+0.25G	85
AC 222,293+PO(S2)	2+0.25G	83
AC 222,293+PO(S2)	3+0.25G	86
AC 222,293+PO(S2)	4+0.25G	94
AC 222,293+MS(S2)	1+0.25G	84
AC 222,293+MS(S2)	2+0.25G	92
AC 222,293+MS(S2)	3+0.25G	97
AC 222,293+MS(S2)	4+0.25G	93
C.V. %		5
LSD 5%		7

PO = petroleum oil with 17% Atplus 300F emulsifier; MS = methylated soybean oil with 15% IGEPAL CO-630 emulsifier.

Summary

Wild mustard control was 94% or greater with all treatments applied at the first stage (S1). Wild mustard control with AC 222,293 at the second application stage (S2) appeared to be enhanced by the addition of petroleum oil or methylated soybean oil. Wild mustard treated at the second stage was still alive at evaluation time, but the terminal bud appeared to be dead and the plants probably did not survive.

Wild mustard competition in sunflower, Casselton, 1986. 'Seedtech 315' sunflower were seeded in an area infested with wild mustard on May 21. Wild mustard densities were established June 13 when the sunflower were in the 4 leaf stage. Wild mustard at establishment included plants in both the 4 leaf and cotyledon stage. The experimental design was a randomized complete block with four replications. Plots were 10 by 25 ft and contained four rows spaced 30 inches apart. Sunflowers were harversted from the center two rows of the plots October 14.

Wild mustard density (plants/m row)	Sunflower yield (lb/A)
0	1339
1	1380
3	1286
9	1321
27	1202
C.V. %	9
LSD 5%	NS

Summary

Sunflower yields were not reduced significantly, but tended to be lowest at the highest wild mustard densities. Wild mustard competition with sunflower may have been minimal due to late emergence of some of the wild mustard and extremely good growing conditions. Adequate rainfall occurred throughout the growing season, moisture was not a limiting factor, and sunflower emergence and growth was ahead of the wild mustard at all times.

Postemergence weed control in flax, Fargo, 1986. 'Culbert' flax was seeded May 27. Initial treatments were applied to 4 to 6 inch flax, 1 to 3 leaf green and yellow foxtail, 1 to 5 inch kochia, and 2 to 4 leaf redroot pigweed June 17 with 72 F and 45% relative humidity. Second applications (P2) were to 6 to 10 inch flax, 4 to 8 leaf foxtail, 6 to 12 inch kochia and 4 to 6 leaf redroot pigweed June 24 with 65 F and 60% relative humidity. The experiment was a RCBD with 4 replications. Flax injury and weed control were evaluated July 7 and August 13.

Treatment	Rate	July 7 Flax inju	July 7 Grft	July 7 KOCZ	July 7 Rrpw	August 13 Yeft	August 13 KOCZ
	(oz/A)	(%)	-------(% control)------				
MCPA-bee+sethoxydim+PO	4+3	11	99	84	71	99	20
Sethoxydim+PO	3	0	99	0	0	99	0
Brox+MCPA-bee+seth+PO	4+1.6+3	25	99	97	96	95	86
Brox+MCPA-bee+seth+PO	4+0.8+3	11	99	91	82	99	76
Brox+MCPA-bee+dicl+PO	4+0.8+13+0.12G	48	50	95	80	9	69
Clop&MCPA&brox/seth+PO(P2)	0.4+1.5+6.7/3	38	99	99	96	97	92
Clop&MCPA&brox/seth+PO(P2)	0.4+1.7+7.5/3	12	98	96	96	98	94
Bromoxynil&MCPA	4+4	14	0	97	94	0	86
DPX-M6316/seth+PO(P2)	0.25/3	9	99	71	93	99	26
DPX-M6316/seth+PO(P2)	0.5/3	9	98	86	96	99	65
DPX-M6316+X-77/seth+PO(P2)	0.125/3	35	99	99	99	97	95
DPX-M6316+X-77/seth+PO(P2)	0.25/3	24	99	99	99	95	95
DPX-M6316+seth+PO	0.125+3	16	99	98	99	95	97
MCPA-bee/seth+PO(P2)	4/3	3	97	87	73	99	60
MCPA-bee/seth+PO(P2)	4/1.5	3	98	86	84	98	54
MCPA-bee/fluazifop-P+PO(P2)	4/3	15	94	85	84	98	39
MCPA-bee/fluazifop-P+PO(P2)	4/1.5	9	99	81	62	98	31
MCPA-bee/DPX-Y6202+PO(P2)	4/1.5	10	97	80	80	97	30
MCPA-bee/DPX-Y6202+PO(P2)	4/0.75	5	75	81	85	66	37
MCPA-bee/DPX-Y6202-31+PO(P2)	4/0.75	6	98	78	68	98	13
MCPA-bee/DPX-Y6202-31+PO(P2)	4/0.38	2	63	90	73	69	53
MCPA-bee/RE-45601+PO(P2)	4/1.5	40	94	95	92	98	73
MCPA-bee/RE-45601+PO(P2)	4/0.75	3	89	89	89	96	58
MCPA-bee/haloxyfop+PO(P2)	4/1.5	3	98	88	91	98	45
MCPA-bee/haloxyfop+PO(P2)	4/0.75	6	95	78	76	90	29
MCPA-bee/fenoxaprop+PO(P2)	4/2	1	96	81	88	96	70
MCPA-bee/fenoxaprop+PO(P2)	4/1	4	96	86	92	98	65
MCPA-bee/diclofop+PO(P2)	4/16+0.12G	11	81	89	90	80	45
MCPA-bee/diclofop+PO(P2)	4/12+0.12G	16	71	79	87	63	31
C.V. %		57	7	9	8	7	34
LSD 5%		10	9	10	9	8	26

& = formulated mixture which was 1:4:17.5 for clopyralid&MCPA& bromoxynil(XRM-4896), and 1:1 for bromoxynil&MCPA; PO applied at 0.25GPA unless otherwise noted; X-77 applied at 0.25%.

Summary

Flax injury was stunting and delayed maturity. Sethoxydim, fluazifop, RE-45601, haloxyfop, fenoxaprop, DPX-Y6202 at 1.5 oz/A, and DPX-Y6202-31 at 0.75 oz/A all provided 89% or greater foxtail control. Treatments containing DPX-M6316, bromoxynil and/or clopyralid generally provided the highest redroot pigweed control. Plots with less than 70% kochia control at the second evaluation date were not harvestable.

Weed control in flax, Fargo, 1986. 'Culbert 79' flax was seeded May 17. Treatments were applied to 4 to 8 inch flax, 1 to 3 leaf green and yellow foxtail, 1 to 5 inch kochia, and 2 to 4 leaf redroot pigweed June 16 with 65 F and 50% relative humidity. Split treatments (indicated by /) were applied to 6 to 10 inch flax, 4 to 8 leaf foxtail, and 6 to 12 inch kochia June 24 with 65 F and 60% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Flax injury and weed control were evaluated July 7 and August 13.

		Flax		July 7			August 13	
Treatment	Rate	Inju	Yield	Grft	KOCZ	Rrpw	Yeft	KOCZ
	(oz/A)	(%)	(Bu/A)	------(% control)-------				
Dalapon+MCPA-dma	12+4	2	--	71	61	73	59	16
Diclofop+bromoxynil	12+4	6	10	21	92	79	25	79
Diclofop+bromoxynil	16+4	6	14	25	91	65	43	83
Diclofop+bromoxynil+PO	12+4+1P	8	--	44	93	58	44	70
Diclofop+brox+MCPA+PO	13+4+0.7+1P	34	--	30	96	88	19	73
Diclofop+PO/MCPA	12+1P/4	8	--	75	65	69	75	35
Diclofop+PO/picl+MCPA	12+1P/0.25+4	11	--	70	71	85	81	36
Diclofop+DPX-M6316+PO	12+0.12+1P	26	9	31	97	98	25	99
Metsulfuron+X-77	0.06+0.12%	18	17	70	99	99	71	99
Sethoxydim+MCPA+MS	1.5+4+2P	3	--	98	81	75	98	41
Sethoxydim+MCPA+PO	1.5+4+2P	4	--	97	90	84	96	65
Sethoxydim+MCPA+PO	3+4+2P	1	--	98	76	78	99	51
Sethoxydim+brox+MS	1.5+4+2P	7	14	96	89	55	98	74
Sethoxydim+brox+MS	3+4+2P	3	16	99	97	59	98	85
Sethoxydim+brox+PO	1.5+4+2P	3	15	98	96	65	95	87
Sethoxydim+brox+PO	3+4+2P	3	16	99	96	68	99	85
Sethoxydim+DPX-M6316+PO	3+0.12+2P	24	12	98	99	99	96	98
Sethoxydim+mets+PO	3+0.06+2P	38	16	99	99	99	93	99
Fluazifop-P+brox+PO	3+4+2P	7	16	96	92	39	92	79
Fluazifop-P+PO/MCPA	3+2P/4	10	--	99	75	79	98	45
Sethoxydim+PO	3+2P	0	--	99	0	0	99	0
Bromoxynil	4	6	9	0	98	71	6	89
C.V. %		81	28	18	10	19	17	22
LSD 5%		11	5	18	11	18	17	20

P in the rate column represents pints per acre; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; / indicates split treatment.

Summary

No important flax stand reductions occurred with any of the treatments (data not presented). Flax was injured by treatment with metsulfuron, DPX-M6316, and bromoxynil plus MCPA plus petroleum. Injured flax was stunted and delayed in maturity. Treatments containing sethoxydim or fluazifop-P provided greater than 90% green and yellow foxtail control. DPX-M6316 and metsulfuron gave greater than 95% control of redroot pigweed and kochia. Kochia control was less with the second evaluation than the first evaluation for all treatments except DPX-M6316 or metsulfuron. Treatments with less than 70% kochia control at the second evaluation date were not harvestable. Flax yields related to weed control and did not appear to be adversely affected by flax injury.

Weed control in flax, Minot, 1986. 'Culbert 79' flax was seeded May 19. Treatments were applied to 5 to 6 inch flax, 2 to 4 leaf green foxtail, 4.5 to 5.5 leaf wild oats, 2 to 4 leaf redroot pigweed and common lambsquarters June 13 with 70 F. Split treatments (indicated by /) were applied June 16 with 65 F. The experimental design was a randomized complete block with four replications. Flax injury and weed control were evaluated July 11. Flax maturity (Matu) was the date in August when 90% of the flax bolls were mature.

Treatment	Rate	Flax Inju	Flax Matu	Flax Yield	Grft	Wioa	Rrpw	Colq
	(oz/A)	(%)	(Aug)	(Bu/A)	----(% control)----			
Dalapon+MCPA-dma	12+4	0	9	8.3	63	8	43	78
Diclofop+bromoxynil	12+4	0	10	13.6	43	82	40	62
Diclofop+bromoxynil	16+4	0	11	12.1	43	78	31	55
Dicl+brox+PO	12+4+1P	0	8	10.4	59	70	15	68
Dicl+brox+MCPA+PO	13+4+0.7+1P	0	10	10.3	72	79	25	68
Dicl+PO/MCPA	12+1P/4	0	11	12.5	72	85	39	99
Dicl+PO/picl+MCPA	12+1P/0.25+4	10	17	11.0	66	76	83	98
Dicl+DPX-M6316+PO	12+0.12+1P	7	17	9.7	13	83	94	96
Metsulfuron+X-77	0.06+0.12%	1	12	11.3	4	16	94	93
Seth+MCPA+MS	1.5+4+2P	0	11	14.8	96	94	44	73
Seth+MCPA+PO	1.5+4+2P	0	10	15.9	96	88	42	99
Seth+MCPA+PO	3+4+2P	1	9	10.9	99	99	33	97
Seth+brox+MS	1.5+4+2P	0	10	15.7	96	94	14	60
Seth+brox+MS	3+4+2P	0	10	13.7	97	98	11	50
Seth+brox+PO	1.5+4+2P	0	12	10.7	95	60	19	50
Seth+brox+PO	3+4+2P	0	11	18.3	97	96	29	62
Seth+DPX-M6316+PO	3+0.12+2P	2	17	19.3	95	98	97	99
Seth+mets+PO	3+0.06+2P	6	18	20.0	98	94	97	98
Fluazifop-P+brox+PO	3+4+2P	0	13	14.9	81	98	42	62
Fluazifop-P+PO/MCPA	3+2P/4	3	11	13.5	93	99	47	98
Sethoxydim+PO	3+2P	0	10	8.5	99	99	1	0
Bromoxynil	4	0	10	7.9	0	0	45	81
No control	0	0	10	4.8	0	0	0	0
C.V. %		266	18	24.6	15	11	35	24
LSD 5%		5	3	4.3	14	11	21	24

P in the rate column represents pints per acre; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; / indicates split treatment.

Summary

None of the treatments caused flax stand reductions (data not presented). Flax injury expressed as stunting and delayed maturity occurred with treatments containing picloram, metsulfuron, or DPX-M6316. Treatment with sethoxydim or fluazifop-P generally provided good wild oats and green foxtail control. DPX-M6316 appeared to antagonize grass weed control with diclofop. Metsulfuron and DPX-M6316 gave 94% or greater redroot pigweed and common lambsquarters control. MCPA also provided greater than 90% common lambsquarters control. Flax yield generally related to weed control. Sethoxydim plus metsulfuron or DPX-M6316 were the only treatments to provide greater than 90% control of all weeds and had the highest flax yields despite delayed flax maturity from treatment with the sulfonylurea herbicides.

Weed control in flax, Langdon, 1986. 'Flor' flax was seeded no-till June 4. Treatments were applied to 1.5 to 2 inch flax and 2 to 4 leaf wild oats June 24 with 70 F. Split treatments (indicated by /) were applied July 1 with 65 F. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Flax injury and weed control were evaluated July 24.

Treatment	Rate	Flax injury	Wioa	Wibu
	(oz/A)	(%)	(% control)	
Dalapon+MCPA-dma	12+4	0	8	13
Diclofopofop+bromoxynil	12+4	16	83	76
Diclofop+bromoxynil	16+4	11	89	83
Diclofop+bromoxynil+PO	12+4+1P	25	75	70
Diclofop+bromoxynil+MCPA+PO	13+4+0.7+1P	19	74	78
Diclofop+PO/MCPA	12+1P/4	16	93	71
Diclofop+PO/picloram+MCPA	12+1P/0.25+4	20	88	95
Diclofop+DPX-M6316+PO	12+0.12+1P	20	89	92
Metsulfuron+X-77	0.06+0.12%	11	28	94
Sethoxydim+MCPA+MS	1.5+4+2P	10	95	33
Sethoxydim+MCPA+PO	1.5+4+2P	1	94	27
Sethoxydim+MCPA+PO	3+4+2P	0	96	40
Sethoxydim+bromoxynil+MS	1.5+4+2P	20	89	75
Sethoxydim+bromoxynil+MS	3+4+2P	20	94	93
Sethoxydim+bromoxynil+PO	1.5+4+2P	20	83	89
Sethoxydim+bromoxynil+PO	3+4+2P	21	95	82
Sethoxydim+DPX-M6316+PO	3+0.12+2P	15	97	91
Sethoxydim+metsulfuron+PO	3+0.06+2P	25	95	97
Fluazifop-P+bromoxynil+PO	3+4+2P	23	93	86
Fluazifop-P+PO/MCPA	3+2P/4	9	96	35
Sethoxydim+PO	3+2P	3	97	0
Bromoxynil	4	0	0	91
C.V. %		68	11	27
LSD 5%		13	12	25

dma = demthylamine; MCPA = MCPA butoxyethanol ester; Brox = bromoxynil; Dicl = diclofop; Flua = fluazifop-P; Mets = metsulfuron; Seth = sethoxydim; X-77 = surfactant; P in the rate column represents pints per acre; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; / indicates split treatment.

Summary

Injury ratings were high, which may reflect the sparse flax stand with no-till seeding. Sethoxydim and fluazifop-P generally provided 90% or greater wild oats control. Metsulfuron, DPX-M6316, and picloram gave greater than 90% wild buckwheat control. Bromoxynil also provided good wild buckwheat control.

Weed control in flax, Carrington, 1986. 'Linton' flax was seeded May 28. Treatments were applied to 4 inch flax June 23 with 70 F. Split treatments (indicated by /) were applied June 26 with 70 F. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Flax injury and weed control were evaluated July 22.

Treatment	Rate	Flax inju	Grft	Rrpw	Colq
	(oz/A)	(%)	--(%	control)-	
Dalapon+MCPA-dma	12+4	0	71	56	77
Diclofop+bromoxynil	12+4	0	74	57	68
Diclofop+bromoxynil	16+4	0	66	51	61
Diclofop+bromoxynil+PO	12+4+1P	0	63	55	64
Diclofop+bromoxynil+MCPA+PO	13+4+0.7+1P	1	53	66	85
Diclofop+PO/MCPA	12+1P/4	3	65	58	84
Diclofop+PO/picloram+MCPA	12+1P/0.25+4	2	59	85	89
Diclofop+DPX-M6316+PO	12+0.12+1P	6	50	95	92
Metsulfuron+X-77	0.06+0.12%	6	46	97	94
Sethoxydim+MCPA+MS	1.5+4+2P	0	96	73	94
Sethoxydim+MCPA+PO	1.5+4+2P	0	90	65	94
Sethoxydim+MCPA+PO	3+4+2P	0	96	75	97
Sethoxydim+bromoxynil+MS	1.5+4+2P	0	89	61	48
Sethoxydim+bromoxynil+MS	3+4+2P	0	91	50	64
Sethoxydim+bromoxynil+PO	1.5+4+2P	0	86	54	81
Sethoxydim+bromoxynil+PO	3+4+2P	0	97	55	55
Sethoxydim+DPX-M6316+PO	3+0.12+2P	9	96	97	95
Sethoxydim+metsulfuron+PO	3+0.06+2P	10	97	98	96
Fluazifop-P+bromoxynil+PO	3+4+2P	0	80	58	67
Fluazifop-P+PO/MCPA	3+2P/4	6	93	54	93
Sethoxydim+PO	3+2P	0	97	3	0
Bromoxynil	4	0	0	52	62
C.V. %		147	19	25	20
LSD 5%		4	19	22	20

dma = demthylamine; MCPA = MCPA butoxyethanol ester; Brox = bromoxynil; Dicl = diclofop; Flua = fluazifop-P; Mets = metsulfuron; Seth = sethoxydim; X-77 = surfactant; P in the rate column represents pints per acre; PO = petroleum oil with 17% emulsifier; MS = methylated seed oil with 15% IGEPAL CO-630 emulsifier; / indicates split treatment.

Summary

None of the treatments caused flax stand reductions (data not presented). DPX-M6316 and metsulfuron caused some flax injury which was expressed as stunting and delayed maturity. Fluazifop-P and sethoxydim generally provided good green foxtail control. Green foxtail control with fluazifop-P tended to be antagonized by a tank mixture with bromoxynil. DPX-M6316 and metsulfuron gave 92% or greater redroot pigweed and common lambsquarters control. MCPA also provided good common lambsquarters control.

Preemergence weed control in dry bean and soybean, Casselton, 1986. Preplant (PPI) treatments were applied, and field cultivator plus harrow incorporated twice in the opposite direction to a depth of three inches. 'Fleetwood' navy bean and 'Ozzie' soybeans were seeded, and preemergence (PE) treatments applied May 20. The soil was dry on the surface and moist below. The cracking (C) treatment was applied May 30. Treatments were to one row each of soybeans and navy bean of the four 30 inch spaced rows 25 ft long. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated June 18, 1986.

Treatment	Rate	Sobe injury	Nabe injury	Grft	Wimu	Colq
	(lb/A)	-----(%)-----		--(% control)---		
Trifluralin(PPI)	1	0	0	92	13	85
Ethalfluralin(PPI)	0.9	0	0	96	9	92
Pendimethalin(PPI)	1.25	0	0	96	24	91
Vernolate(PPI)	2.5	26	0	76	38	86
EPTC(PPI)	3	55	0	91	66	88
Metribuzin+trifluralin(PPI)	0.18+1	0	3	96	84	89
AC 263,499(PPI)	0.06	0	0	79	97	92
AC 263,499(PPI)	0.12	0	0	90	97	97
FMC-57020(PPI)	0.75	0	0	83	59	73
FMC-57020(PPI)	1	0	0	78	66	41
FMC-57020(PPI)	1.25	0	0	86	72	76
FMC-57020(PPI)	2.5	0	15	96	93	91
FMC-57020+metribuzin(PPI)	1+0.18	0	11	72	77	73
FMC-57020+chloramben(PPI)	1+1.8	3	0	86	82	87
CGA-24704(PE)	1.25	0	0	53	0	8
CGA-24704(PE)	1.5	0	0	76	23	20
CGA-24704(PE)	1.8	0	0	70	5	0
CGA-24704(PE)	2.1	0	0	77	5	0
Metolachlor(PE)	3	0	0	80	8	8
Alachlor(PE)	4	0	0	81	26	19
Acetochlor(PE)	3	8	16	91	51	46
Cinmethylin(PE)	1.5	0	0	65	0	15
Cinmethylin+metribuzin(PE)	1.5+0.19	0	0	40	21	20
Chloramben+alachlor(PE)	2.25+2.5	0	0	79	91	86
Chloramben+alachlor(PE)	1.8+2.5	0	0	83	93	59
Chloramben+dinoseb(C)	1.8+3	0	0	53	90	80
Chloramben+etha(PPI)	2.25+0.9	0	1	97	97	98
Chloramben+trif(PPI)	1.8+1.0	0	0	97	96	96
Pend+AC 222,293(PPI)	1.25+0.125	0	0	89	68	75
Pend+AC 222,293(PPI)	1.25+0.188	0	0	97	84	84
Pend+AC 222,293(PPI)	1.25+0.25	0	0	95	84	83
C.V. %		125	223	14	28	23
LSD 5%		5	4	15	21	19

Summary

None of the treatments caused stand reduction of soybean or navy bean (data not presented). Vernolate and EPTC caused 26 and 55% soybean injury, respectively. Acetachlor, FMC-57020 at 2.5 lb/A, and FMC-57020 at 1 plus metribuzin at 0.18 lb/A gave 11 to 16% navy bean injury. AC 263,499 at 0.12 lb/A, FMC-57020 at 2.5 lb/A, and chloramben plus ethalfluralin or trifluralin gave 90% or greater control of green foxtail, wild mustard, and common lambsquarters.

Weed control in soybeans, Carrington, 1986. Preplant incorporated (PPI) treatments were applied and roto-tiller incorporated, and 'Maple Amber' soybeans seeded June 5 on a loam soil, 3.6% organic matter, and 7.2 pH. Preemergence (PE) treatments were applied one day after seeding. Precipitation for 2 weeks following seeding was 0.54 inch. Postemergence (P) treatments were applied to second trifoliolate soybeans June 27. Delayed (D) treatments were applied June 30. The experimental design was a randomized complete block with four replications. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi for preemergence applications, and 8.5 gpa at 35 psi for postemergence applications. Soybean injury and weed control were evaluated July 22.

Treatment	Rate	Soybean injury	Grft	Colq	Rrpw	Prpw
	(oz/A)	(%)	------(% control)-----			
Trifluralin(PPI)	16	0	85	63	79	71
Ethalfluralin(PPI)	16	0	90	83	84	79
Pendimethalin(PPI)	20	5	75	58	58	53
FMC-57020(PPI)	16	0	71	55	55	48
Trifluralin+chloramben(PPI)	16+32	3	89	85	86	81
Trifluralin+metribuzin(PPI)	16+3	0	86	78	80	78
Vernolate(PPI)	32	3	55	65	60	58
Trifluralin(PPI)+acifluorfen(P)	16+6	4	88	88	98	99
Trifluralin(PPI)+bentazon(P)	16+12	0	88	79	84	81
Alachlor(PE)	40	0	67	56	81	81
Metolachlor(PE)	40	0	77	14	62	48
Cinmethylin(PE)	16	4	48	56	45	45
Alachlor+metribuzin(PE)	40+3	0	73	49	80	71
Chloramben(PE)	40	0	73	24	76	58
Sethoxydim+PO(P)/bentazon(D)	3+0.25G+12	0	98	79	76	58
Fluazifop-P+PO(P)/bentazon(D)	3+0.25G+12	0	94	74	69	41
Sethoxydim+PO(P)/acifluorfen(D)	3+0.25G+6	11	98	96	98	97
Fluazifop-P+PO(P)/acifluorfen(D)	3+0.25G+6	4	96	96	98	97
C.V. %		215	12	22	15	22
LSD 5%		6	13	19	16	20

PO = petroleum oil with 17% emulsifier; / indicates separate treatment; G in the rate column represents gallons per acre.

Summary

None of the treatments caused any visible stand reduction (data not presented). None of the treatments caused important injury to soybeans. Green foxtail control was 85% or more with treatments containing trifluralin, ethalfluralin, sethoxydim, or fluazifop-P. Acifluorfen was the only treatment to provide more than 85% common lambsquarters control. Acifluorfen provided 97% or greater redroot and prostrate pigweed control, while none of the other treatments gave more than 86% control. Wild mustard control was 90% or more with treatments containing chloramben, metribuzin, bentazon or acifluorfen.

Weed control in soybeans, Langdon, 1986. Preplant incorporated (PPI) treatments were applied and incorporated twice at right angles with a field cultivator and harrow, and 'McCall' soybeans seeded June 9 at Langdon with a clay loam soil, 4.6% organic matter, and 7.8 pH. Preemergence (PE) treatments were applied June 10. Precipitation for 2 weeks following seeding was 3.92 inches. Postemergence (P) treatments were applied to second and fourth trifoliolate soybeans July 11. Delayed (D) treatments were applied July 15 with 65 F. The experimental design was a randomized complete block with four replications. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi for preemergence applications, and 8.5 gpa at 35 psi for postemergence applications. Soybean injury and weed control were evaluated July 24.

Treatment	Rate	Soybean injury	Wimu	Colq
	(oz/A)	(%)	(% control)	
Trifluralin(PPI)	16	1	8	94
Ethalfluralin(PPI)	16	0	5	97
Pendimethalin(PPI)	20	1	14	92
FMC-57020(PPI)	16	0	43	72
Trifluralin+chloramben(PPI)	16+32	4	94	99
Trifluralin+metribuzin(PPI)	16+3	1	91	95
Vernolate(PPI)	32	3	41	72
Trifluralin(PPI)+acifluorfen(P)	16+6	3	99	99
Trifluralin(PPI)+bentazon(P)	16+12	1	98	98
Alachlor(PE)	40	3	28	85
Metolachlor(PE)	40	0	28	68
Cinmethylin(PE)	16	0	5	53
Alachlor+metribuzin(PE)	40+3	4	85	87
Chloramben(PE)	40	0	90	95
Sethoxydim+PO(P)/bentazon(D)	3+0.25G+12	0	99	92
Fluazifop-P+PO(P)/bentazon(D)	3+0.25G+12	4	99	86
Sethoxydim+PO(P)/acifluorfen(P)	3+0.25G+6	23	99	99
Fluazifop-P+PO(P)/acifluorfen(P)	3+0.25G+6	16	97	79
C.V. %		97	29	14
LSD 5%		5	24	17

PO = petroleum oil with 17% emulsifier; / indicates separate treatment; G in the rate column represents gallons per acre.

Summary

None of the treatments caused any visible stand reduction (data not presented). Acifluorfen applied as a split treatment immediately after sethoxydim or fluazifop-P plus petroleum oil adjuvant caused injury to soybeans. Wild mustard control was 85% or more with treatments containing chloramben, metribuzin, bentazon or acifluorfen, while none of the other treatments exceeded 50% control. All treatments except FMC-57020, vernolate, metolachlor, and cinmethylin provided 79% or greater common lambsquarters control. Same day treatment of fluazifop-P with acifluorfen appeared to antagonize common lambsquarters control with acifluorfen.

Postemergence grass and broadleaf weed control in dry bean and soybean, Casselton, 1986. Two rows each of 'Fleetwood' navy bean (Nabe) and 'Ozzie' soybean (Sobe) were seeded in 10 by 25 ft plots May 20, 1986 at Casselton, ND. The initial treatments (P1) were applied to second trifoliolate navy bean and soybean, 2 to 4 leaf green and yellow foxtail, cotyledon to 4 leaf wild mustard, 1 to 4 inch kochia, and 6 leaf common lambsquarters June 16 with 70 F, 40% relative humidity and clear skies. The second applications (P2) were applied to similar sized plants June 19 with 86 F and 70% relative humidity. The third applications (P3) were applied to third trifoliolate navy bean and soybean, 3 to 5 leaf green and yellow foxtail, 2 to 6 leaf wild mustard, 2 to 6 inch kochia, and 6 to 8 leaf common lambsquarters June 23 with 70 F and 40% relative humidity. Treatments were applied to one row of each bean type. The experimental design was a randomized complete block with four replications. Crop injury and weed control were evaluated July 14 and August 13.

Treatment[a]	Rate	July 14						Aug 13
		Sobe	Nabe	Grft	Wimu	KOCZ	Colq	Grft
	(oz/A)	(% injury)		-------(% control)------				
Haloxyfop+PO(P1)/bentazon(P2)	0.5+1Q+12	0	0	75	95	41	30	58
Haloxyfop+PO(P1)/bentazon(P2)	1.0+1Q+12	0	0	91	91	48	30	76
Fenoxaprop+PO(P1)/bentazon(P2)	2.5+1Q+12	0	0	93	93	54	21	83
AC 263,499(P1)	1	0	1	50	99	54	0	79
AC 263,499+MS(P1)	1+1Q	3	1	83	99	98	68	92
AC 263,499+PO(P1)	1+1Q	1	4	76	99	99	59	94
Fluazifop-P+PO(P1)/bentazon(P2)	2.5+1Q+12	0	0	71	89	39	20	81
Fluazifop-P+PO(P1)/bentazon(P2)	3+1Q+12	0	0	91	93	33	28	92
DPX-Y6202+PO(P1)/bentazon(P2)	0.8+1Q+12	1	1	89	91	40	19	73
DPX-Y6202+PO(P1)/bentazon(P2)	1.2+1Q+12	0	0	92	94	31	23	84
DPX-Y6202+PO(P1)/bentazon(P2)	1.6+1Q+12	0	0	95	95	33	15	85
DPX-Y6202-31+PO(P1)/bentazon(P2)	0.4+1Q+12	0	0	81	94	33	29	71
DPX-Y6202-31+PO(P1)/bentazon(P2)	0.6+1Q+12	0	0	94	94	28	24	87
DPX-Y6202-31+PO(P1)/bentazon(P2)	0.8+1Q+12	0	0	93	94	34	23	89
Sethoxydim+PO(P1)/bentazon(P2)	3+1Q+12	0	0	97	96	33	18	96
Sethoxydim+benazolin+PO(P1)	3+6+1Q	11	0	53	24	86	90	53
Sethoxydim+benazolin+variquat(P1)	3+6+1%	9	0	45	23	88	94	30
Sethoxydim+benazolin+acifluorfen+AG98(P1)	3+6+4+0.25%	1	0	28	91	79	86	19
Bent+PO(P1)/bent+PO(P2)/seth+PO(P3)	6+1Q/6+1Q/3+1Q	3	0	98	99	95	93	98
Bent+28N(P1)/bent+28N(P2)/seth+PO(P3)	6+4Q/6+4Q/3+1Q	1	1	98	99	59	34	99
Bent+28N+PO(P1)/bent+seth+28N+PO(P2)	6+4Q+1Q/6+3+4Q+1Q	1	0	93	99	97	97	83
Bent+acif+PO(P1)/bent+acif+PO(P2)/seth+PO(P3)	6+1+1Q/6+1+1Q/3+1Q	3	1	99	99	99	94	99
Bent+acif+PO(P1)/bent+acif+seth+PO(P2)	6+1+1Q/6+1+3+1Q	3	1	85	99	96	94	92
Bent+acif+PO(P1)/bent+acif+seth+28N(P2)	6+1+1Q/6+1+3+4Q	0	0	65	99	99	93	85
Bent+PO(P1)/bentazon+sethoxydim+PO(P2)	6+1Q/6+3+1Q	6	0	94	99	83	88	88
Bent+PO(P1)/bentazon+sethoxydim+MS(P2)	6+1Q/6+3+1Q	5	0	91	99	86	86	78
C.V. %		133	301	9	8	15	16	15
LSD 5%		3	2	10	9	13	11	16

MS = methylated soybean oil with 15% IGEPAL CO-630 emulsifier; Q in the rate column represents quarts per acre; / indicates a separate treatment.

Summary

All treatments except sethoxydim plus benazolin and an adjuvant gave good wild mustard control. DPX-Y6202-31 at one half the rate of DPX-Y6202 gave similar foxtail control. Foxtail control with AC 263,499 was greater with the second evaluation than the first evaluation. Sethoxydim applied separate from other herbicides tended to give the greatest foxtail control of all treatments. Foxtail control with sethoxydim was antagonized by a tank mixture with benazolin or bentazon. AC 263,499 plus petroleum oil or methylated soybean oil provided more than 95% kochia control. Treatments including benazolin gave 79% or greater kochia and common lambsquarters control. A split application of bentazon provided good control of kochia and common lambsquarters and was more than twice as effective as a single application with the same total rate.

Postmergence broadleaf weed control in dry bean and soybean, Casselton, 1986. 'Fleetwood' navy bean (Nabe) and 'Ozzie' soybean (Sobe) were seeded in rows spaced 30 inches apart May 20. Treatments were applied to second to third trifoliolate soybean, second trifoliolate navy bean, cotyledon to 4 leaf wild mustard, 1 to 4 inch kochia, and 6 leaf common lambsquarters June 16 with 70 F, 40% relative humidity and clear skies. Four days prior to application of the treatments the entire experiment was treated with sethoxydim at 3 oz/A plus 1 pint of petroleum oil with 17% emulsifier for grass weed control. Treatments were applied 8.5 gpa at 35 psi. Plots consisted of two rows of dry bean and two rows of soybean, and treatment was to one row of each type of bean the length of the 25 ft plots. The experiment was a randomized complete block with four replications. Crop injury and weed control were evaluated July 14.

Treatment	Rate	Sobe injury	Nabe injury	Wimu	KOCZ	Colq
	(oz/A)	(%)	(%)	----(%	control)	---
Bentazon+X-77	12+0.25%	0	0	93	40	50
Acifluorfen-RH+AG98	6+0.12%	0	0	98	63	55
Acifluorfen-RP+AG98	6+0.12%	0	0	99	58	53
DPX-M6316+X-77	0.12+0.25%	3	15	94	96	95
Fomesafen+X-77	4+0.25%	0	0	99	30	0
AC 222,293	2	43	4	94	10	13
AC 222,293	3	56	5	96	0	0
AC 222,293	4	69	15	97	10	18
2,4-D-dma	1	3	5	92	23	83
2,4-D-dma	2	23	13	98	58	80
2,4-D-dma	3	33	28	99	45	97
Lactofen	3.2	1	1	99	58	10
Lactofen+10-34-0	3.2+0.25G	0	0	99	75	0
Lactofen+PO	3.2+0.06G	0	0	99	30	0
Lactofen+bentazon+PO	2.4+6+0.12G	3	4	99	70	10
Benazolin+PO	6+0.25G	0	0	10	68	70
Benazolin+variquat	6+1%	3	0	41	85	81
Benazolin+acifluorfen+AG98	6+4+0.25%	3	1	99	85	89
Naptalam&dinoseb	8+16	3	0	82	25	30
DPX-F6025+X-77	0.03+0.25%	0	1	92	20	20
C.V. %		37	107	7	38	24
LSD 5%		6	7	9	35	20
# of reps		4	4	4	2	2

RH = Rohm and Hass; RP = Rhone Poulenc; & = formulated mixture which was 1:2 for Naptalam&dinoseb; dma = dimethylamine; X-77, AG98, and variquat are surfactants; PO = petroleum with 17% emulsifier.

Summary

None of the treatments caused stand reduction (data not presented). AC 222,293 at all rates caused greater than 40% injury to soybean, and 15% or less injury to the navy bean. Navy bean was more tolerant than soybean to AC 222,293 and 2,4-D. DPX-M6316 was more injurious to navy bean than soybean. All treatments except benazolin provided more than 80% wild mustard control. DPX-M6316 provided 95% or more kochia and common lambsquarters control. Benazolin plus acifluorfen or variquat gave more than 80% kochia and common lambsquarters control. 2,4-D was the only other treatment which provided 80% or greater common lambsquarters control.

Bentazon, bromoxynil, and lactofen with additives, Fargo, 1986. 'McCall' soybean, 'Siberian' foxtail millet, 'Seedtech 301' sunflower, and tame yellow mustard were seeded in adjacent 6 foot wide strips for the millet and mustard and 10 foot strips for the soybean and sunflower on May 29. Treatments were applied to two trifoliolate soybean, 6 to 8 leaf sunflower, 5 leaf foxtail millet, and 6 inch tame mustard on June 24 with 80 F and 40% relative humidity. X-77 was at 0.25% spray volume; petroleum oil with 17% Atplus 300F (POAT), once refined sunflower oil with 15% Atplus 300F (SFAT), and methylated once refined sunflower oil with 15% CO-630 (MSFC or MS) were at 1 quart/A; and ammonium sulfate (AMSU or AS) was at 2.5 lb/A in 8.5 gpa. The experimental design was a randomized complete block with three replications.

		Additive							
Herbicide	Rate	None	X-77	POAT	SFAT	MSFC	AMSU	PO+AS	MS+AS
		(% soybean control)							
Bentazon	6	0	0	0	0	0	0	1	0
Bentazon	8	0	0	3	0	0	2	0	2
Bromoxynil	2	0	48	50	52	90	42	33	38
Bromoxynil	3	0	43	62	63	70*	67	68	75
Lactofen	2	0	5	17	3	13	8	23	17
Lactofen	3	0	18	20	8	17	17	25	17
LSD 5% = 12									
		(% Tame mustard control)							
Bentazon	6	65	89	81	76	97	90	82*	95
Bentazon	8	79	79	94	84	74*	92	91	95
Bromoxynil	2	84	88	91	78	98	90	88	73
Bromoxynil	3	82	93	97	93	93*	94	94	90
Lactofen	2	88	92	88	80	62*	89	93	68
Lactofen	3	90	90	99	81	80	95	99	83
LSD 5% = 15									
		(% sunflower control)							
Bentazon	6	7	15	45	32	67*	52	83*	68
Bentazon	8	38	17	58	35	50*	55	83	67*
Bromoxynil	2	98	91	98	88	92	98	93	98
Bromoxynil	3	91	91	99	97	92	98	89	98
Lactofen	2	76	81	80	25	48*	78	82	47*
Lactofen	3	80	77	85	55*	63	84	92	68
LSD 5% = 16									

* indicates a variation among replications which may have been a result of phase separation due to emulsion instability.

Summary

Foxtail millet was evaluated, but control never exceeded 12%, so data are not presented. The CO-630 emulsifier in methylated sunflower oil did not give a good emulsion and variations were observed among replications indicating possible phase separation and non-uniform herbicide application. Treatments were applied in pairs with vigorous shaking of both bottles prior to the first treatment, but the second treatment was not shaken immediately before treatment. Treatments where the higher rate gave less control than the lower rate indicates possible emulsion separation. Treatments including methylated sunflower oil with CO-630 appeared to have more emulsion problems than other spray combinations. Laboratory experiments indicated emulsion stability is greatly influenced by the herbicide involved and addition of inorganic salts. In general, when considering possible emulsion problems, the methylated sunflower oil enhanced tame mustard control with bentazon and bromoxynil more than the other additives. Sunflower oil and methylated sunflower oil appeared to antagonize species control with lactofen.

Additives with acifluorfen, fomesafen, and AC-263,499, Casselton, 1986. 'Ozzie' soybean and 'P-120' navy bean were seeded on May 20. The navy beans were included as 2 of the 4 rows per plot only in the experiment with fomesafen. Each herbicide was a seperate experiment conducted at the same time. Treatments were applied to three trifoliolate beans and cotyledon to 5 inch wild mustard on June 19 with 86F, 70% relative humidity, and clear sky. Evaluations were on July 25 and August 14 and combined in the analysis. The experiments were a randomized complete block with three replications. POAT was petroleum oil with 17% ATplus 300F emulsifier, and MSCO was methylated soybean oil with 15% IGEPAL CO630 emulsifier and were applied at 1 qt/A. Surfactant Ag98 was at 0.12% v/v and ammonium sulfate (AMSU) was at 2.5 lb/A. Kochia and common lambsquarters in two replications were evaluated only on August 14.

Additive	Acifluorfen Rate	Acifluorfen Sobe Inju	Acifluorfen Wimu Cont	Fomesafen Rate	Fomesafen Sobe Inju	Fomesafen Weed control KOCZ	Fomesafen Weed control Colq	Fomesafen Weed control Wimu	AC-263,499 Rate	AC-263,499 Sobe Inju	AC-263,499 Wimu Cont
	(oz/A)	---(%)---		(oz/A)	--------(%)--------				(oz/A)	---(%)---	
None	1	0	41	0.5	0	0	0	59	0.25	0	79
None	2	0	57	1	0	0	0	84	0.50	0	84
None	4	4	88	2	0	13	10	93	1	1	76
None	6	3	94	4	0	35	5	96	2	0	88
average		2	70		0	12	4	83		0	81
AG-98	1	0	64	0.5	0	0	0	80	0.25	0	75
AG-98	2	1	61	1	1	10	15	85	0.50	0	67
AG-98	4	4	94	2	0	25	10	95	1	1	86
AG-98	6	5	97	4	0	30	15	96	2	1	86
average		3	79		0	16	10	89		1	79
MSCO	1	5	86	0.5	0	40	10	90	0.25	0	81
MSCO	2	10	98	1	1	75	45	98	0.50	2.5	81
MSCO	4	10	99	2	3	73	67	99	1	3	93
MSCO	6	15	99	4	8	85	67	99	2	5	85
average		10	95		3	68	29	96		3	85
POAT	1	2	86	0.5	1	30	20	87	0.25	1	78
POAT	2	17	96	1	1	40	33	95	0.50	1	85
POAT	4	14	97	2	2	45	15	99	1	7	94
POAT	6	18	99	4	4	72	50	98	2	6	90
average		13	95		2	47	29	95		4	87
AMSU	1	0	83	0.5	0	0	0	68	0.25	1	75
AMSU	2	3	93	1	0	0	0	81	0.50	1	81
AMSU	4	3	97	2	0	33	7	93	1	1	87
AMSU	6	7	98	4	0	45	20	95	2	1	86
average		3	93		0	19	7	84		1	82
MSCO+AMSU	1	9	91	0.5	2	43	25	91	0.25	2	83
MSCO+AMSU	2	10	96	1	3	63	35	97	0.50	5	85
MSCO+AMSU	4	17	99	2	6	83	65	99	1	2	90
MSCO+AMSU	6	17	97	4	8	87	67	99	2	4	95
average		13	96		5	69	48	96		3	88
LSD 5% (treatments)		5	8		2	16	19	5		4	13
LSD 5% (averages)		3	4		1	8	9	3		2	6

Summary

Navy beans were equally injured as soybeans by the various fomesafen treatments (data not presented). Additives which increased weed control with the herbicides also generally increased soybean injury. Wild mustard control with AC-263,499 was not greatly influenced by the various additives. Ammonium sulfate enhanced wild mustard control when applied with acifluorfen, but not with fomesafen. Petroleum oil and methylated soybean oil additives similarly enhanced wild mustard control with acifluorfen and fomesafen. Kochia control with fomesafen was enhanced more when applied with methylated soybean oil than with petroleum oil.

<u>Sulfonylurea herbicides in safflower, Williston, 1986.</u> 'S-208' safflower was seeded into fallowed soil May 13. Treatments were applied to 8 to 10 leaf safflower, 6 leaf green foxtail, and 3 to 4 inch Russian thistle June 13 with 55F and 65% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replications. Safflower injury and weed control were evaluated July 17.

Treatment	Rate	Grft	Ruth	Safflower Strd	Inju	Yield	Tswt
	(oz/A)	(% control)		(%)	(%)	(lb/A)	(lb)
Chlorsulfuron+X-77	0.25+0.25%	64	95	8	9	1098	36.0
DPX-M6316+X-77	0.25+0.25%	0	95	1	5	1227	36.8
DPX-M6316+X-77	0.38+0.25%	0	96	3	5	1157	37.0
DPX-R9674+X-77	0.13+0.25%	0	97	9	31	633	35.0
DPX-R9674+X-77	0.25+0.25%	0	96	8	38	631	34.0
DPX-A7881+X-77	0.13+0.25%	10	31	3	8	937	36.0
DPX-A7881+X-77	0.25+0.25%	29	13	0	0	1045	36.8
CGA-131036+X-77	0.25+0.25%	5	90	1	13	918	35.7
DPX-M6316+fluazifop+PO	0.25+3+1qt	80	95	5	11	1062	36.3
Clsu+fluazifop+PO	0.25+3+1qt	69	97	4	21	940	35.7
DPX-R9674+fluazifop+PO	0.25+3+1qt	43	96	13	58	487	31.3
DPX-A7881+fluazifop+PO	0.25+3+1qt	52	80	3	24	746	34.6
CGA-131036+fluazifop+PO	0.25+3+1qt	13	96	6	14	794	34.4
No treatment	0	0	0	0	0	1060	34.9
C.V. %		62	17	92	52	16	--
LSD 5%		23	18	6	13	202	--
Reps		4	4	4	4	4	1

Summary

None of the herbicide treatments caused important stand reductions. Treatments containing DPX-R9674 caused greater than 30% crop injury. Chlorsulfuron was the only sulfonylurea herbicide to provide greater than 30% green foxtail control when applied only with X-77. Green foxtail control was lower with CGA-131036 plus fluazifop than when fluazifop was applied with the other sulfonylurea herbicides. Further, fluazifop gave less green foxtail control when applied with DPX-R9674 or DPX-A7881 than when applied with chlorsulfuron. Russian thistle control was 90% or greater with all sulfonylurea herbicides except DPX-A7881. Safflower yield generally related to safflower injury.

Postemergence weed control in safflower, Williston, 1986. An experiment was conducted to evaluate various herbicides for postemergence broadleaf and grass weed control in safflower. Plot area was fallowed in 1985. 'S-541' safflower was seeded at 25 lb/A in 6 inch spaced rows into a Max loam having pH 6.9 and organic matter of 2.1% on May 20. All treatments were applied to 2 to 4 leaf safflower, 2 leaf wild oats, 1 to 2 inch tall Russian thistle, and emerging to 2 leaf green foxtail June 4. Air temperature was 62 F, wind was from the east at 2 mph and relative humidity was 65%. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. Plot size was 10 by 24 ft. The experiment was a randomized complete block design with four replications. Crop injury and weed control were rated July 15. Wild oats density was heavy, green foxtail and Russian thistle densities were light and moderate, respectively.

		Safflower					
			Injury	Stand	Percent Control		
Treatment	Rate	Yield	Rating	Reduction	Grft	Wioa	Ruth
	(oz/A)	(lb/A)	(%)	(%)			
DPX-M6316+X-77	0.125	747	5	0	6	6	95
DPX-M6316+X-77	0.25	511	6	0	0	6	96
DPX-M6316+X-77	0.375	645	8	5	0	5	95
DPX-M6316+X-77	0.5	510	10	6	0	0	94
DPX-M6316+X-77	0.75	471	22	6	12	6	95
Chlorsulfuron+X-77	0.25	542	14	0	66	10	98
Metsulfuron+X-77	0.06	717	12	4	11	30	96
AC 222,293	6	1210	9	4	54	98	69
AC 222,293	8	1192	10	4	68	98	80
DPX-M6316+AC 222,293	0.25+6	906	8	9	30	99	89
DPX-M6316+AC+X-77	0.25+6	1081	9	9	68	99	96
DPX-M6316+Flua+PO	0.25+3	985	5	2	89	94	87
DPX-M6316+Seth+PO	0.25+3	1033	8	6	92	92	80
DPX-M6316+-Y6202+PO	0.25+3	972	1	1	92	92	84
Chlorsulfuron+Seth+PO	0.25+3	906	11	15	97	92	99
CGA-131036+X-77	0.25	80	74	93	26	0	97
CGA-131036+Seth+PO	0.25+3	78	28	91	86	88	74
FMC-57020	12	649	26	11	75	76	21
Untreated Check	0	632	0	0	0	0	0
LSD (0.05)		164	13	7	26	15	19

Seth = sethoxydim; X-77 = surfactant in the spray at 0.25% v/v; PO = petroleum oil with 17% emulsifier at 1 qt/A.

Summary

AC 222,293 at 8 oz/A provided 80% or more wild oats and Russian thistle control with only slight injury to safflower. DPX-M6316, chlorsulfuron and metsulfuron all gave excellent control of Russian thistle but did not control grass weeds. DPX-M6316 applied at 0.75 oz/A caused 22% crop injury. Combinations of DPX-M6316 with AC 222,293 fluazifop-P, sethoxydim or DPX-Y6202 gave 80% or more control of all weeds, except green foxtail with the AC 222,293 combination. Combinations of DPX-M6316 with AC 222,293 tended to reduce DPX-M6316's ability to control Russian thistle. CGA-131036 caused over 90% stand reduction in safflower. FMC-57020 caused a 26% crop injury and an 11% stand reduction.

Response of safflower to DPX-M6316, Williston, 1986. An experiment was conducted to evaluate crop phytotoxicity and weed efficacy of various rates of DPX-M6316 alone and with additives. Plot area was fallow in 1985. 'S-208' safflower was seeded at 25 lb/A in 6 inch spaced rows into a Max loam with pH 6.2 and organic matter of 1.5%, May 13. All treatments were applied June 4 to 4 to 6 leaf safflower, 1 to 2 leaf green foxtail and 1 to 2 inch Russian thistle and wild mustard when the wind was 8 mph, air temperature was 65 F and relative humidity was 55%. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. Plot size was 10 by 24 ft. The experiment design was a randomized complete block with four replications. Weed control and safflower injury were rated July 16. Russian thistle and wild mustard densities were moderate and green foxtail density was sparse.

Treatment	Rate	Safflower Yield	Safflower Injury Rating	Safflower Stand Reduction	Percent Control Ruth	Percent Control Wimu	Percent Control Grft
	(oz/A)	(lb/A)	(%)	(%)			
DPX-M6316	0.125	1062	0	0	13	99	0
DPX-M6316	0.25	1027	0	0	5	99	0
DPX-M6316	0.375	971	0	0	20	99	0
DPX-M6316	0.5	1034	0	0	44	99	0
DPX-M6316	0.75	1082	0	0	30	99	0
Untreated Check	0	956	0	0	0	0	0
DPX-M6316+S	0.125	1145	1	1	80	99	0
DPX-M6316+S	0.25	1181	3	1	97	99	0
DPX-M6316+S	0.375	1144	4	0	96	99	0
DPX-M6316+S	0.5	1167	4	0	98	99	0
DPX-M6316+S	0.75	1117	6	1	96	99	0
Check+S	0	1033	0	0	0	0	0
DPX-M6316+PO	0.125	1188	0	0	95	99	0
DPX-M6316+PO	0.25	1173	3	0	97	99	0
DPX-M6316+PO	0.375	1136	5	5	98	99	0
DPX-M6316+PO	0.5	1095	6	5	97	99	0
DPX-M6316+PO	0.75	1086	8	6	99	99	0
Check+PO	0	1046	0	0	20	0	0
DPX-M6316+Seth+PO	0.125+3	1332	5	3	95	99	86
DPX-M6316+Seth+PO	0.25+3	1248	5	3	95	99	96
DPX-M6316+Seth+PO	0.375+3	1211	5	3	96	97	87
DPX-M6316+Seth+PO	0.5+3	1157	10	8	95	99	90
DPX-M6316+Seth+PO	0.75+3	1148	9	9	89	99	86
Sethoxydim+PO	3	1135	0	0	0	0	98
LSD (0.05)		148	3	4	15	1	9

S = surfactant in the spray at 0.25% v/v; PO = petroleum oil with 17% emulsifier at 1 qt/A.

Summary

DPX-M6316 applied without a surfactant did not injure safflower, completely controlled wild mustard, but gave Russian thistle control of less than 45%. DPX-M6316 applied with a surfactant gave 80% or more control of Russian thistle and complete control of wild mustard. DPX-M6316 with petroleum oil adjuvant gave 95% or more Russian thistle control without important injury to safflower. Sethoxydim and petroleum oil with DPX-M6316 tended to increase injury to safflower compared to DPX-M6316 applied with petroleum oil alone. DPX-M6316 applied in combination with sethoxydim tended to antagonize green foxtail control by sethoxydim.

Weed control in safflower, Williston, 1986. An experiment was conducted to evaluate various treatments for broad spectrum weed control in safflower. Preplant (PPI) herbicides were applied May 19 when the wind was calm, air temperature was 50 F and relative humidity was 65%. Treatments were incorporated twice with a field cultivator. After incorporation 'S-541' safflower was seeded at 25 lb/A in 6 inch spaced rows into a Max loam that had pH 6.9 and organic matter of 2.1%. Postemergence treatments were applied June 11 with no wind, 65 F and 80% relative humidity. The safflower had 4 to 6 leaves, wild oats had 3 to 4 leaves, green foxtail had 2 to 4 leaves and Russian thistle and wild mustard were 1 to 4 inches tall. Plot area was fallowed in 1985. Treatments were applied with a bicycle type plot sprayer delivering 17 gpa for PPI treatments and 8.5 gpa for postemergence treatments. The experiment was a randomized complete block design with four replications and plots were 10 by 25 ft. The crop response and weed control were evaluated July 14. Safflower was harvested on October 13.

		Safflower			Percent Control			
Treatment	Rate	Yield	Strd	Inju	Wimu	Ruth	Wioa	Grft
	(oz/A)	(lb/A)	(%)	(%)				
Trifluralin (PPI)	12	1199	0	0	10	90	83	93
Trifluralin (PPI)	16	1227	3	0	0	88	88	94
Trif+Triallate (PPI)	12+16	1091	0	0	0	79	96	94
Pendimethalin (PPI)	20	1101	1	0	0	68	69	78
Ethalfluralin (PPI)	16	1077	4	3	0	90	80	94
Ethalfluralin (PPI)	20	1178	5	3	36	91	91	97
RE-40885 (PPI)	8	1090	0	0	99	88	6	13
RE-40885 (PPI)	16	1087	0	0	99	93	54	64
RE-40885+RE-45601 (PPI)	16+8	1321	1	3	99	99	98	99
RE-40885+Trif (PPI)	16+12	1339	3	3	99	95	78	90
RE-40885/RE-45601 +PO (PPI/P)	16+2	1325	1	1	98	94	99	98
Trif+Fluo (PPI)	12+6	1158	3	1	92	91	84	91
Trif/AC 222,293 (PPI/P)	8+6	1204	1	1	99	85	97	84
Trif/DPX-M6316 +X-77 (PPI/P)	8+0.25	884	0	8	99	98	51	55
Trif/Clsu+X-7 (PPI/P)	8+0.25	697	5	6	99	96	63	69
Trif+Mets+X-77 (PPI/P)	8+0.06	843	3	11	99	98	75	86
DPX-M6316+Seth+PO (P)	0.25+3	735	5	20	94	91	84	89
Untreated Check	0	479	0	0	0	0	0	0
LSD (0.05)		201	NS	6	10	10	25	25

Trif = trifluralin; X-77 = surfactant in the spray at 0.25% v/v; PO = petroleum oil with 17% emulsifier at 1 qt/A.

Summary

RE-40885 applied PPI provided 98% or more control of wild mustard and 88% or more control of Russian thistle without any crop injury. RE-40885 applied PPI alone or with postemergence RE-45601 gave 94% or greater control of all weeds without significant crop injury. AC 222,293 applied postemergence over the top of a reduced rate of trifluralin gave 84% or greater control of all weed control. DPX-M6316, chlorsulfuron and metsulfuron all caused crop injury and lower yields compared to safflower treated only with trifluralin.

Weed control in corn, Casselton, 1986. 'Pioneer 3953' seed corn was planted May 20, 1986 2 inches deep in 30 inch rows in a Fargo silty clay with 5% organic matter and pH 7.0. The experimental design was a randomized complete block with four replications and plots were four 30 inch rows by 30 ft. Preplant incorporated treatments were applied in the morning of May 20, with preemergence treatments applied shortly after planting. Wind was 3 mph and air temperature 60 F. Preplant incorporated treatments were incorporated with two passes of a field cultivator. Postemergence treatments were applied June 4 when corn had 1 to 2 leaves, green foxtail 2 to 3 leaves and wild mustard 2 to 4 leaves, and June 26 when wild mustard were flowering. Wind was 15 mph and air temperature was 74 F. Weed control was evaluated visually July 10.

Treatment	Rate (lb/A)	% weed control Wimu	% weed control Grft
Cycloate+cyanazine(PPI)	4.0+2.0	81	50
EPTC:safener+cyanazine(PPI)	4.0+2.0	93	86
Butylate+cyanazine(PPI)	4.0+2.0	89	21
CGA-180937+cyanazine(PE)	2.0+2.0	54	66
CGA-180937+cyanazine(PE)	4.0+2.0	90	21
Metolachlor+cyanazine(PE)	4.0+2.0	91	84
Metolachlor+cyanazine(PE)	2.0+2.0	69	21
Alachlor+cyanazine(PE)	2.0+2.0	86	20
BAS-51400+cyanazine(PE)	0.5+2.0	98	26
BAS-51400+cyanazine(PE)	1.0+2.0	96	30
Propachlor+atrazine+PPG-1259(PE)	4.0+0.5+0.15	95	85
Propachlor+atrazine+PPG-1259(PE)	4.0+0.75+0.15	96	85
BAS-51400+cyanazine+oil(PO)	0.25+1.2+1.25%	80	20
BAS-51400+cyanazine+oil(PO)	0.5+1.2+1.25%	90	18
BAS-51400+cyanazine+oil(PO)	1.0+1.2+1.25%	83	10
RS-010+cyanazine(PO)	0.9+1.2	81	8
RS-010+dicamba(PO)	0.9+0.25	96	8
Cyanazine+atrazine+oil(PO)	1.5+0.5+1.25%	90	59
Cyanazine+atrazine+dicamba(PO)	1.5+0.5+0.25	94	96
DPX-M6316(PO)	0.031	94	0
DPX-M6316+surfactant(PO)	0.016+0.25%	79	0
DPX-M6316+surfactant(PO)	0.031+0.25%	81	0
DPX-M6316+dicamba(PO)	0.0078+0.125	96	0
Propachlor(PE)+atra+PPG-1259(PO)	4.0+0.5+0.1	94	94
Propachlor(PE)+bent+PPG-1259(PO)	4.0+0.5+0.1	89	93
Propachlor(PE)+2,4-D+PPG-1259(PO)	4.0+0.25+0.1	90	86
Propachlor(PE)+brox+atra(PO)	4.0+0.25+0.125	79	86
Propachlor(PE)+brox+atra(PO)	4.0+0.25+0.33	81	80
Propachlor(PE)+brox+atra(PO)	4.0+0.3+0.4	94	84
Alachlor(PE)+brox+atra(PO)-(10gpa)	1.0+0.188+0.5	93	80
Alachlor(PE)+brox+atra(PO)-(20gpa)	1.0+0.188+0.5	96	74
Alachlor(PE)+brox+cyan+oil(PO)	1.0+0.25+0.5+1.25%	85	91
Alachlor(PE)+brox+cyan(PO)	1.0+0.25+0.5	65	41
Pendimethalin(PE)+cyan+oil(PO)	2.0+1.2+1.25%	94	85
Cyan(PE)+tridiphane+cyan+oil(PO)	1.5+0.5+1.2+1.25%	84	63
Propachlor(PE)+clopyralid(PO)	4.0+2.0	84	84
Propachlor(PE)+clopyralid(PO)	4.0+0.4	83	76
Cyanazine(PE)+clopyralid(PO)	1.5+0.2	98	29
Cyanazine(PE)+clopyralid(PO)	1.5+0.4	85	9
Propachlor(PE)+brox(PO)-(10gpa)	4.0+0.188	90	91
Propachlor(PE)+brox(PO)-(20gpa)	4.0+0.188	89	93
LSD (0.05)		20	23

Summary

Wild mustard control was good with most soil and foliar applied herbicides. Bromoxynil at 0.188 lb/A applied to wild mustard in the flower stage gave good control. Addition of surfactant to DPX M6316 at 0.031 lb/A reduced wild mustard control compared to the equivalent rate of DPX M6316 applied alone. Corn treated with DPX M6316+surfactant was stunted early in the season. However, these symptoms were not apparent later in the season. Green foxtail control was more variable than wild mustard control. EPTC:safener provided better grass control than did butylate or cycloate.

Fall applied herbicides for corn, Casselton, 1986. Herbicide treatments were applied on November 2, 1985. Wind was 2 mph and air temperature was 42 F. 'Pioneer 3953' seed corn was planted May 20, 1986, 2 inches deep in 30 inch rows in a Fargo silty clay with 5% organic matter and pH 7.0. The experimental design was a randomized complete block with four replications and plots were four 30 inch rows by 30 ft.

			% weed control		
Treatment	Rate (lb/A)	Corn injury	Wild mustard	Green foxtail	Kochia
Atrazine	0.5	0	60	10	20
Atrazine	0.75	0	89	69	75
FMC-57020	0.5	90	68	74	51
FMC-57020	1.0	90	58	83	89
Atra + FMC-57020	0.5 + 0.5	73	58	79	93
Atra + FMC-57020	0.75 + 0.5	60	93	90	94
Atra + FMC-57020	0.5 + 1.0	68	89	46	90
Atra + FMC-57020	0.75 + 1.0	71	90	53	91
Mean		56	75	63	75
High mean		90	93	90	94
Low mean		0	58	10	20
Cooeff. of variation		15	13	11	12
LSD (0.5)		12	15	10	13
No. of reps		4	4	4	4

Summary

Corn injury was unacceptable for all treatments containing FMC-57020. Control of wild mustard, green foxtail and kochia was variable. FMC-57020 alone or in combination with Atrazine provided good control of kochia.

Chlorsulfuron soil residual from 1979, Fargo, 1986. The plot area received chlorsulfuron at 1 to 4 oz/A applied at 10 weekly intervals from June 4 to August 6, 1979. 'Lakota' soybeans and lentils were seeded to the area on May 30, 1986 and evaluated on July 18. The area was moldboard plowed in the fall of each year since the 1979 treatments. The 1979 experiment was a split plot with chlorsulfuron rate as main plots and week of application the subplots. Evaluations were over the main plots and the range represents the highest and lowest stand reduction or injury rating for the subplots in the main plot.

Chlorsulfuron (oz/A)	July 1980 % Stand reduction		August 1981 % Stand reduction		July 1982 % Stand reduction	
	Soybean	Sugarbeet	Soybean	Sugarbeet	Soybean	Sugarbeet
1	40-63	75-98	50-60	98-100	40-50	98-100
2	82-87	92-96	75-80	98-100	65-75	98-100
4	95-100	97-100	92-95	98-100	90-95	98-100

Chlorsulfuron (oz/A)	July 1983 % Stand reduction		July 1983 % injury	August 1984 % injury		July 1985 % injury	July 1985 % Strd
	Soybean	Sugarbeet	Soybean	Soybean	Lentils	Soybean	Lentils
1	0	0	0	0	25-35	0	30
2	0	100	50-60	20-30	75-85	40	85
4	0	100	70-80	70-80	100	60	95

1986: No residual was obvious to either lentils or soybean in 1986.

Summary

Chlorsulfuron residual from 1 to 4 oz/A application in 1979 reduced sugarbeet stands 98 to 100% in 1982 regardless of the rate applied. Soybean stands were reduced similarly in 1982 as in 1980 and 1981, except for a trend for less soybean stand reduction in 1982 from chlorsulfuron at 2 oz/A. Chlorsulfuron residues from 1979 applications were still present to injure soybeans and lentils in 1984. Soybean stand was not reduced, but had injury symptoms in 1985. Subplots were only 6 feet wide, but interplot contamination was low as the untreated plots were easily distinguishable. The residue had apparently dissipated prior to 1986 as injury symptoms to soybean or lentils were not discernible. Thus the residue from chlorsulfuron at 4 oz/A remained for 6 years.

Rotational crop response to sulfonylurea herbicides, Fargo, 1985-1986. Herbicide treatments were applied July 1, 1985 to 'Marshall' wheat seeded May 30, 1985. The experimental area was tilled in the long direction of the plots. Tame mustard, lentils, 'Culbert' flax, 'Park' barley, 'Pioneer 9353' corn, 'Seedtech 301' sunflower, 'C 20' navy bean, and 'Lakota' soybean were seeded as bioassay species across the plots on May 30, 1986. Crop injury was evaluated July 1 and July 18.

Treatment	Rate	Sunflower injury	
		July 1	July 18
	(oz/A)	----------(%)---------	
DPX-R9521	0.28	51	19
DPX-E8698	0.50	50	15
Metsulfuron	0.06	41	21
DPX-M6316	0.50	5	1
DPX-L5300	0.50	10	4
No Treatment	0	11	5
C.V. %		50	72
LSD 5%		21	12

DPX-R9521 = DPX-M6316+metusulfuron(4:1); DPX-E8698 = DPX-M6316+ metsulfuron (10:1)

Summary

Treatments containing metsulfuron were the only treatments which caused sunflower injury the year after application. Sunflower injury was expressed as height reduction. Evaluation of the other species was difficult and not presented due to poor stands and stress from water.

Residual carryover of sunflower herbicides, Langdon, 1986. 'Cargill 204' sunflower were seeded and soil applied treatments applied June 7, 1985. Postemergence treatments were applied July 10, 1985. Buckwheat, sudan grass, oats, flax, wheat, rape, tame mustard, and safflower were seeded as bioassay species across the plots in at least two of the four replications of the experiment in the spring of 1986. Herbicide residues were evident from some of the treatments. Residual activity of the herbicides was not confined only to the plot it was applied probably due to movement with tillage and moisture. Treatments which appeared to have the greatest amount of residual activity to injure 1986 crops included AC 222,293, and possibly fluorochloridone and prometryn.

Atrazine residual, Langdon, 1984-1986. Atrazine was applied at 1, 2, and 4 lb/A on June 1, 1984, and corn was grown on the entire area. Flax, soybeans, barley, Hard Red Spring wheat, oats, sunflower, and canola strips were seeded in early June in 1985 and 1986 as bioassay species. Weed control, crop injury and stand reduction were evaluated in 1985 and 1986.

	Atrazine Rate											
	4 lb/A				2 lb/A				1 lb/A			
	1985		1986		1985		1986		1985		1986	
Species	Strd	Inju	Strd	Inju	Strd	Inju	Strd	Inju	Strd	Inju	Strd	Inju
	(%)											
Flax	88	10	12	0	37	13	7	0	7	13	0	0
Soybeans	98	--	28	18	57	23	5	2	3	10	0	0
Barley	100	--	17	2	99	--	3	0	20	7	0	0
HRSW	100	--	57	20	100	--	23	2	37	27	5	3
Oats	100	--	47	13	98	--	17	5	23	10	5	3
Sunflower	100	--	47	33	91	87	23	3	17	40	3	3
Canola	100	--	98	--	90	83	63	20	22	10	15	3
	(% control)											
Grft	52		0		20		0		20		0	
Rrpw	98		50		81		12		30		0	
Prpw	95		50		80		20		20		0	
Coma	100		100		100		80		98		30	

Summary

Flax, soybeans, and barley were the most tolerant crops to atrazine residual. All crop stands were reduced 37% or greater at the 2 lb/A rate and 88% or greater at the 4 lb/A rate one year after atrazine treatment. Wheat, oats, sunflower, and Canola had 17% or greater stand reductions from 2 lb/A after 2 years. No important injury or stand reductions occurred from 1 lb/A after two years, except for Canola. Broadleaf weed control was 80% or greater at 2 and 4 lb/A one year after atrazine treatment.

<u>2,4-D&glyphosate residual activity, Karlsruhe irrigation, 1986.</u> 2,4-D&glyphosate (formulated mixture in a 1/6:0.9 ratio) was applied at 17, 34, and 67 oz/A the same day (0D), 6 days before (6B), and 14 days before (14B) 'Azure' barley, 'Steele' oats, 'Stoa' oats, 'Pioneer 3969' corn seeding. All treatments were applied to the center 8 feet of the 10 feet wide plots with a bicycle wheel type plot sprayer equipped with 8002 nozzles delivering 17 gpa at 35 psi. Bioassay species were seeded May 21. Common lambsquarters and crop species control were evaluated June 3.

Treatment	Rate	Date	Barley	Oats	Wheat	Corn	Colq
	(oz/A)		-----------(% control)-----------				
2,4-D&glyphosate	11+6	14B	0	0	0	0	3
2,4-D&glyphosate	11+6	6B	4	3	4	0	25
2,4-D&glyphosate	11+6	0D	6	5	10	0	58
2,4-D&glyphosate	22+12	14B	4	3	6	0	43
2,4-D&glyphosate	22+12	6B	9	16	14	1	60
2,4-D&glyphosate	22+12	0D	13	10	18	0	60
2,4-D&glyphosate	43+24	0D	20	18	38	10	70
LSD (5%)			6	6	8	1	19

Summary

2,4-D&glyphosate at 17 oz/A, 6 days prior to planting, appeared to have a residual as indicated by 25% control of common lambsquarters. This would also indicated the 2,4-D component was still active in the soil, since the small grain and corn crops were affected much less than the common lambsquarters. No important crop injury occurred with the low rate or the 14 day before seeding applications. Corn appeared to be the most tolerant, and wheat the most sensitive crop.

Sulfometuron for leafy spurge control. Lym, Rodney G. and Calvin G. Messersmith. Sulfometuron is an analog of chlorsulfuron but with less soil residual and a different weed control spectrum. Sulfometuron currently is used for grass suppression along roadsides and also has shown broadleaf weed control of some species including leafy spurge. The purpose of this experiment was to evaluate sulfometuron alone and in combination with auxin herbicides for leafy spurge control.

The experiment was established in cropland near Hunter, ND that was severely infested with leafy spurge. Spring and fall treatments were applied on June 27 and September 4, 1985, respectively. Leafy spurge was 26 to 36 inches tall and beginning seed set in June while fall regrowth following a summer dormancy had begun when treatments were applied in September. The herbicides were applied with 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 replications. Evaluations were based on percent stand reduction as compared to the control.

		Application and evaluation dates				
		June 27,1985			September 4 , 1985	
Treatment	Rate	August 21, 1985	May 29, 1986	August 18, 1986	May 29, 1986	August 18, 1986
	(oz/A)	(% control)				
Sulfometuron	0.5	---	---	---	16	0
Sulfometuron	1	0	6	0	95	7
Sulfometuron	1.5	0	63	25	---	---
Sulfometuron	2	0	36	6	---	---
Sulfometuron+2,4-D	1+16	95	76	26	99	17
Sulfometuron+dicamba	1+32	96	85	40	97	23
Sulfometuron+picloram	1+8	70	96	59	99	74
Sulfometuron+2,4-D	0.5+16	---	---	---	95	24
Sulfometuron+dicamba	0.5+32	---	---	---	97	51
Sulfometuron+picloram	0.5+8	---	---	---	99	40
Sulfometuron+metsulfuron	2+0.5	0	60	24	88	13
DPX-L5300	1	---	---	---	44	6
LSD (0.05)		25	22	26	26	30

Leafy spurge growth stopped following application of sulfometuron alone, regardless of date. Plants treated with sulfometuron in June had chlorotic leaves when evaluated in August and root bud elongation was inhibited. Leafy spurge top growth was killed when treated with sulfometuron plus an auxin herbicide and root bud growth was inhibited. Leafy spurge root buds were white and short on plants treated with sulfometuron, compared to pink elongated buds found on control plants. Sulfometuron plus an auxin herbicide provided better leafy spurge control than sulfometuron alone, and long-term control was better when sulfometuron was mixed with picloram than with 2,4-D or dicamba. Leafy spurge control declined rapidly between the June and August 1986 evaulations. The optimum herbicide application rates and date and the effectiveness of various retreatments will be evaluated to determine if sulfometuron plus an auxin herbicide can provide cost-effective leafy spurge control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

<u>Leafy spurge control with picloram plus various 2,4-D formulations or pH-buffered spray solution</u>. Lym, Rodney G. and Calvin G. Messersmith. Picloram remains the most effective herbicide for leafy spurge control. Previous research at North Dakota State University has shown annual application of picloram + 2,4-D at 0.25 + 1.0 lb/A to be more cost effective than picloram at 1.0 to 2.0 lb/A applied once. The purpose of these experiments was to compare the effect of a mixed amine or alkanolamine formulation of 2,4-D and pH-buffered spray solution with picloram on leafy spurge control.

The 2,4-D formulation experiments were established on the Sheyenne National Grasslands near McLeod, ND on June 15, 1984 and near Hunter, ND on May 30, 1985. The 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 replications. Evaluations were based on percent stand reduction as compared to the control. Picloram plus the mixed amine formulation of 2,4-D provided better leafy spurge control compared to picloram plus 2,4-D alkanolamine (Table). Leafy spurge control with picloram + 2,4-D mixed amine at 0.25 + 1.0 lb/A was similar to picloram at 0.5 lb/A alone and was approximately 30% less expensive. Similarly, leafy spurge control from picloram plus dicamba was greater when applied with 2,4-D mixed amine than with the alkanolamine. Neither 2,4-D formulation alone controlled leafy spurge.

Previous greenhouse research at North Dakota State University has shown increased picloram uptake and translocation to leafy spurge roots when applied in a pH 4.75 buffered solution compared to higher or lower pH solutions. A field experiment to evaluate long-term leafy spurge control with buffered and unbuffered spray solutions was established on June 3, 1985. The experimental methods were similar to the 2,4-D formulated experiments except citric acid was added to the picloram:water solution as necessary to maintain a pH of 4.75. Leafy spurge control was less when the spray solution was buffered to pH 4.75 compared to unbuffered solutions regardless of picloram rate. The buffered spray solution tended to desiccate the leafy spurge leaves which probably resulted in poor herbicide uptake. The temperature was 74 F with 60% relative humidity when the treatments were applied, but buffered picloram solutions in the greenhouse experiments were applied following a topical surfactant application which may have prevented leaf injury. Thus application during a period of high humidity in the field may result in less leaf injury and increased translocation to the roots as shown in greenhouse experiments. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table. Leafy spurge control with picloram alone and in combination with various 2,4-D formulations and a buffer solution. (Lym and Messersmith).

Treatment	Rate (lb/A)	Aug 1984	May 1985	Aug 1985	June 1986	Aug 1986
		(% control)				
2,4-D formulations, Sheyenne, ND						
Picloram	0.25	76	23	4	1	---
Picloram	0.5	95	75	43	10	---
Picloram+2,4-D alkanolamine	0.25+1.0	78	14	6	3	---
2,4-D mixed amine[a]	4.0	47	7	13	0	---
Picloram+2,4-D mixed amine[a]	0.25+1.0	94	72	23	21	---
2,4-D alkanolamine	4.0	42	20	7	5	---
LSD (0.05)		15	25	15	12	
2,4-D formulations, Hunter, ND						
Picloram+dicamba +2,4-D mixed amine[a]	0.25+1.0+2.0	---	---	99	98	89
2,4-D mixed amine[a]	4.0	---	---	6	3	0
2,4-D alkanolamine	4.0	---	---	5	0	0
Picloram+dicamba +2,4-D alkanolamine	0.25+1.0+2.0	---	---	51	51	25
Picloram+dicamba	0.25+1.0	---	---	53	38	15
LSD (0.05)				15	15	15
pH-buffered, Hunter, ND						
Picloram	0.5	---	---	54	30	36
Picloram	1.0	---	---	83	79	46
Picloram+buffer[b]	0.25	---	---	54	11	6
Picloram+buffer[b]	0.5	---	---	29	7	13
Picloram+buffer[b]	1.0	---	---	38	27	24
LSD (0.05)				17	38	36

[a] Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine)-EH736.
[b] Citric acid buffered to pH 4.75.

Leafy spurge control with resulting forage production from several herbicide treatments. Lym, Rodney G. and Calvin G. Messersmith. An experiment to evaluate long-term leafy spurge control and forage production was established at two sites in North Dakota in 1983. The predominate grasses were bluegrass (*Poa* spp.) with occasional crested wheatgrass, smooth brome, big bluestem, or other native grasses. The treatments were selected based on previous research conducted at North Dakota State University and included 2,4-D at 2 lb/A, picloram + 2,4-D at 0.25 + 1 lb/A, picloram at 2 lb/A, and dicamba at 8 lb/A and were applied in August 1983 or June 1984 as fall or spring treatments. The 2,4-D at 2 lb/A and picloram plus 2,4-D treatments were applied annually while the picloram alone and dicamba treatments were reapplied when leafy spurge control declined to 70% or less. Thus, picloram at 2 lb/A was reapplied at Valley City in August 1985 and at Dickinson in June and August 1986. Dicamba at 8 lb/A was reapplied in June 1985 and 1986 at both locations as spring treatments and at Dickinson in September 1985 and at both locations in 1986 as a fall treatment. The plots were 15 by 50 ft with four replications in a randomized complete block design at each site. Forage yields were obtained by harvesting a 4 by 25 ft section with a rotary mower in July 1984, 1985, and 1986. Sub-samples were taken by hand along each harvested strip and separated into leafy spurge and forage so the weight of each component in the mowed sample could be calculated. The samples were oven dried and are reported with 12% moisture content. Economic return was estimated by converting forage production to animal unit days (AUD) and then to pounds of beef at $0.60/lb minus the cost of the herbicide and estimated application cost, i.e. 2,4-D = $2.00/lb ae, dicamba = $11.75/lb ai, picloram = $40.00/lb ai, and application = $2.05/A. The cost of treatments applied in Fall 1986 is not subtracted from the net return.

Most treatments have resulted in an economic loss at Dickinson despite excellent leafy spurge control from several treatments. This site generally receives 8 to 10 inches less precipitation annually than the Valley City location. Total forage production averaged after 3 years across all treatments was 2315 lb/A at Dickinson and 4018 lb/A at Valley City (Table). Leafy spurge control from 2,4-D at 2 lb/A was not satisfactory from spring or fall applications at either site. However, it did provide short term control resulting in an economic gain at Valley City of $31/A and $2/A and at Dickinson of $8/A and $15/A as spring and fall applied treatments, respectively. Leafy spurge control with picloram + 2,4-D at 0.25 + 1 lb/A averaged over both locations was 67% as a spring applied treatment which was an increase from 44% control in 1985. Above average precipitation was received at both locations in 1986 allowing vigorous leafy spurge regrowth. The stems were only 3 to 5 inches tall but numerous in August 1986. Leafy spurge control was poor with picloram + 2,4-D at 0.25 + 1 lb/A fall applied, but average forage production of 2989 lb/A was only slightly less than the spring average of 3484 lb/A.

Picloram at 2 lb/A spring applied provided 94% leafy spurge control at Valley City and 53% control at Dickinson 36 months after application (Table). Dicamba generally gave good leafy spurge control as a fall but not as a spring applied treatment. All treatments have reduced leafy spurge production compared to the control except the fall application of 2,4-D at 2 lb/A at Valley City. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table. Leafy spurge control, forage production and estimated net return from several herbicide treatments at two sites in North Dakota.

Original treatment date: Herbicide	Rate (lb/A)	Re-treatment time: Herbicide	Rate (lb/A)	Year	Cost ($/A)	Control June (%)	Control Aug (%)	Yield[a] Forage (lb/A)	Yield[a] Leafy spurge (lb/A)	Utilization (AUD)	Total net return[b] ($/A)
						Valley City					
Spring 1984		**Spring**									
2,4-D	2	2,4-D	2[c]	84-86	18	0	24	3266	2475	82	31
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25[c] +1	84-86	42	31	74	4188	1480	105	21
Picloram	2	...	...	...	82	94	86	4401	1266	110	-16
Dicamba	8	Dicamba	8[d]	85,86	288	30	97	3868	1509	97	-230
Fall 1983		**Fall**									
2,4-D	2	2,4-D	2[c]	84-86	18	0	0	2580	3220	65	21
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-86	42	37	8	3950	2120	99	17
Picloram	2	Picloram	2[d]	85	164	98	94	5227	256	131	-85
Dicamba	8	Dicamba	8[d]	86	192	84	58	4662	660	117	-122
		Control						3814	3738	0	
LSD (0.05)						17	18	770	587		
						Dickinson					
Spring 1984		**Spring**									
2,4-D	2	2,4-D	2[c]	84-86	18	0	18	1767	293	44	8
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-86	42	35	59	2779	105	69	-1
Picloram	2	Picloram	2[d]	86	164	53	96	2759	84	69	-123
Dicamba	8	Dicamba	8[d]	85,86	288	38	72	1960	136	49	-259
Fall 1983		**Fall**									
2,4-D	2	2,4-D	2[b]	84-86	18	0	4	2176	646	55	15
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-86	42	14	3	2027	856	51	-12
Picloram	2	Picloram	2[d]	86	164	71	35	2714	35	68	-41
Dicamba	8	Dicamba	8[d]	85,86	288	96	42	2334	54	58	-157
		Control				0	0	1907	1348	0	
LSD (0.05)						13	23	613	283		

[a] Total production of 1984, 1985 and 1986 harvest.
[b] Total net return for 1984, 1985 and 1986. Fall 1986 treatment cost is not subtracted from net return.
[c] Annual retreatment.
[d] Applied when control declines to less than 70%.

Spring or fall applied granular picloram and dicamba for leafy spurge control in North Dakota. Lym, Rodney G. and Calvin G. Messersmith. Granular and liquid formulations of picloram and dicamba were compared for leafy spurge control in two experiments established in 1980 on June 25 and September 3 near Valley City. Eight experiments to compare picloram 2% and 10%G formulations were established on September 14, 1982 and June 10, 1983 near Sheldon, September 9, 1982, June 21, 1983, and June 13 and September 11, 1984 near Dickinson, and June 14 and September 18, 1984 in the Sheyenne National Grasslands. Blank pellets were included in the experiments conducted at Sheldon so the number of pellets applied per plot was similar to improve uniformity of distribution of the picloram 10%G formulation. All experiments were in a randomized complete block design with four replications and 10 by 30 ft plots. The granules were applied uniformly by hand, while the liquid formulations were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Evaluations were based on percent stand reduction compared to the control. A significant interaction between site and treatments occurred, so experimental sites will be discussed individually.

Leafy spurge control with picloram and dicamba was better from fall than spring applied treatments at Valley City, especially when evaluated 24 to 60 months after treatment (Table 1). The control averaged across all treatments after 24, 48, and 60 months was 54, 22, and 13% for spring applications and 78, 62, and 26% for fall applications, respectively. Fall applied dicamba at 8 lb/A and picloram at 2 lb/A as liquids provided similar control after 5 years, but control with granular picloram was better than with granular dicamba. Dicamba and picloram applied in the spring of 1980, generally did not give satisfactory leafy spurge control by 1982 and 1983, respectively. The exception was picloram at 2 lb/A which provided satisfactory control until 1984. Only fall applied picloram 2%G at 1.5 and 2 lb/A provided satisfactory leafy spurge control after 48 months at 83 and 86%, respectively, but no treatment provided satisfactory control 60 months after application.

Picloram 2%G and 10%G at equal rates generally provided similar leafy spurge control at both Sheldon and Dickinson (Table 2). Fall applications of picloram 2%G and 10%G at all application rates, except 2.0 lb/A, provided better leafy spurge control after 9 months than spring applications after 3 months. This difference could be due to insufficient moisture to completely disperse the granules following the June application, because the treatments generally were similar 12 and 24 months after application. Leafy spurge control in 1985 at Sheldon was similar to control in 1984. However, the treatments at Dickinson did not provide satisfactory leafy spurge control in 1985, so specific evaluations were not taken. The soil at Sheldon is very sandy compared to the mostly clay soil at Dickinson which may have allowed deeper picloram movement in the soil profile and thus better long-term leafy spurge root control at Sheldon than Dickinson.

Leafy spurge control with picloram at 1 and 2 lb/A was similar for the 2%G and 10%G when blanks were added, but was much worse with 10%G than 2%G pellets without blanks (Table 2). The picloram 2%G and 10%G pellets were similar in size and 80% fewer pellets per acre are applied with picloram 10%G than with 2%G. Thus, uniform distribution with hand-held application equipment was difficult which probably accounted for the decreased control. Visible grass injury was negligible with either picloram formulation. In general, leafy spurge control with picloram at 2 lb/A declined more rapidly when the liquid (2S) formulation was used compared to 2%G or 10%G.

Similar experiments were begun in 1984 using a new formulation of picloram 10%G with smaller pellets which resulted in more pellets per square foot than the previous 10%G formulation at similar rates. Picloram 2%G and 10%G gave similar leafy spurge control at all application rates except 0.5 lb/A (Table 3). Blanks were not mixed with the new 10%G formulation, but a uniform distribution still was obtained. Control was much lower at Dickinson than at Sheyenne which again probably was due to deeper picloram movement in the sandy soil at Sheyenne than in the clay soil at Dickinson. Unlike previous experiments, spring application of picloram granules provided better leafy spurge control than fall applications when evaluated 12 months after treatment. Fall precipitation was below normal and the soil was very dry until late October in 1984. The dry soil conditions after application apparently caused poor long-term control despite adequate moisture in 1985.

Granular and liquid formulations of dicamba and picloram generally provided similar control at comparable rates. Picloram 2%G and 10%G provided similar leafy spurge control either when blanks were included with the 10%G pellets or when the number of 10%G pellets per square foot was increased by use of a smaller pellet. Generally spring and fall treatment provided similar long-term control except when application was made during very dry conditions. Picloram granules provided better long-term control in sandy compared to clay soils. (Published with the approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table 1. Spring and fall applied granular picloram and dicamba for leafy spurge control at Valley City, ND.

		Application and evaluation date																			
		Spring treatment (25 June 1980)									Fall treatment (3 Sept 1980)										
Herbicide	Rate	6-81	9-81	6-82	9-82	6-83	9-83	6-84	9-84	6-85	6-81	9-81	6-82	9-82	6-83	9-83	6-84	9-84	6-85	8-85
	(lb/A)	(% control)																		
Picloram 2%G	1.0	97	80	53	25	44	22	10	8	3	95	86	84	55	76	52	51	52	18	10
Picloram 2%G	1.5	98	89	87	22	77	38	29	26	11	99	100	100	96	98	97	87	83	59	48
Picloram 2%G	2.0	99	98	90	53	85	72	56	62	28	100	100	99	100	100	98	93	86	68	63
Dicamba 5%G	4.0	74	55	9	3	4	0	4	0	0	94	74	43	31	31	29	18	20	17	9
Dicamba 5%G	6.0	82	54	25	3	16	5	4	3	1	96	99	89	58	55	55	41	40	22	6
Dicamba 5%G	8.0	91	75	45	19	29	6	5	6	0	99	100	98	83	84	78	66	67	39	20
Picloram 2S	2.0	100	99	98	90	94	79	64	71	54	100	100	100	100	98	94	79	78	50	28
Dicamba 4S	8.0	94	74	28	12	42	13	7	5	4	99	99	100	97	92	83	69	72	47	33
LSD (0.05)		9	14	21	17	20	11	11	12	20	3	10	22	29	24	24	29	23	26	23

Table 2. Leafy spurge control using picloram 2%G and 10%G of similar size.

Picloram formulation	Rate	Evaluation date									
		1983		1984		1985		1983		1984	
		June	Aug	June	Aug	June	Aug	June	Aug	June	Aug
	(lb/A)	(% control)									
		Sheldon						Dickinson			
Applied Fall 1982											
2%G+blanks	0.5	66	26	8	21	11	16	38	5	18	5
2%G+blanks	1.0	86	41	29	33	31	18	69	15	42	13
2%G+blanks	1.5	87	67	48	48	47	24	90	37	71	51
2%G	2.0	99	76	80	66	71	44	96	53	79	64
10%G+blanks	0.5	39	11	3	31	0	0	34	9	19	0
10%G+blanks	1.0	83	60	52	56	39	30	84	21	45	36
10%G+blanks	1.5	81	60	43	58	54	38	88	35	55	47
10%G+blanks	2.0	87	63	77	56	65	45	89	40	75	64
10%G	1.0	53	26	11	13	18	13	--	--	--	--
10%G	2.0	89	61	45	45	52	57	--	--	--	--
Liquid (2S)	2.0	94	67	55	44	30	35	94	42	60	41
LSD (0.05)		16	30	19	23	24	25	18	28	30	33
Applied Spring 1983											
2%G+blanks	0.5	--	28	27	10	21	8	--	38	28	12
2%G+blanks	1.0	--	38	58	13	55	14	--	57	53	43
2%G+blanks	1.5	--	86	95	36	92	50	--	62	83	60
2%G	2.0	--	97	94	69	93	62	--	76	89	65
10%G+blanks	0.5	--	26	11	6	18	4	--	25	20	2
10%G+blanks	1.0	--	54	61	16	52	28	--	32	42	23
10%G+blanks	1.5	--	74	70	26	58	35	--	78	75	56
10%G+blanks	2.0	--	92	92	56	92	56	--	63	76	70
Liquid (2S)	2.0	--	93	79	39	76	57	--	96	94	51
LSD (0.05)			22	14	14	23	15	--	23	19	29

Table 3. Leafy spurge control using picloram 2%G, 10%G, and 2S as spring or fall applied treatment.

Picloram formulation	Rate	Evaluation date							
		1984	1985		1986		1984	1985	
		Aug	June	Aug	June	Aug	Aug	June	Sept
	(lb/A)	(% control)							
Applied Spring 1984		Sheyenne					Dickinson		
2%G	0.5	83	89	53	56	34	0	0	0
2%G	1.0	96	99	83	79	54	38	48	8
2%G	1.5	96	100	97	95	91	43	62	13
2%G	2.0	98	100	98	98	94	83	88	53
10%G	0.5	64	75	19	4	4	3	0	4
10%G	1.0	95	99	84	86	82	31	43	23
10%G	1.5	97	99	94	93	86	56	45	16
10%G	2.0	97	99	94	94	86	72	56	31
Liquid (2S)	2.0	98	100	99	98	94	98	80	28
LSD (0.05)		8	10	16	17	24	23	24	21
Applied Fall 1984									
2%G	0.5	--	94	57	76	7	--	71	16
2%G	1.0	--	100	91	91	74	--	85	39
2%G	1.5	--	100	96	98	83	--	97	56
2%G	2.0	--	100	97	97	86	--	98	81
10%G	0.5	--	82	42	43	6	--	46	15
10%G	1.0	--	96	81	66	52	--	79	36
10%G	1.5	--	99	91	89	81	--	91	45
10%G	2.0	--	99	91	96	73	--	95	68
Liquid (2S)	2.0	--	100	99	97	88	--	99	47
LSD (0.05)		--	6	16	14	26	--	9	17

<u>Leafy spurge control with various picolinic acid herbicides</u>. Lym, Rodney G. and Calvin G. Messersmith. Picloram is the main herbicide used for leafy spurge control. Picloram is often applied at 1 to 2 lb/A for long-term control or at 0.25 to 0.5 lb/A as an annual treatment. The use of picloram, especially near open water or in areas with high water tables has been criticized because of its high water solubility, potential to leach into groundwater and high phytotoxicity. The purpose of these experiments was to compare several picolinic acid herbicides both alone and in combination with 2,4-D or picloram for leafy spurge control.

The experiments were established near Hunter, ND on June 3, 1985. Leafy spurge was 18 to 24 inches tall and beginning seed set. Plots were 10 by 30 ft in a randomized complete block design with four replications. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The weather was partly cloudy and 64 F with 60% relative humidity and the soil temperature at 2 inches was 64 F. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

The first experiment compared clopyralid, fluroxypyr and triclopyr alone and in various combinations to picloram for leafy spurge control. Clopyralid alone did not control leafy spurge and tended to reduce control when combined with picloram compared to picloram alone (Table 1). Picloram at 1 lb/A averaged 93 and 81% control compared to 77 and 43% control when combined with clopyralid at 1 lb/A 12 and 14 months after application, respectively. Fluroxypyr and triclopyr provided moderate leafy spurge control the season of application. Control decreased when fluroxypyr or triclopyr were combined with clopyralid and when triclopyr was combined with 2,4-D. Picloram at 1 and 2 lb/A gave 81 and 95% leafy spurge control, respectively, 15 months following application. No other treatment provided satisfactory leafy spurge control at the 15-month evaluation.

Previous research at North Dakota State University has shown that picloram at 0.25 to 0.5 lb/A plus 2,4-D at 1 lb/A provides increased control of leafy spurge compared to picloram alone at similar rates. The second experiment was designed to determine whether a similar enhancement of leafy spurge could be obtained by adding 1 lb/A of 2,4-D to low application rates of clopyralid, fluroxypyr, triclopyr, and dicamba. No treatment provided satisfactory leafy spurge control by August 1985 (Table 2).

Picloram alone or with 2,4-D provided better leafy spurge control than other picolinic acid herbicides or dicamba. Previous research has shown that picloram uptake and translocation are not increased when applied with 2,4-D. Metabolism studies are in progress to determine why this combination treatment provides synergistic leafy spurge control. Whatever the mechanism, it apparently does not function with other picolinic acid herbicides or dicamba. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table 1. Leafy spurge control with various picolinic acid herbicides.

Treatment	Rate	Evaluation date		
		21 Aug 1985	29 May 1986	18 Aug 1986
	(lb/A)	(% control)		
Triclopyr	4	28	28	5
Triclopyr	8	55	42	20
Triclopyr+clopyralid	2+2	6	5	4
Triclopyr+clopyralid	3+3	1	12	18
Triclopyr+2,4-D	0.5+1	3	0	0
Triclopyr+2,4-D	1+2	9	15	5
Picloram	0.5	75	23	9
Picloram	1	93	93	81
Picloram	2	100	97	95
Picloram+clopyralid	0.25+0.25	41	23	21
Picloram+clopyralid	0.5+0.5	61	33	11
Picloram+clopyralid	1+1	95	77	43
Clopyralid	2	6	3	5
Clopyralid	4	0	0	0
Clopyralid+fluroxypyr	0.5+0.5	14	4	1
Clopyralid+fluroxypyr	1+1	29	13	4
Clopyralid+fluroxypyr	2+2	14	3	0
Fluroxypyr	1	40	15	21
Fluroxypyr	2	22	0	0
Fluroxypyr	4	64	33	2
LSD (0.05)		25	27	27

Table 2. Leafy spurge control with 2,4-D combined with various auxin herbicides.

Treatment	Rate	Evaluation date	
		21 August 1985	29 May 1986
	(lb/A)	(% control)	
Triclopyr+2,4-D	0.5+1	13	2
Triclopyr+2,4-D	1+1	1	2
Clopyralid+2,4-D	0.5+1	0	1
Clopyralid+2,4-D	1+1	0	0
Fluroxypyr+2,4-D	0.5+1	0	1
Fluroxypyr+2,4-D	1+1	0	6
Triclopyr+clopyralid	0.5+0.5	0	0
Dicamba+2,4-D	0.5+1	0	4
Dicamba+2,4-D	1+1	11	2
LSD (0.05)		5	5

Leafy spurge control with low rate annual picloram and 2,4-D combination treatments. Lym, Rodney G. and Calvin G. Messersmith. Previous research at North Dakota State University has shown that annual treatments of picloram + 2,4-D for 3 to 5 years will give leafy spurge control similar to expensive high rate picloram treatments. Picloram + 2,4-D at 0.25 + 1 lb/A generally gives 20 to 30% better leafy spurge control than picloram at 0.25 lb/A alone, but the benefit of a herbicide combination declines as the picloram or 2,4-D rate increases. Picloram + 2,4-D at 0.5 + 1 lb/A tends to give only 5 to 10% better control than picloram at 0.5 lb/A alone. The purpose of this experiment was to evaluate long-term leafy spurge control from annual treatments of picloram + 2,4-D amine at relatively low application rates.

The experiment was established at four locations in North Dakota. Spring treatments were applied on June 13, 18 and 19, 1984 at Dickinson, Hunter, and Valley City, respectively, and the fall treatments were applied on September 5 and 18, 1984 at Valley City and the Sheyenne National Grasslands near McLeod, respectively. The soil was a loamy fine sand at Dickinson, a silty clay loam at Hunter, Sheldon and the Sheyenne National Grasslands, and a loam at Valley City. Dickinson, located in western North Dakota, generally receives much less precipitation than the other two sites located in eastern North Dakota. The spring and fall treatments were applied annually in June or September 1984 and 1985. The herbicides were applied with 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 replications except at Hunter which had 8 by 25 ft plots and 3 replications. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

The results from the Dickinson location were different than the other sites and will be discussed separately. Picloram at 0.12, 0.25, 0.38, and 0.5 lb/A provided 2, 28, 63 and 67% leafy spurge control, respectively, as a spring applied treatment at Hunter and Valley City but only 0, 1, 6, and 27% control, respectively, as a fall applied treatment at Sheyenne and Valley City when evaluated 24 months following initial application (Table). The addition of 2,4-D to picloram tended to increase leafy spurge control slightly from spring but not fall applied treatments. The slight increase in control was similar regardless of 2,4-D rate. The increased leafy spurge control obtained when 2,4-D was applied with picloram as a spring treatment was not found when similar treatments were fall applied. Leafy spurge generally begins regrowth in mid to late-July following a fall application and had become reestablished by the following fall. However, spring applied treatments generally maintained control all season and regrowth was typically 0 to 3 inches tall when a killing frost occurred. This limited growth may predispose the plants to winter kill and allow gradually increased control.

The reason for poor control at Dickinson compared to the other locations is not known. A similar experiment begun in 1981 at the same location has resulted in annually increased leafy spurge control. This location has received above average precipitation for the last 24 months and the leafy spurge may be growing more vigorously than previously.

This experiment must be continued for several years to determine whether the presently used picloram at 0.25 to 0.5 lb/A + 2,4-D at 1 lb/A treatment is the most cost effective application rate for an annual leafy spurge control program or whether the picloram and/or 2,4-D rate can be reduced and still maintain acceptable control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table. Leafy spurge control from annual picloram or picloram plus 2,4-D amine treatments spring or fall applied at four locations in North Dakota.

		Application time/location/1986 evaluation date											
		Spring							Fall				
		Hunter		Dickinson		Valley City			Sheyenne		Valley City		
Treatment	Rate	May 29	Aug 18	June 10	Sept 16	June 3	Aug 20	Mean[a]	May 30	Aug 24	June 3	Aug 20	Mean[b]
	(lb/A)	(% control)											
Picloram	0.12	4	7	0	18	0	39	2	42	0	3	0	0
Picloram	0.25	14	37	0	28	39	88	28	67	0	25	1	1
Picloram	0.38	68	80	10	29	60	90	63	74	9	56	3	6
Picloram	0.5	67	88	19	16	67	90	67	89	16	92	38	27
Picloram+2,4-D	0.12+0.12	3	12	3	31	51	41	30	72	0	32	8	4
Picloram+2,4-D	0.12+0.25	2	13	1	18	6	56	4	62	8	12	0	4
Picloram+2,4-D	0.12+0.5	0	7	5	35	17	65	10	67	2	7	0	1
Picloram+2,4-D	0.25+0.12	23	87	3	21	28	89	26	70	5	19	1	3
Picloram+2,4-D	0.25+0.25	11	68	11	45	26	54	21	64	0	18	1	1
Picloram+2,4-D	0.25+0.5	22	75	8	35	35	68	29	58	2	35	6	4
Picloram+2,4-D	0.38+0.12	46	85	6	23	54	80	50	81	15	56	11	13
Picloram+2,4-D	0.38+0.25	82	96	10	34	61	84	70	75	6	48	3	4
Picloram+2,4-D	0.38+0.5	42	87	18	34	78	88	63	89	18	64	3	10
Picloram+2,4-D	0.5+0.12	85	95	6	61	89	90	87	78	15	75	8	11
Picloram+2,4-D	0.5+0.25	84	96	15	36	67	96	74	93	22	89	18	20
Picloram+2,4-D	0.5+0.5	70	92	11	30	89	95	80	94	18	81	15	17
Picloram+2,4-D	0.25+1.0	15	53	16	23	69	90	46	92	12	63	6	9
LSD (0.05)		20	19	11	NS	37	29	23	28	NS	31	15	11

[a] Average control at Hunter and Valley City 24 months following the original 1984 treatment date.
[b] Average control 24 months following the original 1984 treatment date.

Picloram and 2,4-D combination treatments for long-term leafy spurge management. 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 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 years. The purpose of this experiment is 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 1981 at Sheldon and on 11 June 1982 at Valley City. The soil at Dickinson was a loamy fine sand with pH 6.6 and 3.6% organic matter, at Sheldon was a fine sandy loam with pH 7.7 and 2.1% organic matter, and at Valley City was 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 treatments were applied in late August 1981 and in June of 1982 through 1986. The Sheldon location was discontinued following the fall evaluations in 1985. Thus, the Dickinson site has received six picloram and picloram plus 2,4-D treatments and 11 2,4-D treatments, while the Valley City site has received five and ten treatments, respectively. The plots were 10 by 30 ft and each treatment was replicated four times in a randomized complete block design at all sites. Evaluations were based on percent stand reduction as compared to the control.

Picloram at 0.25, 0.375 and 0.5 lb/A provided 58, 77 and 86% leafy spurge control, respectively, 48 months after treatment when averaged across all locations (Table). Control had gradually increased for all picloram treatments over the experiment. 2,4-D alone provided an average of 50% control of leafy spurge after biannual applications for 5 years.

Leafy spurge control increased when 2,4-D was applied with picloram at 0.25 or 0.375 lb/A (Table). Leafy spurge control increased an average of 26 and 14% with picloram at 0.25 or 0.375 lb/A plus 2,4-D at 1 to 2 lb/A, respectively, when compared to the same picloram rate applied alone 48 months after treatment. Picloram at 0.5 lb/A plus 2,4-D provided an average of 95% leafy spurge control and was similar to picloram at 0.5 lb/A alone at 8%. The greatest enhancement with 2,4-D plus picloram seems to be with 2,4-D at 1.5 lb/A or less and picloram at 0.375 lb/A or less. In general, leafy spurge control has been similar at all sites and does not seem to be influenced by soil types, pH, or organic matter. However, leafy spurge control at Dickinson had declined in 1986 compared to 1985 which probably was due to above average precipitation and excellent growing conditions in 1986 following several years of below average precipitation. After six treatments with picloram at 0.5 lb/A alone and all picloram plus 2,4-D treatments are near or have reached the target of 90 to 100% leafy spurge control. Some type of treatment will need to be continued to maintain control, but perhaps more economical treatments will sustain the target control level.

Table. Leafy spurge control from annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments at two locations in North Dakota.

		Site and 1986 evaluation date							
		Dickinson		Valley City		Months after treatment			
Herbicide	Rate	June	Sept.	June	Aug.	12[a]	24	36	48
	(lb/A)	(% control)							
Picloram	0.25	52	48	43	81	39	48	48	58
Picloram	0.375	62	76	82	82	65	62	52	77
Picloram	0.5	70	76	68	78	65	71	81	86
2,4-D bian	1	40	47	28	46	22	30	38	50
2,4-D bian	1.5	36	25	50	41	22	24	26	45
2,4-D bian	2	33	24	65	53	19	30	26	54
Pic+2,4-D	0.25+1	77	83	69	87	52	66	63	85
Pic+2,4-D	0.25+1.5	67	77	62	82	58	66	70	85
Pic+2,4-D	0.25+2	67	73	84	82	57	62	66	83
Pic+2,4-D	0.375+1	82	83	81	90	69	72	70	90
Pic+2,4-D	0.375+1.5	87	91	84	89	68	74	76	93
Pic+2,4-D	0.375+2	79	85	91	89	68	59	76	91
Pic+2,4-D	0.5+1	84	92	91	93	71	75	84	94
Pic+2,4-D	0.5+1.5	80	90	97	94	64	73	80	97
Pic+2,4-D	0.5+2	83	99	94	94	76	75	81	95
LSD (0.05)		19	20	23	16	18	14	19	14

[a] Mean values include data from the Sheldon location which was discontinued after 1985.

<u>Leafy spurge control following a seven-year management program</u>. Lym, Rodney G. and Calvin G. Messersmith. An experiment to evaluate long-term leafy spurge management was established at four sites (Sheyenne National Grassland near McLeod, Sheldon and two near Valley City) in North Dakota in 1980. All sites were established in early June except one site at Valley City which was established in September 1980. The herbicides applied in 1980 included 2,4-D and picloram as liquid (2S) and granule (2%G) formulations, and picloram applied using the roller and pipe-wick applicators. The conventional broadcast treatments were applied using a tractor-mounted sprayer delivering 8 gpa water at 35 psi. A granular applicator was used to apply the picloram 2%G treatments. Solution concentration in the roller was 0.25 lb/gal; this is the same solution concentration as picloram at 2 lb/A sprayed at 8.5 gpa. The solution concentration was increased for the pipe-wick applicator to picloram at 0.5 lb/gal since the pipe-wick applied about half the total volume per acre as the roller applicator. The roller and pipe-wick applicator height was adjusted to treat the top one-half of the tallest leafy spurge stems. The additive in the roller and pipe-wick treatments was a 5% (v:v) oil concentrate (83% paraffin based petroleum oil plus 15% emulsifier). The plots were 15 by 150 ft and treatments were replicated twice at each site in a randomized complete block design. Each plot was divided into six 7.5 by 50 ft subplots and retreatments of 2,4-D, picloram 2S, dicamba or no treatment were applied in June 1981 except the fall Valley City site which was retreated in August 1981.

Original 1980 whole plot treatments were reapplied in 1982 with several of the treatments changed. A carpet applicator was substituted for the roller applicator. The granular picloram treatments were replaced by picloram applied with the pipe-wick or carpet applicator with two passes, the second pass in the opposite direction to the first. Dicamba at 8 lb/A spray applied replaced the picloram plus oil concentrate pipe-wick applied treatment. The carpet applicator was designed by Magnolia Spray Equipment Corp., Jackson, MS, and consists of a 1 by 8 ft carpet attached to a rectangular spray box. The herbicide solution was sprayed onto the backside of the carpet through nozzles inside the spray box. Excess solution was returned to the spray tank. The picloram solution on the carpet applicator was 0.25 lb/gal and 0.4 lb/gal for two and one pass applications, respectively. The whole plots were retreated in 1982 with the original treatment except picloram at 2 lb/A was reapplied to the control subplot only since subplots receiving annual retreatments maintained satisfactory leafy spurge control. The experimental site at the Sheyenne National Grasslands was treated in the fall of 1982 to establish an equal number of spring and fall treatment sites. Subplot retreatments were applied again in 1983, 1984, and 1985. Evaluations are based on visual percent stand reduction as compared to the control.

In general, leafy spurge control was higher from spring applied treatments compared to similar fall applied treatments (Table). Previous research at North Dakota State University has shown spring or fall applied treatments to give similar leafy spurge control; however, in this study the fall treatments were applied to leafy spurge plants that had been harvested from yield in July of each year through 1984. Thus, the plants were shorter and in the vegetative growth stage compared to the normal fall growth stage. This reduced the plant leaf area treated and may have resulted in less herbicide uptake and translocation. The plants were not mowed in 1985 so this variable should not affect control from fall treatments in the future.

Picloram (2S) at 1 and 2 lb/A provided the best long-term leafy spurge control regardless of retreatment (Table). Picloram at 1 and 2 lb/A provided 45% control when averaged over rate and date but control increased to 78 and 57% for spring and fall, respectively, when averaged over dicamba and picloram retreatments. Thus, when higher rates of picloram are applied every few years, there is little advantage in using more than 1 lb/A initially when annual retreatments are applied.

Dicamba at 8 lb/A alone spring applied averaged 20% control, but control increased to 80 and 99% with retreatments of dicamba at 2.0 lb/A or picloram + 2,4-D at 0.25 + 1 lb/A (Table). Leafy spurge control from fall applied dicamba at 8 lb/A averaged 6% and increased to an average of 62% following retreatments of picloram at 0.25 lb/A, picloram + 2,4-D at 0.25 + 1 lb/A or dicamba at 2 lb/A.

Annual application of 2,4-D, the most economical treatment in the study provided 0 and 15% leafy spurge control as a fall and spring applied treatment, respectively (Table). Leafy spurge control was increased to 84% when the 2,4-D original treatment was retreated with picloram + 2,4-D at 0.25 + 1 lb/A annually in the spring, but the same fall applied treatment provided only 19% control.

The annual retreatments that provided the highest leafy spurge control were picloram + 2,4-D at 0.25 + 1 lb/A and dicamba at 2 lb/A (Table). These retreatments averaged 85 and 56% leafy spurge control as spring and fall applied treatments, respectively, when averaged over all whole plot treatments. Annual retreatments of 2,4-D or dicamba at 1 lb/A averaged only 53 and 25% leafy spurge control as spring and fall applied treatments averaged over whole plot treatments, respectively. Leafy spurge control was increased 25% when 2,4-D was added to picloram at 0.25 lb/A compared to picloram at 0.25 lb/A alone as an annual treatment spring applied, but not when fall applied. Thus, the most practical retreatment when considering both cost and control were picloram at 0.25 lb/A alone in the fall or picloram + 2,4-D at 0.25 + 1 lb/A spring applied, but dicamba at 2 lb/A would be the retreatment of choice where picloram could not be applied such as in areas with a water table 10 ft or less below the surface.

No treatment using a reduced-volume applicator maintained satisfactory control alone. The reduced volume applicators would not have an economic advantage if several annual retreatments were required for satisfactory leafy spurge control. Several herbicide treatment alternatives provided 90% or more leafy spurge control 6 years after the initial treatment, but no treatment program had eradicated leafy spurge.

Table. Leafy spurge control in North Dakota following a seven-year management program.

Whole Plot: Treatment[a] 1980	Whole Plot: Rate (lb/A)	Whole Plot: Soln conc[b] (lb/gal)	Treatment[a] 1982	Rate (lb/A)	Soln conc[b] (lb/gal)	Retreatment subplot 1981, 1983-86/rate lb/A: 2,4-D 1.0	Dicamba 1.0	Dicamba 2.0	Picloram 0.25	Picloram +2,4-D 0.25+1.0	Control 0	Mean
						(% control)						
Spring applied												
2,4-D	2.0	0.24	2,4-D	2.0	0.24	14	41	76	68	84	15	50
Picloram 2%G	1.0	--	Picloram (carpet-2 pass)	--	0.25	51	39	67	64	88	0	51
Picloram 2%G	2.0	--	Picloram (wick-2 pass)	--	0.5	81	74	87	86	95	65	81
Picloram 2S	1.0	0.13	Picloram 2S	1.0	0.13	66	58	98	75	90	45	72
Picloram 2S	2.0	0.25	Picloram 2S[c]	2.0	0.25	55	83	75	62	86	27	64
Picloram (Roller)	--	0.25	Picloram (carpet)	--	0.25	54	49	76	46	91	25	57
Picloram+oil conc. (Roller)	--	0.25	Picloram (carpet)	--	0.25	52	67	83	85	91	30	68
Picloram (Wick)	--	0.5	Picloram (wick)	--	0.5	18	38	70	50	87	0	44
Picloram+oil conc. (Wick)	--	0.5	Dicamba	8.0	1.0	74	49	80	77	99	20	67
Control	--	--	Control	--	--	15	63	92	60	85	0	53
Mean						50	56	80	67	90	24	
LSD (0.05) whole plot = 11 subplot = 10 whole plot x subplot = 30												
Fall applied												
2,4-D	2.0	0.24	2,4-D	2.0	0.24	0	22	32	33	19	0	18
Picloram 2%G	1.0	--	Picloram (carpet-2 pass)	--	0.25	8	45	48	38	55	16	35
Picloram 2%G	2.0	--	Picloram (wick-2 pass)	--	0.5	37	28	61	55	52	24	43
Picloram 2S	1.0	0.13	Picloram 2S	1.0	0.13	17	33	58	50	63	42	44
Picloram 2S	2.0	0.25	Picloram 2S[c]	2.0	0.25	37	48	75	55	76	50	57
Picloram (Roller)	--	0.25	Picloram (carpet)	--	0.25	19	23	70	38	47	18	36
Picloram+oil conc. (Roller)	--	0.25	Picloram (carpet)	--	0.25	43	48	78	56	73	25	54
Picloram (Wick)	--	0.5	Picloram (wick)	--	0.5	8	31	54	32	35	9	28
Picloram+oil conc. (Wick)	--	0.5	Dicamba	8.0	1.0	14	21	62	65	60	6	38
Control	--	--	Control	--	--	0	15	47	44	42	0	25
Mean						18	31	59	46	52	19	25
LSD (0.05) whole plot = 15 subplots = 12 whole plot x subplot = 37												

[a] Spray applied except the treatments identified as roller, wick or carpet applicator applied.
[b] Herbicide:water (v/v)
[c] Applied to control subplot only.

Perennial sowthistle control in wheat with experimental herbicides. Messersmith, Calvin G. and Rodney G. Lym. Herbicides that provide both annual and perennial weed control with one application are more cost effective than treatments that require separate applications. Several experimental herbicides were applied in two experiments at the Langdon Experiment Station on June 5, 1985 to 'Coteau' hard red spring wheat in the 3- to 5-leaf stage with some plants tillering. The perennial sowthistle plants varied from just emerging to rosettes with 6 to 8 leaves. Experiments were established in a randomized complete block design with four replications, and plots were 8 by 20 feet. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiments were evaluated visually on June 20 and July 25, 1985 and June 24, 1986 for percent perennial sowthistle control based on reduction of weed density compared to the control and for percent injury to wheat. The wheat density at this field border site was not uniform and yield was not determined.

DPX-L5300 and DPX-T6376 controlled wild mustard and provided an intermediate level of perennial sowthistle control when evaluated in June 1985 (Table). Perennial sowthistle control had increased for each herbicide by the July 1985 evaluation. Perennial sowthistle control in June 1986 was similar to the control observed in July 1985. DPX-T6376 treated wheat plants had slight visible injury when evaluated in June 1985, but injury was not visible by July 1985. Wheat injury was not visible in 1986.

Clopyralid provided approximately 50% perennial sowthistle control in June, but control increased to approximately 75% by July 1985 (Table). Control tended to increase when observed in June 1986 as compared to 1985. Fluroxypyr provided less perennial sowthistle control than clopyralid. Perennial sowthistle control was not improved by adding 2,4-D amine to either clopyralid or fluroxypyr. Picloram and dicamba caused some wheat injury in 1985 and tended to be less effective at the rates used than clopyralid for perennial sowthistle control. The wheat was in the correct stage for picloram application, but picloram was applied above the labeled use rates of 0.25 to 0.37 oz/A. Some wheat plants were past the optimum stage for dicamba application, plus the 4 oz/A rate was above the highest labeled rate in wheat of 2 oz/A. The 2,4-D amine treatment provided an intermediate level of perennial sowthistle control.

DPX-L5300, DPX-T6376, and clopyralid provided acceptable perennial sowthistle control through wheat harvest in 1985 without visible wheat injury that would adversely affect yield. Also, perennial sowthistle control with these three herbicides was maintained or increased in 1986 as compared to 1985. The high rates of herbicide that provided the best control may be too expensive for routine use. However, the lowest rate used sustained control into 1986, and may be the basis for an economically acceptable annual treatment program that may eliminate an established stand of perennial sowthistle in 2 to 4 years. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo).

Treatment	Rate	1985 wheat injury		Wimu control	Pest control 1985		1986
		June 20	July 25	(6/20/85)	June 20	July 25	June 24
	(oz/A)	(%)					
Experiment 1							
DPX-L5300	0.12	0	0	100	31	55	64
DPX-L5300	0.25	0	0	100	51	76	69
DPX-L5300	0.5	0	0	98	48	63	89
DPX-T6376	0.06	4	0	100	29	75	69
DPX-T6376	0.12	1	0	100	45	79	76
LSD (0.05)		5	NS	2	25	25	36
Experiment 2							
Clopyralid	4	0	0		42	83	78
Clopyralid	8	1	0		53	74	95
Clopyralid+2,4-D[a]	4+16	0	1		55	73	84
Fluroxypyr	4	0	0		17	24	19
Fluroxypyr	8	0	0		22	15	12
Fluroxypyr+2,4-D[a]	4+16	0	3		60	37	23
Picloram	1	1	8		4	21	22
Picloram	2	5	17		8	57	87
Dicamba	2	3	2		7	31	15
Dicamba	4	13	6		21	66	78
2,4-D amine[a]	8	0	1		18	40	15
2,4-D amine[a]	16	0	2		38	52	67
LSD (0.05)		4	5		27	45	25

[a] alkanolamine

<u>Post-harvest herbicide application for perennial sowthistle control</u>. Messersmith, Calvin G. and Rodney G. Lym. Post-harvest frequently is the most opportune time for farmers to treat perennial sowthistle either with non-selective herbicides or with higher herbicide rates than can be used in a growing crop. Three experiments were established in barley stubble on September 19, 1984 near Devils Lake, ND. Most of the perennial sowthistle plants were in the 4 to 10 leaf rosette stage, but a few had 6 to 10 inch tall stems with buds or flowers. Experiments were established in a randomized complete block design with four replications, and plots were 10 by 30 ft. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi, except for Experiment 2 where treatments were applied on the second date, October 8, 1984, with a back-pack sprayer at 17 gpa. The perennial sowthistle had been severely frosted before October 8, 1984, and the remaining healthy plants were mostly in the 4 to 6 leaf rosette stage. Experiments 2 and 3 were re-treated post-harvest as listed in the table on August 27, 1985 when most of the perennial sowthistle were in the 5 to 6 leaf rosette stage. The experiments were evaluated visually on June 20 and July 25, 1985, and June 18 and August 5, 1986, for percent perennial sowthistle control based on reduction of weed density compared to the control and for percent of the barley crop injured by herbicide residues in 1985 only.

Complete topgrowth control of perennial sowthistle was obtained with all treatments in Experiment 1 in 1985 (Table). Most treatments had maintained good control when evaluated in June 1986, but perennial sowthistle was becoming reestablished by August 1986. The two picloram + 2,4-D treatments maintained control similar to picloram at 1 lb/A through August 1986, although the experimental variability was high so additional research will be needed to confirm this observation. All treatments that included picloram caused unacceptable injury to the barley crop in 1985. Clopyralid caused slight visible injury in June 1985, but injury was not visible on mature plants in July 1985. Barley injury was not visible in June 1986 so specific evalutions were not recorded, but a few plants in the picloram-treated plots had twisted awns in August 1986.

Dicamba at 1 lb/A in Experiment 2 whether alone or with glyphosate provided approximately 50% perennial sowthistle control with only minor injury to barley in 1985 (Table) Dicamba at 2 and 4 lb/A provided the best perennial sowthistle control in this experiment, but the barley injury was unacceptable. Clopyralid at 0.25 to 0.5 lb/A provided control similar to dicamba at 1 lb/A and did not cause visible crop injury. Glyphosate and chlorsulfuron provided inadequate perennial sowthistle control, and chlorsulfuron caused too much crop injury.

Perennial sowthistle control in June 1986 following retreatment was similar to the control in July 1985 after the initial treatment (Table). Control by all treatments declined substantially by August 1986. Therefore, all treatments would need to be repeated to maintain control.

Perennial sowthistle control tended to improve when 2,4-D was added to clopyralid compared to clopyralid alone in Experiment 3 (Table). Generally triclopyr provided similar perennial sowthistle control whether applied alone or with 2,4-D. Control in June 1986 after retreatment generally was higher than in June 1985 after the initial treatments, but the control with each treatment generally was similar in both July 1985 and August 1986. Thus, annual treatment will have to be continued to maintain good control. None of these treatments caused visible crop injury.

Treatments that provided complete perennial sowthistle control were not acceptable due to severe barley injury. The variability was high among treatments when complete control was not obtained. However, some clopyralid, dicamba, and triclopyr treatments provided an intermediate level of perennial sowthistle control without barley injury, and may be acceptable in a repeat treatment program. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo)

Table. Post-harvest herbicide application for perennial sowthistle control (Messersmith and Lym).

1985 Treatment	1985 Rate (lb/A)	Date applied	1986 Treatment	1986 Rate (lb/A)	Perennial sowthistle control 1985 June 20	Perennial sowthistle control 1985 July 25	Perennial sowthistle control 1986 June 18	Perennial sowthistle control 1986 August 5	Barley injury 1985 June 20	Barley injury 1985 July 25[c]
					(%)					
Experiment 1										
Picloram	0.25	Sept 19			100	100	73	20	23	16
Picloram	0.5	Sept 19			100	100	91	60	28	29
Picloram	1	Sept 19			100	100	91	79	55	63
Picloram+2,4-D[a]	0.25+1	Sept 19			100	100	91	81	21	18
Picloram+2,4-D[a]	0.5+1	Sept 19			100	100	97	86	39	38
Clopyralid	1	Sept 19			97	99	73	27	1	0
Clopyralid	2	Sept 19			100	100	87	54	4	0
LSD (0.05)					3	1	34	54	13	21
Experiment 2										
Dicamba+WK surf.	1+0.5%	Sept 19	Dicamba	0.5	43	58	59	25	3	2
Dicamba+WK surf.	2+1%	Oct 8	Dicamba	1	50	57	79	40	3	8
Dicamba+WK surf.	2+0.5%	Sept 19	Dicamba	0.25	75	88	61	35	12	12
Dicamba+WK surf.	4+1%	Oct 8	Dicamba	0.5	87	93	66	35	37	38
Glyphosate	0.75	Sept 19	Glyphosate	0.75	31	50	63	13	0	3
Glyphosate	1.5	Oct 8	2,4-D	0.5	3	22	20	5	0	0
Glyphosate	1.5	Sept 19	Glyphosate	1.5	19	31	48	35	0	1
Glyphosate	3	Oct 8	2,4-D	1	8	7	42	10	0	0
Clopyralid	0.25	Sept 19	Clopyralid	0.25	43	44	57	15	0	0
Clopyralid	0.5	Oct 8	Clopyralid+2,4-D	0.12+0.5	45	58	67	13	0	0
Dicamba+glyphosate	0.25+0.75	Sept 19	Dicamba+glyphosate	0.25+0.75	41	60	61	10	0	0
Dicamba+glyphosate	0.5+1.5	Oct 8	Dicamba+glyphosate	0.5+0.25	34	54	48	18	1	0
Dicamba+glyphosate	0.5+0.5	Sept 19	Dicamba+glyphosate	0.5+0.5	62	74	66	13	0	1
Dicamba+glyphosate	1+1	Oct 8	Dicamba+glyphosate	1+.25	45	58	65	25	1	1
Chlorsulfuron	0.03	Sept 19			21	46	23	0	26	14
LSD (0.05)					33	38	30	NS	7	9
Experiment 3										
Clopyralid	0.12	Sept 19	Clopyralid	0.12	14	30	39	23	0	0
Clopyralid	0.19	Sept 19	Clopyralid	0.19	34	57	89	54	0	0
Clopyralid	0.25	Sept 19	Clopyralid	0.25	48	39	73	38	0	0
Clopyralid+2,4-D[a]	0.12+0.5	Sept 19	Clopyralid+2,4-D	0.12+0.5	65	57	96	60	0	0
Clopyralid+2,4-D[a]	0.19+0.75	Sept 19	Clopyralid+2,4-D	0.2+0.8	55	60	80	57	0	0
Clopyralid+2,4-D[a]	0.25+1	Sept 19	Clopyralid+2,4-D	0.25+1	58	69	79	58	0	0
Triclopyr	1	Sept 19	Triclopyr	1	39	57	81	56	0	0
Triclopyr	2	Sept 19	Triclopyr	2	55	69	82	65	0	0
Triclopyr+2,4-D[b]	1+1	Sept 19	Triclopyr+2,4-D	1+1	49	63	83	49	0	0
Triclopyr+2,4-D[b]	2+1	Sept 19	Triclopyr+2,4-D	2+1	54	64	93	68	0	1
LSD (0.05)					34	41	25	23	--	NS

[a] alkanolamine
[b] butoxy ethanol ester
[c] only two replications were evaluated for Experiments 2 and 3

<u>Herbicide combinations for perennial sowthistle control.</u> Messersmith, Calvin G., Rodney G. Lym, and Wanda K. Schimming. Two experiments to evaluate herbicide combinations for perennial sowthistle control were established in a non-cropland area at the Langdon Experiment Station on June 26, 1986. Each experiment was a randomized complete block design with three replications. Plots were 10 by 25 feet. Perennial sowthistle plants were in the 8- to 10-leaf rosette stage to bolting. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiments were evaluated visually on July 23 and August 25, 1986 for percent perennial sowthistle control based on reduction of top growth compared to the control.

Metsulfuron alone provided good perennial sowthistle control in Experiment One (Table). Addition of auxin herbicides to metsulfuron tended to decrease control. DPX-L5300 at 0.25 and 0.5 oz/A provided approximately 50% and 80% perennial sowthistle control, respectively. Addition of 2,4-D tended to increase control of DPX-L5300 at 0.25 oz/A but did not affect control at 0.5 oz/A. Dicamba did not affect control of perennial sowthistle with DPX-L5300.

Treatments that included clopyralid provided approximately 60% perennial sowthistle control in Experiment Two (Table). Increasing the rate of clopyralid and 2,4-D from 1.5 + 6 to 2 + 8 oz/A did not improve control. Combinations of clopyralid, 2,4-D, and bromoxynil provided similar control to combinations of clopyralid and 2,4-D. Increasing the rate of bromoxynil from 1.5 to 2.5 oz/A did not improve control. Combinations of dicamba and MCPA gave fair control, but combinations of dichlorprop and 2,4-D with dicamba provided generally poor control.

Table. Perennial sowthistle control with spring-applied herbicides. (Messersmith, Lym, and Schimming).

Treatment[a]	Rate	1986 Evaluation date	
		July 23	August 25
	(oz/A)	(%)	
Experiment 1			
Metsulfuron	0.06	80	72
Metsulfuron + 2,4-D	0.06 + 6	58	58
Metsulfuron + dicamba	0.06 + 2	50	35
DPX-L5300	0.25	61	39
DPX-L5300	0.5	87	73
DPX-L5300 + 2,4-D	0.25 + 6	88	79
DPX-L5300 + 2,4-D	0.5 + 6	80	72
DPX-L5300 + dicamba	0.25 + 2	73	53
DPX-L5300 + dicamba	0.5 + 2	76	71
LSD (0.05)		29	29
Experiment 2			
Clopyralid + 2,4-D	1.5 + 6	62	71
Clopyralid + 2,4-D	2 + 8	71	69
Clopyralid + 2,4-D + bromoxynil	1 + 4 + 1.5	75	53
Clopyralid + 2,4-D + bromoxynil	1 + 4 + 2.5	52	42
Bromoxynil + MCPA	4 + 4	57	44
Dicamba + MCPA	2 + 4	55	62
2,4-D + dichlorprop + dicamba	4 + 4 + 1	52	48
2,4-D + dichlorprop + dicamba	8 + 8 + 2	13	17
2,4-D + dichlorprop + dicamba	16 + 16 + 4	35	32
LSD (0.05)		35	30

[a]2,4-D was the alkanolamine.

Fall application of herbicides for perennial sowthistle control. Messersmith, Calvin G., Rodney G. Lym, and Wanda K. Schimming. Three experiments to evaluate fall application of herbicides for perennial sowthistle control were established in an undisturbed lowland area at the Langdon Experiment Station on August 25, 1985. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Most perennial sowthistle plants had mature seeds while about 30% of the plants were in the 5- to 10-leaf rosette stage. All experiments were randomized complete block design with four replications. Experiment One was a split-block arrangement with herbicide treatments as whole plots and tillage as subplots. Whole plots were 10 by 30 feet and subplots were 10 by 15 feet. The tillage subplots were disced on September 8, 1985. Experiment Two was a split-block arrangement. Whole plots were rates of dicamba, picloram, glyphosate, and clopyralid, and subplots were three rates of 2,4-D alkanolamine. Whole plots were 10 by 30 feet and subplots were 10 by 10 feet. Plots in Experiment Three were 10 by 30 feet. All experiments were evaluated visually on June 25, 1986 for percent perennial sowthistle control based on reduction of weed density compared to the control. Experiment One was reevaluated on August 25, 1986. Experiments Two and Three were not reevaluated since perennial sowthistle density in the controls was reduced to near zero, presumably by very wet soil conditions.

Tillage tended to decrease perennial sowthistle control in Experiment One (Table 1). Dicamba and clopyralid provided approximately 80% and 60% control, respectively. Picloram provided poor control when applied alone. Addition of 2,4-D did not affect control by dicamba or clopyralid on June 25. 2,4-D decreased control by clopyralid at 0.12 lb/A but increased control at 0.25 lb/A compared to clopyralid alone on August 5. Perennial sowthistle control with picloram generally was increased by addition of 2,4-D. 2,4-D alone provided generally poor control especially with tillage.

All treatments except 2,4-D alone provided excellent control of perennial sowthistle in Experiment Two (Table 2). Addition of 2,4-D in this experiment did not affect control with any herbicides tested. The perennial sowthistle stand was poor in 1986 possibly due to extremely wet conditions. Additional experiments must be conducted to determine the effect of 2,4-D in combination with other herbicides on perennial sowthistle control.

All treatments except dicamba plus 2,4-D at 8 + 8 oz/A provided excellent perennial sowthistle control in Experiment Three (Table 3). Due to limited evaluations and loss of perennial sowthistle stand due to wet soil conditions, more research is needed to evaluate metsulfuron and DPX-L5300 on established perennial sowthistle plants.

Table 1. Perennial sowthistle control with herbicides in combination with tillage (Experiment One). (Messersmith, Lym, and Schimming).

Treatment[a]	Rate	June 25, 1986[b]			Aug. 5, 1986[b]		
		Till	No Till	Mean[c]	Till	No Till	Mean[c]
	(lb/A)	(%)					
Picloram	0.06	18	20	19	8	16	12
Picloram	0.12	48	58	53	30	33	32
Picloram + 2,4-D	0.06 + 0.5	58	59	59	38	38	38
Picloram + 2,4-D	0.12 + 0.5	63	75	69	46	63	55
Clopyralid	0.12	66	78	72	51	71	61
Clopyralid	0.25	63	61	62	44	45	45
Clopyralid + 2,4-D	0.12 + 0.5	52	65	59	26	48	37
Clopyralid + 2,4-D	0.25 + 0.5	73	82	78	60	73	67
2,4-D	0.5	26	38	32	15	20	18
2,4-D	1	34	60	47	28	51	40
Dicamba	0.5	76	85	81	63	72	68
Dicamba	1	82	88	85	68	79	74
Dicamba + 2,4-D	0.5 + 0.5	70	93	82	68	85	77
Dicamba + 2,4-D	1 + 0.5	93	98	96	88	94	91
Control	...	3	0	2	3	0	2
Tillage mean[d]		55	64		42	53	

[a] 2,4-D was the alkanolamine.
[b]LSD (0.05) Between herbicide treatment means for the same or different tillage: June = 26; August = 17. Between tillage means for the same herbicide treatment: June = 19; August = 22.
[c]LSD (0.05) June = 22; August = 21.
[d]LSD (0.05) June = 7; August = NS.

Table 2. Perennial sowthistle control with various herbicides in combination with 2,4-D (Experiment Two)[a]. (Messersmith, Lym, and Schimming).

Treatment	Rate	2,4-D rate (lb/A)[b] 0	0.25	0.5	Mean[c]
	(lb/A)	(%)			
Dicamba	0.25	99	97	96	97
Dicamba	0.5	100	100	100	100
Picloram	0.06	99	100	100	100
Picloram	0.12	97	99	99	98
Picloram	0.25	93	99	80	91
Glyphosate	0.75	88	88	95	90
Clopyralid	0.12	98	98	98	98
Clopyralid	0.25	99	99	98	99
Control	....	0	27	53	27
Mean[d]		86	90	91	

[a]Based on evaluations of three replications only.
[b]LSD (0.05) Between main plot treatment means for same or different 2,4-D rates = 17. Between 2,4-D rate means for the same main plot treatment = 23.
[c]LSD (0.05) = 18.
[d]LSD (0.05) = NS.

Table 3. Perennial sowthistle control with herbicides (Experiment Three). (Messersmith, Lym, and Schimming).

Treatment	Rate	Control[a]
	(oz/A)	(%)
Dicamba + 2,4-D alkanolamine	8 + 8	64
Picloram + 2,4-D alkanolamine	2 + 8	92
Clopyralid + 2,4-D alkanolamine	4 + 8	98
DPX-L5300 + X-77 surfactant	2 + 0.25%	97
DPX-L5300 + X-77 surfactant	4 + 0.25%	98
DPX-L5300 + X-77 surfactant	8 + 0.25%	100
Metsulfuron + X-77 surfactant	1 + 0.25%	99
Metsulfuron + X-77 surfactant	2 + 0.25%	100
LSD (0.05)		32

[a]Based on evaluations of 2 replications only.

Field bindweed control and barley yield with various herbicides. Lym, Rodney G. and Calvin G. Messersmith. Field bindweed is an important problem weed in western North Dakota, especially where minimum till and strip-fallow farming are common practices. Three experiments were begun on September 18, 1985 to evaluate late-season herbicide treatment for field bindweed control and crop yield the following growing season. The experiments were located near the ranch headquarters of the Dickinson Experiment Station and were established in 6 to 8 inch corn stubble. The herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 9 by 30 ft in a randomized complete block design with four replications. The weather was overcast, 57 F, 62% relative humidity with a soil temperature of 62 F at 4 inches and approximately 2 inches of snow fell within 18 h of treatment. Bowman 2-row barley was seeded on April 28, 1986 and 3 by 27 ft strips were harvested on August 7, 1986. Field bindweed control evaluations were based on a visible estimate of percent stand reduction as compared to the control.

The first experiment compared dicamba and picloram alone and combined with various chlorsulfuron analogs for field bindweed control. Dicamba at 64 oz/A and sulfometuron + picloram at 1 + 8 oz/A provided 96 and 93% field bindweed control, respectively, 9 months following application (Table 1). However, all treatments that included sulfometuron had nearly 100% crop injury. Field bindweed control tended to increase when dicamba at 16 oz/A was applied with sulfometuron, DPX-L5300 and metsulfuron at 1 oz/A, respectively, but crop injury was also increased. DPX-L5300 was less injurous to barley than metsulfuron or sulfometuron. No treatment provided satisfactory field bindweed control 12 months after application.

The second experiment compared two formulations of 2,4-D alone and in combination with picloram and dicamba for field bindweed control and barley injury and yield. Field bindweed control averaged 89% with picloram + dicamba at 4 + 16 oz/A 9 months following application (Table 1). Control was not increased when 2,4-D was added to picloram + dicamba regardless of formulation. No treatment resulted in crop injury and barley yield tended to increase with all treatments except with 2,4-D mixed amine + picloram + dicamba at 32 + 4 + 16 oz/A. No treatment provided satisfactory field bindweed control 12 months after application.

The third experiment compared various picolinic acid herbicides for field bindweed control and barley injury and yield. Triclopyr and clopyralid in combination with 2,4-D, and fluroxypyr alone or with 2,4-D were applied on September 18, 1985 and retreated on June 12, 1986 when the barley was in the 5-leaf growth stage and the field bindweed was 10 to 12 inches long and beginning to flower. Picloram alone and glyphosate treatments were not repeated. No herbicide treatment provided satisfactory field bindweed control even with two applications (Table 2). The picloram treatments and fluroxypyr + 2,4-D at 0.75 + 1.0 lb/A injured the barley slightly, but yield was not decreased compared to the control. Fluroxypyr at 0.75 lb/A alone and with 2,4-D increased barley yield compared to the control even though field bindweed control was poor. The most economical treatment was 2,4-D at 1 lb/A which provided average field bindweed control and above average barley yield compared to the other treatments in this experiment. In general, no treatment provided long-term field bindweed control, but dicamba gave season-long control and if repeated would be expected to decrease the infestation gradually. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table 1. Field bindweed control and barley injury and yield in 1986 after various herbicide treatments applied on September 18, 1985. (Lym and Messersmith)

Treatment	Rate	Control		Barley Injury		Barley
		June 12	Sept 17	June 12	July 16	yield
	(oz/A)	(%)				(bu/A)
Experiment 1						
Dicamba + X-77	16 + 0.5%	24	0	0	3	..
Dicamba + X-77	32 + 0.5%	68	6	0	3	..
Dicamba + X-77	64 + 0.5%	96	14	3	5	..
Dicamba + glyphosate	16 + 8	70	14	3	3	..
Sulfometuron	1	19	0	98	95	..
DPX-L5300	1	0	18	0	30	..
Metsulfuron	1	26	0	75	43	..
Sulfometuron + dicamba	1 + 16	74	4	98	85	..
DPX-L5300 + dicamba	1 + 16	53	0	15	15	..
Metsulfuron + dicamba	1 + 16	45	10	45	20	..
Sulfometuron + picloram	1 + 8	93	0	95	88	..
Picloram	8	41	15	15	40	..
LSD (0.05)		37	N.S.	13	17	
Experiment 2						
2,4-D mixed amine[a] + picloram + dicamba	32 + 4 + 16	87	4	0	0	26
2,4-D mixed amine[a]	64	14	0	0	0	32
2,4-D alkanolamine	64	39	3	0	0	31
2,4-D alkanolamine + picloram + dicamba	32 + 4 + 16	93	5	0	0	38
Picloram + dicamba	4 + 16	89	15	0	0	37
Control	0	0	0	0	0	26
LSD (0.05)		18	N.S.	N.S.	N.S.	N.S.

[a] Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine) - EH736.

Table 2. Field bindweed control and barley injury and yield in 1986 after various picolinic acid herbicide treatments. (Lym and Messersmith).

September 18, 1985 treatment		June 12, 1986 treatment		Control		Barley injury		Barley yield
Herbicide	Rate	Herbicide	Rate	June 12	Sept 17	June 12	July 16	
	(lb/A)		(lb/A)	(%)				(bu/A)
Picloram + 2,4-D	0.12 + 1	...	...	22	0	10	0	33
Picloram + 2,4-D	0.25 + 1	...	...	44	3	5	0	40
Triclopyr + 2,4-D	0.5 + 1	Triclopyr + 2,4-D	0.5 + 0.5	23	9	0	10	35
Triclopyr + 2,4-D	0.75 + 1	Triclopyr + 2,4-D	0.75 + 0.5	29	11	0	12	41
Clorpyralid + 2,4-D	0.25 + 1.5	Clopyralid + 2,4-D	0.25 + 0.25	6	13	0	0	43
Clorpyralid + 2,4-D	0.375 + 1.5	Clopyralid + 2,4-D	0.38 + 0.5	6	18	0	3	41
Fluroxypyr	0.5	Fluroxypyr	0.5	20	0	0	0	44
Fluroxypyr	0.75	Fluroxypyr	0.75	23	16	0	0	46
Fluroxypyr + 2,4-D	0.5+1	Fluroxypyr + 2,4-D	0.5 + 0.5	22	4	3	0	42
Fluroxypyr + 2,4-D	0.75 + 1	...	...	17	0	10	0	45
Glyphosate + 2,4-D	1.5 + 0.75	...	...	58	0	3	0	44
2,4-D	1	...	...	33	9	0	0	43
Control	...	...	...	0	0	..	..	36
LSD (0.05)				32	N.S.	N.S.	1	9

<u>Absinth wormwood control with clopyralid and picloram</u>. Lym, Rodney G. and Calvin G. Messersmith. Absinth wormwood is a perennial forb that regrows from a root crown each year. The plant causes economic losses by reducing available forage, tainting the milk of cattle that graze it, and as a pollen source for allergies and asthma. The plant is most often found on dry soils, in overgrazed pasture and rangeland, wastelands and roadsides. The purpose of this research was to evaluate low rates of clopyralid and picloram for absinth wormwood control.

The experiment was established near Enderlin, ND, on June 18, 1984. The herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi when absinth wormwood was 4 to 20 inches tall and in the bud stage. The plots were 10 by 30 ft in a randomized complete block design with four replications. Evaluations are based on a visual evaluation of percent stand reduction as compared to the control.

		Evaluation date				
		1984	1985		1986	
Treatment	Rate	20 Aug	29 May	20 Aug	24 June	19 Aug
	(lb/A)	(% control)				
Clopyralid	0.12	33	69	69	47	24
Clopyralid	0.19	48	92	88	65	50
Clopyralid	0.25	73	99	95	83	47
Clopyralid+2,4-D	0.12+0.5	75	97	96	89	45
Clopyralid+2,4-D	0.19+0.75	87	99	97	77	42
Clopyralid+2,4-D	0.25+1.0	84	100	92	77	38
Picloram	0.12	83	92	84	64	22
Picloram	0.19	66	97	96	72	46
Picloram	0.25	90	100	95	85	27
LSD (0.05)		26	12	17	34	36

Absinth wormwood control was higher when evaluated 12 and 15 months following application than after 3 months regardless of treatment. Previous research at North Dakota State University has shown that absinth wormwood is controlled by relatively low rates of dicamba and picloram but the plant dies very slowly. Picloram or clopyralid at 0.25 lb/A provided 95% absinth wormwood control in August 1985 but picloram provided better control than clopyralid when applied at 0.12 and 0.19 lb/A. Clopyralid + 2,4-D at 0.12 + 0.5 lb/A or 0.1875 + 0.75 lb/A tended to provide better control than clopyralid alone, and was similar to clopyralid or picloram at 0.25 lb/A alone. Absinth wormwood control declined rapidly 24 months after treatment. The decline generally was due to reinfestation by seedlings and not regrowth from plants originally treated. A landowner should be able to control absinth wormwood inexpensively with picloram or clopyralid at 0.19 to 0.25 lb/A followed by 2,4-D at 0.25 to 0.5 lb/A to control seedlings as needed. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Russian and spotted knapweed control by several herbicides in North Dakota. Lym, Rodney G. and Calvin G. Messersmith. Several experiments were established statewide in 1984 and 1985 to evaluate various herbicides for control of Russian and spotted knapweed. All experiments were in a randomized complete block design with four replications and 10 by 30 ft plots. The herbicides were applied using a tractor-mounted sprayer at 8.5 gpa and 35 psi. Evaluations were based on visual percent stand reduction as compared to the control.

The Russian knapweed control experiments were established near Williston, ND, on June 30, 1984 on a small grain field that had been an old mining site with a well established weed infestation. The plants were 18 to 24 inches tall, in the bud growth stage and growing under drought conditions. Copyralid at 1 and 2 lb/A, dicamba at 4 lb/A and picloram at 1 lb/A all provided 100% Russian knapweed control 12 months following application in the first experiment (Table 1). Picloram at 0.25 lb/A gave only 68% Russian knapweed control, but provided 93% control when combined with 2,4-D at 1 lb/A. Glyphosate did not provide satisfactory control. The second experiment compared triclopyr and clopyralid alone and combined with 2,4-D for Russian knapweed control. Triclopyr at 2 lb/A gave 82% control and control was not increased with the addition of 2,4-D. Russian knapweed control with relatively low rates of clopyralid was inconsistent. Clopyralid at 0.12 and 0.25 lb/A provided 61 and 19% control, respectively. Low rates of picloram and clopyralid combined with 2,4-D gave good Russian knapweed control in the third experiment. All treatments resulted in 84% or better Russian knapweed control except picloram plus 2,4-D at 0.12 + 1 lb/A which provided only 34% control.

Spotted knapweed control experiments were established at Marmarth and Pekin in western and eastern North Dakota, respectively. The first experiment at Marmarth was begun on September 13, 1984 when the plants were in the rosette growth stage, and the second experiment was established on June 20, 1985 with the plants 6 to 37 inches tall and in the bud growth stage. The experiment at Pekin was established on July 11, 1985 when the plants were 3 to 4 feet tall and beginning to flower. Clopyralid at 0.5 and 1 lb/A, dicamba at 2 lb/A, picloram at 1 lb/A, picloram plus 2,4-D at 0.25 + 1 lb/A and fluroxypyr at 1.0 lb/A provided excellent initial spotted knapweed control (Table 2). Spotted knapweed control from fall applied treatments generally was better at 12 months than at 9 months after application. Picloram at 0.25 lb/A gave good long-term control at Pekin in eastern North Dakota, but 0.5 lb/A was required to give similar control in western North Dakota. Glyphosate and 2,4-D did not provide satisfactory spotted knapweed control.

In general, relatively low rates of clopyralid, dicamba and picloram alone or combined with 2,4-D provided excellent Russian and spotted knapweed control. Spotted knapweed control was similar with similar treatments regardless of application date. 2,4-D, glyphosate and triclopyr either provided unacceptable knapweed control or application rates for satisfactory control were uneconomical. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table 1. Russian knapweed control from various herbicides near Williston, North Dakota. (Lym and Messersmith)

Treatment	Rate	Evaluated June 6, 1985		
		Experiment 1	Experiment 2	Experiment 3
	(lb/A)	------------	(%)	------------
2,4-D	1.0	5	---	---
2,4-D	2.0	0	---	---
2,4-D	4.0	0	---	---
2,4-DB	2.0	0	---	---
Picloram	0.25	68	---	---
Picloram	1.0	100	---	---
Picloram+2,4-D	0.12+1.0	---	---	34
Picloram+2,4-D	0.19+1.0	---	---	86
Picloram+2,4-D	0.25+1.0	93	---	---
Picloram+2,4-D	0.5+1.0	97	---	91
Dicamba	2.0	43	---	---
Dicamba	4.0	100	---	---
Triclopyr	1.0	---	54	---
Triclopyr	2.0	---	82	---
Triclopyr+2,4-D	1.0+1.0	---	28	---
Triclopyr+2,4-D	2.0+1.0	---	70	---
Glyphosate	1.0	61	---	---
Glyphosate	3.0	74	---	---
Clopyralid	0.12	---	61	---
Clopyralid	0.19	---	38	---
Clopyralid	0.25	91	19	---
Clopyralid	1.0	100	---	---
Clopyralid	2.0	100	---	---
Clopyralid+2,4-D	0.12+0.8	---	45	---
Clopyralid+2,4-D	0.12+0.5	---	59	---
Clopyralid+2,4-D	0.25+1.0	---	83	84
Clopyralid+2,4-D	0.5+1.0	---	---	96
LSD (0.05)		41	43	19

Table 2. Spotted knapweed control from various herbicides at Marmarth and Pekin, North Dakota. (Lym and Messersmith)

Treatment	Rate	Marmarth (Sept 13, 1984) June 5, 1985	Marmarth (Sept 13, 1984) Sept 19, 1985	Marmarth (Sept 13, 1984) June 12, 1986	Marmarth (June 20, 1985) Sept 19, 1985	Marmarth (June 20, 1985) June 12, 1986	Pekin (July 11, 85) Aug 26, 1985	Pekin (July 11, 85) June 18, 1986	Pekin (July 11, 85) Aug 26, 1986
	(lb/A)	(%)							
2,4-D	1.0	0	15	18	---	---	---	---	---
Picloram	0.25	46	80	81	55	51	64	100	95
Picloram	0.5	---	---	---	78	90	92	100	87
Picloram	1.0	99	98	100	---	---	---	---	---
Picloram+2,4-D	0.25+1.0	69	100	99	94	75	86	100	93
Dicamba	1.0	41	79	98	---	---	---	---	---
Dicamba	2.0	86	100	94	100	100	99	92	78
Glyphosate	1.0	3	23	25	50	44	83	30	15
Clopyralid	0.25	43	70	83	---	---	---	---	---
Clopyralid	0.5	---	---	---	99	99	95	99	79
Clopyralid	1.0	90	100	98	---	---	---	---	---
Clopyralid+2,4-D	0.25+1.0	---	---	---	93	94	99	94	74
Fluroxypyr	1.0	---	---	---	99	99	68	94	55
LSD (0.05)		30	41	30	33	29	9	9	24

Cattail (Typha spp.) control with herbicides. Messersmith, Calvin G., Rodney G. Lym, Wanda K. Schimming, Kevin B. Thorsness, and Michael V. Hickman. Two experiments were established in a roadside drainage ditch near Fargo, ND to evaluate herbicides currently labeled for cattail control. Experiments 1 and 2 were treated on July 2, 1985 and June 20, 1986, respectively. Each experiment was a randomized complete block design with four replications. Plots were 20 by 30 feet. Treatments were applied to cattail in the early flowering growth stage with a hand-held compressed air sprayer delivering 70 and 140 gpa for Experiments 1 and 2, respectively. Visual evaluations for percent cattail control based on reduction of weed density as compared to the control were taken as indicated (Table).

Cattail control generally increased for all treatments from 2 to 10 months after treatment (MAT), but declined 14 MAT in Experiment 1 (Table). Glyphosate at 3 lb/A provided over 89% control on all evaluation dates. Glyphosate at 1.5 lb/A and amitrole at 5 and 10 lb/A provided over 79% control 10 MAT. Dalapon and 2,4-D provided less than 50% control and were not evaluated furthur. Glyphosate was less effective than amitrole for cattail control 2 MAT in Experiment 2 (Table. A a better final assessement will be the observations to be taken 12 MAT since cattail control should increase, especially with glyphosate. Amitrole provided good control but no longer is labeled for use in water. Thus, glyphosate would be the herbicide of choice for cattail control.

Treatment	Rate	Control		
		2 month	10 month	14 month
	(lb/A)	(%)		
Experiment 1				
2,4-D amine	4	2	5	0
Glyphosate	1.5	39	93	63
Glyphosate	3	87	98	93
Amitrole	5	28	79	38
Amitrole	10	56	95	89
Dalapon	10	13	44	0
Dalapon	20	31	54	8
LSD (0.05)		16	24	15
Experiment 2				
Glyphosate	0.5	0		
Glyphosate	1	11		
Glyphosate	1.5	10		
Amitrole	5	52		
Amitrole	7.5	83		
Amitrole	10	71		
LSD (0.05)		19		

<u>Conventional versus no-till production of wheat, Fargo, 1986</u>. Trials were established in silty clay soil (experiment initiated 1976) to compare conventional (moldboard plowed) and no-till production of wheat in rotation with seven crops under weed-free conditions. Plots were 15 by 40 ft and were sown with wheat in even-numbered years and with one of the seven rotational crops in odd-numbered years. Individual plots are assigned a rotation which has remained consistent since 1976 (i.e. wheat-soybeans-wheat-soybeans or wheat-barley-wheat-barley, etc.). Marshall wheat was seeded on May 27, 1986. The experiment was a randomized complete block with a split plot arrangement (tillage served as the main plots) and four replications.

1985 Crop	Tillage	Wheat yield (bu/A)
Wheat	Till	27.0
	No-till	14.9
Barley	Till	30.5
	No-till	17.3
Flax	Till	29.5
	No-till	19.1
Corn	Till	32.8
	No-till	28.7
Soybeans	Till	32.9
	No-till	30.0
Sunflowers	Till	35.1
	No-till	31.7
Sugarbeets	Till	34.1
	No-till	34.4
LSD (0.05) Crop x Tillage		5.2
No. of reps		4

Summary

Wheat yield averaged across all rotations was numerically lower in no-till (25.2 bu/A) than in conventional till (31.7 bu/A) but this difference was not statistically significant. Wheat yield was less in no-till than in conventional till when the rotational crop was wheat, barley, or flax. When the rotational crop was corn, soybeans, sunflowers, or sugarbeets, wheat yields were not significantly different between tillage systems, although there was a trend for lower yields under no-tillage. The highest wheat yields, especially in no-till, tended to occur on plots rotated to corn, soybeans, sunflowers, and sugarbeets.

Pre and post applications in no-till soybeans, Fargo, 1986. Ozzie soybeans were planted June 2 at 6-inch spacings using a no-till grain drill. Preemergence treatments were applied June 3 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Postemergence treatments were applied on June 30 (P1) in 8.5 gal/A with 8001 tips and on July 2 (P2) in 17 gal/A with 8002 tips. Experimental design was a randomized complete block with three replications. Plots were 10 ft wide by 25 ft long.

		June 24				July 21		
Treatment[1]	Rate (lb/A)	SbInj	VW&WO[1]	KOCZ	Cath	SbInj	Wioa	KOCZ
		---------(% Injury or Control)--------						
Alac-MT+Metr-F+Glyp+X77(Pre)	2.5+.2+.5+.5%	0	58	35	37	0	42	40
Alac-MT+Metr-F+Glyp+X77(Pre)	3+.2+.5+.5%	0	41	40	29	2	48	4
Alac+Metr-F+Glyp+X77(Pre)	2.5+.2+.5+.5%	0	71	45	50	0	39	14
Meto+Metr-F+Glyp+X77(Pre)	2.5+.2+.5+.5%	0	75	48	45	0	40	22
Meto+Metr-F+Glyp+X77(Pre)	3+.2+.5+.5%	0	73	40	45	0	40	19
CGA-24704+Metr-F+Glyp+X77(Pre)	1.25+.2+.5+.5%	0	66	35	46	0	35	18
CGA-24704+Metr-F+Glyp+X77(Pre)	1.75+.2+.5+.5%	0	75	39	54	0	53	18
Acet+Metr-F+Glyp+X77(Pre)	2.5+.2+.5+.5%	0	68	34	37	0	44	7
Acet+Metr-F+Glyp+X77(Pre)	3+.2+.5+.5%	0	65	40	33	0	47	2
Pend+Glyp+X77(Pre)	1.5+.5+.5%	0	67	47	35	0	43	5
Pend+Metr-F+Glyp+X77(Pre)	1.5+.2+.5+.5%	0	69	41	42	3	52	24
Pen+Metr-F+Clam-W+Gly+X7(Pe)	1.5+.2+1.75+.5+.5%	0	77	44	42	0	47	5
Pend+Glyp+X77(Pre)	2+.5+.5%	0	71	52	56	0	45	13
Pend+Metr-F+Glyp+X77(Pre)	2+.2+.5+.5%	0	63	41	42	0	41	31
Pend+Metr-F+Para+X77(Pre)	2+.2+.5+.5%	0	66	68	66	0	43	5
FMC57020+Glyp+X77(Pre)	1+.5+.5%	0	90	62	46	0	70	5
FMC57020+Metr-F+Glyp+X77(Pre)	1+.2+.5+.5%	0	83	87	97	0	67	34
FMC57020+Clam-W+Glyp+X77(Pre)	1+2.75+.5+.5%	0	93	65	42	0	93	54
Cinm+Metr-F+Glyp+X77(Pre)	1.5+.2+.5+.5%	0	72	58	43	0	38	40
Cinm+Metr-F+Glyp+X77(Pre)	1.75+.2+.5+.5%	0	77	45	47	0	44	12
AC263499+Glyp+X77(Pre)	.063+.5+.5%	0	90	77	27	0	98	89
AC263499+Glyp+X77(Pre)	.094+.5+.5%	0	88	78	58	0	90	85
AC263499+Glyp+X77(Pre)	.125+.5+.5%	0	93	59	49	0	96	76
AC263499+Pend+Glyp+X77(Pre)	.063+1.5+.5+.5%	0	83	70	46	0	80	82
AC263499+Pend+Glyp+X77(Pre)	.094+1.5+.5+.5%	0	92	89	42	0	97	67
AC263499+Pend+Glyp+X77(Pre)	.125+1.5+.5+.5%	0	92	88	50	7	94	93
AC263499+Clam-W+Glyp+X77(Pre)	.125+2.75+.5+.5%	0	93	86	42	19	96	96
Glyp+X77(Pre)/ Se+OC(P1)/Be+Ac+OC(P2)	.5+.5%/ .2+1Q/.75+.125+1Q	0	73	38	31	12	98	12
Glyp+2,4-D-bee+X77(Pre)/ Set+OC(P1)/Ben+Aci+OC(P2)	.38+.5+.5%/ .2+1Q/.75+.125+1Q	0	76	54	39	11	98	18
Seth+2,4-D-bee+OC(Pre)/ Set+OC(P1)/Ben+Aci+OC(P2)	.1+.5+1Q/ .2+1Q/.75+.125+1Q	0	39	60	41	12	95	50
Seth+2,4-D-bee+OC+28%N(Pre)/ Set+OC(P1)/Ben+Aci+OC(P2)	.1+.5+1Q+1G/ .2+1Q/.75+.125+1Q	0	32	53	39	13	92	57
Set+2,4-D-be+OC+AmSulf(Pre)/ Set+OC(P1)/Ben+Aci+OC(P2)	.1+.5+1Q+2.5/ .2+1Q/.75+.125+1Q	0	37	28	39	14	80	71
Seth+2,4-D-bee+Brox+OC(Pre)/ Set+OC(P1)/Ben+Aci+OC(P2)	.1+.5+.25+1Q/ .2+1Q/.75+.125+1Q	0	30	35	37	13	56	49
Glyp+X77(Pre)	.5+.5%	0	76	52	40	0	37	4
C.V. %		1010	11	22	18	180	16	35
LSD 5%		NS	13	19	13	9	17	20
# OF REPS		3	3	3	3	3	3	3

[1]OC = petroleum oil containing 17% emulsifier; VW&WO = volunteer wheat plus wild oats.

See summary on next page.

Summary

None of the soil-applied treatments caused appreciable soybean injury except AC263499 applied at 0.125 lb/A. Alachlor-MT (Lasso MicroTech, flowable formulation) appeared to antagonize control of volunteer wheat and wild oats by glyphosate. Treatments involving FMC-57020 or AC263499 were the only combinations providing acceptable preemergence control of volunteer wheat and wild oats. Glyphosate at 0.5 lb/A by itself or in combination with other residual herbicides did not adequately burn down the heavy stand of tall (6 to 12 inch) grasses present at planting. Sethoxydim applied postemergence (0.2 lb/A) following a preemergence application of sethoxydim (0.1 lb/A) generally gave good to excellent wild oat control. The variable yet heavy stands of Canada thistle, perennial sowthistle, biennial wormwood, prickly lettuce, and foxtail barley in this study made evaluation of annual weed control somewhat difficult.

Winter wheat response to fall herbicides, Minot, 1986. Norstar hard red winter wheat was seeded September 17, 1985. Treatments were applied on October 28 when the wheat was in the 1.5 to 2-leaf stage using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzle tips and 35 psi. There were very few weeds at time of spraying and plots were virtually weed-free at harvest. Plots were machine harvested on July 31, 1986.

Treatment[1]	Rate	Wheat stand reduction	Grain yield
	(oz/A)	(%)	(bu/A)
2,4-D-dma	8	1	45.1
2,4-D-bee	8	5	44.6
MCPA-dma	8	1	48.1
MCPA-bee	8	2	47.0
Dicamba+MCPA-dma	2+4	1	49.4
Bromoxynil	8	1	50.3
Bromoxynil&MCPA-UC	12	2	49.6
Clopyralid&MCPA	7.5	0	48.9
Control	0	1	49.3
C.V. %		167	5.6
LSD 5%		NS	NS
# OF REPS		4	4

[1]dma = dimethylamine salt; bee = butoxyethyl ester; Bromoxynil&MCPA = package mix containing 2 lb/gal Brox and 2 lb/gal MCPA; Clopyralid&MCPA = package mix containing 2 lb/gal MCPA and 0.5 lb/gal Clpy (i.e. 7.5 oz/A = 6 oz MCPA plus 1.5 oz Clyp).

Summary

There were no significant differences between herbicide treatments in winter wheat stand reductions or in grain yield.

Experimental soil-applied herbicides in corn, Carrington, 1986. Early preplant and preemergence treatments were applied April 24 and May 14, respectively, using a bicycle wheel sprayer with 8002 tips delivering 17 gal/A at 35 psi. Pioneer 3953 corn was planted into wheat stubble on May 13 using a Buffalo Till planter. Soil type was a loam with 300 lbs/A of 35-12-0 surface-applied on May 1. Weeds present at planting were wild buckwheat and small amounts of kochia and yellow woodsorrel. Weed control and crop injury ratings were taken on June 18, 1986.

Treatment[1]	Rate	Corn injury	Weed control Grft	Weed control Wibw
	(lb/A)	--------(%)--------		
SC0774+X77(EPP)/Glyp+X77(Pre)	1+0.5%/+0.5%	8	76	38
SC0774+X77(EPP)/Glyp+X77(Pre)	1.25+0.5%/0.38+0.5%	6	89	58
SC0774+Atra-L+X77(EPP)/Glyp+X77(Pre)	1+1+0.5%/0.38+0.5%	2	92	93
SC0774+X77(Pre)	0.75+0.5%	0	64	14
SC0774+X77(Pre)	1+0.5%	0	67	13
SC0774+X77(Pre)	1.25+0.5%	0	78	17
SC0774+Glyp+X77(Pre)	1+0.38+0.5%	0	77	36
SC0774+Atra-L+Glyp+X77(Pre)	1+1+0.38+0.5%	0	74	44
Meto+Atra-L+Glyp+X77(Pre)	2.5+1+0.38+0.5%	0	61	43
Meto+Atra-L+X77(EPP)/Meto+Glyp+X77(Pre)	1.7+1+0.5%/0.8+0.38+0.5%	0	89	84
Prcl+Atra-L+Glyp+X77(Pre)	3.5+1+0.38+0.5%	0	32	26
Alac-MT+Atra-L+Glyp+X77(Pre)	2.5+1+0.38+0.5%	0	67	32
PPG1259+Atra-L+Alac-MT+Glyp+X77(Pre)	0.15+0.38+2.5+0.38+0.5%	0	62	16
Lact+Meto+Glyp+X77(Pre)	0.3+2.5+0.38+0.5%	0	66	37
Lact+Meto+X77(EPP)/Meto+Glyp+X77(Pre)	0.3+1.7+0.5%/0.8+0.38+0.5%	0	71	34
EPTC&R25788-EN+Atra-L+Glyp+X77(Pre)	4+1+0.38+0.5%	0	31	55
EPTC&R25788-EN+Atra-L+Glyp+X77(Pre)	6+1+0.38+0.5%	0	56	62
EPTC&R25788-EN+Glyp+X77(Pre)	4+0.38+0.5%	0	20	21
EPTC&R25788-EN+Glyp+X77(Pre)	6+0.38+0.5%	3	30	27
Buty&R25788-EN+Atra-L+Glyp+X77(Pre)	4+1+0.38+0.5%	0	25	50
Buty&R25788-EN+Atra-L+Glyp+X77(Pre)	6+1+0.38+0.5%	0	28	62
Buty&R25788-EN+Glyp+X77(Pre)	4+0.38+0.5%	0	4	23
Buty&R25788-EN+Glyp+X77(Pre)	6+0.38+0.5%	0	10	29
Glyp+X77(Pre)	0.38+0.5%	0	3	33
C.V. %		234	25	43
LSD 5%		3	19	24
# OF REPS		4	4	4

[1]EPTC&R25788-EN and Buty&R25788-EN and encapsulated formulations of Eradicane and Sutan+, respectively; Atra-L = 4L formulation of atrazine; Alac-MT = microencapsulated formulation of alachlor (Lasso MicroTech).

Summary

A small amount of corn injury expressed as bleaching was evident in plots treated with SC0774. In general, SC0774 and metolachlor provided better green foxtail control when applied early preplant (about 2.5 weeks prior to planting) than when applied preemergence. Similarly, atrazine gave good to excellent control of wild buckwheat when applied early preplant but unsatisfactory control when applied preemergence. Lactofen (0.3 lb/A) was ineffective on wild buckwheat regardless of application timing. Metolachlor and alachlor-MT both provided about 65% green foxtail control when applied preemergence at 2.5 lb/A. PPG1259 plus a low rate (0.38 lb/A) of atrazine did not control wild buckwheat. Encapsulated butylate or EPTC applied preemergence were not effective on green foxtail.

Experimental soil-applied herbicides in corn, Minot, 1986. Early preplant and preemergence treatments were applied April 23 and May 13, respectively, using a bicycle wheel sprayer with 8002 tips delivering 17 gal/A at 35 psi. Pioneer 3953 corn was planted into corn stubble on May 12 using a Buffalo Till planter. Soil type was a silt loam with 100 lbs N/A surface-applied on April 24 as 28-0-0. No weeds were present at planting.

Treatment[1]	Rate	June 16 Corn Inj	June 16 Grft
	(lb/A)	----(%)----	
SC0774+X77(EPP)/Glyp+X77(Pre)	1+0.5%/0.38+0.5%	0	79
SC0774+X77(EPP)/Glyp+X77(Pre)	1.25+0.5%/0.38+0.5%	1	83
SC0774+Atra-L+X77(EPP)/Glyp+X77(Pre)	1+1+0.5%/0.38+0.5%	3	81
SC0774+X77(Pre)	.75+0.5%	0	0
SC0774+X77(Pre)	1+0.5%	0	13
SC0774+X77(Pre)	1.25+0.5%	0	12
SC0774+Atra-L+Glyp+X77(Pre)	1+1+0.38+0.5%	0	1
Meto+Atra-L+Glyp+X77(Pre)	2.5+1+0.38+0.5%	0	7
Meto+Atra-L+X77(EPP)/Meto+Glyp+X77(Pre)	1.7+1+0.5%/0.8+0.38+0.5%	0	17
Prcl+Atra-L+Glyp+X77(Pre)	3.5+1+0.38+0.5%	0	7
Alac-MT+Atra-L+Glyp+X77(Pre)	2.5+1+0.38+0.5%	0	2
PPG1259+Atra-L+Alac-MT+Glyp+X77(Pre)	0.15+0.38+2.5+0.38+0.5%	0	25
Lact+Meto+Glyp+X77(Pre)	0.3+2.5+0.38+0.5%	0	10
Lact+Meto+X77(EPP)/Meto+Glyp+X77(Pre)	0.3+1.7+0.5%/0.8+0.38+0.5	0	25
EPTC&R25788-EN+Atra-L+Glyp+X77(Pre)	4+1+0.38+0.5%	0	0
EPTC&R25788-EN+Atra-L+Glyp+X77(Pre)	6+1+0.38+0.5%	0	4
EPTC&R25788-EN+Glyp+X77(Pre)	4+0.38+0.5%	0	1
EPTC&R25788-EN+Glyp+X77(Pre)	6+0.38+0.5%	0	31
Buty&R25788-EN+Atra-L+Glyp+X77(Pre)	4+1+0.38+0.5%	0	8
Buty&R25788-EN+Atra-L+Glyp+X77(Pre)	6+1+0.38+0.5%	0	0
Buty&R25788-EN+Glyp+X77(Pre)	4+0.38+0.5%	0	0
Buty&R25788-EN+Glyp+X77(Pre)	6+0.38+0.5%	0	0
Glyp+X77(Pre)	0.38+0.5%	0	10
C.V. %		717	98
LSD 5%		NS	24
# OF REPS		4	4

[1]EPTC&R25788-EN and Buty&R25788-EN = encapsulated formulations of Eradicane and Sutan+, respectively; Atra-L = 4L formulation of atrazine; Alac-MT = microencapsulated formulation of alachlor (Lasso MicroTech).

Summary

The only corn injury observed in the study was a small amount of bleaching caused by SC0774. SC0774 provided about 80% green foxtail control when applied 2.5 weeks prior to planting but was ineffective when applied preemergence. All other treatments gave poor control of green foxtail.

Early preplant treatments in no-till sunflowers, Carrington, 1986. Early preplant (EPP) and preemergence treatments were applied April 24 and May 26, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Cargill 207 sunflowers were sown May 22 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. 300 lbs/A of 35-12-0 analysis fertilizer was applied broadcast on May 1. Wheat stubble was 8 to 14 inches at planting time.

		At planting				June 25				July 30	
Treatment[1]	Rate	Grft	Wibw	Wimu	Yews	Grft	Wibw	Wimu	Yews	Grft	Wibw
	(oz/A)	(% Control)									
Pendimethalin(Pre)	24	0	0	0	0	81	87	91	100	45	62
Pendimethalin+X77(EPP)	24+.5%	95	88	86	93	87	91	93	99	70	82
Pendimethalin+X77(EPP)	32+.5%	99	94	63	95	91	93	91	98	80	82
Fluorochloridone(Pre)	8	0	0	0	0	52	86	92	89	11	85
Fluorochloridone+X77(EPP)	8+.5%	36	99	100	77	56	83	98	89	9	63
Fluorochloridone+X77(EPP)	10+.5%	58	98	100	74	57	76	98	98	10	86
RE40885(Pre)	16	0	0	0	0	45	81	88	92	11	87
RE40885+X77(EPP)	16+.5%	69	99	100	45	90	89	100	96	61	84
RE40885+X77(EPP)	20+.5%	68	98	96	66	87	93	99	99	54	93
Isoxaben(Pre)	2	0	0	0	0	55	83	81	97	10	65
Isoxaben+X77(EPP)	2+.5%	8	30	81	24	67	91	97	92	15	81
Isoxaben+X77(EPP)	2.6+.5%	15	4	96	5	51	76	98	97	15	83
Lactofen(Pre)	4.8	0	0	0	0	46	77	86	95	5	83
Lactofen+X77(EPP)	4.8+.5%	8	26	100	48	57	85	90	98	19	81
Lactofen+X77(EPP)	6.4+.5%	16	38	100	26	61	80	92	95	7	81
Pend+Fluo(Pre)	24+8	0	0	0	0	70	89	95	97	24	89
Pend+Fluo+X77(EPP)	24+8+.5%	99	100	99	96	89	83	97	98	69	81
Pend+Fluo+X77(EPP)	32+10+.5%	99	97	100	99	90	86	95	97	71	73
Pend+RE40885(Pre)	24+16	0	0	0	0	77	86	94	100	38	83
Pend+RE40885+X77(EPP)	24+16+.5%	99	100	100	98	90	97	100	95	76	80
Pend+RE40885+X77(EPP)	32+20+.5%	99	98	100	100	93	93	100	100	84	88
Pend+Isox(Pre)	24+2	0	0	0	0	75	88	85	97	39	81
Pend+Isox+X77(EPP)	24+2+.5%	97	90	59	98	82	83	82	99	44	66
Pend+Isox+X77(EPP)	32+2.6+.5%	98	95	63	90	87	85	81	98	77	78
Pend+Lact(Pre)	24+4.8	0	0	0	0	76	92	91	97	47	83
Pend+Lact+X77(EPP)	24+4.8+.5%	96	97	99	97	88	87	89	97	65	89
Pend+Lact+X77(EPP)	32+6.4+.5%	99	99	100	99	92	90	90	99	78	84
Pend+Cyan-L+X77(EPP)	24+48+.5%	99	99	100	99	90	95	98	100	77	81
Pend+Cyan-L+X77(EPP)	32+48+.5%	100	99	99	99	90	89	97	100	77	93
Oryz+RE40885+X77(EPP)	24+20+.5%	94	98	97	57	91	96	100	99	80	97
Oryz+Isox+X77(EPP)	24+2.64+.5%	80	25	36	0	90	95	96	91	82	88
Pend+Chloramben(Pre)	24+36	0	0	0	0	79	87	66	95	60	90
Control	0	0	0	0	0	61	87	90	97	17	85
C.V. %		20	21	24	27	11	10	6	5	26	21
LSD 5%		14	15	19	17	11	12	8	NS	17	NS
No. OF REPS		4	4	4	4	4	4	4	4	4	4

[1]All treatments received glyphosate (6 oz ae/A) plus X-77 (0.5%) at planting (tank-mixed with regular preemergence treatments); Cyan-L = 4L formulation of cyanazine.

Summary

Pendimethalin applied at 24 oz/A 4 weeks prior to planting provided excellent control of green foxtail at planting with 32 oz/A providing essentially complete control. Excellent or good to excellent control at planting of wild buckwheat and yellow woodsorrel was also obtained with EPP applications of pendimethalin. Green foxtail control with EPP pendimethalin was also better than the preemergence treatment at 2 months after planting. Early preplant fluorochloridone provided complete control of wild mustard and wild buckwheat at planting. At 1 and 2 months after planting, however, plots receiving fluorochloridone showed no greater wild buckwheat control than the check which received glyphosate at planting. Early preplant fluorochloridone had greater wild mustard control than the check at 1 month after planting, but preemergence fluorochloridone did not exceed the glyphosate check. RE-40885 provided results very similar to those obtained with fluorochloridone but with greater green foxtail control. It was observed that RE-40885 caused bleaching in green foxtail seedlings. Isoxaben provided good to excellent control wild mustard but was ineffective on other species. At 1 month after planting, preemergence isoxaben was controlling wild mustard no better than the glyphosate check, although the early preplant applications showed almost complete control of this species. Lactofen applied early preplant gave complete wild mustard control at planting. However, control of other species and control of wild mustard at 1 month after planting was not different from the check.

Among combination treatments, excellent broad spectrum control was achieved with pendimethalin plus either fluorochloridone or RE-40885. Early preplant applications of these combinations provided a nearly weed-free plot at planting time and control of green foxtail at 1 and 2 months after planting that exceeded the control by a preemergence application. Pendimethalin plus cyanazine provided the best control of all species with no detectable sunflower injury.

Early preplant treatments in no-till sunflowers, Minot, 1986. Early preplant (EPP) and preemergence treatments were applied April 23 and May 22, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Cargill 207 sunflowers were sown May 21 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. Ninety lbs/A of N (anhydrous NH_3) was knifed in during the fall of 1985 and 52 lbs/A of 10-34-0 was broadcast in the spring. Flax stubble was 6 to 8 inches tall at planting time. Crop injury with all treatments was negligible.

		At planting			June 24				July 28				
Treatment[1]	Rate	Wimu	Gfpw	Vofl	Grft	Wimu	Gfpw	Ruth	Grft	Ruth	Gfpw	Colq	KOCZ
	(oz/A)	(% Control)											
Pendimethalin(Pre)	24	0	0	0	60	70	63	58	67	56	60	81	79
Pendimethalin+X77(EPP)	24	53	60	51	84	63	61	46	87	50	67	87	94
Pendimethalin+X77(EPP)	32+.5%	55	40	40	86	78	68	71	89	75	67	99	99
Fluorochloridone(Pre)	8	0	0	0	38	100	66	55	20	34	46	89	74
Fluorochloridone+X77(EPP)	8+.5%	96	83	68	65	100	80	91	42	86	74	93	99
Fluorochloridone+X77(EPP)	10+.5%	100	86	70	49	100	66	84	45	80	84	96	97
RE40885(Pre)	16	0	0	0	51	64	57	54	28	23	54	90	69
RE40885+X77(EPP)	16+.5%	100	86	73	68	99	75	82	68	83	66	99	94
RE40885+X77(EPP)	20+.5%	98	68	86	75	100	65	92	81	96	69	97	94
Isoxaben(Pre)	2	0	0	0	40	35	58	52	38	29	62	56	38
Isoxaben+X77(EPP)	2+.5%	98	45	76	57	100	70	36	67	33	54	97	36
Isoxaben+X77(EPP)	2.6+.5%	99	70	71	52	100	63	50	63	61	70	98	67
Lactofen(Pre)	4.8	0	0	0	40	97	54	86	42	89	56	59	95
Lactofen(EPP)	4.8+.5%	98	78	71	38	100	62	54	32	72	81	85	83
Lactofen(EPP)	6.4+.5%	100	78	53	56	90	61	63	42	58	61	97	89
Pend+Fluo(Pre)	24+8	0	0	0	73	97	74	80	64	80	70	95	98
Pend+Fluo+X77(EPP)	24+8+.5%	99	78	75	86	95	77	83	94	86	71	99	99
Pend+Fluo+X77(EPP)	32+10+.5%	99	88	70	87	100	77	98	94	99	77	99	99
Pend+RE40885(Pre)	24+16	0	0	0	66	85	58	69	65	64	36	94	74
Pend+RE40885+X77(EPP)	24+16+.5%	99	75	83	87	100	67	95	89	94	76	99	99
Pend+RE40885+X77(EPP)	32+20+.5%	99	75	86	85	100	74	100	97	99	76	99	99
Pend+Isox(Pre)	24+2	0	0	0	69	79	58	74	61	62	64	85	80
Pend+Isox+X77(EPP)	24+2+.5%	96	60	85	86	98	52	62	93	64	73	98	98
Pend+Isox+X77(EPP)	32+2.6+.5%	96	78	78	84	100	76	79	94	83	86	99	95
Pend+Lact(Pre)	24+4.8	0	0	0	76	99	56	78	58	84	71	77	81
Pend+Lact+X77(EPP)	24+4.8+.5%	95	75	56	85	99	65	82	94	78	71	98	98
Pend+Lact+X77(EPP)	32+6.4+.5%	98	81	71	84	99	85	69	86	68	73	99	82
Pend+Cyan-L+X77(EPP)	24+48+.5%	100	86	74	90	98	89	99	96	99	91	99	99
Pend+Cyan-L+X77(EPP)	32+48+.5%	98	86	83	93	100	88	100	98	99	91	99	99
Oryz+RE40885+X77(Pre)	24+20+.5%	95	73	83	82	100	52	94	96	93	55	99	99
Oryz+Isox+X77(EPP)	24+2.64+.5%	96	51	65	76	99	74	59	70	61	86	99	62
Pend+Chloramben(Pre)	24+36	0	0	0	66	38	49	44	91	28	49	92	41
Control	0	0	0	0	34	45	63	35	24	4	17	8	0
C.V. %		19	22	25	22	13	15	21	25	31	30	15	22
LSD 5%		16	14	16	22	16	15	22	24	30	28	19	26
# OF REPS		4	4	4	4	4	4	4	4	4	4	4	4

[1]All treatments received glyphosate (6 oz ae/A) plus X-77 surfactact (0.5%) at planting (tank-mixed with regular preemergence treatments); Cyan-L = 4L formulation of cyanazine.

See next page for summary

Summary

Pendimethalin applied early preplant provided about 85% green foxtail control at 1 and 2 months after planting. There was no difference in foxtail control between the 24 and the 32 oz/A rates. Excellent control of common lambsquarters and kochia at 2 months after planting was also achieved with pendimethalin. Preemergence pendimethalin was not as effective as the EPP treatments. Fluorochloridone applied early preplant and evaluated at planting gave excellent control of wild mustard, good control of green flowered pepperweed, and fair control of volunteer flax. At later ratings wild mustard, common lambsquarters, and kochia control were excellent while Russian thistle control was good. For kochia and Russian thistle control, EPP applications were superior to the preemergence treatments. RE-40885 provided results similar to fluorochloridone with notably superior control of green foxtail at the latest rating. The 20 oz/A rate of RE-40885 generally provided better control than did the 16 oz/A rate and EPP applications were typically superior to preemergence treatments. Early preplant isoxaben at the 2 oz/A rate provided excellent control of wild mustard at planting and at 1 month after planting. Isoxaben applied EPP gave fair to poor control of Russian thistle and kochia but excellent control of common lambsquarters. Preemergence isoxaben was not effective on wild mustard or common lambsquarters. Lactofen provided excellent control of wild mustard when applied either EPP or preemergence. Good control of Russian thistle was obtained by preemergence lactofen but not with EPP applications. Lactofen provided good to excellent control of common lambsquarters with EPP applications and of kochia with either EPP or preemergence treatments.

With combination treatments, good to excellent broad spectrum control was achieved using pendimethalin plus either fluorochloridone, RE-40885, or cyanazine. Green flowered pepperweed and volunteer flax were especially difficult to control with only pendimethalin plus cyanazine providing satisfactory control. The early preplant application often provided better control than the preemergence application (at identical rates) for all combinations except pendimethalin plus fluorochloridone.

<u>Early preplant cyanazine and oryzalin for no-till sunflowers, Carrington, 1986.</u> Early preplant (EPP) treatments were applied April 24 (4 weeks early preplant = 4WEPP), May 1 (3WEPP), and May 10, 1986 (2WEPP). Preemergence treatments were applied May 27 and all treatments were applied with a bicycle wheel sprayer delivering 17 gpa at 35 psi with 8002 flat fan nozzles. Cargill 207 sunflowers were seeded in 30-inch rows on May 22 using a Buffalo Till no-till planter. 300 lbs/A of 35-12-0 analysis fertilizer was applied broadcast on May 1. Wheat stubble was 8 to 14 inches at planting time. Plot size was 10 by 25 feet. Glyphosate + X-77 (0.375 lb/A + 0.5%) was applied preemergence to all plots including the control and tank mixed with other preemergence herbicides if any. The experimental design was a randomized complete block with four replications. Sunflower injury and weed control were evaluated on the dates indicated in the table headings.

			June 26				July 30	
Treatment[1]	Rate (lb/A)	Sufl Inj (%)	Grft	Wibw	Wimu	Yews	Grft	Wibw
			---------(% Control)---------					
Cyanazine-L+Pend(pre)	2.5+2	3	86	88	95	94	48	38
Cyan-L+Pendimethalin(pre)	3+2	3	81	87	92	90	35	39
Cyanazine-L(pre)	3	3	65	90	93	91	23	65
Cyan-L+X-77(2WEPP)/Pend(pre)	2.5+0.5%/2	0	88	87	100	95	57	46
Cyan-L+X-77(2WEPP)/Pend(pre)	3+0.5%/2	1	89	90	100	99	70	57
Cyan-L+X-77(2WEPP)/Pend(pre)	3.5+0.5%/2	2	90	92	100	98	64	51
Cyan-L+X-77(2WEPP)	3+0.5%	1	78	88	100	98	34	50
Cyan-L+X-77(3WEPP)/Pend(pre)	2,5+0.5%/2	0	87	89	100	100	62	46
Cyan-L+X-77(3WEPP)/Pend(pre)	3+0.5%/2	0	88	83	100	98	65	43
Cyan-L+X-77(3WEPP)/Pend(pre)	3.5+0.5%/2	0	89	85	100	100	76	56
Cyan-L+X-77(3WEPP)	3+0.5%	1	71	86	98	98	27	44
Cyan-L+X-77(4WEPP)/Pend(pre)	2.5+0.5%/2	0	85	85	99	100	52	57
Cyan-L+X-77(4WEPP)/Pend(pre)	3+0.5%/2	0	88	87	100	99	69	53
Cyan-L+X-77(4WEPP)/Pend(pre)	3.5+0.5%/2	0	87	87	100	99	61	51
Cyan-L+X-77(4WEPP)	3+0.5%	0	72	87	98	97	16	34
Oryzalin+Fluo(pre)	1.25+0.5	0	72	83	98	94	45	38
Oryz+Fluorochloridone(pre)	1.5+0.5	0	54	73	100	94	16	23
Oryzalin(pre)	1.5	0	68	72	95	98	34	30
Oryz+X-77(2WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	90	89	100	97	63	59
Oryz+X-77(2WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	94	95	100	99	89	73
Oryz+X-77(2WEPP)	1.5+0.5%	0	93	91	95	95	83	55
Oryz+X-77(3WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	92	91	100	96	74	60
Oryz+X-77(3WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	92	90	99	86	78	61
Oryz+X-77(3WEPP)	1.5+0.5%	0	91	89	98	91	77	51
Oryz+X-77(4WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	92	93	99	98	74	61
Oryz+X-77(4WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	92	90	99	94	81	69
Oryz+X-77(4WEPP)	1.5+0.5%	0	91	86	86	91	72	47
Cyan-L+Oryz+X-77(4WEPP)	3+1.5+0.5%	0	90	84	93	88	69	35
Control	0	0	40	57	93	90	3	3
C.V. %		116	6	7	5	6	27	44
LSD 5%		1	8	9	7	8	22	30
# OF REPS		4	4	4	4	4	4	4

[1]Cyanazine-L (Cyan-L) = cyanazine 4L formulation; WEPP = number of weeks before planting (weeks early preplant); Glyphosate + X-77 surfactant at 0.375 lb/A + 0.5% was applied preemergence for every treatment including the control (as a tank mix with other preemergence-applied herbicides, if any).

See next page for summary

Summary

Cyanazine at rates up to 3.5 lb/A caused only minor sunflower injury and was observed only when cyanazine was applied preemergence or 2 weeks prior to planting. Applications 3 or 4 weeks prior to planting caused virtually no crop injury. The lack of rainfall for 3 to 4 weeks following planting may have protected the sunflowers from significant cyanazine phytotoxicity. Cyanazine provided good to excellent control of broadleaf weed species at the June rating but by the late July rating, control of wild buckwheat had declined while wild mustard control remained excellent. In general, early preplant treatments of cyanazine were only slightly superior to those applied at planting. With the lack of rainfall following planting, early preplant cyanazine would be expected to significantly outperform the preemergence application. This apparent discrepancy is attributed to the fact that the preemergence treatments at both locations were applied to moist soil, thus enabling significant activation of the applied cyanazine. Oryzalin applied at planting provided substantially less green foxtail control than when applied early preplant. Green foxtail control from early preplant oryzalin was generally good to excellent at both the early and late evaluations.

Early preplant cyanazine and oryzalin for no-till sunflowers, Minot, 1986. Early preplant (EPP) treatments were applied April 23 (4 weeks early preplant = 4WEPP), April 30 (3WEPP), and May 6, 1986 (2WEPP). Preemergence treatments were applied May 21 and all treatments were applied with a bicycle wheel sprayer delivering 17 gpa at 35 psi with 8002 flat fan nozzles. Cargill 207 sunflowers were seeded in 30-inch rows on May 21 using a Buffalo Till no-till planter. Ninety lbs/A of N (anhydrous NH_3) was knifed in during the fall of 1985 and 52 lbs/A of 10-34-0 was broadcast in the spring. Flax stubble was 6 to 8 inches at planting time. Plot size was 10 by 25 feet. Glyphosate + X-77 (0.375 lb/A + 0.5%) was applied preemergence to all plots including the control and tank mixed with other preemergence herbicides if any. The experimental design was a randomized complete block with four replications. Sunflower injury and weed control were evaluated on the dates indicated in the table headings.

See next page for data and summary

Treatment[1]	Rate	June 16 Sufl inj	June 25 Wimu	June 25 Ruth	June 25 Grft	June 25 Vofl	June 25 KOCZ	July 29 Grft	July 29 Wimu	July 29 Colq	July 29 Ruth	July 29 KOCZ
	(lb/A)	(%)	(% control)									
Cyanazine-L+Pend(pre)	2.5+2	0	90	91	79	95	95	90	97	96	93	99
Cyan-L+Pendimethalin(pre)	3+2	0	98	94	92	94	86	94	99	99	96	97
Cyanazine-L(pre)	3	0	95	94	72	94	96	80	99	97	99	99
Cyan-L+X-77(2WEPP)/Pend(pre)	2.5+0.5%/2	0	98	98	94	95	100	93	99	97	99	99
Cyan-L+X-77(2WEPP)/Pend(pre)	3+0.5%/2	0	97	96	89	93	95	93	99	99	99	99
Cyan-L+X-77(2WEPP)/Pend(pre)	3.5+0.5%/2	0	100	99	88	93	100	95	99	99	97	99
Cyan-L+X-77(2WEPP)	3+0.5%	0	98	88	79	95	100	74	92	94	86	99
Cyan-L+X-77(3WEPP)/Pend(pre)	2.5+0.5%/2	0	100	100	85	95	100	97	99	99	99	99
Cyan-L+X-77(3WEPP)/Pend(pre)	3+0.5%/2	0	98	98	91	98	100	96	99	99	99	99
Cyan-L+X-77(3WEPP)/Pend(pre)	3.5+0.5%/2	0	100	100	93	94	100	97	99	99	99	99
Cyan-L+X-77(3WEPP)	3+0.5%	0	98	100	83	91	100	88	95	98	98	99
Cyan-L+X-77(4WEPP)/Pend(pre)	2.5+0.5%/2	0	100	100	91	94	100	94	99	98	97	99
Cyan-L+X-77(4WEPP)/Pend(pre)	3+0.5%/2	0	99	98	90	98	100	96	98	99	98	99
Cyan-L+X-77(4WEPP)/Pend(pre)	3.5+0.5%/2	0	100	100	93	93	99	97	99	99	99	99
Cyan-L+X-77(4WEPP)	3+0.5%	0	100	100	80	96	100	72	99	99	99	99
Oryzalin+Fluo(pre)	1.25+0.5	0	94	73	71	83	84	70	99	93	64	99
Oryz+Fluorochloridone(pre)	1.5+0.5	0	99	75	68	83	94	78	98	92	67	91
Oryzalin(pre)	1.5	0	30	50	68	73	35	73	16	51	54	48
Oryz+X-77(2WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	100	88	88	89	96	95	99	99	90	99
Oryz+X-77(2WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	99	91	88	77	92	93	99	99	86	99
Oryz+X-77(2WEPP)	1.5+0.5%	0	50	56	77	76	56	86	77	96	72	44
Oryz+X-77(3WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	95	95	89	88	96	90	99	98	91	99
Oryz+X-77(3WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	99	92	87	83	99	96	97	99	85	99
Oryz+X-77(3WEPP)	1.5+0.5%	0	86	84	88	91	44	84	89	99	51	67
Oryz+X-77(4WEPP)/Fluo(pre)	1.25+0.5%/0.5	0	100	97	93	85	98	92	99	99	94	96
Oryz+X-77(4WEPP)/Fluo(pre)	1.5+0.5%/0.5	0	99	99	94	89	100	97	93	99	97	99
Oryz+X-77(4WEPP)	1.5+0.5%	0	82	93	92	86	86	93	92	96	91	93
Cyan-L+Oryz+X-77(4WEPP)	3+1.5+0.5%	0	99	98	86	96	92	97	97	99	99	99
Control	0	0	39	34	51	65	60	49	61	55	45	41
C.V. %		0	9	11	13	9	10	15	10	13	17	17
LSD 5%		-	12	13	15	11	12	18	13	18	22	22
# OF REPS		4	4	4	4	4	4	4	4	4	4	4

[1]Cyanazine-L (Cyan-L) = cyanazine 4L formulation; WEPP = number of weeks before planting (weeks early preplant); Glyphosate + X-77 surfactant at 0.375 lb/A + 0.5% was applied preemergence for every treatment including the control (as a tank mix with other preemergence-applied herbicides, if any); Vofl = volunteer flax.

Summary

Cyanazine at rates up to 3.5 lb/A caused no detectable sunflower injury even when applied preemergence. The lack of rainfall for 3 to 4 weeks following planting probably protected the sunflowers from cyanazine phytotoxicity. Cyanazine provided good to excellent control of wild mustard, Russian thistle, kochia, common lambsquarters, and volunteer flax and this control continued through the late July rating. In general, the early preplant treatments of cyanazine were only slightly superior to those applied at planting. With the lack of rainfall following planting, early preplant cyanazine would be expected to outperform the preemergence application. This apparent discrepancy is attributed to the fact that the preemergence treatments were applied to moist surface soil, thereby enabling significant activation of preemergence-applied cyanazine. Oryzalin applied at planting provided substantially less green foxtail control than when applied early preplant. Green foxtail control from early preplant oryzalin was generally good to excellent at both the early and late evaluation.

Rain-activated 2,4-D injury, Fargo, 1986. Ten by 30-foot plots were established on a Fargo silty clay soil. A strip each of wheat ('Marshall'), soybeans (Ozzie'), and sunflowers ('Cargill 301') was planted across the plots on June 9. Herbicide treatments were applied preemergence the same day using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 tips and 35 psi. Rain received soon after spraying was as follows: 0.29 inch on June 10, 0.12 inch on June 13, and 0.26 inch on June 15. Plots were rated for % injury on July 1 when wheat was 4-leaf and tillering, soybeans had 1 trifoliolate leaf, and sunflowers had 6 leaves.

Treatment[1]	Rate	Wheat stand	Sunflower injury	Soybean injury
	(oz/A)	------------	(%)	-----------
2,4-D-dma	8	1	1	1
2,4-D-dma	16	5	6	3
2,4-D-dma	32	7	20	10
2,4-D-dma	64	22	46	27
2,4-D-bee	8	7	9	8
2,4-D-bee	16	6	11	13
2,4-D-bee	32	7	25	16
2,4-D-bee	64	26	50	38
Glyp&2,4-D&Surf	12.5	1	3	2
Glyp&2,4-D&Surf	25	3	12	6
Glyp&2,4-D&Surf	50	13	41	22
Glyp&2,4-D&Surf	100	15	57	33
Glyphosate	18	1	1	0
Glyphosate	36	1	1	0
MCPA-dma	32	14	15	11
MCPA-dma	64	23	32	23
Untreated	0	0	0	0
C.V. %		82	55	70
LSD 5%		10	15	12
# OF REPS		4	4	4

[1]2,4-D-dma = dimethylamine salt of 2,4-D; 2,4-D-bee = butoxyethyl ester formulation of 2,4-D; Glyp&2,4-D&Surf = Landmaster herbicide.

Summary

Wheat stand reductions were evident at lower rates of 2,4-D but only were significant at the 64 oz/A rate. Injury on soybeans and sunflowers was generally apparent at the 8 oz/A rate and became significant at 32 oz/A. Injury to sunflowers and soybeans caused by the 2,4-D in Landmaster (Glyp&2,4-D&Surf) tended to be greater than that caused by equivalent rates of 2,4-D applied alone. Injury caused by 2,4-D amine did not appear to differ from that caused by the ester formulation. MCPA amine generally was less injurious to soybeans and sunflowers than was 2,4-D. Glyphosate applied alone did not appreciably injure any crop at rates up to 36 oz/A (2.25 lb/A).

Weed control in conventional and no-till flax, Fargo, 1986. Culbert flax was seeded at 45 lbs/A on May 27, 1986, in conventional till (fall moldboard plowed) and no-till (wheat stubble) conditions. Glyphosate + X-77 surfactant (0.5 lb ae/A + 0.5%) was applied on May 29 to the entire area including check strips between plots. Preemergence treatments were applied on May 30 using a bicycle wheel sprayer delivering 8.5 gpa at 35 psi with 8001 flat fan nozzles. Postemergence treatments were applied June 26. Plot size was 10 by 25 feet. The experimental design was a split plot with 4 replications and conventional till and no-till serving as main plots. Flax injury was evaluated July 6, and on July 18 flax injury and weed control were evaluated.

Table 1.

Treatment[1]	Rate	July 6 Flax injury	July 18 Flax injury	July 18 Wimu
	(oz/A)	(%)		
Propachlor(pre)/Bromoxinil+MCPA-bee(po)	56/4+4	16	10	98
Propachlor(pre)/Bromoxinil+MCPA-bee(po)	72/4+4	16	9	97
Metolachlor(pre)/Bromoxinil+MCPA-bee(po)	40/4+4	18	11	97
Metolachlor(pre)/Bromoxinil+MCPA-bee(po)	56/4+4	18	10	75
EPTC&R-EN(pre)/Bromoxinil+MCPA-bee(po)	48/4+4	19	10	100
EPTC&R-EN(pre)/Bromoxinil+MCPA-bee(po)	70/4+4	19	9	89
Butylate&R-EN(pre)/Brox+MCPA-bee(po)	48/4+4	13	3	100
Butylate&R-EN(pre)/Brox+MCPA-bee(po)	70/4+4	18	8	98
Sethoxydim+Brox+MCPA-bee+OC(po)	3.2+4+4+1Q	18	16	98
Seth+Picloram+MCPA-bee+OC(po)	3.2+.25+4+1Q	6	4	100
Seth+Picloram+MCPA-bee+OC+AS(po)	3.2+.25+4+1Q+2.5	9	5	98
2,4-D-bee(pre)/Seth+Brox+MCPA-bee+OC(po)	4/3.2+4+4+1Q	16	22	97
Sethoxydim+Picloram+MCPA-bee+ME(po)	3.2+.25+4+1Q	8	6	98
RE-40885(pre)/Sethoxydim+OC(po)	16/3.2+1Q	3	1	66
Isoxaben(pre)/Sethoxydim+OC(po)	2/3.2+1Q	13	8	83
Lactofen(pre)/Sethoxydim+OC(po)	4.8/3.2+1Q	0	1	4
Control	0	0	0	0
LSD .05		8	7	10
No. of Reps		4	4	4

[1]The entire experimental area (including check strips between plots) was burned off at planting time with glyphosate + X-77 at 0.5 lb ae/A + 0.5%; bee = butoxyethyl ester; AS = ammonium sulfate; OC = petroleum oil with 17% emulsifier; ME = methyl ester of sunflower seed oil; EPTC&R-EN and Buty&R-EN = encapsulated formulations of EPTC&Safener (Eradicane) and butylate&Safener (Sutan+), respectively.

Summary. Tillage did not significantly affect flax injury or wild mustard control, so these treatments are averaged across tillages in Table 1. Treatments containing bromoxynil plus MCPA caused early injury (about 10 days after spraying) that ranged from 13 to 19%. Postemergence combinations of picloram plus MCPA were less injurious even though oil concentrate was added. Preemergence propachlor, metolachlor, or encapsulated EPTC or butylate did not appear to injure flax. Preemergence RE-40885 caused 3% flax injury, isoxaben caused 13% injury, and lactofen was entirely safe on flax. A preemergence application of 2,4-D at 4 oz/A did not injure flax. Herbicide combinations containing bromoxynil plus MCPA or picloram plus MCPA generally gave excellent control of wild mustard. Preemergence isoxaben provided 83% wild mustard control while RE-40885 gave only 66% control and lactofen did not control wild mustard.

Tillage had a significant effect on kochia and foxtail control so data for all tillage-treatment combinations are shown in Table 2. Treatments including bromoxinil plus MCPA provided about 90% kochia control in conventional till but generally gave lower control in no-till. This may have resulted from a higher kochia population in no-till. Treatments relying on picloram plus MCPA for kochia control were not satisfactory in either tillage system. The addition of ammonium sulfate to picloram plus bromoxinil plus oil concentrate did not enhance control of kochia or foxtail. Similarly, methylated sunflower oil in place of petroleum oil concentrate did not affect control of these species. Foxtail control was unsatisfactory with preemergence propachlor, metolachlor, and encapsulated EPTC and butylate, but was good to excellent with postemergence sethoxydim. Foxtail control tended to be greater in conventional till than under no-till conditions.

Table 2.

Treatment[1]	Rate	Tillage system	July 18 KOCZ	July 18 Fxtl
	(oz/A)		-----(%)-----	
Prcl(pre)/Brox+MCPA-bee(po)	56/4+4	Till	96	49
		NT	90	12
Prcl(pre)/Brox+MCPA-bee(po)	72/4+4	Till	83	46
		NT	68	3
Meto(pre)/Brox+MCPA-bee(po)	40/4+4	Till	91	62
		NT	64	31
Meto(pre)/Brox+MCPA-bee(po)	56/4+4	Till	92	66
		NT	88	46
EPTC&R-EN(pe)/Brox+MCPA-bee(po)	48/4+4	Till	88	29
		NT	77	28
EPTC&R-EN(pe)/Brox+MCPA-bee(po)	70/4+4	Till	94	46
		NT	43	53
Buty&R-EN(pe)/Brox+MCPA-bee(po)	48/4+4	Till	88	16
		NT	53	7
Buty&R-EN(pe)/Brox+MCPA-bee(po)	70/4+4	Till	92	22
		NT	49	43
Seth+Brox+MCPA-bee+OC(po)	3.2+4+4+1Q	Till	90	96
		NT	89	67
Seth+Picl+MCPA-bee+OC(po)	3.2+.25+4+1Q	Till	48	98
		NT	18	95
Seth+Picl+MCPA-bee+OC+AS(po)	3.2+.25+4+1Q+2.5	Till	39	98
		NT	22	86
24D-be(pe)/Set+Brx+MCP+OC(po)	4/3.2+4+4+1Q	Till	93	96
		NT	60	78
Seth+Picl+MCPA-bee+ME(po)	3.2+.25+4+1Q	Till	32	98
		NT	13	95
RE-40885(pre)/Seth+OC(po)	16/3.2+1Q	Till	58	97
		NT	10	96
Isoxaben(pre)/Seth+OC(po)	2/3.2+1Q	Till	18	78
		NT	3	85
Lactofen(pre)/Seth+OC(po)	4.8/3.2+1Q	Till	0	97
		NT	0	86
Control	0	Till	0	0
		NT	0	0
LSD 0.05			15	26
No. of Reps			4	4

[1]See footnote in Table 1; Fxtl = yellow and green foxtail.

Fall treatments in chemical fallow, Williston and Minot, 1986. Herbicides were applied on wheat stubble at Williston on October 2 and at Minot on October 4, 1985 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Weed control ratings were taken July 10 at Williston and July 11 at Minot. Weed pressure was as follows: green foxtail, heavy at Williston, light to moderate at Minot; kochia and Russian thistle, light to moderate; tansy mustard and flixweed, light.

Treatment[1]	Rate	Williston Grft	Williston KOCZ	Williston TM&FW[1]	Williston Ruth	Minot Grft
	(oz/A)	(% Control)				
Chlorsulfuron	0.188	8	94	98	88	32
Chlorsulfuron	0.375	19	99	99	93	46
Chlorsulfuron	0.5	34	99	98	98	60
Clsu+Hexazinone	0.375+8	60	99	98	94	48
Clsu+Hexazinone	0.375+12	77	99	98	95	70
Clsu+Metribuzin-F	0.375+8	25	99	98	99	22
Clsu+Metribuzin-F	0.375+12	24	99	98	97	33
Clsu+Oryzalin	0.375+24	61	98	99	84	59
Clsu+Ethalfluralin	0.375+16	25	99	98	93	57
Clsu+Pendimethalin	0.375+24	85	99	98	83	46
Clsu+Acetochlor	0.375+48	16	99	98	77	27
Clsu+FMC-57020	0.375+16	53	99	98	98	50
Imazaquin	2	21	99	98	96	40
Imazaquin	4	46	99	98	99	63
Imazaquin	6	46	99	99	99	82
Imazaquin+Hexazinone	4+8	51	99	98	99	72
Imazaquin+Metr-F	4+8	57	99	98	99	68
Imazaquin+FMC-57020	4+16	67	99	98	99	84
Isoxaben	2	0	47	1	0	1
Isoxaben	3	1	100	3	5	5
Isoxaben	4	0	100	19	11	4
Isoxaben+Hexazinone	3+8	47	97	98	77	18
Isoxaben+Metr-F	3+8	17	99	98	78	2
Isoxaben+FMC-57020	3+16	60	99	99	69	4
FMC-57020	16	55	99	98	82	8
FMC-57020	24	58	99	98	95	23
Atrazine-L+Terb	8+32	12	99	90	88	12
Cyanazine-L+Metr-F	40+8	34	100	98	98	6
Control	0	0	0	0	0	0
C.V. %		39	8	3	13	40
LSD 5%		19	10	4	14	19
# OF REPS		4	4	4	4	4

[1]Metribuzin-F = flowable formulation of metribuzin; Atrazine-L = 4L formulation of atrazine; Cyanazine-L = 4L formulation of cyanazine; TM&FW = tansy mustard and flixweed.

Summary

Chlorsulfuron (0.375 or 0.5 oz/A) or imazaquin (2 or 4 oz/A) provided excellent control of broadleaf species but poor control of green foxtail. The combination of these herbicides with hexazinone, metribuzin, oryzalin, ethalfluralin, pendimethalin, acetochlor, or FMC-57020 did not improve green foxtail control to acceptable levels. Isoxaben gave excellent control of kochia but poor control of other species. FMC-57020 alone at 16 and 24 oz/A controlled broadleaf weeds but not green foxtail. The combinations of atrazine with terbutryn (8 + 32 oz/A) or cyanazine with metribuzin (40 + 8 oz/A) likewise provided broadleaf but not foxtail control.

<u>Postemergence weed control in fallow, Minot, 1986.</u> Plots were sprayed May 28, 1986 using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzle tips and 35 psi. Weed stages at time of spraying were as follows: green foxtail, 3 to 4-leaf; kochia, 0.5 to 4-inch; Russian thistle, 1 to 4-inch; volunteer wheat, fully tillered and 15 to 18-inch; volunteer flax, 1 to 2-inch. Plot size was 10 by 30 feet. The experiment was a randomized complete block with 4 replications.

Treatment[1]	Rate	Rated June 24					Rated July 22			
		Grft	KOCZ	Ruth	Vowh	Vofl	Grft	KOCZ	Vofl	Ruth
	(oz/A)	(% Control)								
BAS517+2,4-D-bee+PO	0.8+16+1Q	95	87	98	83	89	84	91	77	92
BAS517+2,4-D-bee+PO	1.2+16+1Q	95	85	97	91	81	89	77	68	96
BAS517+2,4-D-bee+PO	1.6+16+1Q	97	96	98	98	74	92	96	62	97
BAS517+2,4-D-be+Cyan-L+PO	1.2+16+40+1Q	99	99	100	80	100	98	100	97	98
BAS517+24Dbe+Cyan-L+PO+AS	1.2+16+40+1Q+40	98	100	100	83	100	99	95	99	100
BAS517+2,4-D-bee+2,4-DP+PO	1.2+16+16+1Q	95	100	98	93	92	94	99	95	100
BAS517+24Dbe+2,4-DP+PO+AS	1.2+16+16+1Q+40	94	98	99	85	94	90	96	85	100
Glyp&2,4-D&S+X77	12.5+0.5%	93	100	100	100	99	45	96	90	92
Glyp&2,4-D&S+X77	17+0.5%	95	99	100	100	100	59	100	87	92
BAS514+2,4-D-bee+PO	32+16+1Q	67	94	98	31	100	82	79	100	90
BAS514+2,4-D-bee+PO	16+16+1Q	68	96	99	43	99	75	86	100	90
BAS514+2,4-D-bee+Cyan-L+PO	32+16+40+1Q	94	99	100	33	99	97	99	100	98
BAS514+Clsu+PO	32+0.375+1Q	79	93	100	14	97	85	96	99	100
CGA131036+X77	0.285+0.5%	23	93	98	2	90	7	99	63	94
CGA131036+X77	0.426+0.5%	28	97	95	15	62	16	98	49	67
CGA131036+X77	0.571+0.5%	18	99	72	25	86	9	100	49	79
CGA131036+Glyp+X77	0.285+8+0.5%	93	100	98	100	100	51	99	94	91
CGA131036+Glyp+X77	0.426+8+0.5%	95	100	92	100	100	58	99	100	65
CGA131036+Glyp+X77	0.571+8+0.5%	96	100	96	100	99	44	100	74	92
Clsu+Glyp+X77	0.375+8+0.5%	98	100	100	100	100	78	100	100	100
Untreated	0	0	0	0	0	0	0	0	0	0
C.V. %		10	6	4	13	9	19	9	21	10
LSD 5%		11	8	5	12	11	17	11	24	13
# OF REPS		4	4	4	4	4	4	4	4	4

[1] 2,4-D-bee = butoxyethyl ester of 2,4-D; PO = petroleum oil with 17% emulsifier; AS = ammonium sulfate; Glyp&2,4-D&S = Landmaster herbicide; Cyan-L = 4L formulation of cyanazine.

Summary

BAS517 tank mixed with 2,4-D and petroleum oil gave good to excellent control of broadleaf and grass species at one month after application, but was not as effective on volunteer wheat as Landmaster. Green foxtail control at 1 month after application was excellent for both BAS517 and Landmaster but was greater for BAS517 at 2 months after application, suggesting that BAS517 has a significant degree of soil residual. The addition of cyanazine 4L to BAS517 plus 2,4-D plus petroleum oil greatly increased control of green foxtail and broadleafs at the 2-month rating. BAS514 plus 2,4-D plus petroleum oil gave excellent control of broadleaf weeds at the early rating but this level of control was not maintained at 2 months after application. This treatment was not effective on volunteer wheat and gave only fair control of green foxtail although foxtail control did increase with the second rating. It was observed at the first rating that BAS514 caused considerable chlorosis among surviving green foxtail plants. CGA131036 at 0.285 to 0.571 oz/A plus X-77 surfactant provided good to excellent control of kochia and Russian thistle and the addition of glyphosate at 8 oz/A enabled satisfactory control of grasses at 1 month after application. Control by CGA131036 plus glyphosate, however, was not as good as that provided by 0.375 oz/A of chlorsulfuron plus glyphosate.

<u>Burndown study, Fargo, 1986</u>. Herbicides were applied May 20 using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzle tips and 35 psi for all treatments except those consisting of paraquat by itself which were applied in 17 gpa with 8002 tips. At time of treatment, dandelions were nearly completely done flowering. Visual control ratings were taken on June 13, 1986.

		Weed control		
Treatment[1]	Rate	Dand	Peso	Cath
	(oz/A)	-------(%)--------		
Glyphosate+X77	2+0.5%	31	9	24
Glyphosate+X77	4+0.5%	44	22	38
Glyphosate+X77	6+0.5%	47	35	60
Glyphosate+X77	8+0.5%	59	68	67
Glyphosate+methyl ester	4+0.25G	44	-	50
Paraquat+X77	2+0.5%	20	22	13
Paraquat+X77	4+0.5%	33	6	13
Paraquat+X77	6+0.5%	46	11	12
Paraquat+X77	8+0.5%	46	2	11
Paraquat+methyl ester	2+0.25G	24	4	5
Glufosinate+X77	8+0.5%	95	38	12
Glufosinate+X77	12+0.5%	96	-	25
Glufosinate+X77	16+0.5%	99	46	19
Glufosinate+methyl ester	8+0.25G	96	19	9
2,4-D-bee+X77	4+0.5%	19	6	22
2,4-D-bee+X77	8+0.5%	32	63	27
2,4-D-bee+methyl ester	4+0.25G	27	28	33
SC-0051+X77	8+0.5%	49	40	51
SC-0051+X77	16+0.5%	62	42	59
Glyphosate+2,4-D-bee+X77	4+4+0.5%	49	53	34
Glyphosate+2,4-D-bee+X77	6+8+0.5%	60	49	41
Glyphosate+Glufosinate+X77	4+4+0.5%	75	16	29
Glyphosate+Glufosinate+X77	6+6+0.5%	64	62	50
Sethoxydim+X77	1.6+0.5%	0	0	0
Sethoxydim+2,4-D-bee+X77	1.6+4+0.5%	26	41	23
Glyphosate+Paraquat+X77	2+2+0.5%	51	36	20
Glyphosate+Paraquat+X77	4+4+0.5%	59	7	17
Lactofen+X77	3.2+0.5%	54	12	7
Lactofen+X77	4.8+0.5%	59	17	7
Lactofen+Glyphosate+X77	3.2+4+0.5%	68	-	44
Untreated	0	0	0	0
C.V. %		22	56	45
LSD 5%		15	22	17
# OF REPS		4	4	4

[1]Methyl ester = methyl ester of sunflower seed oil plus 17% emulsifier; 2,4-D-bee = butoxyethyl ester of 2,4-D.

Summary

Glufosinate (HOE661) provided nearly complete burndown of dandelions at 8 oz/A and complete burndown at 16 oz/A. All other treatments were ineffective on dandelions. None of the treatments provided acceptable control of perennial sowthistle or Canada thistle.

Dandelion control, Fargo, 1986. Treatments were applied June 11 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. At time of treatment, dandelions were many-leaved and well past the flowering stage, Canada thistle was 8 to 12 inches tall and in the bud stage, and perennial sowthistle was many-leaved with stems beginning to elongate. Visual control ratings were taken on July 2, 1986.

Treatment[1]	Rate	Control		
		Dand	Cath	Pest
	(oz/A)	-------(%)--------		
Glyphosate+X77	8+0.5%	50	56	53
Glyphosate+X77	16+0.5%	67	69	78
Glyphosate+X77	24+0.5%	75	84	91
Paraquat+X77	8+0.5%	31	86	45
Paraquat+X77	16+0.5%	65	90	42
Glufosinate+X77	8+0.5%	77	65	18
Glufosinate+X77	12+0.5%	97	79	69
Glufosinate+X77	16+0.5%	99	89	70
2,4-D-bee+X77	8+0.5%	28	71	38
2,4-D-bee+X77	12+0.5%	47	75	48
2,4-D-bee+X77	16+0.5%	55	83	64
2,4-D-bee+X77	24+0.5%	68	87	71
2,4-DP+X77	8+0.5%	29	41	29
2,4-DP+X77	16+0.5%	28	45	37
MCPP+X77	8+0.5%	13	34	15
MCPP+X77	16+0.5%	28	61	26
MCPA-bee+X77	8+0.5%	25	53	34
MCPA-bee+X77	16+0.5%	35	69	54
Bromoxinil-UC+X77	8+0.5%	8	49	6
Bromoxinil-UC+X77	12+0.5%	12	58	15
Bromoxinil-UC+X77	16+0.5%	14	51	3
Bromoxinil-UC+X77	24+0.5%	10	69	5
Clopyralid	2	23	32	14
Untreated	0	0	0	0
C.V. %		24	19	40
LSD 5%		15	17	23
# OF REPS		4	4	4

[1]2,4-D-bee = butoxyethyl ester of 2,4-D.

Summary

Glufosinate (HOE661) (12 or 16 oz/A) was the only treatment providing essentially complete burndown of dandelion. Canada thistle top growth was controlled by 16 oz/A of paraquat or glufosinate but 3 weeks after application regrowth was occurring from the lower portion of the stem. Bromoxinil at 24 oz/A also caused substantial burndown of Canada thistle shoots but plants were regrowing from the upper part of the stem. Glyphosate at 24 oz/A provided the greatest top growth control of perennial sowthistle.