1987 NORTH DAKOTA WEED CONTROL RESEARCH

WEED SCIENCE

BIOLOGICAL CULTURAL CHEMICAL

NDSU

Weed Research Projects, Department of Agronomy
NORTH DAKOTA STATE UNIVERSITY
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NOT FOR PUBLICATION

SUMMARY OF 1987
WEED CONTROL EXPERIMENTS

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CLIMATIC DATA - AMENIA 1987

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				.39				74	55	79	52	80	58		
2				.07				76	44	76	50	73	55		
3								76	39	69	47	84	49		
4								75	41	85	48	82	51		
5								82	36	86	44	85	63		
6				.07				79	49	95	60	91	56		
7								82	41	83	59	87	60		
8								90	38	65	43	79	55		
9								85	50	76	36	88	64		
10			.27					99	44	65	56				
11								69	45	88	58				
12								84	39	92	53				
13		.03				59	37	86	65	97	60				
14						65	29	79	43	86	61				
15		.15				74	33	95	50	94	51				
16						72	40	94	56	96	55				
17		.70	.82			82	41	57	50	87	67				
18					.07	91	47	50	45	86	60			72	50
19						85	60	61	44	88	56			78	48
20		.62				64	39	60	54	88	61			82	57
21		.90	.98			61	27	55	37	86	63			81	54
22						73	25	51	36	91	64			71	48
23			.15			64	44	61	47	80	63			74	40
24		.03				68	35	63	50	76	56	84	61	77	48
25		.70				80	34	55	52	72	52	87	65		
26		.03				84	48	70	53	73	48	88	67		
27						65	38	80	61	87	47	95	71		
28						90	36	82	61	76	56	88	70		
29			.11			68	42	82	55	76	53	95	68		
30		.03				72	37	86	59	82	50	96	72		
31								89	56						

CLIMATIC DATA - CARRINGTON 4N 1987

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1		T	.13	.04		48	24	74	41	78	55	79	58	90	69
2			T		.95	41	21	74	40	68	47	75	55	88	60
3			.03			50	27	69	44	70	42	80	47	75	53
4		.17		.33		57	31	69	49	79	53	76	54	75	51
5				.03		61	31	81	49	85	49	84	59	88	54
6						64	31	75	40	97	58	86	61	78	56
7				.24		69	38	79	39	82	64	83	56	83	52
8						75	43	88	51	72	47	81	59	87	53
9						65	36	86	51	72	39	84	56	84	55
10	T		.12	.84		48	32	95	49	68	52	81	57	91	57
11			.03	.85		55	28		40	83	57	68	58	82	66
12				.18		55	29	86	49	93	53	67	47	72	51
13				.03		59	36	82	62	94	61	75	47	75	44
14					.10	62	28	77	39	93	63	77	49	82	54
15					.63	73	40	95	51	90	59	87	51	74	56
16						71	42	95	62	96	57	93	66	71	50
17		.21	.25	.05		79	47	72	46	94	57	78	63	75	51
18				2.99	.87	92	49	51	40	85	55	73	60	74	40
19				.01	T	89	56	62	44	86	54	78	56	76	43
20		.78		.21		57	36	62	51	84	56	84	62	82	53
21		2.82	.49	.88		58	25	55	32	88	59	75	55	82	62
22				.04		79	37	52	29	92	61	82	59	70	42
23			.65	.05		67	43	65	43	77	56	83	60	73	37
24		.05	.05			69	39	63	51	75	56	79	53	69	47
25		.26		.04	1.27	74	39	59	50	71	51	84	59	65	51
26	T	.21			.23	75	52	61	50	74	44	85	62	58	51
27		.05				68	38	79	57	86	51	90	67	74	46
28		.06	.36	T		89	49	75	53	88	54	90	70	75	47
29			.37		T	67	41	80	50	72	49	90	63	86	57
30			.05	.04		75	36	83	53	77	47	92	69	74	47
								84	57			91	71	78	36

CLIMATIC DATA - CASSELTON SEED FARM 1987

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	T			.36	1.04	57	27	72	37	85	64	80	51	102	71
2		.06				38	21	73	37	71	50	80	57	92	69
3					.04	44	25	79	43	76	48	76	52	92	65
4						51	27	77	44	69	49	81	51	81	52
5						61	29	74	40	85	46	83	53	72	55
6					T	64	31	78	42	84	58	82	60	88	58
7				.07		70	31	83	42	92	62	89	52	88	53
8			T			73	31	88	44	82	50	87	53	83	54
9				T		76	37	86	47	67	38	88	63	86	58
10						58	31	97	45	75	38	86	60	85	56
11	T		.44	.16		51	33	70	42	68	55	88	64	90	60
12				.12	.07	56	30	84	58	88	55	72	55	91	57
13	T	.09				60	33	84	45	91	61	67	45	74	44
14	T					55	29	79	52	96	62	78	45	82	54
15		.07		.02	.76	65	33	92	47	86	63	73	52	81	63
16		.76			.02	71	36	94	47	91	53	87	62	83	56
17			1.22			73	41	56	51	94	53	101	62	73	53
18					.13	52	41	60	48	94	61	84	66	78	50
19						90	41	51	44	86	60	84	65	75	47
20		T	.42	.15	.13	85	49	61	44	86	55	86	62	79	60
21		.87		1.54		56	27	61	39	87	58	91	60	83	54
22			.15	.50		68	28	44	35	94	69	94	64	82	48
23				T		72	30	53	35	90	68	83	61	72	41
24				.06		62	38	64	50			83	62	74	41
25				.11	.27	70	36	59	49	77	52	89	67	77	55
26		1.31			.83	84	38	60	49	74	48	90	67	58	54
27					T	82	40	73	54	75	46	96	69	61	51
28						65	38	80	60	84	55	90	68	70	49
29			.10			91	45	80	56	73	52	96	73	86	43
30						69	37	81	57	78	51	97	73	75	40
31								85	57			98	73	73	36

CLIMATIC DATA - CROOKSTON 1987

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1			.03	.15		33	19	73	42	75	53	81	58	91	69
2			.01			37	22	72	37	72	44	74	47	91	64
3						47	32	78	44	73	44	87	52	78	56
4				.15		58	33	73	46	73	45	87	60	71	53
5					.27	61	33	82	44	81	58	85	65	83	58
6				.33		68	32	74	45	91	59	89	63	77	51
7			T			71	34	78	40	83	52	86	57	84	53
8				.01		70	43	89	53	74	39	79	57	87	60
9						61	35	78	49	73	49	86	65	81	53
10	.03		.26	.39		53	32	92	42	65	56	85	63	86	63
11				1.12		50	31	61	41	85	54	68	53	88	57
12		.01		T		58	35	81	58	89	53	64	46	69	40
13				T		58	30	82	47	95	65	73	46	77	54
14		.03			.40	64	34	75	50	83	51	84	54	80	61
15					1.25	70	42	95	59	90	60	80	64	74	58
16		.14	.14	.15		68	45	72	50	93	62	97	68	71	51
17		.40		.33	.06	79	47	55	44	89	61	78	64	72	51
18		T		1.43		89	60	55	43	85	55	78	69	73	43
19				.04		82	45	62	45	86	57	80	62	76	52
20		2.23				52	28	59	41	87	65	86	61	80	59
21		.85	T	.89		59	29	42	35	88	62	85	64	78	47
22			.45	.11		70	36	55	37	92	64	89	65	68	42
23						62	38	59	48	80	54	79	58	70	42
24			.06	.08	.16	67	37	64	53	72	57	83	63	73	52
25	.26	.71	.04		.60	76	47	61	51	70	51	86	61	60	53
26		T	.02		.01	79	41	66	55	71	48	87	68	64	47
27			T			63	41	78	62	80	56	95	68	80	48
28			.03			86	41	80	57	76	53	90	63	76	57
29					.38	64	40	79	57	75	42	94	70	83	53
30				.02		59	44	84	53	78	59	90	71	66	41
31		T						85	65			96	72	72	45

CLIMATIC DATA - FARGO 1987

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	T	.11	T	.33	.40	37	24	71	51	76	51	80	58	92	72
2			T			39	19	73	40	74	50	75	55	93	69
3					.06	49	22	73	41	67	47	81	51	81	59
4				T		59	31	73	40	83	50	83	57	71	54
5				.02	T	62	33	79	47	83	45	83	64	86	59
6				.08		71	30	76	47	91	65	91	61	80	60
7			T			73	32	80	45	84	59	87	63	82	54
8			T			77	38	87	45	64	47	81	56	85	54
9						61	39	83	51	74	42	89	68	83	58
10	.02	T	.14	.16		54	31	95	53	67	56	89	64	90	61
11				T		57	33	68	46	88	58	71	60	90	71
12				.07	.06	59	30	80	47	90	56	67	48	71	52
13	.10	.13		.03		53	36	83	60	96	62	76	46	79	46
14				T	.37	65	26	77	45	86	60	75	46	81	62
15		.13		T	.88	71	38	92	56	90	55	86	58	81	64
16		.28			T	71	43	94	55	93	67	101	66	74	57
17		1.05	.27		.43	82	45	56	51	88	67	86	71	77	52
18		T		.05		90	56	51	45	86	60	80	69	74	50
19		T			.08	86	62	61	44	86	55	86	61	77	47
20		.38		.55	.05	63	38	65	55	87	65	88	62	82	58
21		.56	.01	1.33	.01	60	29	55	37	90	68	89	65	80	53
22		T				71	31	54	36	94	69	95	69	70	49
23			.03	.05		62	45	61	47	82	66	84	64	72	41
24		.02	.01		T	66	40	64	53	77	60	83	59	78	52
25	T	.75		.06	.48	79	37	56	52	73	51	86	65	61	56
26	T	.04		.12	.09	82	46	70	54	74	47	88	68	61	55
27		.01			.27	64	40	80	62	84	49	94	73	75	51
28			.02			87	42	81	62	75	57	88	70	76	50
29			.18		.05	67	45	80	55	76	55	94	71	87	55
30	T					69	40	83	57	80	49	95	73	70	45
31				.01				86	58			101	78	73	39

CLIMATIC DATA - LANGDON 1987

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			.12	.36	.01	45	20	64	39	84	55	76	55	82	62
2			.04	.02		30	16	67	35	71	49	75	55	85	58
3			.02			37	24	66	35	65	38	73	46	85	53
4		.05				42	28	71	46	68	42	77	54	72	50
5				.04		49	28	72	44	67	42	79	60	68	52
6						56	34	79	40	81	56	83	59	83	57
7				.83		62	36	73	42	83	62	86	58	77	51
8						65	37	73	48	79	46	77	51	82	55
9					.16	71	40	85	47	65	41	76	58	85	58
10	.01			1.20	.02	54	33	70	45	71	51	81	58	75	53
11			.26	.72		41	26	89	36	64	55	75	57	87	57
12				.19	.20	50	26	65	41	79	51	61	48	76	48
13						52	35	86	54	86	58	65	45	65	43
14		T				56	33	78	36	91	58	71	49	70	54
15				.92	1.60	59	36	70	50	83	55	72	48	74	55
16		.07			.01	70	42	91	54	90	59	80	53	70	53
17		.10	.12		.10	64	46	62	44	91	63	85	60	63	46
18				.05	.01	73	44	58	36	85	55	69	57	70	49
19				1.22		85	52	58	42	82	50	62	55	69	41
20				.01	.33	73	42	64	42	80	58	75	56	73	47
21		.93	1.16		.37	50	26	61	30	85	59	81	52	75	56
22		.11	.05	.41		56	32	40	30	82	64	66	56	68	43
23			.56	.02		76	31	52	34	88	55	69	57	68	40
24				T		57	37	64	47	70	55	70	52	66	41
25		.02				62	39	68	52	77	50	77	57	69	52
26		.34				67	38	56	48	67	46	81	57	61	48
27		.15				71	33	62	50	69	48	80	60	69	49
28		.36			.04	60	38	74	55	80	50	85	62	74	48
29			.10			85	37	71	49	68	45	89	63	74	53
30				T		58	38	75	53	71	44	89	67	71	48
31				.79				80	54			74	65	62	35

CLIMATIC DATA - MINOT 1987

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	T		.26	.02	.14	52	23	82	42	83	54	78	51	88	64
2	T	T	.03			33	25	74	45	71	50	78	55	82	60
3		T		T		46	29	65	42	66	43	74	52	86	53
4		.36				53	35	52	42	69	46	80	63	73	48
5				T		61	37	71	45	78	54	80	62	76	55
6						64	36	78	42	87	61	90	66	91	57
7				.09		65	37	76	44	94	64	76	51	79	54
8						70	38	79	55	80	48	83	54	84	58
9				.41	.01	74	39	85	52	66	47	82	57	86	57
10	.01			.55	T	47	28	83	51	75	51	69	54	78	57
11	.01		.31	.33	.15	33	28	91	42	69	56	70	55	92	61
12	T			.42		52	31	72	46	82	54	56	42	77	46
13		.06		T		57	33	91	59	93	59	70	50	68	49
14				T	.13	60	36	78	39	94	58	74	53	71	55
15					2.37	63	40	75	49	94	58	80	55	65	56
16		T			.10	73	39	93	61	91	68	93	55	69	50
17		.07	.10		.01	69	47	79	44	95	61	88	59	67	48
18				.45	.09	75	47	56	43	83	54	70	57	70	50
19		.03		1.85	.04	85	50	63	47	86	59	61	56	69	48
20				.02		66	41	68	49	88	58	79	58	77	46
21		.68	.08			55	31	50	33	83	57	84	55	82	46
22				.50		62	36	48	30	92	61	65	55	72	45
23		T	.23			81	44	52	37	96	55	84	57	70	39
24		T		T		53	40	68	49	79	53	70	53	71	50
25		.04			.14	69	43	70	54	80	47	78	55	69	51
26	.03	.04			.15	60	49	56	51	70	43	84	63	57	51
27		.76			T	69	36	62	52	78	49	84	65	67	51
28		T	.05	.01		67	39	76	59	89	54	87	67	76	51
29		.15	.32	.06		90	42	68	50	73	49	85	67	75	54
30		T		.04	T	68	46	78	52	72	48	85	69	73	46
31				T				82	60			85	66	66	42

CLIMATIC DATA - WILLISTON 1987

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	T		.23			50	30	86	47	83	49	82	54	83	62
2						49	27	63	49	64	51	77	51	83	56
3		.55			T	59	28	65	46	71	43	86	57	79	53
4						66	33	71	40	82	47	89	61	81	52
5						67	36	73	46	92	53	94	57	85	62
6				.20		70	36	75	43	94	64	94	61	82	51
7						72	38	80	47	93	60	83	50	85	52
8	.05					72	42	87	53	80	48	86	59	87	60
9				T	.02	70	40	88	52	79	48	86	62	85	55
10	.04		.01	.27		50	25	86	52	79	60	74	58	97	65
11				.24		48	25	78	44	84	54	60	51	97	62
12						55	30	91	51	93	56	73	45	74	44
13		.02				60	28	90	51	95	61	78	47	83	52
14					.17	71	31	81	38	94	60	88	55	83	58
15						73	44	89	55	98	70	98	59	70	52
16		.21				73	38	89	57	96	67	97	60	69	45
17		.76	.04	.02	.26	75	45	82	44	94	57	83	58	68	47
18		.07	T	1.58	T	80	45	52	47	85	57	61	55	72	48
19			.44	.05		80	45	72	50	83	60	82	57	80	44
20		.05	.49			58	34	72	36	79	55	82	55	90	47
21				.52		68	30	56	35	90	58	82	55	90	60
22		.03	.02	.13		75	44	55	40	80	59	79	55	69	42
23	T			T		69	44	72	41	75	53	78	56	79	50
24					T	71	43	76	50	76	50	82	51	71	53
25	.02				.30	71	44	73	54	75	50	87	61	64	55
26					T	72	47	68	53	81	47	85	68	62	48
27		.18				74	37	74	55	92	52	92	66	73	47
28		.27	.08			87	49	74	52	88	59	91	73	80	48
29		.03	.02	T		87	40	77	49	73	50	89	71	78	54
30			.02	.22		86	53	81	50	82	49	89	67	70	44
31								85	61			91	69	83	44

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

Abww = Absinth wormwood
Barl (Bar) = Barley
Bdlf = Broadleaf
Bygr = Barnyardgrass
Cath = Canada thistle
Cocb = 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
Gfpw = Greenflower pepperweed
Howe = Horseweed
KOCZ = Kochia
Lent = Lentils
Lesp = Leafy spurge
Mael = Marshelder
Mesa = Meadow salsify
Mil (Ftmi) = Foxtail millet
Nabe = Navy beans
Nfcf = Nightflowering catchfly
Pest = Perennial sowthistle
Pesw = Pennsylvania smartweed
Powe = Pondweed
Prle = 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
alk = alkanolamine
dma = Dimethylaminebee = Butoxyethyl ester
UC = Union Carbide
RH = Rohm and Haas
RP = Rhone-Poulenc
POSS, PO, = Petroleum oil concentrate (17% emulsifier)
SPK = Spike stage
SURF = S = Surfactant
Tswt = TW = Test weight
WP = Wettable powder
WK = Surfactant by DuPont
X-77 = Surfactant by Ortho
Yld = Yield

LIST OF HERBICIDES TESTED IN 1987

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
A-1237	Not released		
AC-222,293 Imazamethabenz	AC-293 Immb	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-2-yl)-p-toluate	Assert
AC-263,499 Imazethapyr	Imep	(+)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid	Pursuit
Acifluorfen	Acif	5-[2-chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoic acid	Blazer Tackle
Alachlor	Alac	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide	Lasso
Amitrole	Amit	1H-1,2,4-triazol-3-amine	Amitrole
Atrazine	Atra	6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine	AAtrex
BAS-090		BASF surfactant	
BAS-51400H	BAS514		None
BAS-51702H	BAS517		None
BAS-51800		Not released	
BCH-815 Dash		BASF surfactant	
Benazolin	Bena	4-chloro-2-oxo-3(2H)-benzothiazoleacetic acid	None
Bentazon	Bent,Bnt, Be	3-(1-methylethyl)-(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 bis(2-methylpropyl)carbamothioate	Sutan
C-4243		Not released	
CGA-131036	CGA131	N-(6-methoxy-4-methyl-1,3,5-triazin-2-yl-aminocarbonyl)-2-(2-chloroethoxy)-benzenesulfonamide	Amber
CGA-180937		Not released	
Chloramben	Clam	3-amino-2,5-dichlorobenzoic acid	Amiben

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Chlorsulfuron	Clsu	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] benzenesulfonamide	Glean
Cinmethylin	Cinm	exo-1-methyl-4-(1-methylethyl)-2-[(2-methylphenyl)methoxy]-7-oxabicyclo [2.2.1]heptane	Cinch
Clomazone	Clom	2-[2-chlorophenyl)methyl]-4,4-dimethyl -3-isoxazolidinone	Command
Cloproxydim	Clox	(E,E)-2-[1-[[(3-chloro-2-propenyl) 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)-1,3,5-triazin-2-yl]amino]-2-methylpropionitrile	Bladex
Cycloate	Cycl	S-ethyl cyclohexylethylcarbamothioate	Ro-Neet
Dalapon	Dala	2,2-dichloropropianoic acid	Dowpon
Dash		BASF surfactant	
Desmidipham	Desm	ethyl [3-[[(phenylamino)carbonyl]oxy] phenyl]carbamate	
Diallate	Dial	S-(2,3-dichloro-2-propenyl)bis(1-methylethyl)carbamothioate	Avadex
Dicamba	Dica	3,6-dichloro-2-methoxybenzoic acid	Banvel
Dichlorprop		(±)-2-(2,4-dichlorophenoxy)propanoic acid	Weedone 2,4-DP
Diclofop	Difp	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy] propanoic acid	Hoelon
Diethatyl	Diet	N-(chloroacetyl)-N-(2,6-diethylphenyl) glycine	Antor
Difenzoquat	Dife	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium	Avenge
Dinoseb	Dino	2-(1-methylpropyl)-4,6-dinitrophenol	Dow General, Premerge
DPX-A7881	None	Not released	Master
DPX-F6025 Chlorimuron	Clim	ethyl-2-[[[[4-chloro-6-methyl-oxypyrimidin-2-yl]amino]carbonyl] amino]sulfonyl]benzoate	Classic

Common Name or Code Name	Abbreviation[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		Thiameturon:DPX-L5300 2:1	Matrix
DPX-E8698		Thiameturon:DPX-L5300 10:1	None
DPX-R9521		check with Tim is available	None
DPX-Y6202(-38) (Quizalofop)	Qufp	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy] propanoic acid	Assure
DPX-M6316 (Thiameturon)	DPX-M6, Thia	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid	Harmony
Endothall	Endo	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	Herbicide 273
EPTC	None	S-ethyl dipropylcarbamothioate	Eptam
Ethalfluralin	Etha	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluormethyl)benzenamine	Sonalan
Ethofumesate	Etho	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate	Nortron
Fenoxaprop	Fenx	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propionic acid	Whip
Fluazifop-P	Flfp-P	(±)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid	Fusilade 2000
Fluorochloridone	Flcd	3-chlor-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone	Racer
Fluroxypyr	Flox	4-amino-3,5-dichloro-6-fluoro-2-pyridloxyacetic acid	Starane
Fomesafen	Fome	5-[2-chloro-4-(trifluormethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide	Reflex
Fosamine		ethyl hydrogen (aminocarbonyl)phosphate	Krenite
Glyphosate	Glyt	N-(phosphonomethyl)glycine	Roundup
Haloxyfop	Halo	2-[4-[[3-chloro-5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid	Verdict

Common Name or Code Name	Abbre-viation[a]	Chemical Name	Trade Name
Hexazinone	Hexa	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione	Velpar
HOE-00661		Ammonium (3-amino-3-carboxypropyl)-methylphosphinate	Ignite
HOE-7125		Not released	Tiller
HOE-7121		Not released	
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	--
KIH-1742		Not released	
Lactofen	Lact	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate	Cobra
Linuron	Linu	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea	Lorox
MCPA	None	(4-chloro-2-methylphenoxy)acetic acid	Numerous
Metolachlor	Meto	2-chloro-N-(2-ethyl-6-methylphenyl) -N-(2-methoxy-1-methylethyl)acetamide	Dual
Metribuzin	Metr	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-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
Oryzalin	Oryz	4-(dipropylamino)-3,5-dinitrobenzene=sulfonamide	Surflan
Paraquat	Para	1,1'-dimethyl-4,4'-bipyridinium ion	Gramoxone Super, Cyclone
Pendimethalin	Pend	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dimitrobenzenamine	Prowl
Phenmedipham	Phen	3-[(methoxycarbonyl)amino]phenyl(3-methylphenyl)carbamate	
Picloram	Picl	4-amino-3,5,6-trichlor-2-pyridine=carboxylic acid	Tordon

Common Name or Code Name	Abbre-viation[a]	Chemical Name	Trade Name
PPG 1013	None	5-(2-chloro-4-trifluormethyl-phenoxy)-2-nitroacetophenone oxine-o-acetic acid	None
PPG 1259	None	(3-[5-(1,1-dimethyl(ethyl)-3-isoxazolyl]-4-hydroxy-1-methyl-2-imidazolidinone)	None
PPG-4000		Not released	
Prometryn	Prom	N,N'-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4-diamine	Caparol
Propachlor	Prcl	2-chloro-N-(1-methylethyl)-N-phenyl acetamide	Ramrod
Propanil	Prnl	N-(3,4-dichlorophenyl)propanamide	Stampede
Pyrazon	Pyra	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	Pyramin
Pyridate			Tough
R-25788, Dichlormid	Dcmd	2,2-dichloro-N,N-di-2-propenylacetamide	None
R-33865, Dietholate	Ext	o,o-diethyl-o-phenyl phosphorothioate	None
RE-40885	None	5-(methylamino)-2-phenyl-4-(3-trifluoro methylphenyl)-3(2H)-furanone	Benchmark
RE-45601 Clethodim	None	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)oxy] imino]propyl-5-[2-(ethylthio)propyl] -3-hydroxy-2-cyclohexene-1-one	Select
RH-0898		Not released	
SC-0051	None	Not released	None
SC-0098	None	Not released	None
SC-0224,		trimethylsulfonium carboxymethyl-aminomethyl phosphosate	Touchdown
SC-0735	None	Not released	None
Sethoxydim	Seth, Sth	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	Poast
Sulfometuron	Sume	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]benzoic acid	Oust
TCA	None	trichloroacetic acid	None

Common Name or Code Name	Abbreviation[a]	Chemical Name	Trade Name
Terbutryn	Tert	N-(1,1-dimethylethyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine	Igran
Thiameturon		See DPX-M6316	
Triallate	Tria	S-(2,3,3-trichloro-2-propenyl)bis(1-methylethyl)carbamothioate	Far-go
Triclopyr	Trcp	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	Garlon
Tridiphane	Trid	2-(3,5-dichlorophenyl)-2-(2,2,2-(trichloroethyl)oxirane	Tandem
Trifluralin	Trif	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine	1Treflan
2,4-D	2,4-D	(2,4-dichlorophenoxy)acetic acid	Numerous
2,4-DB	2,4-DB	(2,4-dichlorophenoxy)butyric acid	Several
2,4-DP	2,4-DP	2-(2,4-dichlorphenoxy)propanoic acid	None
Vernolate	Vern	S-propyl dipropylcarbamethioate	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	6.0	7.5	110	34	950
Mainstation Fargo	Silty clay	6.7	7.0	120	67	830
Casselton, ND	Silty clay	5.0	7.9	Applied 80 lb N		
Amenia, ND	Silt loam	3.6	7.6	123	9	518
Crookston, MN	Silt loam	4.2	7.6	142	18	280
St. Thomas, ND	Silt loam	5.0	7.6	104	25	540
Clara City, MN	Loam	6.3	7.2	287	73	590
Hector, MN	Clay loam	4.1	5.6	79	50	370
Robbin, MN	Silty clay loam	5.8	7.8	120	42	670
Bathgate, ND	Silt loam	4.2	7.6	77	26	355
Hillsboro, ND	Silty clay	5.6	7.2	312	57	610
Mooreton, ND	Silty loam	5.4	6.3	124	28	900
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 Ranch HQ	Clay loam	4.4	6.0	5	14	630
Chaffee, ND	Fine sandy loam	6.7	7.4	20	36	950
New England, ND	Clay loam	5.8	6.7			
Valley City, ND	Stony loam	9.4	6.7			
Multispecies screening (Sec 22)	Silty clay	3.4	7.7	124	31	710
Three species (Sec 22)	Silty clay	3.2	7.5	137	25	850
Pillsbury, ND	Loam	5.9	7.9	46	39	1575
Hunter, ND	Sand	7.4	2.3	14		

Soil applied herbicides, Clara City, 1987. Preplant incorporated herbicides were applied and rototiller incorporated April 20 when the air temp. was 55F, soil temp. at six inches was 54F, wind was northwest at 25-30 mph, soil was dry on the surface, and moist at 1-4 inches. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 20. Preemergence herbicides were applied April 21. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet injury was evaluated May 15 and June 10. Kochia and green foxtail control were evaluated June 10.

		--May15--	---------- June 10 ---------		
Treatment	Rate	Sugarbeet injury rating	Sugarbeet injury rating	Green Foxtail control rating	Kochia control rating
	(lb/A)	-----------------	(%)	----------------	
Metolachlor (Pre)	3	0	0	6	0
Metolachlor (PPI)	2	1	0	88	0
Metolachlor (PPI)	3	4	3	91	15
EPTC+Cycloate (PPI)	1.5+1.5	6	5	95	59
EPTC+Cycloate (PPI)	1.5+2.5	10	0	92	58
EPTC+Cycloate (PPI)	2+2	15	5	96	59
EPTC (PPI)	2.5	18	8	95	61
Cycloate (PPI)	4	0	0	83	20
Diethatyl (Pre)	6	1	0	8	5
Diethatyl (PPI)	4	6	0	61	1
Diethatyl (PPI)	6	6	0	78	17
Ethofumesate (Pre)	3.5	0	0	0	0
Ethofumesate (PPI)	3.5	5	0	88	61
EPTC+Cycl+Diet (PPI)	1.5+1.5+4	14	6	89	45
EPTC+Cycl+Diet (PPI)	2+2+4	24	16	94	55
EPTC+Cycl (PPI)/Diet (Pre)	2+2/4	24	11	96	59
EPTC+Cycl+Meto (PPI)	1.5+1.5+2	14	10	96	58
EPTC+Cycl+Meto (PPI)	2+2+2	21	10	93	33
EPTC+Cycl (PPI)/Meto (Pre)	2+2/2	20	10	96	84
EPTC+Cycl (PPI)/Etho (Pre)	2+2/3	20	10	93	74
EPTC+Diethatyl (PPI)	2+4	14	10	91	49
HIGH MEAN		24	16	96	84
LOW MEAN		0	0	0	0
EXP MEAN		11	5	77	39
C.V. %		41	96	10	61
LSD 5%		6	7	11	34
LSD 1%		8	9	14	45
# OF REPS		4	4	4	4

Summary

Metolachlor at 2 and 3 lb/A gave sugarbeet injury similar to diethatyl at 4 and 6 lb/A whether used alone or in combination with EPTC+cycloate. Metolachlor gave green foxtail control superior to diethatyl. EPTC+cycloate in combination with other herbicides gave greater sugarbeet injury than the herbicides used alone.

Soil applied herbicides, Crookston, 1987. Preplant incorporated herbicides were applied and rototiller incorporated April 23 when the air temp. was 60°F, soil temp. at six inches was 55°F, wind was northeast at 15-20 mph, soil was dry at 0-2 inches and moist at 3-4 inches. The rototiller was operated 4 inches deep for treatments containing EPTC or cycloate and 2 inches deep for all other PPI treatments. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 23. Preemergence herbicides were applied April 23 after planting. 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 8 and June 17. Green foxtail and redroot pigweed control were evaluated June 17.

Treatment	Rate	June 8 Sgbt inj ratg	----- June 17 ----- Sgbt inj ratg	Gr. Fxtl cntl ratg	Rrpw cntl ratg
	(lb/A)	------------	(%)	------------	
Cycloate (PPI)	3	0	11	94	38
Cycloate (PPI)	4	14	14	96	51
EPTC (PPI)	2.5	3	6	85	8
EPTC+Cycloate (PPI)	1.5+1.5	5	10	97	39
EPTC+Cycloate (PPI)	1.5+2.5	4	3	96	50
EPTC+Cycloate (PPI)	2+2	19	21	93	58
Metolachlor (Pre)	3	0	10	93	86
Metolachlor (PPI)	2	5	3	95	86
Metolachlor (PPI)	3	15	20	95	91
Diethatyl (Pre)	6	0	0	19	3
Diethatyl (PPI)	4	3	0	69	52
Diethatyl (PPI)	6	3	5	71	46
Cycloate+Diethatyl (PPI)	2+2	14	20	91	61
Cycloate+Diethatyl (PPI)	3+3	10	11	96	74
Cycloate+Diethatyl (PPI)	3+4	19	19	94	75
Cycloate+Metolachlor (PPI)	2+2	10	30	97	83
Cycloate+Metolachlor (PPI)	3+2	25	41	97	86
Cycloate+Metolachlor (PPI)	3+3	46	65	99	96
Ethofumesate (Pre)	3.5	3	11	75	86
Ethofumesate (PPI)	3.5	3	9	82	94
EPTC+Cycloate+Metolachlor (PPI)	1.5+1.5+2	30	42	97	91
EPTC+Cycloate+Diethatyl (PPI)	1.5+1.5+4	16	16	89	51
EPTC+Cycl (PPI)/Metolachlor (Pre)	1.5+1.5/2	11	18	98	93
EPTC+Cycl (PPI)/Diethatyl (Pre)	1.5+1.5/4	3	8	94	76
EPTC+Cycl (PPI)/Ethofumesate (Pre)	1.5+1.5/3	4	10	97	96
HIGH MEAN		46	65	99	96
LOW MEAN		0	0	19	3
EXP MEAN		10	16	88	67
C.V. %		59	61	10	16
LSD 5%		9	14	12	15
LSD 1%		11	18	16	20
# OF REPS		4	4	4	4

Summary

Metolachlor caused sugarbeet injury similar to diethatyl, but metolachlor+cycloate caused greater sugarbeet injury than diethatyl+cycloate. Metolachlor gave green foxtail and redroot pigweed control superior to diethatyl.

Soil applied herbicides, Wahpeton, 1987. Preplant incorporated herbicides were applied and rototiller incorporated April 30 when the air temp. was 70°F, soil temp. at six inches was 54°F, relative humidity was 23%, wind was south at 15 mph, and soil was dry at 0-3 inches. The rototiller was operated 4 inches deep for treatments containing EPTC or cycloate and 2 inches deep for all other PPI treatments. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 30. Preemergence herbicides were applied April 30 after planting. All herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Wild mustard and redroot pigweed control and sugarbeet injury were evaluated July 2.

Treatment	Rate	Sugarbeet injury rating	Wild Mustard control rating	Redroot Pigweed control rating
	(lb/A)		(%)	
Cycloate (PPI)	3	0	15	31
Cycloate (PPI)	4	5	0	48
EPTC (PPI)	2.5	0	0	36
EPTC+Cycloate (PPI)	1.5+1.5	0	0	41
EPTC+Cycloate (PPI)	1.5+2.5	3	3	59
EPTC+Cycloate (PPI)	2+2	5	4	63
Metolachlor (Pre)	3	14	10	60
Metolachlor (PPI)	2	5	5	56
Metolachlor (PPI)	3	29	11	80
Diethatyl (Pre)	6	19	13	74
Diethatyl (PPI)	4	6	5	33
Diethatyl (PPI)	6	30	0	60
Cycloate+Diethatyl (PPI)	2+2	8	0	38
Cycloate+Diethatyl (PPI)	3+3	13	15	64
Cycloate+Diethatyl (PPI)	3+4	28	30	81
Cycloate+Metolachlor (PPI)	2+2	18	8	64
Cycloate+Metolachlor (PPI)	3+2	16	18	83
Cycloate+Metolachlor (PPI)	3+3	23	28	88
Ethofumesate (Pre)	3.5	0	8	73
Ethofumesate (PPI)	3.5	0	49	76
EPTC+Cyclo+Meto (PPI)	1.5+1.5+2	23	14	74
HIGH MEAN		30	49	88
LOW MEAN		0	0	31
EXP MEAN		12	11	61
C.V. %		78	136	27
LSD 5%		13	21	23
LSD 1%		17	28	30
# OF REPS		4	4	4

Summary

PPI metolachlor at 2 and 3 lb/A gave sugarbeet injury similar to PPI diethatyl at 4 and 6 lb/A. None of the treatments gave good wild mustard control.

Soil applied plus postemergence herbicides, Bathgate, 1987. Preplant incorporated herbicides were applied and rototiller incorporated 7:30 pm May 6. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for other PPI treatments. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Preemergence herbicide treatments were applied May 6 after planting. Soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 12:30 pm May 28 when sugarbeets were cotyledon to 2 leaf, green foxtail were emerging to 3 leaf (1 inch tall), redroot pigweed were cotyledon, and wild buckwheat were cotyledon to 2 leaf (1.5 inches tall). Single application postemergence treatments and the second portion of split treatments were applied 11:30 June 4 when sugarbeets were 2-4 leaf, green foxtail were emerging to 3 leaf (1.5 inches tall), redroot pigweed were cotyledon to 2 leaf, and wild buckwheat were cotyledon to 4 leaf (1.5 inches tall). The third portion of split treatments was applied 1:15 pm June 15 when sugarbeets were 4-10 leaf, green foxtail were 0.5 to 4 inches tall, redroot pigweed were 2-6 leaf, and wild buckwheat were 1 leaf to 2 inches tall.

Date	Sky	Air Temp.	6 inch Soil Temp.	Rel. Hum.	Wind Speed	Wind Dir.	Soil Moisture
		(°F)	(°F)	(%)	(mph)		(inches)
May 6	sunny	55	54	55	0-5	NW	surface=dry, 1-4=moist
May 28	sunny	77	75	60	20	south	0-1=dry, 2-3=moist, 4-6=wet
June 4	cloudy	64	74	39	15	NW	0-1=moist, 2-4=wet
June 15	sunny	93	80	34	10-12	south	0-1=dry, 2-3=moist, 4-6=wet

Postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Redroot pigweed, green foxtail and wild buckwheat control and sugarbeet injury were evaluated June 22.

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Grft cntl ratg	Wibw cntl ratg
	(lb/A)	----------	(%)	----------	
EPTC+Cycloate (PPI)	2+2	28	77	93	36
Diethatyl (PPI)	4	14	50	62	23
Diethatyl (PPI)	6	10	79	83	24
Diethatyl (Pre)	6	4	76	82	0
Ethofumesate (Pre)	3.5	9	86	68	46
Metolachlor (PPI)	2	28	95	93	37
Metolachlor (PPI)	3	30	96	97	44
Metolachlor (Pre)	3	6	92	86	15
EPTC+Cycl+Meto (PPI)	1.5+1.5+2	30	92	99	60
Desmedipham/Desmedipham	0.33/0.5	29	97	49	61
Des&Phen/Des&Phen	0.33/0.5	31	86	58	68
Desm/Desm+Clopyralid	0.33/0.5+0.2	23	96	40	95
Desm/Desm/Desm	0.33/0.5/1	43	97	69	91
Des/Des/Des+Dalapon	0.33/0.5/0.75+1	43	98	82	86
Des/Des/Des+Etho	0.33/0.5/0.75+1	44	99	75	98
Des+Endo/Des+Endo	0.33+0.25/0.5+0.25	20	91	34	74
Des/Des+Sethoxydim+OC	0.33/0.5+0.2+0.25G	40	94	97	78
Clopyralid	0.2	1	44	1	84

Table continued on next page.

Soil applied plus postemergence herbicides, Bathgate, 1987. (continued)

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Grft cntl ratg	Wibw cntl ratg
	(lb/A)	----------	(%)	----------	
EP+Cy (PPI)/Des/Des	2+2/0.33/0.5	69	99	99	89
EP+Cy (PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	86	99	99	99
EP+Cy(PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	71	99	99	89
Metolachlor (PPI)/Desm/Desm	2/0.33/0.5	58	98	96	83
Meto (PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	74	99	99	95
Meto (PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	55	97	99	80
Diethatyl (Pre)/Desm/Desm	6/0.33/0.5	36	97	85	70
Diet (Pre)/Des/Des/Des+Dala	6/0.33/0.5/0.75+1	46	99	99	94
Diet (Pre)/Des/Des+Seth+OC	6/0.33/0.5+0.2+0.25G	58	97	99	74
HIGH MEAN		86	99	99	99
LOW MEAN		1	44	1	0
EXP MEAN		36	90	79	66
C.V. %		26	9	16	16
LSD 5%		13	12	17	15
LSD 1%		18	16	23	20
# OF REPS		4	4	4	4

* OC = Herbimax

Summary

EPTC+cycloate and PPI metolachlor caused 28 to 30% sugarbeet injury, PPI diethatyl caused 10 to 14% injury, and preemergence treatments caused 4 to 9% injury. Postemergence treatments, except clopyralid, caused from 20 to 44% injury to sugarbeets. Postemergence treatments following soil applied herbicides caused considerable sugarbeet injury. Clopyralid gave 84% control of wild buckwheat used alone and 95% control in combination with desmedipham. Metolachlor gave redroot pigweed control superior to diethatyl.

Soil applied plus postemergence herbicides, Clara City, 1987. Preplant incorporated herbicides were applied and rototiller incorporated April 20. The rototiller was set four inches deep for EPTC+cycloate and two inches deep for metolachlor. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 20. Preemergence herbicides were applied April 21. All soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 2:30 pm May 12 when sugarbeets had 2-4 leaves, green and yellow foxtail had 2-5 leaves (1-4 inches tall), and buffalo bur were cotyledon to 3 leaf stage. Single application postemergence treatments and the second split treatments were applied 3:30 pm May 15. The final portion of split treatments was applied May 26. May 12 and May 15 applications were in 8.5 gpa water at 40 psi. May 26 applications were in 10 gpa water. All herbicides were applied to the center four rows of six row plots.

Date	Sky	Air Temp.	6" Soil Temp.	Rel. Hum.	Wind Speed	Wind Dir.	Soil Moisture
		(°F)	(°F)	(%)	(mph)		(inches)
April 20	---	55	54	---	25-30	NW	surface=dry; 1-4=moist
May 12	cloudy	74	70	24	25	south	0-2=dry; 2-6=moist
May 15	sunny	91	70	23	25	SE	0-2=dry; 2-6=moist
May 26	cloudy	65	57	90	0-5	south	wet; 1.2" rain on 5/25

Green and yellow foxtail and buffalo bur control and sugarbeet injury were evaluated June 10.

Treatment*	Rate	Sugarbeet	Gr & Ye Foxtail	Buffalo Bur
	(lb/A)	(% inj)	--(%	control)--
Desmedipham/Desmedipham	0.33/0.5	0	49	89
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	3	60	90
Desm/Desm/Desm+Dalapon	0.33/0.5/0.75+1	15	95	98
Des/Des/Des+Ethofumesate	0.33/0.5/0.75+0.75	14	83	99
Desm/Desm+Clopyralid	0.33/0.5+0.2	4	47	85
Desm/Desm+Sethoxydim+OC	0.33/0.5+0.2+0.25G	5	97	95
Des+Endothall/Des+Endo	0.33+0.25/0.5+0.25	1	40	95
Clopyralid	0.2	0	0	73
EPTC+Cycl(PPI)/Desm/Desm	2+2/0.33/0.5	28	99	99
EP+Cy(PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	30	99	99
EP+Cy(PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	19	99	99
Diethatyl(Pre)/Desm/Desm	4/0.33/0.5	1	71	98
Diet(Pre)/Des/Des/Des+Dala	4/0.33/0.5/0.75+1	10	98	99
Diet(Pre)/Des/Des+Seth+OC	4/0.33/0.5+0.2+0.25G	16	99	99
Metolachlor(PPI)/Desm/Desm	2/0.33/0.5	9	97	96
Meto(PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	13	98	96
Meto(PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	14	99	98
Ethofumesate(Pre)/Des/Des	3.5/0.33/0.5	3	71	99
EXP MEAN		10	78	95
C.V. %		46	14	4
LSD 5%		7	16	5
LSD 1%		9	21	7
# OF REPS		4	4	4

* OC = BASF crop oil concentrate (Booster Plus E)

SUMMARY. Desm/desm and desm/desm/desm+dala following EPTC+cycloate gave greater sugarbeet injury than other treatments. All treatments that contained sethoxydim, dalapon, EPTC+cycloate, or metolachlor gave 95% or greater foxtail spp. control. All treatments except desm/desm, des&phen/des&phen, desm/desm+clopyralid, and clopyralid gave 95% or greater control of buffalo bur.

<u>Soil applied and postemergence herbicides, Crookston, 1987.</u> Preplant incorporated herbicides were applied and rototiller incorporated April 23. The rototiller was operated four inches deep for EPTC+cycloate and two inches deep for metolachlor. Bush Johnson 19 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 23. Preemergence herbicides were applied April 23 after planting. Soil applied treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 11:00 am May 14 when sugarbeets were cotyledon to 2 leaf stage, green foxtail were emerging to 2 leaf stage (1 inch tall), wild buckwheat were cotyledon to 2 leaf stage, common lambsquarters were cotyledon to 6 leaf stage (1 inch tall), and redroot pigweed were cotyledon to 2 leaf stage. Single application postemergence treatments and the second portion of split treatments were applied 10:00 am May 20 when sugarbeets had 2-4 leaves, green foxtail were emerging to 5 leaf stage, wild buckwheat were cotyledon to 5 leaf stage, common lambsquarters were cotyledon to 8 leaf stage (2 inches tall), and redroot pigweed were cotyledon to 6 leaf stage (1 inch tall). Heavy rain fell two hours after May 20 application. The third portion of split treatments was applied 1:30 pm June 3 when sugarbeets had 4-8 leaves. Nearly all weeds in the previously treated plots were a new flush on June 3. Green foxtail were emerging to 2 leaf stage (0.5 inches tall), wild buckwheat had 4-6 leaves (2 inches tall), common lambsquarters were cotyledon stage, and redroot pigweed were cotyledon to 1 leaf stage.

Date	Sky	Air Temp.	6 inch Soil Temp.	Rel. Hum.	Wind Speed	Wind Dir.	Soil Moisture
		(°F)	(°F)	(%)	(mph)		(inches)
April 23	---	60	55	--	15-20	NE	0-2=dry, 3-4=moist
May 14	sunny	72	63	25	15	NW	0-2=dry, 3-4=moist
May 20	cloudy	58	55	83	5	east	surface=damp, 1-4=wet
June 3	---	60	63	54	15	NW	surf=dry, 1-2=moist, 3-4=wet

Postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Green foxtail, wild buckwheat, common lambsquarters, and redroot pigweed control and sugarbeet injury were evaluated June 17.

Experiment continued on next page.

Soil applied and postemergence herbicides, Crookston, 1987. (continued)

Treatment*	Rate	Sgbt inj ratg	Grft cntl ratg	Wibw cntl ratg	Colq cntl ratg	Rrpw cntl ratg
	(lb/A)			(%)		
Desmedipham/Desmedipham	0.33/0.5	9	31	38	25	13
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	13	41	64	49	40
Desm/Desm/Desm+Dalapon	0.33/0.5/0.75+1	31	90	86	96	92
Des/Des/Des+Ethofumesate	0.33/0.5/0.75+0.75	35	86	94	99	99
Desm/Desm+Clopyralid	0.33/0.5+0.2	10	33	80	40	35
Desm/Desm+Sethoxydim+OC	0.33/0.5+0.2+0.25G	14	54	59	38	29
Des+Endothall/Des+Endo	0.33+0.25/0.5+0.25	10	33	66	35	28
Clopyralid	0.2	0	0	58	3	0
EPTC+Cycl(PPI)/Desm/Desm	2+2/0.33/0.5	23	96	84	73	64
EP+Cy(PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	41	98	97	99	98
EP+Cy(PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	19	94	79	71	56
Diethatyl(Pre)/Desm/Desm	4/0.33/0.5	18	86	44	50	50
Diet(Pre)/Des/Des/De+Dala	4/0.33/0.5/0.75+1	33	92	82	96	96
Diet(Pre)/Des/Des+Seth+OC	4/0.33/0.5+0.2+0.25G	21	90	60	48	43
Metolachlor(PPI)/Desm/Desm	2/0.33/0.5	26	96	76	80	93
Meto(PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	40	99	91	99	99
Meto(PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	23	97	79	80	81
Ethofumesate(Pre)/Des/Des	3.5/0.33/0.5	18	95	85	88	91
HIGH MEAN		41	99	97	99	99
LOW MEAN		0	0	38	3	0
EXP MEAN		21	73	73	65	61
C.V. %		40	13	13	19	17
LSD 5%		12	13	14	17	15
LSD 1%		16	17	18	23	20
# OF REPS		4	4	4	4	4

* OC = BASF crop oil concentrate (Booster Plus E)

Summary

All treatments except split desmedipham, desm/desm+clopyralid, desm+endothall/desm+endothall, and clopyralid caused significant visible sugarbeet injury. Many of the weeds emerged after the second half of split applications was applied. Thus postemergence treatments that had three applications gave weed control superior to postemergence treatments with two applications. Clopyralid alone gave only 58% control of wild buckwheat but many wild buckwheat plants emerged after May 20, when the clopyralid was applied.

Soil applied plus postemergence herbicides, Hillsboro, 1987. Preplant incorporated herbicides were applied and rototiller incorporated May 4. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for other PPI treatments. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 4. Preemergence herbicide treatments were applied May 4 after planting. Soil applied treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 4:30 pm May 28 when sugarbeets were cotyledon to 2 leaf, redroot pigweed were cotyledon to 2 leaf, and green foxtail were emerging to 2 leaf (1 inch tall). Single application postemergence treatments and the second portion of split treatments were applied 4:00 pm June 3 when sugarbeets were cotyledon to 4 leaf, redroot pigweed were 2 leaf, and green foxtail were 2-3 leaf (1.5 inches tall). Sugarbeets treated earlier had leaf burn June 3. The third portion of split treatments was applied June 15. Few weeds remained in previously treated plots on June 15 and sugarbeets were severely injured from earlier treatments but had recovered and were growing again.

Date	Sky	Air Temp. (°F)	6 inch Soil Temp. (°F)	Rel. Hum. (%)	Wind Speed (mph)	Wind Dir.	Soil Moisture (inches)
May 4	---	68	46	--	10	south	surface=dry, 1-4=moist
May 28	sunny	79	66	47	25	SW	0-1=dry, 2-3=moist, 4-6=wet
June 3	sunny	68	70	35	15-20	NW	surf-dry, 0-1=moist, 3-4=wet
June 15	sunny	91	80	30	10-12	south	0-1=dry, 2-3=moist, 4-6=wet

Postemergence herbicide treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Sugarbeet injury was evaluated June 8 and June 26. Redroot pigweed and green foxtail control were evaluated June 26.

Treatment*	Rate (lb/A)	June 8 Sgbt inj ratg (%)	June 26 Sgbt inj ratg (%)	June 26 Rrpw cntl ratg (%)	June 26 Grft cntl ratg (%)
EPTC+Cycloate (PPI)	2+2	36	33	76	99
Diethatyl (PPI)	4	23	15	35	55
Diethatyl (PPI)	6	26	16	43	76
Diethatyl (Pre)	6	3	6	25	63
Ethofumesate (Pre)	3.5	8	8	95	81
Metolachlor (PPI)	2	18	15	78	91
Metolachlor (PPI)	3	28	38	96	97
Metolachlor (Pre)	3	8	9	87	86
EPTC+Cycloate+Metolachlor (PPI)	1.5+1.5+2	40	43	96	98
Desmedipham/Desmedipham	0.33/0.5	40	43	94	56
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	38	39	85	65
Desm/Desm+Clopyralid	0.33/0.5+0.2	33	39	88	55
Desm/Desm/Desm	0.33/0.5/1	35	59	99	73
Desm/Desm/Desm+Dalapon	0.33/0.5/0.75+1	35	56	99	85
Desm/Desm/Desm+Ethofumesate	0.33/0.5/0.75+1	34	66	99	71
Desm+Endo/Desm+Endo	0.33+0.25/0.5+0.25	20	30	87	59
Desm/Desm+Sethoxydim+OC	0.33/0.5+0.2+0.25G	38	43	91	86
Clopyralid	0.2	0	0	8	0

Table continued on next page.

Soil applied plus postemergence herbicides, Hillsboro, 1987. (continued)

Treatment*	Rate	June 8 Sgbt inj ratg	---- June 26 ---- Sgbt inj ratg	Rrpw cntl ratg	Grft cntl ratg
	(lb/A)	----------	(%)	----------	
EP+Cy(PPI)/Desm/Desm	2+2/0.33/0.5	69	97	99	99
EP+Cy(PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	69	80	99	99
EP+Cy(PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	66	66	99	98
Metolachlor(PPI)/Desm/Desm	2/0.33/0.5	55	59	97	97
Meto(PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	51	75	99	99
Meto(PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	61	68	99	98
Diethatyl (Pre)/Desm/Desm	6/0.33/0.5	36	46	95	84
Diet(Pre)/Des/Des/Des+Dala	6/0.33/0.5/0.75+1	44	61	99	92
Diet(Pre)/Des/Des+Seth+OC	6/0.33/0.5+0.2+0.25G	33	39	94	92
HIGH MEAN		69	97	99	99
LOW MEAN		0	0	8	0
EXP MEAN		35	42	84	80
C.V. %		27	25	8	10
LSD 5%		13	15	9	11
LSD 1%		18	20	12	14
# OF REPS		4	4	4	4

* OC = BASF oil concentrate (Booster Plus E)

Summary

All incorporated herbicide treatments caused sugarbeet injury of 18% or greater on June 8 while preemergence herbicide treatments caused 8% or less injury. PPI metolachlor at 2 lb/A gave less sugarbeet injury than PPI metolachlor at 3 lb/A on June 26. Metolachlor gave better control of redroot pigweed and green foxtail than diethatyl. Sugarbeet injury from postemergence herbicide treatments that included desmedipham was from 30 to 66% on June 26. Please note that the third postemergence splits were applied June 15, after the June 8 evaluation. Desmedipham+endothall gave or tended to give less sugarbeet injury and less redroot pigweed control than desmedipham used alone. Postemergence herbicides following soil applied herbicides caused considerable sugarbeet injury. Postemergence herbicides following Pre diethatyl caused less sugarbeet injury than postemergence herbicides following EPTC+cycloate.

<u>Soil applied plus postemergence herbicides, Robbin, 1987.</u> Preplant incorporated herbicides were applied and rototiller incorporated 1:00 pm May 6. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for other PPI treatments. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Preemergence herbicide treatments were applied May 6 after planting. Soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 2:00 pm June 4 when sugarbeets, common lambsquarters, and redroot pigweed were cotyledon to 2 leaf, and green foxtail were emerging to 2 leaf (1 inch tall). Single application postemergence treatments and the second portion of split treatments were applied 12:30 pm June 11 when sugarbeets were 2-6 leaf, redroot pigweed were 2-4 leaf, and green foxtail were 3 leaf (1-3 inches tall). The third portion of split treatments was applied 4:30 pm June 22 when sugarbeets were 6-10 leaf, redroot pigweed were 2-6 leaf, and green foxtail were 2 to 6 inches tall.

Date	Sky	Air Temp.	6 inch Soil Temp.	Rel. Hum.	Wind Speed	Wind Direct.	Soil Moisture
		(^oF)	(^oF)	(%)	(mph)		(inches)
May 6	Sunny	74	54	34	10-15	West	0-2=dry, 3-4=wet
June 4	Cloudy	70	62	52	10-12	North	0-1=dry, 2-3=moist, 4-6=wet
June 11	Sunny	81	65	65	10-12	West	Surface=moist, 1-4=wet
June 22	Sunny	94	82	44	5-8	South	Sur=dry, 1-2=moist, 3-4=wet

Postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Redroot pigweed, and green foxtail control and sugarbeet injury were evaluated July 1.

Treatment*	Rate	Sgbt inj ratg	Gr. Fxtl cntl ratg	Rrpw cntl ratg
	(lb/A)	--------	(%)	--------
EPTC+Cycloate (PPI)	2+2	8	95	23
Diethatyl (PPI)	4	5	68	45
Diethatyl (PPI)	6	13	79	68
Diethatyl (Pre)	6	16	64	70
Ethofumesate (Pre)	3.5	3	66	55
Metolachlor (PPI)	2	4	83	51
Metolachlor (PPI)	3	14	85	79
Metolachlor (Pre)	3	13	86	84
EPTC+Cycloate+Metolachlor (PPI)	1.5+1.5+2	20	97	80
Desmedipham/Desmedipham	0.33/0.5	14	19	97
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	21	35	93
Desmed/Desmed+Clopyralid	0.33/0.5+0.2	18	21	98
Desmed/Desmed/Desmed	0.33/0.5/1	24	40	99
Desm/Desm/Desm+Dalapon	0.33/0.5/0.75+1	31	65	99
Desm/Desm/Desm+Ethofumesate	0.33/0.5/0.75+1	31	51	99
Desm+Endothall/Desm+Endothall	0.33+0.25/0.5+0.25	26	46	64
Desmed/Desmed+Sethoxydim+OC	0.33/0.5+0.2+0.25G	30	92	91
Clopyralid	0.2	0	0	4

Table continued on next page.

Soil applied plus postemergence herbicides, Robbin, 1987. (continued)

Treatment*	Rate	Sgbt inj ratg	Gr. Fxtl cntl ratg	Rrpw cntl ratg
	(lb/A)	--------	(%)	-------
EP+Cy (PPI)/Desmed/Desmed	2+2/0.33/0.5	38	98	98
EP+Cy (PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	44	99	99
EP+Cy (PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	36	97	97
Metolachlor (PPI)/Desmed/Desmed	2/0.33/0.5	31	86	96
Meto (PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	39	97	99
Meto (PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	39	98	97
Diethatyl (Pre)/Desmed/Desmed	6/0.33/0.5	35	79	98
Diet (Pre)/Des/Des/Des+Dala	6/0.33/0.5/0.75+1	36	96	99
Diet (Pre)/Des/Des+Seth+OC	6/0.33/0.5+0.2+0.25G	41	98	97
HIGH MEAN		44	99	99
LOW MEAN		0	0	4
EXP MEAN		23	72	81
C.V. %		30	9	11
LSD 5%		10	9	12
LSD 1%		13	12	17
# OF REPS		4	4	4

* OC = Herbimax

Summary

Desmedipham at 0.33 lb/A followed 7 days later by desmedipham at 0.5 lb/A caused less sugarbeet injury than desmedipham at 0.33 lb/A followed by desmedipham+sethoxydim+oil concentrate at 0.5+0.2 lb/A + 1 qt/A. Combining endothall with desmedipham reduced redroot pigweed control compared to desmedipham alone.

Soil applied and postemergence herbicides, Wahpeton, 1987. Preplant incorporated herbicides were applied and rototiller incorporated April 30. The rototiller was operated four inches deep for EPTC+cycloate and two inches deep for metolachlor. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows April 30. Preemergence herbicides were applied April 30 after planting. Soil applied herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots. The first portion of split application postemergence herbicide treatments was applied 9:00 am June 1 when sugarbeets were cotyledon to early 2 leaf, wild mustard were cotyledon to 2 leaf, and redroot pigweed were cotyledon to 1 leaf. Single application postemergence treatments and the second half of split treatments were applied 2:45 pm June 8 when sugarbeets were 2-4 leaf, wild mustard were 4-6 leaf, and redroot pigweed were 4-6 leaf. The third portion of split treatments was applied 3:30 pm June 17 when sugarbeets were 4-8 leaf and few weeds remained in previously treated plots.

Date	Sky	Air Temp.	6 inch Soil Temp.	Rel. Hum.	Wind Speed	Wind Dir.	Soil Moisture
		(^oF)	(^oF)	(%)	(mph)		(inches)
April 30	---	70	54	23	15	south	0-2=dry, 3-4=moist
June 1	cloudy	71	70	69	10-12	NW	0-2=dry, 3-4=moist
June 8	cloudy	66	67	58	20	north	surface=damp, 1-4=wet
June 17	sunny	89	79	55	5-8	west	sur=dry, 1-2=moist, 3-4=wet

Postemergence herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Wild mustard and redroot pigweed control and sugarbeet injury were evaluated July 2.

Experiment continued on next page.

Soil applied and postemergence herbicides, Wahpeton, 1987. (continued)

Treatment*	Rate	Sugarbeet injury rating	Wild Mustard control rating	Redroot Pigweed control rating
	(lb/A)	-----------	(%)	----------
Desmedipham/Desmedipham	0.33/0.5	24	99	99
Desmed&Phenmed/Desmed&Phenmed	0.33/0.5	23	99	92
Desm/Desm/Desm+Dalapon	0.33/0.5/0.75+1	26	99	99
Des/Des/Des+Ethofumesate	0.33/0.5/0.75+0.75	26	99	99
Desm/Desm+Clopyralid	0.33/0.5+0.2	19	99	96
Desm/Desm+Sethoxydim+OC	0.33/0.5+0.2+0.25G	27	99	97
Des+Endothall/Des+Endo	0.33+0.25/0.5+0.25	20	99	96
Clopyralid	0.2	0	0	11
EPTC+Cycl(PPI)/Desm/Desm	2+2/0.33/0.5	36	99	99
EP+Cy(PPI)/Des/Des/Des+Dala	2+2/0.33/0.5/0.75+1	49	99	99
EP+Cy(PPI)/Des/Des+Seth+OC	2+2/0.33/0.5+0.2+0.25G	45	99	99
Diethatyl(Pre)/Desm/Desm	4/0.33/0.5	25	99	99
Diet(Pre)/Des/Des/Des+Dala	4/0.33/0.5/0.75+1	32	99	99
Diet(Pre)/Des/Des+Seth+OC	4/0.33/0.5+0.2+0.25G	36	99	99
Metolachlor(PPI)/Desm/Desm	2/0.33/0.5	30	99	99
Meto(PPI)/Des/Des/Des+Dala	2/0.33/0.5/0.75+1	39	99	99
Meto(PPI)/Des/Des+Seth+OC	2/0.33/0.5+0.2+0.25G	40	99	99
Ethofumesate(Pre)/Des/Des	3.5/0.33/0.5	23	99	99
HIGH MEAN		49	99	99
LOW MEAN		0	0	11
EXP MEAN		29	94	93
C.V. %		20	0	2
LSD 5%		8	0	2
LSD 1%		11	0	3
# OF REPS		4	4	4

* OC = Herbimax

Summary

Sugarbeets treated with EPTC+cycloate were injured by postemergence herbicides more than sugarbeets not treated with a soil applied herbicide. Pretreatment by diethatyl and metolachlor also increased sugarbeet injury from one and two, respectively, of the postemergence treatments. All treatments except clopyralid gave nearly complete wild mustard control. Split application of desmedipham gave redroot pigweed control superior to split desmedipham+phenmedipham. Clopyralid gave very little control of redroot pigweed.

<u>Herbicides on hand weeded sugarbeets, St. Thomas, 1987.</u> Preplant incorporated herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots May 5 when the air temp. was 79°F, soil temp. at six inches was 62°F, wind was west at 5-10 mph, soil was dry at 0-2 inches and moist at 3-4 inches. A rototiller set four inches deep for EPTC+cycloate and two inches deep for all other PPI treatments was used for incorporation. Hilleshog Monoricca sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Temik (1.5 lb a.i./A) was applied during planting using a modified in-furrow applicator. Postemergence herbicide treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots 11:45 am June 15 when the sky was sunny, air temp. was 88°F, soil temp. at six inches was 74°F, relative humidity was 35%, wind was southwest at 5-8 mph, soil was dry at 0-1 inches, moist at 2-3 inches, wet at 4-6 inches, and sugarbeets were in the 6-8 leaf stage. Sugarbeets were hand weeded June 22 and maintained weed free throughout the growing season. Sugarbeets were hand thinned to an 8 inch spacing June 29. Sugarbeet injury was evaluated July 14. Sugarbeet stand counts were taken in the center two rows of each plot August 20. The center two rows of each plot were harvested September 22.

Treatment*	Rate (lb/A)	Sgbt inj (%)	Sgbt Popul #/70ft	Sucrose (%)	Loss to Molas (%)	Impur Index	Root Yield (ton/A)	Extract Sucrose (lb/A)
Untreated Check	---	9	95	13.9	1.9	1016	22.4	5336
Metolachlor (PPI)	2	4	104	14.8	1.8	895	23.0	5888
Metolachlor (PPI)	3	3	96	14.9	1.9	922	25.8	6635
Metolachlor (PPI)	4	9	101	14.8	1.9	958	24.9	6282
Diethatyl (PPI)	4	3	108	14.1	1.9	964	20.8	5039
Diethatyl (PPI)	6	3	98	14.2	1.9	978	23.2	5604
EPTC+Cycloate (PPI)	2+2	5	103	13.9	1.9	999	23.5	5583
Trifluralin (PPI)	0.1	10	103	13.8	1.9	1016	22.2	5156
Trifluralin (PPI)	0.2	13	97	14.6	1.9	937	22.7	5706
Trifluralin (PPI)	0.4	36	75	15.0	1.9	938	19.3	4974
Ethalfluralin (PPI)	0.1	4	99	14.5	2.0	986	21.6	5356
Ethalfluralin (PPI)	0.2	9	89	14.6	1.9	965	21.4	5325
Ethalfluralin (PPI)	0.4	50	59	14.7	2.0	1005	14.9	3685
BAS-51800+SFME (Post)	0.25+0.25G	8	99	14.6	1.8	893	18.3	4626
BAS-51800+SFME (Post)	0.5+0.25G	8	102	14.3	1.9	978	21.1	5131
BAS-51800+SFME (Post)	1+0.25G	8	107	14.1	1.9	981	19.6	4736
BAS-51800 (PPI)	1	10	100	13.8	1.8	974	20.0	4715
Atrazine-L (PPI)	0.1	26	81	14.1	1.9	982	21.9	5276
Atrazine-L (PPI)	0.2	73	35	14.1	1.9	997	16.7	3963
Atrazine-L (PPI)	0.3	79	23	13.9	2.1	1107	13.3	3083
Untreated Check	---	5	108	13.7	1.8	970	20.3	4776
2=4-D (Post)	0.06	58	94	14.2	1.9	960	14.5	3521
2=4-D (Post)	0.12	78	78	13.2	1.9	1043	13.1	2939
Glyphosate (Post)	0.06	48	99	14.2	1.9	1001	19.4	4631
Glyphosate (Post)	0.12	79	49	12.9	2.1	1195	7.3	1561
Clopyralid (Post)	0.1	0	91	13.9	2.0	1044	24.1	5625
Clopyralid (Post)	0.2	14	101	14.2	2.0	1047	24.4	5820
Clopyralid (Post)	0.4	18	105	14.4	1.9	959	22.9	5617
AC-222,293 (PPI)	0.025	26	105	14.2	1.9	960	21.7	5301
AC-222,293 (PPI)	0.05	38	93	14.3	1.9	996	22.1	5382
AC-222,293 (PPI)	0.1	71	63	14.1	1.9	982	18.7	4454
Dicamba (Post)	0.06	44	104	13.7	1.9	1035	18.8	4329
FMC-57020 (PPI)	0.5	16	107	14.6	1.8	911	21.9	5548
FMC-57020 (PPI)	1	30	88	14.2	1.9	968	23.9	5820

Table continued on next page.

Herbicides on hand weeded sugarbeets, St. Thomas, 1987. (continued)

Treatment*	Rate (lb/A)	Sgbt inj (%)	Sgbt Popul #/70ft	Sucrose (%)	Loss to Molas (%)	Impur Index	Root Yield (ton/A)	Extract Sucrose (lb/A)
HIGH MEAN		79	108	15.0	2.1	1195	25.8	6635
LOW MEAN		0	23	12.9	1.8	893	7.3	1561
EXP MEAN		26	90	14.2	1.9	987	20.3	4924
C.V. %		32	10	3.5	8.6	11	15.7	15
LSD 5%		12	13	0.7	NS	NS	4.5	1067
LSD 1%		16	17	0.9	NS	NS	5.9	1413
# OF REPS		4	4	4	4	4	4	4

* SFME = Agsco sunflower methyl ester

Summary

The yields in extractable sucrose per acre from the two untreated but hand-weeded checks were lower than expected, probably due to early season weed competition prior to the first hand weeding and possible damage to the sugarbeets from the handweeding. The two untreated but handweeded checks yielded less (using 5% LSD) extractable sucrose per acre than plots treated with metolachlor at 3 lb/A, which was the treatment with the highest mean in the experiment. Plots treated with diethatyl at 4 lb/A, trifluralin at 0.1 and 0.4 lb/A, ethalfluralin at 0.4 lb/A, BAS-51800 at 0.25, 0.5, and 1.0 lb/A, atrazine at 0.2 and 0.3 lb/A, 2,4-D at 0.06 and 0.12 lb/A, glyphosate at 0.06 and 0.12 lb/A, AC-222,293 at 0.1 lb/A, and dicamba at 0.06 lb/A yielded less (using 1% LSD) extractable sucrose than the highest mean in the experiment.

Effect of herbicides on sugarbeet root rot, Hector, 1987. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi to the center four rows of six row plots and rototiller incorporated April 21 when the air temp. was 63^{o}F, soil temp. at six inches was 52^{o}F, wind was north at 20 mph, soil was dry at 0-2 inches and moist at 3-4 inches. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. Maribo Ultramono sugarbeet was seeded 1.25 inches deep in 22 inch rows April 21. The first half of split application postemergence treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots 12:30 pm May 12 when the air temp. was 75^{o}F, soil temp. at six inches was 65^{o}F, relative humidity was 25%, wind was south at 20 mph, soil was dry at 0-3 inches, moist at 3-4 inches, and sugarbeets were cotyledon to 2 leaf. Single application postemergence treatments and the second half of split treatments were applied in 10 gpa water to the center four rows of six row plots 9:00 am May 19 when the air temp. was 68^{o}F, soil temp. at six inches was 60^{o}F, relative humidity was 85%, wind was east at 0-2 mph, and soil was dry. Sugarbeet injury was evaluated June 10. Ten sugarbeets per plot were rated June 10 for root rot using the following 0-5 values. 0) No apparent symptoms. 1) Slightly brown or discolored hypocotyl but firm under pressure. Very little root pruning. 2) Dark and or discolored hypocotyl with slight girdling of the hypocotyl with evident root pruning and slightly soft root tissue. 3) Very dark hypocotyl and roots with collapsing root tissue but not to the degree of 4. Very evident hypocotyl girdling. Main tap root intact but very soft and deteriorated. Severe root pruning. 4) Very darkly discolored hypocotyl and roots. Root tissue completely collapsed or main tap root severed as a result of severe hypocotyl girdling. No evidence of secondary root system. 5) Dead or dying plant.

Treatment*	Rate	Sugarbeet injury rating	Disease index rating
	(lb/A)	(%)	0 to 5
EPTC (PPI)	2	0	2.47
EPTC (PPI)	3	0	2.48
Cycloate (PPI)	4	3	2.73
EPTC+Cycloate (PPI)	1.5+2.5	0	2.68
EPTC+Cycloate (PPI)	2+2	1	2.23
Diethatyl (PPI)	4	0	2.20
Diethatyl (PPI)	6	0	2.96
Ethofumesate (PPI)	3.5	0	2.82
Metolachlor (PPI)	2	0	2.57
Metolachlor (PPI)	3	3	2.52
Untreated Check	0.0	0	2.46
Desmedipham (Post)	1	11	2.65
Desmedipham 2X (Post)	0.5	14	2.66
Sethoxydim+OC (Post)	0.2+0.25G	0	2.12
Desm+Etho 2X (Post)	0.38+0.75	17	2.71
Desm+Dalapon 2X (Post)	0.5+1	16	2.78
Clopyralid (Post)	0.19	0	2.42
Endothall (Post)	0.75	0	2.45
Desm&Phen 2X (Post)	0.5	12	3.24
Desm&Phen (Post)	1	6	3.25
EXP MEAN		4	2.62
C.V. %		90	20.64
LSD 5%		5	NS
LSD 1%		7	NS
# OF REPS		4	4

* OC = BASF oil concentrate (Booster Plus E)

SUMMARY. Severity of sugarbeet root rot was not affected by herbicide treatment.

Desmedipham plus additives, Amenia, 1987. Bioassay strips of Linton flax, Kirby mustard, McCall soybean, and BJ 19 sugarbeet were seeded April 29. Sethoxydim (0.2 lb ai/A) plus Agsco Sun-It (1 qt/A) was applied to all bioassay strips May 11 to control an early infestation of wild oat and foxtail. All herbicide applications were applied in 8.5 gpa water at 40 psi across the four bioassay species. The first half of split application treatments were applied 11:30 am June 1 when the air temp. was 66°F, sky was overcast, soil temp. at six inches was 67°F, relative humidity was 71%, wind was west at 10-15 mph, soil was dry on the surface, moist at 1-3 inches, wet at 4-6 inches, sugarbeets were cotyledon to early 2 leaf, flax was cotyledon (1 inch tall) to 3-4 inches tall, soybeans were cotyledon to second trifoliate, mustard was cotyledon to 3-4 inches tall, and foxtail was emerging to 2 leaf (1 inch tall). Single application treatments and the second half of split application treatments were applied from 9:00 am to 3:00 pm June 5 when the air temp. was 85°F, sky was sunny, soil temp. at six inches was 71°F, relative humidity was 33%, wind was southeast at 15-20 mph, soil was dry from 0-1 inch, moist at 2-3 inches, wet at 4-6 inches, sugarbeets were 2-6 leaf, flax was 1-5 inches tall, soybeans were cotyledon to second trifoliate (6 inches tall), mustard was 2 leaf to 6 inches, and foxtail was 2-3 leaf (0.5 to 2 inches tall). Plant sizes were variable due to dry soil conditions at planting. Rain several weeks after planting caused a late flush of all species to emerge. Crop injury and green and yellow foxtail control were evaluated June 15.

Treatment*	Rate	Sgbt inj ratg	Flax cntl ratg	Tamu cntl ratg	Soyb cntl ratg	Gr&Yel Fxtl cntl ratg
	(lb/A)			(%)		
Desmedipham	0.25	4	18	56	16	19
Desmedipham	0.5	16	37	76	38	40
Desmedipham	1	49	71	94	44	56
Desmedipham	2	71	93	99	48	66
Desmedipham/Desmedipham	0.25/0.25	8	65	98	33	72
Desmedipham/Desmedipham	0.5/0.5	39	96	99	51	86
Desmedipham+Dalapon	0.25+1	10	43	63	63	63
Desmedipham+Ethofumesate	0.25+0.56	20	64	76	61	46
Desmedipham+Ethofumesate	0.25+1.13	19	77	84	76	58
Desmedipham+Petroleum Oil	0.25+0.25G	14	13	64	26	35
Desmedipham+Sunflower Methyl Ester	0.25+0.25G	8	14	55	30	29
Desmedipham+Dash	0.25+0.25G	16	19	51	28	24
Desmedipham+Spraymate	0.25+0.25G	3	13	48	13	14
Desmedipham+28% N	0.25+1G	4	19	48	21	9
Desmedipham+Dalapon	0.5+1	34	60	90	74	71
Desmedipham+Ethofumesate	0.5+0.56	28	82	95	78	66
Desmedipham+Ethofumesate	0.5+1.13	38	92	92	84	80
Desmedipham+Petroleum Oil	0.5+0.25G	21	39	74	30	33
Desmedipham+Sunflower Methyl Ester	0.5+0.25G	32	29	70	23	48
Desmedipham+Dash	0.5+0.25G	30	31	80	29	38
Desmedipham+Spraymate	0.5+0.25G	16	35	76	29	23
Desmedipham+28% N	0.5+1G	32	40	85	34	26
Desmedipham+Dalapon	1+1	46	75	98	79	74
Desmedipham+Ethofumesate	1+0.56	51	92	99	84	84
Desmedipham+Ethofumesate	1+1.13	56	96	99	87	90
Desmedipham+Petroleum Oil	1+0.25G	45	56	87	45	56
Desmedipham+Sunflower Methyl Ester	1+0.25G	47	57	92	44	49
Desmedipham+Dash	1+0.25G	58	69	91	47	47
Desmedipham+Spraymate	1+0.25G	43	65	96	36	58
Desmedipham+28% N	1+1G	53	70	97	34	51

Table continued on next page.

Desmedipham Plus Additives, Amenia, 1987. (continued)

Treatment*	Rate (lb/A)	Sgbt inj ratg	Flax cntl ratg	Tamu cntl ratg	Soyb cntl ratg	Fxtl cntl ratg
		------------		(%)	------------	
Desmedipham+Dalapon	2+1	78	92	99	84	85
Desmedipham+Ethofumesate	2+0.56	66	99	99	81	90
Desmedipham+Ethofumesate	2+1.13	84	99	99	91	96
Desmedipham+Petroleum Oil	2+0.25G	70	93	99	62	75
Desmedipham+Sunflower Methyl Ester	2+0.25G	65	90	99	49	64
Desmedipham+Dash	2+0.25G	69	91	99	55	72
Desmedipham+Spraymate	2+0.25G	60	92	99	41	59
Desmedipham+28% N	2+1G	70	94	99	41	65
Dalapon	1	0	0	0	14	57
Ethofumesate	0.56	0	24	21	33	0
Ethofumesate	1.13	0	26	25	34	11
Petroleum Oil	0.25G	0	0	0	0	0
Sunflower Methyl Ester	0.25G	0	0	0	0	0
Dash	0.25G	0	0	0	0	0
Spraymate	0.25G	0	0	0	0	0
28% N	1G	0	0	0	0	0
Desm+Dala/Desm+Dala	0.25+1/0.25+1	23	75	99	83	96
Desm+Etho/Desm+Etho	0.25+0.56/0.25+0.56	29	98	99	96	92
Desm+Etho/Desm+Etho	0.25+1.13/0.25+1.13	49	98	99	94	95
Desm+PO/Desm+PO	0.25+0.25G/0.25+0.25G	21	70	99	51	78
Desm+SME/Desm+SME	0.25+0.25G/0.25+0.25G	17	74	99	54	83
Desm+Dash/Desm+Dash	0.25+0.25G/0.25+0.25G	13	70	99	40	69
Des+Sprmate/Des+Sprmate	0.25+0.25G/0.25+0.25G	6	58	98	45	69
Desm+28% N/Desm+28% N	0.25+1G/0.25+1G	6	59	99	33	75
Desm+Dala/Desm+Dala	0.5+1/0.5+1	48	97	99	92	94
Desm+Etho/Desm+Etho	0.5+0.56/0.5+0.56	70	99	99	95	96
Desm+Etho/Desm+Etho	0.5+1.13/0.5+1.13	69	99	99	97	98
Desm+PO/Desm+PO	0.5+0.25G/0.5+0.25G	45	94	99	71	90
Desm+SFME/Desm+SFME	0.5+0.25G/0.5+0.25G	36	88	99	69	89
Desm+Dash/Desm+Dash	0.5+0.25G/0.5+0.25G	43	90	99	48	83
Desm+Sprmate/Desm+Sprmate	0.5+0.25G/0.5+0.25G	38	92	99	44	86
Desm+28% N/Desm+28% N	0.5+1G/0.5+1G	21	93	99	61	85
HIGH MEAN		84	99	99	97	98
LOW MEAN		0	0	0	0	0
EXP MEAN		32	61	78	49	57
C.V. %		31	13	8	19	17
LSD 5%		14	11	9	13	14
LSD 1%		18	14	11	17	18
# OF REPS		4	4	4	4	4

* Petroleum Oil = Herbimax
* Sunflower Methyl Ester = Agsco Sun-It
* 28% N = 28% N solution containing urea and NH_4NO_3

SUMMARY. Desmedipham plus ethofumesate gave greater control of all bioassay species and greater sugarbeet injury than desmedipham alone except where desmedipham rate alone was high enough to give high levels of control or injury. Dalapon, as an additive, increased control of flax, soybean, and foxtail from desmedipham at 0.25 lb/A and increased sugarbeet injury and control of all bioassay species from desmedipham at 0.5 lb/A. Sunflower methyl ester and Dash increased sugarbeet injury without increasing control of bioassay species from desmedipham at 0.5 lb/A.

Desmedipham and Phenmedipham plus additives, Crookston, 1987. KW 3265 sugarbeet was seeded April 22 in 22 inch rows. The first half of split application treatments was applied 1:30 pm May 29 when the air temp. was 85°F, sky was sunny, six inch soil temp. was 75°F, relative humidity was 45%, wind was southwest at 5-10 mph, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, sugarbeets were in the cotyledon stage, redroot pigweed were cotyledon, and common lambsquarters were cotyledon to 4 leaf. Single application treatments and the second half of split application treatments were applied 10:00 am June 3 when the air temp. was 59°F, sky was sunny, soil temp. at six inches was 63°F, relative humidity was 58%, wind was northwest at 15-20 mph, soil was dry from 0-1 inch, moist at 2-3 inches, wet at 4-6 inches, sugarbeets were 2 leaf, redroot pigweed were 1-2 leaf, and common lambsquarters were 2-6 leaf (1 inch tall). Herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Plots were cultivated June 1. Redroot pigweed and common lambsquarters control and sugarbeet injury were evaluated June 17.

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Colq cntl ratg
	(lb/A)	---------	(%)	--------
Desmedipham&Phenmedipham	0.5	11	64	72
Desmedipham&Phenmedipham	1	48	94	98
Des&Phen+Sethoxydim+OC	0.5+0.15+0.25G	26	75	84
Des&Phen+Sethoxydim+OC	1+0.15+0.25G	50	91	96
Sethoxydim+OC	0.15+0.25G	0	0	0
Des&Phen+Sethoxydim+Dash	0.5+0.15+0.25G	16	75	79
Des&Phen+Sethoxydim+Dash	1+0.15+0.25G	46	81	92
Des&Phen+Sethoxydim+SFME	0.5+0.15+0.25G	24	74	89
Des&Phen+Sethoxydim+SFME	1+0.15+0.25G	40	92	93
Des&Phen+Sethoxydim+28% N	0.5+0.15+1G	16	71	77
Des&Phen+Sethoxydim+28% N	1+0.15+1G	30	91	94
Des&Phen+Seth+28% N+OC	0.5+0.15+1G+0.25G	30	82	85
Des&Phen+Seth+28% N+OC	1+0.15+1G+0.25G	55	87	91
Des&Phen+Seth+28% N+Dash	0.5+0.15+1G+0.25G	21	63	81
Des&Phen+Seth+28% N+Dash	1+0.15+1G+0.25G	51	94	97
Des&Phen+Seth+28% N+SFME	0.5+0.15+1G+0.25G	31	79	74
Des&Phen+Seth+28% N+SFME	1+0.15+1G+0.25G	49	93	95
De&Ph/De&Ph+Sethoxydim	0.5/0.5+0.15	29	97	96
De&Ph/De&Ph+Seth+OC	0.5/0.5+0.15+0.25G	48	98	99
De&Ph/De&Ph+Seth+Dash	0.5/0.5+0.15+0.25G	28	98	99
De&Ph/De&Ph+Seth+SFME	0.5/0.5+0.15+0.25G	44	98	99
D&P/D&P+Sethoxydim+28% N	0.33/0.33+0.15+1G	31	93	98
D&P/D&P+Seth+OC+28% N	0.33/0.33+0.15+0.25G+1G	24	99	99
D&P/D&P+Seth+Dash+28% N	0.33/0.33+0.15+0.25G+1G	29	98	99
D&P/D&P+Seth+SFME+28% N	0.33/0.33+0.15+0.25G+1G	13	94	98
Desmed&Phenmed+Dalapon	0.5+1	24	77	85
Desmed&Phenmed+Dalapon	1+1	56	92	97
Desmed&Phenmed+Triallate	0.5+0.5	16	61	72
Desmed&Phenmed+Triallate	1+0.5	29	83	90
EXP MEAN		32	82	87
C.V. %		44	15	10
LSD 5%		20	18	12
LSD 1%		26	23	16
# OF REPS		4	4	4

* OC = BASF crop oil concentrate (Booster Plus E)
* SFME = sunflower methyl ester (Agsco Sun-It)
* 28% N = 28% N solution containing urea and NH_4NO_3

SUMMARY. Sugarbeet injury and redroot pigweed control were not significantly affected by additive. Common lambsquarters control by desmedipham plus phenmedipham at 0.5 lb/A was increased by oil concentrate, sunflower methyl ester, 28% nitrogen+oil concentrate, and dalapon.

Desmedipham&Phenmedipham plus additives, Crookston, 1987. Bush Johnson 19 sugarbeet was seeded in 22 inch rows May 29. The first half of split application treatments was applied 11:00 am June 12 when the air temp. was 81°F, soil temp. at six inches was 69°F, relative humidity was 33%, wind was west at 8-10 mph, sky was sunny, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, sugarbeets had 2 leaves, redroot pigweed had 2 leaves, and green and yellow foxtail had 3 leaves (0.5 to 1 inch tall). Single application treatments and the second half of split treatments were applied at 4:00 pm June 18 when the air temp. was 81°F, soil temp. at six inches was 75°F, relative humidity was 51%, wind was northwest at 8-10 mph, sky was sunny, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, sugarbeets had 4 leaves, redroot pigweed were in the 2 leaf stage to 2 inches tall, and green and yellow foxtail were in the 2 leaf stage to 4 inches tall. Herbicides were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Redroot pigweed, green and yellow foxtail control, and sugarbeet injury were evaluated June 27.

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Gr&Yel Fxtl cntl ratg
	(lb/A)	--------	(%)	-------
Desmedipham&Phenmedipham	0.5	6	81	73
Desmedipham&Phenmedipham	1	20	88	76
Des&Phen+Sethoxydim+OC	0.5+0.15+0.25G	20	85	99
Des&Phen+Sethoxydim+OC	1+0.15+0.25G	25	87	99
Sethoxydim+OC	0.15+0.25G	0	0	99
Des&Phen+Sethoxydim+Dash	0.5+0.15+0.25G	20	79	99
Des&Phen+Sethoxydim+Dash	1+0.15+0.25G	34	88	99
Des&Phen+Sethoxydim+SFME	0.5+0.15+0.25G	17	88	99
Des&Phen+Sethoxydim+SFME	1+0.15+0.25G	30	86	99
Des&Phen+Sethoxydim+28% N	0.5+0.15+1G	14	85	96
Des&Phen+Sethoxydim+28% N	1+0.15+1G	29	88	99
Des&Phen+Seth+28% N+OC	0.5+0.15+1G+0.25G	29	85	99
Des&Phen+Seth+28% N+OC	1+0.15+1G+0.25G	43	93	99
Des&Phen+Seth+28% N+DAX	0.5+0.15+1G+0.25G	18	88	99
Des&Phen+Seth+28% N+DAX	1+0.15+1G+0.25G	38	89	99
Des&Phen+Seth+28% N+SFME	0.5+0.15+1G+0.25G	21	91	99
Des&Phen+Seth+28% N+SFME	1+0.15+1G+0.25G	32	91	99
Des&Phen/Des&Phen+Sethoxydim	0.5/0.5+0.15	21	97	99
Des&Phen/Des&Phen+Seth+OC	0.5/0.5+0.15+0.25G	28	96	99
Des&Phen/Des&Phen+Seth+Dash	0.5/0.5+0.15+0.25G	30	96	99
Des&Phen/Des&Phen+Seth+SFME	0.5/0.5+0.15+0.25G	30	97	99
De&Ph/De&Ph+Sethoxydim+28% N	0.33/0.33+0.15+1G	15	93	99
De&Ph/De&Ph+Seth+OC+28% N	0.33/0.33+0.15+0.25G+1G	22	95	99
De&Ph/De&Ph+Seth+DAX+28% N	0.33/0.33+0.15+0.25G+1G	23	95	99
De&Ph/De&Ph+Seth+SFME+28% N	0.33/0.33+0.15+0.25G+1G	21	94	99
Desmedipham&Phenmedipham+Dalapon	0.5+1	13	91	88
Desmedipham&Phenmedipham+Dalapon	1+1	23	92	85
Desmedipham&Phenmedipham+Triallate	0.5+0.5	11	85	67
Desmedipham&Phenmedipham+Triallate	1+0.5	25	87	79

Table continued on next page.

Desmedipham&Phenmedipham plus additives, Crookston, 1987. (continued)

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Gr&Yel Fxtl cntl ratg
	(lb/A)	--------	(%)	-------
HIGH MEAN		43	97	99
LOW MEAN		0	0	67
EXP MEAN		23	87	94
C.V. %		27	5	4
LSD 5%		9	6	5
LSD 1%		11	7	7
# OF REPS		4	4	4

* OC = Herbimax (Loveland Industries, Inc.)
* SFME = Agsco Sun-It (sunflower methyl ester)
* 28% N = 28% N solution containing urea NH_4NO_3

Summary

Green and yellow foxtail control from sethoxydim was not antagonized by desmedipham plus phenmedipham. Sugarbeet injury from desmedipham plus phenmedipham was increased by the additives Dash, sunflower methyl ester, 28% nitrogen solution, and combinations of oil and fertilizer. Redroot pigweed control from desmedipham plus phenmedipham at 0.5 lb/A was increased by sunflower methyl ester, Dash plus 28% N, sunflower methyl ester plus 28% N, and dalapon as additives.

Late application of postemergence herbicides, Bathgate, 1987. KW 3265 sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Herbicides were applied 1:15 pm June 15 when the air temp. was 93°F, soil temp. at six inches was 80°F, relative humidity was 34%, wind was south at 10-12 mph, sky was sunny, soil was dry at 0-1 inch, moist at 2-3 inches, sugarbeets were in the 6-10 leaf stage, green foxtail were 1-5 inches tall, redroot pigweed were in the 6 leaf stage to 2 inches tall, wild buckwheat were in the 3 leaf stage (1 inch tall) to 4 inches tall, and common mallow were 2-3 inches tall. Treatments were applied in 8.5 gpa water at 40 psi to the center four rows of six row plots. Redroot pigweed, green foxtail, wild buckwheat, and common mallow control and sugarbeet injury were evaluated June 22.

Treatment*	Rate	Sgbt inj ratg	Rrpw cntl ratg	Grft cntl ratg	Wibw cntl ratg	Coma cntl ratg
	(lb/A)	(%)				
Desmedipham	1	13	43	29	35	11
Desmed&Phenmed	1	16	48	41	59	10
Desmedipham+Ethofumesate	1+1	28	85	53	91	40
Desmedipham+Dalapon	1+1	28	69	71	50	15
Desmedipham+Endothall	1+0.75	45	55	76	90	19
Desmedipham+Ethofumesate	1+0.2	14	45	20	60	18
Desmedipham+SFME	1+0.25G	30	68	51	73	12
Desmedipham+Clopyralid	1+0.2	14	78	33	90	33
Endothall	0.75	26	18	45	89	19
HIGH MEAN		45	85	76	91	40
LOW MEAN		13	18	20	35	10
EXP MEAN		24	56	47	71	20
C.V. %		39	22	44	18	38
LSD 5%		13	18	30	19	11
LSD 1%		18	24	40	25	15
# OF REPS		4	4	4	4	4

* SFME = sunflower methyl ester (Agsco Sun-It)

Summary

Addition of ethofumesate at 1.0 lb/A, dalapon, endothall, or sunflower methyl ester to desmedipham increased sugarbeet injury compared to desmedipham alone. Desmedipham&phenmedipham gave greater control of wild buckwheat than desmedipham. Desmedipham+ethofumesate at 1+1 lb/A gave greater sugarbeet injury, and greater control of redroot pigweed, wild buckwheat and common mallow than desmedipham+ethofumesate at 1+0.2 lb/A. Addition of ethofumesate at 1 lb/A to desmedipham increased control of redroot pigweed, wild buckwheat and common mallow compared to desmedipham alone; addition of dalapon to desmedipham improved control of redroot pigweed and green foxtail; addition of sunflower methyl ester improved control of redroot pigweed and wild buckwheat; and addition of clopyralid improved control of redroot pigweed and wild buckwheat. None of the treatments gave adequate control of common mallow.

<u>Common cocklebur control with postemergence herbicides, Hector, 1987.</u> The experiment was established in a commercial sugarbeet field. The first half of split application treatments and all single application treatments were applied 11:00 am June 11 when the air temp. was 78°F, soil temp. at six inches was 65°F, relative humidity was 90%, wind was east at 8 mph, soil was wet, sugarbeets were in the 6 leaf stage, cocklebur had 4-8 leaves (6-10 inches tall), and foxtail were 6 inches tall. The second half of split treatments was applied 12:30 pm June 19 when the air temp. was 82°F, soil temp. at six inches was 75°F, relative humidity was 75%, wind was east at 5 mph, soil was moist, sugarbeets were in the 6-10 leaf stage, cocklebur had 6-12 leaves (8-14 inches tall), and foxtail were 8 inches tall. All herbicides were applied in 10 gpa water to the center four rows of six row plots. Cocklebur and foxtail control and sugarbeet injury were evaluated June 19 and June 26.

		--- June 19 ---			--- June 26 ---		
Treatment	Rate	Sgbt inj ratg	Cocb cntl ratg	Fxtl cntl ratg	Sgbt inj ratg	Cocb cntl ratg	Fxtl cntl ratg
	(lb/A)	(%)					
Clopyralid	0.1	0	60	0	0	60	0
Clopyralid	0.2	0	86	0	0	93	0
Endothall	0.5	21	49	21	8	26	19
Endothall	0.75	25	60	14	23	39	24
Des&Phen/Des&Phen	0.5/0.5	4	21	14	5	30	18
De&Ph/De&Ph+Clopyralid	0.5/0.5+0.2	6	79	6	4	84	0
De&Ph+Dala/De&Ph+Dala	0.5+1/0.5+1	16	44	41	18	50	84
De&Ph+Etho/De&Ph+Etho	0.5+1/0.5+1	16	46	56	15	70	79
De&Ph+Etho/De&Ph+Etho	0.5+0.2/0.5+0.2	21	34	35	10	41	54
De&Ph+Endo/De&Ph+Endo	0.5+0.25/0.5+0.25	21	48	48	13	46	58
HIGH MEAN		25	86	56	23	93	84
LOW MEAN		0	21	0	0	26	0
EXP MEAN		13	53	24	9	54	33
C.V. %		45	18	75	74	29	47
LSD 5%		9	14	25	10	23	23
LSD 1%		12	18	34	14	31	31
# OF REPS		4	4	4	4	4	4

Summary

Clopyralid at 0.1 lb/A gave less common cocklebur control than clopyralid at 0.2 lb/A. Clopyralid at 0.2 lb/A, alone or in combination, gave better common cocklebur control than any other treatment.

<u>Common mallow control in sugarbeets, Shelly, 1987.</u> Beta 3614 sugarbeet was seeded in 22 inch rows April 18. The experiment was established in a commercial field so the plots were cultivated as needed during the growing season. A natural infestation of mallow was very dense in the sugarbeet rows when treatments were applied. The first half of split application treatments was applied 10:00 am June 16 when the air temp. was 86°F, soil temp. at six inches was 70°F, relative humidity was 48%, wind was south at 10-15 mph, sky was sunny, soil was dry at 0-2 inches, wet at 3-4 inches, sugarbeets were in the 8-12 leaf stage, and mallow was 3-7 inches tall. All Bio Mal treatments and the second half of split treatments were applied 10:30 am June 19 when the air temp. was 78°F, soil temp. at six inches was 70°F, relative humidity was 53%, wind was east at 5-8 mph, soil was dry at 0-2 inches, moist at 2-3 inches, and wet at 4-6 inches. All treatments were applied in 17 gpa water at 40 psi to the center four rows of six row plots. Migrant labor weeded the hand weeded check June 23. Mallow control and sugarbeet injury were evaluated July 27. Sugarbeets were harvested from four treatments September 16. Sixty feet of treated row were harvested from each plot.

Treatment	Rate	Sugarbeet injury rating	Common Mallow control rating
		------- (%)	-------
Bio Mal	6×10^{10} spores/A	0	88
Bio Mal	12×10^{10} spores/A	0	97
Bio Mal	24×10^{10} spores/A	0	98
Bio Mal	96×10^{10} spores/A	0	98
Desmed&Phenmed/Desmed&Phenmed	0.5/0.5 lb ai/A	0	3
Desmed&Phenmed+Dalapon 2X	0.5+1 lb ai/A	0	0
Desmed&Phenmed+Ethofumesate 2X	0.5+0.75 lb ai/A	0	10
Des&Phen/Des&Phen+BioMal	0.5/0.5 lb/A+24×10^{10} spores/A	0	10
EXP MEAN		0	50
C.V. %		0	21
LSD 5%		NS	16
LSD 1%		NS	22
# OF REPS		4	4

Experiment continued on next page.

Common mallow control in sugarbeets, Shelly, 1987. (continued)

Treatment	Rate	Sgbt Popul	Sucrose	Loss to Molass	Root Yield	Impurity Index	Extrac Sucros
	(lb/A)	#/60ft	(%)	(%)	(ton/A)		(lb/A)
Weedy Check		42	17.1	1.9	17.0	794	5056
Hand Weeded Check		40	17.1	1.8	13.3	774	4072
Desmed+Ethofume 2X	0.5+0.75	51	17.1	1.9	19.2	805	5746
BioMal	24 X 10^{10}	49	17.3	1.7	14.5	705	4473
EXP MEAN		45	17.1	1.8	16.0	769	4837
C.V. %		24	2.9	9.8	18.3	12	18
LSD 5%		NS	NS	NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

The Bio Mal was very slow to control the common mallow as the Bio Mal was applied June 19 and the common mallow was still quite healthy on July 15. However, much of the treated common mallow turned brown and died between July 15 and evaluation on July 27. Common mallow control was poor with all tested herbicide treatments. Mixing desmedipham and phenmedipham with Bio Mal reduced the common mallow control compared to Bio Mal applied alone. Variability in sugarbeet yields prevented detection of differences in any of the harvest parameters.

Response of several crops and weeds to herbicides. Dexter, Alan G. and John D. Nalewaja. The objective of this experiment was to determine the effect of registered and non-registered herbicides on a number of crops grown in North Dakota. The experiment was established on a Fargo silty clay with 3.4% organic matter, pH 7.7, 124 lb/A of N in the top 2 ft, and high levels of P and K approximately 5 miles north of Fargo, ND, June 2, 1987. Plots were 10 by 40 ft arranged in a randomized complete block with three replications. The center 8 ft of each plot was treated with herbicide. Preemergence and preplant incorporated herbicides were applied in 17 gpa at 40 psi through 8002 nozzles June 2 when air temperature was 75F and soil temperature 6 inches deep was 62F. Incorporation was with a rototiller operated 4 inches deep for thiocarbamates and 2 inches deep for other herbicides. 'Marshall' Hard Red Spring wheat, 'Lyon' oats, 'Manker' barley, 'Siberian' foxtail millet, 'Pioneer 3953' corn, 'S-541' safflower '316 Seed-Tec' sunflower, 'Linton' flax, 'Kirby' tame mustard, 'McCall' soybean, 'C-20' navy bean 'ACH-164' sugarbeets, 'Greenpod' lentils, 'Tokyo' tame buckwheat, amaranth (tame pigweed), and kochia were seeded across the plots June 2. A natural infestation of redroot pigweed also was evaluated. Postemergence herbicides were applied in 8.5 gpa at 40 psi through 8001 nozzles June 25 when air temperature was 73F, relative humidity was 43%, and soil was moist at 1 to 2 and wet at 3 to 4 inch depths. On June 25, HRS wheat, oats, barley, buckwheat, kochia and amaranth were 7 to 10 inches tall, sugarbeets had 6 to 8 leaves, foxtail millet was 11 inches tall, tame mustard was 1 to 4 inches tall, safflower had 6 to 8 leaves, lentils were 2 to 4 inches tall, flax was 4 inches tall, sunflower had 6 to 8 leaves, corn was 5 to 12 inches tall, soybeans had two trifoliolate leaves, navy beans had three trifoliolate leaves, and redroot pigweed was 1 to 7 inches tall. Measurable rain during June was 0.14 inch June 10 and 0.27 inch June 17.

DPX-M6316 and DPX-L5300 are normally applied postemergence, however, they also were applied preplant incorporated (PPI) in this experiment to obtain information on crop tolerance to potential soil residual. Six crops, kochia, and redroot pigweed were injured 30% or more by PPI DPX-M6316 while nine crops, kochia, and redroot pigweed were injured 30% or more by PPI DPX-L5300. PPI KIH-1742 severely injured or controlled most species in the experiment. Only safflower and tame buckwheat were tolerant. Lentils were injured less than 10% by metolachlor and imazethapyr.

The relatively dry conditions following preemergence herbicide application greatly reduced the efficacy of the preemergence herbicides. All preemergence herbicides, except KIH-1742, gave less than 75% control of all species.

Postemergence clopyralid gave over 90% control of lentils, safflower, navy beans, soybeans, and sunflower but had no effect on any other species in the experiment. Kochia control was 90% or better from postemergence DPX-M6316, DPX-L5300, fluroxypyr, bentazon + acifluorfen + ammonium sulfate + oil, glyphosate, paraquat, A-1237, C-4243, and 2,4-DB. Lentils were injured less than 10% by postemergence acifluorfen, fomesafen, lactofen, diclofop, fluazifop, sethoxydim, and BAS-51800. Postemergence A-1237 at 0.05 lb/A caused 35% or greater injury to all species except corn and C-4243 caused 35% or greater injury to all species except oats, barley, and HRS wheat. Soybean and navy bean were severely injured by bentazon + acifluorfen in combination with the methylated sunflower oil adjuvant or the petroleum oil adjuvant + ammonium sulfate. However, bentazon + acifluorfen in combination with X-77, ammonium sulfate, or the petroleum oil adjuvant caused less than 15% injury to soybean and navy bean. Postemergence BAS-51800 caused 15% or less injury to all plant species evaluated.

Table. Response of several crops and weeds to herbicides. (Dexter and Nalewaja).

Treatments	Rate	Weed control or crop injury																
		Oats	Barley	HRS Wht[b]	Len-tils	Saf-flower	Sugar-beets	Tame buck-wheat	Flax	Tame Mustard	Ama-ranth	Fox tail millet	KOCZ	Navy bean	Soy-bean	Corn	Sun-flower	Rrpw
	(lb/A)	(%)																
Preplant incorporated																		
Alachlor	3	73	45	62	23	20	40	17	20	32	95	83	72	2	0	0	0	96
Metolachlor	3	37	47	64	8	13	33	35	23	87	86	88	72	0	0	12	0	98
Butylate	4	87	84	96	20	13	57	63	37	83	78	87	76	15	69	27	13	91
EPTC	4	99	95	98	40	28	55	89	59	90	89	97	83	5	48	52	23	95
Cycloate	4	90	83	97	26	28	58	87	59	82	82	94	58	29	74	29	7	84
Clomazone	1	79	81	92	85	46	18	23	91	93	37	93	96	15	7	97	38	42
Trifluralin	1	94	74	95	30	20	97	96	62	53	98	97	97	8	3	48	0	97
Ethalfluralin	1	96	91	96	42	25	97	97	40	48	97	99	98	2	6	88	2	98
Imazethapyr	0.03	32	25	15	5	47	90	80	82	88	89	74	93	7	5	58	19	94
Imazethapyr	0.06	53	54	28	2	63	98	90	89	93	95	83	92	3	7	75	23	93
Cinmethylin	1.25	88	91	91	84	62	47	86	33	74	53	87	67	15	30	80	15	73
DPX-M6316	0.015	30	13	22	25	17	43	28	33	79	70	33	43	0	2	0	5	75
DPX-L5300	0.015	32	22	15	43	30	89	66	80	94	89	67	91	0	0	24	25	78
BAS-51800	1	15	8	10	88	61	23	10	84	56	47	60	55	10	5	3	3	0
Cyanazine	2	83	74	83	30	65	73	92	86	94	47	75	90	91	15	30	43	47
Metribuzin	0.375	85	73	86	20	62	83	74	88	93	71	60	96	90	3	65	67	91
KIH-1742	0.25	33	52	40	72	17	80	10	69	75	95	80	84	40	40	55	18	93
KIH-1742	0.5	78	92	82	92	22	98	20	92	89	98	85	89	88	57	90	19	98
KIH-1742	1	89	94	96	96	30	99	38	97	98	99	97	99	95	81	96	28	99
Mean		67	63	67	44	35	67	58	64	79	80	81	82	27	24	49	18	81
LSD 5%		16	14	18	23	30	26	19	29	23	27	24	31	16	19	28	24	9
Preemergence																		
Propachlor	5	7	0	0	0	7	12	8	0	8	2	8	3	8	0	12	3	12
Metolachlor	3	0	3	0	3	0	10	0	0	3	5	7	5	0	3	0	3	15
Alachlor	3	0	0	0	15	13	5	7	0	3	8	13	10	7	3	0	3	7
Chloramben	3	5	0	3	5	22	8	7	5	0	0	10	17	3	0	8	0	5
Pendimethylin	1.5	15	0	0	0	5	65	65	0	5	13	23	50	0	0	0	0	28
BAS-51400	0.5	0	0	0	13	15	8	7	3	2	3	8	8	20	15	12	5	10
BAS-51400	1	0	0	0	5	37	0	0	10	0	2	3	5	27	7	5	13	0
BAS-51400	2	3	0	0	12	60	5	5	12	0	3	10	12	27	7	0	3	0
A-1237	0.03	0	0	0	10	5	13	5	13	2	2	8	0	10	3	13	0	43
A-1237	0.06	7	7	3	1	12	32	24	0	5	64	3	20	3	2	0	0	70
C-4243	0.06	0	0	0	0	15	3	7	0	8	5	13	0	0	0	0	0	23
Cinmethylin	1.25	0	0	0	0	13	17	13	0	12	5	8	13	12	0	13	5	0
KIH-1742	0.25	28	43	18	23	15	95	13	8	22	65	42	78	7	2	20	5	87
KIH-1742	0.5	35	48	10	28	7	99	3	30	47	90	50	95	10	0	23	3	94
KIH-1742	1	69	79	40	81	8	99	18	78	68	99	82	99	17	3	57	15	99
Mean		69	79	40	81	60	99	65	78	68	99	82	99	27	15	57	15	99
LSD 5%		17	17	6	19	25	21	17	14	21	9	19	20	NS	NS	21	NS	23
Postemergence[a]																		
DPX-M6316+X-77	0.016+0.25%	0	3	0	95	15	99	92	25	99	92	28	91	78	17	10	99	99
DPX-L5300+X-77	0.016+0.25%	0	0	0	97	94	99	96	65	99	87	60	98	75	97	84	99	92
Clopyralid	0.2	0	0	0	99	97	0	0	0	0	3	0	0	93	99	3	94	0
Fluroxypyr	0.2	0	3	0	99	94	93	95	98	71	55	0	97	98	99	0	96	18
Acifluorfen+X-77	0.375+0.25%	5	0	0	0	73	27	72	60	92	42	3	32	12	0	7	38	73
Fomesafen+X-77	0.2+0.25%	7	0	3	0	15	20	35	8	88	25	0	13	8	3	10	27	37
Lactofen+X-77	0.18+0.25%	7	10	3	3	12	33	74	86	70	48	0	75	11	3	7	13	92
Bentazon+PO	0.75+1Q	3	0	0	94	91	90	65	5	99	0	0	61	5	0	12	70	65
Bent+acif+X-77	0.6+0.25+0.25%	2	3	0	91	90	83	82	65	99	47	10	62	3	0	12	47	82
Bent+acif+PO	0.6+0.25+1Q	10	12	8	99	96	86	89	65	99	38	5	68	12	10	3	50	75
Bent+acif+MS	0.6+0.25+1Q	15	15	10	99	99	97	97	96	99	45	12	83	62	80	27	87	94
Bent+acif+AMS	0.6+0.25+2.5	10	8	3	79	77	70	67	38	99	23	3	58	3	3	7	35	57
Bent+acif +AMS+PO	0.6+0.25 +2.5+1Q	15	18	8	95	98	96	97	95	99	60	12	91	50	43	18	83	96
Bent+acif +AMS+MS	0.6+0.25 +2.5+1Q	40	38	27	99	99	98	99	99	99	90	20	97	91	66	62	94	99
Bromoxynil	0.25	5	5	5	94	98	80	78	23	99	22	10	52	42	42	0	96	65
Dicamba	0.12	0	27	0	97	95	87	75	8	45	75	7	84	88	88	7	90	90
2,4-D	0.25	0	5	0	55	88	82	50	17	96	67	0	73	47	48	0	91	69
2,4-DB	0.5	0	7	0	99	98	98	94	43	99	98	35	96	96	98	37	99	98
Diclofop+PO	1+1Q	62	10	0	0	0	0	0	0	0	0	95	0	0	0	99	0	0
Fluazifop-P+PO	0.19+1Q	99	99	99	0	0	0	0	0	0	0	92	0	0	0	99	0	0
Sethoxydim+PO	0.2+1Q	99	98	97	0	0	0	0	0	0	0	99	0	0	0	99	0	0
Glyphosate+X-77	0.25+0.25%	99	99	99	86	99	99	92	96	99	96	99	99	97	98	99	99	99
Paraquat+X-77	0.5+0.25%	92	87	97	98	99	99	99	97	74	98	63	99	79	99	65	99	97
A-1237	0.05	45	50	42	81	98	97	98	98	98	96	35	99	99	70	27	84	99
A-1237	0.1	67	75	50	98	99	99	99	99	99	98	60	99	99	97	48	93	99
C-4243	0.1	15	23	10	73	78	95	96	83	93	96	48	95	99	91	38	67	99
BAS-51800+PO	0.25+1Q	0	0	0	0	3	5	10	3	3	0	0	0	13	8	0	0	0
BAS-51800+PO	1.0+1Q	0	0	0	0	8	0	5	0	15	0	5	0	0	0	0	0	0
BAS-51400+BAS-090	0.25	17	20	8	98	93	48	15	91	5	10	84	63	92	82	57	87	70
BAS-51400+BAS-090	0.5	35	35	23	99	97	50	20	95	15	20	94	75	91	87	77	92	70
BAS-51400+BAS-090	1.0	35	33	22	99	98	82	27	98	53	32	94	86	95	88	85	93	65
Mean		25	25	20	69	72	65	63	55	69	47	34	63	52	48	35	65	65
LSD 5%		13	11	9	11	11	15	9	12	14	18	13	12	14	13	12	11	13

[a] X-77 = non-ionic surfactant from Chevron Chemical Co, PO = petroleum oil adjuvant from BASF (Booster Plus E), MS = methylated sunflower oil with 15% emulsifier, AMS = ammonium sulfate, BAS-090 = adjuvant from BASF at 1 qt/A, bent = bentazon, acif = acifluorfen.

[b] HRS wht = Hard Red Spring wheat

Diclofop antagonism in wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 27 and preemergence treatments (PE) were applied on April 30. Postemergence treatments (P) were applied to 1 and 4 leaf wild oats and wheat on May 28 with 80 F, 70% relative humidity, and a 15 mph wind. The entire experimental area was treated with MCPA at 4 oz/A for wild mustard control on June 4. Wild oats density was about 100 plants/square yd. Wild oats control was evaluated on July 14 and harvest was August 5.

Treatment[a]	Type	Rate	Wheat Yield	Wheat Injury	Wioa
		(oz/A)	(bu/A)	(%)	(% control)
DPX-M6316/Diclofop	PE/P	0.5/12	23.0	0	83
DPX-L5300/Diclofop	PE/P	0.5/12	22.9	3	82
Dicamba/Diclofop	PE/P	2/12	21.9	1	80
Picloram/Diclofop	PE/P	0.38/12	25.2	0	86
2,4-D-bee/Diclofop	PE/P	16/12	17.4	0	81
MCPA-bee/Diclofop	PE/P	16/12	25.0	0	78
Diclofop	P	12	22.6	0	81
Diclofop+DPX-M6316	P	12+0.5	21.7	1	76
Diclofop+DPX-L5300	P	12+0.5	18.6	0	45
Diclofop+Dicamba	P	12+2	15.3	0	11
Diclofop+Picloram	P	12+0.38	21.2	1	75
Diclofop+2,4-D-bee	P	12+8	13.4	0	26
Diclofop+MCPA-bee	P	12+8	22.1	0	48
No treatment	-	0	14.6	0	0
C.V. %			16.4	403	15
LSD 5%			4.8	NS	13

[a] bee = butoxyethanol ester.

Summary

None of the herbicides applied preemergence had any influence on wild oats control from diclofop applied postemergence. However, 2,4-D, MCPA, dicamba, and DPX-L5300 were antagonistic to wild oats control when applied with diclofop. Yields generally related to wild oats control.

Postemergence wild oats control in wheat, Fargo, 1987. 'Marshall' Hard Red Spring wheat was seeded April 14. Stage 1 (S1) treatments were to 1 to 3 leaf wheat and wild oats, 1.5 leaf green foxtail, and cotyledon to 2 inch broadleaf weeds on May 8 with 60F, 40% relative humidity (RH), and dry soil conditions. Stage 2 (S2) treatments were to 1 and 5 leaf wild oats and wheat with wet soil conditions on May 28 with 78F, 80% RH. No rain occurred for 3 days after the S1 treatments. Rainfall after S2 treatments was none for 10 days. 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 10 by 25 ft plots. The experiment was a randomized complete block design with four replications. Wheat injury and weed control were evaluated on July 14. Harvest was on July 30.

Treatment[a]	Rate	Wheat yield	Wheat injury	Wioa	Wimu	Colq	Wibw
	(oz/A)	(bu/A)	(%)	-----(% control)-----			
Barban (S1)	4	30.1	0	71	0	0	0
Barban+N (S1)	4+1G	21.9	0	72	0	0	0
Barban (S1)	6	24.7	0	71	0	0	0
Diclofop (S1)	12	34.3	0	78	0	0	0
Diclofop (S1)	16	32.5	0	85	0	0	0
Diclofop+PO (S1)	12+0.12G	25.6	0	85	0	0	0
Diclofop+MS (S1)	12+0.12G	26.4	0	84	0	0	0
AC 222,293 (S1)	4	34.1	1	98	98	5	74
AC 222,293 (S1)	5	37.6	0	99	99	15	76
AC 222,293 (S1)	6	33.5	3	99	99	15	78
Barban (S2)	6	27.0	1	75	0	0	0
Diclofop (S2)	16	27.5	0	82	0	0	0
Diclofop+PO (S2)	16+0.12G	22.5	0	85	0	0	0
Diclofop+MS (S2)	16+0.12G	22.9	0	83	0	0	0
AC 222,293 (S2)	6	30.1	0	98	99	5	55
AC 222,293 (S2)	8	26.8	1	99	99	4	66
Difenzoquat (S2)	10	29.1	2	97	0	0	0
Difenzoquat (S2)	12	36.0	2	96	0	0	0
No treatment	0	28.4	0	0	0	0	0
C.V. %		35.3	289	5	3	256	42
LSD 5%		NS	NS	6	1	8	11

[a] N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS methylated sunflower oil with 15% emulsifier; G in the rate column represents gallons/A.

Summary

Wild oats control from barban, diclofop, and AC 222,293 applied to 3 to 5 leaf wild oats was not less than from application at the 2 leaf stage. The drought conditions at early application may have reduced herbicide effectiveness and delayed wild oats emergence until after the S1 treatments. Petroleum oil (PO) and methylated sunflower oil (MS) similarly enhanced or tended to enhance wild oats control with diclofop. AC 222,293 generally gave higher control of Russian thistle, common lambsquarters, and wild buckwheat at the S1 than S2 treatment stage. Diclofop gave higher green foxtail control at the S2 than the S1 treatment stage either because of drought stress or incomplete green foxtail emergence at S1. Wheat yields were variable because of sparse wild oats infestation and variable sparse wheat stand.

Postemergence wild oats control in wheat, Williston, 1987. 'Len' Hard Red Spring wheat was seeded April 23. Stage 1 (S1) treatments were applied on May 14 to 3 to 3.5 leaf wheat and 2.5 wild oats with 57 F, 45% relative humidity, and dry soil conditions. Stage 2 (S2) treatments were applied to 4.5 leaf wild oats and 5.5 leaf wheat on May 26 with 60 F and 78% relative humidity. Rainfall after the S1 treatment was 0.97 inch within 3 days and rainfall after S2 treatment was 0.62 inch for 5 days. 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 10 by 25 ft plots. The experiment was a randomized complete block design with four replications. Wheat injury and weed control were evaluated on July 9 and harvest was on August 10.

Treatment[a]	Rate	Wheat yield	Wheat injury	Wioa	Ruth
	(oz/A)	(bu/A)	(%)	(% control)	
Barban (S1)	4	10.8	0	85	0
Barban+N (S1)	4+1G	13.7	1	86	0
Barban (S1)	6	12.3	1	82	0
Diclofop (S1)	12	14.8	0	94	0
Diclofop (S1)	16	13.7	0	95	0
Diclofop+PO (S1)	12+0.12G	13.6	0	83	60
Diclofop+MS (S1)	12+0.12G	14.9	1	99	0
AC 222,293 (S1)	4	12.7	0	99	75
AC 222,293 (S1)	5	17.1	1	99	81
AC 222,293 (S1)	6	16.9	9	98	82
Barban (S2)	6	12.2	3	80	0
Diclofop (S2)	16	7.8	0	80	0
Diclofop+PO (S2)	16+0.12G	13.3	0	91	0
Diclofop+MS (S2)	16+0.12G	12.5	8	96	9
AC 222,293 (S2)	6	13.4	0	95	50
AC 222,293 (S2)	8	10.7	6	98	53
Difenzoquat (S2)	10	8.4	25	79	25
Difenzoquat (S2)	12	7.3	20	97	48
No treatment	0	8.1	0	0	0
C.V. %		23.3	230	10	75
LSD 5%		4.1	13	12	24

[a] N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated sunflower oil with 15% emulsifier; G in the rate column represents gallons/A.

Summary

Wild oats control from barban, diclofop, and AC 222,293 applied to 3 to 5 leaf wild oats was not less than from application at the 2 leaf stage. The drought conditions at early application may have reduced herbicide effectiveness and delayed wild oats emergence until after the S1 treatments. Petroleum oil (PO) and methylated sunflower oil (MS) similarly enhanced or tended to enhance wild oats control with diclofop. AC 222,293 generally gave higher control of Russian thistle, common lambsquarters, and wild buckwheat at the S1 than S2 treatment stage. Diclofop gave higher green foxtail control at the S2 than the S1 treatment stage either because of drought stress or incomplete green foxtail emergence at S1. Wheat yield generally related to degree of weed control.

Postemergence wild oats control in wheat, Langdon, 1987. 'Coteau' Hard Red Spring wheat was seeded May 9. Stage 1 (S1) treatments were applied May 28 to 1 to 2.5 leaf wild oats and wheat with 72 F and 58% relative humidity. Stage 2 (S2) treatments were applied to 3 to 4 leaf wild oats and wheat on June 9 with 60 F. No rain occurred for 3 days after the S1 treatments but 0.26 inch occurred 1 day after the S2 treatments. 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 10 by 25 ft plots. The experiment was a randomized complete block design with four replications. Weed control was evaluated on July 23.

Treatmenta	Rate	Wheat Yield	Wheat Tswt	Wioa	Grft
	(oz/A)	(bu/A)	(lb)	---(% control)---	
Barban (S1)	4	26	55.8	45	0
Barban+N (S1)	4+1G	27	54.8	60	0
Barban (S1)	6	26	53.9	70	0
Diclofop (S1)	12	33	55.5	63	33
Diclofop (S1)	16	30	55.3	73	53
Diclofop+PO (S1)	12+0.12G	32	54.6	83	60
Diclofop+MS (S1)	12+0.12G	33	51.9	56	43
AC 222,293 (S1)	4	30	55.3	78	0
AC 222,293 (S1)	5	29	53.6	62	10
AC 222,293 (S1)	6	26	53.6	88	0
Barban (S2)	6	26	55.3	83	0
Diclofop (S2)	16	39	55.4	72	92
Diclofop+PO (S2)	16+0.12G	37	54.3	87	93
Diclofop+MS (S2)	16+0.12G	39	52.9	90	89
AC 222,293 (S2)	6	30	54.9	95	13
AC 222,293 (S2)	8	32	54.6	97	9
Difenzoquat (S2)	10	28	54.3	93	0
Difenzoquat (S2)	12	24	54.1	92	0
No treatment	0	24	53.1	0	0
C.V. %		11	3.4	18	60
LSD 5%		5	NS	19	22

a N = 28% nitrogen fertilizer; PO = petroleum oil with 17% emulsifier; MS = methylated sunflower oil with 15% emulsifier; G in the rate column represents gallons/A, Tswt = test weight.

Summary

Wild oats control from barban, diclofop, and AC 222,293 applied to 3 to 4 leaf wild oats was not less than from application at the 1 to 2.5 leaf stage. The drought conditions at early application may have reduced herbicide effectiveness and delayed wild oats emergence until after the S1 treatments. Petroleum oil (PO) and methylated sunflower oil (MS) similarly enhanced or tended to enhance wild oats control with diclofop, except MS at the S1 treatment (possible omission of the adjuvant). Diclofop gave higher green foxtail control at the S2 than the S1 treatment stage either because of drought stress or incomplete green foxtail emergence at S1. Wheat yields were variable because of sparse wild oats infestation and variable sparse wheat stand.

Sulfonylureas with wild oats control herbicides in wheat, Fargo, 1987. 'Marshall' Hard Red Spring wheat was seeded on April 15. Treatments were to mainly 5 leaf wheat and wild oats on May 28 with 78F, 80% relative humidity and wet soil conditions. Treatments were applied with a 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 experiment was a randomized complete block design with four replications. Wild oats control was evaluated on July 13. Wild oats infestation was 100 plants/square yard. Wheat was not harvested because of variable stands caused by an early drought.

Treatment[a]	Rate	Wioa control
	(oz/A)	(%)
Diclofop	12	70
Diclofop+PO	12+0.25G	85
Diclofop+MS	12+0.25G	81
Diclofop+DPX-M6316	12+0.250	70
Diclofop+DPX-M6316	12+0.375	69
Diclofop+DPX-M6316+PO	12+0.250+0.25G	62
Diclofop+DPX-M6316+PO	12+0.375+0.25G	76
Diclofop+DPX-M6316+MS	12+0.250+0.25G	80
Diclofop+DPX-M6316+MS	12+0.375+0.25G	54
AC 222,293	5	95
AC 222,293+DPX-M6316	5+0.250	93
AC 222,293+DPX-M6316	5+0.375	91
AC 222,293+DPX-L5300	5+0.125	94
AC 222,293+DPX-L5300	5+0.250	97
AC 222,293+DPX-M6316&DPX-L5300	5+0.17+0.08	90
AC 222,293+DPX-M6316&DPX-L5300	5+0.25+0.12	91
Difenzoquat	12	89
Difenzoquat+DPX-M6316	12+0.250	88
Difenzoquat+DPX-M6316	12+0.375	81
Difenzoquat+DPX-L5300	12+0.125	85
Difenzoquat+DPX-L5300	12+0.250	85
Difenzoquat+DPX-M6316&DPX-L5300	12+0.17+0.08	89
Difenzoquat+DPX-M6316&DPX-L5300	12+0.25+0.12	85
DPX-M6316+X-77	0.375+0.25%	0
DPX-L5300+X-77	0.250+0.25%	10
DPX-M6316&DPX-L5300+X-77	0.25+0.12+0.25%	0
No treatment	0	0
C.V. %		7
LSD 5%		7

a PO = petroleum oil with 17% emulsifier, MS = methylated sunflower with 15% emulsifier, X-77 = non-ionic surfactant from Chevron Chemical Co., G in the rate column represents gallons/A, & = formulated mixture.

Summary

The inclusion of a sulfonylurea herbicide with AC 222,293 or difenzoquat did not reduce wild oats control. DPX-M6316 applied with diclofop did not reduce wild oats control when applied alone. However, wild oats control with diclofop was or tended to be antagonized when applied with DPX-M6316 + oil adjuvants. Wheat was not injured by any treatment (data not presented).

Sulfonylureas with wild oats control herbicides in wheat, Minot, 1987. 'Stoa' Hard Red Spring wheat was seeded on May 7. Treatments were to 5 leaf wheat and 3 leaf wild oats on June 8 with 70F at Minot. Treatments were applied with a 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 experiment was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 10. Wild oats infestation was 100 plants/square yard. Wheat was not harvested because of variable stands caused by an early drought.

Treatment[a]	Rate (oz/A)	Wheat injury (%)	Wioa (%control)	Grft (%control)
Diclofop	12	0	35	54
Diclofop+PO	12+0.25G	3	79	67
Diclofop+MS	12+0.25G	0	86	71
Diclofop+DPX-M6316	12+0.250	0	34	30
Diclofop+DPX-M6316	12+0.375	0	41	44
Diclofop+DPX-M6316+PO	12+0.250+0.25G	0	53	36
Diclofop+DPX-M6316+PO	12+0.375+0.25G	0	43	25
Diclofop+DPX-M6316+MS	12+0.250+0.25G	0	55	39
Diclofop+DPX-M6316+MS	12+0.375+0.25G	1	85	54
AC 222,293	5	0	95	20
AC 222,293+DPX-M6316	5+0.250	0	97	41
AC 222,293+DPX-M6316	5+0.375	1	95	28
AC 222,293+DPX-L5300	5+0.125	1	96	34
AC 222,293+DPX-L5300	5+0.250	3	96	36
AC 222,293+DPX-M6316&DPX-L5300	5+0.17+0.08	0	90	64
AC 222,293+DPX-M6316&DPX-L5300	5+0.25+0.12	0	95	51
Difenzoquat	12	6	96	14
Difenzoquat+DPX-M6316	12+0.250	6	96	33
Difenzoquat+DPX-M6316	12+0.375	0	95	25
Difenzoquat+DPX-L5300	12+0.125	4	95	44
Difenzoquat+DPX-L5300	12+0.250	3	95	40
Difenzoquat+DPX-M6316&DPX-L5300	12+0.17+0.08	13	95	34
Difenzoquat+DPX-M6316&DPX-L5300	12+0.25+0.12	4	95	41
DPX-M6316+X-77	0.375+0.25%	1	0	20
DPX-L5300+X-77	0.250+0.25%	0	5	26
DPX-M6316&DPX-L5300+X-77	0.25+0.12+0.25%	0	0	30
No treatment	0	0	5	8
C.V. %		18	28	46
LSD 5%		5	27	24

[a] PO = petroleum oil with 17% emulsifier, MS = methylated sunflower with 15% emulsifier, X-77 = non-ionic surfactant from Chevron Chemical Co., G in the rate column represents gallons/A, & = formulated mixture.

Summary

The inclusion of a sulfonylurea herbicide with AC 222,293 or difenzoquat did not reduce wild oats control. DPX-M6316 applied with diclofop did not reduce wild oats control. However, wild oats and green foxtail control with diclofop was or tended to be antagonized when applied with DPX-M6316 + oil adjuvants. Oil adjuvants with the herbicides did not influence injury to wheat.

Sulfonylureas with wild oats control herbicides in wheat, Williston, 1987. 'Len' Hard Red Spring wheat was seeded on April 29. Treatments were to 4 to 5 leaf wheat and wild oats on May 26 with 67 F and 65% relative humidity. Treatments were applied with a plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. Experiments were a randomized complete block with four replications. Wheat injury and weed control were evaluated July 9. Wild oats infestation was 30 plants/square yard. Harvest was on August 7.

Treatment[a]	Rate (oz/A)	Wheat injury (%)	Wioa (% control)	Ruth (% control)	Wheat yield (bu/A)
Diclofop	12	0	86	0	15.4
Diclofop+PO	12+0.25G	1	96	31	15.1
Diclofop+MS	12+0.25G	0	95	8	15.8
Diclofop+DPX-M6316	12+0.250	0	89	99	15.8
Diclofop+DPX-M6316	12+0.375	0	88	99	15.4
Diclofop+DPX-M6316+PO	12+0.250+0.25G	3	94	99	16.1
Diclofop+DPX-M6316+PO	12+0.375+0.25G	0	93	99	14.5
Diclofop+DPX-M6316+MS	12+0.250+0.25G	0	92	99	14.6
Diclofop+DPX-M6316+MS	12+0.375+0.25G	1	92	99	14.8
AC 222,293	5	1	95	44	16.3
AC 222,293+DPX-M6316	5+0.250	0	93	99	16.3
AC 222,293+DPX-M6316	5+0.375	0	95	99	14.9
AC 222,293+DPX-L5300	5+0.125	0	92	98	16.5
AC 222,293+DPX-L5300	5+0.250	3	93	99	15.5
AC 222,293+DPX-M6316&DPX-L5300	5+0.17+0.08	1	89	99	16.0
AC 222,293+DPX-M6316&DPX-L5300	5+0.25+0.12	1	95	99	15.8
Difenzoquat	12	30	95	43	12.0
Difenzoquat+DPX-M6316	12+0.250	24	93	99	11.8
Difenzoquat+DPX-M6316	12+0.375	27	95	99	11.6
Difenzoquat+DPX-L5300	12+0.125	21	93	99	11.2
Difenzoquat+DPX-L5300	12+0.250	24	91	99	12.2
Difenzoquat+DPX-M6316&DPX-L5300	12+0.17+0.08	28	93	99	10.5
Difenzoquat+DPX-M6316&DPX-L5300	12+0.25+0.12	19	92	99	12.1
DPX-M6316+X-77	0.375+0.25%	0	0	99	13.5
DPX-L5300+X-77	0.250+0.25%	0	25	99	13.7
DPX-M6316&DPX-L5300+X-77	0.25+0.12+0.25%	0	2	75	13.6
No treatment	0	0	0	0	13.6
C.V. %		51	6	19	11.4
LSD 5%		5	7	21	2.3

[a] PO = petroleum oil with 17% emulsifier, MS = methylated sunflower with 15% emulsifier, X-77 = non-ionic surfactant from Chevron Chemical Co., G in the rate column represents gallons/A, & = formulated mixture.

Summary

The inclusion of a sulfonylurea herbicide with AC 222,293 or difenzoquat did not reduce wild oats control. DPX-M6316 applied with diclofop did not reduce wild oats control, regardless if applied alone or with an oil adjuvant. All treatments containing sulfonylurea herbicides controlled Russian thistle. Oil adjuvants with the herbicides did not influence injury to wheat. The only important injury to wheat was from difenzoquat which tended to cause lower wheat yields than with the other treatments.

<u>Postemergence wild oats and broadleaf control herbicide combinations in wheat, Fargo, 1987.</u> 'Marshall' Hard Red Spring wheat was seeded April 15. Herbicide treatments were applied to 1 and 5 leaf wheat and wild oats, and cotyledon to 4 inch broadleaf weeds on May 28 with 78F, 80% relative humidity, and wet soil conditions. 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 10 by 24 ft plots. No rain occurred for 10 days after treatment. The experiment was a randomized complete block with four replications. Evaluation was on July 14 and harvest on July 29. Broadleaf weed control was evaluated only when the weeds were present in the replication. Wild oats infestation was moderate at about 25 plants/square yard.

Treatments[a]	Rate	Wheat inj	Wioa	Colq	KOCZ	Wimu	Wibw	Wheat yield
	(oz/A)	(%)	-----(%	control)	------			(bu/A)
Diclofop	12	0	74	0	0	0	00	26.9
Diclofop&Bromoxynil&MCPA Ester	12.8+4+0.7	0	60	82	58	89	20	34.8
Diclofop+Bromoxynil-UC	12+4	0	69	93	90	84	99	35.1
Diclofop+Clopyralid	12+2	0	55	66	0	0	--	28.8
Diclofop+Clopyralid&MCPA	12+1.5+8	0	25	98	68	99	99	35.1
Diclofop+Clopyralid+2,4-D-alk	12+1.47+8	0	35	98	99	99	93	36.0
Diclofop+Fluroxypyr	12+2	2	73	28	93	93	99	38.2
Diclofop+BAS-51400	12+4	2	54	59	85	95	0	23.1
AC 222,293	5	1	90	0	0	99	85	35.7
AC 222,293+Clopyralid	5+1.5	1	92	39	0	99	70	38.6
AC 222,293+Clopyralid+2,4-D-alk	5+1.47+8	1	73	99	99	99	99	37.2
AC 222,293+Fluroxypyr	5+2	1	97	81	99	99	95	39.9
AC 222,293+Clopyralid&MCPA	5+1.5+8	1	88	74	70	99	63	39.9
AC 222,293+Bromoxynil-UC	5+4	0	91	99	80	99	99	37.8
AC 222,293+Bromoxynil&MCPA-RP	5+4+4	1	83	99	96	99	95	37.9
AC 222,293+BAS-51400+MS	5+4+0.25G	5	59	68	84	99	70	18.9
Difenzoquat	12	1	96	5	0	0	0	36.3
Difenzoquat+Clopyralid	12+2	2	92	55	33	0	95	31.5
Difenzoquat+Clopyralid+2,4-D-alk	12+1.47+8	5	93	99	50	98	99	37.4
Difenzoquat+Fluroxypyr	12+2	1	94	20	99	98	99	34.3
Difenzoquat+Clopyralid&MCPA	12+1.5+8	6	92	99	99	99	95	35.2
Difenzoquat+BAS-51400	12+4	9	96	59	79	20	18	21.7
No treatment	0	0	0	0	0	0	0	26.8
C.V. %		99	11	41	28	14	17	18.7
LSD 5%		2	11	35	35	17	24	8.8
# OF REPS		4	4	4	2	3	2	4

[a] & = formulated mixture, UC = Union Carbide, alk = alkanolamine, RP = Rhone Poulenc, MS = methylated sunflower oil with 15% emulsifier, inj = injury.

Summary

Wild oats control with diclofop was antagonized by all broadleaf herbicide treatments except bromoxynil and fluroxypyr. Clopyralid + 2,4-D and BAS-51400 were antagonistic to AC 222,293. None of the broadleaf control herbicides were antagonistic to difenzoquat for wild oats control. Wheat treated with BAS-51400 yielded less than when treated with other herbicides giving similar weed control indicating injury from BAS-51400. Difenzoquat + clopyralid + MCPA was the only treatment giving more than 90% control of all weed species.

AC 222,293 antagonism in wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 15. Treatments were applied to 1 and 5 leaf wheat and wild oats on May 28 with 78 F, 80% relative humidity, and a 15 mph wind. Soil conditions were very wet at treatment. An early drought caused variable emergence. The experimental area was treated with MCPA at 4 oz/A on June 4 to control wild mustard. Evaluation was on July 13. Wild oats density exceeded 200 plants/sq yard.

Treatment[a]	Rate (oz/A)	Wheat injury (%)	Wioa control (%)
AC 222,293	6	0	89
AC 222,293	8	0	94
AC 222,293+MCPA-dma	6+4	0	84
AC 222,293+MCPA-dma	6+8	0	81
AC 222,293+MCPA-dma	8+4	0	78
AC 222,293+MCPA-dma	8+8	0	75
AC 222,293+MCPA-bee	6+4	0	84
AC 222,293+MCPA-bee	6+8	0	84
AC 222,293+MCPA-bee	8+4	0	92
AC 222,293+MCPA-bee	8+8	0	90
AC 222,293+2,4-D-dma	6+4	0	71
AC 222,293+2,4-D-dma	6+8	0	69
AC 222,293+2,4-D-dma	8+4	0	78
AC 222,293+2,4-D-dma	8+8	0	73
AC 222,293+2,4-D-bee	6+4	0	82
AC 222,293+2,4-D-bee	6+8	0	81
AC 222,293+2,4-D-bee	8+4	0	90
AC 222,293+2,4-D-bee	8+8	0	83
AC 222,293+Propanil	6+20	0	53
AC 222,293+Propanil	8+20	0	51
AC 222,293+Picloram	6+0.5	9	73
AC 222,293+Picloram	8+0.5	10	87
AC 222,293+Clopyralid	6+2	0	76
AC 222,293+Clopyralid	8+2	0	81
No treatment	0	0	0
C.V. %		201	14
LSD 5%		2	15

[a] dma = dimethylamine, bee = butoxyethanol ester.

Summary

MCPA and 2,4-D amine and ester, when applied in combination with AC 222,293, tended or reduced wild oats control compared to AC 222,293 applied alone. 2,4-D was more antagonistic to wild oats control than MCPA and the amine of both herbicides compared to the ester. Propanil was the most antagonistic of the herbicides evaluated. Picloram and clopyralid similarly tended to antagonize wild oats control with AC 222,293. These results are in agreement with the results in 1986.

Sulfonylurea antagonism of diclofop for wild oats control in wheat, Fargo, 1987. Two experiments with the same conditions were conducted to determine the antagonism of several sulfonylurea herbicides on wild oats control with diclofop. 'Marshall' Hard Red Spring wheat was seeded on April 15. Treatments were applied to 1 and 5 leaf wheat and wild oats on May 28 with 78F, 80% relative humidity and wet soil conditions. All herbicides were applied in 8.5 gpa at 35 psi to an 8 ft wide strip the length of 10 by 24 ft plots. No rain occurred for 10 days after treatment. The entire experimental area was treated with MCPA at 4 oz/A for broadleaf weed control on June 4. The experiments were randomized complete block designs with four replications. Wild oats control was visually determined on July 13. Wild oats densities exceeded 200 plants/square yard. Wheat was not harvested because of the variable sparse stand.

Sulfonylurea[a]		Diclofop	---Wild oats control---		
			Adjuvant		
Herbicide	Rate	Rate	None	PO	MS
	(oz/A)	(oz/A)	--------(%)---------		
		EXPERIMENT 1			
None	0	12	73	83	83
DPX-M6316&DPX-L5300	0.08+0.04	12	64	70	71
DPX-M6316&DPX-L5300	0.17+0.08	12	66	56	56
DPX-M6316&DPX-L5300	0.25+0.12	12	50	48	53
DPX-L5300	0.125	12	56	60	41
DPX-M6316	0.250	12	65	76	77
DPX-M6316&DPX-L5300+X-77	0.25+0.12+0.25%	0	9	--	--
DPX-L5300+X-77	0.250+0.25%	0	11	--	--
DPX-M6316+X-77	0.375+0.25%	0	0	--	--
None	0	0	0	--	--
LSD 5%			--------(10)---------		
		EXPERIMENT 2			
DPX-M6316	0	12	78	86	87
DPX-M6316	0.125	12	72	78	80
DPX-M6316	0.250	12	73	80	74
DPX-M6316	0.375	12	69	74	69
LSD 5%			--------(7)----------		

[a] PO = petroleum oil 1 qt/A containing 17% emulsifier, MS =methylated sunflower oil 1 qt/A containing 15% emulsifier, X-77 = non-ionic surfactant, & = formulated mixture.

Summary

EXPERIMENT 1. DPX-M6316&DPX-L5300, DPX-M6316, and DPX-L5300 applied with or without petroleum oil or methyated sunflower oil antagonized or tended to antagonize wild oats control with diclofop. Antagonism of wild oats control generally increased as the rate of DPX-M6316&DPX-L5300 increased, especially when applied with oil adjuvants. DPX-L5300 was more antagonistic than DPX-M6316 to wild oats control with diclofop, with or without adjuvants. Wild oats control with diclofop was antagonized more by DPX-L5300 when applied with methylated sunflower oil than with petroleum oil. DPX-L5300 was the most antagonistic of the sulfonylureas to wild oats control with diclofop and also tended to be most injurious to wild oats when applied without diclofop.
EXPERIMENT 2. Wild oats control with diclofop generally decreased as rate of DPX-M6316 in the spray increased. Thus, these data further substantiate the results indicated in Experiment 1. The reduction in wild oats control from increasing DPX-M6316 rate was greater when diclofop was applied with petroleum oil than alone and the greatest when applied with methylated sunflower oil. The oils similarly enhanced diclofop applied without DPX-M6316, indicating that the antagonistic effect of DPX-M6316 on wild oats control with diclofop was enhanced more by methylated sunflower oil than petroleum oil.

Evaluation of herbicides for wild oats control in wheat, Fargo, 1987. 'Marshall' Hard Red Spring wheat was seeded on April 15. Dry soil at seeding caused variable emergence of both wild oats and wheat. A rainy period after May 15 resulted in wet conditions at treatment. Herbicides were applied to 1 and 5 leaf wild oats and wheat on May 28 with 78F and 80% 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 experiment was a randomized complete block with four replications. Wheat injury and wild oats control were evaluated on July 13. Harvest was on July 29.

Treatment[a]	Rate	Wheat yield	Wheat injury	Wioa control
	(oz/A)	(bu/A)	(%)	(%)
RH-0898	2.5	25.1	3	61
RH-0898+PO	1.5+0.25G	24.8	6	80
RH-0898+MS	1.5+0.25G	27.0	5	85
RH-0898+PO	2.5+0.25G	3.5	41	99
RH-0898+MS	2.5+0.25G	10.2	28	99
Fenoxaprop	2.5	30.3	13	98
HOE-7125	2.5	29.8	1	87
HOE-7121	2.5	28.2	4	93
Fenx+2,4-D-ester	2.5+4	28.8	0	79
Diclofop	16	33.6	1	85
AC 222,293	5	25.9	6	87
Difenzoquat	12	23.9	5	96
No treatment	0	23.8	0	0
C.V. %		22.3	44	6
LSD 5%		7.8	5	7

[a] PO = petroleum oil with 17% emulsifier, MS = methylated sunflower with 15% emulsifier, G in the rate column represents gallons/A.

Summary

RH-0898 at 2.5 oz/A injured the wheat and reduced yields. Oil adjuvants enhanced toxicity of RH-0898 to both wheat and wild oats. Petroleum oil tended to be more injurious than methylated sunflower oil to wheat, but not to wild oats. Additives of 2,4-D to fenoxyprop decreased wild oats control and wheat injury compared to fenoxyprop alone. HOE-7125 gave less wild oats control than HOE-7121.

Adjuvants with herbicides for wild oats control in wheat, Fargo, 1987. 'Marshall' Hard Red Spring wheat was seeded on April 15. Early drought prevented uniform wheat and wild oats emergence and rains in mid-May delayed treatment. Treatments were applied to 5 leaf wheat and wild oats on May 28 with 78 F, 80% relative humidity, and wet soil conditions. No rain occurred for 10 days after treatment. 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 entire area of the experiment was treated with MCPA at 6 oz/A for broadleaf weed control on June 4. The experiment was a randomized complete block with four replications. Wild oats control and wheat injury were visually evaluated on July 13. Wild oats infestation was more than 100 plants/square yard. The wheat was not harvested because of a variable stand.

Adjuvant[a]	Rate	Diclofop 12 oz/A	AC 222,293 4 oz/A	Difenzoquat 10 oz/A
	(gal/A)	-----(% wild oats control)----		
Petroleum oil	0.25	77	76	91
Dash	0.25	73	73	96
Methylated SOAT	0.25	70	77	95
ND1	0.25	74	76	96
Methylated SOWI	0.25	77	75	92
LI-700	0.25	68	71	96
28% liquid fertilizer	1	66	67	95
28% liquid fertilizer	8.5	40	66	89
20% liquid urea	8.5	43	58	93
LSD 5%		-------------(13)-------------		

a SOAT = sunflower oil with 15% ATplus, ND1 = modified seed oil with 15% emulsifier, SOWI = sunflower seed oil with 15% Witco emulsifier, 28% = ammonium nitrate:urea (50:50).

Summary

None of the treatments caused injury to wheat at the evaluation date so the data was not presented in the table. However, treatments applied in liquid fertilizer carrier , especially the 28% urea and ammonium nitrate mixture, caused a visible contact leaf burn to the wheat several days after treatment. Wild oats control with diclofop was less when applied in fertilizer carrier than water plus adjuvant. Visual observations indicated diclofop formed a poor emulsion in the fertilizer carriers. However, a non-adjuvant treatment was not included. The oil adjuvants were all similar and tended to be greater than 28% liquid fertilizer adjuvant for enhancing wild oats control with diclofop. Other research results have indicated that oil adjuvants enhanced diclofop toxicity to wild oats. The wild oats control with 28% liquid nitrogen fertilizer at 1 gpa probably would have been similar to control without oil. Wild oats control with AC 222,293 was similar with the oil adjuvants. Wild oats control with AC 222,293 tended to be greater when applied with oil adjuvants than when applied with fertilizer as an adjuvant or carrier. Wild oats control with difenzoquat was not influenced by adjuvant or carrier.

Diclofop plus adjuvants for wild oats control in wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 15. Treatments were applied to 1 and 5 leaf wild oats and wheat on May 28 with 78 F, 80% relative humidity, and a 15 mph wind. Adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO), methylated sunflower oil with 15% Witco emulsifier (MS), linseed oil fatty acids with 15% emulsifier (AG-1), and BCH-815 from BASF. Adjuvants were applied at 1 qt/A. Evaluation was July 14 and harvest was July 30.

Treatment	Rate	Wheat Yield	Wheat Injury	Wioa
	(oz/A)	(bu/A)	(%)	(% control)
Diclofop	8	28.75	0	73
Diclofop	10	29.04	0	78
Diclofop	12	30.28	0	82
Diclofop	14	20.58	0	88
Diclofop	16	32.34	0	92
Diclofop+PO	8	29.51	0	83
Diclofop+PO	10	29.48	0	85
Diclofop+PO	12	19.59	0	87
Diclofop+PO	14	32.54	0	88
Diclofop+PO	16	27.92	0	93
Diclofop+MS	8	31.67	0	80
Diclofop+MS	10	21.75	0	87
Diclofop+MS	12	30.16	0	87
Diclofop+MS	14	21.40	0	85
Diclofop+MS	16	33.01	3	86
Diclofop+AG-1	8	26.50	0	84
Diclofop+AG-1	10	26.31	0	88
Diclofop+AG-1	12	30.64	0	85
Diclofop+AG-1	14	36.82	0	90
Diclofop+AG-1	16	26.64	1	89
Diclofop+BCH-815	8	33.15	0	86
Diclofop+BCH-815	10	26.94	0	87
Diclofop+BCH-815	2	28.60	0	87
Diclofop+BCH-815	4	29.90	0	87
Diclofop+BCH-815	6	29.12	3	91
No treatment	0	24.08	0	0
C.V. %		25.89	396	6
LSD 5%		NS	1	7

Summary

All adjuvants enhanced wild oats control with diclofop so that 8 oz/A plus an adjuvant generally gave control equal to diclofop at 12 or 14 oz/A applied alone. Wild oats control did not increase as much with increasing rates of diclofop when applied with MS, AG-1, or BCH-815 compared to applied alone or with PO. Yields did not relate closely to wild oats control because of variable wheat and wild oats stands from the early drought which influenced emergence.

AC 222,293 plus adjuvants for wild oats control in wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 27. Treatments were applied to 1 and 5 leaf wild oats and wheat on May 28 with 80 F, 70% relative humidity, and a 15 mph wind. Adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO), methylated sunflower oil with 15% Witco emulsifier (MS), linseed oil fatty acids with 15% emulsifier (AG-1), and BCH-815 from BASF. Adjuvants were applied at 1 qt/A. Weed control evaluation was July 4.

Treatment	Rate (oz/A)	Wheat injury (%)	Wild oats control (%)
AC 222,293	3	0	93
AC 222,293	4	0	95
AC 222,293	5	0	98
AC 222,293+PO	3	0	98
AC 222,293+PO	4	0	98
AC 222,293+PO	5	1	99
AC 222,293+MS	3	1	98
AC 222,293+MS	4	0	96
AC 222,293+MS	5	0	97
AC 222,293+AG-1	3	0	98
AC 222,293+AG-1	4	0	98
AC 222,293+AG-1	5	0	99
AC 222,293+BCH-815	3	0	98
AC 222,293+BCH-815	4	1	99
AC 222,293+BCH-815	5	3	98
LSD 5%		2	2

Summary

Wild oats control with AC 222,293 exceeded 93% for all treatments, so the response to adjuvants was limited. However, AC 222.293 at 3 oz/A with any of the adjuvants gave wild oats control equal to that with AC 222,293 alone at 5 oz/A. None of the treatments caused any visible injury to wheat.

AC 444,406 for wild oats control in wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 27. Treatments were applied to 1 and 4 leaf wheat and wild oats on May 28 with 80 F, 70% relative humidity, and a 15 mph wind. The entire experiment was treated with MCPA at 4 oz/A for wild mustard control. Evaluation was on July 14. Harvest was on August 5.

Treatment	Rate (oz/A)	Wioa (% control)	Wheat Injury (%)	Wheat Yield (bu/A)
AC-444406	5	96	1	25.0
AC-444406	7	97	0	25.2
AC 222,293	5	94	1	24.9
No treatment	0	0	0	14.3
C.V. %		2	298	16.0
LSD 5%		2	NS	5.7

Summary

None of the treatments caused any injury to wheat. AC 444,406 gave similar control of wild oats compared to AC 222,293. Wheat yield was increased 10 bu/A by wild oats control. Wheat and wild oats stands were uniform in this experiment located in the airport area.

Additives with AC 222,293 in wheat, Williston, 1987. 'Len' Hard Red Spring wheat was seeded on April 23. Treatments were applied on May 29 with 65 F and 76% relative humidity to 5.5 to 6 leaf wheat, 5 leaf wild oats, and 3 inch Russian thistle. Treatments were applied with a tractor mounted sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 10 by 24 ft plots. The experiment was a randomized complete block with four replications. Wild oats density was about 25 plants/square yard and Russian thistle about 5 plants/square yard. Evaluation was July 9 and harvest August 5.

Treatment[a]	Rate	Wheat injury	Wioa	Ruth	Wheat Yield	Wheat Test Wt.
	(oz/A)	(%)	-(% control)-		(bu/A)	(lb/bu)
AC 222,293	3	0	83	25	16.5	60.8
AC 222,293	5	0	88	22	13.2	60.4
AC 222,293+X-77	3+0.25%	0	86	27	15.3	60.9
AC 222,293+X-77	5+0.25%	2	94	61	12.2	60.3
AC 222,293+PO	3+0.25G	0	89	42	14.9	60.5
AC 222,293+PO	5+0.25G	1	94	64	14.3	60.6
AC 222,293+MS	3+0.25G	0	88	31	15.0	60.7
AC 222,293+MS	5+0.25G	1	94	49	14.7	60.8
AC 222,293+DASH	3+0.25G	1	93	33	16.0	60.6
AC 222,293+DASH	5+0.25G	0	95	52	17.0	61.2
AC 222,293+LI-700	3+0.25G	0	92	35	17.0	61.1
AC 222,293+LI-700	5+0.25G	0	90	30	14.9	60.5
No treatment	0	0	0	0	12.3	59.4
C.V. %		321	6	44	12.6	--
LSD 5%		NS	7	23	2.7	--
# OF REPS		4	4	4	4	1

[a] X-77 = non-ionic surfactant from Chevron Chem. Co., PO = petroleum oil with 17% emulsifier, MS = methylated sunflower oil with 15% emulsifier, DASH and LI-700 are commercial adjuvants, G in the rate column represents gallons/A.

Summary

All adjuvants enhanced or tended to enhance wild oats control with AC 222,293. The enhancement of wild oats control was similar with all adjuvants and at both rates of AC 222,293. All adjuvants except LI-700 generally enhanced Russian thistle control with AC 222,293 at 5 oz/A, but not at 3 oz/A. Wheat yield was not greatly increased by weed control because of the low weed infestations and generally low yields.

Diclofop with other herbicides, Langdon, 1987. 'Coteau' Hard Red Spring wheat was seeded on May 9. Stage 1 (S1) treatments were applied to 2.5 leaf wild oats and wheat on May 28 with 72 F and 58% relative humidity. Stage 2 (S2) treatments were applied to 3 to 4 leaf wild oats and wheat on June 9 with 60 F. No rain occurred for 3 days after S1 treatments but 0.26 inch occurred 1 day after S2 treatments. Treatments were applied in 8.5 gpa at 35 psi to an 8 ft wide strip the length of 10 by 25 ft plots. Weed control was evaluated on July 25. Wild oats density was sparse. A 4 by 16 ft area was harvested for yield.

Treatment[a]	Stage	Rate	Wheat injury	Wioa	Grft	Wheat Yield	Tswt
		(oz/A)	(%)	(% control)		(bu/A)	(lb)
No treatment	-	0	0	0	0	27	56.9
Diclofop+PO	S1	12+0.25G	0	69	29	30	56.5
Diclofop+PO	S1	16+0.25G	1	65	34	32	57.3
Diclofop+Bromoxynil+MCPA	S1	13+4+0.7	0	58	31	29	56.4
Diclofop+DPX-M6316+PO	S1	12+0.19+0.25G	0	66	18	30	55.9
Diclofop+DPX-M6316	S1	12+0.19	0	74	30	32	55.9
Diclofop+DPX-M6316+PO	S1	16+0.19+0.25G	0	64	34	32	55.9
Diclofop	S2	16	3	69	86	35	57.5
Diclofop+DPX-M6316+PO	S2	12+0.19+0.25G	4	88	84	35	57.6
Tiller	S2	0.425G	4	69	96	33	56.9
Difenzoquat	S2	10	1	81	3	29	57.0
C.V. %			224	15	33	12	1.5
LSD 5%			NS	14	19	NS	1.2

aPO = petroleum oil with 17% emulsifier, Tiller = HOE-7125 at 10.6 oz/A, G in the rate column represents gallon/A, Tswt = test weight.

Summary

No important injury to wheat occurred from any treatment. Wild oats control with diclofop was not antagonized by any of the broadleaf herbicides in the mixture. Diclofop plus DPX-M6316 plus PO gave higher wild oats control at the second stage of application than the first, indicating that some wild oats plants emerged after the first application. HOE-7125 was the only treatment to give more than 90% control of green foxtail. Yields only tended to be increased by the treatments as weed densities were sparse.

Broadleaf weed control in wheat, Prosper, 1987. 'Marshall' Hard Red Spring wheat was seeded on April 16. Treatments were applied to 5 leaf wheat, 3 leaf foxtail, and 1 to 4 inch kochia and common lambsquarters on May 29 with 70 F and 50% relative humidity. Treatments were applied with a 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 experiment was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 16. Weed infestations were generally sparse except for kochia. Wheat yield was not taken because of hail injury.

Treatment[a]	Rate	Wheat injury	Yeft+ grft	Colq	KOCZ
	(oz/A)	(%)	--(% control)--		
2,4-D-dimethylamine	6	0	0	99	91
MCPA-dimethylamine	6	0	0	99	86
Dicamba+MCPA-dimethylamine	1.5+4	5	0	99	97
Dicamba+2,4-D-dimethylamine	1.5+4	8	0	99	96
Picloram+MCPA-dimethylamine	0.250+6	5	0	99	84
Bromoxynil-UC&MCPA	3+3	2	6	99	92
Bromoxynil-UC&MCPA	4+4	1	16	99	96
Bromoxynil-UC+2.4-D-butoxyethanol ester	2+4	0	10	99	91
DPX-M6316+X-77	0.250+0.25%	0	10	97	93
DPX-L5300+X-77	0.125+0.25%	0	10	99	98
DPX-M6316&DPX-L5300+X-77	0.17+0.08+0.25%	0	15	97	93
Metsulfuron+X-77	0.062+0.25%	0	8	97	96
Clopyralid+2,4-D-alkanolamine	1.5+8	1	0	99	83
Clopyralid+Picloram+2,4-D-alkanolamine	1.5+0.25+8	4	0	97	89
Fluroxypyr	2	0	0	68	88
Propanil&MCPA	15+5	0	10	98	69
Diclofop+Bromoxynil-UC	12+4	0	35	99	90
No treatment	0	0	0	0	0
C.V. %		141	249	6	6
LSD 5%		3	NS	7	8

[a] UC = Union Carbide, & = formulated mixture, X-77 = non-ionic surfactant from Chevron Chemical Co.

Summary

None of the treatments caused important injury to wheat. Kochia control exceeded 82% with all treatments, except propanil&MCPA. Diclofop gave 35% foxtail control and plots contained a mixture of yellow and green foxtail. Wild mustard was effectively controlled by all treatments except fluroxypyr. Treatments which gave more than 90% kochia control were: 2,4-D, dicamba + 2,4-D or MCPA, bromoxynil + MCPA or 2,4-D, DPX-M6316 and/or DPX-L5300, and metsulfuron.

Broadleaf weed control in wheat, Williston, 1987. 'Len' Hard Red Spring wheat was seeded on April 29. Treatments were applied to 4 to 5 leaf wheat and 1 to 2 inch weeds on May 29 with 75 F and 40% relative humidity. Treatments were applied with a 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 experiment was a randomized complete block with four replications. Russian thistle control was evaluated July 7. Russian thistle infestations were generally sparse. Wheat harvest was on August 10.

Treatment[a]	Rate (oz/A)	Wheat yield (bu/A)	Wheat Test Wt. (lb/bu)	Ruth (% control)
2,4-D-dimethylamine	6	12.1	60.25	94
MCPA-dimethylamine	6	12.1	60.44	41
Dicamba+MCPA-dimethylamine	1.5+4	12.1	61.40	90
Dicamba+2,4-D-dimethylamine	1.5+4	12.7	60.64	91
Picloram+MCPA-dimethylamine	0.250+6	13.0	59.96	66
Bromoxynil-UC&MCPA	3+3	13.5	60.22	85
Bromoxynil-UC&MCPA	4+4	13.7	60.80	89
Bromoxynil-UC+2.4-D-butoxyethanol ester	2+4	14.5	60.96	76
DPX-M6316+X-77	0.250+0.25%	13.8	60.99	86
DPX-L5300+X-77	0.125+0.25%	14.2	61.40	95
DPX-M6316&DPX-L5300+X-77	0.17+0.08+0.25%	14.2	60.44	96
Metsulfuron+X-77	0.062+0.25%	14.3	60.96	99
Clopyralid+2,4-D-alkanolamine	1.5+8	12.8	60.67	95
Clopyralid+Picloram+2,4-D-alkanolamine	1.5+0.25+8	12.7	60.67	95
Fluroxypyr	2	14.7	60.16	69
Propanil&MCPA	15+5	10.8	60.73	13
Diclofop+Bromoxynil-UC	12+4	14.7	60.35	75
No treatment	0	13.2	60.19	0
C.V. %		9.8	--	9
LSD 5%		1.8	--	10
# REPS		4	1	4

[a] UC = Union Carbide, & = formulated mixture, X-77 = non-ionic surfactant from Chevron Chemical Co.

Summary

None of the treatments caused any injury to wheat (data not presented). Russian thistle control exceeded 75% except for fluroxypyr, MCPA alone, or MCPA in combination with propanil or picloram. Wheat yield did not reflect weed control because of the low weed density and low yields.

Broadleaf weed control in wheat, Minot, 1987. 'Stoa' Hard Red Spring wheat was seeded on May 7. Treatments were applied to 5 leaf wheat and weeds less than 3 inches on June 8 with 70 F. Treatments were applied with a 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 experiment was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 10. Wheat harvest was on August 19. Weed infestations were generally sparse.

Treatment[a]	Rate	Wheat inj	Grft	Colq	Wimu	Wheat yield	Wheat Test Wt
	(oz/A)	(%)	(% control)			(bu/A)	(lb/bu)
2,4-D-dimethylamine	6	0	16	94	98	15.2	56.5
MCPA-dimethylamine	6	0	0	96	99	15.4	56.8
Dicamba+MCPA-dimethylamine	1.5+4	1	33	96	93	15.4	57.3
Dicamba+2,4-D-dimethylamine	1.5+4	0	13	99	98	15.1	57.1
Picloram+MCPA-dimethylamine	0.250+6	1	0	97	99	17.1	57.0
Bromoxynil-UC&MCPA	3+3	0	39	99	97	16.8	57.4
Bromoxynil-UC&MCPA	4+4	0	16	98	99	13.9	57.2
Bromoxynil-UC+2.4-D-bee	2+4	11	61	99	99	15.2	57.3
DPX-M6316+X-77	0.250+0.25%	0	33	99	99	16.1	57.6
DPX-L5300+X-77	0.125+0.25%	1	16	98	92	13.5	57.3
DPX-M6316&DPX-L5300+X-77	0.17+0.08+0.25%	1	18	97	92	16.2	57.5
Metsulfuron+X-77	0.062+0.25%	0	0	0	69	15.9	57.3
Clopyralid+2,4-D-alkanolamine	1.5+8	0	14	98	99	14.1	57.8
Clopyralid+Picloram+2,4-D-alk	1.5+0.25+8	0	13	99	99	16.1	57.7
Fluroxypyr	2	1	10	51	49	13.7	57.5
Propanil&MCPA	15+5	3	54	98	99	14.2	57.0
Diclofop+Bromoxynil-UC	12+4	0	83	97	99	17.4	57.8
No treatment	0	0	0	0	0	14.5	57.0
C.V. %		426	100	11	16	7.5	1.3
LSD 5%		NS	33	13	19	1.6	NS

[a] UC = Union Carbide, & = formulated mixture, bee = butoxyethanol ester, X-77 = non-ionic surfactant from Chevron Chemical Co., alk = alkanolamine, inj = injury.

Summary

None of the treatments caused important injury to wheat. The low control of wild mustard with metsulfuron is not in agreement with previous results or results from experiments at other locations in 1987. All other treatments except fluroxypyr gave more than 91% wild mustard control. Wheat yield did not reflect weed control because of the low weed density and low yields.

Broadleaf weed control in wheat, Carrington, 1987. 'Butte 86' Hard Red Spring wheat was seeded on May 4. Treatments were applied to 5 leaf wheat, and weeds less than 4 inches on June 11 with 82 F. Treatments were applied with a plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 8 by 24 ft plots. The experiment was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 15. Weed infestations were generally sparse.

Treatment[a]	Rate (oz/A)	Wheat injury (%)	Colq	Wimu	Grft
			--(%	control)--	
2,4-D-dimethylamine	6	0	35	99	0
MCPA-dimethylamine	6	0	83	94	0
Dicamba+MCPA-dimethylamine	1.5+4	0	82	94	0
Dicamba+2,4-D-dimethylamine	1.5+4	1	33	99	0
Picloram+MCPA-dimethylamine	0.250+6	0	96	99	0
Bromoxynil-UC&MCPA	3+3	0	99	99	0
Bromoxynil-UC&MCPA	4+4	1	99	99	0
Bromoxynil-UC+2.4-D-butoxyethanol ester	2+4	0	99	94	0
DPX-M6316+X-77	0.250+0.25%	0	--	--	-
DPX-L5300+X-77	0.125+0.25%	0	93	99	0
DPX-M6316&DPX-L5300+X-77	0.17+0.08+0.25%	0	95	96	0
Metsulfuron+X-77	0.062+0.25%	0	97	99	-
Clopyralid+2,4-D-alkanolamine	1.5+8	0	90	99	0
Clopyralid+Picloram+2,4-D-alkanolamine	1.5+0.25+8	0	98	99	0
Fluroxypyr	2	0	18	92	0
Propanil&MCPA	15+5	0	99	99	33
Diclofop+Bromoxynil-UC	12+4	0	96	87	78
No treatment	0	0	0	0	0
C.V. %		582	13	9	126
LSD 5%		NS	14	11	13

[a] UC = Union Carbide, & = formulated mixture, X-77 = non-ionic surfactant from Chevron Chemical Co.

Summary

None of the treatments caused important injury to wheat. Diclofop gave 78% foxtail control and propanil only 33%. Common lambsquarters control was less with 2,4-D amine alone or with dicamba than with most other treatments which has not occurred previously, indicating a chance occurrence. All treatments controlled wild mustard.

Broadleaf weed control in wheat, Langdon, 1987. 'Cando' durum wheat was seeded on April 30. Treatments were applied to 4 leaf wheat and weeds less than 4 inches tall on June 10 with 60 F and 0.26 inch rain within 2h after treatment. Treatments were applied with a 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 experiment was a randomized complete block with four replications. Wheat injury and weed control were evaluated July 23. Weed infestations were generally sparse.

Treatment[a]	Rate	Wheat injury	KOCZ	Wibw	Coma	Colq	Wheat Yield	Wheat Tswt
	(oz/A)	(%)	---(% control)---				(bu/A)	(lb)
2,4-D-dimethylamine	6	0	25	0	20	88	34	50.8
MCPA-dimethylamine	6	0	14	10	8	84	26	50.3
Dicamba+MCPA-dimethylamine	1.5+4	6	77	28	28	99	37	52.3
Dicamba+2,4-D-dimethylamine	1.5+4	4	99	25	18	99	40	51.5
Picloram+MCPA-dimethylamine	0.250+6	1	15	33	26	99	35	51.6
Bromoxynil-UC&MCPA	3+3	0	5	5	23	99	33	50.0
Bromoxynil-UC&MCPA	4+4	0	11	13	13	94	30	49.7
Bromoxynil-UC+2.4-D-bee	2+4	1	85	75	91	99	39	51.6
DPX-M6316+X-77	0.250+0.25%	0	98	46	66	82	36	51.6
DPX-L5300+X-77	0.125+0.25%	1	99	5	23	97	35	51.5
DPX-M6316&DPX-L5300+X-77	0.17+0.08+0.25%	0	99	26	35	93	36	51.3
Metsulfuron+X-77	0.062+0.25%	1	99	23	29	97	33	52.4
Clopyralid+2,4-D-alkanolamine	1.5+8	0	18	65	25	97	35	50.8
Clopyralid+Picloram+2,4-D-alk	1.5+0.25+8	1	13	38	35	99	30	51.3
Fluroxypyr	2	0	95	76	45	31	41	53.6
Propanil&MCPA	15+5	0	38	33	20	99	35	51.0
Diclofop+Bromoxynil-UC	12+4	0	99	96	65	99	42	54.1
No treatment	0	0	0	0	0	0	25	48.3
C.V. %		205	24	58	74	16	17	3.6
LSD 5%		2	19	27	33	19	8	2.7

a UC = Union Carbide, & = formulated mixture, X-77 = non-ionic surfactant from Chevron Chemical Co, bee = butoxyethanol ester, alk = alkanolamine, Tswt = test weight.

Summary

None of the treatments caused important injury to wheat. Common lambsquarters control exceeded 81% with all treatments except fluroxypyr. Dicamba + 2,4-D, sulfonylureas, fluroxypyr, bromoxynil + 2,4-D, and diclofop + bromoxynil were the only treatments to provide more than 84% kochia control. Control of wild buckwheat and common mallow was less than normal for many treatments which may be from the rain which occurred 2h after treatment. Yield was generally increased by all treatments and related most closely to kochia control.

Foxtail control in wheat, Minot, 1987. 'Stoa' wheat was seeded and preemergence (PE) treatments applied on May 8 with 90 F, clear sky,and a 5 mph wind. Postemergence treatments (P) were applied to 5 leaf wheat, 1 inch tall green foxtail, and 1 to 2 inch tall common lambsquarters on June 8 with 70 F, partly cloudy sky, and 5 mph wind. A second postemergence treatment (P-2) was applied June 12 with 70 F (90 F later in the day), clear sky, and a 5 to 10 mph wind. Evaluation was on July 9. Weed infestation was sparse and variable.

						Wheat		
Treatment[a]	Type	Rate	Grft	Colq	Ruth	Injury	Yield	Test wt
		(oz/A)	-(%	control)--		(%)	(bu/A)	(lb)
Pendimethalin	PE	8	61	94	21	0	14.0	56.3
A-1237	PE	0.25	61	96	52	0	14.6	56.8
A-1237	PE	0.50	80	95	95	0	13.8	56.7
A-1237	PE	1	95	97	98	0	16.5	56.8
C-4243	PE	0.50	56	93	73	0	14.5	56.8
C-4243	PE	1	64	97	60	0	16.5	56.5
C-4243	PE	2	93	95	98	0	14.3	57.0
A-1237	P	0.25	43	98	95	0	11.7	56.8
A-1237+MS	P	0.25+0.25G	56	99	87	5	9.9	56.2
A-1237	P	0.50	57	99	98	0	10.3	56.4
A-1237+MS	P	0.50+0.25G	46	98	95	3	9.1	56.3
C-4243	P	1	65	97	95	3	9.3	56.5
C-4243	P	2	70	98	98	4	10.1	56.7
Diclofop+Bromoxynil-UC	P-2	12+4	88	99	92	6	11.7	56.4
No treatment	--	0	0	0	0	0	11.8	56.1
C.V. %			39	4	25	195	11.5	0.9
LSD 5%			35	5	27	4	2.1	NS

[a]MS = methylated sunflower oil with 15% Witco emulsifier, UC = Union Carbide, G in the rate column represents gallon/A.

Summary

A-1237 and C-4243 at the highest rates applied preemergence gave good foxtail control, but were less effective when applied postemergence. Common lambsquarters control was 90% or more with all treatments. Russian thistle control with these herbicides appeared more effective when applied postemergence than preemergence. None of the treatments cuased any injury to wheat.

Bromoxynil combinations for weed control, Fargo, 1987. 'Marshall' Hard Red Spring wheat was seeded April 21. Treatments were applied to 3 to 6 leaf wheat, and 1 to 8 inch kochia on June 4 with 80 F, 35% relative humidity, and moist soil conditions. The only rain for 10 days after treatment was 0.14 inches on the sixth day. The experiment was a randomized complete block design with four replications. Crop injury and weed control were determined on June 24 and kochia control again on July 28 prior to harvest on August 5. Kochia population was dense with 15 plants/square foot.

Treatment[a]	Rate	June 24 Wimu	June 24 KOCZ	July 28 KOCZ	Wheat yield
	(oz/A)	----(% control)-----			(bu/A)
Bromoxynil&MCPA-RP	2+2	99	65	80	32.4
Bromoxynil&MCPA-RP+MCPA Ester	2+2+2	96	59	45	--
Bromoxynil&MCPA-RP+MCPA Ester	2+2+4	99	74	72	--
Bromoxynil&MCPA-RP	3+3	98	80	75	32.0
Bromoxynil&MCPA-RP+MCPA Ester	3+3+1	99	86	83	31.3
Bromoxynil&MCPA-RP+MCPA Ester	3+3+4	99	75	75	30.8
Bromoxynil&MCPA-RP	4+4	99	81	81	24.8
Bromoxynil-UC+2,4-D Ester	2+2	97	78	66	26.5
Bromoxynil-UC+2,4-D Ester	2+4	99	63	61	--
Bromoxynil-UC+2,4-D Ester	2+6	99	86	76	25.8
Bromoxynil-UC+2,4-D Ester	3+3	99	78	57	25.1
Bromoxynil-UC+2,4-D Ester	3+4	99	79	68	25.4
Bromoxynil-UC+2,4-D Ester	3+7	99	78	76	25.0
Bromoxynil-UC+2,4-D Ester	4+4	99	86	82	29.4
Bromoxynil&MCPA-RP+28%N	2+2+8.5G	98	69	64	--
Bromoxynil&MCPA-RP+28%N	3+3+8.5G	96	85	72	36.0
Bromoxynil-UC+DPX-M6316&DPX-L5300	4+0.08+0.04	99	95	94	29.9
Bromoxynil-UC+DPX-M6316&DPX-L5300	4+0.17+0.08	99	99	97	37.0
Bromoxynil-UC+DPX-M6316	4+0.12	99	92	89	26.4
Bromoxynil-UC+DPX-M6316	4+0.25	99	98	96	34.1
Bromoxynil-UC+DPX-L5300	4+0.06	99	98	96	38.6
Bromoxynil-UC+DPX-L5300	4+0.12	99	97	98	25.9
DPX-M6316+X-77	0.25+0.25%	99	98	94	34.3
Bromoxynil-UC	4	87	75	75	28.5
2,4-D-dimethylamine	6	99	78	54	--
No treatment	0	0	0	0	--
C.V. %		5	14	17	10.0
LSD 5%		7	16	18	4.2

[a] & = formulated mixture, RP = Rhone Poulenc, Ester = butoxyethanol ester, UC =Union Carbide, N = 28% nitrogen fertilizer, X-77 = non-ionic surfactant from Chevron Chemical Co., G in the rate column represents gal/A.

Summary

Wheat was not injured or stand reduced by any treatment (data not presented). All treatments gave nearly complete control of wild mustard, except bromoxynil at 4 oz/A applied alone. Kochia control with formulated bromoxynil with MCPA was not increased by the addition of more MCPA to the spray. The low kochia control with bromoxynil combinations with 2,4-D or MCPA may be a result of the large plants at treatment. Also, large plants may have protected small plants from thorough spray coverage reducing kochia control from bromoxynil + MCPA or 2,4-D treatments. Kochia control from bromoxynil and MCPA was the same with 28% nitrogen fertilizer or water carrier. Treatments containing sulfonylureas all gave 89% or greater kochia control. Kochia control from 2,4-D was less at the harvest rating than earlier, indicating that kochia recovered from 2,4-D injury or new plants emerged after treatment. Wheat yield was not obtained [illegible] with dense kochia at harvest.

Clopyralid for wheat, Fargo, 1987. 'Marshall' wheat was seeded on April 21. Treatments were applied to 3 and 6 leaf wheat, 1 and 8 inch tall kochia, and 2 and 6 leaf wild mustard on June 5 with 80 F, 35% relative humidity, and a 10 mph wind. Weed control evaluation was on June 29 and July 8. Harvest was on August 5 and some plots were not harvested because of uncontrolled kochia.

		Aug 5	June 29			July 8
Treatment[a]	Rate	Wheat yield	Wheat injury	KOCZ	Wimu	KOCZ
	(oz/A)	(bu/A)	(%)	--(% control)--		
Clopyralid+2,4-D-alk	1.05+5.8	25.5	4	85	99	67
Clopyralid+2,4-D-alk+X-77	1.05+5.8+0.25%	25.9	1	80	99	72
Clopyralid+2,4-D-alk	1.26+7	24.8	6	82	99	68
Clopyralid+2,4-D-alk	1.50+8	27.5	9	85	99	71
Clpy+2,4-D-alk+M6316+X-77	1.05+5.8+.125+.25%	25.1	8	98	99	92
Clopyralid+2,4-D-alk+Dicamba	1.05+5.8+1	25.3	12	97	99	95
Clopyralid+Dicamba	1+1	30.6	7	88	99	89
Clopyralid	1	--	0	13	8	3
Clopyralid+X-77	1+0.25%	--	0	24	0	10
Clopyralid+DPX-M6316+X-77	1+0.12+0.25%	29.9	6	99	99	94
Clopyralid+Bromoxynil&MCPA-UC	1+4+4	29.9	10	90	99	78
XRM-4813	6.85	24.6	3	61	99	56
XRM-4813+X-77	6.85+0.25%	--	0	44	99	34
XRM-4813	7.26	--	3	66	99	50
XRM-4813	8.50	--	2	60	99	61
XRM-4813+Picloram	6.85+0.25	25.8	9	64	99	53
XRM-4813+Dicamba	6.85+1.25	26.6	16	96	99	96
XRM-4813+DPX-M6316+X-77	6.85+0.12+0.25%	33.6	4	98	99	92
Picloram+MCPA	0.38+8	22.5	13	71	99	54
RS-010	7	--	0	41	38	16
RS-010+DPX-M6316	7+0.1	29.2	4	73	99	71
RS-010+DPX-L5300	7+0.1	29.9	6	92	99	87
RS-010+Bromoxynil-UC	7+2	--	4	63	65	51
Dicamba+2,4-D-alkanolamine	2+6	25.2	14	98	99	98
Bromoxynil&MCPA-UC	4+4	32.2	8	90	98	81
DPX-M6316+X-77	0.25+0.25%	36.2	4	98	99	97
No treatment	0	--	0	0	0	0
C.V. %		24.1	103	15	8	18
LSD 5%		NS	8	15	11	17
# OF REPS		4	4	4	3	4

[a] alk = alkanolamine, X-77 = nonionic surfactant, Clpy = Clopyralid, M6316 = DPX-M6316, & = formulated mixture, UC = Union Carbide.

Summary

DPX-M6316, clopyralid plus 2,4-D and DPX-M6316 and X-77 or dicamba, clopyralid plus DPX-M6316 plus X-77, XRM-4813 plus dicamba or DPX-M6316 and X-77, and dicamba plus 2,4-D were the only treatments which gave more than 90% kochia control at the late evaluation. Wild mustard control was nearly complete with all treatments, except RS-010 alone or with bromoxynil. Clopyralid and RS-010, each alone, gave less than 16% kochia control at the late evaluation. Yields did not vary significantly among treatments because of a variable kochia infestation.

Grass and broadleaf weed control in wheat Fargo, 1987. 'Wheaton' Hard Red Spring wheat was seeded on May 29. Treatments were applied to 4 to 5 leaf wheat and yellow foxtail and 4 inch kochia on June 17 with 85 F and 80% relative humidity. Rainfall was 0.27 inch on June 17 before application and 0.01 inch on June 21. The experiment was a randomized complete block design with four replications. Yellow foxtail and kochia exceeded 50 plants/square yard and redroot pigweed was less than 1 plant/square yard. Evaluations were visual ratings and wheat yield was not determined because of hail injury.

		July 17					August 11	
		Wheat						
Treatment[a]	Rate	Injury	Stand	Yeft	KOCZ	Rrpw	KOCZ	Yeft
	(oz/A)	(%)	(%)	------(% control)-----				
AC 222,293+MS	5+0.25G	1	0	9	19	0	24	0
AC 222,293+BAS-51400+BAS-090	5+4+0.25G	9	0	88	80	71	86	86
AC 222,293+BAS-51400+MS	5+4+0.25G	9	3	86	76	32	81	85
AC 222,293+A-1237	5+0.5	14	5	73	86	99	87	39
BAS-51400+BAS-090	4+0.25G	9	3	94	70	58	75	84
BAS-51400+MS	4+0.25G	9	0	92	74	53	83	88
BAS-51400+DPX-M6316+BAS-090	4+0.25+0.25G	9	0	88	94	98	94	79
BAS-51400+DPX-M6316+MS	4+0.25+0.25G	5	5	92	90	96	90	80
BAS-51400+2,4-D-dma+MS	4+4+0.25G	8	0	87	78	82	80	83
A-1237	0.25	18	14	53	77	99	66	39
A-1237+MS	0.25+0.25G	15	5	41	65	95	68	28
A-1237+PO	0.25+0.25G	16	3	83	70	99	65	34
A-1237	0.50	19	14	48	89	99	85	24
A-1237	1	26	23	60	94	99	90	29
C-4243	2	6	1	59	85	99	77	19
DPX-M6316+X-77	0.25+0.25%	6	0	58	94	98	92	40
Fenoxaprop+2,4-D-bee+MCPA-bee	1.5+4+4	6	0	36	72	86	50	10
Fenoxaprop+2,4-D-bee	1.5+4	11	3	84	65	94	50	71
Fenoxaprop+MCPA-bee	1.5+4	4	0	87	40	77	55	70
Fenoxaprop	1.5	7	0	91	5	0	0	89
Fenoxaprop	2.5	13	0	96	5	0	0	89
HOE-7121	7.7	11	1	97	83	83	65	92
HOE-7125	7.7	11	6	93	58	87	49	86
Propanil&MCPA	15+4	3	0	21	19	33	21	8
Diclofop+Bromoxynil-UC	12+4	5	0	51	64	28	61	48
Diclofop+Bromoxynil-UC	8+4	3	0	43	58	7	66	45
Diclofop+Bromoxynil-UC+PO	8+4+0.25G	5	0	24	58	13	54	13
Diclofop+Bromoxynil-UC+MS	8+4+0.25G	5	0	29	63	17	69	29
C.V. %		64	192	20	24	28	25	38
LSD 5%		8	7	18	21	29	22	27
# OF REPS		4	4	4	4	3	4	4

[a] MS = methylated sunflower oil with 15% emulsifier, dma = dimethylamine, PO = petroleum oil with 17% emulsifier, bee = butoxyethanol ester, & = formulated mixture, UC = Union Carbide, X-77 = non-ionic surfactant, G in the rate column represents gallons/acre.

Summary

BAS-51400 applied alone or in combination with other herbicides, fenoxaprop alone, HOE-7121, and HOE-7125 gave 79% or more yellow foxtail control which was evident until August 11, the preharvest evaluation. Injury to wheat was a leaf dessication with A-1237 and crop stunting with BAS-51400. Injury from BAS-51400 appeared to persist at the preharvest evaluation with certain treatments. Kochia control at the late evaluation exceeded 80% for A-1237 at 0.5 oz/A or more and with all BAS-51400 treatments. DPX-M6316 alone or with BAS-51400 gave 90% or more kochia control. 2,4-D or MCPA, alone or in combination, were or tended to be antagonistic to yellow foxtail control with fenoxaprop.

BAS-51400 for weed control in wheat, Fargo, 1987. 'Wheaton' Hard Red Spring wheat was seeded on May 29. The 2 lf treatments were applied to 2 leaf wheat, 3 leaf yellow foxtail, and 2 inch broadleaf weeds on June 12 with 73 F and 55% relative humidity (RH). The 4 lf treatments were applied to 4 leaf wheat and yellow foxtail, 4 inch kochia, and 1.5 inch redroot pigweed on June 15 with 80 F and 35% RH. The EJ treatments were applied to jointing wheat and yellow foxtail and to 10 inch kochia on July 2 with 75 F and 68% RH. No rain occurred for 48h after any treatment. 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 10 by 24 ft plots. The experiment was a randomized complete block with four replications. Yellow foxtail and kochia density was more than 5 plants/square foot and redroot pigweed less than 5 plants/square yard. Evaluations were visual estimates and the wheat was not harvested because of damage from hail.

Treatment[a]	Rate	Wheat injury	July 17			August 11	
			Yeft	KOCZ	Rrpw	KOCZ	Yeft
	(oz/A)	(%)	(% control)				
BAS-51400+BAS-090 (2 lf)	4	0	91	92	55	94	91
BAS-51400+BAS-090 (2 lf)	8	3	93	97	58	95	89
BAS-51400+BAS-090 (2 lf)	16	9	97	98	83	96	96
BAS-51400+MS (2 lf)	4	4	78	91	58	94	79
BAS-51400+MS (2 lf)	8	3	91	89	66	96	93
BAS-51400+MS (2 lf)	16	4	94	92	64	94	97
BAS-51400+BAS-090 (4 lf)	4	6	82	82	15	91	89
BAS-51400+BAS-090 (4 lf)	8	1	80	82	38	88	86
BAS-51400+BAS-090 (4 lf)	16	2	80	87	61	93	85
BAS-51400+MS (4 lf)	4	0	59	74	25	80	55
BAS-51400+MS (4 lf)	8	3	89	70	48	89	93
BAS-51400+MS (4 lf)	16	5	91	88	51	92	98
BAS-51400+BAS-090 (EJ)	4	4	33	15	0	60	76
BAS-51400+BAS-090 (EJ)	8	5	49	26	8	80	91
BAS-51400+BAS-090 (EJ)	16	5	49	38	0	82	88
BAS-51400+MS (EJ)	4	1	25	15	0	56	86
BAS-51400+MS (EJ)	8	5	36	8	5	73	88
BAS-51400+MS (EJ)	16	3	43	23	0	76	94
C.V. %		106	17	19	41	10	10
LSD 5%		5	16	17	19	12	12

[a] MS = methylated sunflower oil with 15% emulsifier; MS and BAS-090, an adjuvant from BASF, were applied at 1 quart/A.

Summary

Control of all weeds with BAS-51400 at 4 or 8 oz/A was reduced or tended to be reduced as application was delayed and applied to larger plants, regardless of adjuvant. BAS-090 more than methylated sunflower oil tended to enhance yellow foxtail control with BAS-51400 at 4 oz/a applied at the 2 and 4 leaf stages, but not at the tillering stage. Wheat injury was not important at the July 17 evaluation. Injury was observed at the August 11 evaluation but not recorded because yields were planned.

Preemergence foxtail control in wheat, Fargo, 1987. Preplant treatments (PPI) were applied and twice incorporated with a field cultivator plus harrow, 'Wheaton' wheat was seeded, preemergence twice harrow incorporated treatments (PEI) applied, and preemergence treatments (PE) applied on May 12 with 75 F, 20% relative humidity, 15 mph wind, and a clear sky. Soil conditions were very dry. Weed control was evaluated on June 13 and August 11. Wheat was not harvested because of hail damage, but the inadequate kochia control would have made harvest difficult.

			June 13			August 11	
Treatment	Type	Rate	Wheat strd[a]	Yeft	KOCZ	KOCZ	Yeft
		(oz/A)	(%)	------(% control)-----			
Trifluralin	PEI	8	22	94	78	28	79
Triallate	PPI	16	28	0	0	0	0
Triallate+Propachlor	PPI	16+32	24	58	19	0	8
Triallate+Propachlor	PPI	16+48	34	56	25	0	20
Triallate+Propachlor	PPI	16+64	45	51	15	0	10
Propachlor	PE	48	0	59	11	23	43
Pendimethalin	PE	16	0	90	56	23	58
RE-40885	PE	8	0	29	73	59	5
RE-40885	PE	16	0	61	89	78	16
RE-45601	PPI	2	19	60	0	0	70
RE-45601	PE	2	9	59	0	0	55
A-1237	PE	0.25	6	61	65	25	10
A-1237	PE	0.50	0	68	73	43	18
A-1237	PE	1	0	87	92	80	18
C-4243	PE	0.50	0	43	62	58	0
C-4243	PE	1	0	65	86	76	15
C-4243	PE	2	0	89	95	85	23
No treatment	--	0	0	0	0	0	0
C.V. %			83	27	25	43	92
LSD 5%			12	22	16	19	32

[a] strd = stand reduction.

Summary

Propachlor at 64 oz/A incorporated with triallate increased wheat stand reduction and did not adequately control foxtail. A-1237 and C-4243 at the highest rate applied gave 80% or more season long kochia control, but only gave early season foxtail control.

Herbicide combinations in wheat, Casselton, 1987. 'Marshall' wheat was seeded April 23. Treatments were applied to 5 leaf wheat and 2 leaf weeds on June 2 with 75 F, 50% relative humidity, and an 8 mph wind. Weed control evaluation was on June 30 and harvest was on August 4.

Treatment[a]	Rate (oz/A)	Injury (%)	Yield (bu/A)	Wimu (% control)
Picloram+2,4-D-dma+Dicamba	0.25+6+1	5	45.1	99
Picloram+2,4-D-dma+Dicamba	0.38+6+1	7	37.8	99
Picloram+2,4-D-dma	0.25+6	5	47.0	99
Picloram+2,4-D-dma+X-77	0.25+6+0.25%	5	45.1	99
Picloram+2,4-D-dma	0.38+6	6	41.6	99
Picloram+2,4-D-dma+DPX-M6316+X-77	0.25+6+0.12+0.25%	4	46.6	99
Picloram+DPX-M6316+X-77	0.25+0.12+0.25%	6	47.8	99
Fluroxypyr+2,4-D-alk+Dicamba	1+6+1	5	48.8	99
Fluroxypyr+2,4-D-alk+Dicamba	1.5+6+1	5	47.6	99
Fluroxypyr+2,4-D-alk+Dicamba	2+6+1	4	46.1	99
Fluroxypyr+2,4-D-alk	1+6	0	50.3	99
Fluroxypyr+2,4-D-alk	1.5+6	0	49.1	99
2,4-D-dma+Dicamba	6+1.5	4	48.5	99
MCPA-dma+Dicamba	6+1	5	48.4	99
MCPA-dma+Dicamba	4+1.5	5	48.6	99
DPX-M6316+X-77	0.25+0.25%	0	52.1	99
Bromoxynil&MCPA-RP	4+4	1	45.3	99
No treatment	0	0	50.6	0
C.V. %		30	9.9	0
LSD 5%		1	6.6	0

[a] dma = dimethylamine, X-77 = nonionic surfactant, alk = alkanolamine, & = formulated mixture, RP = Rhone Poulenc, G in the rate column represents gallon/A.

Summary

None of the treatments caused any important injury to wheat. The only weed in the area was wild mustard at a low density which was completely controlled by all treatments. Wheat yield tended to be lower with the picloram plus 2,4-D and picloram plus 2,4-D plus dicamba treatments compared to the other treatments. The wild mustard did not reduce the yield of the untreated control because of the sparse density and emergence weeks after wheat emergence.

Cinmethylin with chlorsulfuron in wheat, Williston, 1987. Preplant treatments (PPI) were applied and cultivator incorporated, 'Stoa' Hard Red Spring wheat seeded, and preemergence once harrow incorporated treatments (PEI) applied on May 15. The experiment was on fallow soil which was given 50 lb/A nitrogen. Postemergence treatments were applied to 2 leaf wheat (2 LF) on May 26 and to 5 leaf wheat (5 LF) on June 8. Grain harvest was from 80 sq ft on August 10.

					Wheat				
Treatment[a]	Type	Rate	Grft	Ruth	Height	Strd	Inju	Yield	Tswt
		(oz/A)	(% control)		(cm)	----(%)---		(bu/A)	(lb)
Clsu+Cinm	(PPI)	0.15+4	87	98	49.8	6	1	23.3	59.9
Clsu+Cinm	(PPI)	0.15+8	91	96	51.8	10	3	25.7	59.0
Clsu+Cinm	(PPI)	0.15+12	94	96	51.5	21	4	26.2	59.4
Clsu+Cinm	(PPI)	0.187+4	89	96	49.5	8	0	22.9	59.2
Clsu+Cinm	(PPI)	0.187+8	94	95	52.0	16	5	25.7	59.0
Clsu+Cinm	(PPI)	0.187+12	94	94	56.3	41	5	26.4	58.1
Cinmethylin	(PPI)	4	63	0	53.0	3	0	18.7	59.1
Cinmethylin	(PPI)	8	80	0	52.3	15	1	22.3	58.3
Cinmethylin	(PPI)	12	94	19	55.5	45	5	24.8	58.8
Trifluralin	(PPI)	8	95	59	53.8	36	4	26.0	57.7
Chlorsulfuron	(PPI)	0.25	33	98	50.8	0	0	18.6	60.4
Cultivated, No treatment		0	0	0	52.0	0	0	14.9	59.6
Clsu+Cinm	(PEI)	0.15+4	86	98	50.5	8	1	25.1	59.3
Clsu+Cinm	(PEI)	0.15+8	93	96	52.5	11	1	26.1	59.6
Clsu+Cinm	(PEI)	0.15+12	90	96	52.5	8	4	26.0	59.8
Clsu+Cinm	(PEI)	0.187+4	88	96	52.3	8	0	25.3	59.7
Clsu+Cinm	(PEI)	0.187+8	90	96	51.0	13	4	24.9	59.3
Clsu+Cinm	(PEI)	0.187+12	96	98	56.0	13	6	27.5	59.7
Cinmethylin	(PEI)	4	61	0	50.3	5	0	21.4	59.2
Cinmethylin	(PEI)	8	90	28	52.3	5	3	24.7	59.6
Cinmethylin	(PEI)	12	93	38	53.0	14	3	25.8	59.2
Trifluralin	(PEI)	8	90	44	54.0	10	3	23.7	59.4
Chlorsulfuron	(PEI)	0.25	58	96	52.3	1	0	21.0	59.4
No treatment		0	0	0	52.3	0	0	13.4	59.1
Clsu+Cinm	(2 LF)	0.15+4	65	48	53.0	0	0	21.1	60.1
Clsu+Cinm	(2 LF)	0.15+8	56	46	56.3	0	0	21.7	60.4
Clsu+Cinm	(2 LF)	0.187+4	54	49	54.5	1	0	19.9	60.6
Clsu+Cinm	(2 LF)	0.187+8	80	46	54.0	0	0	21.8	60.5
Chlorsulfuron	(2 LF)	0.187	38	48	54.5	0	0	20.5	60.7
Chlorsulfuron	(2 LF)	0.25	51	48	53.8	0	0	20.1	60.4
Chlorsulfuron	(3 LF)	0.187	14	43	56.8	0	0	17.6	60.4
Chlorsulfuron	(3 LF)	0.25	15	23	55.5	0	0	16.5	60.3
Chlorsulfuron	(5 LF)	0.25	15	46	51.3	0	0	18.2	60.5
No treatment		0	0	0	52.5	0	0	18.1	60.0
C.V. %			15	47	7.0	75	165	7.7	0.8
LSD 5%			14	37	NS	9	3	2.4	0.9

[a]Clsu = Chlorsulfuron, Cinm = Cinmethylin, Strd = stand reduction, Inju = injury, Tswt = test weight.

Summary

Wheat stand reduction occurred from cinmethylin applied preplant incorporated at 8 or more oz/A, but only at 12 oz/A when applied preemergence incorporated. Cinmethylin at 12 oz/A or trifluralin at 8 oz/A caused similar wheat stand reductions, regardless of method of application. Chlorsulfuron gave greater green foxtail control when applied at the 2 leaf than the 3 or 5 leaf wheat stage and was less than 57%, regardless of method of application. Cinmethylin applied in combination with chlorsulfuron generally gave greater green foxtail control than either herbicide alone. Chlorsulfuron PPI or PEI gave more than 95% control of Russian thistle, but less than 50% when applied postemergence.

Cimethylin and Chlorsulfuron combinations for foxtail control in Stoa HRSW, Minot 1987. Stoa HRSW was seeded on May 7. Preemergence incorporated (PEI) treatments were applied with a bicycle wheel plot sprayer delivering 17 gpa at 35 psi and harrow incorporated twice on May 8. Soil conditions were dry. Temperature was 90°F at the time of application. Post emergence (POST) treatments were applied in 8.5 gpa at 35 psi to 4 leaf wheat and 2 to 4 leaf green foxtail on June 3. Weather conditions were cloudy and 65°F. Foxtail and wheat were under stress from the dry soil conditions. Plots were not harvested due to crop failure from drought. The trial was a randomized complete block design with four replicates.

Treatment	Rate	Stage of Application	Wheat Injury	Green Foxtail Control
	oz/A ai.			
Chlorsulfuron	0.12	PEI	0	21
Chlorsulfuron	0.187	PEI	1	33
Chlorsulfuron	0.375	PEI	0	60
Trifluralin	8.0	PEI	0	89
Cimethylin	4.0	POST	0	0
Cimethylin	8.0	POST	0	0
Cimethylin	12.0	POST	0	0
Chlorsulfuron+Cimethylin	.15+4	POST	6	10
Chlorsulfuron+Cimethylin	.15+8	POST	0	13
Chlorsulfuron+Cimethylin	.15+12	POST	3	20
Chlorsulfuron+Cimethylin	.187+4	POST	0	28
Chlorsulfuron+Cimethylin	.187+8	POST	8	21
Chlorsulfuron+Cimethylin	.187+12	POST	0	20
Chlorsulfuron	0.25	POST	0	30
Untreated control			0	0
Average			1	23
CV %			454	34
LSD 5%			NS	11

SUMMARY

Trifluralin at 8.0 oz/A applied preemergence harrow incorporated gave satisfactory control of green foxtail. The low moisture condition at planting and the drought conditions following planting reduced the activity of Chlorsulfuron and Cimethylin on the green foxtail. Chlorsulfuron applied preemergence tended to give better control than when applied post emergence; however was not satisfactory. Cimethylin had no activity on green foxtail in this study.

HRSW response to sulfonyl urea herbicides, Minot 1987. ND606 HRSW was seeded on May 6. Soil was fertilized for a 40 bu/A yield goal. Treatments were applied to 4.5-5.0 leaf wheat, 1 to 2 inch tall common lambsquarter and 2 to 4 leaf green foxtail at 3:00 PM on June 3. All treatments were applied with a bicycle wheel plot sprayer pressurized with CO2 at 35 psi delivering 8.5 gpa. Wheat was harvested on August 20. Due to soil variability, the third replicate was not included in the yield or test weight. The trial is a randomized complete block with four replicates. Experimental units are 10 x 60 feet with 7 x 60 feet treated and 4 x 60 feet harvested for yield.

HRSW Response to Sulfonyl Urea Herbicides, Minot 1987

Treatment	Rate	Rate	Wheat Inj.	Percent Control Colq.	Fxtl	Test Weight	Yield
	g/Ha	oz/A	%			lb/bu	bu/A
CGA-131036+X-77	15+.25%	.214	0	94	15	58.7	38.5
CGA-131036+X-77	25+.25%	.357	0	93	16	58.6	38.7
CGA-131036+X-77	35+.25%	.500	0	95	18	59.2	40.1
CGA-131036+X-77	60+.25%	.857	0	96	16	59.2	40.6
Chlorsulfuron+X-77	20+.25%	.286	0	96	18	59.0	40.1
Untreated Control			0	0	0	58.4	39.3
Average			0	79	14	58.9	39.5
CV %			0	4	24	0.73	5.43
LSD 5%			NS	6	5	NS	NS

SUMMARY

All treatments gave excellent control of common lambsquarter and very poor control of green foxtail. Weed infestations were light. Several different crops will be seeded over each plot in the Spring of 1988 to evaluate herbicide residual.

Wheat variety response to difenzoquat, Carrington, 1987. Hard Red Spring wheat varieties and Durum wheat varieties were seeded April 21. Difenzoquat was applied at 1 lb/A across the variety strips on June 8 with 65 F and 73% relative humidity. Harvest was on July 29 for spring wheat and July 31 for durum varieties.

Hard Red Spring Wheat.

Variety	Wheat injury	Test Weight		Wheat Yield	
		Untreated	Treated	Untreated	Treated
	(0 to 9 rating)	-----(lb/Bu)-----		-----(bu/A)------	
2369	4	61	61	56.8	53.5
747	6	59	54	46.3	27.9
Alex	8	61	60	40.8	25.7
Baart	7	58	56	23.3	21.0
Butte 86	7	60	61	34.1	31.0
Celtic	8	60	58	38.9	17.3
Columbus	7	59	58	37.0	32.5
Coteau	6	60	58	38.5	33.4
Cutless	8	60	58	32.6	17.9
Guard	8	60	56	38.7	23.3
Katepwa	6	59	58	40.6	32.2
Kenyon	6	59	57	41.8	30.4
Lancer	6	61	59	37.6	32.4
Leif	5	60	60	33.6	30.9
Len	8	60	58	25.0	17.5
Marshall	7	60	59	25.4	25.8
Norak	3	60	60	35.4	45.1
Nordic	7	61	59	33.4	24.9
Shield	5	60	59	31.3	26.5
Stoa	6	61	58	38.6	24.8
Success	5	59	57	22.7	34.2
Tammy	6	59	58	28.4	36.2
Telemark	6	59	58	37.1	41.0
Waldron	7	59	56	37.6	22.4
Wheaton	6	59	59	27.9	32.8
ND606	4	60	61	34.7	43.1
ND618	8	60	53	35.1	22.0
ND622	6	61	60	34.1	32.0
ND626	6	61	59	39.5	35.9
ND631	8	61	58	31.1	19.4
ND632	7	60	58	44.4	29.1
ND636	7	60	59	38.6	24.1
ND639	6	61	59	36.2	26.8
ND640	3	60	60	31.8	30.0
SD2956	5	60	59	42.1	28.2

Durum Wheat.

Variety	Wheat injury	Test Weight Untreated	Test Weight Treated	Wheat Yield Untreated	Wheat Yield Treated
	(0 to 9 rating)	-----(lb/Bu)-----		-----(bu/A)------	
Fjord	5	58	56	34.6	23.7
Laker	8	57	54	28.3	16.2
Lloyd	6	57	56	32.8	24.0
Medora	4	57	60	43.4	33.5
Monroe	5	59	59	34.8	35.5
Rugby	4	58	57	37.1	29.5
Stockholm	3	58	57	50.9	38.7
Vic	7	56	56	37.7	19.0
Ward	5	58	58	41.6	32.1
D81151	3	58	59	42.1	51.0
D81154	9	57	--	42.0	9.4
D8172	7	56	54	48.1	13.3
D8191	7	57	56	40.7	24.6
D8193	6	57	57	37.9	32.8
D8261	8	59	55	43.3	15.0
D8263	8	56	51	36.7	11.0
D8269	5	56	56	38.1	32.6
D8291	6	58	56	48.3	34.5
D8302	5	58	57	48.8	36.6
D8304	8	57	--	44.7	8.5
D8309	6	57	58	41.1	30.6
D83103	9	58	--	40.3	6.4
D8311	6	60	60	39.6	32.6
D8370	8	57	52	34.0	17.3
D8374	9	56	--	20.8	4.5
D8380	9	57	--	29.4	4.5
FA883-323	8	57	53	34.6	10.6
FA884-326	7	55	56	35.8	16.6

Summary

Injury from difenzoquat was quite severe. Temperatures were 11 degrees above normal and the relative humidity average or below average for the week after difenzoquat application. The data represents only one replication so the injury ratings do not always relate to yield reduction. However, cultivars given a rating of 8 or 9 usually had a yield reduction and those with less than a 5 injury rating usually did not have a large yield reduction.

<u>Wheat variety response to Difenzoquat, Williston, 1987.</u> Hard Red Spring wheat varieties and durum wheat varieties were seeded April 27. Difenzoquat was applied at 1 lb/A across the variety strips to 4 to 5 leaf wheat with 70 F, 60% relative humidity, sunny sky, and 3 mph wind on May 19.

Hard Red Spring Wheat

Variety	Injury (%)
Waldron	75
Stoa	0
Columbus	0
Shield	5
Lew	70
ND 606	10
ND 640	15
ND 626	20
Marshall	10
Guard	35
Telemark	10
747	50
Celtic	25
Newana	0
Coteau	15
Butte	0
Katepwa	15
Leader	5
Cutless	15
ND 622	0
Len	30
ND 631	10
Wheaton	5
SD 2956	0
Success	10
Leif	0
Rambo	0
Pondera	0
Alex	20
Butte 86	0
Kenyon	0
Lancer	0
Glenman	10
ND 636	5
ND 618	15
ND 632	30
2369	0
Nordic	10
Norak	0
Norseman	10
Tammy	0
MT 7926	5

Durum Wheat

Variety	Injury (%)
Crosby	0
Vic	60
Arcola	5
Fjord	25
Lloyd	15
D 8191	0
D 8261	50
D 8291	0
D 8302	0
D 8311	5
D 8380	60
Ward	0
Monroe	5
Kyle	60
Stockholm	5
Cando	0
D 8193	0
D 8263	40
FA883-323	50
D 8304	40
D 8370	5
D 83103	55
Rugby	5
Medora	5
Sceptre	0
Laker	70
D 8172	20
D 81154	60
D 8269	5
FA884-326	5
D 8309	0
D 8374	50

Summary

'Waldron', 'Len', and '747' were the only Hard Red Spring wheat cultivars severely injured by difenzoquat. The Durum wheat cultivars responded in three groups: tolerant (0% injury), intermediate (1 to 25% injury), and susceptible (40 to 70% injury).

Wheat cultivar response to difenzoquat, Langdon, 1987. Cultivars were seeded on May 6. Difenzoquat, at 16 oz/A, was applied to 4.5 to 6 leaf wheat on June 12. Visual injury was evaluated July 2. The harvest was a 4.5 by 4 ft sample and was not replicated. Difenzoquat did not cause any discoloration after treatment.

Hard Red Spring wheat				Durum wheat			
	Yield				Yield		
Cultivar	Untreated	Treated	Injury	Cultivar	Untreated	Treated	Injury
	-----(bu/A)------		(%)		-----(bu/A)------		(%)
Baart	41.3	34.0	5	Cando	63.4	51.6	15
Waldron	45.5	28.6	60	Ward	64.1	56.0	10
Coteau	58.2	50.6	10	Rugby	61.3	44.0	15
Len	64.7	34.3	70	Vic	50.4	37.8	70
Alex	58.3	39.7	60	Lloyd	56.9	39.9	20
Marshall	71.4	54.8	20	Medora	61.8	59.0	10
2369	64.2	48.7	15	Monroe	70.8	62.8	5
Columbus	56.4	58.1	15	Arcola	61.6	45.8	10
Guard	54.3	32.7	80	Kyle	59.5	38.8	85
Wheaton	76.4	64.1	15	Laker	58.3	38.6	70
Stoa	70.9	60.7	15	Sceptre	62.9	57.1	45
Katepwa	49.4	50.3	15	Stockholm	63.3	53.6	0
Success	57.7	44.2	15	Fjord	66.9	46.5	60
Norak	60.9	54.6	5	D8172	68.0	60.4	20
Leif	60.7	62.3	5	D8191	58.0	70.0	40
Norseman	68.6	49.6	25	D8193	43.2	45.7	40
747	58.8	34.9	70	D81151	75.1	74.5	15
Celtic	56.6	37.7	60	D81154	58.2	43.1	60
Butte 86	58.7	48.5	15	D8261	67.2	47.9	25
Kenyon	53.3	42.3	20	D8263	62.2	42.1	30
Nordic	63.5	52.5	30	D8269	55.4	54.3	45
Telemark	63.6	49.1	15	D8291	69.2	43.7	10
Shield	44.0	52.6	0	FA883-323	70.7	49.6	70
Tammy	54.3	44.5	5	FA884-326	45.4	22.7	70
ND 606	64.7	67.6	5	D8302	59.8	59.1	5
ND 618	57.5	37.0	50	D8304	65.3	45.2	30
ND 622	73.8	55.2	15	D8309	45.5	40.3	5
ND 626	56.3	37.8	50	D8311	64.5	47.8	15
ND 631	46.2	51.6	40	D8370	72.3	74.2	10
ND 632	57.8	43.4	40	D8374	66.2	50.9	15
ND 636	48.8	53.3	30	D8380	73.4	57.4	20
ND 639	69.9	53.5	15	D83103	69.7	37.2	40
ND 640	55.3	47.8	20				
SD 2956	71.4	54.7	15				

Summary

The data indicates distinct differences among Hard Red Spring and durum wheat cultivars in tolerance to difenzoquat. A higher portion of the durum compared to spring wheat cultivars indicated complete tolerance to difenzoquat. The yield of several spring wheat cultivars was reduced equally to susceptible Waldron with nearly a 50% yield reduction.

Barley cultivar response to diclofop, Langdon, 1987. Barley cultivars were seeded on May 6. Diclofop was applied at 20 oz ai/A across the cultivars. The barley lodged, which made injury evaluation and harvest difficult. The diclofop treated cultivars all tended to lodge about one week earlier than the untreated cultivars.

Cultivar	Yield		Test weight	
	Treated	Untreated	Treated	Untreated
	------(bu/A)------		------(lb/Bu)-----	
Morex	73.1	85.3	43.2	45.0
Azure	73.1	76.1	42.2	45.0
Robust	73.7	92.9	43.5	46.7
Hazen	72.8	90.8	42.7	44.7
Heartland	81.2	76.3	41.2	42.2
B1601	65.9	89.7	41.0	43.0
ND7309	89.9	100.9	44.0	45.0
ND8376	77.3	78.2	43.5	43.7
ND8377	79.2	97.1	42.7	44.0
Bowman	74.3	85.6	45.7	45.5
Ellice	62.3	63.1	40.5	41.7
Lewis	55.3	89.7	42.7	45.7
Gallatin	62.2	59.8	42.0	42.7
ND7691	61.8	74.8	44.5	44.7
ND8671	80.5	90.3	46.5	47.5
LSD 5%	-----20.5-----		------2.9-----	
# OF REPS	2		2	

Summary

All treated barley cultivars tended to have lower test weight and seed yield, except yields were similar for treated and untreated Azure, Heartland, ND8376, Ellice, and Gallatin. The lodging may have increased from diclofop which was applied at more than 1.5 times the normal use rate. However, the data indicates differences among barley cultivars in susceptibility to diclofop.

HRSW, durum, barley, oat and flax variety response to metsulfuron, Minot 1987. HRSW and durum varieties were seeded April 22 and barley, oat and flax varieties were seeded April 23. Propachlor at 3.0 lb/A a.i. was surface applied to all varieties on May 4. Diclofop .75 lb + bromoxynil .25 lb/A ai. was applied to HRSW, durum and barley, and bromoxynil + MCPA .25 + .25 lb/A ai. was applied to oats on May 14. Bromoxynil + MCPA at .25 + .25 and Sethoxydim at .3 lb/A ai. was applied to flax on June 4. Metsulfuron at .06 oz/A ai. or 0.1 oz product/acre was applied to approximately 5 leaf HRSW, durum, barley and oat varieties and 3 inch flax on May 28. Metsulfuron was applied with a bicycle wheel plot sprayer delivering 8.5 gpa at 35 psi. Temperature was 60°F with partly cloudy skies and winds were southerly at 10 to 15 mph, shield was used. Injury evaluations were made on June 20 and July 24. Plots were not replicated and were not harvested for yield.

HRSW Var.	HRSW Injury 6/20	7/24
	----%----	
Waldron	15	5
Alex	15	5
Columbus	5	5
Katepwa	5	0
Kenyon	5	0
Lancer	5	0
Lew	10	5
Cutless	10	5
Coteau	15	5
Butte 86	5	0
Stoa	5	0
Shield	5	0
Baart	10	0
Guard	5	10
747	5	10
Len	0	0
2369	5	5
Marshall	5	0
Wheaton	5	0
Success	10	0
Tammy	5	0
Rambo	5	0
Leif	5	0
Norak	15	0
Celtic	5	0
Nordic	5	0
Telemark	5	0
Norseman	5	0
SD2956	5	5
ND618	0	0
ND626	0	5
ND631	10	0
ND632	5	0
ND606	5	0
ND622	5	0
ND636	5	0
ND639	5	0
ND640	10	0
Average	6	2

Durum Var.	Durum Injury 6/20	7/24
	----%------	
Ward	15	0
Rugby	15	5
Vic	15	0
Monroe	5	5
Medora	10	15
Arcola	5	5
Kyle	55	25
Sceptre	5	0
Fjord	25	10
Stockholm	10	0
Laker	35	10
Lloyd	15	5
D8261	20	5
D8263	10	5
D8269	40	15
D8291	10	5
D8370	30	10
D8374	10	0
D8380	25	5
D83103	10	5
FA883-326	20	10
FA883-323	5	5
D8172	5	0
D8191	5	0
D8193	10	0
D81151	15	5
D81154	15	5
D8302	10	0
D8304	5	10
D8309	5	0
D8311	5	0
Average	15	5

Barley Var.	Barley Injury 6/20	7/24
	----%----	
Azure	15	10
B1601	10	0
Hazen	5	0
Morex	10	0
Robust	5	0
ND7309	5	0
ND8376	10	0
ND8377	10	5
Bowman	10	0
Ellice	15	10
Gallatin	10	5
Hector	2	0
Lewis	15	10
ND7691	10	5
ND8671	10	5
Average	9	3

Oat Var.	Oat Injury 6/20	7/24
	----%----	
Border	20	10
Dumont	30	15
Fidler	15	15
Hytest	30	15
Kelsey	30	25
Monida	10	5
Moore	30	10
Otana	20	15
Porter	50	55
Proat	20	40
Riel	25	10
Sandy	20	10
Steele	20	10
ND810104	15	5
ND820603	10	10
Average	23	17

Flax Var.	Flax Injury 6/20	7/24
	----%----	
Dufferin	40	10
McGregor	25	15
NorMan	30	10
NorLin	25	5
Linton	20	5
Flor	20	5
Clark	25	0
CI3096	30	10
Average	27	8

SUMMARY

No HRSW or barley variety was seriously injured by metsulfuron. Durum varieties were injured more than HRSW varieties. Kyle durum was the most susceptible durum variety. Oat varieties were the most susceptible of the small grain crops with Kelsey, Porter and Proat oats being 25% injured or greater on the July 24 evaluation. The injured oat varieties tended to have delayed heading and reduced tillering. All oat varieties were slightly chlorotic following treatment. Flax varieties were initially injured; however, recovered nicely following the July rainfalls.

HRSW and durum response to difenzoquat, Minot 1987. Wheat and durum varieties were seeded April 22. Ramrod at 3.0 lb/A was applied May 4. Diclofop .75 lb + bromoxynil 0.25 lb/A was applied May 14. Avenge at 1.0 lb/A (2 quarts) was applied with a bicycle wheel plot sprayer delivering 8.5 gpa at 35 psi to 5 leaf wheat on May 28. Wheat injury evaluations were made on June 20 and July 24. The plots were not replicated thus the plots were not yielded.

HRSW Variety	HRSW Injury 6/20	HRSW Injury 7/24
	-------%	-------
Waldron	85	40
Alex	70	40
Columbus	30	10
Katepwa	30	5
Kenyon	30	5
Lancer	25	5
Lew	65	55
Cutless	25	10
Coteau	20	0
Butte 86	10	0
Stoa	15	5
Shield	25	5
Baart	20	15
Guard	85	60
747	85	75
Len	75	40
2369	20	0
Marshall	20	5
Wheaton	30	5
Success	20	5
Tammy	20	5
Rambo	20	5
Leif	10	0
Norak	10	0
Celtic	80	45
Nordic	35	10
Telemark	30	7
Norseman	55	35
SD2956	25	5
ND618	25	5
ND626	50	35
ND631	30	5
ND632	30	0
ND606	30	7
ND622	20	0
ND636	20	0
ND639	25	5
ND640	30	5
Average	35	15

Durum Variety	Durum Injury 6/20	Durum Injury 7/24
	------%	--------
Ward	5	0
Rugby	5	0
Vic	45	25
Monroe	5	0
Medora	5	0
Arcola	15	5
Kyle	65	25
Sceptre	20	0
Fjord	25	15
Stockholm	25	5
Laker	85	60
Lloyd	40	15
D8261	50	35
D8263	60	15
D8269	25	5
D8291	20	5
D8370	5	0
D8374	20	10
D8380	75	40
D83103	70	50
FA883-326	75	25
FA883-323	65	40
D8172	20	5
D8191	25	5
D8193	40	30
D81151	65	65
D81154	50	25
D8302	+	+
D8304	85	60
D8309	50	40
D8311	50	20
Average	40	20

+Intial stand was poor thus a fair rating could not be determined.

SUMMARY

All HRSW and durum varieties had lighter colored foliage one week following treatment. Susceptible varieties tended to have poorer recoveries with delayed heading, reduced tillering and shortened height. Notes were taken, but not documented for each variety. Varieties with 40% or greater injury ratings are Waldron, Alex, Lew, 747, Len and Celtic HRSW and Laker, D8380, D81151, D8304 and D8309 durum.

<u>Weed control in sunflower, Williston, 1987.</u> Preplant treatments (PPI) were applied and incorporated by two passes of a cultivator having 9 inch shovels, 'Pioneer 6440' hybrid sunflower seeded, and preemergence treatments (PE) applied on May 22 with 41 to 48 F, 49 to 58% relative humidity, and 6 mph wind. Postemergence treatments (P) were applied to 2 to 3 leaf sunflower, 2 leaf green foxtail, and less than 2 inch Russian thistle and tame yellow mustard on June 8 with 66 F, 47% relative humidity, clear sky, and 4 mph wind. The experiment was conducted on fallow soil given 50 lb/A nitrogen. Tame yellow mustard and green foxtail infestations were moderate and Russian thistle was dense. Harvest was on September 22.

Treatment[a]	Type	Rate	Tymu	Ruth	Grft	Sunflower Height	Sunflower Inju	Sunflower Yield	Sunflower Tswt
		(oz/A)	-(%	control)-		(cm)	(%)	(lbs/A)	(lb)
EPTC	PPI	40	85	18	99	118	1	882	33.9
EPTC+Chloramben	PPI	40+32	97	98	99	138	0	1594	34.4
Trifluralin	PPI	12	10	90	97	122	0	878	34.4
Trif+Chloramben	PPI	12+32	81	97	99	131	0	1469	34.3
Pendimethalin	PPI	20	39	55	94	126	0	1210	33.6
Ethalfluralin	PPI	12	10	95	99	117	0	734	34.5
Trif+Isoxaben	PPI	12+1.14	95	76	95	132	0	1246	34.2
Etha+Isoxaben	PPI	12+1.14	93	94	99	132	0	1786	34.0
Trif+RE-40885	PPI	12+8	58	90	99	124	0	1334	33.7
Alachlor	PE	40	54	0	81	114	0	820	33.4
Pend+AC 222,293	PPI+P	20+3	99	73	97	123	0	1184	34.0
No treatment		0	0	0	0	92	0	161	32.4
C.V. %			28	14	8	5	693	30	--
LSD 5%			24	14	10	12	NS	487	--
# OF REPS			4	4	4	2	4	4	1

[a]Trif = Trifluralin, Etha = Ethalfluralin, Pend = Pendimethalin, Inju = injury, Tswt = test weight.

Summary

Sunflower yields related directly to the degree of weed control. Treatments with chloramben or isoxaben gave the greatest control of all weeds. AC 222,293 postemergence controlled tame yellow mustard but not Russian thistle. Treatments with ethalfluralin generally gave higher Russian thistle control than those with trifluralin or pendimethalin.

Weed control in sunflower, Minot, 1987. Preplant treatments (PPI) were applied, roto-tiller incorporated, 'Pioneer 6440' sunflower seeded, and preemergence treatments (PE) applied on June 3 with 60 F and a 5 to 10 mph wind. Weed densities were sparse. Evaluation was on July 9.

Treatment	Type	Rate	Sunflower injury	Wimu	Colq
		(oz/A)	(%)	(% control)	
EPTC	PPI	40	3	52	95
EPTC+Chloramben	PPI	40+32	1	98	98
Trifluralin	PPI	12	0	37	96
Trifluralin+Chloramben	PPI	12+32	0	90	99
Pendimethalin	PPI	20	0	39	97
Ethalfluralin	PPI	12	1	26	99
Trifluralin+Isoxaben	PPI	12+1.1	5	97	97
Trifluralin+Isoxaben	PPI	12+1.3	4	98	99
Trifluralin+Isoxaben	PPI	12+1.5	0	98	98
Ethalfluralin+Isoxaben	PPI	12+1.1	3	98	99
Ethalfluralin+Isoxaben	PPI	12+1.3	3	92	99
Ethalfluralin+Isoxaben	PPI	12+1.5	3	99	99
Isoxaben	PPI	1.5	0	98	89
Trifluralin+RE-40885	PPI	12+8	0	76	98
Alachlor	PE	40	0	59	65
No treatment	--	0	0	0	0
C.V. %			194	35	13
LSD 5%			NS	35	17

Summary

All treatments, except alachlor, gave 89% or more common lambsquarters control. All isoxaben treatments gave more than 90% wild mustard control without important injury to sunflower.

Weed control in sunflower, Carrington, 1987. Preplant treatments (PPI) were applied, roto-tiller incorporated, and 'Sigco 465a' sunflower seeded on June 5. Preemergence treatment (PE) was applied on June 8. Evaluation was on July 12.

Treatment	Type	Rate	Sunflower injury	Grft	Rrpw	Colq
		(oz/A)	(%)	--(%	control)--	
EPTC	PPI	40	0	93	77	82
EPTC+Chloramben	PPI	40+32	0	94	95	94
Trifluralin	PPI	12	0	89	84	82
Trifluralin+Chloramben	PPI	12+32	0	92	94	87
Pendimethalin	PPI	20	0	95	89	87
Ethalfluralin	PPI	12	0	91	82	73
Trifluralin+Isoxaben	PPI	12+1.1	0	83	89	82
Ethalfluralin+Isoxaben	PPI	12+1.1	0	88	76	83
Trifluralin+RE-40885	PPI	12+8	0	82	83	85
Alachlor	PE	40	0	68	68	50
Control	--	0	0	0	0	0
C.V. %			50	8	16	20
LSD 5%			NS	9	18	26
# OF REPS			4	4	4	3

Summary

All treatments, except alachlor, gave 80% or more green foxtail control. None of the herbicides caused any injury to sunflower.

<u>Weed control in sunflower, Fargo, 1987.</u> Preplant treatments (PPI) were applied and field cultivator incorporated once to a wet soil on June 1 with 65 F, 95% relative humidity, and no wind. 'Seedtech 316' sunflower was seeded and preemergence treatments (PE) applied on June 3 with 60 F, 35% relative humidity, and a 15 mph wind. Evaluation was on July 20.

Treatment	Type	Rate (oz/A)	Sunflower injury (%)	Yeft (% control)	Rrpw (% control)
EPTC	PPI	48	0	62	51
EPTC+Chloramben	PPI	48+32	0	87	97
Ethalfluralin	PPI	16	0	93	93
Trifluralin	PPI	16	0	91	88
Pendimethalin	PPI	24	0	92	93
Trifluralin+Chloramben	PPI	16+32	0	95	96
Trifluralin+Isoxaben	PPI	16+1.14	1	96	96
Trifluralin+Isoxaben	PPI	16+1.32	3	94	95
Trifluralin+Isoxaben	PPI	16+1.5	9	88	79
Isoxaben	PPI	1.5	3	0	41
Ethalfluralin+Isoxaben	PPI	16+1.14	0	95	95
Ethalfluralin+Isoxaben	PPI	16+1.32	0	95	97
Ethalfluralin+Isoxaben	PPI	16+1.50	3	94	97
RE-40885	PPI	8	0	34	42
RE-40885	PPI	16	0	33	46
RE-40885+RE-45601	PPI	16+8	0	91	64
RE-40885+Trifluralin	PPI	8+16	0	88	91
RE-40885+Trifluralin	PPI	16+16	0	96	93
Imazamethabenz+Trifluralin	PPI	4+16	3	94	96
Alachlor	PE	48	0	43	34
RE-40885	PE	8	0	0	5
RE-40885	PE	16	0	10	36
RE-40885+RE-45601	PE	8+8	0	85	49
RE-40885+RE-45601	PE	16+8	0	80	54
RE-40885+Alachlor	PE	16+48	0	58	43
C.V. %			347	22	30
LSD 5%			NS	22	29

Summary

The low foxtail control with EPTC was probably due to having one, not two, soil incorporations. The second soil incorporation was not performed because of a rain shower during the first incorporation, which caused wet soil and a second incorporation would have caused excessive soil packing. Wild mustard was seeded to the area but did not emerge. All treatments containing dinitroaniline herbicides gave 85% or greater foxtail and redroot pigweed control.

Sunflower variety response to herbicides, Fargo, 1987. Two experiments were conducted with similar conditions in the same plot area. The ethalfluralin, trifluralin, and isoxaben treatments were applied and twice field cultivator incorporated on May 4. The sunflowers were seeded in dry soil on May 12. The AC 222,293 was applied to only one replication of the second experiment to sunflowers in the 6 to 8 leaf stage on June 22 with 88 F, 85% relative humidity, a 5 mph wind, and clear sky. The sunflowers were kept weed-free by hand hoeing and cultivation. Replication 2 of the first experiment was flooded prior to sunflower emergence. Evaluation was on July 20.

		Sunflower variety								
Treatment[a]	Rate	Sigco 448	Sigco 449	Cargill 207	Dahlgren 705	Interstate 897	Interstate 3001	Seedtech 316	Royal Hybrid 2141	Seedtech Sunwheat
	(oz/A)	(% stand reduction)								
		EXPERIMENT ONE								
Etha+Isox	16+1.1	3	24	19	29	33	34	24	30	41
Etha+Isox	16+2.1	33	61	44	71	82	86	61	51	64
Etha+Isox	16+3.2	38	76	53	78	90	94	86	80	87
Trif+Isox	16+3.2	70	76	70	87	94	96	87	82	71
Isoxaben	3.2	58	85	70	86	97	97	83	81	91
No treatment	0	0	0	0	0	0	0	0	0	0
C.V. %		48	36	40	34	31	19	34	44	33
LSD 5%		24	29	26	30	30	20	29	36	29
# OF REPS		4	4	4	4	4	4	4	4	4
		EXPERIMENT TWO								
		(% injury)								
AC 222,293	10	30	50	20	15	5	15	40	15	25
AC 222,293	31	50	70	40	65	50	70	75	35	50
No treatment	0	0	0	0	0	0	0	0	0	0
# OF REPS		1	1	1	1	1	1	1	1	1

[a] Etha = Ethalfluralin, Isox= Isoxaben.

Summary

The high stand reduction from the isoxaben may have resulted from the extremely wet conditions prior to sunflower emergence. No large differences occurred among varieties in susceptibility to isoxaben. However, Sigco 448 and Cargill 207 tended to be more resistant to stand reduction by isoxaben than the other varieties.

The injury from AC 222,293 was high because the rates were high. Only minor differences among varieties occurred in tolerance to AC 222,293.

Sunflower stage and AC 222,293, Fargo, 1987. 'Seed tech 316' sunflower was seeded June 3. The sunflowers were kept weed free by cultivation and hand hoeing. The 4 to 6 leaf treatment (4-6LF) was applied on June 22 with 88 F, 85% relative humidity, clear sky, and a 5 mph wind. The 8 to 10 leaf treatment (8-10LF) was applied on July 2 with 75 F; the 12 leaf treatment (12LF) on July 9 with 85 F; and the bud stage treatment (BUD) on July 24 with 75 F. Evaluations were taken on September 11.

Treatment	Stage	Rate	Sunflower Injury	Height reduction	Lodging	Sterile area	Stand	Head diameter
		(oz/A)	(%)	(inches)		(cm)	(no)	(cm)
AC 222,293	(4-6LF)	6	2	1	0	4.98	23	15.4
AC 222,293	(8-10LF)	6	2	7	0	8.58	21	15.2
AC 222,293	(12LF)	6	2	3	2	8.19	18	15.5
AC 222,293	(BUD)	6	2	2	0	7.15	18	17.2
No treatment		0	0	0	0	4.00	20	16.2
C.V. %			145	113	168	31.05	21	5.8
LSD 5%			NS	4	1	3.15	NS	NS

Summary

AC 222,293 at 6 oz/A did not cause visible injury to plant foliage. However, AC 222,293 applied to sunflower from the 8 leaf to the bud stage had heads which contained more sterile non-plump seeds than the untreated sunflowers or sunflowers treated at the 4 to 6 leaf stage. Observations also indicated large fused achenes, especially with treatment at the 12 leaf stage.

Difenzoquat influence upon sunflower, Fargo, 1987. 'Seed tech 316' sunflower was seeded on June 3 to a Fargo silty clay soil. Treatments were applied to cotyledon to 2 leaf sunflowers 4 to 6 days after emergence, on June 17. Difenzoquat was applied in 8.5 gpa to the two center rows of the four row plots which were 10 ft wide by 25 ft long. The sunflowers were kept weed free by hand hoeing and cultivation. Plant heights were the average of six plants selected randomly and were measured from the soil to the head on September 3. Seed yield was not obtained because of excessive seed loss to birds.

Treatment	Days after emergence	Rate	Sunflower plant height
	(number)	(oz/A)	(cm)
Difenzoquat	4	1	175.3
Difenzoquat	4	2	170.1
Difenzoquat	4	4	176.8
Difenzoquat	4	6	174.9
Difenzoquat	4	8	172.9
No treatment	-	0	173.6
C.V. %			3.7
LSD 5%			NS
# OF REPS			4

Summary

Sunflower height was not influenced by difenzoquat, regardless of the rate.

Sunflower cultivar response to AC 222,293, Langdon, 1987. The sunflower cultivars were seeded to a field in flax the previous year and a soil test of 55 lb/A N, 46 P, and 470 K, May 13. Trifluralin at 1 lb/A was applied and soil incorporated before seeding. AC 222,293 at 5 oz/A plus Pydrin at 1 fluid oz/A was applied over all sunflower cultivars on June 16 with 91 F and sunflowers 16 to 20 inches tall. Harvest was on October 15. Sunflower injury rating was taken as number of plants without heads and malformed heads in 20 ft of row prior to harvest.

Brand	Hybrid	Days to flower	Headless plants (No)	Malformed heads (No)	yield (lb/A)
		(No)			
Dahlgren	D0855	76	4	1.33	1438
Dahlgren	D0705	76	2	0.33	1769
Interstate	IS3007	76	3	0.67	1766
Interstate	IS3312	75	2	2.33	1092
Interstate	IS7111	74	1	0.33	1797
Interstate	EX51011	77	2	0.67	1605
Cenex	6101	73	2	0.67	1880
Cenex	8101	75	0	0.33	2236
Cenex	7101	76	2	1.00	1833
Cargill	SF100	78	3	1.33	2219
Cargill	SF102	78	3	1.33	1773
Cargill	SF103	76	1	0.67	2423
Cargill	207	75	0	0.67	2546
Cargill	208	78	0	1.00	2655
Cargill	EXP409687	78	1	0.33	3095
Pioneer	6440	77	0	0.67	2272
Jacques	Columbia II	73	1	0.67	1748
Stauffer	S1296	72	0	1.67	1860
Stauffer	EX8413	76	2	0	1905
Agri Pro-Sokota	2057	72	0	0	1446
Agri Pro-Sokota	5600	76	3	2.33	1467
Seedtec	330	73	2	0	1864
Seedtec	Dakota Gold	76	2	2.00	1348
Seedtec	Dakota Gold II	72	0	0.67	1481
Northern Sales	SVKE183	77	2	3.33	1647
Northern Sales	SVKE549	75	1	0.67	2135
Northern Sales	SVKE550	75	0	0	2165
Northern Sales	SVKE551	78	2	1.67	2074
Northern Sales	SVKE556	74	2	1.67	1763
Northern Sales	SVKE558	75	0	0	1962
Northern Sales	SVKE571	73	0	0	2352
Northern Sales	SVKE579	73	0	0.67	2137
Northern Sales	SVKE592	72	0	1.00	1765
Northern Sales	SVKE695	74	1	0.33	1683
Svaloef	SVKE596	73	0	0.33	1322
Svaloef	SVKE599	75	2	0.67	1222
Svaloef	SVKE600	75	1	0	1433
Svaloef	SVKE668	77	1	3.33	1531
Svaloef	SVKE669	77	7	1.33	1484
Svaloef	SVKE672	75	8	1.67	872
Svaloef	SVKE698	75	1	0	1292
Svaloef	SVKE700	75	1	1.33	1961
Svaloef	SVKE703	73	1	0.67	1955
Svaloef	SVKE597	74	1	0.33	1532
USDA	894	77	3	0.67	1822
USDA	894	77	1	3.67	1803
USDA	894	77	5	3.67	1561
USDA	894	77	3	2.67	1646
USDA	894	78	6	0.67	1391
LSD 5%		3	4	2.14	579

Summary

The number of plants without heads or malformed heads varied with hybrid. However, the number of malformed heads did not relate to the number of plants without heads for a hybrid. Yield differences may not be from injury as there were no control treatments and birds also caused some seed loss.

Postemergence herbicides for wild mustard control in sunflower, Minot 1987. Pioneer 6440 sunflower was seeded on June 3. Stage 1 (S1) treatments were applied to 4-6 leaf sunflower 4 to 6 inches tall on June 26 with NW winds at 5-10 mph, a shield was used. Skies were clear and temperature was 60°F. The stage 2 (S2) treatments were applied on July 14 to 18-20 inch sunflowers. Skies were mostly sunny and temperature was 70°F, winds were calm. All treatments were applied with a bicycle wheel plot sprayer delivering 8.5 gpa at 35 psi. The experimental design was a randomized complete block with four replicates. Weed populations were very low and irratic, thus evaluation of weed control was not made. Sunflower injury was evaluated September 4. The ratings reflect the reduction in yielding ability and not the reduction in plant tissue. Trial was not harvested because of severe bird damage.

Treatment	Rate	Stage of Application	Sunflower Injury
	oz/A ai.		%
AC222-293	2.0	S1	1
AC222-293	4.0	S1	8
AC222-293	6.0	S1	91
Acifluorfen	1.0	S1	0
Acifluorfen	1.5	S1	0
Metribuzin	2.0	S1	3
Metribuzin	3.0	S1	9
AC222-293	2.0	S2	1
AC222-293	4.0	S2	16
AC222-293	6.0	S2	69
Acifluorfen	1.0	S2	1
Acifluorfen	1.5	S2	1
Metribuzin	2.0	S2	5
Metribuzin	3.0	S2	20
Mean			16
CV %			56
LSD 5%			13

AC222-293 at 6 oz/A caused the greatest amount of injury (head malformation) to the sunflower regardless of stage of application; however, the 4-6 leaf treated sunflower (S1) was injured more than the 10 to 20" sunflower (S2). AC222-293 at 4 oz/A caused significant injury to 18 to 20 inch sunflowers. Metribuzin caused severe early burn on sunflowers at both stages of application; however, sunflowers recovered quite well, except the 18 to 20 inch flowers treated with the 3 oz rate were injured 20%. Acifluorfen did not injure flowers in this trial at any stage of application.

Weed control in flax, Prosper, 1987. 'Linton' flax was seeded on April 17. Treatments were applied to 4 inch flax and kochia, and emerging green foxtail on May 29 (Date 1) with 70 F and 50% relative humidity and June 3 (Date 2) with 70 F and 35% relative humidity. Treatments were applied with a 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 experiment was a randomized complete block design with four replications. Evaluation was on June 16 and August 19.

Treatment[a]	Date	Rate	June 16 Flax injury	June 16 Grft	June 16 KOCZ	August 19 Grft	August 19 KOCZ
		(oz/A)	(%)	-----(%	control)-----		
Dalapon+MCPA-bee	1	12+4	9	81	83	13	36
Diclofop+Bromoxynil-UC	1	12+4	4	76	78	18	40
Diclofop+Bromoxynil-UC	1	16+4	11	85	60	11	30
Diclofop+Bromoxynil-UC+PO	1	12+4+0.12G	8	51	83	5	24
Diclofop+Brox-UC+MCPA-bee+PO	1	13+4+0.7+0.12G	6	49	84	3	29
Diclofop+DPX-M6316+PO	1	12+0.12+0.12G	23	73	96	6	78
Diclofop+PO/MCPA-bee	1/2	12+0.12G/4	16	69	88	10	33
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/4	10	99	85	23	18
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/8	13	97	80	21	11
Sethoxydim+MCPA-bee+PO	1	1.5+4+0.25G	10	99	83	11	45
Sethoxydim+MCPA-dma+PO	1	1.5+4+0.25G	11	97	93	28	46
Seth+MCPA-bee+PO/MCPA-bee	1/2	1.5+4+0.25G/4	21	97	85	5	23
Sethoxydim+MCPA-bee+PO	1	3+4+0.25G	14	99	78	26	26
Sethoxydim+MCPA-bee+MS	1	1.5+4+0.25G	8	99	88	25	34
Sethoxydim+MCPA-bee+Dash	1	1.5+4+0.25G	6	97	78	8	23
Seth+MCPA-bee+MS/MCPA-bee	1/2	1.5+4+0.25G/4	13	96	86	25	46
Sethoxydim+DPX-M6316+PO	1	1.5+0.12+0.25G	18	95	97	13	50
Sethoxydim+DPX-M6316+MS	1	1.5+0.12+0.25G	11	96	96	23	68
Sethoxydim+DPX-M6316+MS	1	1.5+0.25+0.25G	28	96	97	15	84
Sethoxydim+DPX-M6316+Dash	1	1.5+0.12+0.25G	14	96	95	18	50
Sethoxydim+Bromoxynil-UC+PO	1	1.5+4+0.25G	1	97	96	10	26
Seth+Bromoxynil&MCPA-RP+PO	1	1.5+4+4+0.25G	9	98	88	19	39
No treatment	-	0	0	0	0	0	0
C.V. %			85	10	9	90	52
LSD 5%			14	12	16	NS	27
# OF REPS			4	4	2	4	4

[a]bee = butoxyethanol ester, UC = Union Carbide, PO = petroleum oil with 17% emulsifier, Brox = Bromoxynil, dma = dimethylamine, MS = methylated sunflower oil with 15% emulsifier, RP = Rhone Poulenc.

Summary

None of the treatments caused important injury to flax, except DPX-M6316 tended to be more injurious than other treatments. Treatments containing DPX-M6316 generally gave higher kochia control than the other treatments. The green foxtail present at the August evaluation probably emerged after treatment since control with all sethoxydim treatments exceeded 95% at the June evaluation. MCPA as a split application of 4 oz/A with sethoxydim followed by MCPA at 4 oz/A alone tended to give greater kochia control than MCPA at 8 oz/A applied after sethoxydim, especially when the first MCPA plus sethoxydim treatment was applied with methylated sunflower oil.

Weed control in flax, Carrington, 1987. 'Linton' flax was seeded on May 20. Treatments were applied to 4 inch flax and weeds 1 inch on June 15 (Date 1) with 75 F followed by an 0.25 inch rain after 5h and on June 18 (Date 2) with 85 F followed by a 0.03 inch rain in 1 day and 0.40 inch in 2 days. Treatments were applied with a plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide strip the length of the 8 by 24 ft plots. The experiment was a randomized complete block design with four replications. Evaluation was on July 15.

Treatment[a]	Date	Rate (oz/A)	Flax injury (%)	Grft	Vowh	Rrpw
				-----(% control)----		
Dalapon+MCPA-bee	1	12+4	0	44	10	46
Diclofop+Bromoxynil-UC	1	12+4	0	3	0	9
Diclofop+Bromoxynil-UC	1	16+4	0	13	0	25
Diclofop+Bromoxynil-UC+PO	1	12+4+0.12G	0	10	0	48
Diclofop+Brox-UC+MCPA-bee+PO	1	13+4+0.7+0.12G	0	0	0	23
Diclofop+DPX-M6316+PO	1	12+0.12+0.12G	0	0	0	99
Diclofop+PO/MCPA-bee	1/2	12+0.12G/4	0	21	0	74
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/4	3	72	15	45
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/8	0	68	9	88
Sethoxydim+MCPA-bee+PO	1	1.5+4+0.25G	0	48	29	28
Sethoxydim+MCPA-dma+PO	1	1.5+4+0.25G	0	20	15	24
Seth+MCPA-bee+PO/MCPA-bee	1/2	1.5+4+0.25G/4	0	46	36	71
Sethoxydim+MCPA-bee+PO	1	3+4+0.25G	0	92	66	35
Sethoxydim+MCPA-bee+MS	1	1.5+4+0.25G	0	44	48	29
Sethoxydim+MCPA-bee+Dash	1	1.5+4+0.25G	0	68	50	30
Seth+MCPA-bee+MS/MCPA-bee	1/2	1.5+4+0.25G/4	0	39	49	71
Sethoxydim+DPX-M6316+PO	1	1.5+0.12+0.25G	0	66	18	99
Sethoxydim+DPX-M6316+MS	1	1.5+0.12+0.25G	0	44	45	99
Sethoxydim+DPX-M6316+MS	1	1.5+0.25+0.25G	0	44	44	99
Sethoxydim+DPX-M6316+Dash	1	1.5+0.12+0.25G	0	56	38	99
Sethoxydim+Bromoxynil-UC+PO	1	1.5+4+0.25G	0	44	40	5
Seth+Bromoxynil&MCPA-RP+PO	1	1.5+4+4+0.25G	0	38	38	34
No treatment	-	0	0	0	0	0
C.V. %			956	43	49	41
LSD 5%			NS	23	16	29

[a]bee = butoxyethanol ester, UC = Union Carbide, PO = petroleum oil with 17% emulsifier, Brox = Bromoxynil, dma = dimethylamine, MS = methylated sunflower oil with 15% emulsifier, RP = Rhone Poulenc.

Summary

None of the treatments caused important injury to flax. Treatments containing DPX-M6316 generally gave higher redroot pigweed control than other treatments. Green foxtail control with sethoxydim was antagonized by MCPA amine. Sethoxydim at 3 oz/A was required for green foxtail control. MCPA at 8 oz/A applied as a second treatment after sethoxydim tended to give greater redroot pigweed control than a split application of 4 oz/A with sethoxydim and a second 4 oz/A alone.

Weed control in flax, Minot, 1987. The experiment was conducted in a flax seed production field. Treatments were applied to 4 inch tall flax (some plants flowering), 5 leaf wild oats (some boot stage), and 0.5 inch tall foxtail on June 18 with 75 F and a 1 mph wind. Plants were under drought stress at treatment. The second postemergence treatments, split (after /), were applied on June 22 with 75 F, 5 mph wind, clear sky, and drought conditions. The sethoxydim + MCPA-dma + PO treatment did not emulsify from the original mixture and a new mixture was prepared the day of treatment. PO was petroleum oil 11N with Atplus 300F emulsifier, BCH-815 was from BASF, and MS was methylated sunflower oil with 15% Witco emulsifier. Evaluation was July 10.

Treatment[a]	Rate	Flax injury	Wioa	Grft
	(oz/A)	(%)	(% control)	
Dalapon+MCPA-bee	12+4	10	34	48
Diclofop+Bromoxynil-UC	12+4	0	13	20
Diclofop+Bromoxynil-UC	16+4	8	30	24
Diclofop+Bromoxynil-UC+PO	12+4+0.12G	4	8	24
Diclofop+Bromoxynil-UC+MCPA-bee+PO	13+4+0.7+0.12G	3	9	29
Diclofop+DPX-M6316+PO	12+0.12+0.12G	1	13	0
Diclofop+PO/MCPA-bee	12+0.12G/4	6	34	26
Sethoxydim+PO/MCPA-bee	1.5+0.25G/4	0	51	61
Sethoxydim+PO/MCPA-bee	1.5+0.25G/8	18	46	50
Sethoxydim+MCPA-bee+PO	1.5+4+0.25G	6	64	54
Sethoxydim+MCPA-dma+PO	1.5+4+0.25G	5	56	61
Sethoxydim+MCPA-bee+PO/MCPA-bee	1.5+4+0.25G/4	11	63	61
Sethoxydim+MCPA-bee+PO	3+4+0.25G	1	84	79
Sethoxydim+MCPA-bee+MS	1.5+4+0.25G	1	78	63
Sethoxydim+MCPA-bee+BCH-815	1.5+4+0.25G	6	46	54
Sethoxydim+MCPA-bee+MS/MCPA-bee	1.5+4+0.25G/4	4	78	73
Sethoxydim+DPX-M6316+PO	1.5+0.12+0.25G	3	34	54
Sethoxydim+DPX-M6316+MS	1.5+0.12+0.25G	8	66	76
Sethoxydim+DPX-M6316+MS	1.5+0.25+0.25G	3	60	59
Sethoxydim+DPX-M6316+BCH-815	1.5+0.12+0.25G	9	73	74
Sethoxydim+Bromoxynil-UC+PO	1.5+4+0.25G	3	58	60
Sethoxydim+Bromoxynil&MCPA-RP+PO	1.5+8+0.25G	6	66	59
No treatment	0	0	3	5
C.V. %		166	37	32
LSD 5%		NS	24	22

[a] bee = butoxyethanol ester, UC = Union Carbide, dma = dimethylamine, RP = Rhone Poulenc, G in the rate column represents gallon/A.

Summary

The wild oats and foxtail control was low with all treatments, indicating the influence of drought on grass species control with several grass control herbicides. The drought at treatment was such that some of the grass plants appeared to be dying. The area around the experiment was treated when moisture was more adequate and effective grass species control was obtained from sethoxydim at 3 oz/A plus PO. The spray mixtures were stored mixed without water for more than a week. However, the one treatment which was mixed the day of treatment was not more effective than the other treatments. Thus, the premixing should not have accounted for the low level of control.

Weed control in flax, Williston, 1987. 'Flor' flax was seeded on April 29. Treatments were applied to 3 inch flax, 6 leaf tame yellow mustard, and 1 to 2 inch Russian thistle and green foxtail on May 29 (Date 1) with 75 F and 45% relative humidity and June 3 (Date 2) with 51 F and 79% relative humidity. Treatments were applied with a 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 experiment was a randomized complete block design with four replications. Evaluation was on August 29.

			Flax				
Treatment[a]	Date	Rate	Injury	Yield	Tymu	Ruth	Grft
		(oz/A)	(%)	(bu/A)	-(% control)--		
Dalapon+MCPA-bee	1	12+4	9	5.0	96	54	36
Diclofop+Bromoxynil-UC	1	12+4	0	8.2	80	84	45
Diclofop+Bromoxynil-UC+PO	1	12+4+0.12G	0	9.7	87	91	68
Diclofop+Brox-UC+MCPA-bee+PO	1	13+4+0.7+0.12G	1	11.7	96	95	55
Diclofop+DPX-M6316+PO	1	12+0.12+0.12G	0	9.9	99	96	21
Diclofop+PO/MCPA-bee	1/2	12+0.12G/4	3	9.1	95	87	85
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/4	9	6.6	92	65	94
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/8	21	5.2	90	59	95
Sethoxydim+MCPA-bee+PO	1	1.5+4+0.25G	3	6.2	89	43	96
Sethoxydim+MCPA-dma+PO	1	1.5+4+0.25G	3	5.2	96	48	95
Seth+MCPA-bee+PO/MCPA-bee	1/2	1.5+4+0.25G/4	5	8.2	98	83	94
Sethoxydim+MCPA-bee+PO	1	3+4+0.25G	5	6.0	93	36	96
Sethoxydim+MCPA-bee+MS	1	1.5+4+0.25G	1	6.3	92	53	96
Sethoxydim+MCPA-bee+Dash	1	1.5+4+0.25G	4	6.5	95	50	95
Seth+MCPA-bee+MS/MCPA-bee	1/2	1.5+4+0.25G/4	9	8.7	97	80	95
Sethoxydim+DPX-M6316+PO	1	1.5+0.12+0.25G	1	12.8	99	95	95
Sethoxydim+DPX-M6316+MS	1	1.5+0.12+0.25G	3	12.1	99	95	98
Sethoxydim+DPX-M6316+MS	1	1.5+0.25+0.25G	4	12.8	99	94	96
Sethoxydim+DPX-M6316+Dash	1	1.5+0.12+0.25G	1	13.3	99	96	97
Sethoxydim+Bromoxynil-UC+PO	1	1.5+4+0.25G	1	11.3	95	92	96
Seth+Bromoxynil&MCPA-RP+PO	1	1.5+4+4+0.25G	3	11.1	88	95	97
No treatment	-	0	0	3.3	0	0	0
C.V. %			91	18.1	5	19	9
LSD 5%			5	2.2	6	19	11

[a]bee = butoxyethanol ester, UC = Union Carbide, PO = petroleum oil with 17% emulsifier, Brox = Bromoxynil, dma = dimethylamine, MS = methylated sunflower oil with 15% emulsifier, RP = Rhone Poulenc.

Summary

None of the treatments caused important injury to flax. Treatments containing DPX-M6316 generally gave higher Russian thistle control than the other treatments. Yields related to Russian thistle control. MCPA at 4 oz/a with sethoxydim plus petroleum oil or methylated seed oil followed by MCPA at 4 oz/A alone tended to give greater Russian thistle control than MCPA at 8 oz/A applied after sethoxydim.

Weed control in flax, Langdon, 1987. 'Norman' flax was seeded on April 28. Treatments were applied to 1 to 7 inch flax, 4 leaf common mallow, and 0 to 5 inch wild buckwheat on June 10 (Date 1) with 50 F and drizzle during the last six treatments and on June 12 (Date 2) with 70 F. Treatments were applied with a 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 experiment was a randomized complete block design with four replications. Evaluation was on July 23.

Treatment[a]	Date	Rate	Flax injury	Grft	Wibw	Coma	Flax Yield	Flax Tswt
		(oz/A)	(%)	-(%	control)	-	(bu/A)	(lb)
Dalapon+MCPA-bee	1	12+4	3	91	0	0	23	51.4
Diclofop+Bromoxynil-UC	1	12+4	1	87	85	13	33	52.8
Diclofop+Bromoxynil-UC	1	16+4	2	92	73	0	32	53.1
Diclofop+Bromoxynil-UC+PO	1	12+4+0.12G	4	69	93	8	31	53.6
Diclofop+Brox-UC+MCPA-bee+PO	1	13+4+0.7+0.12G	1	74	85	0	33	53.1
Diclofop+DPX-M6316+PO	1	12+0.12+0.12G	5	48	25	0	26	52.5
Diclofop+PO/MCPA-bee	1/2	12+0.12G/4	3	81	0	0	26	52.6
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/4	0	98	0	0	27	52.5
Sethoxydim+PO/MCPA-bee	1/2	1.5+0.25G/8	1	95	0	0	27	52.8
Sethoxydim+MCPA-bee+PO	1	1.5+4+0.25G	1	98	0	0	24	52.1
Sethoxydim+MCPA-dma+PO	1	1.5+4+0.25G	0	76	0	0	24	52.1
Seth+MCPA-bee+PO/MCPA-bee	1/2	1.5+4+0.25G/4	3	96	0	0	26	52.1
Sethoxydim+MCPA-bee+PO	1	3+4+0.25G	0	98	0	0	26	51.9
Sethoxydim+MCPA-bee+MS	1	1.5+4+0.25G	3	97	0	0	24	52.0
Sethoxydim+MCPA-bee+Dash	1	1.5+4+0.25G	0	97	0	0	28	51.8
Seth+MCPA-bee+MS/MCPA-bee	1/2	1.5+4+0.25G/4	4	93	0	0	25	52.0
Sethoxydim+DPX-M6316+PO	1	1.5+0.12+0.25G	3	95	0	0	25	51.9
Sethoxydim+DPX-M6316+MS	1	1.5+0.12+0.25G	5	97	0	0	27	52.3
Sethoxydim+DPX-M6316+MS	1	1.5+0.25+0.25G	4	95	29	0	30	52.5
Sethoxydim+DPX-M6316+Dash	1	1.5+0.12+0.25G	5	97	5	0	27	51.9
Sethoxydim+Bromoxynil-UC+PO	1	1.5+4+0.25G	2	89	93	0	34	53.6
Seth+Bromoxynil&MCPA-RP+PO	1	1.5+4+4+0.25G	3	94	92	8	33	53.0
No treatment	-	0	0	0	0	3	27	52.5
C.V. %			86	12	30	568	13	1.1
LSD 5%			3	14	11	NS	5	0.8

[a]bee = butoxyethanol ester, UC = Union Carbide, PO = petroleum oil with 17% emulsifier, Brox = Bromoxynil, dma = dimethylamine, MS = methylated sunflower oil with 15% emulsifier, RP = Rhone Poulenc.

Summary

None of the treatments caused important injury to flax. Bromoxynil treatments gave the highest wild buckwheat control. A rain immediately after treatment may have accounted for the low common mallow control with DPX-M6316 which usually controls common mallow. Green foxtail control with sethoxydim was antagonized by MCPA amine. Yield was not greatly influenced by weed control because of the sparse infestation.

Bentazon for flax, Fargo, 1987. 'Linton' flax was seeded on April 22. Treatments were applied to 2 and 6 inch tall flax, 1 and 8 inch tall kochia, 2 leaf foxtail, and 2 and 6 leaf wild mustard on June 4 with 70 F, 35% relative humidity, clear sky, and a 15 mph wind. The entire area was treated with sethoxydim at 3 oz/A plus methylated sunflower oil to control volunteer wheat on June 15. Evaluation was on June 23 and July 28. Weed densities were wild mustard at 10 plants/sq ft and kochia at 30 plants/sq ft. Flax was not harvested for yield because of a variable stand from the drought before emergence.

		June 23			July 28
Treatment[a]	Rate	Flax injury	Wimu	KOCZ	KOCZ
	(oz/A)	(%)	-----(% control)-----		
Bentazon	8	0	99	36	23
Bentazon	12	0	99	51	18
Bentazon	16	1	97	64	39
Bentazon+PO	8+0.25G	0	97	88	62
Bentazon+PO	12+0.25G	1	99	94	77
Bentazon+PO	16+0.25G	2	99	98	91
Bentazon+Bromoxynil-UC	8+4	3	97	87	68
Bentazon+Bromoxynil-UC+PO	8+4+0.25G	1	99	98	93
Bentazon+Bromoxynil-UC	16+8	3	99	96	80
Bentazon+Bromoxynil-UC+PO	16+8+0.25G	3	99	98	97
Bentazon+MCPA-dma	8+4	6	99	84	66
Bentazon+MCPA-bee	8+4	1	99	91	61
Bentazon+MCPA-dma+PO	8+4+0.25G	5	99	83	65
Bentazon+MCPA-bee+PO	8+4+0.25G	2	99	88	73
Bentazon+MCPA-dma	16+8	8	99	97	83
Bentazon+MCPA-dma+PO	16+8+0.25G	8	99	96	90
DPX-M6316	0.25	5	99	41	23
Bromoxynil-UC	4	3	99	88	86
MCPA-dma	4	3	99	30	25
Bromoxynil&MCPA-UC	4+4	3	99	97	94
No treatment	0	0	0	0	0
C.V. %		66	2	11	22
LSD 5%		2	2	12	20

[a]PO = petroleum oil with 17% emulsifier, UC = Union Carbide, dma = dimethylamine, bee = butoxyethanol ester, G in the rate column represents gallon/A.

Summary

None of the treatments caused any important injury to flax. All treatments gave complete control of the wild mustard. Oil adjuvants tended to enhance kochia control with bentazon, bentazon plus bromoxynil, and bentazon plus MCPA. Flax, at the kochia densities in this experiment, would not be harvestable with any treatment which gave less than 90% control. The greatest kochia control was with bentazon at 16 oz/A plus bromoxynil at 8 oz/A plus petroleum oil adjuvant.

Bentazon for flax, Prosper, 1987. 'Linton' flax was seeded on April 19. Treatments were applied to 3 inch tall flax and kochia, cotyledon common lambsquarters, and emerging foxtail on May 29 with 70 F, 50% relative humidity, cloudy sky, and a 5mph wind. Evaluation was on June 15 and August 19. Two hail storms occurred in the area preventing meaningful harvest. Weed densities were quite variable.

		June 15			Aug 19
Treatment[a]	Rate	Flax injury	Colq	KOCZ	KOCZ
	(oz/A)	(%)	-----(% control)-----		
Bentazon	8	0	51	45	14
Bentazon	12	0	68	63	14
Bentazon	16	0	65	68	24
Bentazon+PO	8+0.25G	3	97	96	58
Bentazon+PO	12+0.25G	1	96	99	76
Bentazon+PO	16+0.25G	0	93	98	67
Bentazon+Bromoxynil-UC	8+4	5	96	90	66
Bentazon+Bromoxynil-UC+PO	8+4+0.25G	8	99	95	88
Bentazon+Bromoxynil-UC	16+8	10	98	99	86
Bentazon+Bromoxynil-UC+PO	16+8+0.25G	9	99	97	93
Bentazon+MCPA-dma	8+4	8	97	95	58
Bentazon+MCPA-bee	8+4	9	97	65	26
Bentazon+MCPA-dma+PO	8+4+0.25G	13	98	75	66
Bentazon+MCPA-bee+PO	8+4+0.25G	3	98	70	38
Bentazon+MCPA-dma	16+8	14	99	84	44
Bentazon+MCPA-dma+PO	16+8+0.25G	20	99	95	78
DPX-M6316	0.25	11	61	55	19
Bromoxynil-UC	4	11	99	89	69
MCPA-dma	4	3	92	45	60
Bromoxynil&MCPA-UC	4+4	6	99	99	71
No treatment	0	0	0	0	0
C.V. %		136	11	17	36
LSD 5%		NS	13	27	27
# OF REPS		4	4	2	4

[a]PO = petroleum oil with 17% emulsifier, UC = Union Carbide, dma = dimethylamine, bee = butoxyethanol ester, G in the rate column represents gallon/A.

Summary

Kochia control was enhanced by the inclusion of an oil adjuvant with bentazon alone, bentazon plus bromoxynil, and bentazon plus MCPA, at the late evaluation. Common lambsquarters control exceeded 90% for all treatments except bentazon or DPX-M6316 without adjuvants. None of the treatments caused important injury to flax.

Biomal for common mallow control in flax, Langdon, 1987. 'Linton' flax was seeded on May 13. Treatments were applied in 17 gpa at 35 psi to 3 inch tall flax and 2 to 2.5 true leaf mallow at 15 to 30 plants/sq ft on June 11 at 8:30 pm with 58% relative humidity. Relative humidity at 10:00 pm was 67% and at 7:00 am on June 12 was 74% with a heavy dew. The dew was gone at 11:00 am and relative humidity was 61% and at 1:00 pm was 38%. Purslane, at 2 to 15 plants/sq ft, and an occassional kochia were also present. A 6 ft wide border around each plot was treated with DPX-M6316 to control weeds, in order to prevent fungal spread. Grass weeds were controlled with sethoxydim applied at 3 oz/A.

		Common mallow			July 28		Flax	
Treatment	Rate	July 8	July 28	Aug 5	KOCZ	Copu	Yield	Tswt
		------------(% control)------------					(bu/A)	(lb)
No treatment	0	0	33	100	0	0	9.5	41.8
Biomal	6x10 spores/A	10	35	100	0	0	10.1	44.5
Biomal	12x10 spores/A	9	40	100	0	0	12.3	43.3
Biomal	24x10 spores/A	18	64	100	0	0	17.4	45.6
DPX-M6316+X-77	0.50 oz/A+0.5%	100	100	100	99	99	21.6	49.7
DPX-M6316+X-77	0.25 oz/A+0.5%	100	100	100	99	99	22.6	49.4
DPX-M6316+X-77	0.125 oz/A+0.5%	81	78	100	99	99	23.1	46.6
C.V. %		12	20	0	0	0	18.7	3.1
LSD 5%		8	18	NS	0	0	4.5	2.0

Summary

No purslane was present at harvest, apparently the purslane could not compete with the dense mallow infestation. Kochia was present at harvest only in replications 1 and 2 of the control treatment (no treatment), replications 1 and 3 of biomal applied at 12x10 , and replication 2 of biomal applied at 6x10 spores/A. The fungal infestation developed slowly after treatment, but the mallow plants died rapidly once infected. Control was about 50% on July 28 and 100% on August 5. The borders did not prevent the spread among plots as mallow was controlled in the untreated plots. DPX-M6316 provided early season control which related to flax yield increases. The DPX-M6316 caused chlorosis soon after treatment, but plants recovered. Flax in the plots where mallow was controlled late by biomal lodged from the dead mallow plants. Several mallow plants emerged in late August and appeared normal even at harvest in September. Thus, the fungus did not have a residual or the environment did not favor infection.

AC 263,499 in navy bean, Casselton, 1987. Preplant treatments (PPI) were applied and incorporated twice by field cultivator plus harrow into dry soil, 'C-20' navy beans were seeded, and preemergence treatments (PE) were applied on May 14 with 70 F, 40% relative humidity, clear sky, and a 15 mph wind. Postemergence treatments (P) were applied to monofoliolate navy bean and 3 inch tall wild mustard on June 11 with 80 F, 70% relative humidity, clear sky, and a 15 mph wind. Evaluation was on June 15, 4 days after postemergence treatments were applied, and on July 30. Weed densities were yellow foxtail at 20 plants/sq ft, wild mustard at 100 plants/sq ft, and kochia at 20 plants/sq ft. Harvest was on September 16 and many plots were not harvested because of excessive kochia. Further, yields were low because of poor emergence caused by flooding.

			6-15	9-16	6-15			7-30		
			Navy bean							
Treatment[a]	Type	Rate	Injury	Yield	Yeft	Wimu	KOCZ	Yeft	Wimu	KOCZ
		(oz/A)	(%)	(lb/A)	---------(% control)---------					
Trifluralin+Clam	PPI	1+2	13	-	98	56	97	98	21	79
Metolachlor+AC499	PPI	3+.032	0	-	99	98	97	99	99	42
Metolachlor+AC499	PPI	3+.047	1	795	99	97	98	99	97	61
Metolachlor+AC499	PPI	3+.063	1	673	99	98	98	99	99	74
Metolachlor+AC499	PPI	3+.094	1	653	99	99	99	99	99	92
Metolachlor/Bent	PPI/P	3/1	3	-	99	96	54	96	97	0
Metolachlor/AC499	PPI/P	3/.032	3	-	98	81	33	99	98	0
Metolachlor/AC499	PPI/P	3/.047	3	-	97	78	43	99	99	0
Metolachlot/AC499	PPI/P	3/.063	7	-	98	82	43	99	99	0
Metolachlor/AC499	PPI/P	3/.094	7	-	98	76	53	98	99	15
Metolachlor+AC499	PRE	3+.032	0	631	98	99	99	99	99	82
Metolachlor+AC499	PRE	3+.047	0	466	99	99	99	99	99	90
Metolachlor+AC499	PRE	3+.063	3	449	99	99	99	99	99	97
Metolachlor+AC499	PRE	3+.094	9	713	99	99	99	99	99	97
Metolachlor/Bent	PRE/P	3/1	3	-	97	96	61	82	99	0
Metolachlor/AC499	PRE/P	3/.032	3	-	98	54	41	98	96	16
Metolachlor/AC499	PRE/P	3/.047	3	-	98	71	46	97	99	3
Metolachlor/AC499	PRE/P	3/.063	8	-	97	71	46	99	98	23
Metolachlor/AC499	PRE/P	3/.094	8	-	99	74	49	99	99	10
AC499	P	.063	1	-	15	35	24	76	95	25
AC499+PO	P	.063+.25G	6	-	26	53	51	73	99	74
AC499+MS	P	.063+.25G	6	-	29	61	56	84	99	83
AC499+Seth+MS	P	.032+.063+.25G	3	-	18	39	44	74	97	70
AC499+Seth+MS	P	.063+.063+.25G	5	-	19	48	49	86	99	86
No treatment	-	0	0	-	0	0	0	0	0	0
C.V. %			109	23	5	10	16	6	10	34
LSD 5%			6	211	6	10	14	8	12	22

[a]Clam = Chloramben, AC499 = AC 263,499, Bent = Bentazon, MS = methylated sunflower oil with 15% emulsifier, Seth = Sethoxydim, G in the rate column represents gallons/A.

Summary

Foxtail control was nearly complete for all treatments containing metolachlor and AC 263,499 and the trifluralin plus chloramben treatment. Metolachlor with postemergence bentazon, or various postemergence AC 263,499 treatments gave between 70 and 86% foxtail control. The methylated sunflower oil adjuvant with postemergence AC 263,499 enhanced or tended to enhance the control of all weeds compared to AC 263,499 alone or with petroleum oil. Kochia control was the greatest with preemergence application of AC 263,499. However, the excessive rainfall soon after seeding may have favored the preemergence treatments. The only plots harvestable were those with PPI or PE AC 263,499.

Weed control in soybeans, Carrington, 1987. Preplant treatments (PPI) were applied, rototiller incorporated, and 'McCall' soybean seeded on June 5. Preemergence treatments were applied June 8. Sethoxydim treatments were applied to 1.5 trifloiolate soybeans (1.5TF) on June 29. Other postemergence treatments were applied to 2 trifoliolate soybeans (2TF) on July 2, except fomesafen, which was applied on July 6.

Treatment[a]	Type	Rate	Soybean injury	Grft	Colq	Rrpw
		(oz/A)	(%)	--(% control)---		
Trifluralin	PPI	16	1	82	48	89
Ethalfluralin	PPI	16	2	90	85	95
Pendimethalin	PPI	20	1	77	60	60
Clomazone	PPI	12	0	62	41	29
Vernolate	PPI	32	3	55	40	70
Trifluralin+Metribuzin	PPI	16+3	3	94	52	82
Clomazone&Trifluralin	PPI	12+9	2	86	23	56
Trifluralin/Acifluorfen	PPI/2TF	16/6	23	69	71	80
Trifluralin/Bentazon	PPI/2TF	16/12	2	33	45	62
Trifluralin/Lactofen	PPI/2TF	16/2.5	22	35	44	91
Trifluralin/Fomesafen	PPI/2TF	16/4	2	57	26	65
Alachlor	PE	40	2	85	30	80
Metolachlor	PE	40	4	79	14	78
Cinmethylin	PE	20	1	87	69	24
Chloramben	PE	40	1	70	56	83
Alachlor+Metribuzin	PE	40+3	3	87	57	92
Sethoxydim+PO/Bentazon	1.5TF	1.5+0.25G/12	4	95	50	57
Sethoxydim+PO/Acifluorfen	1.5TF	1.5+0.25G/6	19	95	90	87
Sethoxydim+PO/Bentazon+Acif	1.5TF	1.5+0.25G/10+4	20	94	91	87
No treatment	--	0	0	9	20	11
C.V. %			71	25	54	29
LSD 5%			6	26	39	28

[a]PO = petroleum oil with 17% emulsifier, Acif = Acifluorfen, G in the rate column represents gallon/A.

Summary

Ethalfluralin tended to give greater control of all weeds than trifluralin or pendimethalin. Sethoxydim applied postemergence and followed by acifluorfen or acifluorfen plus bentazon gave 87% or more control of all weed species. Lactofen tended to give the greatest redroot pigweed control compared to the other postemergence herbicides.

Preemergence weed control in soybean and dry bean, Casselton, 1987. Preplant (PPI) treatments were applied on May 14 and soil incorporated with a field cultivator plus harrow twice in opposite directions. 'McCall' soybean and 'C-20' navy bean were seeded. Preemergence (PE) treatments were applied on May 14. Rainfall was 1.4 inch within 2 days after seeding. Postemergence (P) treatments were to monofoliolate beans and 3 inch wild mustard on June 11 with 80 F and 70% relative humidity. Plots were 10 by 25 ft consisting of two 30-inch-spaced rows each of dry bean and soybean and treatment was to an 8 ft wide strip the length of the plots to one row of each crop. The experiment was a randomized complete block with four replications. Evaluations were on June 9 and and July 21 and weeds exceeded 10 plants/square yard.

		June 9						July 21	
		Dry bean							
Treatment[a]	Rate	injury	Yeft	Wimu	KOCZ	Colq	Wimu	KOCZ	Yeft
	(oz/A)	(%)	------(% control)-----					(% control)	
AC 263,499 (PPI)	1	3	94	99	98	99	99	86	90
Trifluralin (PPI)	16	0	97	4	94	96	8	90	98
Ethafluralin (PPI)	15	0	96	30	97	98	0	82	98
Pendimethalin (PPI)	20	0	95	19	90	96	0	61	96
Trif+Metribuzin (PPI)	16+3	8	99	94	97	99	86	18	87
Trif+Chloramben (PPI)	16+3	0	99	50	98	99	10	74	95
Trif+AC 263,499 (PPI)	16+1	0	99	99	99	99	99	96	97
Ethafluralin+Metr (PPI)	15+3	9	98	96	98	99	67	50	79
Alachlor (PPI)	48	0	94	61	40	83	20	0	80
Metolachlor (PPI)	48	0	98	53	18	79	18	0	95
Clomazone (PPI)	12	43	76	53	89	91	18	87	92
Clomazone (PPI)	16	48	82	69	94	93	35	88	84
Clomazone+Metr (PPI)	12+3	59	97	98	98	98	97	71	78
Clomazone+AC 263,499 (PPI)	8+1	10	95	99	99	99	99	86	89
Clomazone+Trif (PPI)	12+12	34	97	60	95	97	36	91	94
Clomazone&Trif (PPI)	9+12	18	92	30	95	95	10	91	98
Clomazone&Trif+Metr (PPI)	9+12+3	36	94	97	98	98	90	43	92
Chloramben-W (PE)	48	0	96	88	95	99	43	39	83
Alachlor (PE)	48	0	94	33	58	73	0	0	77
Metolachlor (PE)	48	0	97	13	21	46	0	5	93
Cinmethylin (PE)	20	0	90	21	61	58	0	5	72
Cinm (PE) + AC 263,499 (P)	20+1	0	86	28	29	28	89	15	96
Cimn (PE) + Bentazon (P)	20+12	0	87	23	46	36	84	8	80
Cinm (PE) + Acifluorfen (P)	20+6	0	94	20	29	30	95	0	87
C.V. %		97	6	18	19	21	40	40	12
LSD 5%		14	8	13	19	23	25	26	17

[a] Trif = Trifluralin, Metr = Metribuzin, & = formulated mixture, Cinm = Cinmethylin.

Summary

Soybeans were not injured by any of the treatments at either evaluation (data not presented). Dry beans were injured by clomazone treatments, but recovered by the July 21 evaluation. Soybean or dry bean stands were not reduced by any treatment. Trifluralin + AC 263,499 was the only treatment to control all weeds at 96% or more at the July 21 evaluation. AC 263,499 applied postemergence did not control kochia, but preplant incorporated AC 263,499 gave 85% or more kochia control at the July 30 evaluation. Metribuzin, AC 263,499, bentazon, and acifluorfen were the only treatments to give 80% or more wild mustard control.

Postemergence weed control in soybeans, Casselton, 1987. 'McCall' soybean was seeded on May 14. 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. Treatments were to first trifoliolate soybean (Stage 1), 3 to 4 leaf wild mustard and green and yellow foxtail, and 3 inch tall kochia on June 12 with 88 F and 65% relative humidity, except for Stage 2 treatments. Stage 2 treatments were applied to third trifoliolate soybean and 9 to 12 inch broadleaf weeds on June 18 with 90 F and 80% relative humidity. A 1.22 inch rain occurred 5 days after the June 12 treatments and a 0.42 inch rain occurred 2 days after the June 18 treatments. The experiment was a randomized complete block with four replications. Weed densities exceeded 5 plants/ square foot for each species. Evaluations were visual estimates on July 3 and 30.

			July 3				July 30		
			Soyb	Yeft+			Yeft+		
Treatment[a]	Stage	Rate	inju	Grft	KOCZ	Wimu	Grft	Wimu	KOCZ
		(oz/A)	(%)	-(%	control)-		-(%	control)-	
Bentazon+PO	1	12+1Qt	0	0	66	77	0	92	19
Bentazon+PO/Bentazon+PO	2	6+1Qt/6+1Qt	0	3	92	98	0	99	66
Bent+Acif+PO/Bent+Acif+PO	2	6+1+1Qt/6+1+1Qt	5	9	94	99	0	99	63
Acifluorfen+PO	1	2+1Qt	0	16	66	93	0	98	10
Acifluorfen+AG98	1	6+0.12%	0	4	58	96	0	98	16
Fomesafen+X-77	1	4+0.25%	3	9	50	97	0	99	11
Lactofen	1	3.2	3	8	78	87	0	96	30
Lactofen+X-77	1	3.2+0.25%	0	5	86	91	0	96	25
Lactofen+PO	1	3.2+1Qt	3	16	85	96	0	99	25
Lactofen+28% Nitrogen	1	3.2+4Qt	0	0	83	91	0	99	38
Lactofen+MS	1	3.2+1Qt	0	4	78	90	0	99	39
Benazolin+PO	1	6+1Qt	0	0	69	71	0	76	81
Benazolin+Variquat	1	6+0.5%	0	0	75	58	0	69	81
Benazolin+Lactofen+AG98	1	6+1.6+0.125%	18	4	82	92	0	80	64
Benazolin+Acifluorfen+AG98	1	4+4+0.12%	4	25	83	99	9	98	48
Benazolin+Acifluorfen+AG98	1	6+4+0.12%	14	11	84	98	9	99	57
AC 263,499	1	1	0	78	81	95	77	96	46
AC 263,499+MS	1	1+1Qt	1	83	96	95	77	99	83
AC 263,499+Benazolin+MS	1	1+4+1Qt	1	64	91	85	83	89	89
DPX-M6316+X-77	1	0.12+0.25%	3	8	91	93	0	88	69
DPX-M6316+Benazolin+X-77	1	0.12+6+0.25%	0	4	94	74	8	90	88
C.V. %			119	49	11	5	55	4	25
LSD 5%			5	11	12	7	9	4	17

[a] PO = petroleum oil with 17% emulsifier, Bent = Bentazon, Acif = Acifluorfen, AG98 and X-77 = nonionic surfactant, 28% Nitrogen = 28% nitrogen liquid fertilizer, MS = methylated sunflower oil with 15% emulsifier, Qt in the rate column represents quarts/A, Inju = Injury.

Summary

All treatments except benazolin alone or with lactofen gave 88% or more wild mustard control at the late evaluation. Kochia control at the late evaluation only exceeded 80% for benazolin alone or in combination with DPX-M6316 or AC 263,499, and AC 263,499 applied with methylated sunflower oil. Acifluorfen and lactofen appeared to antagonize kochia control with benazolin at the second evaluation date. Methylated seed oil adjuvant increased kochia control with AC 263,499 at both evaluation dates. The split application of bentazon or bentazon+acifluorfen gave greater kochia control than bentazon applied once at the same total rate. AC 263,499 was the only herbicide to give greater than 60% foxtail control at both evaluation dates.

Acifluorfen in soybean, Casselton, 1987. 'McCall' soybean was seeded on May 14. Treatments were applied to first trifoliolate soybeans, 2 to 5 leaf foxtail, 3 inch wild mustard, 2 inch kochia, and 1.5 inch common lambsquarters on June 11 with 80 F, 70% relative humidity, and a 15 mph wind. Evaluation was on July 3 and 30.

		July 3				July 30		
Treatment	Rate	Soybean injury	Yeft+ Grft	KOCZ	Wimu	Wimu	KOCZ	Yeft+ Grft
	(oz/A)	(%)	----------(% control)----------					
Acifluorfen-RP	4	1	3	23	87	99	0	0
Acifluorfen-RP	6	1	11	31	88	98	3	0
Acifluorfen-RP	8	0	5	35	93	99	3	0
Acifluorfen-RP+28N	4+1G	0	0	36	95	98	5	0
Acifluorfen-RP+28N	6+1G	0	9	32	91	99	3	0
Acifluorfen-RP+28N	8+1G	1	0	46	99	99	9	0
28N	1G	0	0	0	0	21	0	0
Acifluorfen-RP+10-34-0	4+1G	0	13	36	95	98	3	0
Acifluorfen-RP+10-34-0	6+1G	3	5	41	99	99	3	0
Acifluorfen-RP+10-34-0	8+1G	0	3	66	98	99	5	14
10-34-0	1G	0	0	0	0	0	0	0
Acif-RP+Fluazifop+PO	6+3+.25G	1	45	79	99	99	10	19
Acif-RP+DPX-Y6202-38+PO	6+1+.25G	4	68	75	99	99	5	19
Acif-RP+Sethoxydim+PO	6+3+.25G	6	81	75	99	99	0	78
Acif-RP+Fenoxaprop+PO	2+2.5+.25G	6	48	84	93	99	23	10
Acif-RP+Fenoxaprop+PO	6+2.5+.25G	4	33	84	99	99	28	5
Fenoxaprop+PO	1.5+.25G	0	94	0	0	0	0	89
Fenoxaprop+PO	2+.25G	0	95	0	0	0	0	94
No treatment	0	0	0	0	0	0	0	0
C.V. %		124	40	35	3	13	192	53
LSD 5%		2	15	20	3	14	14	13

RP = Rhone Poulenc, 28N = 28% liquid nitrogen fertilizer, 10-34-0 = liquid nitrogen phosphorous fertilizer, Acif = Acifluorfen, PO = petroleum oil with 17% emulsifier, G in the rate column represents gallon/A.

Summary

All treatments with acifluorfen gave excellent wild mustard control at the second evaluation. However, the early evaluation indicated a more rapid control when acifluorfen was applied with fertilizer or an oil adjuvant. None of the treatments gave adequate foxtail control except when fenoxaprop was applied without acifluorfen. None of the treatments gave adequate kochia control at the second evaluation. 10-34-0 only tended to enhance kochia control with acifluorfen at the early evaluation. However, the adjuvants and grass control herbicides, when applied with aciflourfen, enhanced kochia control at the early evaluation. None of the treatments caused important injury to soybean.

Total postemergence weed control in soybeans, Casselton, 1987. 'McCall' soybeans and 'C-20' navy beans were seeded on May 14. All treatments were applied to first trifoliolate soybeans , 3 to 4 leaf wild mustard and foxtail, and to 3 inch kochia on June 12 with 88 F, 65% relative humidity, clear sky, and a 10 mph wind. The second, split (after /), treatments were applied to second trifoliolate soybeans and 12 inch to flowering wild mustard on June 18 with 90 F, 80% relative humidity, and a clear sky. The third, split (after //), treatments were applied to third trifoliolate soybeans on June 23. Evaluation was on July 2 and 21.

		July 2					July 21		
		Navy bean	Soy-bean			Yeft +			Yeft +
		Injury							
Treatment[a]	Rate			Kocz	Wimu	Grft	Wimu	Kocz	Grft
	(oz/A)	---(%)---		--------(% control)----------					
Bent+Acif/Bent+Seth+PO	8+2/8+2.4	1	0	91	99	95	99	49	80
Bent+Acif/Bent+Seth+PO+28N	8+2/8+2.4	4	1	89	99	94	98	44	95
Bent+Acif/Bent+Seth+BCH-815	8+2/8+2.4	3	1	86	99	96	99	45	97
Bent+Acif/Bent+Seth+BCH-815+28N	8+2/8+2.4	8	1	80	97	96	99	59	98
Bent+Acif/Bent//Seth+BCH-815	8+2/8//2.4	1	1	81	99	57	99	26	89
Bent+Acif/Seth+BCH-815	16+2/2.4	0	0	60	82	98	92	19	97
Bent+Seth+BCH-815	16+2.4	0	0	63	74	55	85	25	30
Bent+Seth+BCH-815+28N	16+2.4	0	0	61	86	73	93	20	59
Bent+Seth+PO	16+2.4	1	0	78	89	15	95	35	18
Bent+Seth+PO+28N	16+2.4	0	0	59	82	69	95	15	50
Bent+Seth+MS	16+2.4	0	0	54	76	52	93	16	28
Bent+Seth+MS+28N	16+2.4	0	0	55	62	77	83	16	60
Bent+PO/Seth+PO	16/2.4	1	0	80	94	97	97	24	99
Bent+Acif+Seth+BCH-815	16+2+2.4	3	1	78	95	61	96	43	50
Bent+Acif+Seth+BCH-815+28N	16+2+2.4	3	1	79	94	73	96	25	38
Bent+Acif/Seth+PO	16+2/2.4	0	0	29	76	96	99	8	99
Bent+Acif+Seth+PO	16+2+2.4	4	0	83	93	47	96	29	38
Bent+Acif+Seth+PO+28N	16+2+2.4	1	0	78	86	78	93	25	38
No treatment	0	0	0	0	0	0	0	0	0
C.V. %		185	348	18	13	17	7	46	31
LSD 5%		4	NS	17	15	20	9	18	27
# OF REPS		4	4	4	4	3	4	4	4

[a] Bent = Bentazon, Acif = Acifluorfen, Seth = sethoxydim, PO = petroleum oil with 17% emulsifier applied at 0.25 gallon/A v/v, 28N = 28% nitrogen liquid fertilizer applied at 1 gallon/A v/v, BCH-815 = adjuvant from BASF applied at 0.25 gallon/A v/v, MS = methylated sunflower oil with 15% emulsifier applied at 0.25 gallon/A v/v.

Summary

None of the treatments caused any important injury to soybean or navy bean. Common lambsquarters was present at the second evaluation, but none of the treatments gave any visible control. The common lambsquarters may have emerged after the treatments were applied, as the plants were not evident during the first evaluation. Wild mustard control exceeded 90% on July 21 for all treatments, except for the tank mixture of bentazon at 16 oz/A plus sethoxydim at 2.4 oz/A plus 28% nitrogen at 1 gallon/A with either BCH-815 or methylated sunflower oil. None of the treatments gave adequate kochia control, but the bentazon plus acifluorfen split application gave greater or tended to give greater control than the single application, except the split application that did not contain sethoxydim and adjuvant. The presence of the oil adjuvant in a treatment, but not the 28% nitrogen, tended to enhance kochia control at the July 2 evaluation. However, foxtail control was generally enhanced by 28% nitrogen, regardless of the oil adjuvant with sethoxydim.

Bentazon with additives in soybeans, Casselton, 1987. 'McCall' soybean was seeded on May 14. The first postemergence treatments were applied to first trifoliolate soybeans (1TF) and 3 to 4 leaf wild mustard on June 12 with 88 F, 65% relative humidity, and a 10 mph wind. The second postemergence treatments were applied to second trifoliolate soybeans (2TF) and 12 inch to flowering wild mustard on June 18 with 90 F, 80% relative humidity, clear sky, and no wind. Wild mustard density was 25 plants/square ft. Evaluation was on June 19, only one day after the application of the second postemergence treatments. However, the first treatment controlled wild mustard, which, along with foxtail, was the major weed species. A second evaluation was on July 30, but only common lambsquarters was evaluated.

Treatment[a]	Stage	Rate	June 19 Soybean injury	June 19 Wimu	July 30 Colq
		(oz/A)	(%)	(%control)	
Bentazon	1TF	12	2	97	67
Bentazon+PO	1TF	12+0.25G	5	98	88
Bentazon+MSW	1TF	12+0.25G	11	98	81
Bentazon+NDR	1TF	12+0.25G	9	96	79
Bentazon+BCH-815	1TF	12+0.25G	7	96	78
Bentazon+X-77	1TF	12+0.25%	3	98	91
Bentazon+28N	1TF	12+1G	3	98	82
Bentazon+PO+28N	1TF	12+0.25G+0.33G	6	99	84
Bentazon+MSW+28N	1TF	12+0.25G+0.33G	10	97	73
Bentazon+BCH-815+28N	1TF	12+0.25G+0.33G	10	98	80
Bentazon/Bentazon	1TF/2TF	6/6	4	96	46
Bent+PO/Bent+PO	1TF/2TF	6+0.12G/6+0.12G	4	94	77
Bent+PO+28N/Bent+PO+28N	1TF/2TF	6+0.12G+0.5G/6+0.12G+0.5G	5	96	81
Bent+28N/Bent+28N	1TF/2TF	6+0.5G/6+0.5G	2	95	47
No treatment	-	0	0	0	0
C.V. %			33	3	17
LSD 5%			2	3	17

[a] PO = petroleum oil with 17% emulsifier, MSW = methylated sunflower oil with Witco emulsifier, NDR = modified linseed oil, BCH-815 = adjuvant by BASF, X-77 = nonionic surfactant, 28N = 28% liquid nitrogen fertilizer, Bent = Bentazon.

Summary

Wild mustard control exceeded 94%, regardless of bentazon rate or adjuvant included in the treatment. Common lambsquarters control tended to be enhanced by additives, with the greatest enhancement from X-77 and petroleum oil. The split application of bentazon at 6+6 oz/A alone or with 28% N gave less common lambsquarters control than 12 oz/A as one application alone or with 28% N. However, when petroleum oil was included with 28% N the split application equalled the comparable single treatment.

Weed control in corn, Carrington, 1987. An experiment was conducted to evaluate broad-spectrum weed control in corn with various herbicide treatments. Preplant incorporated (PPI) treatments were applied and roto-tiller incorporated, and 'Pioneer 3953' corn was seeded on June 5. Preemergence (PE) treatments were applied June 8. Postemergence (P) treatments were applied to 4 leaf corn, 3 leaf green foxtail, and 1.5 inch broadleaf weeds on June 29 with 65 F and 70% relative humidity. Each plot consisted of three rows of corn spaced 30 inches apart and 25 ft long. 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. The experimental design was a randomized complete block with four replications. Corn injury and weed control were evaluated on July 10.

Treatment	Rate	Corn injury	Grft	Rrpw	Colq
	(oz/A)	(%)	----(% control)---		
EPTC&S&E (PPI)	64	0	98	95	99
EPTC&S+cyanazine (PPI)	64+32	3	94	86	92
EPTC&S+atrazine (PPI)	64+16	0	96	94	97
EPTC&S+cyanazine+atrazine (PPI)	64+24+8	3	97	99	99
Butylate&S+atrazine (PPI)	64+16	0	94	93	92
Butylate&S+cyanazine (PPI)	64+32	0	95	96	99
Butylate&S+cyanazine+atrazine (PPI)	64+24+8	0	95	98	95
Propachlor+cyanazine (PE)	64+32	1	94	96	97
Pendimethalin+cyanazine (PE)	24+32	0	89	92	96
BAS-51400+cyanazine (PE)	16+32	11	93	96	96
Propachlor+PPG 1259 (PE)	64+2.4	1	69	53	56
Alachlor+cyanazine (PE)	40+24	0	88	95	88
Metolachlor+cyanazine (PE)	40+24	0	84	94	62
Pendimethalin+atrazine (PE)	16+16	4	18	35	34
Propachlor (PE)+DPX-M6316+X-77 (P)	48+0.25+0.25%	5	80	99	98
Propachlor (PE)+PPG 1259 (P)	64+2.4	43	49	55	60
BAS-51400+cyanazine+MS (P)	16+19.2+0.25G	71	93	95	99
Pyridate+cyanazine (P)	14.4+16	13	75	99	97
Pyridate+cyanazine (P)	14.4+24	33	76	99	99
Pyridate&atrazine (P)	7+9	6	53	97	94
Cyanazine+DPX-M6316+SO (P)	24+0.25+0.25G	24	76	99	99
Dicamba (P)	4	11	30	86	81
2,4-D (P)	8	1	23	82	97
Bromoxynil (P)	6	0	33	98	99
Clopyralid (P)	2	0	11	33	40
Atrazine&bentazon (P)	8+8	5	49	96	99
C.V. %		115	20	19	20
LSD 5%		14	19	23	24

S = dietholate safener; E = dichlormid extender; MS = methylated seed oil with 15% emulsifier; SO = soybean oil with 15% emulsifier;

Summary

All postemergence treatments containing BAS-51400, cyanazine, PPG 1259, or dicamba caused greater than 10% injury to corn. BAS-51400 + cyanazine + methylated seed oil postemergence caused 71% injury to corn, while PPG 1259 postemergence following propachlor preemergence caused 43% injury to corn. DPX-M6316 postemergence after propachlor preemergence did not injure corn and controlled redroot pigweed and common lambsquarters. However, DPX-M6316 + cyanazine + soybean oil caused 24% injury to corn. Treatments including EPTC, butylate, or BAS-51400 provided 93% or greater green foxtail control. All treatments except propachlor + PPG 1259, metolachlor + cyanazine, pendimethalin + atrazine, and clopyralid gave more than 80% control of both common lambsquarters and redroot pigweed.

Preemergence weed control in corn, Casselton, 1987. An experiment was conducted to evaluate broad-spectrum weed control in corn with various soil applied herbicides. Preplant (PPI) treatments were applied and field cultivator plus harrow incorporated twice in the opposite direction to a depth of 3 inches on May 14. 'Pioneer 3952' corn was seeded and preemergence (PE) treatments applied May 14 with sunny skies, 70 F, and 40% relative humidity. Postemergence (P) treatments were applied to 3 leaf corn, 2 to 3 leaf yellow foxtail, and 2 to 4 leaf wild mustard and common lambsquarters on June 5 with clear skies, 80 F, and 35% relative humidity. Each plot consisted of four rows of corn spaced 30 inches apart and 25 ft long. 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 the middle two rows of the four row plots. The experimental design was a randomized complete block with four replications. Yellow foxtail densities averaged 500 plants/square yard and wild mustard and common lambsquarters densities averaged 250 plants/square yard. Corn injury (inju), stand reduction (strd), and weed control were evaluated on June 9 and July 3.

		June 9					July 3		
		Corn					Corn		
Treatment	Rate	Strd	Inju	Yeft	Wimu	Colq	Inju	Yeft	Wimu
	(oz/A)	---(%)---		-(% control)--			(%)	(% control)	
EPTC&S+cyan(PPI)	64+32	0	0	98	99	99	0	98	98
EPTC&S+cyan+PPG 1259(PPI	64+24+2.5	84	45	95	99	99	84	95	99
EPTC&S+PPG 1259(PPI)	64+2.5	90	60	97	99	99	88	96	98
Alachlor+cyan(PPI)	40+24	0	0	89	98	99	0	83	96
Metolachlor+cyan(PPI)	40+24	0	0	96	93	96	0	90	83
Propachlor+cyan(PE)	64+32	0	0	92	97	98	0	80	95
CGA-180937+cyan(PE)	32+32	0	0	96	90	98	0	86	78
CGA-180937+cyan(PE)	64+32	0	0	98	96	99	0	96	93
BAS-51400+cyan(PE)	16+32	1	12	97	95	99	4	96	91
Propachlor+PPG 1259(PE)	64+2.5	43	30	93	99	99	40	88	96
Prcl(PE)+PPG 1259(P)	64+2.4	0	8	96	92	95	10	96	99
Alachlor+cyan(PE)	40+24	0	0	95	96	99	0	90	95
Metolachlor+cyan(PE)	40+24	0	0	97	86	95	0	90	74
Prcl(PE)+DPX-M6+X-77(P)	64+0.25+0.25%	0	13	96	92	86	33	76	99
Prcl(PE)+DPX-M6+X-77(P)	64+0.37+0.25%	0	13	97	95	95	40	81	99
Prcl(PE)+bena+atra+PO(P)	64+4+8+0.12G	0	1	94	83	92	0	83	80
Prcl(PE)+bena+atra+PO(P)	64+4+8+0.25G	0	3	95	83	97	6	85	84
C.V. %		55	47	3	3	4	45	7	8
LSD 5%		9	7	4	4	5	10	8	9

Summary

Preplant incorporated PPG 1259 caused 84% or greater stand reduction and 45% or greater injury to corn at both evaluation dates. PPG 1259 applied preemergence was not as injurious to corn as when applied preplant incorporated, but still caused 30% or more corn stand reduction and injury. Treatments including DPX-M6316 caused chlorosis and stunting which was more evident with the late than early evaluation. All treatments gave 89% or greater yellow foxtail control at the first evaluation. Yellow foxtail control tended to be less at the second evaluation than the first evaluation for cyanazine + propachlor or CGA-180937, and all treatments applied postemergence following propachlor preemergence, except PPG 1259. All treatments provided 83% or greater broadleaf weed control at the first evaluation date and 74% or greater control at the second evaluation date. EPTC&dietholate + cyanazine tended to provide the best weed control with the least injury to corn.

Postemergence weed control in corn, Casselton, 1987. An experiment was conducted to evaluate various postemergence herbicide treatments for broad-spectrum weed control in 'Pioneer 3952' corn seeded May 14, 1987. Treatments were applied to 3 leaf corn, 2 to 3 leaf yellow foxtail, 2 to 4 leaf wild mustard, and 2 to 4 leaf common lambsquarters on June 5 with clear skies, 80 F, and 35% relative humidity. Moisture and temperature were favorable for plant growth. Each plot consisted of four rows of corn spaced 30 inches apart and 25 ft long. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to the middle two rows of the four row plots. The experiment was a randomized complete block with four replications. Wild mustard and yellow foxtail densities exceeded 250 plants/square yard, and common lambsquarters populations were light and variable. Crop injury (inju) and weed control were evaluated June 16 and July 3.

		June 16				July 3		
Treatment	Rate	Corn inju	Yeft	Wimu	Colq	Corn inju	Yeft	Wimu
	(oz/A)	(%)	--(% control)-			(%)	(% control)	
BAS-51400+cyanazine+MS	16+19.2+0.25G	48	99	99	99	40	98	99
Pyridate+cyanazine	14.4+16	0	97	99	99	0	93	99
Pyridate+cyanazine	14.4+24	4	98	99	99	0	97	99
Pyridate&atrazine	7+9	0	68	99	99	0	65	99
Atrazine&PPG 1259	8.3+1.7	1	56	99	99	0	45	99
PPG 1259+dicamba	1.6+4	6	30	99	99	0	29	99
PPG 1259+2,4-D	1.6+4	6	23	99	99	0	46	99
Cyanazine&atrazine+SO	24+8+0.25G	11	98	99	99	0	98	99
Cyanazine+SO	32+0.25G	12	98	99	99	0	98	99
Cyanazine+DPX-M6316+SO	24+0.25+0.25G	12	98	99	99	0	95	99
SC-0051+atrazine+SO	16+8+0.25G	11	98	99	99	0	95	99
SC-0051+SO	16+0.25G	9	97	99	99	0	88	99
DPX-M6316+dicamba+X-77	0.25+4+0.25%	7	39	99	99	11	29	99
DPX-M6316+MS	0.25+0.25G	6	56	99	99	6	25	99
Dicamba	4	0	1	97	97	4	20	99
2,4-D	8	0	0	99	99	0	15	99
Bromoxynil	6	5	3	99	99	0	1	99
Clopyralid+PO	2+0.25G	4	0	4	65	0	0	0
Clopyralid+atrazine+PO	2+4 +0.25G	3	36	99	99	0	25	99
Clopyralid+atrazine+PO	2+8+0.25G	1	66	99	99	0	64	99
Clpy+atra+tridiphane+PO	2+4+2+0.25G	1	70	98	99	0	55	99
Bentazon+atrazine+PO	8+8+0.25G	0	50	99	99	0	43	99
C.V. %		64	14	2	1	179	21	1
LSD 5%		6	11	2	1	7	16	1

PO = petroleum oil with 17% emulsifier; SO = soybean oil with 15% emulsifier; MS = methylated seed oil with 15% emulsifier; X-77 = nonionic surfactant; & = formulated mixture; G in the rate column represents gallons/acre.

Summary

BAS-51400 + cyanazine caused 40% or greater injury to corn at both evaluation dates. Several herbicide treatments caused slight injury to corn which was evident on June 16, but not on July 3. Injury to corn from DPX-M6316 + dicamba was more evident with the late than the early evaluation. Treatments including cyanazine, BAS-51400, pyridate + cyanazine, or SC-0051 provided 88% or greater yellow foxtail control at both evaluation dates. All treatments except clopyralid + petroleum oil provided excellent wild mustard and common lambsquarters control.

Additives with cyanazine and BAS-51400 in corn, Casselton, 1987. An experiment was conducted to evaluate various additives with cyanazine and BAS-51400 in 'Pioneer 3952' corn seeded May 14. Treatments were applied to 3 leaf corn, 2 to 3 leaf yellow foxtail, 2 to 4 leaf wild mustard, and 2 to 4 leaf common lambsquarters on June 5 with clear skies, 80 F, and 35% relative humidity. Each plot consisted of four rows of corn spaced 30 inches apart and 25 ft long. All treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to the center two rows of the four row plots. The experimental design was a randomized complete block with four replications. Wild mustard and yellow foxtail densities exceeded 250 plants/square yard, and common lambsquarters and kochia densities were light and variable. Corn injury and weed control were evaluated on June 16.

Treatment	Rate	Corn injury	Yeft	Wimu	Colq	KOCZ
	(oz/A)	(%)	----------(% control)----------			
Cyanazine	32	1	48	99	21	9
Cyanazine+SO	16+0.25G	13	77	99	99	99
Cyanazine+MS	16+0.25G	10	67	99	99	99
Cyanazine+FFA	16+0.25G	12	68	99	99	99
BAS-51400	4	6	71	15	0	0
BAS-51400	8	15	81	28	16	26
BAS-51400+BAS-090	4+0.25G	73	97	59	86	87
BAS-51400+MS	4+0.25G	74	97	56	80	83
BAS-51400+FFA	4+0.25G	43	96	48	69	69
C.V. %		24	12	9	14	16
LSD 5%		8	12	9	12	14

SO = soybean oil with 15% emulsifier; MS = methylated seed oil with 15% emulsifier; FFA = free fatty acids of linseed soil with 15% emulsifier; BAS-090 = an adjuvant from BASF; G in the rate column represents gallons/acre.

Summary

All additives increased cyanazine and BAS-51400 injury to corn and weed control. Cyanazine at 32 oz/A did not injure corn, but provided less control of yellow foxtail, common lambsquarters, and kochia than cyanazine at 16 oz/A applied with the various additives. Yellow foxtail control with cyanazine tended to be enhanced more by soybean oil than methylated seed oil or the free fatty acids of linseed oil. Weed control and injury to corn were greater with BAS-51400 at 4 oz/A + additives than BAS-51400 at 8 oz/A without additives. Corn injury was 43% or greater when BAS-51400 was applied with the various additives. BAS-51400 + additives provided 96% or greater yellow foxtail control. BAS-090 and methylated seed oil enhanced broadleaf weed control with BAS-51400 more than the free fatty acids of linseed oil.

Postemergence wild oat control in corn, Fargo, 1987. Pioneer 3953 seed corn was planted 1.5 inches deep on April 29. Row spacing was 30 inches and seeding rate was 40,000 seeds per acre. Treatments were applied May 30 when corn was 2 to 4-leaf, wild oats were 1-leaf to tillering (mostly 3-leaf to tillering), and wild mustard was cotyledon to 2-leaf. Relative humidity was 45% and air temperature was 84 F The soil was dry on the surface but very moist underneath. Herbicide applications were made with a bicycle wheel sprayer delivering 17 gpa with 8002 nozzle tips and 40 psi. Estimates of percent corn injury and weed control were taken on June 15. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment	Rate	Corn inj	Weed control Wioa	Wimu
	(lb/A)	------(%)-----		
Cyanazine+X-77	1.5+0.5%	3	38	100
Atrazine+Cyanazine+X-77	0.125+1.375+0.5%	2	44	100
Atrazine+Cyanazine+X-77	0.375+1.125+0.5%	2	53	100
Atrazine+Cyanazine+X-77	0.75+0.75+0.5%	2	41	100
Tridiphane+Cyanazine+X-77	0.5+1.5+0.5%	3	45	100
Tridiphane+Atrazine+Cyanazine+X-77	0.5+0.125+1.375+0.5%	3	60	100
Tridiphane+Atrazine+Cyanazine+X-77	0.5+0.25+1.25+0.5%	2	63	100
Tridiphane+Atrazine+Cyanazine+X-77	0.5+0.375+1.125+0.5%	3	63	100
Tridiphane+Atrazine+Cyanazine+X-77	0.5+0.5+1+0.5%	2	70	100
Tridiphane+Atrazine+Cyanazine+X-77	0.5+0.75+0.75+0.5%	3	71	100
Tridiphane+Cyanazine+X-77	0.75+1.5+0.5%	3	64	100
Tridiphane+Atrazine+Cyanazine+X-77	0.75+0.125+1.375+0.5%	3	69	100
Tridiphane+Atrazine+Cyanazine+X-77	0.75+0.25+1.25+0.5%	3	69	100
Tridiphane+Atrazine+Cyanazine+X-77	0.75+0.375+1.125+0.5%	3	73	100
Tridiphane+Atrazine+Cyanazine+X-77	0.75+0.5+1+0.5%	4	72	100
Tridiphane+Atrazine+Cyanazine+X-77	0.75+0.75+0.75+0.5%	2	81	100
Control	0	0	0	0
C.V. %		36	18	0
LSD 5%		1	15	NS
# of reps		4	4	4

Summary. None of the treatments caused corn injury exceeding 3 to 4%. With or without tridiphane, there was a trend for greater wild oat control as the rate of atrazine increased. There was also a trend for increased wild oat control as tridiphane rate was increased from 0 to 0.5 to 0.75 lb/A. Highest level of wild oat control (81%) was achieved with atrazine at 0.75 and cyanazine at 0.75 lb/A in combination with tridiphane at 0.75 lb/A. The generally low control ratings in this experiment are attributed (at least in part) to the advanced stage of wild oats at time of spraying.

Weed control in grain sorghum, Carrington, 1987. An experiment was conducted to evaluate broadspectrum weed control in grain sorghum with soil applied and postemergence herbicide treatments. Preplant incorporated treatments (PPI) were applied and roto-tiller incorporated prior to seeding of 'DK 18' grain sorghum on June 9. Preemergence treatments (PE) were applied June 10. Postemergence treatments (P) were applied to seedling sorghum and weeds on July 2 with 65 F and 75% relative humidity. All treatments were applied with a bicycle wheel type plot sprayer delivering 17.0 gpa at 35 psi for preemergence treatments and 8.5 gpa at 35 psi for postemergence treatments. The experiment was a randomized complete block design with 4 replications. Sorghum injury and weed control were evaluated August 7 and harvest was on October 20.

Treatment[a]	Type	Rate	Grft	Rrpw	Colq	Grain sorghum Test weight	Grain sorghum Yield
		(lb/A)	--(% control)-			(lb)	(bu/A)
BAS-51400	PE	1	80	78	78	43.5	41.3
BAS-51400+PO	P	0.5+0.25G	82	64	40	45.5	39.3
Cyanazine+Atrazine	PPI	1.5+0.75	69	55	90	48.3	46.6
Alachlor+Cyanazine	PPI	2+1.5	71	81	90	47.5	54.8
Alachlor+Cyanazine	PE	2+1.5	88	93	85	48.0	54.3
Propachlor+Cyanazine	PPI	3+1.5	68	53	90	48.0	47.1
Propachlor+Cyanazine	PE	3+1.5	78	68	79	47.3	49.5
RE-40885	PE	1	35	83	90	46.8	38.4
Alachlor+Atrazine	PPI	2+0.75	76	83	85	48.8	65.0
Atrazine+Dicamba+2,4-D	P	0.75+0.25+0.4	0	99	99	41.8	24.5
No treatment	-	0	0	0	0	46.0	35.8
C.V. %			14	11	16	3.5	12.6
LSD 5%			12	11	18	2.3	8.2

[a]PO = petroleum oil, G in the rate column represents gallon/A.

Summary

BAS-51400 plus petroleum oil postemergence caused slight sorghum injury and atrazine plus dicamba and 2,4-D caused severe injury (injury not presented in table). BAS-51400 provided 80% green foxtail control preemergence and postemergence. Alachlor plus cyanazine provided better green foxtail and redroot pigweed control preemergence than preplant incorporated. Atrazine plus 2,4-D and dicamba gave complete control of redroot pigweed and common lambsquarters. RE-40885 gave 83% redroot pigweed control and 90% common lambsquarters control, but only 35% green foxtail control. BAS-51400 at 1 lb/A preemergence provided better redroot pigweed and common lambsquarters control than BAS-51400 at 0.5 lb/A postemergence. Grain sorghum yield generally related to weed control and crop injury. Alachlor with atrazine or cyanazine gave the highest yields, while atrazine plus 2,4-D and dicamba reduced yields compared to the untreated plots.

Postemergence weed control in safflower, Williston, 1987. 'S-541' safflower was seeded on May 12, 1987 to a field which was fallow in 1986 and given 50 lb/A nitrogen fertilizer. Treatments were applied to 4- to 6- leaf safflower, 3-leaf green foxtail, and 2 to 3 inch tall tame yellow mustard and Russian thistle on June 8 with 74 F, 30% relative humidity, clear sky, and 4 mph wind. The second treatments (after/) were applied on June 11 with 65 F, 50% relative humidity, clear sky, and 5 mph wind. Weed control and safflower response were determined on July 23 and harvest was 80 square feet on September 10. Percent oil in safflower seed was determined by NMR analysis.

Treatment[a]	Rate	Tymu	Ruth	Grft	Safflower Inju	Safflower Yield	Safflower Tswt	Safflower Oil
	(oz/A)	-(%	control)-		(%)	(lb/A)	(lb)	(%)
DPX-M6316+S	0.125+0.25%	91	97	5	11	470	37.1	46.9
DPX-M6316+S	0.167+0.25%	89	96	6	7	479	37.4	46.9
DPX-M6316+S	0.25+0.25%	94	97	44	9	549	37.4	47.8
DPX-M6316+PO	0.167+0.125G	96	98	0	5	487	37.0	45.5
Fluazifop-P+PO	3+0.125G	0	0	91	3	201	34.6	46.4
Flua-P+DPX-M6+PO	3+0.125+0.125G	90	97	90	6	836	38.6	48.1
Flua-P+DPX-M6+PO	3+0.167+0.125G	89	98	86	8	845	38.1	48.0
Flua-P+DPX-M6+PO	3+0.25+0.125G	90	96	85	11	905	38.0	48.2
Flua-P+DPX-M6+S	3+0.25+0.25%	87	96	87	23	827	37.8	47.3
AC 222,293	6	99	41	0	0	388	35.7	47.0
AC 222,293+S	6+0.125%	96	63	0	0	534	35.9	47.7
AC293+DPX-M6+S	6+0.167+0.125%	98	97	0	13	428	36.3	45.0
AC293+DPX-M6+S	6+0.25+0.125%	98	98	0	3	564	37.4	47.0
DPX-M6+S/AC293+S	0.25+0.25%/6+0.12%	98	99	0	4	536	37.3	46.8
DPX-M6+S/Flua-P+PO	0.125+0.25%/3+0.12G	89	96	66	8	709	38.2	46.8
DPX-M6+S/Flua-P+PO	0.167+0.25%/3+0.12G	89	97	63	11	705	38.0	45.8
DPX-M6+S/Flua-P+PO	0.25+0.25%/3+0.12G	92	97	72	8	673	37.9	45.0
Flua-P+PO/DPX-M6+S	3+0.125G/0.125+0.25%	84	96	95	11	815	37.7	47.1
Flua-P+PO/DPX-M6+S	3+0.125G/0.167+0.25%	88	95	93	12	845	37.6	46.2
Flua-P+PO/DPX-M6+S	3+0.125G/0.25+0.25%	81	97	93	19	828	37.8	46.9
Sethoxydim+PO+DPX-M6	3+0.25G+0.25	88	97	97	4	960	38.0	47.3
DPX-Y6202-38+DPX-M6+S	0.8+0.25+0.25%	92	98	68	6	923	37.8	47.7
Diclofop+DPX-M6+PO	12+0.167+0.125G	90	98	21	11	562	36.9	47.6
No treatment	0	0	0	0	0	85	34.0	46.9
C.V. %		7	5	40	82	17	1.8	2.0
LSD 5%		8	6	27	9	150	1.0	1.6
# OF REPS		4	4	4	4	4	4	3

[a]S = X-77 nonionic surfactant, PO = petroleum oil with 17% Atplus emulsifier, Flua-P = Fluazifop-P, DPX-M6 = DPX-M6316, AC293 = AC 222,293, G in the rate column represents gallon/A, Inju = injury, Tswt = test weight.

Summary

Safflower yields generally related to the degree of weed control. Both grass and broadleaf weed control were required to maximize yields. Russian thistle control exceeded 93% with all treatments containing DPX-M6316. AC 222,293 at 6 oz/A alone or with DPX-M6316 gave more than 95% tame yellow mustard control, regardless of adjuvants. Green foxtail control with fluazifop-P only tended to be reduced by DPX-M6316 in the spray treatment. However, green foxtail control was lower with fluazifop-P as a second treatment following DPX-M6316, which may be due to the larger foxtail or different environment at the second treatment date.

Various herbicides for weed control in safflower, Williston, 1987. Preplant treatments (PPI) were applied to a dry soil surface and incorporated twice with a field cultivator having 9 inch shovels, 'S-541' safflower was seeded, and preemergence treatments (PE) were applied on May 12 with 62 F, 57% relative humidity, and 4 mph wind. Postemergence treatments (P) were applied to 4- to 6- leaf safflower, 3-leaf Russian thistle, and 2 to 3 inch tall tame yellow mustard on June 8 with 66 F, 47% relative humidity, clear sky, and 4 mph wind. The experiment was conducted on fallow soil given 50 lb/A nitrogen. Tame yellow mustard and green foxtail infestations were moderate and Russian thistle was dense. Weed control and safflower response were determined on July 23 and harvest was 80 square feet on September 10. Safflower test weight was influenced by Russian thisitle seed in certain samples. Percent oil in safflower seed was determined by NMR analysis.

						Safflower				
Treatment[a]	Type	Rate	Tymu	Ruth	Grft	Strd	Inju	Yield	Tswt	Oil
		(oz/A)	-(%	control)-		(%)	(%)	(lb/A)	(lb)	(%)
Trifluralin	PPI	12	18	78	98	0	3	703	37.8	46.8
Trifluralin	PPI	16	15	80	98	0	0	627	37.6	48.0
Pendimethalin	PPI	20	21	38	96	0	0	442	37.0	46.9
Trif+Triallate	PPI	12+16	18	78	97	0	2	689	37.3	47.2
Ethalfluralin	PPI	20	30	93	98	0	3	930	38.9	46.7
RE-40885	PPI	8	83	78	89	0	0	963	37.6	47.4
RE-40885	PPI	12	93	89	91	0	0	1233	38.2	47.3
RE-40885	PPI	16	94	91	94	0	1	1341	38.9	47.3
RE-40885+Trif	PPI	16+8	80	74	95	0	3	971	38.0	47.2
RE-40885+RE-45601	PPI+P	16+8	93	91	98	0	0	1289	38.9	47.1
RE-408+RE-456+PO	PPI+P	16+2+0.25G	95	96	99	0	0	1420	39.7	47.6
RE-408+RE-456+PO	PPI+P	12+2+0.25G	91	92	98	0	0	1410	39.9	47.0
Trif+AC 222,293	PPI+P	8+6	98	80	98	6	3	1075	38.9	46.8
Trif+DPX-M6316+S	PPI+P	8+0.167+0.25%	98	99	94	6	0	1311	39.1	45.8
DPX-M6316+S	P	0.167+0.25%	99	98	15	20	5	626	36.4	46.3
DPX-M6+Flua-P+PO	P	0.167+3+0.25G	98	99	76	11	1	1020	38.7	47.7
Cinmethylin	PE	12	5	0	55	0	0	428	36.8	47.1
Cinm+DPX-M6+S	PE+P	12+0.167+0.25%	98	99	69	10	5	1056	38.5	46.7
Cinm+DPX-M6	PE	12+0.25	0	0	63	0	6	499	37.4	47.1
No treatment		0	0	0	0	0	3	134	35.5	45.9
C.V. %			24	8	11	109	208	15	1.8	1.9
LSD 5%			20	9	13	4	NS	187	1.0	NS
# OF REPS			4	4	4	4	4	4	4	3

[a]Trif = Trifluralin, RE-408 = RE-40885, RE-456 = RE-45601, PO = petroleum oil with 17% emulsifier, S = X-77 nonionic surfactant, DPX-M = DPX-M6316, Flua-P = Fluazifop-P, Cinm = Cinmethylin, G in the rate column represents gallon/A, Strd = stand reduction, Inju = injury, Tswt = test weight.

Summary

Safflower yields generally related directly to the degree of weed control obtained with the various treatments. None of the treatments caused important safflower injury or stand reduction. RE-40885 at 12 oz/A or more alone (PPI) or with RE-45601 (PPI or P) gave 85% or more control of all weeds. AC 222,293 and DPX-M6316 postemergence controlled tame yellow mustard.

DPX-M6316 with adjuvants in safflower, Williston, 1987. 'S-541' safflower was seeded and pendimethalin at 16 oz/A was applied preemergence for grass weed control on May 12. The experiment was conducted on fallow soil given 50 lb/A nitrogen. Treatments were applied to 4-leaf safflower and a sparse infestation of 2 to 3 inch tall Russian thistle on June 11 with 72 F, 37% relative humidity, clear sky, and a 4 mph wind. Safflower harvest was from 80 square feet on September 15. Percent oil in safflower seed was determined by NMR analysis. The experiment was a split-plot arrangement in a randomized complete block design.

			Safflower					
Treatment[a]	Rate	Ruth	Height	Strd	Inju	Yield	Tswt	Oil
	(oz/A)	(% control)	(cm)	(%)	(%)	(lb/A)	(lb)	(%)
DPX-M6316	0.125	20	47.5	0	0	1366	40.2	46.3
DPX-M6316	0.167	0	43.5	0	0	1196	39.1	46.4
DPX-M6316	0.25	8	45.3	0	0	1214	39.0	46.9
DPX-M6316	0.375	17	46.3	0	0	1213	39.5	46.0
DPX-M6316	0.50	0	50.3	0	1	1188	39.4	46.3
DPX-M6316	0.75	13	49.5	0	3	1284	39.9	46.2
No treatment	0	0	47.8	0	0	1255	39.5	46.1
DPX-M6316+S	0.125+0.25%	98	46.3	0	7	1227	39.2	46.9
DPX-M6316+S	0.167+0.25%	83	45.3	0	4	1275	39.7	46.6
DPX-M6316+S	0.25+0.25%	98	46.3	0	8	1209	38.8	46.7
DPX-M6316+S	0.375+0.25%	99	47.3	1	9	1185	39.3	47.4
DPX-M6316+S	0.50+0.25%	98	46.3	0	6	1189	39.8	46.9
DPX-M6316+S	0.75+0.25%	98	48.0	1	8	1295	39.6	46.8
Surfactant	0.25%	0	49.5	0	0	1274	39.5	46.9
DPX-M6316+PO	0.125+0.25G	97	50.5	2	8	1303	38.9	48.0
DPX-M6316+PO	0.167+0.25G	99	46.5	3	11	1176	37.8	47.9
DPX-M6316+PO	0.25+0.25G	99	43.5	6	16	1167	37.6	48.0
DPX-M6316+PO	0.375+0.25G	99	43.5	10	16	1027	36.8	48.2
DPX-M6316+PO	0.50+0.25G	99	47.5	8	18	1002	36.4	47.9
DPX-M6316+PO	0.75+0.25G	99	47.0	10	23	1031	36.1	47.8
PO	0.25G	17	50.0	0	0	1442	40.3	46.4
C.V. %		22	7.3	119	37	10	1.7	1.3
LSD 5%		22	NS	3	3	172	0.9	1.0
# OF REPS		3	4	4	4	4	4	3

[a]S = X-77 nonionic surfactant, PO = petroleum oil 11N with 17% emulsifier, G in the rate column represents gallon/A, Strd = stand reduction, Inju = injury, Tswt = test weight.

Summary

None of the DPX-M6316 treatments caused important safflower stand reduction. Injury to safflower from DPX-M6316 was alone § X-77 § PO. DPX-M6316 at 0.75 oz/A alone only gave 13% Russian thistle control, but 0.25 oz/A gave more than 95% control when with X-77 or PO.

Rotational crop response to chlorsulfuron and metsulfuron, Fargo, 1987. Herbicide treatments were applied to 'Era' wheat on June 15, 1982. Since 1982 the area has only been cultivated in the long direction of the plots. Tame yellow mustard, 'Linton' flax, lentils, 'Pioneer 3953' corn, 'Seedtech 316' sunflower, 'C-20' navy bean, and 'McCall' soybean were seeded as bioassay species across the plots on June 3. Injury varied somewhat from the precise plot area, and was probably due to herbicide movement with tillage. Injury, as percent stand reduction, was evaluated July 15.

Experiment 1.

Treatment	Rate	Lentils	Flax	Sunflower	Corn	Soybean	Dry bean
	(oz/A)	--------------(% stand reduction)----------------					
No treatment	0	5	2	2	0	0	0
Chlorsulfuron	0.06	2	2	0	0	0	0
Chlorsulfuron	0.12	8	0	0	0	0	0
Chlorsulfuron	0.18	2	0	0	0	0	0
Chlorsulfuron	0.25	15	10	19	11	0	2
Chlorsulfuron	0.37	20	12	10	23	4	4
Chlorsulfuron	0.50	7	1	5	10	0	0
Metsulfuron	0.10	7	0	10	0	0	2
Metsulfuron	0.25	2	0	0	2	0	0
Metsulfuron	0.50	10	5	12	10	7	9

Experiment 2.

Treatment	Rate	Lentils	Flax	Sunflower	Corn	Soybean	Dry bean
	(oz/A)	--------------(% stand reduction)----------------					
No treatment	0	0	0	0	0	0	0
Chlorsulfuron	0.25	17	7	9	20	0	7
Chlorsulfuron	0.50	57	20	36	62	19	7
Chlorsulfuron	0.75	57	20	34	79	7	22
Chlorsulfuron	1.00	71	17	50	80	14	12
Chlorsulfuron	1.50	76	46	72	95	41	50
Metsulfuron	0.50	45	5	24	22	4	2
Metsulfuron	1.00	40	14	47	35	11	10

Summary

Soil residues were still evident five years after chlorsulfuron and metsulfuron application. The residual from the 1 oz/A rate of chlorsulfuron and metsulfuron still caused severe injury to many broadleaf crops. The residual appeared greater from chlorsulfuron than metsulfuron. However, the plots had begun to show cross contamination from the tillage so that precise determination was difficult.

Annual Forage Weed Control - Minot, 1987

Trade Name	Chemical Name	App.	Rate	Kramer Triticale -Injury-		Kramer Triticale Yield	Kramer Triticale Height	Speltz -Injury-		Speltz Yield	Speltz Height	Piper Sudan Grass -Injury-		Piper Sudan Grass Yield	Piper Sudan Grass Height
			oz/A	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm
Fargo	Triallate	PPI	16	13	8	3.41	75	23	17	2.46	63	77	37	2.37	107
Prowl	Pendimethalin	PPI	12	20	25	2.42	72	20	15	2.51	62	90	73	1.04	115
Prowl	Pendimethalin	PE	12	2	3	4.05	76	5	7	3.22	66	83	58	1.32	103
Bladex	Cyanazine	PPI	16	33	37	2.38	71	47	38	1.25	58	28	7	4.63	124
Ramrod	Propachlor	PE	48	0	7	3.62	74	2	10	2.71	69	22	15	3.59	123
Banvel	Dicamba	P	4	5	7	3.33	79	10	13	2.49	61	2	13	4.02	123
2,4-D	2,4-D Amine	P	8	5	3	3.97	80	5	7	2.64	61	3	10	4.95	124
MCPA	MCPA Amine	P	8	0	5	3.79	79	0	5	3.22	66	5	25	4.88	120
Assert	Imazamethabenz	P	6	2	0	3.81	81	3	7	2.29	65	48	33	3.70	106
Hoelon	Diclofop	P	12	0	3	3.55	74	2	5	3.26	62	55	48	2.83	97
Bronate	Brox+MCPA	P	4+4	0	0	3.74	76	2	5	2.59	59	5	13	4.12	124
Buctril	Bromoxynil	P	4	0	3	3.59	78	3	3	2.22	59	10	8	4.91	121
Harmony+X77	DPXM6316+X77	P	.375+.25%	5	5	3.22	75	8	25	2.01	62	78	63	2.76	85
Check	Untreated		0	--	-	3.90	82	-	-	3.11	71	--	--	4.76	128
Mean				7	8	3.48	77	10	12	2.57	63	39	31	3.56	114
C.V.%				86	66	14.1	4	56	65	26.0	9	28	49	36.1	10
LSD 5%				9	9	0.82	6	9	13	NS	NS	18	26	2.16	19

Trade Name	Chemical Name	App.	Rate	Trudan 8 Hybrid Sudan Grass -Injury-		Trudan 8 Hybrid Sudan Grass Yield	Trudan 8 Hybrid Sudan Grass Height	Highland 2 Sudan X Sorghum -Injury-		Highland 2 Sudan X Sorghum Yield	Highland 2 Sudan X Sorghum Height	Sumax Sorghum -Injury-		Sumax Sorghum Yield	Sumax Sorghum Height
			oz/A	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm
Fargo	Triallate	PPI	16	68	23	3.78	100	10	8	5.87	120	53	27	3.19	89
Prowl	Pendimethalin	PPI	12	87	68	1.89	99	82	58	2.00	94	92	73	1.30	76
Prowl	Pendimethalin	PE	12	43	32	3.54	91	42	32	4.86	106	37	47	2.76	97
Bladex	Cyanazine	PPI	16	27	10	3.97	112	7	5	6.99	134	17	13	4.85	107
Ramrod	Propachlor	PE	48	12	12	4.38	115	17	5	6.48	130	13	15	4.78	107
Banvel	Dicamba	P	4	7	10	5.97	118	3	3	6.99	128	2	20	4.61	103
2,4-D	2,4-D Amine	P	8	3	12	5.52	119	3	3	6.35	134	3	8	4.98	108
MCPA	MCPA Amine	P	8	2	15	5.13	111	2	10	6.73	122	7	33	3.66	104
Assert	Imazamethabenz	P	6	40	25	3.91	103	37	15	5.99	109	78	60	1.48	64
Hoelon	Diclofop	P	12	38	38	3.29	99	37	23	5.07	104	62	65	1.23	74
Bronate	Brox+MCPA	P	4+4	0	13	5.33	117	2	12	5.47	117	3	22	3.49	102
Buctril	Bromoxynil	P	4	5	8	5.37	118	0	7	7.10	123	15	20	3.65	106
Harmony+X77	DPXM6316+X77	P	.375+.25%	87	77	2.51	71	83	72	2.87	74	99	93	0.29	43
Check	Untreated		0	--	-	4.71	121	-	-	5.62	119	--	--	5.54	111
Mean				32	26	4.24	107	25	20	5.60	115	37	38	3.27	92
C.V.%				40	50	23.1	11	40	45	19.2	10	17	36	45.0	11
LSD 5%				21	22	1.64	20	17	15	1.80	20	11	23	2.47	18

Annual forages response to herbicides, Minot 1987. Preplant incorporated (PPI) treatments were applied to dry soil and rototiller incorporated twice, forages were seeded and post plant preemergence treatments (PE) were applied to moist soil on June 29. The preplant and preemergence treatments were applied in 17 gpa at 35 psi. The sky was sunny, temperature was 65°F and winds were northerly at 5 mph. The shield was used. Post emergence (P) treatments were applied in 8.5 gpa at 35 psi to 5 leaf triticale, 4 leaf speltz, 6 leaf millets, sudan grass, hybrid sudan grass and sudan x sorghum cross and 7 leaf sorghum on July 25. The sky was sunny, wind was 5-10 mph from the east. Shield was used. Temperature was 80°F, humidity was 65%. The experiment was a randomized complete block with three replicates. Experimental units were 10 x 4 feet with 7 x 4 feet treated. Injury evaluations were made August 18 and September 1. Plots were harvested on September 3. Yield is expressed in tons/acre on an as harvested moisture bases.

				Dawn Proso Millet				Manta Foxtail Millet				Mil-Hy 100 Pearl Millet			
Trade Name	Chemical Name	App.	Rate	-Injury-		Yield	Height	-Injury-		Yield	Height	-Injury-		Yield	Height
			oz/A	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm	8/18	9/1	ton/A	cm
Fargo	Triallate	PPI	16	5	5	5.97	58	13	5	5.27	56	20	8	9.27	93
Prowl	Pendimethalin	PPI	12	73	47	2.55	58	91	60	1.71	58	65	43	5.72	85
Prowl	Pendimethalin	PE	12	92	67	1.89	53	87	75	1.42	48	33	15	10.25	102
Bladex	Cyanazine	PPI	16	5	8	6.28	55	30	8	4.40	65	2	2	13.63	113
Ramrod	Propachlor	PE	48	10	8	6.02	59	94	40	2.59	48	82	23	5.96	90
Banvel	Dicamba	P	4	2	10	5.42	58	5	8	5.14	61	0	2	12.66	110
2,4-D	2,4-D Amine	P	8	0	2	6.63	59	3	8	5.47	59	2	3	10.91	96
MCPA	MCPA Amine	P	8	0	2	7.18	62	5	3	5.47	56	0	5	11.52	113
Assert	Imazamethabenz	P	6	7	5	7.02	63	22	12	5.57	53	13	17	10.35	108
Hoelon	Diclofop	P	12	25	15	4.88	55	92	92	0.64	31	87	78	2.08	69
Bronate	Brox+MCPA	P	4+4	3	5	6.81	62	2	3	6.33	63	0	5	12.31	101
Buctril	Bromoxynil	P	4	0	2	6.33	62	2	0	5.90	61	0	0	13.75	115
Harmony+X77	DPXM6316+X77	P	.375+.25%	0	8	6.93	58	23	13	4.41	56	10	17	11.87	95
Check	Untreated		0	--	-	5.82	63	-	-	5.50	61	--	--	11.57	104
Mean				17	14	5.69	59	36	25	4.27	55	24	17	10.13	100
C.V.%				33	39	16.1	15	23	40	21.2	13	67	87	30.5	11
LSD 5%				9	9	1.54	NS	14	17	1.52	12	27	25	5.18	18

Sethoxydim with additives, Fargo, 1987. 'Marshall' wheat, 'Lyon' oats, and Siberian foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, May 3. Treatments were applied to 5-leaf wheat and oats, and 3-leaf foxtail millet on June 8 with 65F, 85% relative humidity, and intermittent drizzle. The adjuvants were petroleum oil with 17% Atplus 300F (PO); BCH-815 (BASF adjuvant); Li-700 (Loveland Industries); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; linseed oil fatty acid with 15% emulsifier (AG-1); and surfactant X-77. X-77 was applied at 0.25% (v/v) and other adjuvants at 1 qt/A. Evaluation was on June 22 and July 14. Data are an average over the two evaluations. Generally the differences among treatments were greater at the second than at the first evaluation because of recovery.

	Wheat - Seth, oz/A				Oats - Seth, oz/A				Ftmi - Seth, oz/A			
Adjuvant	0.5	1.0	1.5	mean	0.5	1.0	1.5	mean	0.5	1.0	1.5	mean
	(% control)											
None	2	2	5	3	3	4	9	5	13	18	51	27
PO	8	39	55	25	14	56	71	47	69	91*	93	84
BCH-815	11	16	29	19	15	20	38	26	38	59	84	60
Li-700	5	31	46	27	8	31	66	35	27	76	89	64
MS	17	53	43	38	23	66	72	54	78	94	96	89
MSa	25	51	72	49	34	69	86	63	84	89	94	89
AG-1	16	42	59	39	23	56	83	54	76	90	97	88
X-77	4	5	36	15	6	9	41	19	28	71	83	61
LSD 5%	---- 11 ----				---- 19 ----				---- 24 ----			

* indicates a missing plot calculation

Summary

Methylated sunflower oil with emulsifier a tended to be more effective than the Witco emulsifier and methylated sunflower oil enhanced sethoxydim control of all species more than the other adjuvants. Sethoxydim at 1 oz/A applied with sunflower methyl ester generally gave equal control to sethoxydim at 1.5 oz/A applied with petroleum oil. BCH-815 was less effective as an adjuvant in this experiment than in others indicating a response to methods of mixing or application.

Fluazifop-P with additives, Fargo, 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species, June 30. The adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO); BCH-815 (BASF adjuvant); Li-700 (Loveland Industries); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; linseed oil fatty acid (AG-1) with 15% emulsifier; and X-77 (v/v). X-77 was applied at 0.25% (v/v) and the other adjuvants at 1 qt/A. Evaluations were on July 17 and August 7. Data from the two evaluations were combined. However, differences among treatments generally were greater at the second evaluation because of recovery by the plants with moderate injury.

	Wheat - Flua, oz/A				Oats - Flua, oz/A				Ftmi - Flua, oz/A			
Adjuvant	0.25	0.5	1.0	mean	0.25	0.5	1.0	mean	0.25	0.5	1.0	mean
	(% control)											
None	19	60	95	58	30	44	94	56	6	31	48	28
PO	61	74	92	76	23	64	95	61	10	31	50	31
BCH-815	56	82	97	78	35	83	96	71	9	26	54	31
Li-700	40	68	94	67	23	50	95	56	20	22	48	30
MS	48	65	97	70	48	56	97	67	14	21	48	28
MSa	50	80	92	74	33	85	96	71	13	29	48	30
AG-1	40	68	95	68	20	75	96	64	13	43	62	39
X-77	60	74	96	77	39	76	94	70	15	28	49	31
LSD 5%	----	17	----		----	18	----		----	11	----	

Summary

No important differences among adjuvants occurred as to enhancement of fluazifop phytotoxicity to the bioassay species. X-77 generally enhanced species control with fluazifop similarly to the oil adjuvants.

Haloxyfop with additives, Fargo, 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species, June 30. The adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO); BCH-815 (BASF adjuvant); Li-700 (Loveland Industries); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; and linseed oil fatty acid (AG-1) with 15% emulsifier. Adjuvants were applied at 1 qt/A. Evaluations were on July 17 and August 7. Data from the two evaluations were combined. However, differences among treatments generally were greater at the second evaluation because of recovery by the plants with moderate injury.

	Wheat - Halo, oz/A				Oats - Halo, oz/A				Ftmi - Halo, oz/A			
Adjuvant	0.25	0.5	0.75	mean	0.25	0.5	0.75	mean	0.25	0.5	0.75	mean
	(% control)											
None	3	10	16	10	6	13	13	11	6	17	20	14
PO	50	79	96	75	28	80	95	68	42	71	88	67
MS	68	94	96	86	78	96	97	90	61	83	87	77
MSa	60	91	95	82	70	94	97	87	58	79	87	74
AG-1	53	87	96	79	73	92	97	87	67	85	90	81
BCH-815	56	80	97	78	68	81	98	82	56	65	86	69
LSD 5%	----	15	----		----	15	----		----	13	----	

Summary

The methylated seed oils (MS, MSa) and AG-1 tended to enhance the control of all species more than petroleum oil and BCH-815 adjuvants.

Fenoxaprop with additives, Fargo, 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species, June 30. The adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO); BCH-815 (BASF adjuvant); Li-700 (Loveland Industries); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; and linseed oil fatty acid (AG-1) with 15% emulsifier. Adjuvants were applied at 1 qt/A. Evaluations were on July 17 and August 7. Data from the two evaluations were combined. However, differences among treatments generally were greater at the second evaluation because of recovery by the plants with moderate injury.

Adjuvant	Wheat - Feno, oz/A				Oats - Feno, oz/A				Ftmi - Feno, oz/A			
	0.5	0.75	1.0	mean	0.5	0.75	1.0	mean	0.5	0.75	1.0	mean
	(% control)											
None	0	8	7	5	4	13	27	15	60	77	89	75
PO	2	1	7	3	30	32	65	42	88	90	95	91
MS	3	3	11	6	26	47	65	46	86	90	93	90
MSa	8	0	4	4	27	41	68	45	85	90	94	90
AG-1	6	7	12	8	27	33	55	38	83	87	92	87
BCH-815	5	8	1	5	21	28	20	23	64	80	86	77
LSD 5%	NS				18				9			

Summary

Methylated sunflower oil and petroleum oil similarly enhanced the phytotoxicity of fenoxaprop. However, fenoxaprop at 0.75 oz/A tended to give higher oats control when applied with methylated sunflower oil than the other adjuvants.

DPX-Y6202 with additives, Fargo, 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species, June 30. The adjuvants were petroleum oil with 17% Atplus 300F emulsifier (PO); BCH-815 (BASF adjuvant); Li-700 (Loveland Industries); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; and linseed oil fatty acid (AG-1) with 15% emulsifier. Adjuvants were applied at 1 qt/A. Evaluations were on July 17 and August 7. Data from the two evaluations were combined. However, differences among treatments generally were greater at the second evaluation because of recovery by the plants with moderate injury.

Adjuvant	Wheat - DPX, oz/A			Oats - DPX, oz/A			Ftmi - DPX, oz/A		
	0.25	0.5	0.75	0.25	0.5	0.75	0.25	0.5	0.75
	(% control)								
None	32	90	97	8	46	87	8	63	92
BCH-815	96	99	99	65	92	97	75	89	94
PO	98	99	99	65	92	97	84	94	95
MS	96	99	99	75	91	94	77	90	94
MSa	97	98	99	81	86	95	83	90	94
AG-1	95	98	94	71	90	95	81	90	79
LSD 5%	7			16			9		

Summary

The control of most species with DPX-Y6202 at 0.5 or 0.75 oz/A was too high to determine differences in enhancement of phytotoxicity by the various adjuvants. The methylated sunflower oil (MSa) enhanced oats control with DPX-Y6202 at 0.25 oz/A more than the petroleum oil or BCH-815.

RE-45601 with additives, Fargo, 1987. 'Marshall' wheat, 'Lyon' oats, and Siberian foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, May 3. Treatments were applied to 5-leaf wheat and oats, and 3-leaf foxtail millet on June 8 with 65F, 85% relative humidity, and intermittent drizzle. The adjuvants were petroleum oil with 17% Atplus 300F (PO); BCH-815 (BASF adjuvant); methylated sunflower oil with emulsifier w (MS) and with emulsifier Atplus 300F (MSa) at 15%; and linseed oil fatty acid with 15% emulsifier (AG-1). Adjuvants were applied at 1 qt/A. Evaluation was on June 22 and July 14. Data are an average over the two evaluations. Generally the differences among treatments were greater at the second than at the first evaluation because of recovery.

	Wheat - RE45, oz/A			Oats - RE45, oz/A			Ftmi - RE45, oz/A		
Adjuvant	0.25	0.5	0.75	0.25	0.5	0.75	0.25	0.5	0.75
					(% control)				
None	3	12	23	6	13	36	43	53	71
PO	67	85	96	78	88	96	87	98	98
MS	83	97	98	86	96	96	89	97	98
MSa	89	94	98	93	96	98	96	96	98
AG-1	84	93	97	83	93	96	96	97	97
BCH-815	79	96	95	89	96	96	92	95	97
LSD 5%		9			6			6	

Summary

Difference in enhancement of species control with RE-45601 by the various adjuvants was small at the high control obtained in the experiment. Petroleum oil adjuvant tended to enhance wheat and oats control with RE-45601 less than the other adjuvants evaluated.

Volume of oil adjuvants with sethoxydim, Fargo 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf grass species on July 2. The petroleum oil was 11N with 17% Atplus emulsifier (PO), methylated sunflower oil containing 15% Witco emulsifier (MS), modified linseed oil was AG-1, modified rapeseed oil was NDR, and BCH-815 was from BASF. Sethoxydim was at 1 oz/A, bentazon and sodium bicarbonate at 16 oz/A for all treatments. The experiment was a split plot with adjuvants as the main plots and contained 3 replications. The data are an average of the July 17 and August 4 evaluations.

Oil	Salt Antagonist											
	None				Bentazon				$NaHCO_3$			
Adjuvant / Volume, pt/A	1	2	4	mean	1	2	4	mean	1	2	4	mean
	(% control)											
Wheat												
PO	65	50	76	64	10	17	32	20	24	39	37	34
MS	51	55	53	53	26	36	41	34	45	43	48	45
BCH	44	66	70	60	35	24	34	31	46	48	33	43
AG-1	51	60	72	61	26	36	50	37	23	42	44	36
NDR	44	40	75	53	3	9	57	23	4	38	27	23
avg	51	54	69		20	24	43		29	42	38	
LSD 5% OxVxS=14; OxS=12; VxS=9												
Oats												
PO	62	83	85	77	12	8	22	14	42	40	49	44
MS	76	81	81	79	12	18	25	18	41	52	46	46
BCH	70	86	91	83	15	8	23	16	37	54	45	45
AG-1	74	88	88	84	13	23	37	25	14	41	41	32
NDR	48	37	93	59	2	6	45	17	7	17	21	15
avg	66	75	88		11	13	31		28	41	40	
LSD 5% OxVxS=NS; OxS=9; VxS=7												
Millet												
PO	85	85	87	86	49	46	56	50	67	74	72	71
MS	79	76	76	77	53	52	63	56	74	72	74	74
BCH	82	85	84	84	51	59	60	57	80	86	76	81
AG-1	84	83	87	84	47	58	64	57	46	62	66	58
NDR	72	70	85	76	14	19	72	35	39	54	63	52
avg	80	80	84		43	47	63		61	70	70	
LSD 5% OxVxS=NS; OxS=10; VxS=7												

Summary

Only the data for oats will be discussed as the responses were greater for oats than the other species along with a lower error mean square. The oil by salt by volume interaction was not significant indicating that all oils responded similarly to oil volume regardless of salts present. Oats control increased with each increase in oil volume, averaged over oil adjuvants for sethoxydim applied without a salt. None of the oil adjuvants overcame the bentazon or sodium bicarbonate antagonism. All oils were similar except NDR was less effective than the other oil when with sethoxydim alone or with sodium bicarbonate and AG-1 was less effective than PO, MS, or BCH-815 when with sethoxydim along with sodium bicarbonate.

Sethoxydim plus fertilizer antagonism, Fargo, 1987. 'Marshall' wheat, 'Lyon' oats, and 'Siberian' millet were seeded in adjacent 6 ft wide strips as bioassay species on May 3. Treatments were applied to 5 leaf wheat and wild oats, and 3 leaf foxtail millet on June 8 with 65 F, 85% relative humidity and an intermittent drizzle. Sethoxydim was applied at 1 oz/A in all treatments. The adjuvants were petroleum oil with 17% Atplus 300F (PO), BCH-815 (adjuvant from BASF), methylated sunflower oil with 15% Witco (MS), and linseed oil fatty acid with 15% emulsifier (AG-1). The adjuvants were all applied at 1 qt/A. The ammonium sulfate (AMSU), ammonium nitrate (AMNI), and urea were all applied at 40 oz/A, bentazon (Bent) and $NaHCO_3$ (HCO_3) at 16 oz/A, and 28% nitrogen fertilizer (28%N) at 0.33 gpa. Evaluation was on June 22 and July 14. Data was averaged over the two evaluations.

		Wheat				Oats				Millet			
Oil	Fertilizer	alone	Bent	HCO_3	avg	alone	Bent	HCO_3	avg	alone	Bent	HCO_3	avg
		(% control)											
PO	None	49	17	34		72	18	46		91	36	91	
PO	AMSU	54	24	52		76	21	77		91	39	94	
PO	28%N	71	20	68		81	21	79		97	31	95	
PO	Urea	51	31	23		77	28	33		92	64	92	
PO	AMNI	62	16	63		82	14	78		92	28	96	
					42				54				75
BCH-815	None	76	32	56		83	38	67		98	86	97	
BCH-815	AMSU	77	44	77		85	55	88		96	64	96	
BCH-815	28%N	83	48	78		87	62	88		97	91	94	
BCH-815	Urea	72	44	36		81	40	36		97	77	94	
BCH-815	AMNI	78	40	81		86	50	84		95	85	94	
					62				69				91
MS	None	74	28	43		81	30	50		94	43	91	
MS	AMSU	73	48	76		83	57	84		95	79	96	
MS	28%N	79	45	79		84	66	87		97	90	96	
MS	Urea	65	39	42		81	35	66		92	89	92	
MS	AMNI	76	41	77		84	65	85		92	83	96	
					59				69				88
AG-1	None	67	30	28		81	26	38		92	53	90	
AG-1	AMSU	69	39	45		82	50	69		94	68	94	
AG-1	28%N	73	46	26		83	44	23		91	77	80	
AG-1	Urea	49	37	15		68	33	13		89	63	61	
AG-1	AMNI	69	44	58		83	43	81		94	69	95	
					46				55				81
LSD 5% Oil by fertilizer and salt=				13					11				16
LSD 5% Oil=				7					3				9

Summary

Oats generally had the greatest difference in response to adjuvants so the discussion will be limited to oats. BCH-815 and MS similarly enhanced oats control with sethoxydim and similarly interacted with salts and fertilizer. NaHCO , but not bentazon, antagonism of sethoxydim was overcome by AMSU, 28%N, and AMNI, except when applied with AG-1. AG-1 did not produce a stable emulsion when mixed with salts. Bentazon antagonism was reduced by AMSU, 28%N, and AMNI applied with BCH-815 or MS.

Fluazifop with various adjuvants and salts, Fargo 1987. 'Marshall' wheat, 'Lyon' oats and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species on June 12. Treatments were applied to species in the 5 leaf stage on July 10. Plants were stressed from aphid injury at treatment. Evaluation was on July 28. Petroleum oil (PO) was with 17% Atplus 300 11F, methylated sunflower oil (SFM) contained 15% Witco emulsifier, BCH-815 (adjuvant from BASF), and linseed oil (AG-1) with 15% emulsifier. Only the foxtail millet data are presented as the wheat and oats were completely controlled with all treatments. Oil adjuvants were applied at 1 qt/A, the bentazon (Bent) at 16 oz/A, $NaHCO_3$ (HCO_3) at 16 oz/A and the ammonium sulfate (AMSU), 28% nitrogen fertilizer (ammonium nitrate+urea), urea, and ammonium nitrate (AMNI) were all at 40 oz/A in 8.5 gpa Fargo water spray carrier.

		Fertilizer Salts					
Oil	Salt	None	AMSU	28%N	Urea	AMNI	
		--------- (% foxtail millet control) ---------					
PO	None	72	68	72	74	74	
PO	Bent	72	61	52	50	48	
PO	HCO_3	67	57	68	72	71	
							65
BCH	None	68	65	60	54	62	
BCH	Bent	58	43	27	42	37	
BCH	HCO_3	67	69	58	62	59	
							55
SFM	None	77	77	75	81	74	
SFM	Bent	60	57	72	55	63	
SFM	HCO_3	63	73	67	70	67	
							69
AG-1	None	69	68	72	75	71	
AG-1	Bent	48	47	53	51	53	
AG-1	HCO_3	67	57	63	67	57	
							61
Avg.	None	72	70	70	71	70	
Avg.	Bent	60	52	51	49	50	
Avg.	HCO_3	65	64	64	68	64	

LSD 5% oil and salt by fertilizer = 16
LSD 5% fertilizer = 5
LSD 5% oils = 2

Summary

Data taken on the control of redroot pigweed with bentazon generally indicated that the oils and fertilizers did not significantly affect redroot pigweed control, but the data were variable. Averaged over salt additive redroot pigweed control with bentazon was 85% with PO, 75% with BCH-815, 76% with SFM, and 73% with AG-1. Fertilizer salts did not greatly antagonize foxtail millet control with fluazifop applied with the oil adjuvants without bentazon or $NaHCO_3$. However, foxtail millet control was generally reduced when the fertilizer salts and bentazon or $NaHCO_3$ were all applied with fluazifop. The reduction varied with the specific oil adjuvant and salt. BHC-815 with fluazifop+bentazon and fertilizer salts caused the greatest reduction in foxtail millet control. Notes were not taken as to possible effects these mixtures had on emulsion stability.

Percent emulsifier with sethoxydim and fluazifop, Fargo 1987. 'Marshall' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species on July 2 for both the sethoxydim and the fluazifop experiments. All adjuvants were applied at 1 qt/A. Methylated sunflower oil (MS) contained Witco (W), Atplus 300F (A), or RS-410 (R) emulsifiers at various percentages. BCH-815 was an adjuvant from BASF. Evaluations were on July 17 and August 4 and the average of the evaluations are presented in the table.

Treatment	Emulsifier	Sethoxydim, 1 oz/A			Fluazifop, 1 oz/A		
		Wheat	Oats	Ftmi	Wheat	Oats	Ftmi
	(%)	(% control)					
MSW	2.5	63	86	81	89	92	45
MSW	5.0	55	65	80	91	82	43
MSW	10.0	72	93	84	90	96	51
MSW	15.0	66	83	81	91	93	42
MSA	2.5	67	89	83	91	92	55
MSA	5.0	72	86	83	72	59	39
MSA	10.0	71	87	85	92	95	46
MSA	15.0	68	79	81	89	95	47
MSR	2.5	60	85	81	91	93	49
MSR	5.0	50	57	68	75	78	46
MSR	10.0	75	90	85	84	84	43
MSR	15.0	75	84	84	81	81	43
DASH	0.0	60	58	74	91	96	52
C.V. %		19	19	8	9	16	14
LSD 5%		NS	NS	NS	NS	NS	NS

Summary

The reduced species control with methylated sunflower oil with Witco or R emulsifier at 5% was not likely based upon emulsion quality. The low values may reflect an error in sample preparation or application. The percent emulsifier in the oil adjuvant applied with sethoxydim did not influence species control. The adjuvants with 5% emulsifier again indicated less efficacy than the other percentages. However, the same oils were used and the spray mixing was at the same time as for sethoxydim so any error could have occurred in both experiments. Percent emulsifier in the methylated sunflower oil did not influence efficacy. However, methylated sunflower oil adjuvant enhancement of wheat and oats control tended to decrease as percent of R emulsifier increased, when disregarding the 5% emulsifier.

2,4-D with adjuvants, Fargo 1987. Tame yellow mustard, redroot pigweed, 'McCall' soybean, and 'F1' sunflower was seeded in adjacent strips as bioassay species, May 5. Treatments were applied to 2-3 trifoliolate soybeans, 4-6 leaf sunflowers, 3-4 inch redroot pigweed and 4-5 inch tall tame mustard on June 16 with 80F, 60% relative humidity and SE wind at 15 mph. Evaluation was on July 1. X-77 was applied at 0.25% (v/v) and other adjuvants at 1 qt/A. Petroleum oil (PO) had 17% emulsifier Atplus 300F, methylated sunflower oil had 15% Witco (MSW), linseed oil fatty acid (NDL) had 15% RS emulsifier, and BCH-815 was from BASF. The 2,4-D was dma (dimethyl amine) and bee (butoxyethanol ester).

Treatment	Rate (oz/A)	Soybean (% injury)	Rrpw	Vosf	Tamu
			----- (%	control)	-----
2,4-Ddma	1.5	8	0	5	5
2,4-Ddma+X-77	1.5	13	2	3	3
2,4-Ddma+PO	1.5	3	14	6	15
2,4-Ddma+MSW	1.5	10	6	2	7
2,4-Ddma+NDL	1.5	20	18	17	15
2,4-Ddma+BCH-815	1.5	17	13	17	17
2,4-Ddma	3	3	3	5	15
2,4-Ddma+X-77	3	52	55	63	80
2,4-Ddma+PO	3	75	82	74	85
2,4-Ddma+MSW	3	75	77	77	88
2,4-Ddma+NDL	3	71	75	73	92
2,4-Ddma+BCH-815	3	73	77	70	87
2,4-Dbee	1.5	33	27	53	60
2,4-Dbee+X-77	1.5	43	31	49	62
2,4-Dbee+PO	1.5	52	40	57	73
2,4-Dbee+MSW	1.5	43	32	55	65
2,4-Dbee+NDL	1.5	43	38	52	55
2,4-Dbee+BCH-815	1.5	48	32	52	72
2,4-Dbee	3	58	44	55	60
2,4-Dbee+X-77	3	58	57	66	78
2,4-Dbee+PO	3	73	57	63	73
2,4-Dbee+MSW	3	58	58	70	85
2,4-Dbee+NDL	3	70	63	66	75
2,4-Dbee+BCH-815	3	55	58	70	84
C.V. %		25	24	17	21
LSD 5%		18	16	13	20

Summary

The oil adjuvants all similarly enhanced broadleaf species control by 2,4-D. The broadleaf species enhancement generally was more by the oils than by surfactant X-77. The oil adjuvants generally enhanced 2,4-D amine more than the esters.

Bromoxynil with adjuvants, Fargo 1987. Tame yellow mustard, redroot pigweed, 'McCall' soybean, and 'F1' sunflower were seeded in adjacent strips as bioassay species, May 5. Treatments were applied to 2-3 trifoliolate soybeans, 4-6 leaf sunflowers, 3-4 inch redroot pigweed and 4-5 inch tall tame mustard on June 16 with 80F, 60% relative humidity and SE wind at 15 mph. Evaluation was on July 1. X-77 was applied at 0.25% (v/v) and other adjuvants at 1 qt/A. Petroleum oil (PO) had 17% emulsifier Atplus 300F, methylated sunflower oil had 15% Witco (MSW), linseed oil fatty acid (NDL) had 15% RS emulsifier, and BCH-815 was from BASF.

Treatment[a]	Rate (oz/A)	Soybean (% ir)	Rrpw	Vosf	Tamu
			-------(%	control)-------	
Brox-UC	1.5	28	25	53	60
Brox-UC	3	30	35	85	97
Brox-UC+X-77	1.5+0.25%	13	23	55	73
Brox-UC+X-77	3+0.25%	32	38	94	93
Brox-UC+PO	1.5+0.25G	13	17	65	67
Brox-UC+PO	3+0.25G	27	32	78	91
Brox-UC+MSW	1.5+0.25G	23	27	86	78
Brox-UC+MSW	3+0.25G	24	33	95	93
Brox-UC+NDL	1.5+0.25G	37	38	80	78
Brox-UC+NDL	3+0.25G	28	45	97	98
Brox-UC+BCH-815	1.5+0.25G	16	18	72	62
Brox-UC+BCH-815	3+0.25G	32	28	92	63
C.V. %		47	37	22	21
LSD 5%		NS	NS	NS	28

[a] UC=Union Carbide

Summary

The various adjuvants did not significantly influence broadleaf species control with bromoxynil. However, the linseed oil fatty acids tended to enhance species control with bromoxynil at 1.5 oz/A compared to all other adjuvants.

Formulation and sethoxydim antagonism, Fargo 1987. 'Marshall' wheat, 'Lyon' oats, and Siberian foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 3-leaf species on July 6. All adjuvants were applied at 1 qt/A. The low spray pH treatments (1.6 to 3) were obtained by adding HCl. The oil adjuvants were petroleum oil 11N with 17% Atplus 300F emulsifier (PO), methylated sunflower oil with 15% Witco emulsifier (MS), and BCH-815 an adjuvant from BASF. Ammonium sulfate (AMSU) was at 2.5 lb/A, bentazon at 1 lb/A, and $NaHCO_3$ at 1 lb/A. The spray carrier was Fargo water and sethoxydim was at 0.5 oz/A. Evaluations were on July 20 and August 4 and were averaged for presentation in the Table.

Treatment	Wheat			Oats			Millet		
	alone	Bent	HCO_3	alone	Bent	HCO_3	alone	Bent	HCO_3
	(% control)								
Seth+MS	47	20	13	55	34	28	74	33	64
Seth+MS (low pH)	48	30	58	63	36	85	66	49	79
Seth+MS+AMSU	50	37	52	65	51	79	73	48	81
Seth+PO	50	12	11	54	16	18	69	12	51
Seth+PO (low pH)	43	22	51	52	22	65	77	23	78
Seth+PO+AMSU	41	17	45	48	18	60	63	25	74
Seth+BCH-815	49	13	20	70	26	43	76	32	74
Seth+BCH-815+AMSU	57	31	50	75	52	78	67	45	80
LSD 5%	----- 13 -----			----- 18 -----			----- 16 -----		

Summary

Sodium bicarbonate antagonism of species control with sethoxydim was overcome by a low pH or ammonium sulfate in the spray carrier, regardless of other adjuvants. Bentazon antagonism was partly overcome by ammonium sulfate, but only when with methylated sunflower oil or BCH-815. The low pH caused emulsion instability with some combination treatments which may have confounded the results.

Oil volume with broadleaf herbicides, Fargo 1987. Tame yellow mustard, redroot pigweed, 'McCall' soybean, and 'F1' sunflower was seeded in adjacent strips as bioassay species, May 5. Treatments were applied to 2-3 trifoliolate soybeans, 4-6 leaf sunflowers, 3-4 inch redroot pigweed and 4-5 inch tall tame mustard on June 16 with 80F, 60% relative humidity and SE wind at 15 mph. Evaluation was on July 1. The adjuvants were applied at 1 qt/A. Petroleum oil (PO) had 17% emulsifier Atplus 300F, methylated sunflower oil had 15% Witco (MSW), linseed oil fatty acid had 15% RS emulsifier (AG-1), and the once refined sunflower oil 15% Atplus 300F (SF). The 2,4-D was butoxyethanol ester (bee).

Treatment	Rate	Soybean	Rrpw	Vosf	Tamu
	(oz/A)	(%ir)	------ (%	control)	------
Bentazon	8	2	2	10	48
Bentazon+PO	8+0.06G	4	10	25	77
Bentazon+PO	8+0.12G	7	18	25	72
Bentazon+MSW	8+0.06G	6	15	32	90
Bentazon+MSW	8+0.12G	4	17	38	91
Bentazon+AG-1	8+0.06G	3	13	28	92
Bentazon+AG-1	8+0.12G	4	16	35	94
Bentazon+SF	8+0.06G	2	5	15	80
Bentazon+SF	8+0.12G	4	12	23	94
2,4-D bee	3	45	68	68	73
2,4-D bee+MSW	3+0.06G	73	79	77	77
2,4-D bee+MSW	3+0.12G	78	82	82	83
2,4-D bee+AG-1	3+0.06G	67	73	70	72
2,4-D bee+AG-1	3+0.12G	75	77	78	77
2,4-D bee+PO	3+0.06G	65	73	75	80
2,4-D bee+PO	3+0.12G	82	83	81	88
C.V. %		28	14	17	13
LSD 5%		15	9	14	17

Summary

All adjuvants enhanced bentazon phytotoxicity, and methylated sunflower oil and once-refined sunflower oil tended to enhance phytotoxicity more than petroleum oil. The phytotoxicity of 2,4-D was enhanced similarly by all adjuvants. Oil adjuvants tended to enhance both bentazon and 2,4-D more at 1 pint/A than at 0.5 pints/A.

<u>Diclofop and bromoxynil with oil adjuvants, Fargo 1987.</u> 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet was seeded in adjacent 6 foot wide strips as bioassay species on June 6. Treatments were applied to 5-leaf species on July 2. The petroleum oil 11N with 17% Atplus 300F emulsifier (PO), methylated sunflower oil (MS) with 15% Witco emulsifier, and linseed oil free fatty acids with 15% RS-410 emulsifier (AG-1) were all applied at 1 qt/A with diclofop at 12 oz/A alone and with bromoxynil at 4 oz/A. Species control was evaluated on July 17 and August 10 and the data for the two evaluations averaged in the Table.

Treatment[a]	Rate	Wheat	Oats	Ftmi
	(oz/A)	---------- (	% control)	---------
Diclofop+PO	12+0.25G	0	76	87
Diclofop+MS	12+0.25G	0	60	77
Diclofop+AG-1	12+0.25G	1	76	84
Diclofop+Brox-UC+PO	12+4+0.25G	1	66	80
Diclofop+Brox-UC+MS	12+4+0.25G	0	71	78
Diclofop+Brox-UC+AG-1	12+4+0.25G	0	67	80
C.V. %		181	9	6
LSD 5%		NS	10	7

[a] UC = Union Carbide

Summary

The methylated sunflower oil was less effective than the petroleum oil as an adjuvant with diclofop, but equal to petroleum oil when with diclfop plus bromoxynil.

Grass herbicides with fatty acids, Fargo 1987. 'Wheaton' wheat, 'Lyon' oats, and 'Siberian' foxtail millet were seeded in adjacent 6 foot wide strips as bioassay species, June 6. Treatments were applied to 5-leaf species on July 2. The adjuvants were all at 1 qt/A and contained 15% emulsifier with the fatty acids. Methylated sunflower oil contained 15% Witco emulsifier, petroleum oil 11N 17% Atplus 300F, and BCH-815 was an adjuvant from BASF. Each herbicide was a separate experiment but procedures were the same for all experiments. The fatty acid emulsions had short stability. The species control was evaluated on July 17 and August 4 and the averages presented in the tables.

Table 1. Sethoxydim at (1 oz/A)

Treatment	Wheat	Oats	Ftmi
	(% control)		
Linseed oil FFA	61	85	89
Rapeseed oil FFA	58	87	86
Safflower oil FFA	51	67	81
Sunflower oil FFA	62	81	84
Methylated sunflower oil	71	89	85
Petroleum oil	63	70	84
BCH-815	69	94	87
C.V. %	12	12	4
LSD 5%	NS	NS	NS

Table 2. Fluazifop at (0.5 oz/A)

Treatment	Wheat	Oats	Ftmi
	(% control)		
Linseed oil FFA	79	86	40
Rapeseed oil FFA	69	70	23
Safflower oil FFA	73	76	26
Sunflower oil FFA	82	80	42
Methylated sunflower oil	82	85	34
Petroleum oil	78	62	38
BCH-815	83	82	37
C.V. %	7	13	16
LSD 5%	NS	NS	10

Experiment continued on next page.

Grass herbicides with fatty acids, Fargo 1987. (continued)

Table 3. Diclofop at (12 oz/A)

Treatment	Wheat	Oats	Ftmi
	---------- (% control) ----------		
Linseed oil FFA	0	68	77
Rapeseed oil FFA	0	69	82
Safflower oil FFA	1	70	88
Sunflower oil FFA	1	55	81
Methylated sunflower oil	1	69	86
Petroleum oil	0	72	86
BCH-815	1	70	81
C.V. %	136	6	7
LSD 5%	NS	7	NS

Table 4. Fenoxaprop at (0.75 oz/A)

Treatment	Wheat	Oats	Ftmi
	---------- (% control) ----------		
Linseed oil FFA	1	74	91
Rapeseed oil FFA	1	76	93
Safflower oil FFA	1	68	89
Sunflower oil FFA	0	63	88
Methylated sunflower oil	1	81	90
Petroleum oil	2	79	91
BCH-815	0	40	84
C.V. %	140	9	2
LSD 5%	NS	11	3

Summary

Fatty acids were similar to the petroleum oil and methylated sunflower oil adjuvants with the various herbicides. Sunflower free fatty acids tended to be less effective as adjuvants with diclofop, fenoxaprop, and fluazifop than the linseed free fatty acids. BCH-815 was less effective than the other adjuvants with fenoxaprop.

Three species evaluation of the time of application effect on broadleaf and grass herbicide antagonism, Fargo (NW section 22), 1987. Wheaton wheat, Lyon oats, and Siberian foxtail millet were seeded in adjacent six foot strips across the herbicide plots June 6. Herbicide treatments were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of 10 foot plots and across the three grass species. Day one (D1) was July 8 and day seven (D7) was July 14. Treatments divided by "2 hours" had the first portion of the treatment applied two hours prior to the second portion.

Day	Date	Time of Day	Air Temp.	6" Soil Temp.	Relative Humidity	Wind Speed	Wind Direction
			(°F)	(°F)	(%)	(mph)	
D1	July 8	1:00 pm	76	72	66	5	north
D3	July 10	4:00 pm	87	74	49	0-5	southeast
D4	July 11	3:30 pm	69	74	76	10-15	northwest
D5	July 12	8:00 pm	60	68	78	0-5	north
D6	July 13	9:00 am	73	68	47	0-3	east
D7	July 14	11:00 am	68	68	63	0-3	south

The soil was dry at 0-2 inches but had moisture at 3-4 inches July 8 through July 14. Wheat was nine inches tall, foxtail millet was 12-15 inches tall, and oats was thirteen inches tall July 8. Wheat, oats, and foxtail millet control were evaluated July 29.

Treatment*	Rate	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
	(lb/A)	(%)	(%)	(%)
Sethoxydim D6	0.1	33	60	83
Sethoxydim D6	0.2	82	96	92
Fluazifop-P D6	0.09	99	89	19
Fluazifop-P D6	0.188	98	98	40
Sethoxydim+Desmedipham D6	0.1+0.75	15	15	43
Sethoxydim+Desmedipham D6	0.2+0.75	59	60	72
Fluazifop-P+Desmedipham D6	0.09+0.75	92	45	18
Fluazifop-P+Desmedipham D6	0.188+0.75	98	94	33
Sethoxydim+Bentazon D6	0.1+1	3	3	15
Sethoxydim+Bentazon D6	0.2+1	27	12	39
Fluazifop-P+Bentazon D6	0.09+1	86	37	2
Fluazifop-P+Bentazon D6	0.188+1	98	97	20
Sethoxydim+Acifluorfen D6	0.1+0.5	18	26	49
Sethoxydim+Acifluorfen D6	0.2+0.5	50	72	83
Fluazifop-P+Acifluorfen D6	0.09+0.5	60	43	12
Fluazifop-P+Acifluorfen D6	0.188+0.5	97	98	40
Sethoxydim D6/Desmedipham D7	0.1/0.75	57	53	62
Sethoxydim D6/Desmedipham D7	0.2/0.75	91	93	87
Fluazifop-P D6/Desmedipham D7	0.09/0.75	97	87	37
Fluazifop-P D6/Desmedipham D7	0.188/0.75	99	98	47
Sethoxydim D6/Bentazon D7	0.1/1	32	71	76
Sethoxydim D6/Bentazon D7	0.2/1	65	95	93
Fluazifop-P D6/Bentazon D7	0.09/1	97	90	23
Fluazifop-P D6/Bentazon D7	0.188/1	99	98	26
Sethoxydim D6/Acifluorfen D7	0.1/0.5	35	63	77
Sethoxydim D6/Acifluorfen D7	0.2/0.5	78	98	92
Fluazifop-P D6/Acifluorfen D7	0.09/0.5	95	87	52
Fluazifop-P D6/Acifluorfen D7	0.188/0.5	98	98	59

Experiment continued on next page.

Three species evaluation of the time of application effect on broadleaf and grass herbicide antagonism, Fargo (NW section 22), 1987. (continued)

Treatment*	Rate	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
	(lb/A)	------------	(%)	-----------
Sethoxydim/2 hours/Desmed D6	0.1/0.75	60	64	66
Sethoxydim/2 hours/Desmed D6	0.2/0.75	82	87	86
Fluazifop-P/2 hours/Desmed D6	0.09/0.75	95	87	28
Fluazifop-P/2 hours/Desmed D6	0.188/0.75	97	98	38
Sethoxydim/2 hours/Bentazon D6	0.1/1	35	74	83
Sethoxydim/2 hours/Bentazon D6	0.2/1	78	93	91
Fluazifop-P/2 hours/Bentazon D6	0.09/1	98	85	16
Fluazifop-P/2 hours/Bentazon D6	0.188/1	98	98	30
Sethoxy/2 hours/Acifluorfen D6	0.1/0.5	38	76	82
Sethoxy/2 hours/Acifluorfen D6	0.2/0.5	65	97	94
Flua-P/2 hours/Acifluorfen D6	0.09/0.5	96	91	42
Flua-P/2 hours/Acifluorfen D6	0.188/0.5	98	97	50
Desmedipham D1/Sethoxydim D6	0.75/0.1	38	39	70
Desmedipham D1/Sethoxydim D6	0.75/0.2	48	90	91
Desmedipham D1/Fluazifop-P D6	0.75/0.09	96	88	21
Desmed D1/Fluazifop-P D6	0.75/0.188	99	96	32
Bentazon D1/Sethoxydim D6	1/0.1	37	71	75
Bentazon D1/Sethoxydim D6	1/0.2	61	98	94
Bentazon D1/Fluazifop-P D6	1/0.09	97	89	20
Bentazon D1/Fluazifop-P D6	1/0.188	99	99	40
Acifluorfen D1/Sethoxydim D6	0.5/0.1	39	71	76
Acifluorfen D1/Sethoxydim D6	0.5/0.2	53	95	95
Acifluorfen D1/Fluazifop-P D6	0.5/0.09	94	86	30
Acifluorfen D1/Fluazifop-P D6	0.5/0.188	97	97	44
Desmedipham D3/Sethoxydim D6	0.75/0.1	45	63	72
Desmedipham D3/Sethoxydim D6	0.75/0.2	55	87	94
Desmedipham D3/Fluazifop-P D6	0.75/0.09	95	90	25
Desmed D3/Fluazifop-P D6	0.75/0.188	99	99	35
Bentazon D3/Sethoxydim D6	1/0.1	30	48	71
Bentazon D3/Sethoxydim D6	1/0.2	53	94	92
Bentazon D3/Fluazifop-P D6	1/0.09	97	86	18
Bentazon D3/Fluazifop-P D6	1/0.188	98	99	41
Acifluorfen D3/Sethoxydim D6	0.5/0.1	32	67	76
Acifluorfen D3/Sethoxydim D6	0.5/0.2	72	95	92
Acifluorfen D3/Fluazifop-P D6	0.5/0.09	96	83	27
Acifluorfen D3/Fluazifop-P D6	0.5/0.188	97	97	55
Desmedipham D4/Sethoxydim D6	0.75/0.1	50	50	65
Desmedipham D4/Sethoxydim D6	0.75/0.2	80	79	82
Desmedipham D4/Fluazifop-P D6	0.75/.09	94	86	31
Desmed D4/Fluazifop-P D6	0.75/0.188	98	98	40
Bentazon D4/Sethoxydim D6	1/0.1	29	62	80
Bentazon D4/Sethoxydim D6	1/0.2	53	94	93
Bentazon D4/Fluazifop-P D6	1/0.09	96	91	23
Bentazon D4/Fluazifop-P D6	1/0.188	97	98	33
Acifluorfen D4/Sethoxydim D6	0.5/0.1	25	75	74
Acifluorfen D4/Sethoxydim D6	0.5/0.2	53	94	90
Acifluorfen D4/Fluazifop-P D6	0.5/0.09	90	70	41
Acifluorfen D4/Fluazifop-P D6	0.5/0.188	99	96	48

Table continued on next page.

Three species evaluation of the time of application effect on broadleaf and grass herbicide antagonism, Fargo (NW section 22), 1987. (continued)

Treatment*	Rate	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
	(lb/A)		(%)	
Desmedipham D5/Sethoxydim D6	0.75/0.1	58	46	56
Desmedipham D5/Sethoxydim D6	0.75/0.2	86	81	81
Desmedipham D5/Fluazifop-P D6	0.75/0.09	95	73	32
Desmedipham D5/Fluazifop-P D6	0.75/0.188	97	98	37
Bentazon D5/Sethoxydim D6	1/0.1	28	55	66
Bentazon D5/Sethoxydim D6	1/0.2	37	85	77
Bentazon D5/Fluazifop-P D6	1/0.09	97	84	13
Bentazon D5/Fluazifop-P D6	1/0.188	98	98	29
Acifluorfen D5/Sethoxydim D6	0.5/0.1	38	58	76
Acifluorfen D5/Sethoxydim D6	0.5/0.2	80	95	90
Acifluorfen D5/Fluazifop-P D6	0.5/0.09	92	76	36
Acifluorfen D5/Fluazifop-P D6	0.5/0.188	98	97	57
HIGH MEAN		99	99	95
LOW MEAN		3	3	2
EXP MEAN		73	79	55
C.V. %		11	10	14
LSD 5%		13	13	12
LSD 1%		17	17	16
# OF REPS		3	3	3

* BASF petroleum oil (Booster Plus E) was applied at 1 quart per acre with all treatments containing sethoxydim or fluazifop-P.

Summary

The control of one or more grass species by sethoxydim or fluazifop-P was antagonized by tank mixes with desmedipham, bentazon, or acifluorfen applied on day 6. Applying the grass herbicide 2 hours before or 1 day before the broadleaf herbicides generally eliminated significant antagonism. Grass control from fluazifop-P was not antagonized by broadleaf herbicides applied 1, 2, 3, or 5 days before fluazifop-P except that acifluorfen 2 days before fluazifop-P at 0.09 lb/A and desmedipham 2 days before fluazifop-P at 0.09 lb/A antagonized oats control. Grass control from sethoxydim generally was antagonized by broadleaf herbicides applied 1, 2, 3, or 5 days before sethoxydim.

<u>Three species evaluation of the effect of additives on grass herbicide antagonism, Fargo (NW section 22), 1987.</u> Siberian foxtail millet, Wheaton wheat, and Lyon oats were seeded in adjacent six foot strips across herbicide plots June 6. Herbicide treatments were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of 11 foot plots and across the three grass species before 4:30 pm June 30 when the air temp. was 80°F, soil temp. at six inches was 70°F, relative humidity was 32%, wind was east at 0-5 mph, sky was partly cloudy, soil was dry at 0-2 inches, and moist at 3-4 inches. Foxtail millet was 3-7 inches tall, oats was 5-11 inches tall, and wheat was 4-7 inches tall on June 30. Foxtail millet, oats, and wheat control were evaluated July 24.

Treatment*	Rate	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
	(lb/A)	----------	(%)	---------
Sethoxydim+OC	0.05+0.25G	17	18	91
Sethoxydim+OC	0.1+0.25G	65	77	97
Sethoxydim+OC	0.2+0.25G	91	97	99
Sethoxydim+Dash	0.05+0.25G	40	68	96
Sethoxydim+Dash	0.1+0.25G	82	97	97
Sethoxydim+Dash	0.2+0.25G	97	99	99
Sethoxydim+SFME	0.05+0.25G	33	75	96
Sethoxydim+SFME	0.1+0.25G	75	98	99
Sethoxydim+SFME	0.2+0.25G	99	99	99
Sethoxydim+OC+28% N	0.05+0.25G+1G	32	58	96
Sethoxydim+OC+28% N	0.1+0.25G+1G	77	92	98
Sethoxydim+OC+28% N	0.2+0.25G+1G	99	99	99
Sethoxydim+Dash+28% N	0.05+0.25G+1G	35	58	94
Sethoxydim+Dash+28% N	0.1+0.25G+1G	79	97	98
Sethoxydim+Dash+28% N	0.2+0.25G+1G	98	99	99
Sethoxydim+SFME+28% N	0.05+0.25G+1G	43	72	95
Sethoxydim+SFME+28% N	0.1+0.25G+1G	87	97	98
Sethoxydim+SFME+28% N	0.2+0.25G+1G	98	99	98
Desmedipham+Sethoxydim+OC	0.5+0.1+0.25G	58	40	68
Desmedipham+Sethoxydim+Dash	0.5+0.1+0.25G	70	65	74
Desmedipham+Sethoxydim+SFME	0.5+0.1+0.25G	77	65	73
Desm+Seth+OC+28% N	0.5+0.1+0.25G+1G	68	53	68
Desm+Seth+Dash+28% N	0.5+0.1+0.25G+1G	75	67	72
Desm+Seth+SFME+28% N	0.5+0.1+0.25G+1G	91	76	73
Bent+Acif+Seth+OC	0.63+0.25+0.1+0.25G	10	12	52
Bent+Acif+Seth+Dash	0.63+0.25+0.1+0.25G	48	66	79
Bent+Acif+Seth+SFME	0.63+0.25+0.1+0.25G	63	53	77
Bent+Acif+Seth+OC+28% N	0.63+0.25+0.1+0.25G+1G	52	33	72
Bent+Acif+Seth+Dash+28% N	0.63+0.25+0.1+0.25G+1G	93	88	78
Bent+Acif+Seth+SFME+28% N	0.63+0.25+0.1+0.25G+1G	92	93	80
BAS-51702+OC	0.025+0.25G	35	92	96
BAS-51702+OC	0.05+0.25G	86	99	98
BAS-51702+OC	0.1+0.25G	99	99	99
BAS-51702+Dash	0.025+0.25G	72	99	97
BAS-51702+Dash	0.05+0.25G	98	99	98
BAS-51702+Dash	0.1+0.25G	99	99	99
BAS-51702+SFME	0.025+0.25G	80	99	96
BAS-51702+SFME	0.05+0.25G	99	99	99
BAS-51702+SFME	0.1+0.25G	99	99	99

Table continued on next page.

Three species evaluation of the effect of additives on grass herbicide antagonism, Fargo (NW section 22), 1987. (continued)

Treatment*	Rate	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
	(lb/A)	----------	(%)	---------
BAS-51702+OC+28% N	0.025+0.25G+1G	42	96	93
BAS-51702+OC+28% N	0.05+0.25G+1G	96	99	99
BAS-51702+OC+28% N	0.1+0.25G+1G	99	99	99
BAS-51702+Dash+28% N	0.025+0.25G+1G	51	98	95
BAS-51702+Dash+28% N	0.05+0.25G+1G	92	99	99
BAS-51702+Dash+28% N	0.1+0.25G+1G	99	99	99
BAS-51702+SFME+28% N	0.025+0.25G+1G	89	99	96
BAS-51702+SFME+28% N	0.05+0.25G+1G	99	99	99
BAS-51702+SFME+28% N	0.1+0.25G+1G	99	99	99
Desm+BAS-51702+OC	0.5+0.05+0.25G	62	88	76
Desm+BAS-51702+Dash	0.5+0.05+0.25G	73	97	91
Desm+BAS-51702+SFME	0.5+0.05+0.25G	77	98	87
Desm+BAS-51702+OC+28% N	0.5+0.05+0.25G+1G	70	88	81
Desm+BAS-51702+Dash+28% N	0.5+0.05+0.25G+1G	78	99	93
Desm+BAS-51702+SFME+28% N	0.5+0.05+0.25G+1G	84	99	88
Bent+Acif+BAS-51702+OC	0.63+0.25+0.05+0.25G	25	60	69
Bent+Acif+BAS-51702+Dash	0.63+0.25+0.05+0.25G	43	85	88
Bent+Acif+BAS-51702+SFME	0.63+0.25+0.05+0.25G	55	94	84
Bent+Acif+BAS517+OC+28% N	0.63+0.25+0.05+0.25G+1G	25	43	72
Bent+Acif+BAS517+Dash+28%N	0.63+0.25+0.05+0.25G+1G	88	98	84
Bent+Acif+BAS517+SFME+28%N	0.63+0.25+0.05+0.25G+1G	98	99	88
Fluazifop-P+OC	0.09+0.25G	98	98	42
Fluazifop-P+OC	0.188+0.25G	99	99	82
Fluazifop-P+Dash	0.09+0.25G	93	97	32
Fluazifop-P+Dash	0.188+0.25G	99	99	75
Fluazifop-P+SFME	0.09+0.25G	94	99	23
Fluazifop-P+SFME	0.188+0.25G	99	99	75
Fluazifop-P+OC+28% N	0.09+0.25G+1G	99	98	40
Fluazifop-P+OC+28% N	0.188+0.25G+1G	99	99	76
Fluazifop-P+Dash+28% N	0.09+0.25G+1G	96	99	32
Fluazifop-P+Dash+28% N	0.188+0.25G+1G	99	99	65
Fluazifop-P+SFME+28% N	0.09+0.25G+1G	98	98	30
Fluazifop-P+SFME+28% N	0.188+0.25G+1G	99	99	61
Desmedipham+Flua-P+OC	0.5+0.09+0.25G	68	89	22
Desmedipham+Flua-P+Dash	0.5+0.09+0.25G	70	91	23
Desmedipham+Flua-P+SFME	0.5+0.09+0.25G	71	91	30
Desmedipham+Flua-P+OC+28% N	0.5+0.09+0.25G+1G	68	90	20
Desmedipham+Flua-P+Dash+28% N	0.5+0.09+0.25G+1G	75	93	28
Desmedipham+Flua-P+SFME+28% N	0.5+0.09+0.25G+1G	73	80	22
Bent+Acif+Flua-P+OC	0.63+0.25+0.09+0.25G	86	96	19
Bent+Acif+Flua-P+Dash	0.63+0.25+0.09+0.25G	80	98	22
Bent+Acif+Flua-P+SFME	0.63+0.25+0.09+0.25G	60	91	18
Bent+Acif+Flua-P+OC+28% N	0.63+0.25+0.09+0.25G+1G	60	80	18
Bent+Acif+Flua-P+Dash+28%N	0.63+0.25+0.09+0.25G+1G	77	91	48
Bent+Acif+Flua-P+SFME+28%N	0.63+0.25+0.09+0.25G+1G	83	90	49

Table continued on next page.

Three species evaluation of the effect of additives on grass herbicide antagonism, Fargo (NW section 22), 1987. (continued)

Treatment*	Rate (lb/A)	Wheat injury rating	Oats injury rating	Foxtail Millet injury rating
		----------	(%)	---------
HIGH MEAN		99	99	99
LOW MEAN		10	12	18
EXP MEAN		76	87	75
C.V. %		12	7	11
LSD 5%		15	9	14
LSD 1%		20	12	18
# OF REPS		3	3	3

* OC = BASF crop oil concentrate (Booster Plus E)
* SFME = Agsco Sun-It (sunflower methyl ester)
* 28% N = 28% N solution containing urea and NH_4NO_3

Summary

Sethoxydim at 0.05 or 0.1 lb/A + Dash or sunflower methyl ester gave control of oats superior to sethoxydim + oil concentrate. Sethoxydim at 0.05 or 0.1 lb/A + oil concentrate + 28% N gave control of oats superior to sethoxydim + oil concentrate. Addition of 28% N to treatments containing Dash or sunflower methyl ester did not improve oats control. BAS-51702 at 0.025 lb/A + Dash or sunflower oil gave control of wheat superior to BAS-51702 + oil concentrate. BAS-51702 at 0.025 lb/A + Dash + 28% N gave less wheat control than BAS-51702 + Dash. Fluazifop-P at 0.09 lb/A + sunflower methyl ester gave less foxtail millet control than fluazifop-P at 0.09 lb/A + petroleum oil. Desmedipham and bentazon + acifluorfen antagonized the control of one or more of the three bioassay species when tank mixed with sethoxydim or fluazifop-P regardless of additive. Desmedipham and bentazon + acifluorfen antagonized control of one or more of the three bioassay species when tank mixed with BAS-51702 except when sunflower methyl ester + 28% N was the additive.

Three species evaluation of broadleaf and grass herbicide combinations, Fargo (NW section 22), 1987. Lyon oats, Wheaton wheat, and Siberian foxtail millet were seeded in adjacent six foot strips across herbicide plots June 6. Treatments were applied in 8.5 gpa water at 40 psi to an 80 inch strip through the center of each 11 foot plot and across the three grass species before 2:00 pm July 2 when the air temp. was 74°F, soil temp. at six inches was 75°F, relative humidity was 66%, wind was northwest at 15-25 mph, sky was cloudy, soil was dry on the surface, moist at 1-2 inches, wet at 3-4 inches, foxtail millet were in the 6 leaf stage (8 inches tall), oats were in the 6 leaf stage (7.5 inches tall), and wheat had 5 leaves (6 inches tall). Foxtail millet, oats, and wheat control were evaluated July 24.

Treatment*	Rate (lb/A)	Wheat	Oats	Foxtail Millet
		(% injury)		
Sethoxydim+OC	0.1+0.25G	68	96	97
Bentazon+Sethoxydim+OC	1+0.1+0.25G	3	22	61
Desmedipham+Sethoxydim+OC	1+0.1+0.25G	67	59	68
Acifluorfen+Sethoxydim+OC	0.375+0.1+0.25G	83	91	78
Fomesafen+Sethoxydim+OC	0.25+0.1+0.25G	68	83	90
Lactofen+Sethoxydim+OC	0.25+0.1+0.25G	82	91	87
Bromoxynil+Sethoxydim+OC	0.25+0.1+0.25G	70	77	95
DPX-M6316+Sethoxydim+OC	0.015+0.1+0.25G	62	91	96
DPX-L5300+Sethoxydim+OC	0.015+0.1+0.25G	60	78	92
AC-263499+Sethoxydim+OC	0.06+0.1+0.25G	92	88	88
Clopyralid+Sethoxydim+OC	0.2+0.1+0.25G	72	94	96
MCPA(amine)+Sethoxydim+OC	0.25+0.1+0.25G	67	91	98
MCPA(ester)+Sethoxydim+OC	0.25+0.1+0.25G	90	98	98
Fluazifop-P+OC	0.1+0.25G	97	99	73
Bentazon+Fluazifop-P+OC	1+0.1+0.25G	96	97	47
Desmedipham+Fluazifop-P+OC	1+0.1+0.25G	97	94	38
Acifluorfen+Fluazifop-P+OC	0.375+0.1+0.25G	91	96	57
Fomesafen+Fluazifop-P+OC	0.25+0.1+0.25G	94	98	73
Lactofen+Fluazifop-P+OC	0.25+0.1+0.25G	96	96	61
Bromoxynil+Fluazifop-P+OC	0.25+0.1+0.25G	98	99	36
DPX-M6316+Fluazifop-P+OC	0.015+0.1+0.25G	99	99	58
DPX-L5300+Fluazifop-P+OC	0.015+0.1+0.25G	99	99	62
AC-263499+Fluazifop-P+OC	0.06+0.1+0.25G	98	92	90
Clopyralid+Fluazifop-P+OC	0.2+0.1+0.25G	99	99	54
MCPA(amine)+Fluazifop-P+OC	0.25+0.1+0.25G	98	98	48
MCPA(ester)+Fluazifop-P+OC	0.25+0.1+0.25G	99	99	54
DPX-Y6202-38+OC	0.05+0.25G	99	98	97
Bentazon+DPX-Y6202-38+OC	1+0.05+0.25G	98	98	97
Desmedipham+DPX-Y6202-38+OC	1+0.05+0.25G	93	67	61
Acifluorfen+DPX-Y6202-38+OC	0.375+0.05+0.25G	99	97	98
Fomesafen+DPX-Y6202-38+OC	0.25+0.05+0.25G	99	94	98
Lactofen+DPX-Y6202-38+OC	0.25+0.05+0.25G	98	82	95
Bromoxynil+DPX-Y6202-38+OC	0.25+0.05+0.25G	98	94	98
DPX-M6316+DPX-Y6202-38+OC	0.015+0.05+0.25G	99	99	98
DPX-L5300+DPX-Y6202-38+OC	0.015+0.05+0.25G	98	90	96
AC-263499+DPX-Y6202-38+OC	0.06+0.05+0.25G	99	76	89
Clopyralid+DPX-Y6202-38+OC	0.2+0.05+0.25G	99	99	99
MCPA(amine)+DPX-Y6202-38+OC	0.25+0.05+0.25G	98	42	92
MCPA(ester)+DPX-Y6202-38+OC	0.25+0.05+0.25G	99	68	98
Fenoxaprop+OC	0.1+0.25G	3	94	98
Bentazon+Fenoxaprop+OC	1+0.1+0.25G	0	35	81
Desmedipham+Fenoxaprop+OC	1+0.1+0.25G	55	60	65
Acifluorfen+Fenoxaprop+OC	0.375+0.1+0.25G	35	65	88

Table continued on next page.

Three species evaluation of broadleaf and grass herbicide combinations, Fargo (NW section 22), 1987. (continued)

Treatment*	Rate (lb/A)	Wheat	Oats	Foxtail Millet
		-------	(% injury)	-------
Fomesafen+Fenoxaprop+OC	0.25+0.1+0.25G	38	58	76
Lactofen+Fenoxaprop+OC	0.25+0.1+0.25G	27	60	94
Bromoxynil+Fenoxaprop+OC	0.25+0.1+0.25G	8	83	97
DPX-M6316+Fenoxaprop+OC	0.015+0.1+0.25G	0	96	97
DPX-L5300+Fenoxaprop+OC	0.015+0.1+0.25G	7	50	95
AC-263499+Fenoxaprop+OC	0.06+0.1+0.25G	87	83	87
Clopyralid+Fenoxaprop+OC	0.2+0.1+0.25G	7	90	97
MCPA(amine)+Fenoxaprop+OC	0.25+0.1+0.25G	0	35	87
MCPA(ester)+Fenoxaprop+OC	0.25+0.1+0.25G	0	67	97
BAS-51702+OC	0.05+0.25G	95	99	98
Bentazon+BAS-51702+OC	1+0.05+0.25G	20	62	52
Desmedipham+BAS-51702+OC	1+0.05+0.25G	95	94	87
Acifluorfen+BAS-51702+OC	0.375+0.05+0.25G	84	99	91
Fomesafen+BAS-51702+OC	0.25+0.05+0.25G	72	96	87
Lactofen+BAS-51702+OC	0.25+0.05+0.25G	86	96	95
Bromoxynil+BAS-51702+OC	0.25+0.05+0.25G	97	99	99
DPX-M6316+BAS-51702+OC	0.015+0.05+0.25G	97	99	98
DPX-L5300+BAS-51702+OC	0.015+0.05+0.25G	94	99	95
AC-263499+BAS-51702+OC	0.06+0.05+0.25G	99	99	97
Clopyralid+BAS-51702+OC	0.2+0.05+0.25G	97	99	99
MCPA(amine)+BAS-51702+OC	0.25+0.05+0.25G	93	98	98
MCPA(ester)+BAS-51702+OC	0.25+0.05+0.25G	99	99	99
RE-45601+OC	0.05+0.25G	96	99	98
Bentazon+RE-45601+OC	1+0.05+0.25G	43	59	55
Desmedipham+RE-45601+OC	1+0.05+0.25G	97	94	83
Acifluorfen+RE-45601+OC	0.375+0.05+0.25G	90	96	69
Fomesafen+RE-45601+OC	0.25+0.05+0.25G	83	98	85
Lactofen+RE-45601+OC	0.25+0.05+0.25G	92	98	88
Bromoxynil+RE-45601+OC	0.25+0.05+0.25G	96	99	92
DPX-M6316+RE-45601+OC	0.015+0.05+0.25G	98	99	88
DPX-L5300+RE-45601+OC	0.015+0.05+0.25G	98	99	85
AC-263499+RE-45601+OC	0.06+0.05+0.25G	98	98	95
Clopyralid+RE-45601+OC	0.2+0.05+0.25G	99	99	96
MCPA(amine)+RE-45601+OC	0.25+0.05+0.25G	99	99	89
MCPA(ester)+RE-45601+OC	0.25+0.05+0.25G	99	99	96
EXP MEAN		77	87	84
C.V. %		9	7	9
LSD 5%		12	9	13
LSD 1%		15	12	17
# OF REPS		3	3	3

* OC = BASF crop oil concentrate (Booster Plus E)

SUMMARY. The control of one or more of the three bioassay species was antagonized in several instances when the grass control herbicide was combined with a broadleaf control herbicide as compared to control from the grass control herbicide alone. Sethoxydim was antagonized by six, fluazifop-P by eight, DPX-Y6202-38 by five, fenoxaprop by ten, BAS-51702 by two, and RE-45601 by three of the twelve tested herbicides. None of the broadleaf control herbicides antagonized all the grass control herbicides. Clopyralid only antagonized foxtail millet control from fluazifop-P. MCPA amine frequently was more antagonistic than MCPA ester.

Evaluation of sulfometuron and other sulfonylurea herbicides for leafy spurge control. Lym, Rodney G. and Calvin G. Messersmith. Previous research at North Dakota State University has shown that sulfometuron delays, and sometimes stops, bud growth on leafy spurge roots. A herbicide that prevents or delays bud regrowth should improve long-term control since leafy spurge reestablishes by growth from the root buds following top growth control. The purpose of these experiments was to evaluate sulfometuron alone and in combination with auxin herbicides applied throughout the growing season for leafy spurge control. Also, DPX-L5300, chlorsulfuron, and fosamine were evaluated for leafy spurge control.

All herbicides were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 x 30 ft in a randomized complete block design. The sulfometuron experiment establishment dates in 1986 and leafy spurge growth stages were: June 5 near Hunter, ND, at the true flower stage; July 22 and August 27 near Chaffee, ND, at the mature seed and fall regrowth stages, respectively; September 3 near Valley City, ND, well branched and in the fall regrowth stage; and September 15 near Dickinson, ND, in the fall regrowth stage with most leaves chlorotic or bright red. As leafy spurge control declined, a retreatment of picloram at 4 oz/A was applied 12 months after the original treatment as a split-block treatment to the back one-third of each plot at Hunter and Chaffee. Evaluations were based on percent stand reduction as compared to the control.

No treatment applied in June near Hunter provided satisfactory leafy spurge control 2 months after treatment (MAT) (Table 1). There was 10% or less grass injury with all treatments. These plots were cultivated by the landowner and were not evaluated further. Similar sulfometuron plus auxin herbicide treatments applied in July near Chaffee provided 82 to 100% top growth control 1 MAT. Sulfometuron alone did not provide satisfactory leafy spurge control. When evaluated in May 1987, grass injury tended to increase as the sulfometuron rate increased and was higher when sulfometuron was applied with picloram or dicamba compared to sulfometuron alone. When evaluated in August 1987, control was similar when sulfometuron was applied either alone or with an auxin herbicide prior to the picloram retreatment (62%) compared to no prior treatment (48%), although there was a trend for improved control when a treatment preceded picloram application.

Leafy spurge control tended to be better when sulfometuron plus an auxin herbicide was applied in August or September (Table 2) compared to June or July (Table 1). However, grass injury also was higher. Long-term leafy spurge control tended to be higher as the sulfometuron rate increased up to 2 oz/A but the dicamba, 2,4-D, and picloram rate had little effect on control over the ranges evaluated. Sulfometuron + picloram at 2 + 8 to 16 oz/A provided the best long-term leafy spurge control 12 MAT (averaged 93% over the Valley City and Dickinson locations). However, grass injury averaged 42 and 77% 12 MAT at the two locations, respectively (Table 2).

DPX-L5300 alone or applied with 2,4-D or dicamba did not provide long-term leafy spurge control (Table 3). DPX-L5300 + picloram at 1 + 8 oz/A provided 77 and 21% leafy spurge control 3 and 12 MAT, respectively, averaged over locations and was similar to sulfometuron + picloram at 1 + 8 oz/A. However, no DPX-L5300 treatment injured grass. Chlorsulfuron applied with an auxin herbicide did not provide satisfactory leafy spurge control. Sulfometuron applied with amitrole, fluroxypyr, and picloram all resulted in similar leafy spurge control. Fosamine provided inconsistent leafy spurge control even when applied at 96 oz/A. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Leafy spurge control by sulfometuron with auxin herbicides applied in June at Hunter or July at Chaffee (Lym and Messersmith).

		Location and evaluation date						
		Hunter		Chaffee				
		Aug 86		Aug 86	May 87		Aug 87	
Treatment	Rate	Control	Grass injury	Control	Control	Grass injury	Control	Retreatment[a]
	(oz/A)	(%)						
Sulfometuron + picloram	0.25 + 4	19	10	..	..	..	..	..
Sulfometuron + dicamba	0.25 + 8	0	10	..	..	..	..	..
Sulfometuron + 2,4-D	0.5 + 8	5	0	..	..	..	..	..
Sulfometuron + picloram	0.5 + 8	41	0	100	40	11	15	52
Sulfometuron + dicamba	0.5 + 16	1	10	83	5	0	7	54
Sulfometuron + 2,4-D	1 + 8	0	10	97	18	3	8	53
Sulfometuron + picloram	1 + 8	40	10	99	60	20	16	54
Sulfometuron + picloram	1 + 16	9	0	..	..	..	..	..
Sulfometuron + dicamba	1 + 16	..	..	82	47	11	14	76
Sulfometuron + picloram	2 + 32	..	..	99	97	30	60	66
Sulfometuron + dicamba	2 + 128	..	..	100	96	49	59	69
Sulfometuron + picloram + 2,4-D	0.5 + 4 + 16	18	10	..	..	..	..	..
Sulfometuron	1	..	..	31	18	10	7	66
Sulfometuron	2	..	..	13	16	15	8	72
Control	0	0	0	0	0	0	0	48
LSD(0.05)		27	NS	15	32	21	22	NS

[a] Picloram at 4 oz/A applied as a split-block to the back one-third of each plot on June 29, 1987.

Table 2. Sulfometuron with auxin herbicides applied in August or September for leafy spurge control (Lym and Messersmith).

Treatment	Rate	Chaffee May 87 Control	Chaffee May 87 Grass injury	Chaffee Aug 87 Control	Valley City May 87 Control	Valley City May 87 Grass injury	Valley City Aug 87 Control	Dickinson June 87 Control	Dickinson June 87 Grass injury	Dickinson Sept 87 Control	Dickinson Sept 87 Grass injury
	(oz/A)	-----	-----	-----	-----	-----	(%)	-----	-----	-----	-----
Sulfometuron + 2,4-D	0.5 + 16	..	..	..	41	0	11	..	..	..	..
Sulfometuron + 2,4-D	0.5 + 32	..	..	..	57	0	9	55	61	23	33
Sulfometuron + picloram	0.5 + 8	89	35	15	96	7	39	..	..	..	..
Sulfometuron + picloram	0.5 + 12	..	..	..	98	3	68	97	71	67	26
Sulfometuron + picloram	0.5 + 16	..	..	..	99	4	81	..	..	..	..
Sulfometuron + dicamba	0.5 + 16	68	8	16	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	1 + 8	35	83	1	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	1 + 16	..	..	..	90	5	26	..	..	..	..
Sulfometuron + 2,4-D	1 + 32	..	..	..	93	6	41	..	..	..	..
Sulfometuron + picloram	1 + 8	95	46	32	99	8	85	..	..	..	..
Sulfometuron + picloram	1 + 12	..	..	..	99	6	88	..	..	..	..
Sulfometuron + picloram	1 + 16	..	..	..	99	8	86	..	..	..	..
Sulfometuron + dicamba	1 + 16	81	36	17	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	2 + 16	..	..	..	97	34	68	75	73	26	33
Sulfometuron + 2,4-D	2 + 32	..	..	..	99	29	73	78	70	29	33
Sulfometuron + picloram	2 + 8	..	..	..	99	49	97	95	89	83	60
Sulfometuron + picloram	2 + 12	..	..	..	99	41	95	99	94	90	80
Sulfometuron + picloram	2 + 16	..	..	..	99	37	98	99	98	93	91
Sulfometuron + picloram	2 + 32	94	56	70	..	..	..	..	..	..	..
Sulfometuron + dicamba	2 + 128	95	53	56	..	..	..	..	..	..	..
Picloram	16	..	..	..	99	0	63	..	..	..	..
Fosamine	64	43	15	9	..	..	..	..	..	..	..
Fosamine	96	56	13	20	..	..	..	..	..	..	..
LSD (0.05)		29	19	28	12	21	22	20	29	22	24

Table 3. DPX-L5300 and chlorsulfuron with auxin herbicides for leafy spurge control (Lym and Messersmith).

Treatment	Rate	Chaffee Aug 86 Leafy spurge	Chaffee Aug 86 Grass injury	Chaffee May 87 Leafy spurge	Chaffee Aug 87 Leafy spurge	Dickinson Sept 86 Leafy spurge	Dickinson June 87 Leafy spurge	Dickinson Aug 87 Leafy spurge
	(oz/A)	-----	-----	-----	(% control)	-----	-----	-----
DPX-L5300	1	0	0	0	0	21	0	0
DPX-L5300	2	0	0	0	0	8	0	0
DPX-L5300 + 2,4-D	1 + 16	3	0	0	0	42	3	0
DPX-L5300 + picloram	1 + 8	67	0	36	20	87	5	15
DPX-L5300 + dicamba	1 + 16	3	0	8	3	42	0	0
Chlorsulfuron + 2,4-D	0.5 + 16	0	0	0	0	57	0	0
Chlorsulfuron + picloram	0.5 + 8	42	10	9	0	63	3	10
Chlorsulfuron + dicamba	0.5 + 16	3	10	3	0	37	0	0
Sulfometuron + amitrole	1 + 32	11	20	6	0	27	6	6
Sulfometuron + fluroxypyr	1 + 16	49	40	30	12	97	15	0
Sulfometuron + picloram	1 + 8	59	30	40	13	..	..	..
Fosamine + X-77 surf.	32 + 0.5%	..	..	..	..	62	14	8
Fosamine + X-77 surf.	64 + 0.5%	..	..	..	..	10	11	0
Fosamine + X-77 surf.	96 + 0.5%	..	..	..	..	68	52	10
LSD (0.05)		18	18	21	11	40	12	NS

Sulfometuron applied alone and with auxin herbicides for leafy spurge control. Lym, Rodney G. and Calvin G. Messersmith. Sulfometuron is an analog of chlorsulfuron but with slightly less soil residual and a different weed control spectrum. Sulfometuron currently is used for grass suppression along roadsides and also has controlled some broadleaf weeds 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 severely infested with leafy spurge near Hunter, ND. 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. As leafy spurge control declined, a retreatment of picloram at 0.25 lb/A was applied on August 26, 1986, as a split-block treatment to the back one-third of each plot to evaluate sulfometuron as a pretreatment to picloram. Evaluations were based on percent stand reduction as compared to the control.

Leafy spurge growth stopped following application of sulfometuron alone, regardless of application date. Plants treated with sulfometuron alone in June were not controlled visibly but 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 the pink elongated buds on untreated 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 (Table). Leafy spurge control declined rapidly between the June and August 1986 evaulations.

Leafy spurge control increased to a maximum of 100% following retreatment with picloram at 0.25 lb/A (Table). Control averaged 81 and 67% in August 1987, when picloram was applied to plants originally treated with sulfometuron in the spring and fall, respectively. Control increased following the picloram retreatment as the sulfometuron rate increased following spring but not fall treatments. The best long-term control was sulfometuron spring-applied with either picloram or metsulfuron followed by the picloram retreatment which averaged 94 and 93%, respectively. The optimum herbicide application rates and date and the effectiveness of various retreatments must be evaluated further 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 58105).

Table. Leafy spurge control with sulfometuron applied either alone or with various auxin herbicides (Lym and Messersmith).

Application date/ treatment	Rate	Evaluation date Aug 1985	May 1986	Aug 1986	May 1987 Single	May 1987 Retreat.[a]	August 1987 Single	August 1987 Retreat.[a]
	(oz/A)	---------------------(% control)---------------------						
June 27, 1985								
Sulfometuron	1	0	6	0	0	87	5	63
Sulfometuron	1.5	0	63	25	12	88	17	85
Sulfometuron	2	0	36	6	3	87	10	82
Sulfometuron+2,4-D	1+16	95	76	26	8	84	24	64
Sulfometuron+dicamba	1+32	96	85	40	35	98	55	86
Sulfometuron+picloram	1+8	70	96	59	51	100	67	94
Sulfometuron+metsulfuron	2+0.5	0	60	24	0	98	5	93
Control	..	0	0	0	0	63	0	55
LSD (0.05)		25	22	26	25	31	20	31
September 4, 1985								
Sulfometuron	0.5	..	16	0	0	54	0	40
Sulfometuron	1	..	95	7	23	77	21	56
Sulfometuron+2,4-D	1+16	..	99	17	3	92	8	72
Sulfometuron+dicamba	1+32	..	97	23	15	91	13	73
Sulfometuron+picloram	1+8	..	99	74	33	83	38	83
Sulfometuron+2,4-D	0.5+16	..	95	24	21	87	26	62
Sulfometuron+dicamba	0.5+32	..	97	51	19	83	19	84
Sulfometuron+picloram	0.5+8	..	99	40	17	86	27	71
Sulfometuron+metsulfuron	2+0.5	..	88	13	0	83	0	62
DPX-L5300	1	..	44	6	4	76	4	49
Control	..	..	0	0	0	73	0	38
LSD (0.05)			26	30	36	29	32	NS

[a] Picloram at 0.25 lb/A applied as a split-block to the back one-third of each plot on August 26, 1986.

Fluroxypyr for leafy spurge control. Lym, Rodney G., and Calvin G. Messersmith. Fluroxypyr is a picolinic acid herbicide similar to picloram but with less soil residual and a different weed control spectrum. The purpose of this experiment was to evaluate fluroxypyr for leafy spurge control as a single application treatment, applied with auxin herbicides, and in a repetitive treatment program.

The experiment was established on a dense stand of leafy spurge near Dickinson, ND, on July 14, 1986. Previous research had indicated the optimum application time for leafy spurge control with fluroxypyr was post seed-set. The herbicides were applied using a tractor-mounted sprayer delivery 8.5 gpa at 35 psi. The retreatments were applied as a split-block treatment. The original whole plots were 15 x 56 ft and the retreatment subplots were 10 x 15 ft with three replications. Evaluations were based on percent stand reduction as compared to the control.

Fluroxypyr at 0.5 and 1 lb/A provided an average of 90 and 41% leafy spurge control 2 and 11 months after treatment (MAT), respectively (Table). Control was similar when fluroxypyr at 0.25 or 0.5 lb/A was applied alone or with dicamba, picloram, or 2,4-D. Picloram at 1 lb/A provided 73% leafy spurge control 11 MAT which was the expected level of control from this treatment based on long-term evaluations at North Dakota State University. No single treatment provided satisfactory control 14 MAT.

Leafy spurge control, when averaged over retreatments, increased to an average of 73% regardless of the original fluroxypyr treatment and was similar to the picloram treatments (Table). The best retreatments were picloram alone at 0.5 lb/A, picloram + fluroxypyr at 0.25 + 0.25 lb/A, and + picloram + 2,4-D at 0.25 + 1 lb/A which averaged 94, 89, and 86% control, respectively. In comparsion, fluroxypyr at 0.5 lb/A applied as a retreatment averaged only 69% control.

In general, fluroxypyr alone and applied with dicamba, picloram, and 2,4-D provided similar control to picloram + 2,4-D at 0.25 + 1 lb/A both in the year of treatment and following various retreatments (Table). For example, fluroxypyr at 0.5 lb/A applied twice provided 83% leafy spurge control compared to 89% with picloram + 2,4-D at 0.25 + 1 lb/A applied twice. The picloram + 2,4-D treatment was the most cost-effective treatment in a long-term leafy spurge research program conducted in North Dakota. Thus fluroxypyr applied once provided less leafy spurge control than picloram at similar rates, but fluroxypyr may be useful in a retreatment program especially in areas where picloram cannot be used. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table. Leafy spurge control with fluroxypyr alone and in combination with auxin herbicides (Lym and Messersmith).

Treatment	Rate	Evaluation date		Retreatment/rate (lb/A)/evaluated Sept 87							
		Sept 86	June 87	Fluro. 0.5	Pic. 0.25	Pic. 0.5	Fluro. + Pic. 0.25+0.25	Fluro. + Pic. 0.5+0.25	Pic.+ 2,4-D 0.25+1	Con-trol	Mean
	(lb/A)	(% control)									
Fluroxypyr	0.5	88	34	83	78	98	96	85	89	0	75
Fluroxypyr	1	92	47	70	88	89	87	78	86	13	73
Fluroxypyr+picloram	0.25+0.25	95	27	64	84	96	91	78	93	10	74
Fluroxypyr+picloram	0.5+0.25	98	40	63	71	98	93	87	94	16	74
Fluroxypyr+2,4-D	0.5+1	94	27	72	72	93	80	77	84	5	69
Fluroxypyr+dicamba	0.25+0.25	96	13	64	88	94	86	88	70	8	71
Picloram+2,4-D	0.25+1	99	25	79	91	97	85	77	89	3	75
Picloram	1	81	73	74	76	87	89	60	81	17	69
Control		0	0	51	68	96	90	56	86	0	64
Mean				69	80	94	89	76	86	8	
LSD (0.05)		13	28	whole plot = NS; subplots = 8; whole plot x subplot = 32							

Leafy spurge control under trees and along waterways. Lym, Rodney G. and Calvin G. Messersmith. Leafy spurge is difficult to control with herbicides near trees or open water such as ponds, ditches, and rivers because of potential damage to desirable vegetation or water contamination. However, these areas provide a constant source of seed for infestation of nearby and downstream areas if no control measures are initiated. The purpose of these experiments was to evaluate several herbicides for both leafy spurge control and potential to damage desirable vegetation.

Three experiments for leafy spurge control under trees were established in a shelter belt located in a waterfowl rest area near Valley City, ND. The plots were located in a dense stand of leafy spurge growing under mature ash and elm trees that had been planted five ft apart in 12-ft rows. The herbicides were applied either with a hand-held single-nozzle sprayer delivering 40 gpa or with the controlled droplet applicator (CDA) which applied approximately 4 gpa. The hand-held sprayer treatments were applied as a premeasured amount of herbicide:water per plot to assure the correct rate and three passes were made across each plot to assure adequate coverage. The CDA treatments covered each plot only once. The experiment starting dates and leafy spurge stage at treatment were: June 26, 1986, flowering and beginning seed set; September 3, 1986, post-seed set and chlorotic leaves; and June 16, 1987, yellow bract to flowering growth stage. There were four replications per treatment in a randomized complete block design and the plots were 12 by 24 ft. Evaluations were based on percent stand reduction as compared to the control.

Initial leafy spurge control was poor when glyphosate was applied alone, regardless of rate or treatment date (Table 1). Control improved to over 90% 12 months after treatment (MAT) following a June but not September application. Grass injury was nearly 100% with all glyphosate treatments.

Sulfometuron alone did not control leafy spurge satisfactorily (Table 1). However, control at 12 MAT increased by an average of 10 and 35% when applied with glyphosate in the spring and fall, respectively, compared to glyphosate alone. Leafy spurge control averaged 97% with sulfometuron + 2,4-D at 1 or 2 + 17 oz/A but grass injury was over 50%. Picloram, applied with the CDA at a picloram:water concentration of 1:7, provided nearly 100% leafy spurge control with no grass injury. Several ash trees had some leaf curling but no visible permanent damage from this treatment.

The experiment to evaluate leafy spurge control with herbicides that can be used near water was established on June 27, 1986 along a ditchbank in Fargo. The experimental design and application methods were similar to the tree experiment. All plots were treated with 2,4-D at 1 lb/A in June 1987 to control leafy spurge seedlings.

Amitrole at 4 lb/A provided 91 and 95% leafy spurge control 12 and 15 MAT, respectively, but there was 64% grass injury (Table 2). Increasing the application rate to 8 lb/A increased grass injury but not leafy spurge control. Unfortunately, amitrole is no longer cleared for use near water. Fosamine provided 90% leafy spurge control 12 MAT but also 57% grass injury. No other fosamine treatment provided satisfactory control and evaluations varied considerably from plot to plot indicating this herbicide may provide inconsistent control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Leafy spurge control under trees (Lym and Messersmith).

Application date and treatment	Rate	Aug 86 Control	May 87 Control	May 87 Grass injury	Aug 87 Control	Aug 87 Grass injury
	(oz/A)	(% control)				
June 26, 1986						
Glyphosate	8.5	9	92	88	79	..
Glyphosate	17	41	96	98	94	..
Sulfometuron	0.5	15	0	0	29	..
Sulfometuron	1	9	0	0	19	..
Sulfometuron	2	9	28	15	19	..
Sulfometuron +glyphosate	0.5 + 8.5	13	98	98	90	..
Sulfometuron +glyphosate	1 + 8.5	13	96	99	95	..
Sulfometuron +glyphosate	2 + 8.5	24	99	96	85	..
Picloram (CDA)	1:7[a]	99	95	0	85	..
LSD (0.05)		19	8	14	23	
September 3, 1986						
Glyphosate	17	..	65	99	54	..
Sulfometuron +glyphosate	2 + 17	..	99	99	89	..
Sulfometuron +2,4-D	2 + 17	..	69	66	51	..
Picloram (CDA)	1:7[a]	..	86	9	66	..
LSD (0.05)			26	17	31	
June 16, 1987						
Glyphosate	8.5	..	..	..	13	98
Glyphosate	17	..	..	..	30	98
Sulfometuron +glyphosate	0.5 + 8.5	..	..	..	9	83
Sulfometuron +glyphosate	1 + 8.5	..	..	..	12	86
Sulfometuron +glyphosate	2 + 8.5	..	..	..	36	76
Sulfometuron + 2,4-D	1 + 17	..	..	..	95	48
Sulfometuron + 2,4-D	2 + 17	..	..	..	99	63
Picloram (CDA)	1:7[a]	..	..	..	96	0
LSD (0.05)					12	25

[a] Solution concentration picloram (Tordon 22K):water.

Table 2. Leafy spurge control along ditchbanks (Lym and Messersmith).

Treatment	Rate	Control Aug 86 Control	Control May 87 Control	Control May 87 Grass injury	Control Aug 87 Control
	(lb/A)	-----	-----	(%)	-----
Amitrole	2	99	69	23	80
Amitrole	4	100	91	64	95
Amitrole	8	100	87	81	96
Fosamine	2	5	14	3	59
Fosamine	4	19	58	10	55
Fosamine	8	40	90	57	82
LSD (0.05)		19	17	42	28

<u>Picloram and 2,4-D combination treatments for long-term leafy spurge management</u>. 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 seven picloram and picloram plus 2,4-D treatments and 13 2,4-D treatments, while the Valley City site has received six and 12 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, 0.38 and 0.5 lb/A provided 49, 69 and 77% leafy spurge control, respectively, 60 months after treatment (Table). Control had declined by approximately 9% compared to the previous year. 2,4-D alone provided an average of 47% control of leafy spurge after biannual applications for 6 years.

Leafy spurge control 60 months after treatment increased by an average of 26, 16, and 13% when 2,4-D at 1 to 2 lb/A was applied with picloram at 0.25, 0.38, or 0.5 lb/A respectively, when compared to the same picloram rate applied alone. Picloram at 0.5 lb/A plus 2,4-D provided an average of 90% leafy spurge control but had declined slightly compared to the previous year. 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 and 1987 compared to 1985 which probably was due to above average precipitation and excellent growing conditions in 1986 following several years of below average precipitation.

Picloram at 0.5 lb/A alone and all picloram at 0.38 or 0.5 lb/A plus 2,4-D treatments are near or have reached the target of 90% or better 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. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

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 (Lym and Messersmith).

		Site and 1987 evaluation date								
		Dickinson		Valley City		Months after treatment				
Herbicide	Rate	June	Sept	May	Aug	12[a]	24	36	48	60
	(lb/A)	(% control)								
Picloram	0.25	51	30	48	61	39	48	48	58	49
Picloram	0.38	65	51	74	79	65	62	52	77	69
Picloram	0.5	76	63	77	78	65	71	81	86	77
2,4-D bian	1	55	30	24	25	22	30	38	50	39
2,4-D bian	1.5	48	27	48	42	22	24	26	45	49
2,4-D bian	2	54	24	55	27	19	30	26	54	54
Pic+2,4-D	0.25+1	79	79	67	94	52	66	63	85	73
Pic+2,4-D	0.25+1.5	81	84	74	85	58	66	70	85	77
Pic+2,4-D	0.25+2	75	62	76	90	57	62	66	83	76
Pic+2,4-D	0.38+1	79	73	90	91	69	72	70	90	84
Pic+2,4-D	0.38+1.5	85	81	84	92	68	74	76	93	84
Pic+2,4-D	0.38+2	82	85	90	95	68	59	76	91	86
Pic+2,4-D	0.5+1	82	81	92	99	71	75	84	94	87
Pic+2,4-D	0.5+1.5	86	89	97	96	64	73	80	97	91
Pic+2,4-D	0.5+2	86	87	96	98	76	75	81	95	91
LSD (0.05)		20	19	20	19	18	14	19	14	14

[a] Mean values through 48 months after treatment include data from the Sheldon location which was discontinued after 1985.

Leafy spurge control following an eight-year management program. 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 as liquid and picloram as liquid (2S) and granular (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 because 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 (see Table). A carpet applicator was substituted for the roller applicator. 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 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 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 through 1987. 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 for 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. Even though the plants were not mowed after 1984, the control in 1987 averaged 15% higher for spring- compared to fall-applied treatments, respectively. There was a 23% difference between the two averages in 1986 (data not shown). Thus, control from the fall-applied treatment is gradually increasing.

Picloram (2S) at 1 and 2 lb/A had provided the best long-term leafy spurge control regardless of retreatment in previous evaluations (Table). However, picloram at 1 and 2 lb/A without an annual retreatment (i.e. retreatment control) only provided 27% control when averaged over rate and application date in 1987 but control increased to 84 and 59% for spring and fall, respectively, when averaged over annual retreatments with dicamba at 2 lb/A and picloram + 2,4-D at 0.25 + 1 lb/A. 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 4% control, but control increased to 80 and 96% with retreatments of dicamba at 2 lb/A or picloram + 2,4-D at 0.25 + 1 lb/A, respectively (Table). Leafy spurge control from fall-applied dicamba at 8 lb/A also averaged 4% and increased to an average of 68% following retreatments of dicamba at 2 lb/A and 50% following retreatments of picloram at 0.25 lb/A or picloram + 2,4-D at 0.25 + 1 lb/A.

Annual application of 2,4-D, the most economical treatment in the study, provided 3 and 22% leafy spurge control as a fall- and spring-applied treatments, respectively (Table). Leafy spurge control was increased to 96% 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 31% control.

The annual retreatments averaged across all whole plot treatments, that provided the highest leafy spurge control was picloram + 2,4-D at 0.25 + 1 lb/A in the spring (93%) and dicamba at 2 lb/A in the fall (69%) (Table). Annual retreatments of dicamba at 1 lb/A averaged only 38 and 45% leafy spurge control as a spring- or fall- applied treatment averaged over whole plot treatments, respectively. Leafy spurge control was increased 31% 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 retreatments 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 (i.e., carpet, pipewick, roller) 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 7 yr after the initial treatment, but no treatment program had eradicated leafy spurge. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table. Leafy spurge control in North Dakota following an eight-year management program (Lym and Messersmith).

Whole plot: Treatment[a] 1980	Rate (lb/A)	Soln conc (lb/gal)	Treatment[a] 1982	Rate (lb/A)	Soln conc[b] (lb/gal)	Retreatment subplot 1981, 1983-87/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	22	40	64	55	96	0	47
Picloram 2%G	1.0	--	Picloram (carpet-2 pass)	--	0.25	72	20	70	69	96	0	54
Picloram 2%G	2.0	--	Picloram (wick-2 pass)	--	0.5	81	45	79	75	98	59	73
Picloram 2S	1.0	0.13	Picloram 2S	1.0	0.13	73	29	87	65	89	23	61
Picloram 2S	2.0	0.25	Picloram 2S[b]	2.0	0.25	59	72	73	68	95	15	64
Picloram (Roller)	--	0.25	Picloram (carpet)	--	0.25	48	25	80	42	93	5	49
Picloram+oil conc. (Roller)	--	0.25	Picloram (carpet)	--	0.25	49	53	77	79	97	23	63
Picloram (Wick)	--	0.5	Picloram (wick)	--	0.5	13	14	60	30	83	0	33
Picloram+oil conc. (Wick)	--	0.5	Dicamba	8.0	1.0	57	42	80	67	96	4	57
Control	--	--	Control	--	--	20	28	65	63	95	0	39
Mean						51	38	74	62	93	13	55
LSD (0.05): whole plot = 13; subplot = 10; whole plot x subplot = 30.												
Fall applied												
2,4-D	2.0	0.24	2,4-D	2.0	0.24	3	27	53	42	31	0	26
Picloram 2%G	1.0	--	Picloram (carpet-2 pass)	--	0.25	6	56	75	39	63	7	41
Picloram 2%G	2.0	--	Picloram (wick-2 pass)	--	0.5	19	44	57	57	48	14	40
Picloram 2S	1.0	0.13	Picloram 2S	1.0	0.13	15	46	75	45	48	26	43
Picloram 2S	2.0	0.25	Picloram 2S[b]	2.0	0.25	28	65	80	60	70	44	58
Picloram (Roller)	--	0.25	Picloram (carpet)	--	0.25	9	28	69	47	42	8	34
Picloram+oil conc. (Roller)	--	0.25	Picloram (carpet)	--	0.25	38	60	82	56	66	24	54
Picloram (Wick)	--	0.5	Picloram (wick)	--	0.5	8	41	70	44	30	14	34
Picloram+oil conc. (Wick)	--	0.5	Dicamba	8.0	1.0	11	41	68	54	46	4	37
Control	--	--	Control	--	--	0	42	62	40	36	0	31
Mean						14	45	69	48	48	15	40
LSD (0.05): whole plot = 17; subplots = 14; whole plot x subplot = 28.												

[a] Spray applied except the treatments identified as roller, wick or carpet applicator applied.
[b] Applied to control subplot only.

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 in June 1984 at Dickinson, Hunter, and Valley City, and the fall treatments were applied in September 1984 at Valley City and the Sheyenne National Grasslands near McLeod. 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 treatments were applied annually in June in 1984 through 1987. The fall treatments were applied in September 1984 and 1985, but discontinued thereafter. 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 three 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 for spring- but not for 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. Thus, the fall treatments were discontinued.

Leafy spurge control generally was greater 36 months after the initial treatment than 24 months at Hunter and Valley City, but not Dickinson (Table). The reason for poor control at Dickinson compared to the other locations is not known. A similar experiment, begun in 1981 at Dickinson, resulted in annual increases in leafy spurge control. Dickinson has received above average precipitation for the last 36 months and the leafy spurge may be growing more vigorously than previously.

Leafy spurge control 36 months after treatment averaged 10, 40, 67 and 78% with picloram alone at 0.12, 0.25, 0.38 and 0.5 lb/A, respectively, and control increased slightly when picloram was applied with 2,4-D to an average of 22, 46, 66 and 89%, respectively. This increase is much less than previously reported when 2,4-D at 1 to 2 lb/A was applied with picloram. The 2,4-D application rate did not affect leafy spurge control; control averaged 56% over the picloram treatments regardless of the 2,4-D rate.

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 in 1987 from annual picloram or picloram plus 2,4-D amine treatments spring or fall applied since 1984 at four locations in North Dakota (Lym and Messersmith).

		Application time/location/evaluation date													
		Spring								Fall					
		Hunter-1987		Dickinson-1987		Valley City-1987		Mean[a]		Sheyenne-1987		Valley City 1986/1987			
Treatment	Rate	May 29	Aug 21	June 2	Sept 9	May 28	Aug 20	1986	1987	May 30	Aug 24	June 3	Aug 20	May 20	Mean[b]
	(lb/A)	(% control)													
Picloram	0.12	2	3	3	4	18	55	2	10	42	0	3	0	1	0
Picloram	0.25	17	27	6	13	62	62	28	40	67	0	25	1	0	1
Picloram	0.38	64	67	31	29	70	81	63	67	74	9	56	3	2	6
Picloram	0.5	74	79	9	33	81	82	67	78	89	16	92	38	43	27
Picloram+2,4-D	0.12+0.12	3	22	6	21	40	57	30	22	72	0	32	8	17	4
Picloram+2,4-D	0.12+0.25	3	12	3	6	24	55	4	14	62	8	12	0	0	4
Picloram+2,4-D	0.12+0.5	7	10	13	23	54	61	10	31	67	2	7	0	0	1
Picloram+2,4-D	0.25+0.12	40	73	10	20	67	70	26	54	70	5	19	1	0	3
Picloram+2,4-D	0.25+0.25	42	55	28	45	44	71	21	43	64	0	18	1	0	1
Picloram+2,4-D	0.25+0.5	30	25	22	29	51	73	29	41	58	2	35	6	6	4
Picloram+2,4-D	0.38+0.12	45	69	13	27	64	81	50	55	81	15	56	11	14	13
Picloram+2,4-D	0.38+0.25	84	87	22	40	73	82	70	79	75	6	48	3	4	4
Picloram+2,4-D	0.38+0.5	52	44	36	64	80	88	63	66	89	18	64	3	4	10
Picloram+2,4-D	0.5+0.12	94	92	40	54	92	86	87	93	78	15	75	8	8	11
Picloram+2,4-D	0.5+0.25	87	90	27	66	85	83	74	86	93	22	89	18	19	20
Picloram+2,4-D	0.5+0.5	79	80	40	73	95	94	80	87	94	18	81	15	7	17
Picloram+2,4-D	0.25+1.0	22	40	23	43	73	82	46	48	92	12	63	6	7	9
LSD (0.05)		26	31	18	23	30	19	23	20	28	NS	31	15	18	11

[a] Average control at Hunter and Valley City 24 and 36 months following the original 1984 treatment date.
[b] Average control 24 months following the original 1984 treatment date, fall treatments discontinued after 1985.

Leafy spurge control with picloram plus dicamba or various 2,4-D formulations. 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 picloram + 2,4-D at 0.25 + 1.0 lb/A applied annually to be more cost effective than picloram at 1 to 2 lb/A applied once. The purpose of these experiments was to compare the effect of dicamba and/or various 2,4-D formulations applied with picloram for leafy spurge control.

The initial 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 2,4-D mixed amine provided better leafy spurge control than picloram + 2,4-D alkanolamine (Table 1). Leafy spurge control from picloram + 2,4-D mixed amine at 0.25 + 1 lb/A was similar to control from picloram at 0.5 lb/A alone but picloram + 2,4-D is 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.

Picloram + dicamba + 2,4-D mixed amine provided 72% leafy spurge control 2 years after application at Hunter (Table 1). This level of control was similar to that attained with picloram at 2 lb/A in North Dakota but is 70% less expensive. Therefore, similar experiments were begun in 1986 to evaluate this combination treatment further. Experiments were established on June 11 and 18, near Dickinson and Valley City, respectively, and on August 28 on the Sheyenne National Grasslands and September 3 and 15 near Valley City and Dickinson, respectively.

Leafy spurge control was much lower at Dickinson than at Valley City or Sheyenne regardless of treatment (Table 2). The plots near Dickinson were on an abandoned mine site with a very dense leafy spurge stand. The soil drains quickly and generally was much drier than nearby areas. The combination of a dense stand and poor growing conditions may account for the poor leafy spurge control from both spring- and fall-applied treatments.

In general, leafy spurge control was similar with all 2,4-D formulation combinations in experiments begun in 1986 (Table 2). No treatment provided the long-term control obtained with the picloram + dicamba + 2,4-D mixed amine treatment applied at Hunter in 1985 (Table 1). Previous research at North Dakota State University has shown that the benefit of applying 2,4-D with picloram may not be apparent after one application. Likewise, subtle but consistent differences in control due to 2,4-D formulation may take several years to become obvious. Therefore, these treatments were reapplied in 1987 to evaluate the long-term effect of picloram combined with various 2,4-D formulations and dicamba on leafy spurge control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo.)

Table 1. Leafy spurge control with picloram applied with various formulations of 2,4-D (Lym and Messersmith).

Location/ application date Treatment	Rate	Months after treatment				
		3	12	15	24	27
	(lb/A)	(% control)				
Sheyenne, June 1984						
Picloram	0.25	76	23	4	1	..
Picloram	0.5	95	75	43	10	..
Picloram+2,4-D alkanolamine	0.25+1	78	14	6	3	..
Picloram+2,4-D mixed amine[a]	0.25+1	94	72	23	21	..
2,4-D mixed amine[a]	4	47	7	13	0	..
2,4-D alkanolamine	4	42	20	7	5	..
LSD (0.05)		15	25	15	12	
Hunter, June 1985						
Picloram+dicamba +2,4-D mixed amine[a]	0.25+1+2	99	98	89	72	60
Picloram+dicamba +2,4-D alkanolamine	0.25+1+2	51	51	25	25	18
2,4-D mixed amine[a]	4	6	3	0	0	0
2,4-D alkanolamine	4	5	0	0	0	0
Picloram+dicamba	0.25+1	53	38	15	0	7
LSD (0.05)		15	15	15	15	20

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

Table 2. Leafy spurge control with picloram applied with dicamba and various formulations of 2,4-D (Lym and Messersmith).

Original application date / Treatment	Rate (lb/A)	Valley City 3/9	Valley City 12	Valley City 15[a]	Dickinson 3/9	Dickinson 12	Dickinson 15	Sheyenne 9	Sheyenne 12
		(% control)							
Spring 1986									
2,4-D mixed amine[b]+ picloram+dicamba	2+0.25+1	43	7	52	3	3	46	..	..
2,4-D mixed amine[b]+ picloram+dicamba	2+0.25+0.5	78	24	63	10	3	28	..	..
2,4-D mixed amine[b]+ picloram +dicamba	1+0.12+0.5	37	5	49	11	7	23	..	..
2,4-D alkanolamine[c]+ picloram+dicamba	2+0.25+1	59	8	75	10	6	45	..	..
Picloram+dicamba	0.25+1	83	9	73	16	6	38	..	..
LSD (0.05)		40	19	43	NS	NS	NS		
Fall 1986									
2,4-D mixed amine[b]+ picloram+dicamba	2+0.25+1	95	40	..	33	1	..	89	31
2,4-D alkanolamine[c]+ picloram+dicamba	2+0.25+1	93	24	..	..	..	..	92	49
2,4-D mixed amine[b]+ picloram+dicamba	4+0.5+2	99	80	..	61	12	..	95	56
2,4-D ester[d]+2,4-DP +dicamba+picloram	2+2+0.5+0.25	89	10	..	36	3	..	94	40
2,4-D ester[d]+2,4-DP +dicamba+picloram	2+2+0.5+0.5	99	54	..	50	6	..	98	71
2,4-D alkanolamine[c]+ picloram+dicamba	4+0.5+2	97	36	..	60	8	..	96	55
Picloram+dicamba	0.5+2	98	45	..	76	18	..	94	58
Picloram	0.5	95	35	..	32	0	..	96	47
LSD (0.05)		5	31		NS	NS		8	NS

[a] Treatments reapplied June 1987.

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

[c] 2,4-D alkanolamine.

[d] 2,4-D isooctyl ester:2,4-DP butoxyethanol ester:dicamba (4:4:1)-EH680.

Spring or fall applied granular picloram and dicamba for leafy spurge control. 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 were 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 generally poor long-term control despite adequate moisture in 1985. Picloram at 2 lb/A maintained an average of 92 and 70% control 36 months after treatment as a spring and fall applied treatment, respectively, regardless of formulation.

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% pellets or when the number of 10% 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	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	99	98	90	53	85	72	56	62	28	100	100	99	100	100	98	93	86	68	63
Dicamba 5%G	4	74	55	9	3	4	0	4	0	0	94	74	43	31	31	29	18	20	17	9
Dicamba 5%G	6	82	54	25	3	16	5	4	3	1	96	99	89	58	55	55	41	40	22	6
Dicamba 5%G	8	91	75	45	19	29	6	5	6	0	99	100	98	83	84	78	66	67	39	20
Picloram 2S	2	100	99	98	90	94	79	64	71	54	100	100	100	100	98	94	79	78	50	28
Dicamba 4S	8	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	Sheldon 1983 June	Sheldon 1983 Aug	Sheldon 1984 June	Sheldon 1984 Aug	Sheldon 1985 June	Sheldon 1985 Aug	Dickinson 1983 June	Dickinson 1983 Aug	Dickinson 1984 June	Dickinson 1984 Aug
	(lb/A)	(% control)									
Applied Fall 1982											
2%G+blanks	0.5	66	26	8	21	11	16	38	5	18	5
2%G+blanks	1	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	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	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	87	63	77	56	65	45	89	40	75	64
10%G	1	53	26	11	13	18	13	--	--	--	--
10%G	2	89	61	45	45	52	57	--	--	--	--
Liquid (2S)	2	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	--	38	58	13	55	14	--	57	53	43
2%G+blanks	1.5	--	86	95	36	92	50	--	62	83	60
2%G	2	--	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	--	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	--	92	92	56	92	56	--	63	76	70
Liquid (2S)	2	--	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	1984 Aug	1985 June	1985 Aug	1986 June	1986 Aug	1987 May	1987 Aug	1984 Aug	1985 June	1985 Sept
	(lb/A)	(% control)									
Applied Spring 1984		Sheyenne							Dickinson		
2%G	0.5	83	89	53	56	34	27	37	0	0	0
2%G	1	96	99	83	79	54	51	48	38	48	8
2%G	1.5	96	100	97	95	91	79	73	43	62	13
2%G	2	98	100	98	98	94	94	86	83	88	53
10%G	0.5	64	75	19	4	4	4	2	3	0	4
10%G	1	95	99	84	86	82	68	58	31	43	23
10%G	1.5	97	99	94	93	86	68	59	56	45	16
10%G	2	97	99	94	94	86	91	76	72	56	31
Liquid (2S)	2	98	100	99	98	94	92	76	98	80	28
LSD (0.05)		8	10	16	17	24	27	28	23	24	21
Applied Fall 1984											
2%G	0.5	--	94	57	76	7	4	4	--	71	16
2%G	1	--	100	91	91	74	64	71	--	85	39
2%G	1.5	--	100	96	98	83	77	79	--	97	56
2%G	2	--	100	97	97	86	76	67	--	98	81
10%G	0.5	--	82	42	43	6	9	1	--	46	15
10%G	1	--	96	81	66	52	33	33	--	79	36
10%G	1.5	--	99	91	89	81	64	72	--	91	45
10%G	2	--	99	91	96	73	68	70	--	95	68
Liquid (2S)	2	--	100	99	97	88	74	73	--	99	47
LSD (0.05)		--	6	16	14	26	28	24	--	9	17

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, 1986, and 1987. 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 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 ae, picloram = $40.00/lb ae, and application = $2.05/A. The cost of treatments applied in fall 1987 is not subtracted from the net return.

Most treatments resulted in less economic gain at Dickinson than Valley City despite excellent leafy spurge control from several treatments. Dickinson generally receives 5 to 6 inches less precipitation annually than Valley City. Total forage production averaged after 4 yr across all treatments was 4820 lb/A at Dickinson and 7968 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, 2,4-D provided short term control resulting in an economic gain of $82/A and $57/A at Valley City and of $35/A and $45/A at Dickinson 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 76% in 1987 (Table) as a spring applied treatment which was an increase from 44% control in 1985 (data not shown). Above average precipitation was received at both locations in 1986 allowing vigorous leafy spurge regrowth. Leafy spurge control was poor with picloram + 2,4-D at 0.25 + 1 lb/A fall applied, but forage production (averaged across locations) of 6190 lb/A was only slightly less than the spring average of 6867 lb/A.

Picloram at 2 lb/A spring applied provided 83% leafy spurge control at Valley City 48 months after application but only 64% control 15 months after a second application at Dickinson (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 (Lym and Messersmith).

Original treatment date: Herbicide	Rate (lb/A)	Re-treatment time: Herbicide	Rate (lb/A)	Year	Cost ($/A)	1987 Control June (%)	1987 Control Aug (%)	Yield[a] Forage (lb/A)	Yield[a] Leafy spurge (lb/A)	Utilization (AUD)	Total net return[b] ($/A)
								Valley City			
Spring 1984		**Spring**									
2,4-D	2	2,4-D	2[c]	84-87	24	10	18	7089	3676	177	82
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-87	56	59	86	8143	1936	204	66
Picloram	2	...	...	...	82	84	83	9073	1417	227	54
Dicamba	8	Dicamba	8[d]	85,86	288	86	63	8740	1918	219	-157
Fall 1983		**Fall**									
2,4-D	2	2,4-D	2[c]	84-87	24	3	0	5424	5155	136	57
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-87	56	93	16	8096	2918	202	65
Picloram	2	Picloram	2[d]	85	164	100	99	9142	261	229	-27
Dicamba	8	Dicamba	8[d]	86	192	99	88	8680	688	217	-27
		Control				0	0	7321	6053	0	
LSD (0.05)						15	10	1843	1624		
								Dickinson			
Spring 1984		**Spring**									
2,4-D	2	2,4-D	2[c]	84-87	24	9	18	3934	472	98	35
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-87	56	63	65	5591	146	142	28
Picloram	2	Picloram	2[d]	86	164	96	64	5917	108	148	-75
Dicamba	8	Dicamba	8[d]	85,86	288	77	49	4601	210	115	-219
Fall 1983		**Fall**									
2,4-D	2	2,4-D	2[b]	84-87	24	11	4	4585	1350	115	45
Picloram + 2,4-D	0.25 +1	Picloram + 2,4-D	0.25 +1[c]	84-87	56	34	8	4283	1329	107	8
Picloram	2	Picloram	2[d]	86	164	99	85	5445	54	136	-82
Dicamba	8	Dicamba	8[d]	85,86	288	97	82	5277	57	132	-209
		Control				0	0	3749	2417	0	
LSD (0.05)						11	12	1063	687		

[a] Total production of 1984 through 1987 harvest.
[b] Total net return for 1984 through 1987. Fall 1987 treatment cost is not subtracted from net return.
[c] Annual retreatment.
[d] Applied when control declines to less than 70%.

<u>Experimental herbicides in no-till corn, Minot, 1987.</u> Early preplant treatments were applied April 22, 1987, preemergence treatments were applied May 6, and postemergence treatments were applied June 5. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Pioneer 3953 seed corn was planted 1 to 1.5 inches deep into flax stubble at 21,000 seeds per acre on May 5. Soil type was a loam with pH of 6.6 and organic matter of 3.4%. Weed stages were as follows: no weeds emerged on April 22 or at planting time; on June 5, foxtail (mostly green foxtail) was 1 to 2-leaf and 1 inch tall, and corn was 2 to 3-leaf and 4 to 5 inches tall. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate	Corn injury	Foxtail control
	(lb/A)	------(%)	------
SC-0774+R-29148+Atra+Cyan+X77(EPP)	0.75+0.125+0.5+1+0.5%	0	86
SC-0774+R-29148+Atra+Cyan+X77(EPP)	1+0.17+0.5+1+0.5%	0	89
SC-0774+R-29148+Atra+Cyan+X77(EPP)	1.25+0.21+0.5+1+0.5%	0	93
SC-0774+R-29148+Atrazine+Cyanazine(Pre)	0.75+0.125+0.5+1	0	78
SC-0774+R-29148+Atrazine+Cyanazine(Pre)	1+0.17+0.5+1	0	85
SC-0774+R-29148+Atrazine+Cyanazine(Pre)	1.25+0.21+0.5+1	0	91
Metolachlor+Atrazine+Cyanazine+X77(EPP)	2+0.5+1+0.5%	0	56
Metolachlor+Atrazine+Cyanazine(Pre)	2+0.5+1	0	73
Alachlor-MT+Atrazine+Cyanazine+X77(EPP)	2+0.5+1+0.5%	0	30
Alachlor-MT+Atrazine+Cyanazine(Pre)	2+0.5+1	0	56
SC-0735+R-29148+Atra+Cyan+X77(EPP)	0.75+0.125+0.5+1+0.5%	0	91
SC-0735+R-29148+Atrazine+Cyan(Pre)	0.5+0.083+0.5+1	0	75
SC-0735+R-29148+Atrazine+Cyan(Pre)	0.75+0.125+0.5+1	0	92
SC-0735+R-29148(Pre)	0.75+0.125	0	60
SC-0735+Atrazine+Tween20(Po)	0.25+1+0.25%	0	62
SC-0735+Atrazine+Tween20(Po)	0.375+1+0.25%	0	71
Tridiphane+Atrazine+SO(Po)	0.75+1+0.25%	0	21
EPTC&R-29148-M+Atrazine(Pre)	4+0.75	0	13
EPTC&R-29148-M+Atrazine(Pre)	6+0.75	0	44
EPTC&R-29148-M+Atrazine(EPP)	6+0.75	0	27
EPTC&R-29148-M(Pre)	4	0	9
EPTC&R-29148-M(Pre)	6	0	20
Atra&PPG-1259+Metolachlor(Pre)	0.75&0.15+2	0	59
PPG-1259+Cyanazine+Metolachlor(Pre)	0.15+1.5+2	0	84
PPG-1259+Cyanazine+Metolachlor(Pre)[2]	0.15+1.5+2	0	85
PPG-1259+Metribuzin+Metolachlor(Pre)	0.15+0.25+2	0	66
Control [Glyt+X77+AS(Pre)]	0 [0.38+0.5%+2.5]	0	0
C.V. %		0	23
LSD 5%		NS	19
# of reps		4	4

[1] All plots received glyphosate plus X77 plus ammonium sulfate (0.375 + 0.5% + 2.5 lb/A) at planting time as a tank mix with other preemergence herbicides, if any; formulations used = cyanazine flowable (4L), atrazine wettable powder, alachlor microencapsulated (Alachlor-MT); EPTC&R-29148-M = microencapsulated formulation of EPTC; Atra&PPG-1259 = package mix of atrazine + PPG-1259.

[2] Did not receive glyphosate plus X77 plus ammonium sulfate.

See next page for summary

Summary. None of the treatments injured corn. SC-0774 applied with atrazine plus cyanazine generally provided about 85 to 93% foxtail control. Early preplant applications seemed slightly more effective than preemergence applications and greater control was obtained with higher rates, but these differences were not statistically significant. SC-0735 applied at 0.75 lb/A with atrazine plus cyanazine provided about 90% control as an early preplant or preemergence application. However, a similar treatment with only 0.5 lb/A applied preemergence gave 75% control of foxtail. Postemergence applications of SC-0735 with 1 lb/A atrazine gave only 65 to 70% foxtail control but this control was markedly better than that achieved with 1 lb/A of atrazine plus tridiphane (note: different spray adjuvants used). Encapsulated EPTC plus safener provided poor control of foxtail. Metolachlor gave better foxtail control than encapsulated alachlor (Alachlor MicroTech) when each was combined with atrazine plus cyanazine.

Experimental herbicides in no-till corn, Langdon, 1987. Early preplant treatments were applied April 24, 1987, preemergence treatments were applied May 8, and postemergence treatments were applied June 9. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Pioneer 3953 seed corn was planted 1 to 1.5 inch deep at 22,000 seeds per acre on May 8. Soil type was a loam with pH of 6.2 and organic matter of 6.1%. Weed stages were as follows: common mallow was in cotyledonary stage on April 24; at planting, kochia was 0.5 to 1 inch tall and common mallow had a few leaves; on June 9, green foxtail was 4-leaf, common mallow was 6 to 8-leaf, wild mustard was flowering, and kochia and common lambsquarters were 6 to 8 inches tall. Crop injury and weed control were evaluated on June 29. Plot size was 10 by 25 feet. The experiment was arranged in a randomized complete block design with four replications.

Summary. None of the treatments injured corn. SC-0774 at 1.25 lb/A in combination with atrazine plus cyanazine provided 85% green foxtail control. Somewhat better foxtail control was achieved with soil-applied applications of SC-0735 at 0.75 lb/A in combination with atrazine plus cyanazine. SC-0734 applied preemergence by itself or postemergence with atrazine at 1 lb/A gave only about 50% control. Postemergence atrazine plus tridiphane, however, provided less than 20% foxtail control (note: different adjuvants used). Nearly complete control of broadleaf weeds was provided by soil applications of SC-0735 at 0.75 lb/A in combination with atrazine plus cyanazine. Excellent broadleaf control was also obtained with SC-0774, metolachlor, or alachlor-MT in combination with atrazine plus cyanazine, although in some cases common mallow and/or kochia were not controlled satisfactorily by a preemergence application when the corresponding early preplant treatment gave at least 90% control.

See next page for data

Treatment[1]	Rate	Corn Inj	Weed control Coma	Wimu	Grft	KOCZ	Colq
	(lb/A)	-------------(%)-------------					
SC-0774+R-29148+Atra+Cyan(EPP)	0.75+0.13+0.5+1	0	89	96	78	100	97
SC-0774+R-29148+Atra+Cyan(EPP)	1+0.17+0.5+1	0	95	98	77	100	100
SC-0774+R-29148+Atra+Cyan(EPP)	1.25+0.21+0.5+1	0	96	100	85	100	100
SC-0774+R-29148+Atra+Cyan(Pre)	0.75+0.125+0.5+1	0	57	93	59	64	100
SC-0774+R-29148+Atra+Cyan(Pre)	1+0.17+0.5+1	0	52	98	69	-	100
SC-0774+R-29148+Atra+Cyan(Pre)	1.25+0.21+0.5+1	0	89	99	85	93	100
Metolachlor+Atrazine+Cyanazine(EPP)	2+0.5+1	0	91	89	86	100	98
Metolachlor+Atrazine+Cyanazine(Pre)	2+0.5+1	0	30	60	-	66	81
Alachlor-MT+Atrazine+Cyanazine(EPP)	2+0.5+1	0	94	95	65	100	99
Alachlor-MT+Atrazine+Cyanazine(Pre)	2+0.5+1	0	62	94	73	62	96
SC-0735+R-29148+Atra+Cyan(EPP)	0.75+0.125+0.5+1	0	99	100	88	100	100
SC-0735+R-29148+Atra+Cyan(Pre)	0.5+0.083+0.5+1	0	95	100	77	78	100
SC-0735+R-29148+Atra+Cyan(Pre)	0.75+0.125+0.5+1	0	100	100	94	97	100
SC-0735+R-29148(Pre)	0.75+0.125	0	99	95	51	-	100
SC-0735+Atrazine+Tween20(Po)	0.25+1+0.25%	1	81	100	49	63	97
SC-0735+Atrazine+Tween20(Po)	0.375+1+0.25%	0	94	100	45	81	100
Tridiphane+Atrazine+SO(Po)	0.75+1+0.25%	0	86	88	13	81	96
EPTC&R-29148-M+Atrazine(Pre)	4+0.75	0	25	65	53	23	-
EPTC&R-29148-M+Atrazine(Pre)	6+0.75	0	27	50	67	38	57
EPTC&R-29148-M+Atrazine(EPP)	6+0.75	0	56	70	60	99	94
EPTC&R-29148-M(Pre)	4	1	26	0	-	9	11
EPTC&R-29148-M(Pre)	6	0	11	0	50	10	11
Atra&PPG-1259+Metolachlor(Pre)	0.75&0.15+2	1	30	74	79	72	92
PPG-1259+Cyanazine+Metolachlor(Pre)	0.15+1.5+2	0	44	73	91	68	80
PPG-1259+Cyanazine+Metolachlor(Pre)[2]	0.15+1.5+2	0	52	97	95	48	97
PPG-1259+Metribuzin+Metolachlor(Pre)	0.15+0.25+2	0	21	60	87	49	96
Control [Glyp+X77+AS(Pre)]	0 [0.38+0.5%+2.5	0	26	0	0	29	21
C.V. %		580	29	19	24	24	13
LSD 5%		NS	26	21	23	24	15
# of reps		4	4	4	4	4	4

[1]All plots received glyphosate plus X77 plus ammonium sulfate (0.375 + 0.5% + 2.5 lb/A) at planting time as a tank mix with other preemergence herbicides, if any; formulations used: cyanazine flowable (4L), atrazine wettable powder, alachlor microencapsulated (Alachlor-MT); EPTC&R-29148-M = microencapsulated formulation of EPTC; X-77 surfactant (0.5%) was included with all EPP treatments.
[2]Did not receive glyphosate plus X77 plus ammonium sulfate.

Early preplant treatments in no-till corn, Minot, 1987. Early preplant (EPP) and preemergence (Pre) treatments were applied April 23 and May 6, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Pioneer 3953 seed corn was planted in 30-inch rows on May 6 using a Buffalo Till planter and a seeding rate of 23,000 seeds per acre. 300 lbs/A urea was broadcast on May 7. Soil type was a loam with a pH of 6.6 and organic matter of 3.4%. The crop was established in standing wheat stubble with 1,966 lbs/A residue. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Corn injury and weed control were evaluated on June 30 and August 11.

See next page for data and summary

Treatment[1]	Rate	June 30 Corn injury	June 30 Fxtl[2]	August 11 Wimu	August 11 Fxtl
	(lb/A)	----------(%)	---------		
Atrazine(EPP)	0.5	0	4	-	0
Atrazine(EPP)	0.75	0	8	98	20
Atrazine(EPP)	1	0	10	97	0
Atrazine(Pre)	0.75	0	6	99	0
Atrazine+Cyanazine(EPP)	0.5+1.5	0	69	100	41
Atrazine+Cyanazine(EPP)	0.5+2.5	0	85	100	70
Atrazine+Cyanazine(Pre)	0.5+2.5	0	88	-	70
Atrazine+Cyanazine(EPP)	0.75+1.5	0	31	100	55
Atrazine+Cyanazine(EPP)	0.75+2.5	0	88	100	75
Atrazine+Cyanazine(Pre)	0.75+2.5	0	86	-	78
Atrazine+Alac-MT(EPP)/Alac-MT(Pre)	0.5+1.7/0.8	0	47	94	35
Atrazine+Meto(EPP)/Meto(Pre)	0.5+1.7/0.8	0	82	92	71
Atrazine+Prcl(EPP)/Prcl(Pre)	0.5+2.3/1.2	0	5	-	0
Cyanazine+Alac(EPP)/Alac(Pre)	1.5+1.3/0.7	0	83	-	52
Cyanazine+Alac(EPP)/Alac(Pre)	1.5+1.7/0.8	0	83	100	72
Cyanazine+Alac(EPP)/Alac(Pre)	2.5+1.7/0.8	0	89	100	80
Cyanazine+Alachlor(Pre)	2.5+2.5	0	87	100	78
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	1.5+1.3/0.7	0	82	98	72
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	1.5+1.7/0.8	0	81	100	75
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	2.5+1.7/0.8	0	90	99	86
Cyanazine+Alachlor-MT(Pre)	2.5+2.5	0	91	99	83
Cyanazine+Meto(EPP)/Meto(Pre)	1.5+1.3/0.7	0	87	100	80
Cyanazine+Meto(EPP)/Meto(Pre)	1.5+1.7/0.8	0	91	99	81
Cyanazine+Meto(EPP)/Meto(Pre)	2.5+1.7/0.8	0	97	100	91
Cyanazine+Metolachlor(Pre)	2.5+2.5	0	96	100	83
Cyanazine+Prcl(EPP)/Prcl(Pre)	1.5+1.7/0.8	0	25	99	23
Cyanazine+Prcl(EPP)/Prcl(Pre)	1.5+2.3/1.2	0	36	100	31
Cyanazine+Prcl(EPP)/Prcl(Pre)	2.5+2.3/1.2	0	85	100	64
Cyanazine+Propachlor(Pre)	2.5+3.5	0	84	-	63
Cyanazine+Pendimethalin(EPP)	1.5+1	0	90	-	79
Cyanazine+Pendimethalin(EPP)	2+1.5	0	97	98	92
Cyanazine+Pendimethalin(EPP)	2.5+2	0	98	99	94
Cyanazine+Pendimethalin(Pre)	2.5+2	0	100	98	95
Control [Glyphosate(Pre)]	0 [0.375]	0	0	0	3
C.V. %		0	9	3	22
LSD 5%		NS	9	4	18
# of reps		4	4	4	4

[1]All plots received a preemergence treatment of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; X-77 surfactant was added to all treatments at 0.5%; flowable formulations of atrazine and cyanazine used; alachlor-MT = microencapsulated formulation of alachlor (Lasso MicroTech).
[2]Fxtl = mostly green foxtail with some yellow foxtail.

Summary. All treatments provided excellent control of wild mustard. Foxtail control provided by pendimethalin and acetanilide herbicides ranked from greatest to least as follows: pendimethalin, metolachlor, alachlor = alachlor-MT, propachlor. Atrazine at 0.5 and 0.75 lb/A provided poor control of foxtail but mixtures of atrazine plus cyanazine at 2.5 lb/A gave about 85% control. Early preplant and preemergence treatments at equivalent rates provided similar control of foxtail. Rainfall received from application and two weeks after planting was 0.16 and 0.55 inches for preemergence and early preplant treatments, respectively.

Early preplant treatments for no-till corn, Carrington, 1987. Early preplant (EPP) and preemergence (Pre) treatments were applied April 24 and May 7, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Pioneer 3953 seed corn was planted into flax stubble in 30-inch rows on May 7 using a John Deere MaxEmerge no-till planter and a seeding rate of 23,000 seeds per acre. 161 lbs/A N and 61 lbs/A P_2O_5 was broadcast on October 23, 1986. Soil type was a silt loam with a pH of 5.6 and organic matter of 4.1%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of corn injury and weed control were taken on July 1 and August 12.

Treatment[1]	Rate	July 1 Corn injury	July 1 Fxtl[2]	July 1 Wimu	July 1 Wibw	August 12 Fxtl	August 12 Wibw
	(lb/A)	(%)					
Atrazine(EPP)	0.5	0	39	8	-	13	4
Atrazine(EPP)	0.75	0	66	95	-	43	-
Atrazine(EPP)	1	0	43	100	96	31	-
Atrazine(Pre)	0.75	0	9	-	-	42	-
Atrazine+Cyanazine(EPP)	0.5+1.5	0	89	96	96	76	-
Atrazine+Cyanazine(EPP)	0.5+2.5	0	94	99	98	76	89
Atrazine+Cyanazine(Pre)	0.5+2.5	0	89	100	94	71	68
Atrazine+Cyanazine(EPP)	0.75+1.5	0	95	100	99	83	89
Atrazine+Cyanazine(EPP)	0.75+2.5	0	94	100	98	54	60
Atrazine+Cyanazine(Pre)	0.75+2.5	0	94	97	97	81	74
Atrazine+Alac-MT(EPP)/Alac-MT(Pre)	0.5+1.7/0.8	0	79	94	93	30	-
Atrazine+Meto(EPP)/Meto(Pre)	0.5+1.7/0.8	0	91	94	27	49	36
Atrazine+Prcl(EPP)/Prcl(Pre)	0.5+2.3/1.2	0	16	-	-	28	-
Cyanazine+Alac(EPP)/Alac(Pre)	1.5+1.3/0.7	0	65	98	96	34	-
Cyanazine+Alac(EPP)/Alac(Pre)	1.5+1.7/0.8	0	84	98	90	49	84
Cyanazine+Alac(EPP)/Alac(Pre)	2.5+1.7/0.8	0	92	98	99	71	77
Cyanazine+Alachlor(Pre)	2.5+2.5	0	86	99	98	52	86
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	1.5+1.3/0.7	0	79	99	90	37	99
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	1.5+1.7/0.8	0	81	100	83	33	73
Cyanazine+Alac-MT(EPP)/Alac-MT(Pre)	2.5+1.7/0.8	0	80	100	93	37	-
Cyanazine+Alachlor-MT(Pre)	2.5+2.5	0	86	100	91	46	51
Cyanazine+Meto(EPP)/Meto(Pre)	1.5+1.3/0.7	0	82	100	96	38	-
Cyanazine+Meto(EPP)/Meto(Pre)	1.5+1.7/0.8	0	88	98	90	66	68
Cyanazine+Meto(EPP)/Meto(Pre)	2.5+1.7/0.8	0	90	100	93	69	68
Cyanazine+Metolachlor(Pre)	2.5+2.5	0	90	100	97	71	88
Cyanazine+Prcl(EPP)/Prcl(Pre)	1.5+1.7/0.8	0	65	100	93	8	-
Cyanazine+Prcl(EPP)/Prcl(Pre)	1.5+2.3/1.2	0	56	100	85	3	-
Cyanazine+Prcl(EPP)/Prcl(Pre)	2.5+2.3/1.2	0	94	100	96	72	83
Cyanazine+Propachlor(Pre)	2.5+3.5	0	89	99	96	43	-
Cyanazine+Pendimethalin(EPP)	1.5+1	0	89	98	91	51	-
Cyanazine+Pendimethalin(EPP)	2+1.5	0	93	98	94	77	88
Cyanazine+Pendimethalin(EPP)	2.5+2	0	97	98	99	75	89
Cyanazine+Pendimethalin(Pre)	2.5+2	0	88	99	94	66	-
Control [Glyphosate(Pre)]	0 [0.375]	0	3	0	0	0	2
C.V. %		0	11	5	7	36	30
LSD 5%		NS	12	6	8	25	30

[1] All plots received a preemergence treatment of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; X-77 surfactant was added to all treatments at 0.5%; flowable formulations of atrazine and cyanazine used; Alachlor-MT = microencapsulated formulation of alachlor (Lasso MicroTech).
[2] Fxtl = mixture of green foxtail and yellow foxtail.

See next page for summary

Summary. All treatments provided excellent control of wild mustard and nearly all treatments gave good to excellent control of wild buckwheat (at the July 1 evaluation). Foxtail control provided by pendimethalin and acetanilide herbicides ranked from greatest to least as follows: pendimethalin, metolachlor = alachlor = alachlor-MT, propachlor. Preemergence and early preplant treatments at equivalent rates appeared to provide similar foxtail control. Rainfall received from application to two weeks after planting was 3.81 and 3.98 inches for preemergence and early preplant applications, respectively.

Fall treatments for no-till corn, Casselton, 1987. Fall (F) treatments and preemergence (Pre) treatments were applied October 23, 1986 and May 13, 1987, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Pioneer 3953 seed corn was planted into soybean residue (4215 lb/A) on May 13 (before spraying) using a Hiniker no-till row crop planter. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent control were taken on May 13 immediately prior to planting.

Treatment[1]	Rate	At-planting weed control KOCZ	At-planting weed control Wimu
	(lb/A)	----(%)-----	
Atrazine+Pendimethalin(F)	0.75+2	94	95
Atrazine+Pendimethalin(F)	1+2.5	97	98
Atrazine+Pendimethalin(Pre)	0.75+2	0	0
Atrazine+Alachlor(F)	0.75+3.5	86	78
Atrazine+Alachlor(F)	1+4	89	93
Atrazine+Alachlor(Pre)	0.75+3.5	0	0
Atrazine+Alachlor-MT(F)	0.75+3.5	90	97
Atrazine+Alachlor-MT(F)	1+4	95	98
Atrazine+Alachlor-MT(Pre)	0.75+3.5	0	0
Atrazine+Metolachlor(F)	0.75+3	87	94
Atrazine+Metolachlor(F)	1+3.5	84	99
Atrazine+Metolachlor(Pre)	0.75+3	0	0
Atrazine+Propachlor(F)	0.75+5	90	90
Atrazine+Propachlor(F)	1+6	95	98
Atrazine+Propachlor(Pre)	0.75+5	0	0
Cyanazine+Pendimethalin(F)	3+2	88	95
Cyanazine+Pendimethalin(F)	3.5+2.5	96	95
Cyanazine+Pendimethalin(Pre)	3+2	0	0
Cyanazine+Alachlor(F)	3+3.5	91	88
Cyanazine+Alachlor(F)	3.5+4	74	94
Cyanazine+Alachlor(Pre)	3+3.5	0	0
Cyanazine+Alachlor-MT(F)	3+3.5	86	93
Cyanazine+Alachlor-MT(F)	3.5+4	94	96
Cyanazine+Alachlor-MT(Pre)	3+3.5	0	0
Cyanazine+Metolachlor(F)	3+3	89	94
Cyanazine+Metolachlor(F)	3.5+3.5	90	96
Cyanazine+Metolachlor(Pre)	3+3	0	0
Cyanazine+Propachlor(F)	3+5	96	98
Cyanazine+Propachlor(F)	3.5+6	94	95
Cyanazine+Propachlor(Pre)	3+5	0	0
Atrazine+Cyanazine+Alachlor(F)	0.75+2.5+3.5	95	100
Atrazine+Cyanazine+Metolachlor(F)	0.75+2.5+3	93	98
Control	0	0	0
LSD 5%		10	8

[1] Formulations used: atrazine dry flowable, cyanazine wettable powder; Alachlor-MT = microencapsulated formulation of alachlor (Alachlor Microtech).

Summary. Weed control was not evaluated after planting time since a burndown treatment of glyphosate at 1 lb ae/A plus HOE-00661 at 1 lb/A failed to control kochia emerged at planting time. When control was evaluated at planting time, good to excellent control of kochia and wild mustard was achieved with both atrazine and cyanazine, although no treatments afforded complete control of both species.

Fall treatments for no-till corn, Carrington, 1987. Fall (F) treatments and preemergence (Pre) treatments were applied October 10, 1986 and May 7, 1987, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Pioneer 3953 seed corn was planted 1.5 inches deep into wheat stubble (2530 lb/A) on May 6 (before spraying) using a John Deere MaxEmerge row crop planter. Seeding rate was 20,500 seeds per acre. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. The entire experimental area was treated immediately after planting with glyphosate + X-77 (0.75 lb/A + 0.5%). Visual estimates of percent control were taken on June 29.

Treatment[1]	Rate	Weed control Wimu	Yeft[1]	Wibw
	(lb/A)	---------	(%)	-------
Atrazine+Pendimethalin(F)	0.75+1.5	92	63	68
Atrazine+Pendimethalin(F)	1+2	97	76	82
Atrazine+Pendimethalin(Pre)	0.75+1.5	99	79	63
Atrazine+Alachlor(F)	0.75+3	94	6	90
Atrazine+Alachlor(F)	1+3.5	100	32	67
Atrazine+Alachlor(Pre)	0.75+3	99	37	46
Atrazine+Alachlor-MT(F)	0.75+3	94	37	30
Atrazine+Alachlor-MT(F)	1+3.5	99	21	-
Atrazine+Alachlor-MT(Pre)	0.75+3	100	72	87
Atrazine+Metolachlor(F)	0.75+2.5	96	25	20
Atrazine+Metolachlor(F)	1+3	100	38	78
Atrazine+Metolachlor(Pre)	0.75+2.5	98	52	34
Atrazine+Propachlor(F)	0.75+4.5	94	3	35
Atrazine+Propachlor(F)	1+5.5	95	16	71
Atrazine+Propachlor(Pre)	0.75+4.5	100	19	29
Cyanazine+Pendimethalin(F)	2.5+1.5	99	76	76
Cyanazine+Pendimethalin(F)	3+2	100	82	67
Cyanazine+Pendimethalin(Pre)	2.5+1.5	100	97	100
Cyanazine+Alachlor(F)	2.5+3	96	5	-
Cyanazine+Alachlor(F)	3+3.5	100	41	48
Cyanazine+Alachlor(Pre)	2.5+3	100	59	93
Cyanazine+Alachlor-MT(F)	2.5+3	100	18	-
Cyanazine+Alachlor-MT(F)	3+3.5	100	28	61
Cyanazine+Alachlor-MT(Pre)	2.5+3	100	78	99
Cyanazine+Metolachlor(F)	2.5+2.5	96	27	-
Cyanazine+Metolachlor(F)	3+3	96	38	17
Cyanazine+Metolachlor(Pre)	2.5+3	100	82	88
Cyanazine+Propachlor(F)	2.5+4.5	95	10	-
Cyanazine+Propachlor(F)	3+5.5	99	5	-
Cyanazine+Propachlor(Pre)	2.5+4.5	100	74	94
Atrazine+Cyanazine+Alachlor(F)	0.75+2+3	100	26	74
Atrazine+Cyanazine+Metolachlor(F)	0.75+2+2.5	100	52	73
Control	0	0	0	0
LSD 5%		5	22	34

[1]Alachlor-MT = microencapsulated alachlor (Lasso MicroTech); mostly yellow foxtail with some green foxtail.

Summary. All treatments provided complete or nearly complete control of wild mustard. High variability in wild buckwheat control data make conclusions difficult. Fall-applied herbicide combinations provided less than 40% control of yellow foxtail with the exception of treatments involving pendimethalin. Foxtail control was higher with preemergence treatments involving 2.5 lb/A cyanazine than comparable treatments involving 0.75 lb/A atrazine. In mixtures with cyanazine, pendimethalin provided best foxtail control, followed by metolachlor, then alachlor-MT, then alachlor, then propachlor.

Early preplant cyanazine in no-till soybeans, Fargo, 1987. Early preplant treatments were applied April 28 (5WPP = 5 weeks preplant), May 5 (4WPP), and May 13 (3WPP). Preemergence treatments were applied June 6. Kochia at the 5WPP, 4WPP, 3WPP, and Pre timings was 0.5 to 1-inch, 0.5 to 1.5-inch, 1 to 2.5-inch, and 3 to 5 inches tall, respectively. All treatments were applied a bicycle wheel sprayer delivering 17 gal/A using 8002 nozzles and 40 psi. McCall soybeans were seeded 1 to 1.5 inches deep on June 6 into untilled soil covered with a medium to heavy level of plant residue. A Hiniker no-till row crop planter set on 30-inch rows was used. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were taken on June 6 before planting and weed control and crop injury were again evaluated on July 15.

		June 6				July 15		
		Weed control				Soybean	Weed control	
Treatment[1]	Rate	KOCZ	Wimu	Yeft	Vowh	injury	KOCZ	Wimu
	(lb/A)	(%)						
Cyanazine+Pendimethalin+OC(5WPP)	3+2+1Q	87	100	76	92	0	96	99
Cyanazine+Pendimethalin+OC(5WPP)	3.5+2+1Q	91	100	68	93	0	97	100
Cyanazine+Pendimethalin+OC(4WPP)	3+2+1Q	96	100	72	92	0	99	100
Cyanazine+Pendimethalin+OC(4WPP)	3.5+2+1Q	98	100	69	92	0	96	100
Cyanazine+Pendimethalin+OC(3WPP)[2]	3+2+1Q	100	100	65	94	0	97	98
Cyanazine+Pendimethalin+OC(3WPP)[2]	3.5+2+1Q	99	100	74	95	0	98	100
Cyanazine+Pendimethalin+OC(Pre)	3+2+1Q	0	0	0	0	1	95	100
Cyanazine+Pendimethalin+OC(Pre)	3.5+2+1Q	0	0	0	0	1	98	100
Control [Glyphosate+X77 (Pre)]	0 [0.375+0.5%]	0	0	0	0	0	77	99
C.V.%		6	0	20	4	407	5	1
LSD 5%		6	0	14	4	NS	6	NS
# of reps		4	4	4	4	4	4	4

[1]All plots received a preemergence treatment of glyphosate plus X-77 (0.375 + 0.5%); OC = petroleum oil adjuvant containing 17% emulsifier.
[2]Less than 0.1 inch of rain fell about 1 hour after application of 3WPP treatments.

Summary. Early preplant treatments of cyanazine provided excellent control of wild mustard when evaluated at planting time or four weeks after planting. Kochia control was 100% or nearly 100% by cyanazine applied three or four weeks prior to planting. Kochia control by the 5WPP treatments was only about 90% at planting time but was approaching 100% at the second evaluation indicating that the burndown of 0.375 lb/A of glyphosate was adequate to control kochia escaping the early preplant cyanazine. Glyphosate applied at planting without any early preplant cyanazine provided only 77% kochia control. Early preplant cyanazine-pendimethalin combinations provided 65 to 75% yellow foxtail control and about 93% control of volunteer wheat at planting time. Foxtail control from EPP treatments could not be evaluated midseason due to extremely dense kochia in the check strips between plots, but it was evident that control was only fair to poor. Virtually no soybean injury was caused by any of the cyanazine treatments.

Fall and early preplant imazaquin and imazethapyr in no-till soybeans, Fargo, 1987. Fall (F) treatments were applied October 29, 1986, early preplant (EPP) treatments were applied April 25, 1987, and preemergence (Pre) treatments were applied June 8 using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 35 psi. When EPP treatments were applied, moderate to heavy infestations of kochia were present and were 0.25 to 0.5-inch tall. McCall soybeans were seeded 1 to 1.5 inches deep on June 3 using a Hiniker no-till planter. Seeding rate was 175,000 seeds per acre and row spacing was 30 inches. Soil type was a silty clay with pH of ≈8 and organic matter of ≈5%. On June 4 the entire experimental area was treated with a burndown herbicide mixture of 1 lb/A glyphosate plus 0.25 lb/A bromoxynil plus an amount of Landmaster II containing 0.25 lb/A 2,4-D and 0.28 lb/A glyphosate. Visual estimates of percent control were taken on June 3 (prior to planting) and on July 17. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

		Rated June 3				Rated July 17		
Treatment	Rate	Fxtl	Wimu	KOCZ	Colq	SbInj	KOCZ	Fxtl[1]
	(oz/A)	(% control)						
Imazaquin(F)	1.25	22	-	97	100	0	-	16
Imazaquin(F)	1.5	13	97	96	99	0	18	33
Imazaquin(F)	2	23	-	98	100	1	-	63
Imazaquin+X-77(EPP)	1+0.5%	15	96	75	38	1	-	19
Imazaquin+X-77(EPP)	1.25+0.5%	12	-	-	-	2	-	36
Imazaquin+X-77(EPP)	1.5+0.5%	15	100	-	47	0	-	31
Imazaquin+X-77(EPP)	2+0.5%	-	-	-	-	4	-	59
Imazaquin(Pre)	1	0	0	0	0	0	76	-
Imazaquin(Pre)	1.25	0	0	0	0	0	39	-
Imazaquin(Pre)	1.5	0	0	0	0	1	73	67
Imazaquin(Pre)	2	0	0	0	0	0	49	48
Imazethapyr(F)	2	13	99	98	100	1	96	92
Imazethapyr(F)	3	23	99	99	100	1	100	92
Imazethapyr(F)	4	19	100	100	-	1	-	88
Imazethapyr+X-77(EPP)	1.5+0.5%	27	99	87	78	0	93	91
Imazethapyr+X-77(EPP)	2+0.5%	23	97	96	92	9	95	90
Imazethapyr+X-77(EPP)	3+0.5%	-	100	97	89	8	100	96
Imazethapyr+X-77(EPP)	4+0.5%	45	100	99	-	23	100	96
Imazethapyr(Pre)	1.5	0	0	0	0	4	-	-
Imazethapyr(Pre)	2	0	0	0	0	10	93	96
Imazethapyr(Pre)	3	0	0	0	0	10	98	95
Imazethapyr(Pre)	4	0	0	0	0	0	85	96
Imazaquin+Imazethapyr(F)	1+1.5	18	99	100	100	0	99	77
Imazaquin+Imazethapyr(F)	1.25+2	27	-	97	100	8	100	91
Imazaquin+Imazethapyr+X-77(EPP)	1+1.5+0.5%	41	100	97	76	1	100	93
Imazaquin+Imazethapyr+X-77(EPP)	1.25+2+0.5%	28	100	96	91	2	100	95
Imazaquin+Imazethapyr(Pre)	1+1.5	0	0	0	0	3	94	86
Imazaquin+Imazethapyr(Pre)	1.25+2	0	0	0	0	0	99	96
Control	0	0	0	0	0	0	0	0
C.V. %		57	2	6	15	226	12	16
LSD 5%		19	2	8	18	10	14	16
# of reps		4	4	4	4	4	4	4

[1]Fxtl = mostly yellow foxtail with a small percentage of green foxtail.

See next page for summary

Summary. Fall-applied imazaquin provided nearly complete control of wild mustard, kochia, and common lambsquarters at planting, although it appears that kochia emerging after planting were not controlled. Imazaquin applied early preplant gave excellent "burndown" of wild mustard but not of kochia and common lambsquarters. Preemergence-applied imazaquin provided only fair to poor kochia control at the July 17 evaluation. Imazethapyr applied in the fall gave essentially complete at-planting control of broadleaf weeds. Early preplant applications of imazethapyr (at 2 oz/A and above) performed similarly, except that common lambsquarter control was only about 90% at planting time. Kochia control was 95 to 100% and foxtail control was 90 to 95% on July 17 for both fall and early preplant applications of imazethapyr. Preemergence applications of this herbicide gave results comparable to fall and early preplant treatments. No soybean injury was observed with imazaquin treatments, but imazethapyr appeared to cause about 10% injury when applied either early preplant or preemergence at rates of 2 or 3 oz/A.

Weed control in conventional and no-till soybeans, Pillsbury, 1987. Plots were established on a loam soil having a pH of 7.9 and organic matter of 5.9%. Wheat stubble from the 1986 crop was moderate to heavy and approximately 6 inches tall. Tilled plots received two passes with a tandem disc prior to planting or herbicide application. Inoculated McCall soybeans were planted June 4 using a flex planter for 30-inch rows and a Tye no-till drill for 8-inch rows. Seeding depth was about 1.5 inches and seeding rate was 150 to 160,000 seeds per acre for all plots. Preemergence (Pre) and preplant incorporated (PI) herbicides were applied June 4 using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 35 psi. PPI treatments were incorporated twice using a field cultivator. No-till blocks received glyphosate (0.375 lb/A) immediately after planting. Sethoxydim treatments were applied June 26 (P1) using 8.5 gpa and 8001 nozzles. Green foxtail was 2 to 5-leaf, relative humidity was 42%, and air temperature was 73 F. Bentazon plus acifluorfen tank mixes were applied June 29 (P2) using 17 gpa. Soybeans were 1 to 2 trifoliolate, redroot pigweed was 3 to 5-leaf, humidity was 75%, and temperature was 70 F. Visual estimates of percent soybean injury and weed control were taken on July 13 and plots were combine harvested on October 19. Plot size was 10 by 25 feet and the experiment was a randomized complete block design arranged as a split-split plot with tillage as main plots and row spacing as sub-plots.

See next page for data and summary

Tillage	Row spacing (inch)	Treatment[1] Herbicide	Rate (lb/A)	Soybean injury (%)	Weed control Grft (%)	Weed control Rrpw (%)	Grain yield (bu/A)
Tilled	30	Trifluralin+Metribuzin(PPI)	1+0.2	0	91	90	25.3
		Trifluralin+Clomazone(PPI)	1+0.75	0	82	70	24.4
		Trifluralin+Chloramben(PPI)	1+2.75	0	88	86	26.2
		Sethoxydim+OC(P1) Bentazon+Acifluorfen(P2)	0.2+1Q 0.75+0.25	17	98	92	25.4
		Handweeded check Trif+Imep+Clomazone(PPI)	1+0.05+0.5	0	100	100	27.7
		Weedy check	0	0	0	0	10.1
Tilled	8	Trifluralin+Metribuzin(PPI)	1+0.2	0	94	96	32.5
		Trifluralin+Clomazone(PPI)	1+0.75	0	90	86	30.1
		Trifluralin+Chloramben(PPI)	1+2.75	0	93	96	28.8
		Sethoxydim+OC(P1) Bentazon+Acifluorfen(P2)	0.2+1Q 0.75+0.25	19	99	98	33.4
		Handweeded check Trif+Imep+Clomazone(PPI)	1+0.05+0.5	0	100	100	28.4
		Weedy check	0	0	0	0	21.0
		LSD(0.05) (within tilled plots)		2	6	9	5.3
No-till	30	Pendimethalin+Metribuzin(Pre)	1.5+0.25	0	88	93	29.6
		Metolachlor+Metribuzin(Pre)	2+0.25	0	87	90	25.1
		Pendimethalin+Chloramben(Pre)	1.5+3	0	99	100	29.6
		Sethoxydim+OC(P1) Bentazon+Acifluorfen(P2)	0.2+1Q 0.75+0.25	17	99	99	28.5
		Handweeded check Pend+Imep+Clomazone(PPI)	1.8+0.05+0.5	0	100	100	25.6
		Weedy check	0	0	0	0	18.9
No-till	8	Pendimethalin+Metribuzin(Pre)	1.5+0.25	0	80	85	29.1
		Metolachlor+Metribuzin(Pre)	2+0.25	0	68	-	27.0
		Pendimethalin+Chloramben(Pre)	1.5+3	0	92	-	29.2
		Sethoxydim+OC(P1) Bentazon+Acifluorfen(P2)	0.2+1Q 0.75+0.25	17	99	98	27.0
		Handweeded check Pend+Imep+Clomazone(PPI)	1.8+0.05+0.5	0	100	100	25.5
		Weedy check	0	0	0	0	25.5
		LSD(0.05) (within no-till plots)		2	12	10	5.0

[1] OC = petroleum oil adjuvant containing 17% emulsifier; Imep = imazethapyr.

Summary. Main effects of tillage and row spacing were not significant across the experiment. In tilled plots, however, there was a significant effect of row spacing on yield, with 8-inch rows yielding an average of 5.7 bu/A more than 30-inch rows. The advantage of narrow rows may have been due to agronomic factors (i.e. better plant spacing, etc.) or to earlier canopy closure which could enable better competition with weeds escaping the herbicide treatments. The latter possibility seems likely given the extremely large difference (10.9 bu/A) between the weedy checks in 8 versus 30-inch rows. A difference in yield between weedy checks in the 8 versus 30-inch rows was also obtained in no-till plots. Most herbicide treatments gave good to excellent weed control. Exceptions included a weakness on pigweed of trifluralin + clomazone in tilled plots and fair to poor control of foxtail by metolachlor + metribuzin in no-till plots with 8-inch rows. The total postemergence program provided the highest percent weed control over the experiment and yields were not lower than other treatments despite soybean injury ratings from 17 to 19%.

Preemergence 2,4-D injury in no-till soybeans, Fargo, 1987. McCall soybeans were seeded 1 to 1.5 inches deep on June 9 into untilled soil covered with a medium to heavy level of plant residue. A Hiniker no-till row crop planter was used. Treatments were applied immediately after seeding with a bicycle wheel sprayer delivering 17 gal/A using 8002 nozzles and 40 psi. On June 10, 0.14 inch of rain was received and another 0.27 inch of rain fell on June 17. The entire experimental area was treated with paraquat (0.5 lb/A) plus pendimethalin (2 lb/A) plus imazethapyr (0.05 lb/A) plus clomazone (0.5 lb/A) on June 12. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent soybean injury were taken on July 2. Grain yields were not taken due to heavy hail occurring in mid August.

Treatment[1]	Rate (lb/A)	Soybean injury (%)
2,4-D-bee	0.25	1
2,4-D-bee	0.375	1
2,4-D-bee	0.5	0
2,4-D-bee	0.75	1
2,4-D-bee	1	2
2,4-D-bee	1.5	1
2,4-D-dma	0.25	0
2,4-D-dma	0.375	1
2,4-D-dma	0.5	0
2,4-D-dma	0.75	0
2,4-D-dma	1	1
2,4-D-dma	1.5	3
Control	0	0
C.V. %		175
LSD 5%		NS
# of reps		4

[1] 2,4-D-bee = butoxyethyl ester of 2,4-D; 2,4-D-dma = dimethylamine salt of 2,4-D.

Summary. Applications of up to 1.5 lb/A of 2,4-D followed immediately by 0.14 inch of rainfall did not cause significant levels of visually determined injury to McCall soybeans seeded in a no-till situation.

Fall and EPP herbicide combinations in no-till sunflowers, Fargo, 1987. Fall (F) treatments were applied October 21, 1986 and early preplant (EPP) treatments were applied May 1, 1987 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Weeds present on May 1 were kochia (1 inch tall) and common lambsquarters (1 inch tall and 4-leaf). Sunflowers (Seedtech 316) were planted 1 0.5 to 2 inches deep and at 21,000 seeds per acre on June 3 using a Hiniker no-till row crop planter set at 30-inch rows. The entire area (including check strips between plots) was treated with a burndown herbicide mixture of 0.25 lb/A 2,4-D + 0.28 lb/A glyphosate (Landmaster II), 1 lb/A glyphosate, and 0.25 lb/A bromoxynil. Soil type was a silty clay with pH about 8 and organic matter about 5%. Plot size was 10 by 25 ft. The experiment was arranged in a randomized complete block design with four replications. Weed control was evaluated on June 3 (just prior to planting) and on July 16.

Treatment[1]	Rate	June 3				July 16	
		Yeft	Wimu	KOCZ	Colq	Sufl inj	Yeft
	(lb/A)	(%)					
Pendimethalin+Cyanazine-L(F)	2+3	92	91	93	-	0	5
Pendimethalin+Cyanazine-L(F)	2.5+3.5	95	95	97	97	0	8
Pendimethalin+Cyanazine-L(EPP)	2+3	100	100	97	99	0	20
Pendimethalin+Cyanazine-L(EPP)	2.5+3.5	100	100	99	100	0	32
Pendimethalin+Fluorochloridone(F)	2+0.5	89	86	95	91	0	5
Pendimethalin+Fluorochloridone(F)	2.5+0.75	96	90	88	85	0	5
Pendimethalin+Fluorochloridone(EPP)	2+0.5	98	100	98	-	0	2
Pendimethalin+Fluorochloridone(EPP)	2.5+0.75	99	100	98	100	0	15
Pendimethalin+Fluorochloridone(Pre)	2+0.5	-	-	-	-	0	36
Pendimethalin+RE-40885(F)	2+1	83	98	94	98	0	0
Pendimethalin+RE-40885(F)	2.5+1.25	81	98	98	98	0	5
Pendimethalin+RE-40885(EPP)	2+1	97	99	92	99	0	22
Pendimethalin+RE-40885(EPP)	2.5+1.25	98	99	93	100	0	10
Pendimethalin+RE-40885(Pre)	2+1	-	-	-	-	0	33
Oryzalin+Cyanazine-L(F)	1.5+3	86	93	94	99	0	0
Oryzalin+Cyanazine-L(F)	1.75+3.5	67	96	96	-	0	2
Oryzalin+Cyanazine-L(EPP)	1.5+3	96	100	93	-	0	0
Oryzalin+Cyanazine-L(EPP)	1.75+3.5	99	100	92	-	0	11
Oryzalin+Cyanazine-L(Pre)	1.5+3	-	-	-	-	0	29
Oryzalin+Fluorochloridone(F)	1.5+0.5	91	76	88	86	0	2
Oryzalin+Fluorochloridone(F)	1.75+0.75	78	87	96	-	0	0
Oryzalin+Fluorochloridone(EPP)	1.5+0.5	76	100	97	100	0	12
Oryzalin+Fluorochloridone(EPP)	1.75+0.75	90	100	98	99	0	10
Oryzalin+Fluorochloridone(Pre)	1.5+0.5	-	-	-	-	0	13
Oryzalin+RE-40885(F)	1.5+1	74	98	95	97	0	0
Oryzalin+RE-40885(F)	1.75+1.25	54	97	96	99	0	3
Oryzalin+RE-40885(EPP)	1.5+1	87	97	70	80	0	16
Oryzalin+RE-40885(EPP)	1.75+1.25	95	99	74	81	0	9
Oryzalin+RE-40885(Pre)	1.5+1	-	-	-	-	0	4
Control	0	0	0	0	0	0	0
C.V. %		10	5	6	5	0	117
LSD 5%		12	7	8	7	0	18
# of reps		4	4	4	4	4	4

[1]All plots received burndown herbicides at planting (see above).

See next page for summary

Summary. Weed emergence after planting was sparse and irregular for most species, thus allowing a mid-season evaluation of only foxtail. At-planting foxtail control was excellent with early preplant applications of 2 or 2.5 lb/A of pendimethalin (in combination with broadleaf herbicides), while fall applications were generally not as effective, particularly at the 2 lb/A rate. Foxtail control by oryzalin at 1.5 and 1.75 lb/A often was inferior to that provided by pendimethalin and was usually more effective when applied early preplant than in the fall. Best control of foxtail at planting was achieved when pendimethalin or oryzalin was applied early preplant in combination with cyanazine. Fluorochloridone and cyanazine gave complete at-planting control of wild mustard when applied early preplant but fall applications were not as effective. RE-40885 provided complete or nearly complete control of wild mustard with fall or early preplant treatments. Fluorochloridone provided the lowest wild mustard control of any of the fall-applied treatments. All three broadleaf herbicides generally gave 90% or better kochia control at planting whether applied in the fall or spring. Fair kochia control was observed with oryzalin plus RE-40885 applied early preplant. A formulation of RE-40885 having poor mix-ing qualities was used for spring treatments and may have caused the lower control when mixed with oryzalin, although a similar interaction was not seen with pendimethalin spring-applied with RE-40885. This same problem seemed to occur with common lambsquarters. The poor formulation may have interacted differently with oryzalin and pendimethalin. Control of common lambsquarters at planting was excellent with nearly all treatments. All treatments provided poor foxtail control by the July 16 evaluation. No sunflower injury was detected in any of the treatments.

Early preplant treatments in no-till sunflowers, Minot, 1987. Early preplant (EPP) and preemergence (Pre) treatments were applied April 22 and May 19, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Cargill 207 sunflowers were sown in 30-inch rows on May 19 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. Wheat stubble was 4 to 6 inches at planting time. Soil type was a loam with a pH of 6.6 and organic matter of 3.4%. 300 lbs/A of urea was broadcast on May 7. Foxtail was a mixture of green and yellow foxtail. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent control were taken on June 30 and August 11.

See next page for data and summary

Treatment[1]	Rate	June 30 Fxtl	June 30 Wimu	Aug. 11 Fxtl	Aug. 11 Wimu
	(lb/A)	----(% control)----			
Pendimethalin(Pre)	1.5	97	-	89	-
Pendimethalin+X77(EPP)	1.5+0.5%	96	0	84	0
Pendimethalin+X77(EPP)	2+0.5%	92	0*	85	0*
Fluorochloridone(Pre)	0.5	37	-	14	-
Fluorochloridone+X77(EPP)	0.5+0.5%	31	-	6	-
Fluorochloridone+X77(EPP)	0.63+0.5%	37	100	9	100
RE-40885(Pre)	1	91	-	81	-
RE-40885+X77(EPP)	1+0.5%	53	-	34	-
RE-40885+X77(EPP)	1.25+0.5%	74	100	58	100
Isoxaben(Pre)	0.125	20	-	4	-
Isoxaben+X77(EPP)	0.125+0.5%	13	96*	0	-
Isoxaben+X77(EPP)	0.165+0.5%	27	99*	11	100*
Lactofen(Pre)	0.3	6	-	0	-
Lactofen+X77(EPP)	0.3+0.5%	8	0	0	0
Lactofen+X77(EPP)	0.4+0.5%	6	0*	0	0*
Pendimethalin+Fluorochloridone(Pre)	1.5+0.5	96	100	94	100
Pendimethalin+Fluorochloridone+X77(EPP)	1.5+0.5+0.5%	91	-	81	-
Pendimethalin+Fluorochloridone+X77(EPP)	2+0.63+0.5%	97	100	88	100
Pendimethalin+RE-40885(Pre)	1.5+1	99	99*	97	100*
Pendimethalin+RE-40885+X77(EPP)	1.5+1+0.5%	97	99*	89	100*
Pendimethalin+RE-40885+X77(EPP)	2+1.25+0.5%	98	100	97	100
Pendimethalin+Isoxaben(Pre)	1.54+0.125	95	98	92	98
Pendimethalin+Isoxaben+X77(EPP)	1.5+0.125+0.5%	93	100	88	100
Pendimethalin+Isoxaben+X77(EPP)	2+0.165+0.5%	97	99*	94	100*
Pendimethalin+Cyanazine+X77(EPP)	1.5+3+0.5%	97	99*	94	100*
Pendimethalin+Cyanazine+X77(EPP)	2+3+0.5%	99	100	96	100
Pendimethalin+Lactofen(Pre)	1.5+0.3	96	79*	90	74*
Pendimethalin+Lactofen+X77(EPP)	1.5+0.3+0.5%	92	-	86	-
Pendimethalin+Lactofen+X77(EPP)	2+0.4+0.5%	97	-	89	-
Oryzalin+RE-40885+X77(EPP)	1.5+1.25+0.5%	98	100	96	100
Oryzalin+Isoxaben+X77(EPP)	1.5+0.165+.5%	97	99	95	98
Pendimethalin+Chloramben(Pre)	1.5+2.25	98	93	97	88
Control [Glyphosate+X77(Pre)]	0 [0.38+0.5%]	6	0	0	0
LSD 5% for comparisons involving no *		9	7	10	13
LSD 5% for comparisons involving one *		-	8	-	14
LSD 5% for comparisons involving two *		-	8	-	15

[1]All plots received glyphosate plus X-77 surfactant (0.375 + 0.5%) at planting time as a tank mix with other preemergence herbicides, if any; 4L (flowable) formulation of cyanazine used.

Summary. When evaluated on June 30, pendimethalin alone or in combination provided 92 to 98% foxtail control either as a preemergence or early preplant application. Early preplant oryzalin also provided excellent foxtail control (in combination with RE-40885 or isoxaben. Foxtail control by pendimethalin or oryzalin was between 80 and 95% when evaluated August 11. With the exception of lactofen applied preemergence, all herbicides applied for broadleaf control (fluorochloridone, cyanazine, isoxaben, RE-40885, and chloramben) gave near complete control of wild mustard. Rainfall received between application and 2 weeks after planting was 1.96 and 2.51 inches for early preplant and preemergence treatments, respectively.

Early preplant treatments in no-till sunflowers, Carrington, 1987. Early preplant and preemergence treatments were applied April 23 and May 29, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Cargill 207 sunflowers were sown in 30-inch rows on May 29 using a John Deere MaxEmerge planter and a seeding rate of 22,000 seeds per acre. 161 lbs/A N and 61 lbs/A P_2O_5 was broadcast on October 23, 1986. Flax stubble was 2 to 4 inches at planting time. Soil type was a silt loam with a pH of 5.6 and organic matter of 4.1%. Foxtail was a mixture of green and yellow foxtail. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on July 1 and August 12.

Treatment[1]	Rate	July 1			Aug 12	
		Fxtl	Wimu	Wibw	Fxtl	Wibw
	(lb/A)	-------(% control)------				
Pendimethalin(Pre)	1.5	67	-	41	44	0
Pendimethalin+X77(EPP)	1.5+0.5%	73	-	23	26	13
Pendimethalin+X77(EPP)	2+0.5%	89	-	39	63	20
Fluorochloridone(Pre)	0.5	27	99	44	7	11
Fluorochloridone+X77(EPP)	0.5+0.5%	38	81*	19	14	15
Fluorochloridone+X77(EPP)	0.625+0.5%	27	-	18	5	10
RE-40885(Pre)	1	13	99*	20	3	21
RE-40885+X77(EPP)	1+0.5%	78	98	85	37	36
RE-40885+X77(EPP)	1.25+0.5%	64	99	84	28	47
Isoxaben(Pre)	0.125	23	97*	8	8	10*
Isoxaben+X77(EPP)	0.125+0.5%	30	98	35	10	13
Isoxaben+X77(EPP)	0.165+0.5%	37	99	45	19	20
Lactofen(Pre)	0.3	7	95*	9	0	0
Lactofen+X77(EPP)	0.3+0.5%	9	69*	8	0	0
Lactofen+X77(EPP)	0.4+0.5%	18	96	28	5	0
Pendimethalin+Fluorochloridone(Pre)	1.5+0.5	79	99	80	40	65
Pendimethalin+Fluorochloridone+X77(EPP)	1.5+0.5+0.5%	81	98	58	50	20
Pendimethalin+Fluorochloridone+X77(EPP)	2+0.625+0.5%	76	98	20	36	0
Pendimethalin+RE-40885(Pre)	1.5+1	64	99	44	40	0
Pendimethalin+RE-40885+X77(EPP)	1.5+1+0.5%	80	96	60	24	20
Pendimethalin+RE-40885+X77(EPP)	2+1.25+0.5%	94	99	88	64	64
Pendimethalin+Isoxaben(Pre)	1.5+0.125	79	99*	64	34	28
Pendimethalin+Isoxaben+X77(EPP)	1.5+0.125+0.5%	78	95	44	47	15
Pendimethalin+Isoxaben+X77(EPP)	2+0.165+0.5%	89	97*	68	55	31
Pendimethalin+Cyanazine+X77(EPP)	1.5+3+0.5%	93	99	96	54	76
Pendimethalin+Cyanazine+X77(EPP)	2+3+0.5%	96	99	99	81	100
Pendimethalin+Lactofen(Pre)	1.5+0.3	70	98	60	42	26
Pendimethalin+Lactofen+X77(EPP)	1.5+0.3+0.5%	83*	83*	23*	48*	16*
Pendimethalin+Lactofen+X77(EPP)	2+0.4+0.5%	79	67*	19	43	0
Oryzalin+RE-40885+X77(EPP)	1.5+1.25+0.5%	89	98	65	55	17
Oryzalin+Isoxaben+X77(EPP)	1.5+0.165+0.5%	85	99	70	60	63
Pendimethalin+Chloramben(Pre)	1.5+2.25	91	97	80	65	31
Control [Glyphosate+X77(Pre)]	0 [0.375+0.5%]	9	91*	24	0	0*
LSD 5% for comparisons involving no *		24	17	39	24	35
LSD 5% for comparisons involving one *		26	18	42	26	38
LSD 5% for comparisons involving two *		-	19	-	-	41

[1]All plots received a preemergence application of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; 4L (flowable formulation of cyanazine used.

See next page for summary

Summary. Pendimethalin alone or in combination generally provided foxtail control ranging from 75 to 90%. There was a tendency for EPP applications to outperform Pre applications and for 2 lb/A to outperform 1.5 lb/A although differences were usually not significant. All broadleaf herbicides provided excellent control of wild mustard. Lactofen, however, was somewhat inconsistent in controlling wild mustard. Few treatments provided acceptable control of wild buckwheat. Cyanazine at 3 lb/A plus pendimethalin applied early preplant gave 100% wild buckwheat control even at the late-season rating.

Early preplant cyanazine and oryzalin in no-till sunflowers, Minot, 1987. Early preplant cyanazine and oryzalin treatments were applied April 21 (4WPP), April 28 (3WPP), and May 5 (2WPP). Preemergence treatments were applied May 19. Spray volume was 17 gal/A with 8002 nozzle tips and 35 psi. Cargill 207 sunflowers were sown May 19 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. 300 lbs of urea was broadcast on May 7, 1987. Wheat stubble was 4 to 6 inches at planting time. Soil type was a loam with a pH of 6.6 and organic matter of 3.4%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replication. Visual estimates of percent weed control were obtained on June 30, and August 10.

See next page for data and summary

Treatment[1]	Rate	June 30 Fxtl	June 30 Wimu	Aug 10 Fxtl	Aug 10 Wimu
	(lb/A)	------(% control)----			
Cyanazine+Pendimethalin(Pre)	2.5+2	98	99	98	100
Cyanazine+Pendimethalin(Pre)	3+2	98	99*	98	100*
Cyanazine(Pre)	3	83	99*	54	100*
Cyanazine+X77(2WPP)/Pendimethalin(Pre)	2.5+0.5%/2	98	99*	98	100*
Cyanazine+X77(2WPP)/Pendimethalin(Pre)	3+0.5%/2	98	99	98	100
Cyanazine+X77(2WPP)/Pendimethalin(Pre)	3.5+0.5%/2	98	99	97	100
Cyanazine+X77(2WPP)	3+0.5%	85	99*	56	97*
Cyanazine+X77(3WPP)/Pendimethalin(Pre)	2.5+0.5%/2	98	99	97	100
Cyanazine+X77(3WPP)/Pendimethalin(Pre)	3+0.5%/2	98	99	94	99
Cyanazine+X77(3WPP)/Pendimethalin(Pre)	3.5+0.5%/2	98	99*	95	100*
Cyanazine+X77(3WPP)	3+0.5%	85	99*	52	100*
Cyanazine+X77(4WPP)/Pendimethalin(Pre)	2.5+0.5%/2	98	99	97	100
Cyanazine+X77(4WPP)/Pendimethalin(Pre)	3+0.5%/2	98	99	97	100
Cyanazine+X77(4WPP)/Pendimethalin(Pre)	3.5+0.5%/2	98	99	97	100
Cyanazine+X77(4WPP)	3+0.5%	79	99	40	100
Oryzalin+Fluorochloridone(Pre)	1.25+0.5	87	99*	66	100*
Oryzalin+Fluorochloridone(Pre)	1.5+0.5	88	98*	74	99*
Oryzalin(Pre)	1.25	84	0*	67	-
Oryzalin+X77(2WPP)/Fluo(Pre)	1.25+0.5%/0.5	93	99	86	100
Oryzalin+X77(2WPP)/Fluo(Pre)	1.5+0.5%/0.5	94	99	93	100
Oryzalin+X77(2WPP)	1.5+0.5%	89	13*	82	7*
Oryzalin+X77(3WPP)/Fluo(Pre)	1.25+0.5%/0.5	94	99	93	100
Oryzalin+X77(3WPP)/Fluo(Pre)	1.5+0.5%/0.5	96	99	93	100
Oryzalin+X77(3WPP)	1.5+0.5%	93	9	87	-
Oryzalin+X77(4WPP)/Fluo(Pre)	1.25+0.5%/0.5	94	99	90	100
Oryzalin+X77(4WPP)/Fluo(Pre)	1.5+0.5%/0.5	90	99	90	100
Oryzalin+X77(4WPP)	1.5+0.5%	90	2	85	0
Cyanazine+Oryzalin+X77(4WPP)	3+1.5+0.5%	96	99	95	100
Control [Glyphosate+X77(Pre)]	0 [0.375+0.5%]	0	0	0	0
C.V. %		4	4	14	2
LSD 5% for comparisons involving no *		4	4	16	3
LSD 5% for comparisons involving one *		-	5	-	3
LSD 5% for comparisons involving two *		-	5	-	4

[1]All plots received a preemergence application of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; 4L (flowable) formulation of cyanazine used.

Summary. No sunflower injury was caused by any of the treatments. At the June 30 evaluation, cyanazine applied alone provided 80 to 85% foxtail control regardless of time of application but control had declined to 40 to 50% by August 10. Combinations of cyanazine plus pendimethalin, however, provided 98% foxtail control on June 30 and 94 to 98% control on August 10. Oryzalin applied preemergence with or without fluorochloridone gave 84 to 88% foxtail control while early preplant oryzalin gave 90 to 95% control. All treatments involving cyanazine or fluorochloridone provided essentially complete control of wild mustard. Rainfall received between application and 2 weeks after planting was 1.93, 2.09, 2.45, and 2.48 inches for preemergence, 2WPP, 3WPP, and 4WPP treatments, respectively.

<u>Early preplant cyanazine and oryzalin in no-till sunflowers, Carrington, 1987.</u> Early preplant treatments were applied April 23 (5WPP), April 28 (4WPP), and May 6 (3WPP). Cargill 207 sunflowers were sown in 30-inch rows on May 29 using a John Deere MaxEmerge planter and a seeding rate of 22,000 seeds per acre. Preemergence treatments were applied May 29. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A using 8002 nozzles and 35 psi. 161 lbs/A N and 61 lbs/A P_2O_5 were broadcast on October 23, 1986. Foxtail was a mixture of green and yellow foxtail. Flax stubble was 2 to 4 inches at planting. Soil type was a silt loam with a pH of 5.6 and organic matter of 4.1%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on June 30 and August 11.

		June 30			Aug 11		
Treatment[1]	Rate	Fxtl	Wimu	Wibw	Fxtl	Wimu	Wibw
	(lb/A)	----------(% control)--------					
Cyanazine+Pendimethalin(Pre)	2.5+2	73	-	92	55	-	95
Cyanazine+Pendimethalin(Pre)	3+2	79	-	-	76	-	100*
Cyanazine(Pre)	3	71*	-	-	54	-	96*
Cyanazine+X77(3WPP)/Pend(Pre)	2.5+0.5%/2	94	99	100*	82	100	100*
Cyanazine+X77(3WPP)/Pend(Pre)	3+0.5%/2	96	-	99	84	-	100
Cyanazine+X77(3WPP)/Pend(Pre)	3.5+0.5%/2	94	100*	99	87	100*	99
Cyanazine+X77(3WPP)	3+0.5%	87	-	-	69	-	-
Cyanazine+X77(4WPP)/Pend(Pre)	2.5+0.5%/2	96	99	100*	84	99	100
Cyanazine+X77(4WPP)/Pend(Pre)	3+0.5%/2	97	99*	100*	88	100	99
Cyanazine+X77(4WPP)/Pend(Pre)	3.5+0.5%/2	96	99	99	87	100	98
Cyanazine+X77(4WPP)	3+0.5%	98	99*	100*	41	-	92*
Cyanazine+X77(5WPP)/Pend(Pre)	2.5+0.5%/2	92	99	98	71	100	93
Cyanazine+X77(5WPP)/Pend(Pre)	3+0.5%/2	93	97*	100*	68	98*	100*
Cyanazine+X77(5WPP)/Pend(Pre)	3.5+0.5%/2	90	99	100*	74	100*	100
Cyanazine+X77(5WPP)	3+0.5%	77	99	98	54	-	94*
Oryzalin+Fluorochloridone(Pre)	1.25+0.5	15*	98*	0	24	-	0
Oryzalin+Fluorochloridone(Pre)	1.5+0.5	60	-	18	34	-	5
Oryzalin(Pre)	1.5	27*	73*	45*	14*	-	41
Oryzalin+X77(3WPP)/Fluo(Pre)	1.25+0.5%/0.5	89	99*	94	62	100*	81
Oryzalin+X77(3WPP)/Fluo(Pre)	1.5+0.5%/0.5	91	99	91	67	100*	79
Oryzalin+X77(3WPP)	1.5+0.5%	79	63*	-	52	-	-
Oryzalin+X77(4WPP)/Fluo(Pre)	1.25+0.5%/0.5	74	97*	74	44	-	46
Oryzalin+X77(4WPP)/Fluo(Pre)	1.5+0.5%/0.5	91*	-	93*	63*	-	-
Oryzalin+X77(4WPP)	1.5+0.5%	86	71	70	75	62	24
Oryzalin+X77(5WPP)/Fluo(Pre)	1.25+0.5%/0.5	83	99	93	57	100	65
Oryzalin+X77(5WPP)/Fluo(Pre)	1.5+0.5%/0.5	91	99	95*	72	100	61*
Oryzalin+X77(5WPP)	1.5+0.5%	95	85	89	79	71*	23*
Cyanazine+Oryzalin+X77(5WPP)	3+1.5+0.5%	90	99	98	52	100*	85
Control [Glyt+X77(Pre)]	0 [0.375+0.5%]	34	-	-	15	1*	2*
C.V. %		17	12	15	36	16	25
LSD 5% for comparisons involving no *		14	11	12	22	15	18
LSD 5% for comparisons involving one *		16	13	15	25	17	21
LSD 5% for comparisons involving two *		18	15	17	29	20	24

[1] All plots received a preemergence application of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; 4L (flowable) formulation of cyanazine used.

See next page for summary

Summary. No sunflower injury was caused by any of the treatments. At the June 30 evaluation, preemergence applications of cyanazine alone or in combination with pendimethalin provided between 70 and 80% foxtail control. When applied 3 or 4 weeks prior to planting, however, foxtail control by cyanazine with or without preemergence pendimethalin was 90 to 98%. Similar results were achieved with applications 5 weeks before planting except that cyanazine alone gave only 77% foxtail control. By the August 11 evaluation, foxtail control had declined somewhat where pendimethalin was applied and had declined substantially where only cyanazine had been applied. Wild mustard and wild buckwheat control was near 100% for all cyanazine treatments. Preemergence oryzalin with or without fluorochloridone provided fair to poor foxtail control whereas early preplant treatments generally provided from 80 to 90% control at the June 30 evaluation. Better foxtail control was often achieved with oryzalin applied at 1.5 lb/A as compared to 1.25 lb/A. By August 11, oryzalin was only providing about 60 to 75% foxtail control. Rainfall received between application and 2 weeks after planting was 0.31, 4.75, 4.92, and 4.92 inches for the Pre, 3WPP, 4WPP, and 5WPP treatments, respectively.

Herbicide combinations in no-till sunflowers, Minot, 1987. Early preplant and preemergence treatments were applied April 22 and May 20, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. There were no weeds emerged on April 22. Cargill 207 sunflowers were sown in 30-inch rows on May 19 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. Postemergence treatments were applied using a spray volume of 8.5 gal/A and 35 psi on June 13 when sunflowers were in the V-2 vegetative growth stage, foxtail (mostly green with some yellow foxtail) was 2-leaf, wild mustard was 2 to 4-leaf (1 to 3 inches tall). 300 lbs urea/A was broadcast on May 7. Wheat stubble was 4 to 6 inches at planting time. Soil type was a loam with a pH of 6.6 and organic matter of 3.4%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on June 29 and August 11.

See next page for data and summary

Treatment[1]	Rate	Sufl Inj	June 29 Grft	June 29 Wimu	Aug. 11 Grft	Aug. 11 Wimu
	(lb/A)	(%)	----(% control)----			
Sethoxydim+Acifluorfen(Po)	0.2+0.125	0	62	5	45	0
Sethoxydim+Acifluorfen+X77(Po)	0.2+0.125+0.5%	3	84	83	62	75
Diclofop+Acifluorfen(Po)	0.75+0.125	11	22	25	5	-
AC 222,293(Po)	0.375	0	10	94	0	97
AC 222,293+Acifluorfen(Po)	0.375+0.063	9	9	-	0	-
AC 222,293+Acifluorfen(Po)	0.375+0.125	22	8	94	0	97
AC 222,293+Sethoxydim+X77(Po)	0.2+0.1+0.5%	0	69	96	30	98
AC 222,293+Sethoxydim+X77(Po)	0.2+0.2+0.5%	0	96	98	77	100
AC 222,293+Sethoxydim+Acifluorfen(Po)	0.375+0.05+0.063	9	8	96	3	98
Pendimethalin(Pre)/AC 222,293(Po)	2/0.375	0	96	95	95	98
Pendimethalin+X77(EPP)/AC 222,293(Po)	2+0.5%/0.375	0	88	100	83	100
Pendimethalin(Pre)/Acifluorfen(Po)	2/0.125	0	93	90	88	98
Pendimethalin+X77(EPP)/Acifluorfen(Po)	2+0.5%/0.125	0	87	22	86	22
Pendimethalin+Chloramben(Pre)	2+2.25	0	99	84	97	89
Pendimethalin+X77(EPP)/Chloramben(Pre)	2+0.5%/2.25	0	97	52	96	54
Alachlor-MT(Pre)/AC 222,293(Po)	2.5/0.375	0	75	99	68	98
Alachlor-MT(Pre)/Acifluorfen(Po)	2.5/0.125	0	87	45	83	48
Alachlor-MT+Chloramben(Pre)	2.5+2.25	0	97	5	93	0
Fluorochloridone(Pre)/Sethoxydim+X77(Po)	0.5/0.2+0.5%	0	98	99	95	99
Fluorochloridone+X77(EPP)/Seth+X77(Po)	0.5+0.5%/0.2+0.5%	0	98	98	95	96
Fluorochloridone+Pendimethalin(Pre)	0.5+2	0	94	99	91	100
Fluorochloridone+Pendimethalin+X77(EPP)	0.5+2+0.5%	0	90	100	83	100
Fluorochloridone+Alachlor-MT(Pre)	0.5+2.5	0	91	98	87	100
Fluorochloridone+X77(EPP)/Alac-MT(Pre)	0.5+0.5%/2.5	0	92	100	86	100
Lactofen(Pre)/Sethoxydim+X77(Po)	0.3/0.2+0.5%	0	96	92	91	94
Lactofen+X77(EPP)/Sethoxydim+X77(Po)	0.3+0.5%/0.2+0.5%	0	94	0	87	0
Control [Glyphosate+X77(Pre)]	0 [0.375+0.5%]	0	3	0	0	0
C.V. %		117	13	15	16	15
LSD 5%		3	14	15	14	15

[1]All plots received a preemergence treatment of glyphosate + X-77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; Alachlor-MT = microencapsulated formulation of alachlor.

Summary. Acifluorfen at 0.125 lb/A caused 22% injury when applied with AC 222,293 but 0 to 3% injury when applied alone or with sethoxydim and 11% injury when tank mixed with diclofop. Sethoxydim provided 95% or greater control of foxtail when applied at 0.2 lb/A except when tank mixed with acifluorfen where control dropped to 85%. Control by sethoxydim applied at 0.1 lb/A was about 70%. Foxtail control by alachlor-MT approached 100% when mixed with chloramben and was about 90% when combined with fluorochloridone, but was 75 to 85% when followed by postemergence AC 222,293 or acifluorfen which have little or no foxtail activity at the rates applied. Treatments providing good to excellent control of both foxtail and wild mustard included AC 222,293 plus sethoxydim, pendimethalin followed by AC 222,293, fluorochloridone followed by sethoxydim, fluorochloridone plus either pendimethalin or alachlor-MT, and preemergence lactofen followed by sethoxydim.

Herbicide combinations in no-till sunflowers, Carrington, 1987. Early preplant and preemergence treatments were applied April 23 and May 29, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Cargill 207 sunflowers were sown in 30-inch rows on May 29 using a John Deere MaxEmerge planter and a seeding rate of 22,000 seeds per acre. Postemergence treatments were applied on June 25 when sunflowers were in the V-8 vegetative growth stage, foxtail (an even mix of green and yellow foxtail) was in the 3-leaf stage, wild mustard was in the cotyledon to early bud stages (mostly 1 inch tall and 2-leaf), and wild buckwheat was mostly 3 inches tall although some plants were beginning to vine. 161 lbs N/A and 61 lbs P_2O_5/A were broadcast on October 23, 1986. Flax stubble was 2 to 4 inches at planting time. Soil type was a silt loam with a pH of 5.6 and organic matter of 4.1%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on June 10 and August 12.

Treatment[1]	Rate	June 10 Sufl Inj	June 10 Fxtl	June 10 Wimu	June 10 Wibw	Aug. 12 Fxtl	Aug. 12 Wimu	Aug. 12 Wibw
	(lb/A)	(%)	(%)					
Sethoxydim+Acifluorfen(Po)	0.2+0.125	3	85	99	96	47	99	95
Sethoxydim+Acifluorfen+X77(Po)	0.2+0.125+0.5%	9	94	98	93	84	97	74
Diclofop+Acifluorfen(Po)	0.75+0.125	9	75	98	95	46	95	94
AC 222,293(Po)	0.375	0	57	99	95	59	99	96
AC 222,293+Acifluorfen(Po)	0.375+0.063	5	10	97	97	19	96	72
AC 222,293+Acifluorfen(Po)	0.375+0.125	6	28	99	95	25	99	82
AC 222,293+Sethoxydim+X77(Po)	0.2+0.1+0.5%	0	78	99	92	73	99	90
AC 222,293+Sethoxydim+X77(Po)	0.2+0.2+0.5%	0	98	99	95	95	99	89
AC 222,293+Seth+Acif(Po)	0.375+0.05+0.063	8	56	99	99	55	100	75
Pendimethalin(Pre)/AC 222,293(Po)	2/0.375	0	90	99	98	89	100	98
Pend+X77(EPP)/AC 222,293(Po)	2+0.5%/0.375	0	93	99	97	88	99	95
Pendimethalin(Pre)/Acif(Po)	2/0.125	5	74	99	97	64	98	96
Pend+X77(EPP)/Acifluorfen(Po)	2+0.5%/0.125	5	92	99	97	85	97	93
Pendimethalin+Chloramben(Pre)	2+2.25	0	96	96	96	95	92	95
Pend+X77(EPP)/Chloramben(Pre)	2+0.5%/2.25	0	99	64	94	96	65	98
Alachlor-MT(Pre)/AC 222,293(Po)	2.5/0.375	0	92	99	92	87	100	93
Alachlor-MT(Pre)/Acifluorfen(Po)	2.5/0.125	7	75	98	95	75	100	92
Alachlor-MT+Chloramben(Pre)	2.5+2.25	0	91	95	76	81	96	55
Fluorochloridone(Pre)/Seth+X77(Po)	0.5/0.2+0.5%	1	91	99	89	77	100	83
Fluo+X77(EPP)/Sethoxydim+X77(Po)	0.5+0.5%/0.2+0.5%	0	95	98	25	92	98	23
Fluorochloridone+Pend(Pre)	0.5+2	0	88	99	93	84	100	97
Fluorochloridone+Pend+X77(EPP)	0.5+2+0.5%	0	88	99	24	85	97	24
Fluorochloridone+Alac-MT(Pre)	0.5+2.5	0	95	99	96	90	100	91
Fluo+X77(EPP)/Alachlor-MT(Pre)	0.5+0.5%/2.5	0	74	98	43	70	100	57
Lactofen(Pre)/Sethoxydim+X77(Po)	0.3/0.2+0.5%	0	96	98	90	89	100	73
Lactofen+X77(EPP)/Seth+X77(Po)	0.3+0.5%/0.2+0.5%	0	97	92	46	95	62	43
Control [Glyphosate+X77(Pre)]	0 [0.375+0.5%]	0	41	51	27	32	35	13
C.V. %		84	24	12	25	28	14	28
LSD 5%		2	27	16	29	29	19	31

[1]All plots received a preemergence application of glyphosate + X77 (0.375 + 0.5%) as a tank mix with other preemergence herbicides, if any; Alachlor-MT = microencapsulated formulation of alachlor.

See next page for summary

Summary. Early preplant pendimethalin appeared to provide better foxtail control than did pendimethalin applied preemergence. Alachlor-MT generally did not provide 90% or greater control of foxtail unless combined with an herbicide having significant foxtail activity (such as chloramben, etc.). Acifluorfen caused between 3 and 9% sunflower injury and provided excellent control of wild mustard and wild buckwheat. AC 222,293 (at 0.25 or 0.375 lb/A) likewise provided excellent control of both wild mustard and wild buckwheat. Foxtail control by sethoxydim at 0.1 lb/A was only about 75% while control with 0.2 lb/A was 95% or greater. Preemergence applications of fluorochloridone and lactofen were far superior to early preplant applications on wild buckwheat.

Burndown alternatives in no-till sunflowers, Minot, 1987. Preemergence treatments were applied June 5 when foxtail was 1-leaf (1 inch), wild mustard was 2-leaf (0.5 inch), and Russian thistle was 1 inch tall. Acifluorfen applications (P1) were sprayed June 12 when wild mustard was cotyledon to 2-leaf (1 inch), Russian thistle was 1 to 2 inches tall, and sunflowers were in the V-E stage (cotyledon). Sethoxydim applications (P2) were applied on June 25 when foxtail (mostly green foxtail with some yellow foxtail) was 4-leaf. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A (8002 nozzles and 35 psi) for preemergence treatments and 8.5 gal/A (8001 nozzles and 35 psi) for postemergence treatments. Cargill 207 sunflowers were sown in 30-inch rows on June 2 using a Buffalo Till planter and a seeding rate of 22,000 seeds per acre. 300 lbs/A urea was broadcast on May 7. Wheat stubble was 4 to 6 inches at planting. Soil type was a loam with a pH of 6.6 and organic matter of 3.4%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on June 29 and Aug 11.

Treatment[1]	Rate	Sufl Inj	June 29 Fxtl	June 29 Wimu	June 29 Ruth	Aug. 11 Fxtl	Aug. 11 Wimu
	(lb/A)	(%)	(% control)				
Lactofen+Glyphosate+Pend(Pre)	0.3+0.38+2	1	87	94	93	64	100
Lactofen+Glyphosate+Pend(Pre)	0.3+0.25+2	3	87	99	95	63	100
Lactofen+Pendimethalin(Pre)	0.3+2	1	20	98	94	11	100
Lactofen+Glyt+2,4-D+Pend(Pre)	0.3+0.25+0.38+2	8	87	99	95	69	100
Lactofen+Sethoxydim+Pend(Pre)	0.3+0.1+2	1	87	97	93	71	100
Lactofen+Seth+2,4-D+Pend(Pre)	0.3+0.1+0.38+2	5	88	98	93	69	100
Lactofen+Sethoxydim+Pend(Pre)	0.3+0.2+2	0	97	99	0	84	99
Lactofen(Pre)/Sethoxydim(P2)	0.3/0.2	1	97	98	58	65	99
Fluorochloridone+Pendimethalin(Pre)	0.5+2	0	39	98	99	16	100
Fluorochloridone+Seth+Pend(Pre)	0.5+0.1+2	0	88	100	89	74	100
Fluo+2,4-D+Sethoxydim+Pend(Pre)	0.5+0.38+0.1+2	0	89	98	99	75	100
Fluorochloridone+2,4-D+Pend(Pre)	0.5+0.38+2	0	43	99	0	28	99
Fluorochloridone+Glyt+Pend(Pre)	0.5+0.38+2	0	96	99	92	91	99
Fluorochloridone+Glyt+Pend(Pre)	0.5+0.25+2	0	92	99	91	87	100
Fluo+Glyphosate+2,4-D+Pend(Pre)	0.5+0.25+0.38+2	0	91	97	96	80	100
2,4-D+Seth(Pre)/Acif(P1)/Seth(P2)	0.38+0.1/0.13/0.2	0	99	99	100	90	100
Acifluorfen(P1)/Sethoxydim(P2)	0.13/0.2	0	97	29	4	84	0
Glyt(Pre)/Acif(P1)/Seth(P2)	0.38/0.13/0.2	0	99	98	28	97	98
Glyt(Pre)/Acif(P1)/Seth(P2)	0.25/0.13/0.2	0	99	92	4	93	51
Glyt+2,4-D(Pre)/Acif(P1)/Seth(P2)	0.25+0.38/0.13/0.2	0	99	97	93	94	100
Paraquat(Pre)/Acif(P1)/Seth(P2)	0.38/0.13/0.2	0	99	94	92	93	91
Glyphosate+Pend+Chloramben(Pre)	0.38+2+2.25	0	93	95	89	89	93
Paraquat+Pend+Chloramben(Pre)	0.25+2+2.25	0	45	79	27	24	45
Paraquat+Pend+Chloramben(Pre)	0.38+2+2.25	0	69	96	76	60	95
Glyphosate(Pre)	0.38	0	89	98	6	74	100
LSD 5%		NS	8	10	16	11	15

[1]All preemergence treatments and all postemergence sethoxydim treatments were applied with 0.5% X-77 surfactant; butoxyethyl ester formulation of 2,4-D used.

Summary. Low levels of sunflower injury were detected in plots treated with lactofen and the application of preemergence 2,4-D plus lactofen caused additional injury. Preemergence 2,4-D without lactofen, however, caused no visibly detectable sunflower injury. Preemergence glyphosate applied alone (without any residual herbicides) provided 98% wild mustard control when evaluated June 29. Preemergence lactofen and fluorochloridone appeared to provide excellent burndown of wild mustard but burndown of Russian thistle by these two herbicides seemed inconsistent. Paraquat apparently was not as effective as glyphosate in providing burndown of foxtail and Russian thistle.

Burndown alternatives in no-till sunflowers, Carrington, 1987. Preemergence treatments were applied June 4 when foxtail was 1-leaf (1 inch tall), wild mustard was cotyledon to flowering but mostly cotyledon to 2-leaf, and wild buckwheat was 2 to 10-leaf (2 to 5 inches tall). Acifluorfen applications (P1) were applied on June 12 when wild mustard was 2-leaf to flowering (mostly 4-leaf), wild buckwheat was 5-inches long, and sunflowers were V-E to V-2 (cotyledon to 2-leaf). Sethoxydim applications (P2) were applied on June 25 when foxtail (mix of green and yellow foxtail) was in the 4-leaf stage. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A (8002 nozzles and 35 psi) for preemergence treatments and 8.5 gal/A (8001 nozzles and 35 psi) for postemergence treatments. Cargill 207 sunflowers were sown May 29 using a John Deere MaxEmerge planter and a seeding rate of 22,000 seeds per acre. 161 lbs/A N and 61 lbs/A P_2O_5 was broadcast on October 23, 1986. Flax stubble was 2 to 4 inches at planting. Soil type was a silt loam with a pH of 5.6 and organic matter of 4.1%. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications. Visual estimates of percent weed control were obtained on July 10 and Aug 12.

			July 10			Aug. 12		
Treatment[1]	Rate	Sufl Inj	Fxtl	Wimu	Wibw	Fxtl	Wimu	Wibw
	(lb/A)	(%)	---------(% control)---------					
Lactofen+Glyphosate+Pend(Pre)	0.3+0.38+2	3	97	99	95	88	78	73
Lactofen+Glyphosate+Pend(Pre)	0.3+0.25+2	0	92	99	47	73	79	39
Lactofen+Pendimethalin(Pre)	0.3+2	0	33	99	25	26	99	26
Lactofen+Glyt+2,4-D+Pend(Pre)	0.3+0.25+0.38+2	1	90	99	93	72	99	60
Lactofen+Sethoxydim+Pend(Pre)	0.3+0.1+2	1	81	98	0	74	99	0
Lactofen+Seth+2,4-D+Pend(Pre)	0.3+0.1+0.38+2	4	88	99	72	75	100	49
Lactofen+Sethoxydim+Pend(Pre)	0.3+0.2+2	1	96	99	29	89	97	23
Lactofen(Pre)/Sethoxydim(P2)	0.3/0.2	0	96	99	0	92	100	0
Fluorochloridone+Pend(Pre)	0.5+2	0	50	98	61	45	99	39
Fluorochloridone+Seth+Pend(Pre)	0.5+0.1+2	0	93	99	60	89	100	47
Fluo+2,4-D+Sethoxydim+Pend(Pre)	0.5+0.38+0.1+2	0	92	99	97	74	102	79
Fluo+2,4-D+Pendimethalin(Pre)	0.5+0.38+2	0	66	99	66	45	102	53
Fluo+Glyphosate+Pend(Pre)	0.5+0.38+2	0	91	99	90	77	102	66
Fluo+Glyphosate+Pend(Pre)	0.5+0.25+2	0	93	99	71	84	100	64
Fluo+Glyphosate+2,4-D+Pend(Pre)	0.5+0.25+0.38+2	0	95	99	96	87	100	86
2,4-D+Seth(Pre)/Acif(P1)/Set(P2)	0.38+0.1/0.13/0.2	2	98	98	56	86	99	23
Acifluorfen(P1)/Sethoxydim(P2)	0.13/0.2	0	85	42	0	80	48	0
Glyt(Pre)/Acif(P1)/Seth(P2)	0.38/0.13/0.2	0	98	95	85	91	94	62
Glyt(Pre)/Acif(P1)/Seth(P2)	0.25/0.13/0.2	0	98	71	60	90	94	50
Glyt+2,4-D(Pre)/Acif(P1)/Set(P2)	0.25+0.38/0.13/0.2	0	98	99	38	89	100	30
Paraquat(Pre)/Acif(P1)/Seth(P2)	0.38/0.13/0.2	0	98	97	30	95	98	24
Glyphosate+Pend+Chloramben(Pre)	0.38+2+2.25	0	96	98	97	88	99	88
Paraquat+Pendimethalin+Clam(Pre)	0.25+2+2.25	0	92	95	56	88	93	50
Paraquat+Pendimethalin+Clam(Pre)	0.38+2+2.25	0	94	99	88	84	97	63
Glyphosate(Pre)	0.38	0	65	94	62	43	98	39
LSD 5%		1	23	19	40	27	19	48

[1] All preemergence treatments and all postemergence sethoxydim treatments were applied with 0.5% X-77 surfactant; butoxyethyl ester formulation of 2,4-D used.

Summary. A burndown application of glyphosate at 0.38 lb/A or glyphosate at 0.25 lb/A plus 2,4-D was required to give satisfactory wild buckwheat control. The lower rate of glyphosate (0.25 lb/A) gave adequate burndown for foxtail and wild mustard. Sethoxydim plus 2,4-D (0.1 + 0.38 lb/A) appeared to provide satisfactory burndown of foxtail and wild mustard although foxtail burndown may have been less than complete in some instances (note that X-77 was used as the adjuvant with sethoxydim instead of the recommended phytobland oil). Preemergence lactofen and fluorochloridone has provided excellent burndown of wild mustard but not of foxtail and wild buckwheat.

BAS514 for weed control in no-till spring wheat, Fargo, 1987. Fall treatments (F) were applied October 17, 1986, preemergence treatments (Pre) were applied May 4, 1987, and postemergence treatments (P) were applied May 27 with wheat in the 4 to 5-leaf stage and foxtail (mostly yellow foxtail) in the 1-leaf stage. All treatments were applied with a bicycle wheel sprayer delivering either 17 gal/acre (F and Pre treatments) or 8.5 gpa (P treatments) at 35 psi. Marshall wheat was seeded into wheat stubble at 80 lb per acre on April 30 using a Haybuster no-till drill. Plot size was 10 by 20 ft and the experiment was a completely randomized block having four replications. Wheat injury was evaluated on June 12 and wheat injury and foxtail control were evaluated on July 6.

Treatment[1]	Rate[1]	June 12 Wheat injury	July 6 Wheat injury	July 6 Fxtl
	(lb/A)	(%)		
BAS514(F)/Imazamethabenz(P)	0.5/0.38	1	0	18
BAS514(F)/Imazamethabenz(P)	0.75/0.38	0	0	19
BAS514(F)/Imazamethabenz(P)	1/0.38	0	0	49
BAS514(F)/Imazamethabenz(P)	1.5/0.38	7	0	55
BAS514(F)	1	1	0	28
BAS514+BAS090(Pre)/Immb(P)	0.5+1Q/0.38	4	0	50
BAS514+BAS090(Pre)/Immb(P)	0.75+1Q/0.38	15	0	87
BAS514+BAS090(Pre)/Immb(P)	1+1Q/0.38	10	0	90
BAS514+BAS090(Pre)/Immb(P)	1.5+1Q/0.38	15	0	97
BAS514+BAS090(Pre)	1.5+1Q	8	0	93
BAS514+Imazamethabenz+BAS090(P)	0.25+0.38+1Q	10	0	11
BAS514+Imazamethabenz+BAS090(P)	0.5+0.38+1Q	14	0	40
BAS514+Imazamethabenz+BAS090(P)	0.75+0.38+1Q	11	0	38
BAS514+Imazamethabenz+BAS090(P)	1+0.38+1Q	18	0	65
BAS514+BAS090(P)	0.5+1Q	12	0	20
Control	0	0	0	0
C.V. %		88	0	43
LSD 5%		10	NS	29
# of reps		4	4	4

[1]Entire experimental area (including check strips between plots) received glyphosate (1.5 lb ae/A) plus HOE-00661 (1 lb/A) at planting time (preemergence); 1Q = 1 quart per acre.

Summary. Good to excellent foxtail control was achieved with BAS514 only when applied preemergence at 0.75 lb/A or more. Wheat injury observed with preemergence and postemergence treatments was apparently caused by BAS514 and was typically between 10 and 15% for all but the lowest rates. The presence of perennial sowthistle in certain plots indicated that BAS514 provided substantial control of this species.

Preemergence 2,4-D injury in no-till spring wheat, Fargo, 1987. Marshall wheat was seeded 1.5 inches deep on June 9 into untilled soil covered with a light to moderate level of plant residue. The grain drill was equipped with cutting coulters but not with press wheels designed for slot closure in no-till. Treatments were applied immediately after seeding with a bicycle wheel sprayer delivering 17 gal/A using 8002 nozzles and 40 psi. On June 10, 0.14 inch of rain was received and another 0.27 inch of rain fell on June 17. The entire experimental area was treated with paraquat (0.5 lb/A) on June 12 to control emerged vegetation. On July 3, a package mix product containing diclofop, MCPA, and bromoxynil ('One Shot') was applied over all plots at the equivalent of 1 lb/A of diclofop. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent wheat stand reduction were taken on July 2.

Treatment[1]	Rate	Stand reduction
	(lb/A)	(%)
2,4-D-ester	0.375	1
2,4-D-ester	0.5	1
2,4-D-ester	0.75	2
2,4-D-ester	1	8
2,4-D-ester	1.5	6
2,4-D-amine	0.375	1
2,4-D-amine	0.5	2
2,4-D-amine	0.75	2
2,4-D-amine	1	9
2,4-D-amine	1.5	7
Control	0	0
C.V. %		94
LSD 5%		5
# of reps		4

[1] 2,4-D-ester = butoxyethyl ester and 2,4-D-amine = dimethylamine.

Summary. With 0.14 inch of rain falling one day after 2,4-D application (and 0.27 inch seven days later), wheat stand reductions due to 0.375 to 0.75 lb ae/A of 2,4-D were negligible. 2,4-D amine or ester at 1 to 1.5 lb ae/A caused between 6 and 9% stand reductions. Grain yields were not taken in this study because of substantial hail damage received in late July.

Fall treatments for weed control in fallow, Minot, 1987. Fall treatments were sprayed October 9, 1986 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzle tips and 35 psi. Spring treatments were applied on June 1, 1987 when tansy mustard was 12 to 24 inches tall, Russian thistle 1 to 4 inches tall, and foxtail (mostly green) was 1 to 3-leaf. Plot size was 10 by 25 ft. The experiment was a randomized complete block with four replications. Percent control was evaluated on July 9, 1987.

Treatment[1]	Rate	Weed control Grft	Tamu	Ruth
	(oz/A)	-------(%)-----		
BAS514(F)	12	82	14	-
BAS514(F)	16	93	8	96
BAS514(F)	24	98	9	96
BAS514(F)	32	96	9	97
BAS514+Chlorsulfuron(F)	12+0.25	86	97	99
BAS514+Chlorsulfuron(F)	16+0.25	75	99	98
BAS514+Chlorsulfuron(F)	24+0.25	91	100	99
BAS514+CGA-131036(F)	16+0.25	85	95	100
BAS514+Atrazine-DF(F)	12+12	76	95	95
BAS514+Atrazine-DF(F)	12+16	83	100	-
BAS514+Atrazine-DF(F)	16+12	81	100	-
BAS514+Atrazine-DF(F)	16+16	90	100	98
BAS514+Atrazine-DF(F)	24+12	91	98	99
BAS514+Atrazine-DF(F)	24+16	98	99	99
BAS514+Atra-DF+Cyan-W(F)	16+8+24	79	99	100
CGA-131036(F)	0.25	13	99	52
CGA-131036(F)	0.375	17	99	
Clomazone(F)	12	6	84	12
CGA-131036+Clomazone(F)	0.25+12	22	100	73
CGA-131036+Clomazone(F)	0.375+16	10	100	43
Clomazone+Clsu(F)	12+0.25	40	100	82
Clsu(F)/BAS514+BAS090(S)	0.25/16+0.25G[1]	95	95	96
Clsu(F)/BAS514+BAS090(S)	0.25/24+0.25G	90	99	98
Untreated	0	0	0	0
C.V. %		17	14	15
LSD 5%		17	15	17
# of reps		4	4	4

[1] Atrazine-DF = dry flowable formulation; Cyan-W = wettable powder formulation of cyanazine; 0.25G = 0.25 gal/acre.

Summary. Nearly complete control of foxtail was achieved with BAS514 applied alone in the fall at 1.5 lb/A. Tank mixing with chlorsulfuron or atrazine appeared to lower foxtail control with BAS514 although differences were often not significant. Treatments with BAS514 or chlorsulfuron provided excellent control of Russian thistle while clomazone and CGA-131036 provided only fair to poor control of this species. Tansy mustard control of 95 to 100% was achieved with chlorsulfuron, and CGA-131036 but clomazone provided only 84% control and BAS514 was especially weak on this species. Combinations of BAS514 with 12 to 16 oz/A of atrazine gave nearly complete control of tansy mustard.

Combinations of postemergence plus residual herbicides in fallow, Minot, 1987. Early treatments (P1) were applied May 19 when foxtail (mostly green foxtail) was 2 to 3-leaf and very sparse and tansy mustard 5 to 12 inches tall with some flowering. Air temperature on May 19 was 80 F and relative humidity was 60%. Late treatments (P2) were applied June 5 when foxtail was 1 to 3-leaf (moderately heavy) and tansy mustard was 12 to 24 inches tall and flowering. Temperature on June 5 was 77 F, RH was 57%, and the soil surface was dry. All treatments were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi (treatments 1 to 3 received 17 gpa with 8002 nozzles). Soil type was a loam. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent control were taken on July 10.

Treatment[1]	Rate	Weed control Grft	Weed control Tamu
	(lb/A)	-----(%)----	
BAS514+BAS090(P1)	0.5+1Q[1]	90	17
BAS514+BAS090(P1)	1+1Q	96	0
BAS514+BAS090(P1)	2+1Q	98	14
BAS514+BAS090+Glyt&2,4-D(P1)	0.5+1Q+0.53	80	99
BAS514+BAS090+Glyt&2,4-D(P1)	1+1Q+0.53	96	100
BAS514+BAS090+Glyt&2,4-D(P1)	2+1Q+0.53	99	100
BAS514+BAS090+Clsu+Glyt&2,4-D(P1)	1+1Q+0.0104+0.53	93	99
BAS514+BAS090+Clsu+Glyt&2,4-D(P1)	1+1Q+0.0156+0.53	97	100
BAS514+BAS090+Atra+Glyt&2,4-D(P1)	1+1Q+0.5+0.53	98	100
BAS514+BAS090+Cyan+Glyt&2,4-D(P1)	1+1Q+2+0.53	97	100
Chlorsulfuron+Glyphosate&2,4-D(P1)	0.0156+0.53	77	98
BAS514+BAS090(P2)	0.5+1Q	71	20
BAS514+BAS090(P2)	1+1Q	70	5
BAS514+BAS090(P2)	2+1Q	81	12
BAS514+BAS090+Glyt&2,4-D(P2)	0.5+1Q+0.53	89	83
BAS514+BAS090+Glyt&2,4-D(P2)	1+1Q+0.53	94	91
BAS514+BAS090+Glyt&2,4-D(P2)	2+1Q+0.53	95	90
BAS514+BAS090+Clsu+Glyt&2,4-D(P2)	1+1Q+0.0104+0.53	94	92
BAS514+BAS090+Clsu+Glyt&2,4-D(P2)	1+1Q+0.0156+0.53	94	90
Chlorsulfuron+Glyphosate&2,4-D(P2)	0.0156+0.53	93	98
BAS514+BAS090+Clomazone+Atra+2,4-D(P2)	0.5+1Q+0.5+0.5+0.5	58	88
BAS514+BAS090+Clomazone+Atra+2,4-D(P2)	0.375+1Q+0.375+0.5+0.5	71	68
Clomazone+Atrazine+Glyt&2,4-D(P2)	0.5+0.5+0.53	90	97
Clomazone+Glyphosate&2,4-D(P2)	0.5+0.53	91	97
Control	0	0	0
C.V. %		11	12
LSD 5%		13	12

[1] Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D; formulations used: wettable powder of atrazine, flowable of cyanazine, and butoxyethyl ester of 2,4-D; 1Q = 1 quart/acre.

Summary. BAS514 alone provided excellent foxtail control when applied in the 3rd week of May prior to emergence of most of the foxtail, but only as much as 80% control when applied in early June. Since both application timings received activating rainfall from two to six days after application, the lower control from the June application date seems to indicate a lower efficacy of BAS514 when applied postemergence to foxtail. This trend is further seen in the fact that when glyphosate was applied with BAS514 on June 5, control was equal to BAS514 applied alone on May 19. BAS514 provided poor control of tansy mustard. Tansy mustard was controlled by treatments involving Landmaster II and chlorsulfuron, especially when applied at the earlier growth stage.

Postemergence treatments in fallow, Minot, 1987. Treatments were applied June 5 using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. Air temperature was 80 F and relative humidity was 56% at time of spraying. Weed stages were as follows: green foxtail, 1 to 2-lf, 1-in tall; Russian thistle, cotyledon to 8-in tall; kochia, 4 to 8-in tall; tansy mustard, 14 to 24-in tall, flowering. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent control were taken on July 10.

Treatment[1]	Rate	Weed control			
		Grft	Ruth	KOCZ	Tamu
	(lb/A)	(%)			
Glyphosate&2,4-D	0.19&0.17	94	92	100	96
Glyphosate&2,4-D	0.28&0.25	97	87	99	100
Glyphosate&2,4-D	0.38&0.34	96	94	100	100
Glyphosate&2,4-D+AS	0.19&0.17+2.5	97	90	100	98
Glyphosate&2,4-D+AS	0.28&0.25+2.5	97	89	98	-
Glyphosate&2,4-D+Dicamba	0.19&0.17+0.125	97	93	100	95
Glyphosate&2,4-D+Dicamba	0.19&0.17+0.25	95	98	100	99
Glyphosate&2,4-D+Dicamba	0.19&0.17+0.5	99	100	100	100
Glyphosate&2,4-D+Dicamba+AS	0.19&0.17+0.5+2.5	99	100	100	100
Glyphosate&2,4-D+Dicamba	0.28&0.25+0.125	98	95	99	100
Glyphosate&2,4-D+Dicamba	0.28&0.25+0.25	98	99	100	100
Glyphosate&2,4-D+Dicamba	0.28&0.25+0.5	98	100	99	100
Glyphosate&dicamba	0.28&0.125	98	94	100	99
Glyphosate&dicamba	0.38&0.17	97	98	100	98
Glyphosate&dicamba+Dicamba	0.28&0.125+0.125	95	97	100	-
Glyphosate&dicamba+Dicamba	0.28&0.125+0.25	97	100	100	-
Paraquat+Diuron+X-77	0.375+0.1+0.5%	73	91	-	86
Paraquat+Diuron+X-77	0.5+0.1+0.5%	86	89	-	92
Paraquat+Diuron+2,4-D+X-77	0.375+0.1+0.5+0.5%	70	92	-	56
Paraquat+Diuron+2,4-D+X-77	0.5+0.1+0.5+0.5%	90	93	-	97
Para+Diur+Fluazifop-P+X-77	0.375+0.1+0.063+0.5%	81	91	-	75
Para+Diur+Fluazifop-P+X-77	0.375+0.1+0.094+0.5%	91	93	-	75
Ammonium thiosulfate+X-77	2G+0.5%	0	0	0	0
Ammonium thiosulfate+X-77	4G+0.5%	10	0	0	2
Ammonium thiosulfate+PO	2G+0.25%	6	0	0	0
Control	0	0	0	0	0
LSD 5%		8	4	1	2

[1] Glyphosate&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D; Glyphosate&dicamba = Fallowmaster herbicide containing 1.12 lb ae/gal glyphosate and 0.5 lb ae/gal dicamba; AS = ammonium sulfate; PO = petroleum oil adjuvant with 17% emulsifier; G = gallons per acre.

Summary. 95 to 100% green foxtail control was achieved with all treatments involving glyphosate. There was no evidence of antagonism by dicamba of foxtail control by Landmaster II. All treatments involving glyphosate provided essentially complete control of kochia and tansy mustard although there seemed to be a slight weakness in tansy mustard control at the lowest rate of Landmaster II when less than 0.5 lb/A dicamba was added. Control of Russian thistle with Landmaster II was only about 90 to 95% with or without ammonium sulfate. Complete Russian thistle control seemed to require the presence of 0.25 (or 0.17) lb/A of dicamba in the mixture. Paraquat mixtures did not generally provide above 90% control of the weed species evaluated. Foxtail control was greater at the 0.5 than at the 0.375 lb/A rate of paraquat.

False chamomile control in potholes, Mohall, 1987. Treatments were applied June 11 using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. At time of spraying fall germinated (winter annual) plants were 8 to 14 inches tall while those germinating in the spring (summer annual) were 1 to 5 inches tall. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications. Visual estimates of percent control were taken on July 21.

Treatment	Rate	False chamomile control: Winter annual	False chamomile control: Summer annual
	(oz/A)	------(%)------	
Chlorsulfuron+X-77	0.25+0.25%	86	77
Metsulfuron+X-77	0.06+0.25%	89	86
Metsulfuron+2,4-D+X-77	0.06+2+0.25%	89	89
Metsulfuron+MCPA+X-77	0.06+2+0.25%	74	84
DPX-M6316+X-77	0.25+0.25%	70	50
DPX-M6316+X-77	0.5+0.25%	77	72
DPX-M6316+MCPA+X-77	0.25+2+0.25%	48	40
DPX-L5300+X-77	0.125+0.25%	72	84
DPX-L5300+X-77	0.25+0.25%	83	87
DPX-R9674+X-77	0.25+0.25%	76	74
DPX-R9674+X-77	0.5+0.25%	87	85
CGA-131036+X-77	0.25+0.25%	93	67
Clopyralid+X-77	1.5+0.25%	20	26
Clopyralid+X-77	3+0.25%	68	58
Clopyralid&2,4-D+X-77[1]	1.5&6+0.25%	51	49
BAS-514+BAS-090	1+0.25G	2	1
BAS-514+BAS-090	2+0.25G	3	0
Glyphosate+X-77	4+0.25%	27	38
Glyt+Mets+X-77	4+0.06+0.25%	94	99
Glyt+DPX-M6316+X-77	4+0.25+0.25%	81	70
Glyt+Clomazone+X-77	4+12+0.25%	38	35
Control	0	2	4
C.V. %		17	17
LSD 5%		17	16
# of reps		3	3

[1] Clopyralid&2,4-D = Curtail 205 herbicide containing 2 lb 2,4-D and 0.5 lb clopyralid per gallon.

Summary. Sulfonylurea herbicides, chlorsulfuron, metsulfuron, CGA-131036, DPX-M6316, and DPX-L5300 (DPX-R9674 is a package mix of DPX-M6316 and DPX-L5300), provided most effective control of false chamomile. Among these, DPX-M6316 appears to be least effective. Metsulfuron plus 4 oz/A of glyphosate provided nearly complete control of false chamomile.

Glyphosate and HOE-00661 for no-till burndown, Pillsbury, 1987. Treatments were applied May 2 (early), May 14 (mid), and May 29 (late) when kochia was 0.5 to 1, 1.5 to 4, and 2 to 10 inches tall, respectively. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for all treatments involving glyphosate and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. Environmental conditions for these dates were as follows: on May 2, relative humidity (RH) was low and air temperature was 70 F; on May 14, RH was 25% and temperature was 80 F; on May 29, RH was 70% and temperature was 80 F. Visual estimates of percent control were taken on May 23 (21 days after treatment) for the early spray timing, June 1 (18 DAT) and June 9 (26 DAT) for the mid timing, and June 23 (25 DAT) for the late timing. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate	Kochia control Early 21 DAT	Mid 18 DAT	Mid 26 DAT	Late 25 DAT
	(lb/A)	(%)			
Glyphosate+X77	0.5+0.5%	69	74	84	98
Glyphosate+X77	0.375+0.5%	41	68	75	97
Glyphosate+X77	0.25+0.5%	11	27	44	94
Glyphosate+AS+X77	0.5+2.5+0.5%	78	97	98	97
Glyphosate+AS+X77	0.375+2.5+0.5%	54	80	87	95
Glyphosate+AS+X77	0.25+2.5+0.5%	11	73	85	95
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	87	94	96	96
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	81	81	90	97
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	66	50	69	94
Glyt&2,4-D+2,4-D-dma+AS	0.375&0.33+0.17+2.5	95	99	98	98
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	83	95	96	95
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	78	82	95	97
HOE-00661+X77	1+0.5%	65	63	62	97
HOE-00661+X77	0.75+0.5%	18	44	45	96
HOE-00661+X77	0.5+0.5%	12	6	20	91
HOE-00661+Glyphosate+X77	0.75+0.25+0.5%	29	44	53	93
HOE-00661+Glyphosate+X77	0.75+0.188+0.5%	21	39	34	97
HOE-00661+Glyphosate+X77	0.5+0.25+0.5%	9	25	31	91
HOE-00661+Glyphosate+X77	0.5+0.188+0.5%	19	19	28	90
HOE-00661+Glyphosate+X77	0.375+0.25+0.5%	16	14	19	84
HOE-00661+Glyphosate+AS+X77	0.375+0.25+2.5+0.5%	49	78	79	84
HOE-00661+Glyphosate+X77	0.375+0.188+0.5%	4	15	18	85
Control	0	0	0	4	0
C.V. %		23	13	13	3
LSD 5%		14	10	11	4
# of reps		4	4	4	4

[1]AS = ammonium sulfate; X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D.

See next page for summary

Summary. Ammonium sulfate increased kochia control with glyphosate when applied to 1.5 to 4-inch plants. This adjuvant did not significantly increase control with glyphosate of smaller kochia or of larger plants ranging to 10 inches in height. Excellent control of the large kochia was obtained at all glyphosate rates with or without ammonium sulfate. Glyphosate plus 2,4-D (0.375 + 0.33 lb ae/A) (Landmaster II) plus enough extra 2,4-D amine to provide a total of 0.5 lb 2,4-D per acre provided better control of 0.5 to 1-inch kochia than did glyphosate at 0.375 lb ae/A with or without ammonium sulfate. This increased control of the smallest kochia by 2,4-D was especially dramatic at the 0.25 lb ae/A rate of glyphosate but the increase was less evident on the 1.5 to 4-inch plants and not significant on the largest plants which were readily controlled by glyphosate alone. As with glyphosate alone, ammonium sulfate significantly increased control by the glyphosate plus 2,4-D mixtures of 1.5 to 4-inch kochia but not of the smaller or the larger plants. HOE-00661 applied alone or in combination with glyphosate provided poor control of the small and mid-size kochia. Ammonium sulfate, however, dramatically increased control of these smaller plants by HOE-00661 plus glyphosate applied at 0.375 + 0.25 lb ae/A. Tank mix combinations of HOE-00661 plus glyphosate did not increase control of large kochia over either herbicide applied alone (at equivalent rates) and in certain cases appeared to provide significantly less control than either of the herbicides applied alone. These data indicate a possible antagonism between glyphosate and HOE-00661 in kochia control.

Glyphosate and HOE-00661 for early-spring no-till burndown, Cayuga, 1987. Treatments were applied May 4 when wild oats were 2 to 3-leaf, greenflower pepperweed was 1 to 3 inches tall, wild buckwheat was cotyledon to 2-leaf, Russian thistle was 0.5 to 1.5 inches tall, and kochia was 0.5 to 1 inch tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for all treatments involving glyphosate, and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. Visual estimates of percent control were taken on May 16 (12 days after treatment) and on May 27 (23 DAT). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate	Rated 12 DAT			Rated 23 DAT				
		Wioa	Gfpw	Wibw	Wioa	Gfpw	Wibw	Ruth	KOCZ
	(lb/A)	(% control)							
Glyphosate+X77	0.5+0.5%	96	71	55	98	94	90	92	100
Glyphosate+X77	0.375+0.5%	98*	64	40	99	97	94	100	100*
Glyphosate+X77	0.25+0.5%	94	41	46	96	91	90	97	98
Glyphosate+AS+X77	0.5+2.5+0.5%	96	88	69	95	98	97	100	100
Glyphosate+AS+X77	0.375+2.5+0.5%	97*	67	63	98	94	92	99	99*
Glyphosate+AS+X77	0.25+2.5+0.5%	96	54	55	98	87	91	98	96
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	100	100	99	100	100	100	100	100
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	94	95	62	97	100	97	100	98
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	96*	88	67	94	100	94	98*	99
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	95	94	70	95	100	96	100	98
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	97	86	75	98	98	96	99	99
HOE-00661+X77	1+0.5%	85	79	100	83	63	99	99	96
HOE-00661+X77	0.75+0.5%	79	56	99	76	33	93	94	90
HOE-00661+X77	0.5+0.5%	67	51	76	55*	11*	72*	67*	40*
HOE-00661+Glyt+X77	0.75+0.25+0.5%	90	47	97*	84	29	99	98	99
HOE-00661+Glyt+X77	0.75+0.188+0.5%	89	37	100	85	29	97	99	97*
HOE-00661+Glyt+X77	0.5+0.25+0.5%	85	29	100	89	16	96	94	-
HOE-00661+Glyt+X77	0.5+0.188+0.5%	81	31	96	83	19	93	85	73
HOE-00661+Glyt+X77	0.375+0.25+0.5%	88	33	88	88	13	95	79	82*
HOE-00661+Glyt+AS+X77	0.375+0.25+2.5+0.5%	95	55	50	97	92	94	100	98
HOE-00661+Glyt+X77	0.375+0.188+0.5%	68	20	90	72	6	86	49	41
Control	0	0	0	0	9	0	0	3	0
C.V. %		9	26	21	10	14	9	11	33
LSD 5% for comparisons involving no *		11	22	21	12	13	11	15	18
LSD 5% for comparisons involving one *		12	-	23	13	14	12	16	19
LSD 5% for comparisons involving two *		13	-	-	-	-	-	17	20

[1]AS = ammonium sulfate; X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D.

See next page for summary

Summary. When evaluating wild oat control with glyphosate or HOE-00661 or wild buckwheat control with at least 0.5 lb/A of HOE-00661, 12 days was apparently sufficient time for maximal expression of the treatment effects. Allowing 23 days between spraying and evaluation proved to be more desirable for observing other treatment effects. Greenflower pepperweed, however, generally showed less control from HOE-00661 mixtures when evaluated at 23 days rather than at 12 days after treatment, indicating that regrowth was occurring during the interval between evaluation dates. Control of 2 to 3-leaf wild oats was near complete with all rates of glyphosate alone and was not enhanced by addition of ammonium sulfate. Wild oat control with glyphosate&2,4-D (Landmaster II) plus additional 2,4-D amine was equivalent to that by glyphosate alone. HOE-00661 did not satisfactorily control wild oats and appeared to antagonize wild oat control by glyphosate when the two herbicides were tank-mixed. This antagonism was alleviated by ammonium sulfate. Control of 1 to 3-inch greenflower pepperweed was generally 90 to 98% with glyphosate with or without ammonium sulfate. Glyphosate&2,4-D plus additional 2,4-D gave essentially complete control at all rates. HOE-00661 provided poor control of greenflower pepperweed and substantially antagonized control by glyphosate when the two herbicides were mixed. As with wild oats, this antagonism was alleviated by addition of ammonium sulfate. Control of cotyledon to 2-leaf wild buckwheat was 90 to 94% for all rates of glyphosate alone and appeared to increase slightly though not significantly with additions of either ammonium sulfate or 2,4-D. HOE-00661 at 1 lb/A gave complete burndown of wild buckwheat but only fair control at 0.5 lb/A. Combinations of 0.75 lb/A of HOE-00661 with low rates of glyphosate (0.25 or 0.19 lb/A) provided near complete wild buckwheat control. The effectiveness of glyphosate and HOE-00661 on wild buckwheat was not reduced by tank mix combinations of these two herbicides. Excellent burndown of 0.5 to 1.5-inch Russian thistle and 0.5 to 1-inch kochia was achieved with glyphosate alone at all rates and thus the potential enhancement of control by addition of ammonium sulfate or 2,4-D could not be determined. Excellent Russian thistle and kochia control was also obtained with 0.75 to 1 lb/A of HOE-00661. Interestingly, the addition of ammonium sulfate to low rates of HOE-00661 plus glyphosate (0.375 + 0.25 lb/A) afforded essentially complete control of these two species when control without the adjuvant was only about 80%.

Glyphosate and HOE-00661 for mid-spring no-till burndown, Cayuga, 1987. Treatments were applied May 19 when wild oats were 3 to 4-leaf (6 to 8 inches tall), greenflower pepperweed was 8 to 14 inches tall, wild buckwheat was 3 to 5 inches tall, Russian thistle was 5 to 8 inches tall, kochia was 3 to 4 inches tall, and yellow foxtail was 2 to 4 inches tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for all treatments involving glyphosate, and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. At the time of spraying, air temperature was 50 F and relative humidity was close to 100% with a light mist and damp vegetation. Visual evaluations of percent control were taken on June 11 (23 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate	Weed control - 23 DAT				
		Wioa	Gfpw	Wibw	Ruth	Yeft
	(lb/A)	(%)				
Glyphosate+X77	0.5+0.5%	99	99	94	100	97
Glyphosate+X77	0.375+0.5%	99	97	91	100	-
Glyphosate+X77	0.25+0.5%	100	92	77	100	-
Glyphosate+AS+X77	0.5+2.5+0.5%	100*	100*	98*	100*	100*
Glyphosate+AS+X77	0.375+2.5+0.5%	100	100	98	100	99*
Glyphosate+AS+X77	0.25+2.5+0.5%	99	94	86	100	99
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	99	99	94	100*	99*
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	100	99	90	100	100
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	99	96	80	99	99*
Glyt&2,4-D+2,4-D-dma+AS	0.375&0.33+0.17+2.5	100	100	92	100	99
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	100	100	90	100	98
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	100	99	93	99*	99
HOE-00661+X77	1+0.5%	91	89	99	98	97
HOE-00661+X77	0.75+0.5%	82	61	96	77	-
HOE-00661+X77	0.5+0.5%	72	71	97	52	-
HOE-00661+Glyphosate+X77	0.75+0.25+0.5%	97	81	99	100	94*
HOE-00661+Glyphosate+X77	0.75+0.188+0.5%	95	82	99	99	97*
HOE-00661+Glyphosate+X77	0.5+0.25+0.5%	92	59	98	98	93
HOE-00661+Glyphosate+X77	0.5+0.188+0.5%	88	72	96	98	96*
HOE-00661+Glyphosate+X77	0.375+0.25+0.5%	88*	64*	90*	97*	-
HOE-00661+Glyphosate+AS+X77	0.375+0.25+2.5+0.5%	94	63	99	99	99
HOE-00661+Glyphosate+X77	0.375+0.188+0.5%	82	55	96	79	93*
Control	0	0	0	0	0	0
C.V. %		4	9	6	8	4
LSD 5% for comparisons involving no *		5	10	7	10	5
LSD 5% for comparisons involving one *		6	11	8	11	6
LSD 5% for comparisons involving two *		6	11	9	11	6
# of reps		4	4	4	4	4

[1]AS = ammonium sulfate; X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D.

See next page for summary

Summary. Glyphosate applied alone or with ammonium sulfate or 2,4-D provided complete control of 3 to 4-leaf wild oats, 5 to 8-inch Russian thistle, and 2 to 4-inch yellow foxtail, even at 0.25 lb ae/A. Control of 8 to 14-inch greenflower pepperweed and 3 to 5-inch wild buckwheat by glyphosate was increased in some instances by the addition of either ammonium sulfate or 2,4-D. HOE-00661 at 1 lb/A provided nearly complete control of wild buckwheat, Russian thistle, and yellow foxtail but lower rates maintained high levels of burndown only with wild buckwheat. Control by glyphosate of wild oats and greenflower pepperweed was antagonized by some tank-mixes with HOE-00661. The antagonism of glyphosate (0.25 lb/A) activity by HOE-00661 (0.375 lb/A) was overcome by ammonium sulfate in the case of wild oats but not with greenflower pepperweed. High relative humidity and damp vegetation during spraying probably increased control by some treatments over what would be expected under more normal conditions.

Glyphosate and HOE-00661 for late-spring no-till burndown, Cayuga, 1987. Treatments were applied May 30 when wild oats were 4 to 5-leaf (8 to 14 inches tall), greenflower pepperweed was 9 to 16 inches tall, wild buckwheat was 5 to 12 inches long, Russian thistle was 8 to 12 inches tall, kochia was 5 to 12 inches tall, and yellow foxtail was 3 to 4-leaf (3 to 6 inches tall). Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for all treatments involving glyphosate, and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. At the time of spraying, air temperature was 80 to 85 F and relative humidity was 40%. Visual evaluations of percent control were taken on June 22 (23 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications.

See next page for data and summary

Treatment[1]	Rate (lb/A)	Wioa	Gfpw	Wibw	KOCZ	Ruth	Yeft
		Weed control - 23 DAT					
		-------------(%)-------------					
Glyphosate+X77	0.5+0.5%	100	99	80	99	100	100
Glyphosate+X77	0.375+0.5%	100	97	63	98*	100	99
Glyphosate+X77	0.25+0.5%	100	98	58	94	99	99
Glyphosate+AS+X77	0.5+2.5+0.5%	100	99	88	100	100	100
Glyphosate+AS+X77	0.375+2.5+0.5%	100	93	71	99	100	100
Glyphosate+AS+X77	0.25+2.5+0.5%	100	96	53	99	100	99
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	100	98	93	99	99	100
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	100	97	83	96	100	100
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	99	96	79	98	99	100
Glyt&2,4-D+2,4-D-dma+AS	0.375&0.33+0.17+2.5	100	98	92	99	100	100
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	100	97	89	99	100	99
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	100	98	84	99	100	99
HOE-00661+X77	1+0.5%	87	100	97	98	100	96
HOE-00661+X77	0.75+0.5%	71	98	97	98	99	99
HOE-00661+X77	0.5+0.5%	48	90	92	86	90	96
HOE-00661+Glyphosate+X77	0.75+0.25+0.5%	96	97	97	92	99	99
HOE-00661+Glyphosate+X77	0.75+0.188+0.5%	92	97	97	98	99	100
HOE-00661+Glyphosate+X77	0.5+0.25+0.5%	91	92	94	92*	99	99
HOE-00661+Glyphosate+X77	0.5+0.188+0.5%	90	90	95	81	94	98
HOE-00661+Glyphosate+X77	0.375+0.25+0.5%	93	93	89	90	98	99
HOE-00661+Glyphosate+AS+X77	0.375+0.25+2.5+0.5%	99	88	88	86	99	100
HOE-00661+Glyphosate+X77	0.375+0.188+0.5%	88	91	82	81	97	97
Control	0	0	0	0	0	0	0
C.V. %		6	4	11	5	4	2
LSD 5% for comparisons involving no *		7	5	13	7	5	3
LSD 5% for comparisons involving one *		-	-	-	7	-	-
LSD 5% for comparisons involving two *		-	-	-	8	-	-
# of reps		4	4	4	4	4	4

[1]AS = ammonium sulfate; X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D.

Summary. Four to 5-leaf wild oats, 8 to 12-inch Russian thistle, and 3 to 4-leaf yellow foxtail were completely controlled by all treatments containing glyphosate. No antagonism of glyphosate activity on these species by 2,4-D was evident. There was, however, antagonism of glyphosate activity on wild oats when mixed with HOE-00661, although the antagonism noted with glyphosate at 0.25 lb/A and HOE-00661 at 0.375 lb/A was overcome by the addition of ammonium sulfate. Control by glyphosate of Russian thistle and yellow foxtail did not appear to be significantly antagonized by HOE-00661. HOE-00661 alone at 0.75 or 1 lb/A provided complete or near complete burndown of Russian thistle and yellow foxtail but was not as effective on wild oats. Glyphosate provided unsatisfactory burndown of 5 to 12-inch wild buckwheat (80% control with 0.5 lb/A) and control was not significantly enhanced by ammonium sulfate. Application of a glyphosate plus 2,4-D package mix with additional 2,4-D greatly increased wild buckwheat burndown compared to glyphosate alone (at equivalent glyphosate rates). The most effective control of wild buckwheat (97%) was obtained with HOE-00661 at 0.75 or 1 lb/A by itself or in combination with glyphosate. Nine to 16-inch greenflower pepperweed and 5 to 12-inch kochia were controlled at high levels (generally 95 to 100%) by treatments involving glyphosate alone, glyphosate plus ammonium sulfate, glyphosate plus 2,4-D, or HOE-00661 at 0.75 or 1 lb/A. Mixtures of glyphosate with HOE-00661 at 0.5 or 0.375 lb/A provided control of greenflower pepperweed and kochia that was inferior, in some instances, to control by glyphosate alone.

Paraquat and sethoxydim plus 2,4-D for no-till burndown, Pillsbury, 1987. Treatments were applied May 2 (early), May 14 (mid), and May 29 (late) when kochia was 0.5 to 1, 1.5 to 4, and 2 to 10 inches tall, respectively. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for treatments involving sethoxydim and glyphosate, and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. Environmental conditions for these dates were as follows: on May 2, relative humidity (RH) was low and air temperature was 70 F; on May 14, RH was 25% and temperature was 80 F; on May 29, RH was 70% and temperature was 80 F. Visual evaluations of percent control were taken on May 14 (12 days after treatment) and May 23 (21 DAT) for the early spray timing, June 1 (18 DAT) and June 9 (26 DAT) for the mid timing, and June 23 (25 DAT) for the late timing. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

		Kochia control				
		Early		Mid		Late
Treatment[1]	Rate[1]	12 DAT	21 DAT	18 DAT	26 DAT	25 DAT
	(lb/A)	(%)				
Paraquat+X77	0.5+0.5%	84	91	92	92	96
Paraquat+X77	0.375+0.5%	67	76	87	88	93
Paraquat+X77	0.25+0.5%	32	58	65	68	88
Paraquat+Diuron+X77	0.5+0.1+0.5%	79	84	81	88	90
Paraquat+Diuron+X77	0.375+0.1+0.5%	69	81	85	86	96
Paraquat+Diuron+X77	0.25+0.1+0.5%	56	57	82	78	86
Paraquat+Diuron+X77	0.1875+0.1+0.5%	49	68	-	-	-
Paraquat+2,4-D+X77	0.25+0.25+0.5%	80	80	73	75	88
Paraquat+2,4-D+X77	0.5+0.25+0.5%	-	-	-	-	95
Paraquat+2,4-D+Diuron+X77	0.25+0.25+0.1+0.5%	64	76	90	93	83
Paraquat+2,4-D+Brox+X77	0.5+0.25+0.25+0.5%	-	-	-	-	99
Sethoxydim+2,4-D+OC	0.1+0.5+0.25G	13	18	13	24	34
Sethoxydim+2,4-D+OC	0.05+0.5+0.25G	14	14	26	25	39
Sethoxydim+2,4-D+OC	0.025+0.5+0.25G	12	14	19	21	25
Sethoxydim+2,4-D+Brox+OC	0.1+0.5+0.25+0.25G	-	-	-	-	16
Seth+2,4-D+28%UAN+OC	0.1+0.5+1G+0.25G	14	23	24	26	31
Seth+2,4-D+28%UAN+OC	0.075+0.5+1G+0.25G	12	15	28	30	30
Seth+2,4-D+28%UAN+OC	0.05+0.5+1G+0.25G	12	30	15	18	30
Sethoxydim+2,4-D+Dash	0.1+0.5+0.25G	19	30	24	19	24
Sethoxydim+2,4-D+Dash	0.075+0.5+0.25G	20	39	29	24	39
Sethoxydim+2,4-D+Dash	0.05+0.5+0.25G	15	18	25	23	35
Glyt&2,4-D+2,4-D-dma+Brox	0.47+0.28+0.25	-	-	-	-	84
Ammonium thiosulfate+X77	2G+0.5%	2	0	0	3	-
Ammonium thiosulfate+X77	4G+0.5%	1	1	0	1	-
Ammonium thiosulfate+X77	8G+0.5%	3	0	0	1	-
Ammonium thiosulfate+OC	4G+0.25G	1	0	0	0	-
Control		0	0	0	4	0
C.V. %		33	31	20	24	11
LSD 5%		15	16	11	14	9
# of reps		4	4	4	4	4

[1] 28%UAN = 28% urea ammonium nitrate solution; unless otherwise indicated in treatment list, 2,4-D = dimethylamine salt for early and mid application timings and butoxyethyl ester for late timing; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D; OC = petroleum oil with 17% emulsifier; Dash = trade name of BASF surfactant of proprietary composition; G = gallons per acre (i.e. 0.25G = 1 quart per acre).

See next page for summary

Summary. Evaluations 12 days after the early application may have been taken too soon to observe maximum percent control, particularly for treatments involving 2,4-D. For the mid-May application, evaluations taken 18 or 26 days after treatment appear little different. Paraquat at 0.5 lb/A provided about 90 to 95% burndown of kochia. Paraquat plus a low rate (0.1 lb/A) of diuron did not increase control over paraquat alone. Paraquat plus 2,4-D plus bromoxynil (0.5 + 0.25 + 0.25 lb/A) provided essentially complete burndown of 2 to 10-inch kochia. Control ratings with paraquat were generally better with older and larger kochia, a trend more easily observed at the 0.25 and 0.375 lb/A rates. Poor kochia control was obtained with sethoxydim plus 2,4-D tank mixes. No kochia control was achieved with ammonium thiosulfate.

Paraquat and sethoxydim plus 2,4-D for early-spring no-till burndown, Cayuga, 1987. Treatments were applied May 4 when wild oats were 2 to 3-leaf, greenflower pepperweed was 1 to 3 inches tall, wild buckwheat was cotyledon to 2-leaf, Russian thistle was 0.5 to 1.5 inches tall, and kochia was 0.5 to 1 inch tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for all treatments involving sethoxydim and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. Visual estimates of percent control were taken on May 16 (12 days after treatment) and May 27 (23 DAT). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

See next page for data and summary

Treatment[1]	Rate[1] (lb/A)	Weed control Evaluated 12 DAT Wioa	Gfpw	Wibw	Ruth	Evaluated 23 DAT Wioa	Gfpw	Wibw	Ruth	KOCZ
		(%)								
Paraquat+X77	0.5+0.5%	91	27	53	-	85	24	55	88	-
Paraquat+X77	0.375+0.5%	54	35	34	-	71*	52*	24*	95*	-
Paraquat+X77	0.25+0.5%	22	15	11	40	51*	6*	6*	78*	-
Paraquat+Diuron+X77	0.5+0.1+0.5%	85	21	84	-	86	15	64	98*	97*
Paraquat+Diuron+X77	0.375+0.1+0.5%	80	37	68	-	84	9	62	99	-
Paraquat+Diuron+X77	0.25+0.1+0.5%	36	13	51	-	45	12	29	-	-
Paraquat+Diuron+X77	0.1875+0.1+0.5%	18	9	19	37	48*	7*	15*	46*	53*
Paraquat+2,4-D+X77	0.25+0.25+0.5%	27	55	12	49	66	64	10	-	-
Para+2,4-D+Diuron+X77	0.25+0.25+0.1+0.5%	45	79	42	42	73	92	60	97	77*
Sethoxydim+2,4-D+OC	0.1+0.5+0.25G	4	76	4	63	19	96	30	76*	-
Sethoxydim+2,4-D+OC	0.05+0.5+0.25G	10	69	4	53	18	94	33	78	57*
Sethoxydim+2,4-D+OC	0.025+0.5+0.25G	4	57	5	48	15	91	51	90	71
Seth+2,4-D+28%UAN+OC	0.1+0.5+1G+0.25G	55	73	10	56	50	94	60	91	59*
Seth+2,4-D+28%UAN+OC	0.075+0.5+1G+0.25G	9	73	3	63	41	95	39	80	-
Seth+2,4-D+28%UAN+OC	0.05+0.5+1G+0.25G	9	74	9	56	39	94	50	84*	-
Seth+2,4-D+Dash	0.1+0.5+0.25G	81	79	11	46	87	96	54	86	70*
Seth+2,4-D+Dash	0.075+0.5+0.25G	71*	84*	15*	45*	78	94	56	89	66*
Seth+2,4-D+Dash	0.05+0.5+0.25G	63	87	11	62	86	98	59	83	65*
Ammonium thiosulfate+X77	2G+0.5%	0	0	0	0	0	1	0	0	0*
Ammonium thiosulfate+X77	4G+0.5%	0	0	0	0	0	2	0	1	0*
Ammonium thiosulfate+X77	8G+0.5%	0	0	0	0	0	2	0	0	0*
Ammonium thiosulfate+OC	4G+0.25G	0	0	0	0	0	0	0	0	0*
Control	0	0	0	1	0	0	3	0	0	0
C.V. %		45	25	51	42	35	21	44	17	38
LSD 5% for comparisons involving no *		21	15	14	31	23	15	21	18	39
LSD 5% for comparisons involving one *		23	16	15	33	25	16	23	19	42
LSD 5% for comparisons involving two *		-	-	-	-	27	17	24	20	45
# of reps		4	4	4	4	4	4	4	4	4

[1] 2,4-D = dimethylamine salt of 2,4-D; X77 = X-77 surfactant; 28%UAN = 28% solution of urea ammonium nitrate; OC = petroleum oil with 17% emulsifier; Dash = trade name of BASF surfactant of proprietary composition; G = gallons per acre.

Summary. In general, percent control did not decline from the first to the second evaluation and appeared to increase for several treatments, particularly those involving 2,4-D and sethoxydim. Twenty-three days after treatment is probably the better of the two evaluation dates and the following comments will refer exclusively to this 23 DAT evaluation. Paraquat did not provide adequate burndown of any species, although about 90% control of 0.5 to 1-inch Russian thistle was observed with 0.5 and 0.375 lb/A. The addition to paraquat of a low rate (0.1 lb/A) of diuron may have enhanced the burndown of Russian thistle and cotyledon to 2-leaf wild buckwheat, although experimental variability precludes a clear conclusion. The addition to 0.25 lb/A paraquat of both diuron and 0.25 lb/A 2,4-D amine provided 92% burndown of 1 to 3-inch greenflower pepperweed and 97% burndown of Russian thistle, but only fair control was achieved with other species. Control of 2 to 3-leaf wild oats was unsatisfactory with all sethoxydim plus 2,4-D mixtures. Dash used in place of oil concentrate greatly enhanced wild oat control by sethoxydim. Mixtures of sethoxydim plus 0.5 lb/A of 2,4-D amine provided about 95% burndown of greenflower pepperweed, 30 to 60% burndown of wild buckwheat, 80 to 90% burndown of Russian thistle, and 60 to 70% burndown of 0.5 to 1-inch kochia. The adjuvants Dash and 28% urea ammonium nitrate may have increased broadleaf control by 2,4-D in some instances but these observations are not conclusive.

Paraquat and sethoxydim plus 2,4-D for mid-spring no-till burndown, Cayuga, 1987. The experiment was established near Cayuga, North Dakota on a loam soil having a pH of 7.4 and organic matter of 4.0%. No tillage had occurred since harvest of millet in 1986 and light to moderate levels of stubble and straw were present. Treatments were applied May 19 when wild oats were 3 to 4-leaf (6 to 8 inches tall), greenflower pepperweed was 8 to 14 inches tall, wild buckwheat was 3 to 5 inches tall, and Russian thistle was 5 to 8 inches tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for treatments involving sethoxydim and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. At time of spraying, air temperature was 50 F and relative humidity was close to 100% with light mist and damp vegetation. Visual estimates of percent control were taken on June 11 (23 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate[2]	Weed control - 23 DAT Wioa	Gfpw	Wibw	Ruth
	(lb/A)	-----------	(%)	-----------	
Paraquat+X77	0.5+0.5%	96	39	24	100
Paraquat+X77	0.375+0.5%	97	37	20	100
Paraquat+X77	0.25+0.5%	83	22	23	100
Paraquat+Diuron+X77	0.5+0.1+0.5%	95	42	38	100*
Paraquat+Diuron+X77	0.375+0.1+0.5%	89	32	33	100*
Paraquat+Diuron+X77	0.25+0.1+0.5%	78	17	26	100*
Paraquat+2,4-D-dma+X77	0.25+0.25+0.5%	80	31	22	99
Para+2,4-D-dma+Diuron+X77	0.25+0.25+0.1+0.5%	77	59	44	100*
Sethoxydim+2,4-D-dma+OC	0.1+0.5+0.25G	45*	85*	42*	-
Sethoxydim+2,4-D-dma+OC	0.05+0.5+0.25G	17	91	15	79
Sethoxydim+2,4-D-dma+OC	0.025+0.5+0.25G	10	86	15	83
Seth+2,4-D-dma+28%UAN+OC	0.1+0.5+1G+0.25G	61	91	37	83
Seth+2,4-D-dma+28%UAN+OC	0.075+0.5+1G+0.25G	45	92	22	81
Seth+2,4-D-dma+28%UAN+OC	0.05+0.5+1G+0.25G	29	92	19	81
Seth+2,4-D-dma+Dash	0.1+0.5+0.25G	83	89	48	82
Seth+2,4-D-dma+Dash	0.075+0.5+0.25G	72	91	34	82
Seth+2,4-D-dma+Dash	0.05+0.5+0.25G	64	94	30	78
Ammonium thiosulfate+X77	2G+0.5%	0	0	2	0
Ammonium thiosulfate+X77	4G+0.5%	2	0	8	0
Ammonium thiosulfate+X77	8G+0.5%	0	0	3	0
Ammonium thiosulfate+OC	4G+0.25G	0	0	3	0
Control	0	0	0	0	0
C.V. %		21	15	51	3
LSD 5% for comparisons involving no *		16	10	17	3
LSD 5% for comparisons involving one or two *		17	11	18	4
# of reps		4	4	4	4

[1] X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; OC = petroleum oil with 17% emulsifier; Dash = trade name of BASF surfactant of proprietary composition.
[2] G = gallons per acre (i.e. 0.25G = 1 quart per acre).

See next page for summary

Summary. Paraquat alone provided complete burndown of 5 to 8-inch Russian thistle, nearly complete control of 3 to 4-leaf wild oats, and poor control of 8 to 14-inch greenflower pepperweed and 3 to 5-inch wild buckwheat. Adding low rates (0.1 lb/A) of diuron to paraquat treatments did not improve control. The addition of diuron and 0.25 lb/A 2,4-D to 0.25 lb/A paraquat increased control of greenflower pepperweed and wild buckwheat from about 20% to about 40 to 60%. Sethoxydim did not provide satisfactory control of wild oats when mixed with 2,4-D amine. Wild oat control with sethoxydim was enhanced by the addition of 28% urea ammonium nitrate and was enhanced further when oil concentrate was replaced with Dash. The 2,4-D amine in sethoxydim plus 2,4-D tank mixes provided about 80% burndown of Russian thistle, 90% burndown of greenflower pepperweed, and poor control of wild buckwheat. The adjuvants Dash and 28% urea ammonium nitrate did not appear to enhance the activity of 2,4-D on these broadleaf species. Ammonium thiosulfate provided almost no control of any weed species. The high humidity and damp vegetation at time of spraying may have increased the control of some treatments over what would be expected under more normal conditions.

Paraquat and sethoxydim plus 2,4-D for late-spring no-till burndown, Cayuga, 1987. Treatments were applied May 30 when wild oats were 4 to 5-leaf (8 to 14 inches tall), greenflower pepperweed was 9 to 16 inches tall, wild buckwheat was 5 to 12 inches long, Russian thistle was 8 to 12 inches tall, and yellow foxtail was 3 to 4-leaf (3 to 6 inches tall). Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi for treatments involving sethoxydim and glyphosate and 17 gal/A with 8002 nozzles and 35 psi for all other treatments. At time of spraying, air temperature was 80 to 85 F and relative humidity was 40%. Visual estimates of percent control were taken on June 22 (23 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

See next page for data and summary

Treatment[1]	Rate[1] (lb/A)	Weed control - 23 DAT Wioa	Gfpw	Wibw	KOCZ	Ruth	Yeft
		(%)					
Paraquat+X77	0.5+0.5%	45	78	24	-	99	-
Paraquat+X77	0.375+0.5%	42	68	16	-	99	83
Paraquat+X77	0.25+0.5%	18	39	15	-	97	83
Paraquat+Diuron+X77	0.5+0.1+0.5%	55	82	31	-	99	88
Paraquat+Diuron+X77	0.375+0.1+0.5%	41	58	28	60	100	87
Paraquat+Diuron+X77	0.25+0.1+0.5%	42	33	21	82*	98	92*
Paraquat+2,4-D-bee+X77	0.25+0.25+0.5%	44	85	24	47*	99	82*
Paraquat+2,4-D-bee+X77	0.5+0.25+0.5%	75*	92	25	-	100	88*
Para+2,4-D-bee+Diuron+X77	0.25+0.25+0.1+0.5%	32	92	38	-	99	83
Para+2,4-D-bee+Brox+X77	0.5+0.25+0.25+0.5%	48	95	86	-	98	90
Sethoxydim+2,4-D-bee+OC	0.1+0.5+0.25G	67	97	41	23	82	48
Sethoxydim+2,4-D-bee+OC	0.05+0.5+0.25G	38	92	44	18	79	32*
Sethoxydim+2,4-D-bee+OC	0.025+0.5+0.25G	26	77	30	22*	77	18*
Seth+2,4-D-bee+Brox+OC	0.1+0.5+0.25+0.25G	40	94	93	-	84	28*
Seth+2,4-D-bee+28%UAN+OC	0.1+0.5+1G+0.25G	73	94	30	-	79	71
Seth+2,4-D-bee+28%UAN+OC	0.075+0.5+1G+0.25G	66	94	31	28*	80	52*
Seth+2,4-D-bee+28%UAN+OC	0.05+0.5+1G+0.25G	45*	78	28	16*	82	47*
Seth+2,4-D-bee+Dash	0.1+0.5+0.25G	82	90	35	16	80	70
Seth+2,4-D-bee+Dash	0.075+0.5+0.25G	81	94	35	19	79	61
Seth+2,4-D-bee+Dash	0.05+0.5+0.25G	34	95	31	-	83	45*
Glyt&2,4-D+2,4-D-dma+Brox	0.47+0.28+0.25	99	99	96	93	100	96
Control		0	0	0	0	0	0
C.V. %		34	18	31	33	3	19
LSD 5% for comparisons involving no *		24	19	16	25	3	19
LSD 5% for comparisons involving one *		26	-	-	27	-	21
LSD 5% for comparisons involving two *		28	-	-	29	-	22

[1] X77 = X-77 surfactant; 2,4-D-dma = dimethylamine salt of 2,4-D; 2,4-D-bee = butoxyethyl ester of 2,4-D; OC = petroleum oil with 17% emulsifier; 28%UAN = 28% solution of urea ammonium nitrate; Dash = trade name of BASF surfactant of proprietary composition; Glyt&2,4-D = Landmaster II herbicide containing 0.9 lb ae/gal glyphosate and 0.8 lb ae/gal 2,4-D; G = gallons per acre.

Summary. Paraquat did not provide satisfactory burndown on any species except Russian thistle. Paraquat provided approximately 85 to 90% control of 3 to 4-leaf yellow foxtail, but this level of burndown usually would be considered marginal for a no-till cropping situation. Paraquat was particularly ineffective on 4 to 5-leaf wild oats and 5 to 12-inch wild buckwheat. The addition of 2,4-D at 0.25 lb/A did little to increase wild buckwheat control but increased control of 9 to 16-inch greenflower pepperweed to about 85 to 90%. Diuron seemed to increase control in some instances, although differences were not statistically significant. Sethoxydim plus 2,4-D at 0.1 + 0.5 lb/A provided fair to poor burndown of wild oats and yellow foxtail and the addition of bromoxynil to the mixture further decreased control of these grasses. Foxtail control but not wild oat control was enhanced by adding 28% urea ammonium nitrate to the sethoxydim plus 2,4-D tank mix. When Dash was used with sethoxydim plus 2,4-D in place of oil concentrate, control of both grass species tended to be increased. The 0.5 lb/A of 2,4-D ester in the sethoxydim plus 2,4-D tank mixes provided about 80% control of Russian thistle, 30 to 40% control of wild buckwheat, 90 to 95% control (in most cases) of greenflower pepperweed, and 15 to 30% control of kochia. Control of these broadleaf species by sethoxydim plus 2,4-D plus oil concentrate mixtures was not affected by 28% UAN or Dash.

Burndown efficacy of residual herbicides, Pillsbury and Cayuga, 1987. At Pillsbury, cyanazine treatments were applied on May 2 when kochia was 0.5 to 1 inch tall, while imazethapyr and linuron were applied on May 29 when kochia was 2 to 10 inches tall. Environmental conditions at Pillsbury were as follows: on May 2, relative humidity (RH) was about 30% and air temperature was 70 F; on May 29, RH was 40% and temperature was 80 F. At Cayuga, cyanazine treatments were applied on May 5 when wild oats were 2 to 3-leaf, greenflower pepperweed was 1 to 3 inches tall, wild buckwheat was cotyledon to 2-leaf, and kochia was 0.5 to 1 inch tall. Imazethapyr and linuron were applied at Cayuga on May 30 when wild oats were 4 to 5-leaf (8 to 14 inches tall), greenflower pepperweed was 9 to 16 inches tall, wild buckwheat was 5 to 12 inches long, and kochia was 5 to 12 inches tall. Environmental conditions at Cayuga were as follows: on May 5, RH was low and temperature was 70 F; on May 30, RH was 40% and temperature was 80 to 85 F. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 35 psi. Visual estimates of percent weed control were taken on June 23 at Pillsbury and June 22 at Cayuga. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

		Pillsbury	Cayuga			
Treatment[1]	Rate[2]	KOCZ	Wioa	Gfpw	Wibw	KOCZ
	(lb/A)	--------(% control)--------				
Cyanazine-L+OC	2+0.25G	40	31*	43	96	-
Cyanazine-L+Dash	2+0.25G	42	34	25	98	-
Cyanazine-L+OC	2.5+0.25G	44	26	27	99	-
Cyanazine-L+Dash	2.5+0.25G	62	39*	46	96	-
Cyanazine-L+OC	3+0.25G	49	29	39	90	-
Cyanazine-L+Dash	3+0.25G	14	-	-	-	-
Imazethapyr+X77	0.063+0.5%	84	26	30	6	27*
Imazethapyr+OC	0.063+0.25G	56	9*	36	6	40
Imazethapyr+Dash	0.063+0.25G	71	36	44*	15	42*
Imazethapyr+X77	0.094+0.5%	61	8	40	8	-
Linuron+X77	0.75+0.5%	41	4	40	97	51
Linuron+OC	0.75+0.25G	61	12*	35	96	56
Linuron+Dash	0.75+0.25G	60	4	41	93	42*
Linuron+X77	1.25+0.5%	86	14	41	98	70
Linuron+OC	1.25+0.25G	90	16	51	99	57*
Linuron+Dash	1.25+0.25G	82	12*	48	99	61*
Control	0	0	0	0	1	9*
C.V. %		31	99	66	8	30
LSD 5% for comparisons involving no *		25	28	35	7	29
LSD 5% for comparisons involving 1 *		-	30	38	-	32
LSD 5% for comparisons involving 2 *		-	33	-	-	34
# of reps		4	4	4	4	4

[1] Dash = trade name of BASF surfactant of proprietary composition; X77 = X-77 surfactant; OC = petroleum oil with 17% emulsifier.
[2] G = 1 gallons per acre (i.e. 0.25G = 1 quart per acre).

Summary. Cyanazine plus either oil concentrate or Dash and linuron plus oil concentrate, Dash, or X-77 surfactant provided excellent burndown of wild buckwheat. Eighty-five to 90% kochia control at Pillsbury was obtained with linuron (plus oil concentrate or X-77) or imazethapyr (plus X-77). All other treatments provided fair to poor burndown of the weed species present.

Antagonism of glyphosate burndown by residual herbicides, Cayuga, 1987. Treatments were applied May 19 when wild oats were 3 to 4-leaf (4 to 6 inches tall), greenflower pepperweed was 6 to 12 inches tall, wild buckwheat was 3 to 5 inches tall, and Russian thistle was 4 to 5 inches tall. All herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 35 psi. At time of spraying, air temperature was 50 F and relative humidity was close to 100% with a light mist and damp vegetation. Visual estimates of percent weed control were taken on June 8 (20 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[1]	Rate	Weed control - 20 DAT Wioa	Gfpw	Wibw	Ruth
	(lb/A)	----------(%)---------			
Glyphosate+X77	0.375+0.5%	100	100*	96	100
Glyphosate+X77	0.25+0.5%	100	99	90	100
Metolachlor+Glyphosate+X77	2.5+0.375+0.5%	100	100	98	100
Metolachlor+Glyphosate+X77	2.5+0.25+0.5%	100	92	89	100
Alachlor+Glyphosate+X77	2.5+0.375+0.5%	100	99	98	100
Alachlor+Glyphosate+X77	2.5+0.25+0.5%	100	98	95	100
Alachlor-MT+Glyphosate+X77	2.5+0.375+0.5%	100	95	95	100
Alachlor-MT+Glyphosate+X77	2.5+0.25+0.5%	100	91	83	100
Propachlor+Glyphosate+X77	4+0.375+0.5%	100	100*	94	100
Propachlor+Glyphosate+X77	4+0.25+0.5%	100	98	88	100
Pendimethalin+Glyphosate+X77	1.5+0.375+0.5%	100	99	96	100
Pendimethalin+Glyphosate+X77	1.5+0.25+0.5%	100	96	89	100
Chloramben+Glyphosate+X77	2.5+0.375+0.5%	100	98	98	100
Chloramben+Glyphosate+X77	2.5+0.25+0.5%	100	96*	98	100
Metribuzin+Glyphosate+X77	0.375+0.375+0.5%	100	98	98	100*
Metribuzin+Glyphosate+X77	0.375+0.25+0.5%	100	97*	95	100
Imazethapyr+Glyphosate+X77	0.063+0.375+0.5%	100	99	97	100
Imazethapyr+Glyphosate+X77	0.063+0.25+0.5%	100	98	97	100*
Imazethapyr+Glyphosate+X77	0.063+0.1875+0.5%	100	95	95	100
Imazethapyr+X77	0.063+0.5%	44	34	71	62*
Cinmethylin+Glyphosate+X77	1.25+0.375+0.5%	100	99	98	100
Cinmethylin+Glyphosate+X77	1.25+0.25+0.5%	100	99	94	100*
Control	0	0	0	0	2*
C.V. %		2	5	6	4
LSD 5% for comparisons involving no *		3	6	7	5
LSD 5% for comparisons involving one or two *		-	7	-	6

[1] X77 = X-77 surfactant; Alachlor-MT = microencapsulated formulation of alachlor (Alachlor MicroTech).

Summary. Three to 4-leaf wild oats and 4 to 5-inch Russian thistle were completely controlled by either 0.375 or 0.25 lb ae/A glyphosate and the control was not affected by any of the tank-mixed residual herbicides. Greenflower pepperweed was also completely controlled by glyphosate alone but control with 0.25 lb/A was significantly antagonized by metolachlor at 2.5 lb/A and the microencapsulated formulation of alachlor (Alachlor MicroTech). Microencapsulated alachlor also antagonized control of wild buckwheat by 0.25 lb/A glyphosate. Chloramben or imazethapyr mixed with 0.25 lb/A glyphosate gave higher wild buckwheat control than was obtained with glyphosate alone. High relative humidity and damp vegetation during spraying probably increased control (and may have masked antagonism) compared with results expected under more normal conditions.

Seedling foxtail barley control in spring with fall-applied trifluralin. Donald, William W. The objective of this experiment was to determine whether preplant-incorporated trifluralin applied in the fall to chisel-plowed land controlled seedling foxtail barley in the following spring in flax. The experiment had a randomized complete block design with four blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a site that had been no-till farmed in the previous eight years before being chisel plowed and field-cultivated and harrowed just prior to treatment. The loam soil had 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml. and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on October 6, 1986 in 8.3 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 30 psi and 3 mph. The sky was clear and there was no wind. Air temperature and relative humidity were 15 C and 84%, respectively. The soil surface was moist at the time of spraying, but seedling foxtail barley had not yet emerged. Immediately after spraying, the treatment was shallowly incorporated with a spike toothed harrow twice at right angles. Control of seedling foxtail barley was evaluated visually on May 13.

Trifluralin rate	Foba[a] control evaluation	Foba[a] density reduction
(lb/A)	(%)[b]	(no./m^2)[bc]
0	0 b	274 a
0.50	85 a	63 b
0.71	85 a	69 b
1.00	89 a	112 b

[a] Foba = foxtail barley.
[b] Means in a column followed by the same letter were not different at P = 0.05 by Duncan's multiple range test.
[c] Control density was 274 plants/m^2.

Summary

Acceptable control of seedling foxtail barley was achieved in the spring with fall-applied trifluralin at 0.5 to 1.0 lb/A (Table). Seedlings also were stunted by herbicide treatment. Spring ppi application of trifluralin is also likely to be effective (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

<u>Established foxtail barley control in spring, 1986</u>. Donald, William W. The objective of this experiment was to determine whether postemergence grass herbicides applied in spring could kill established foxtail barley in no-till fallow. Since lower rates of several of these herbicides were tested in the previous year, higher application rates were examined in this trial. This experiment had a randomized complete block design with three blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a no-till wheat field next to a low-lying wet spot. The site had not been tilled in the previous eight years. Wheat straw covered a loam soil with 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on June 6, 1986, in 8.3 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 20 psi and 3 mph. The sky was overcast and the wind was 10 to 13 mph. Air temperature and relative humidity were 26 C and 71%, respectively. The site received light rain within 3 hours of application. The soil surface and weeds were moist at the time of spraying. Dense, solid stands of perennial, well-tillered foxtail barley were 0.5 feet tall at treatment. Control was evaluated visually on June 27 and July 23, roughly three and seven weeks after treatment.

Treatment	Rate	Foba[a] June 27, 1986	Foba[a] July 23, 1986
	(lb/A)	(%)[b]	(%)[b]
Cyanazine[c]	1.5	5 gh	0 d
	3.0	30 ef	0 d
Paraquat[d]	1.0	25 fg	0 d
	2.0	45 d-f	23 cd
Haloxyfop[c]	0.75	49 c-f	88 a
	1.50	52 c-e	92 a
Fluazifop[c]	0.75	32 ef	22 cd
	1.50	37 ef	17 d
Sethoxydim[c]	1.0	48 c-f	50 bc
	2.0	42 ef	67 ab
Glyphosate[d]	0.5	72 bc	73 ab
	0.65	82 ab	76 ab
	0.75	82 ab	75 ab
HOE-00661	1.5	68 b-d	5 d
	3.0	96 a	55 b

[a] Foba = foxtail barley.
[b] Means in a column followed by the same letter were not different at P=0.05 by Duncan's multiple range test.
[c] BASF crop oil concentrate at 1 qt/A was added.
[d] X-77 surfactant at 0.25% (v/v) was added.

See next page for summary

Summary

Only glyphosate at 0.65 to 0.75 lb/A plus X-77 at 0.25% (v/v) and HOE-00661 at 3 lb/A provided acceptable early season control of established foxtail barley three weeks after application (Table). However, established plants regrew from tillers by seven weeks after treatment with these herbicides. Haloxyfop at 0.75 to 1.5 lb/A plus crop oil concentrate at 1 qt/A provided excellent control of most established plants, with very limited regrowth. Cyanazine, paraquat, fluazifop, and sethoxydim at high application rates failed to provide either adequate early or late season control. (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

<u>Established foxtail barley control in spring, 1985</u>. Donald, William W. The objective of this experiment was to determine whether postemergence grass herbicides applied in spring could kill established foxtail barley in no-till fallow. This experiment had a randomized complete block design with four blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a no-till flax field which had not been tilled in the last seven years. Flax straw covered a loam soil which had 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on May 16, 1985, in 10.9 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 20 psi and 3 mph. The sky was clear and the wind speed was 5 to 8 mph. Air temperature and relative humidity were 16 C and 81%, respectively. Foxtail barley was well established, well tillered and 0.5 feet tall at treatment. The weeds and soil surface were dry at the time of application. Dense stands excluded annual weeds. Control was evaluated visually June 13 and July 8, roughly one and two months after treatment.

See next page for data and summary

Treatment	Rate	Foba[a] control	
		June 13, 1985	July 8, 1985
	(lb/A)	(%)	
Control	-	0	0
Glyphosate[b]	0.25	15	0
	0.38	70	0
HOE-00661	0.50	0	0
	0.75	43	0
	1.00	48	0
Fenoxaprop	0.15	0	0
	0.25	0	0
Quizalofop	0.052	0	0
	0.083	0	0
	0.125	0	0
Fluazifop[c]	0.1	0	0
	0.2	0	0
	0.4	15	0
Haloxyfop[c]	0.125	0	0
	0.25	35	0
Sethoxydim[c]	0.10	0	0
	0.25	0	0
	0.50	5	0
SMY 1500	0.25	0	0
	0.50	0	0
AC222,293	0.125	0	0
	0.25	0	0

[a] Foba = foxtail barley.
[b] Surfactant X-77 added at 0.5% (v/v).
[c] Crop oil concentrate added at 1 qt/A.

Summary

All tested herbicides failed to provide season-long control of well-established perennial foxtail barley two months after spring treatment when applied at the normal time of planting for spring-sown crops (Table). Glyphosate at 0.38 lb/A plus X-77 surfactant at 0.5% (v/v) provided only marginal early-season control, but not eradication. Treated plants regrew from tillers although sprayed foliage was necrotic and desiccated after one month. (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

Established foxtail barley control in spring with glyphosate plus 2,4-D. Donald, William W. The objective of this experiment was to determine whether postemergence glyphosate or glyphosate plus 2,4-D as the isopropylamine salt (Landmaster) applied in spring could kill established foxtail barley in no-till fallow. This experiment had a randomized complete block design with three blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a field that had been chisel-plowed in the previous year after seven years in no-till. In the previous year, the site had been planted to barley after chisel-plowing and seedbed preparation in spring. The surface was covered with heavy straw and with both foxtail barley seedlings and established plants that had been growing since the previous spring. The infestation was uniform and dense, but not as well tillered as another stand that had been growing for several years. The soil was a loam with 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on April 29, 1986, in 8.3 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 20 psi and 3 mph. The sky was clear and the wind was 5 to 6 mph. Air temperature and relative humidity were 30.5 C and 57%, respectively. Control of established foxtail barley was evaluated visually May 27 and June 27, roughly one and two months after treatment.

Treatment	Rate	Ammonium Sulfate Rate	Foba[a] control May 27, 1986	Foba[a] control June 27, 1986
	(lb/A)[c]	(lb/A)	(%)[b]	
Control	0	0	0 b	0 b
Glyphosate	0.35	-	100 a	95 a
	0.35	2.5	99 a	100 a
	0.5	-	99 a	95 a
	0.5	2.5	100 a	97 a
	0.65	-	99 a	95 a
	0.65	2.5	100 a	93 a
Glyphosate + 2,4-D[d]	0.35 + 0.74	-	97 a	98 a
	0.35 + 0.74	2.5	100 a	96 a
	0.5 + 1.06	-	100 a	96 a
	0.5 + 1.06	2.5	67 a	67 a
	0.65 + 1.37	-	97 a	93 a
	0.65 + 1.37	2.5	100 a	98 a

[a] Foba = foxtail barley.
[b] Means in a column followed by the same letter were not different at P=0.05 by Duncan's multiple range test.
[c] X-77 at 0.25% (v/v) added to all herbicide treatments.
[d] Landmaster formulation was used.

See next page for summary

Summary

All treatments provided good to excellent control of established foxtail barley, nearly eradicating the weed (Table). Control could be achieved with glyphosate alone at 0.35 lb/A or glyphosate plus 2,4-D at 0.35 plus 0.74 lb/A with X-77 surfactant at 0.25% (v/v). Glyphosate may have been effective at this lower than expected rate because the established foxtail barley had been growing for only one growing season prior to treatment. If older stands had been treated, higher application rates may have been needed. Ammonium sulfate would be expected to synergize the action of glyphosate under such conditions. (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

<u>Seedling foxtail barley control in spring with fall-applied herbicides, 1986</u>. Donald, Wiliam W. The objective of this field experiment was to determine whether fall-applied herbicides could provide residual control of established foxtail barley seedlings and seedlings emerging in the following spring in no-till fallow. Foxtail barley seedlings can emerge throughout the growing season when moisture conditions permit. This experiment had a randomized complete block design with three blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a minimum-till wheat field next to a low-lying wet spot which was flooded periodically in fall and spring. The site had been chisel plowed early in the previous summer and field cultivated-harrowed, but had no further tillage. Consequently, very little straw cover was present. The site was a saline loam with 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on October 4, 1986, in 8.7 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 20 psi and 2.5 mph. The sky was clear and the air was calm at spraying. Air temperature and relative humidity were 8.5 C and 94.5%, respectively. The soil surface and emerged seedlings were dry at spraying. Seedling foxtail barley control was evaluated visually on May 27 and June 27.

See next page for data and summary

Treatment	Rate	Foba[a] control May 27, 1986	June 27, 1986
	(lb/A)	(%)[b]	
Control	-	0 f	0 e
Chlorsulfuron[c]	0.01	58 b-d	38 c-e
	0.03	3 ef	3 e
Metsulfuron[c]	0.01	28 d-f	7 e
	0.03	3 ef	0 e
Glyphosate[c] + ammonium sulfate	0.13 + 2.5	75 ab	35 c-e
	0.25 + 2.5	90 ab	70 a-d
	0.38 + 2.5	96 a	80 a-c
HOE-00661	0.5	67 a-c	7 e
	1.0	96 a	55 b
Fluazifop[d]	0.2	3 ef	3 e
	0.4	95 a	87 a
Quizalofop[c]	0.06	92 ab	66 a-d
	0.10	96 a	88 a
	0.15	99 a	62 a-d
Haloxyfop[d]	0.12	98 a	57 a-d
	0.25	98 a	87 ab
Thiameturon[c]	0.01	3 ef	3 e
	0.03	3 ef	3 e
Pronamide	0.25	37 c-e	30 de
	0.50	77 ab	23 de
	0.75	87 ab	26 de

[a] Foba = foxtail barley.
[b] Means in a column followed by the same letter were not different at P=0.05 by Duncan's multiple range test.
[c] X-77 surfactant at 0.5% (v/v) was added.
[d] Crop oil concentrate at 1 qt/A was added.

Summary

Fall treatments which provided 75% to 99% control of foxtail barley seedlings in the following spring included glyphosate, haloxyfop, HOE-00661, pronamide, and quizalofop (Table). Only quizalofop, fluazifop, haloxyfop, and high rates of glyphosate provided residual foxtail barley seedling control until late June. Chlorsulfuron, metsulfuron and thiameturon provided poor residual control of foxtail barley seedlings. Application of sulfonylurea herbicides prior to foxtail barley germination may be necessary in order to achieve good residual control in the following growing season (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

<u>Established foxtail barley control in spring with fall-applied herbicides, 1985-1986</u>. Donald, William W. The objective of this experiment was to determine whether pronamide would control established foxtail barley when applied to straw-covered no-till fields in the fall. This experiment had a randomized complete block design with three blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a no-till flax field that was heavily and uniformly infested with well-established foxtail barley. At the time of treatment, mature plants had shed seed and were regreening from their crowns. Spray coverage might have been a problem because of excessive dead tissue covering new foliar regrowth. Flax straw covered a loam soil with 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on October 3, 1985, in 8.7 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 20 psi and 2.5 to 3 mph. The sky was clear and the wind was less than 5 mph. Air temperature and relative humidity were 12.5 C and 85%, respectively. The soil surface and weed were dry at spraying. Control was evaluated visually on May 29 and June 27.

Treatment	Rate	Foba[a] control May 29, 1986	Foba[a] control June 27, 1986
	(lb/A)	(%)	(%)
Control	-	0	0
Pronamide	0.50	100	95
	0.75	100	95
	1.00	100	95
	1.50	100	95

[a] Foba = foxtail barley.

Summary

Pronamide at 0.5 to 1.5 lb/A applied in early October provided excellent control of established and seedling foxtail barley through late June of the following growing season (Table) (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).

Established foxtail barley control in spring with fall-applied herbicides, 1986-1987. Donald, William W. The objective of this experiment was to determine whether fall applications of cyanazine or pronamide could provide control of established foxtail barley in the following growing season in no-till fallow. This experiment had a randomized complete block design with four blocks and plots measured 10 by 25 ft. The experiment was established near Sarles in north central North Dakota on a no-till wheat field which had been in no-till for the previous eight years. Wheat straw covered a loam soil with 31 to 32% sand, 40 to 44% silt, and 23 to 29% clay. Soil pH and organic matter were 7.8 and 5.1%, respectively. The spray carrier water had a pH of 8.4, a dissolved ECE of 3024 mosm/ml, and dissolved carbonate, bicarbonate, chlorine, and sulfate at 12, 598, 390, and 274 ppm, respectively. Dissolved cations consisted of calcium, magnesium, sodium, and potassium at 10, 9, 584, and 11 ppm, respectively. Herbicides were applied on October 7, 1986, in 11.0 gal/A water carrier with a bicycle sprayer equipped with six 8001 Teejet flat fan nozzles spaced 20 inches apart at 30 psi and 3 mph. The sky was cloudy and the wind was 11 to 15 mph. Air temperature and relative humidity were 11 C and 98%, respectively. The soil surface and weeds were dry at spraying. Dense stands of well-established foxtail barley were 23 cm tall at the time of treatment. Control was evaluated visually on May 13.

Treatment	Rate	Foba[a] control
	(lb/A)	(%)[b]
Control	-	0 b
Pronamide	0.5	8 b
	0.75	42 a
	1.0	38 a
	1.5	58 a
Cyanazine	1.0	3 b
	2.0	0 b

[a] Foba = foxtail barley.
[b] Means in a column followed by the same letter were not different at P=0.05 by Duncan's multiple range test.

Summary

Fall applications of cyanazine and pronamide failed to provide acceptable control of well-established foxtail barley (Table). Heavy weed residues and wheat straw at the time of fall treatment may have prevented full spray coverage. Plants were very well established and actively growing at treatment (Metabolism & Radiation Research Laboratory and Department of Agronomy, North Dakota State University, Fargo. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture and does not imply its approval to the exclusion of other products that may also be suitable).