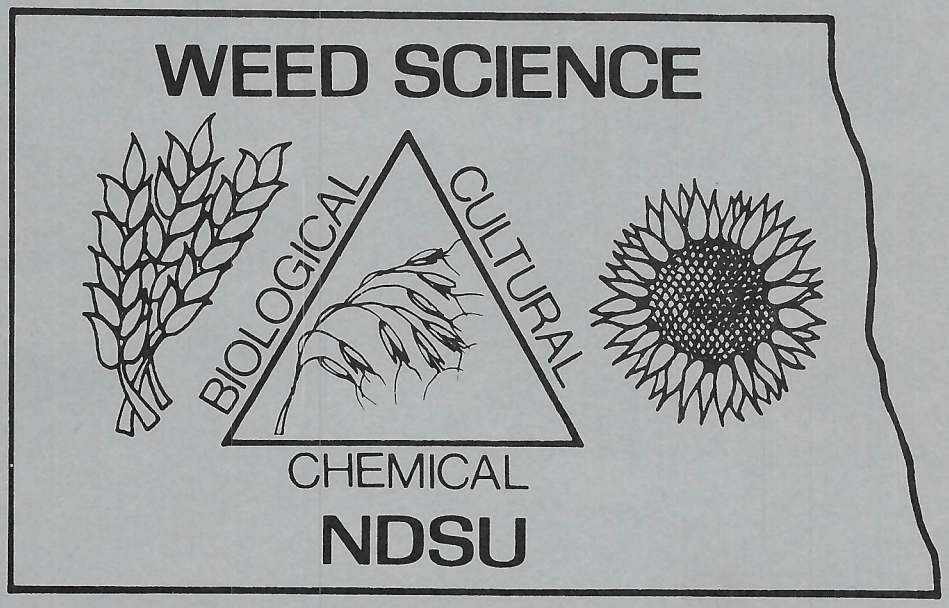
1988 NORTH DAKOTA WEED CONTROL RESEARCH



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

NOT FOR PUBLICATION

SUMMARY OF 1988 WEED CONTROL EXPERIMENTS

Crop and Weed Sciences Department
North Dakota State University
Fargo, North Dakota

W. H. Ahrens
R. G. Lym
C. G. Messersmith
J. D. Nalewaja
F. A. Manthey
T. J. Peters
Jerzy Palazynski
Zenon Woznieca

D. E. Peterson - Crop and Weed Sciences Department - Extension
A. G. Dexter - Crop and Weed Sciences Department - Extension
North Dakota State University - University of Minnesota

Technicians

K. M. Christianson
M. G. Ciernia
J. L. Luecke
R. F. Roach

Graduate Research Assistants

M. W. Bredehoeft
J. W. Flake
J. A. Hemenway
P. M. McMullan
O. R. Swenson
K. B. Thorsness

Experiments conducted in cooperation with:
Curt Thompson, Minot Experiment Station
Neil Riveland, Williston Experiment Station
John Lukach, Langdon Experiment Station
Blaine Schatz, Carrington Experiment Station
Tom Conlon, Dickinson Experiment Station

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

Table of Contents

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

Sugarbeet weed control, titles I
General weed control in crops, titles II
Perennial weed control, titles IV
Weed control in reduced tillage systems, titles V
Climatic data, Amenia/Prosper VI
Climatic data, Carrington VII
Climatic data, Casselton VIII
Climatic data, Crookston IX
Climatic data, Fargo X
Climatic data, Langdon XI
Climatic data, Minot XII
Climatic data, Pillsbury/Page XIII
Climatic data, Williston XIV
Key to abbreviations XV
List of herbicides tested XVI
Soil characteristics XXI

Gold Section: Sugarbeet Weed Control

Fall and sping applied herbicides, Amenia 1
Fall and sping applied herbicides, Crookston 2
Soil applied herbicides, Bathgate 3
Soil applied herbicides, Clara City 4
Soil applied herbicides, Crookston 5
Soil applied herbicides, Hillsboro 6
Soil applied herbicides, Mooreton 7
Soil applied herbicides, Raymond 8
Soil applied herbicides, Robbin 9
Soil applied plus postemergence herbicides, Bathgate 10
Soil applied plus postemergence herbicides, Clara City 12
Soil applied plus postemergence herbicides, Crookston 14
Soil applied plus postemergence herbicides, Hillsboro 16
Soil applied plus postemergence herbicides, Mooreton 18
Soil applied plus postemergence herbicides, Raymond 20
Soil applied plus postemergence herbicides, Robbin 22
Common cocklebur control, Raymond 24
Effect of herbicides on sugarbeet root rot, Hector 25
Trifluralin application at different growth stages, Amenia 26
Simulated herbicide drift on sugarbeets, Amenia 28
Simulated herbicide drift on sugarbeets, Amenia 30
Herbicides on weed free sugarbeets, Fargo 31
Herbicides on weed free sugarbeets, St. Thomas 32
Time of application of sethoxydim and clopyralid plus additives, Amenia. 34
Multispecies screening of PPI, Pre, and Postemergence herbicides, Fargo 36
Injury to sugarbeets and other crops from herbicide carryover, Fargo ... 38
Three species evaluation of the effect of additives on antagonism,Amenia 40
Broadleaf herbicides plus additives, Amenia 42

Green section: General Weed Control in Crops

Table of contents

	Page	File
Wild oats control in wheat, Fargo	1	WO2
Wild oats control in wheat, Langdon	2	WO3
Wild oats control in wheat, Minot	3	WO4
Wild oats control in wheat, Williston	4	WO5
Antagonism of wild oats control, Williston	5	WO6
Antagonism of wild oats control, Minot	6	WO7
Antagonism of wild oats control, Fargo	7	WO8
AC 222,293 plus bromoxynil and surfactant, Fargo	8	WO9
Diclofop plus adjuvants, Fargo	9	WO10
Wild oats and broadleaf herbicide combinations, Fargo	10	WO11
Antagonism of diclofop by various compounds, Fargo	11	WO12
Evaluation of herbicides for wild oats control, Fargo	12	WO13
Adjuvants with AC 222,293, Williston	13	WO14
Wild oats control evaluation, Langdon	14	WH22
Wild oat control in durum wheat, Minot 1988	15	Wh26
Wild oats herbicides with adjuvants, Prosper	16	WO15
Hard Red Spring wheat cultivar response to herbicides, Minot	17	VA1
Oats cultivar response to sulfonyl urea herbicides, Minot	18	VA2
Durum wheat response to herbicides, Minot	19	VA3
Wheat cultivar response to herbicides, Williston	20	VA4
Small grain response to herbicides, Fargo	21	WH1
Broadleaf weed control in wheat, Williston	22	WH2
Broadleaf weed control in wheat, Langdon	23	WH3
Broadleaf weed control in oats, Minot	24	WH4
Broadleaf weed control in wheat, Carrington	25	WH5
Broadleaf weed control in wheat, Casselton	26	WH6
Broadleaf weed control in wheat with sulfonylureas, Casselton	27	WH7
Fluroxypyr for weed control in wheat, Fargo	28	WH8
Preemergence foxtail control in wheat, Fargo	29	WH9
Postemergence foxtail control in wheat, Fargo	30	WH10
2,4-D diethanolamine with carbonates, Exp 1, Fargo	31	WH11
2,4-D diethanolamine with carbonates, Exp 2, Fargo	32	WH12
Kochia control with 2,4-D, Fargo	33	WH13
Carbonate antogonism of 2,4-D, Exp 1, Fargo	34	WH14
Carbonate antagonism of 2,4-D, Exp. 2, Fargo	35	WH15
Sodium bicarbonate antagonism of 2,4-D, Fargo	36	WHZN
BAS 514 for weed control in wheat, Exp 1, Fargo	37	WH16
BAS-514 for weed control in wheat, Exp 2, Fargo	38	WH17
S-23121 for broadleaf weed control in wheat, Fargo	39	WH18
Preemergence weed control in wheat, Williston	40	WH19.W
Small grain response to postemergence herbicides, Fargo	41	WH19
CGA-131036 fall and spring applied on small grains, Williston	42	WH20
Fenoxaprop and HOE-7113 on Durum and HRS wheat, Langdon	43	WH21
Harrowing for weed control, Langdon	44	WH23
Green foxtail control in wheat, Minot 1988	45	WH25

Green Section Cont.

Weed control in flax, Fargo	46	FX1
Weed control in flax, Carrington	47	FX2
Weed control in flax, Williston	48	FX3
Weed control in flax, Minot	49	FX4
Acifluorfen for Flax desiccation, Casselton	50	FX8
Dessication of flax, Minot 1988	51	FX10
Weed control in flax, Langdon	52	FX9
Flax variety response to sulfonyl urea herbicides	53	FX11
Weed control in sunflower, Carrington	54	SF5
Weed control in sunflower, Minot	55	SF6
Weed control in sunflower, Williston	56	SF7
Weed control in sunflower, Casselton	57	SF8
Postemergence AC 222,293 in sunflower, Fargo	58	SF9
AC 222,293 on weed free sunflower, Casselton	59	SF10
Weed control in soybean, Carrington	60	SB5
Preemergence weed control in soybean, Casselton	61	SB15
Postemergence weed control in soybean, Casselton	62	SB16
Herbicide combinations postemergence in soybean, Casselton	63	SB22
Bentazon with adjuvants, Casselton	64	SP25
Imazethapyr with adjuvants, Casselton	65	SP27
Dash volume with sethoxydim plus bentazon, Prosper	66	SP32
Postemergence broadleaf weed control in dry bean, Casselton	67	DB1
Weed control with imazethapyr in dry bean, Casselton	68	DB2
Weed control in corn, Casselton	69	CO1
Weed control in corn, Carrington	70	CO3
Postemergence weed control in corn, Casselton	71	CO2
Weed control in grain sorghum, Carrington	72	GS1
Postemergence weed control in canola, Langdon	73	CA1
Preemergence Weed control in canola, Langdon 1988	74	CA2
Weed control in safflower, Williston	75	SA1
Annual forage crops response to herbicides, Minot	76	FOR1
Commercial petroleum oils with sethoxydim, Exp 1, Fargo	77	SP3
Commercial petroleum oils with sethoxydim, Exp 2, Fargo	78	SP43
Commercial petroleum oils with fluazifop, Prosper	79	SP4
Commercial petroleum oils with DPX-Y6202, Fargo	80	SP44
Sethoxydim formulations with adjuvants, Exp 1, Prosper	81	SP11
Sethoxydim formulations with adjuvants, Exp 2, Fargo	82	SP11Y
Sethoxydim time-of-day application, Exp 1, Fargo	83	SP12
Sethoxydim time-of-day application, Exp 2, Prosper	84	SP13
Sethoxydim miximg method, Exp 1, Fargo	85	SP15

Green section cont.

Sethoxydim plus adjuvants, Fargo	88	SP19
Fluazifop plus adjuvants, Fargo	89	SP20
Clethodim plus adjuvants, Fargo	90	SP21
DPX-Y6202 plus adjuvants, Exp 1, Fargo	91	SP22
DPX-Y6202 plus adjuvants, Exp 2, Fargo	92	SP23
Fenoxaprop plus adjuvants, Prosper	93	SP33
Haloxyfop plus adjuvants, Fargo	94	SP34
Sethoxydim with NaHCO3 or Na2CO3, Fargo	95	SP26
DPX-R9674 with adjuvants, Fargo	96	SP28
2,4-D with adjuvants, Fargo 1988	97	SP29
Sethoxydim with adjuvants and antagonism, Fargo	98	SP30
Fluazifop with adjuvants and antagonism, Prosper	99	SP31
Adjuvants with fluazifop, Fargo	100	SP39
Adjuvants with sethoxydim, Fargo	101	SP40
Glyphosate with adjuvants, Prosper	102	SP41
Paraquat with adjuvants, Prosper	103	SP42
False chamomile control on fallow and or noncrop land, Minot	105	CAM
Common milkweed control on fallow, Minot	106	PER

Pink Section: Perennial Weed Control

	Page
Fluroxypyr alone and with auxin herbicides for leafy spurge control	1-2
Evaluation of sulfometuron applied mid-summer and fall for leafy spurge control	3-5
Sulfometuron applied alone and with auxin herbicides as an annual treatment for leafy spurge control	6-9
Leafy spurge control under trees and along waterways	10-12
Leafy spurge control with various herbicides combinations applied alone or with spray additives	13-16
Picloram and 2,4-D combinations treatments for long-term leafy spurge management	17-18
Leafy spurge control with low rate annual picloram and 2,4-D combination treatments	19-20
Leafy spurge control with picloram plus dicamba or various 2,4-D formulations applied annually	21-23
Late-season leafy spurge control with sulfometuron and picloram	24-25
Leafy spurge control with resulting forage production from several herbicides treatments	26-27
Leafy spurge control following a nine-year management program	28-30
Post-harvest treatments for field bindweed control	31-32

Blue Section: Weed Control in Reduced Tillage Systems

	Page	File
Triazine-tridiphane mixtures for postemergence grass control in corn, Fargo	1	CO20
Corn plantback following imazaquin and imazethapyr in no-till soybeans, Fargo	2	
Weed control economics in minimum till and no-till soybeans, Fargo	3	SBWT
Carryover injury to wheat by clomazone applied in soybeans, Casselton	8	CMD1
Carryover injury to wheat by clomazone applied in soybeans, Carrington	9	CMD4
Fall and EPP imazethapyr and BAS514 in no-till soybeans, Minot	10	SB1
Fall and EPP imazethapyr and BAS514 in no-till soybeans, Carrington	11	SB2
Early preplant cyanazine in no-till soybeans, Fargo	12	SB3
Early preplant treatments in no-till soybeans, Fargo	13	SB4
Burndown treatments for no-till soybeans, Carrington	14	SB20
Cyanazine injury in no-till sunflowers and soybeans, Minot	15	SF3
Fall and EPP cyanazine and RE-40885 in no-till sunflowers, Minot	16	SF1
Fall and EPP cyanazine and RE-40885 in no-till sunflowers, Carrington	17	SF2
Early preplant treatments in no-till sunflowers, Fargo	18	SF4
Fall-applied herbicides in chemical fallow, Minot	19	FA2
Longevity of soil-applied herbicides in fallow, Minot	20	FA1
BAS514 and clomazone for weed control in fallow, Page	21	FA18
Postemergence treatments in fallow, Minot	22	FA19
Postemergence treatments in fallow, Carrington	23	FA20
Burndown of four-leaf oats, wheat, and foxtail millet, Fargo	24	FA24
Burndown of boot-stage oats, wheat, and foxtail millet, Fargo	25	FA23
Carryover injury to wheat by clomazone applied in fallow, Minot	26	CMD2
Carryover injury to wheat by clomazone applied in fallow, Williston	28	CMD3
False chamomile control on fallow and noncrop land, Mohall	29	FA21
Paraquat and sethoxydim plus 2,4-D for no-till burndown, Fargo	30	FA678
Paraquat and sethoxydim plus 2,4-D for no-till burndown, Pillsbury	31	FA131415
Glyphosate and HOE-00661 for no-till burndown, Fargo	32	FA345
Glyphosate and HOE-00661 for no-till burndown, Pillsbury	33	FA1011
Burndown efficacy of residual herbicides, Fargo and Pillsbury	34	FA916
Antagonism of glyphosate burndown by residual herbicides, Fargo	35	FA17
Common milkweed control on fallow, Minot	36	

CLIMATIC DATA - PROSPER/AMENIA 1988

	Precipitation					April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1					.62			82	58	91	64	77	54	86	63
2								82	54	96	58	87	47	88	67
3								80	43	93	62	92	58	81	63
4								66	35	96	61	92	67	77	54
5								77	35	98	63	107	73	92	55
6								85	49	96	58	106	81	97	60
7		.27		.23	.23	83	34	70	50	100	58	86	61	83	63
8						75	39	74	42	82	58	91	56	76	51
9						46	25	73	46	82	39	90	58	90	49
10					.23	56	23	71	48	90	46	76	53	97	70
11						69	24	76	54	98	60	81	46	92	65
12		.23	.19	.03	.03	69	30	82	38	79	61	88	55	90	67
13			.03		1.29	52	28	66	27	81	60	90	61	75	66
14		.03	.47			49	19	82	49	66	57	92	53	86	61
15		.03				55	19	61	37	78	51	89	57	95	64
16						82	21	68	32	79	47	91	51	103	73
17						47	26	78	40	90	58	87	56	76	66
18		.03				49	13	94	61	98	66	86	61	82	63
19		.03		.07		61	12	65	55	100	64	89	52	83	54
20						46	20	73	51	97	55	83	52	88	64
21		.39	.19			51	17	58	52	94	68	90	51	82	68
22		.03				53	21	73	49	84	60	93	52	88	57
23			.43			54	28	85	43	82	61	97	63	81	53
24						67	21	81	44	95	63	86	49	90	52
25						53	29	90	52	83	58	92	51	79	49
26		.07				46	32	88	57	67	54	100	62	85	42
27						63	27	88	53	94	61	107	71	72	45
28		.07				72	24	91	66	86	62	98	75	70	39
29						80	31	93	65	80	56	95	64	75	39
30	.15					77	51	92	67	82	49	94	53	82	41
31								94	68			98	70	85	61

CLIMATIC DATA - CARRINGTON 1988

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1		.01	.50	.10	.95	58	27	71	59	90	61	75	57	68	57
2		.02			.02	61	30	69	47	88	57	84	52	82	61
3			.14		.14	69	29	56	37	90	57	88	54	77	63
4				T		63	40	60	30	93	64	88	60	80	51
5				.30		54	31	72	28	94	61	100	65	91	56
6		T				72	28	84	47	95	60	102	65	96	65
7		.11		.18	T	82	36	76	49	97	60	99	57	91	66
8		T			T	67	44	59	40	86	64	91	53	75	47
9						46	26	75	35	82	51	90	60	89	47
10						53	23	75	41	93	54	82	49	99	64
11		.17				69	34	75	50	98	62	78	42	91	64
12		.20	.34	.19	.20	66	33	78	43	82	57	85	55	91	58
13					.09	52	29	67	26	82	52	85	58	88	63
14		T	.23			50	20	73	44	65	54	89	57	86	55
15		.01		.08		54	15	72	44	73	46	88	62	95	66
16					.89	81	32	72	27	76	44	93	47	93	65
17				T		45	26	83	44	94	54	87	48	80	60
18				.02		48	13	84	62	94	64	80	53	78	58
19		.09		T		60	18	71	53	93	61	80	48	82	52
20						49	21	72	52	97	55	80	46	87	56
21			.43			49	19	70	47	93	64	88	48	86	65
22						48	19	74	41	84	54	92	53	85	49
23			.63			54	17	82	42	89	58	86	65	80	51
24						54	32	84	45	95	67	85	50	88	49
25						53	26	90	54	86	56	95	58	86	46
26		.19				49	31	85	49	84	53	101	54	77	43
27					.03	61	24	85	46	99	61	104	58	70	38
28		.35				71	31	89	59	85	69	102	70	68	34
29	.40					81	31	02	63	76	55	90	62	75	35
30						78	49	90	57	77	58	93	69	75	50
31								92	60			93	69	75	50

CLIMATIC DATA - CASSELTON 1988

	Precipitation					April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1					.07	45	20	74	48	93	63	85	55	98	62
2					.47	60	38	80	60	89	58	76	49	94	63
3						61	34	81	42	94	62	85	62	89	66
4					.03	62	39	78	36	92	62	90	60	82	56
5					.01	69	26	68	36	96	61	94	70	79	53
6						61	25			96	58	107	83	92	54
7		T		.22		74	32	84	41	96	58	106	64	80	49
8		.46		.16	.18	83	50	68	43	98	58	83	57	83	50
9						75	33	75	43	86	40	92	59	76	49
10						46	22	74	48	81	49	85	52	88	52
11					.08	57	26	74	48	90	53	77	46	99	66
12		.14			.01	70	36	78	54	97	64	84	56	98	66
13		.01	.42	.17	.93	49	32	83	25	78	59	88	55	94	66
14		.02	.53		.25	56	18	65	43	82	58	90	55	78	61
15			.02			51	18	82	51	73	45	93	61	87	64
16						55	24	66	31	74	46	90	53	98	64
17						82	24	75	35	79	54	90	58	105	64
18					.03	44	13	78	45	90	66	88	64	78	66
19		.18				50	13	94	57	100	63	87	54	86	55
20		.04		.06		62	23	68	53	98	62	87	52	83	55
21		.21	.16			46	19	74	54	95	56	84	53	88	71
22		.31				53	19	58	50	93	56	89	56	95	68
23			.22			55	27	75	47	94	58	93	60	88	54
24						55	25	85	46	90	57	98	60	83	55
25						68	30	83	52	94	66	87	53	92	54
26						56	32	87	55	93	60	91	55	80	43
27		.10			T	55	29	90	49	94	62	98	67	82	49
28						68	26	87	60	93	55	106	79	73	40
29						72	31	91	63	91	56	96	74	71	41
30	.90					80	48	90	64	80	50	94		76	42
31				.04				92	67			96	75	81	52

CLIMATIC DATA - CROOKSTON 1988

	Precipitation					April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1					.89	51	32	80	62	87	60	77	48	73	63
2			.01		T	59	33	81	42	93	65	83	57	84	65
3						55	37	74	34	91	61	89	67	83	57
4					.07	54	33	63	33	93	69	91	73	80	58
5				.08		57	28	72	39	94	65	104	71	92	60
6		.05		.12		68	34	85	59	94	65	100	66	96	74
7		.41		.01		76	46	75	45	95	60	80	52	84	49
8		.08				73	32	71	43	69	38	88	62	74	50
9						42	26	70	43	79	54	86	54	85	59
10					T	51	31	68	46	87	63	71	45	97	70
11		.08				61	35	70	51	95	67	78	50	95	68
12		.25	.30	.46	.21	63	30	73	28	80	59	83	62	88	66
13			.49		.26	45	21	71	34	82	55	84	54	73	64
14		.23	.11			41	19	78	44	74	52	85	62	85	67
15			T		.02	51	26	45	35	74	46	85	50	94	69
16						77	25	63	40	75	56	84	57	90	65
17				T		40	14	74	52	86	54	84	63	76	64
18		.07	.28	.01		45	13	89	55	89	61	84	50	81	51
19				.05		57	21	61	56	95	53	84	57	81	59
20		.11	.30			44	18	69	53	90	67	81	52	86	70
21		.14			.02	46	26	56	46	88	57	87	55	83	58
22			.03			50	28	75	43	82	60	92	67	86	58
23			T	.32		52	26	82	43	81	61	91	62	77	65
24						62	32	75	52	90	59	84	50	87	53
25						44	29	86	52	81	52	86	65	75	41
26		.05			.06	49	22	82	49	82	61	95	65	80	47
27			T			60	24	87	62	89	66	101	71	69	47
28						70	41	89	65	79	51	94	71	68	43
29						77	51	91	69	80	55	89	52	68	42
30	T			.12		77	55	89	71	80	56	89	65	78	50
31		.14		.52	.03			91	66			91	60	83	52

CLIMATIC DATA - FARGO 1988

	Precipiation					April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1					.43	55	24	80	60	89	66	75	59	88	64
2	T		T		.02	61	29	82	54	93	62	85	53	87	67
3	T				T	53	39	79	42	92	62	91	62	83	63
4	T				.01	65	40	68	37	93	66	92	69	78	56
5						60	34	77	36	94	69	106	78	92	56
6		T		.09		71	27	83	55	94	64	102	77	97	64
7		.28		.20	.09	80	36	71	50	97	66	86	64	86	64
8		T			T	78	39	75	42	81	56	89	58	76	50
9		.07		T		45	27	71	45	80	42	89	63	88	52
10					T	54	26	70	49	89	55	75	52	98	71
11					.02	67	29	75	55	96	64	79	46	93	67
12		.35	.18	.15	.02	69	35	81	37	84	61	87	61	92	68
13			.03		1.36	51	26	64	24	82	60	90	63	78	66
14		.04	.69			48	20	82	51	67	58	92	57	87	62
15		.05	T			54	18	62	36	78	51	88	62	96	67
16	T				T	81	32	66	34	78	48	89	52	104	74
17	T				T	48	24	75	47	86	58	76	67		
18		T				47	12	92	63	97	66	86	63	82	66
19		.19		.01		59	17	68	56	98	63	88	56	82	54
20		.26		T	.03	46	24	72	54	95	56	82	55	88	65
21		.41	.06		T	51	20	57	52	93	69	89	54	82	71
22		.10			.16	54	19	73	51	83	57	93	62	87	61
23			.28	T		55	25	84	44	85	62	96	66	81	56
24	T					68	31	77	45	94	66	86	53	89	51
25						52	28	87	53	83	58	89	56	78	50
26	T	.04			T	45	29	86	55	85	53	97	65	83	47
27						62	27	85	54	03	65	105	71	71	46
28		T		.08		71	32	90	68	86	62	96	74	71	42
29						79	44	90	66	80	58	94	67	74	40
30	.01	T				76	52	91	69	81	55	93	57	80	50
31		.03		T	T			92	71			98	74	84	65

CLIMATIC DATA - LANGDON 1988

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1						40	20	77	56	92	64	79	58	86	56
2			.09		T	56	30	73	55	88	56	73	48	74	58
3			.02			62	20	75	37	85	56	79	52	78	59
4						62	33	52	28	88	60	89	59	79	51
5				1.00		60	28	50	23	92	66	91	64	78	51
6				.23		55	28	62	34	95	64	88	68	92	59
7		T		.34		65	30	79	49	93	63	89	57	99	68
8		.44				72	38	72	44	96	63	78	53	78	40
9						72	26	50	34	74	45	84	57	76	47
10						38	23	70	36	79	54	75	50	88	56
11						52	28	65	43	89	65	64	47	98	60
12		.13				66	34	69	48	92	59	74	50	82	59
13		.01	.02	.36		59	24	62	24	75	50	76	57	87	61
14		.03		1.04		45	17	68	32	81	53	79	52	71	60
15		.10	.25	.10	T	45	18	68	37	66	48	75	57	81	61
16		.01	.03		.10	52	26	50	27	67	40	78	47	94	66
17					.08	70	18	65	36	75	54	82	47	81	58
18			.06			39	13	77	54	92	61	81	54	76	55
19		.15		T		43	15	82	51	91	59	78	48	77	53
20				.27		53	13	71	50	89	53	77	50	80	54
21		T				43	18	68	46	91	66	79	52	82	58
22						40	23	68	40	91	60	84	58	83	51
23			.05		.02	40	17	78	49	79	56	89	67	79	52
24						49	32	75	46	86	49	82	50	75	51
25			T			50	30	78	55	92	57	81	55	82	49
26						47	23	93	46	80	57	91	56	73	44
27		.02			T	46	26	78	45	83	62	95	57	74	40
28						62	29	87	60	93	61	97	66	65	42
29		.08		.05		71	39	91	62	79	51	99	61	65	38
30						77	52	90	64	79	48	83	50	70	44
31								86	68			87	59	77	51

CLIMATIC DATA - MINOT 1988

	Precipitation					April		May		June		July		August	
Date	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1				.84		46	26	83	50	86	62	62	57	86	62
2		.83				62	36	60	45	80	64	68	56	77	59
3		.09				72	41	45	36	88	52	82	62	75	57
4				T		76	41	44	34	91	58	90	60	76	48
5				.77		60	28	48	31	94	70	86	64	83	57
6						54	31	66	34	96	67	88	66	97	64
7				.03	.06	71	38	80	52	96	70	83	57	100	63
8		.22				81	39	72	42	100	73	81	57	74	44
9		.07			.23	46	25	58	36	95	57	87	55	73	50
10			.05			46	26	75	41	87	56	79	52	92	58
11		.06				57	30	73	45	98	71	71	44	96	63
12		.04			.05	74	37	75	47	93	58	78	51	85	60
13				T	T	62	29	77	32	83	49	77	57	91	61
14		T	.48	.01	.17	52	22	62	43	82	53	85	60	69	59
15		.02	.72		.03	49	23	68	44	60	51	93	62	89	66
16		.01				56	25	56	34	70	50	81	54	95	69
17	T					77	27	75	42	78	55	90	50	91	61
18				T		42	16	82	56	97	55	85	53	78	57
19		.11			T	49	20	64	44	95	65	74	53	78	58
20				.01		59	25	71	51	90	61	76	47	88	52
21		T	.42			43	17	74	43	100	68	80	54	88	60
22						49	17	74	43	93	58	88	62	82	55
23					.02	46	22	78	49	88	63	94	66	79	55
24			T			57	28	82	51	99	66	81	49	79	51
25						44	24	84	62	96	55	85	59	86	51
26						47	27	84	50	81	56	97	59	76	45
27		.02			T	49	24	78	52	90	71	100	57	73	39
28						61	33	87	60	99	67	103	66	68	39
29						72	43	89	58	91	60	101	65	67	37
30	.09		.22			80	47	97	66	79	59	86	53	76	41
31								85	69			92	67	85	55

CLIMATIC DATA - PILLSBURY AND PAGE 1988

Date	Precipitation			
	April	May	June	July
1				
2				
3				
4				
5				
6				
7		.30		
8				
9				
10				
11				
12				
13				
14				
15			1.04	
16				
17				
18				
19		.65		
20				
21				
22				
23				
24				
25		.90		
26				
27				
28				
29	.25			
30				
31				

CLIMATIC DATA - WILLISTON 1988

Date	Precipitation					April		May		June		July		August	
	April	May	June	July	Aug.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1		.24			.02	64	28	71	44	79	58	78	52	89	57
2		.30			T	73	32	65	40	82	55	89	55	83	58
3				T		71	38	61	31	92	51	90	65	79	56
4	.14			.09		65	37	65	30	98	62	89	60	85	50
5						58	31	66	33	103	60	94	67	100	56
6						71	34	80	51	104	72	94	66	106	60
7		.01		.02		72	46	79	50	105	69	81	50	105	58
8	.01	.24				71	34	72	44	104	71	88	53	77	49
9	T					48	26	76	40	96	61	88	56	92	54
10						58	26	79	43	105	65	81	50	93	63
11		T				78	31	81	48	105	68	80	55	92	64
12				.07	.16	77	35	76	45	89	57	85	65	91	60
13			T		.03	59	27	75	37	81	55	84	59	90	63
14		.26	.76			58	21	75	48	72	50	94	62	95	59
15			.07		.05	67	26	67	49	73	48	96	62	99	58
16						77	35	83	40	83	54	86	63	99	74
17				.03		67	30	88	55	102	60	82	53	90	55
18		.03		.12		56	22	89	53	102	70	76	53	84	58
19					.04	61	22	74	42	95	63	77	53	85	59
20			.18			59	30	75	49	105	66	83	51	92	56
21			.03			53	21	77	44	95	69	91	57	92	57
22					T	54	24	80	43	95	65	102	62	78	51
23						60	25	82	46	101	69	102	62	83	51
24						59	30	88	55	100	79	90	55	90	54
25						48	23	88	59	89	52	96	60	88	51
26		.01			T	50	26	83	65	99	68	99	60	79	50
27						63	23	91	65	99	68	108	66	73	43
28		.32		.02		75	33	91	58	100	66	104	70	73	40
29						82	40	98	48	95	66	97	63	82	41
30			1.98			81	47	95	64	80	55	99	57	85	55
31								88	58			100	62	84	48

KEY TO ABBREVIATIONS AND EVALUATIONS

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

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

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

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

Species

Abww = Absinth wormwood
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
Latu = Ladysthumb
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 =(Sgbt) = 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
PRE, 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 = Dimethylamin
bee = Butoxyethyl ester
dea = diethanolamine
MS = modified seed oil
PO, OC = 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 1988

Common Name or Code Name	Abbreviation[a]	Company	Formulation	Trade Name
A-1237	A1237	Uniroyal	0.8 lb/gal	None
AC-222,293 Imazamethabenz	AC-293 Immb	American Cyanamid	2.5 lb/gal	Assert
AC-263,499 Imazethapyr	Imep	American Cyanamid	2 lb/gal AS	Pursuit
Acifluorfen	Acif	BASF Rhone Poulenc	2 lb/gal E,S 2 lb/gal S	Blazer Tackle
Alachlor	Alac	Monsanto	4 lb/gal E 4 lb/gal MT, 15% G	Lasso
Amitrole	Amit	Rhone-Poulenc	2 lb/gal S	Amitrole T
Atrazine	Atra	Various	80% WP, 90% DF, 4 lb/gal F	Numerous
BAS-090		BASF	Surfactant	None
BAS-51400H	BAS514	BASF		Facet
Benazolin	Bena	Nor-Am	50% SC	None
Bentazon	Bent	BASF	4 lb/gal S	Basagran
Bromoxynil	Brox	Rhone-Poulenc	2 lb/gal E	Buctril
Butylate + Safener	Buty	ICI	6.7 lb/gal L 10% G	Sutan+
C-4243		Uniroyal	0.8 lb/gal	None
CGA-131036	CGA131	Ciba Geigy	75% WP	Amber
CGA-136872	CGA136	Ciba Geigy	75% DF	Beacon
Chloramben	Clam	Rhone-Poulenc	75% SP	Amiben
Chlorsulfuron	Clsu	DuPont	75% DF	Glean
Cinmethylin	Cinm	DuPont	7 lb/gal EC	Cinch
Clethodim	Clet	Valent	2 lb/gal	Select

Common Name or Code Name	Abbreviation[a]	Company	Formulation	Trade Name
Clomazone	Clom	FMC	4 lb/gal	Command
Clopyralid	Clpy	Dow	3 lb/gal S	Stinger
Clopyralid+2,4-D	Clpy&2,4-D	Dow	0.38 + 2 lb/gal S	Curtail
Cyanazine	Cyan	DuPont	80% WP, 90% DF 4 lb/gal F	Bladex
Cycloate	Cycl	ICI	6 lb/gal E	Ro-Neet
Dalapon	Dala	Dow	75% SP	Dowpon
Desmedipham	Desm	Nor-Am	1.3 lb/gal E	Betanex
Desmedipham + Phenmedipham	Des & Phen	Nor-Am	0.65+0.65 lb/gal E	Betamix
Diallate	Dial	Monsanto	4 lb/gal E	Avadex
Dicamba	Dica	Sandoz	4 lb/gal S	Banvel
Dichlorprop		Rhone-Poulenc	4 lb/gal EC	Weedone 2,4-DP
Diclofop	Difp	Hoechst-Roussel	3 lb/gal E	Hoelon
Diethatyl	Diet	Nor-Am	4 lb/gal E	Antor
Difenzoquat	Dife	American Cyanamid	2 lb/gal S	Avenge
Diquat	Diqu	Valent	2 lb/gal S	Diquat
DPX-A7881	DPX-A7	DuPont	75% DF	Muster
DPX-L5300	DPX-L5	DuPont	75% DF	Express
DPX-M6316	DPX-M6	DuPont	75% DF	Harmony
DPX-R9674 (DPX-L5300 + DPX-M6316)	DPX-R9	DuPont	75% DF	Harmony Extra
DPX-Y6202(-44) (Quizalofop)	Qufp	DuPont	0.75 lb/gal EC	Assure
DPX-V9360 Accent	DPX-V9	DuPont	72% DF	Accent
Endothall	Endo	Pennwalt	3 lb/gal S	Herbicide 273

Common Name or Code Name	Abbreviation[a]	Company	Formulation	Trade Name
EPTC	EPTC	ICI	7 lb/gal E	Eptam
Ethalfluralin	Etha	Elanco	3 lb/gal E	Sonalan
Ethofumesate	Etho	Nor-Am	4 lb/gal F 1.5 lb/gal E	Nortron
Fenoxaprop	Fenx	Hoechst-Roussel	1.5 lb/gal E	Whip option
Fluazifop-P	Flfp-P	ICI	1 lb/gal E	Fusilade 2000
Fluroxypyr	Flox	Dow	1.7 lb/gal	Starane
Fomesafen	Fome	ICI	2 lb/gal	Reflex
Fosamine	Fosa	DuPont	4 lb/gal S	Krenite
Glyphosate	Glyt	Monsanto	3 lb/gal S	Roundup
Haloxyfop	Halx	Dow	2 lb/gal	Verdict
HOE-00661		Hoechst-Roussel	1.68 lb/gal	Ignite
HOE-7113		Hoechst-Roussel	0.5 lb/gal	Puma
HOE-7125 (fenoxaprop+MCPA + 2,4-D)		Hoechst-Roussel	0.75 lb/gal	Tiller
HOE-7121 (fenoxaprop+MCPA + 2,4-D)		Hoechst-Roussel	0.5 lb/gal	
Imazaquin	Imqn	American Cyanamid	1.5 lb/gal	Scepter
Isoxaben	Isox	Elanco	75%	--
Imazethapyr	Imep	American Cyanamid	2.5 lb/gal	Pursuit
Lactofen	Lact	PPG	2 lb/gal S	Cobra
Linuron	Linu	DuPont	50% WP, 4 lb/gal F	Lorox
MCPA	MCPA	Rhone-Poulenc	4 lb/gal E, S	Several
Metolachlor	Meto	Ciba-Geigy	8 lb/gal E	Dual
Metribuzin	Metr	Mobay DuPont	4 lb/gal F, 75% DF 4 lb/gal F, 75% DF	Sencor Lexone
Metsulfuron	Mets	DuPont	60% DF	Ally/Escort

Common Name or Code Name	Abbreviation[a]	Company	Formulation	Trade Name
Oryzalin	Oryz	Elanco	4 lb/gal F	Surflan
Paraquat	Para	ICI	1.5 lb/gal S 2 lb/gal S	Gramoxone Super Cyclone
Pendimethalin	Pend	American Cyanamid	4 lb/gal E	Prowl
Picloram	Picl	Dow	2 lb/gal S	Tordon 22K
Propachlor	Prcl	Monsanto	4 lb/gal F	Ramrod
Propanil + MCPA	Prnl + MCPA	Rohm & Haas	3.0 + 1.4 lb E	Stampede CM
Pyrazon	Pyra	BASF	4.2 lb/gal F	Pyramin
Pyridate	Pyri	Gilmore	3.75 lb/gal E	Tough
R-25788, Dichlormid	Dcmd	ICI	6 lb/gal E	None
R-33865, Dietholate	Ext	ICI	6 lb/gal E	None
RO17-3664	None	Mobay	2 lb/gal	
RE-40885	None	Valent	80% WP	Benchmark
S-23121	None	Valent	0.83 lb/gal F	None
S-53482	None	Valent	0.83 lb/gal F	None
S-63596	None	Valent	0.89 lb/gal F	None
SAN-582H	None	Sandoz	6 lb/gal E	None
SC-0051	None	ICI	3 lb/gal	None
SC-0098	None	ICI	1.7 lb/gal	None
Sethoxydim	Seth, Sth	BASF	1.5 lb/gal E	Poast
Sulfometuron	Sume	DuPont	75% DF	Oust
Thiameturon		See DPX-M6316		

Common Name or Code Name	Abbreviation[a]	Company	Formulation	Trade Name
Triallate	Tria	Monsanto	4 lb/gal E, 10% G	Far-go
Triclopyr	Trcp	Dow	4 lb/gal	Garlon
Tridiphane	Trid	Dow	4 lb/gal E	Tandem
Trifluralin	Trif	Elanco	4 lb/gal E	Treflan
2,4-D	2,4-D	Various	Various E, S	Numerous
2,4-DB	2,4-DB	Various	2 lb/gal	Numerous

[a]Abbreviations in the tables may consist of only the first one, two, or three listed letters when space was limited. Abbreviations of numbered compounds 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	lb/A N	P	K
Amenia, ND (Fall expt)	Silt loam	3.6	7.6	195	67	1090
Amenia, ND (Time of appl.)	Silt loam	3.7	7.7	204	66	995
Amenia, ND (Treflan)	Silt loam	3.8	7.7	213	64	900
Amenia, ND (bioassays)	Silt loam	3.5	7.3	112	75	1030
Amenia, ND (Drift 1)	Silt loam	3.2	7.5	133	66	1030
Amenia, ND (Drift 2)	Silt loam	3.6	7.3	153	65	1080
Bathgate, ND	Silt loam	4.1	7.8	118	63	595
Carrington, ND	Loam	3.6	7.2	Fertilized by test		
Casselton, ND	Silty clay	5.0	7.9	Applied 80 lb N		
Chaffee, ND	Fine sandy loam	6.7	7.4	20	36	950
Clara City, MN	Silty clay loam	high	8.1	100	75	273
Crookston, MN	Silt loam	-	7.8	337	9	470
Dickinson Ranch HQ	Clay loam	4.4	6.0	5	14	630
Fargo, ND (Sect. 22)	Silty clay	6.0	7.5	110	34	950
Fargo, ND (sugarbeets)	Silty clay	5.1	7.2	112	47	750
Hector, MN	Clay loam	4.0	6.2	79	66	550
Hillsboro, ND	Silty clay	-	7.3	126	41	1360
Hunter, ND	Sand	7.4	6.8	14		
Langdon, ND	Clay loam	4.6	7.8	Fertilized by test		
Minot, ND	Loam	2.7	7.0	Fertilized by test		
Mooreton, ND	Silty loam	3.0	6.6	187	19	645
New England, ND	Clay loam	5.8	6.7			
Pillsbury, ND	Loam	5.9	7.9	46	39	1575
Raymond, MN	Silty clay loam	9.7	7.6	252	141	--
Robbin, MN	Silty clay loam	4.4	8.0	205	35	860
St. Thomas, ND	Silt loam	4.2	7.8	301	20	590
Valley City, ND (Sec 22)	Stony loam	9.4	6.7			
Williston, ND	Silty clay	3.2	7.5	137	25	850
	Loam	2.3	6.8	Fertilized by test		

Fall and spring applied herbicides, Amenia, 1987-1988. Fall herbicide treatments were applied October 21, 1987 when the air temp. was 37F, soil temp. at six inches was 36F, and the wind was south at 8-12 mph. Spring herbicide treatments were applied May 5, 1988 when the air temp. was 71F, soil temp. at six inches was 62F, wind was northeast at 5-10 mph, soil was dry at 0-2 inches, and moist at 3-4 inches. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots and incorporated with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for metolachlor treatments. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5, 1988. Green foxtail and redroot pigweed control and sugarbeet injury were evaluated July 1, 1988.

Treatment	Rate (lb/A)	Sugarbeet injury	Redroot Pigweed control	Green Foxtail control
			(%)	
EPTC (Fall)	4	28	92	75
Cycloate (Fall)	4	0	88	75
EPTC+Cycloate (Fall)	2+2.5	6	97	83
EPTC+Cycloate (Fall)	3+2	10	97	92
Metolachlor (Fall)	2	0	97	68
Metolachlor (Fall)	3	0	99	88
Metolachlor (Fall)	4	5	99	95
Metolachlor (Fall)	6	9	99	97
EPTC+Diallate (Fall)	4+1.5	26	97	73
EPTC+Diallate (Fall)	3+2	20	87	87
EPTC (Spring)	2	20	98	88
EPTC+Cycloate (Spring)	1.5+2	16	99	92
Metolachlor (Spring)	2	0	99	81
Metolachlor (Spring)	3	10	99	87
EPTC+Diethatyl (Spring)	2+4	34	99	97
HIGH MEAN		34	99	97
LOW MEAN		0	87	68
EXP MEAN		12	96	85
C.V. %		87	4	13
LSD 5%		15	5	16
LSD 1%		20	7	22
# OF REPS		4	4	4

Summary

Fall applied EPTC at 4 lb/A caused greater sugarbeet injury than fall applied EPTC+cycloate at 2+2.5 or 3+2 lb/A. Fall EPTC at 4 lb/A gave less green foxtail control than fall EPTC+cycloate at 3+2 lb/A. Fall metolachlor at 2 or 3 lb/A gave sugarbeet injury and weed control similar to spring metolachlor at 2 or 3 lb/A. Only fall cycloate at 4 lb/A and fall EPTC+diallate at 3+2 lb/A gave less than 90% redroot pigweed control. Only fall EPTC at 4 lb/A, fall cycloate at 4 lb/A, fall metolachlor at 2 lb/A, and fall EPTC+diallate at 4+1.5 lb/A gave less than 80% green foxtail control.

Fall and spring applied herbicides, Crookston, 1987-1988. Fall herbicide treatments were applied October 22, 1987 when the air temp. was 38F, soil temp. at six inches was 35F, wind was northeast at 5-10 mph, and the soil was moist at 0-4 inches. Spring herbicide treatments were applied April 26, 1988 when the air temp. was 52F, soil temp. at six inches was 40F, wind was west at 5-10 mph, soil was dry at 0-1 inch, moist at 1-3 inches, and wet at 3-6 inches. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots and incorporated with a rototiller set four inches deep for treatments containing EPTC or cycloate and two inches deep for metolachlor treatments. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 26, 1988. Common lambsquarters and redroot pigweed control and sugarbeet injury were evaluated June 1, 1988.

Treatment	Rate (lb/A)	Sugarbeet injury	Common Lambsquarters control	Redroot Pigweed control
		----------	(%) ----------	
EPTC (Fall)	4	0	84	65
Cycloate (Fall)	4	0	93	83
EPTC+Cycloate (Fall)	2+2.5	0	91	64
EPTC+Cycloate (Fall)	3+2	0	92	84
Metolachlor (Fall)	2	0	75	98
Metolachlor (Fall)	3	0	77	98
Metolachlor (Fall)	4	3	94	99
Metolachlor (Fall)	6	10	98	99
EPTC+Diallate (Fall)	4+1.5	3	93	78
EPTC+Diallate (Fall)	3+2	0	94	58
EPTC (Spring)	2	3	95	81
EPTC+Cycloate (Spring)	1.5+2	3	96	94
Metolachlor (Spring)	2	0	73	99
Metolachlor (Spring)	3	8	89	99
EPTC+Diethatyl (Spring)	2+4	10	89	93
HIGH MEAN		10	98	99
LOW MEAN		0	73	58
EXP MEAN		3	89	86
C.V. %		225	9	12
LSD 5%		NS	12	14
LSD 1%		NS	16	19
# OF REPS		4	4	4

Summary

None of the treatments caused significant sugarbeet injury. Metolachlor at 2 lb/A fall applied gave weed control similar to 2 lb/A spring applied. Metolachlor at 3 lb/A fall applied gave similar redroot pigweed control but less common lambsquarters control than 3 lb/A spring applied. Metolachlor at 2 or 3 lb/A fall applied and at 2 lb/A spring applied gave or tended to give less common lambsquarters control than other treatments. All metolachlor treatments, spring EPTC+cycloate at 1.5+2 lb/A, and spring EPTC+diethatyl gave similar control of redroot pigweed which was or tended to be greater than redroot pigweed control from other treatments. Fall EPTC+cycloate at 3+2 lb/A gave better redroot pigweed control than fall EPTC+cycloate at 2+2.5 lb/A.

Soil applied herbicides, Bathgate, 1988. Preplant incorporated herbicides were applied and rototiller incorporated May 3 when the air temp. was 55F, soil temp. at six inches was 53F, wind was north at 8-12 mph, soil was dry at 0-2 inches and moist at 2-4 inches. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. 'Interstate Puressa II' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3. Preemergence herbicides were applied May 3. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Redroot pigweed control and sugarbeet injury were evaluated June 25.

Treatment	Rate (lb/A)	Sugarbeet injury (%)	Redroot Pigweed control (%)
EPTC	2.5	6	71
Metolachlor	1.5	3	64
Metolachlor	2	4	79
EPTC+Cycloate	1.5+1.5	8	66
Metolachlor	3	8	90
EPTC+Cycloate	2+2	13	73
Cycloate	4	0	49
Diethatyl	4	4	64
Diethatyl (pre)	4	0	0
EPTC+Cycloate+Diethatyl	1.5+1.5+4	18	94
EPTC+Cycl/Diet (pre)	1.5+1.5/4	10	69
Ethofumesate	3	0	83
HIGH MEAN		18	94
LOW MEAN		0	0
EXP MEAN		6	67
C.V. %		94	12
LSD 5%		8	12
LSD 1%		11	16
# OF REPS		4	4

Summary

Only EPTC+cycloate at 2+2 lb/A and EPTC+cycloate+diethatyl at 1.5+1.5+4 lb/A caused sugarbeet injury over 10%. Only metolachlor at 3 lb/A and EPTC+cycloate+diethatyl at 1.5+1.5+4 lb/A gave 90% or greater redroot pigweed control.

Soil applied herbicides, Clara City, 1988. Preplant incorporated herbicides were applied and rototiller incorporated April 19 when the air temp. was 63F, soil temp. at six inches was 49F, wind was north at 8-12 mph, soil was dry at 0-1 inches, moist at 1-3 inches, and wet at 3-6 inches. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. 'KW 3265' sugarbeet was seeded in 22 inch rows April 20. Preemergence herbicides were applied April 19. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Sugarbeet injury was evaluated May 23.

Treatment	Rate (lb/A)	Sugarbeet injury (%)
EPTC	2.5	9
Metolachlor	1.5	0
Metolachlor	2	1
EPTC+Cycloate	1.5+1.5	3
Metolachlor	3	4
EPTC+Cycloate	2+2	13
Cycloate	4	3
Diethatyl	4	0
Diethatyl (pre)	4	0
EPTC+Cycloate+Diethatyl	1.5+1.5+4	16
EPTC+Cycloate/Diet (pre)	1.5+1.5/4	5
Ethofumesate	3	0
HIGH MEAN		16
LOW MEAN		0
EXP MEAN		4
C.V. %		86
LSD 5%		5
LSD 1%		7
# OF REPS		4

Summary

EPTC at 2.5 lb/A, EPTC+cycloate at 2+2 lb/A, and EPTC+cycloate+diethatyl at 1.5+1.5+4 lb/A caused significant sugarbeet injury. Weed populations were too erratic for evaluation of weed control.

Soil applied herbicides, Crookston, 1988. Preplant incorporated herbicides were applied and rototiller incorporated April 26 when the air temp. was 52F, soil temp. at six inches was 40F, wind was west at 5-10 mph, soil was dry at 0-1 inches, moist at 1-3 inches, and wet at 3-6 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 26. Preemergence herbicides were applied April 26. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Common lambsquarters and redroot pigweed control and sugarbeet injury were evaluated June 1.

Treatment	Rate	Sugarbeet injury	Common Lambsquarters control	Redroot Pigweed control
	(lb/A)		(%)	
EPTC	2	20	96	92
Metolachlor	1.5	5	66	94
Metolachlor	2	0	77	97
EPTC+Cycloate	1.5+1.5	11	97	92
Metolachlor	3	10	82	99
EPTC+Cycloate	1.5+2	9	97	94
EPTC+Cycloate	1+2.5	5	97	97
EPTC+Cycloate	2+2	26	98	98
EPTC+Cycloate	1.5+2.5	15	98	95
EPTC+Cycloate+Triallate	1.5+2+2	13	98	99
Cycloate	4	5	93	94
EPTC+Cycl/Meto (pre)	1.5+2/2	43	99	99
Diethatyl	4	0	20	79
EPTC+Cycloate+Diethatyl	1.5+2+3	36	97	99
Cycloate+Diethatyl	3+3	11	91	96
EPTC+Cycloate+Diethatyl	1.5+1.5+4	28	98	99
Diethatyl	6	3	20	71
EPTC+Cycl/Diethatyl (pre)	1.5+2/4	36	99	99
Ethofumesate	3.5	3	87	98
EPTC+Cycloate/Etho (pre)	1.5+2/3	50	99	99
HIGH MEAN		50	99	99
LOW MEAN		0	20	71
EXP MEAN		16	85	94
C.V. %		45	9	7
LSD 5%		10	11	9
LSD 1%		14	14	12
# OF REPS		4	4	4

Summary

EPTC alone or EPTC+cycloate with EPTC at 2 lb/A caused or tended to cause greater sugarbeet injury than EPTC+cycloate that included EPTC at 1 or 1.5 lb/A. Addition of diethatyl, ethofumesate, or metolachlor to EPTC+cycloate gave greater sugarbeet injury than EPTC+cycloate alone. Metolachlor gave less control of common lambsquarters than EPTC, EPTC+cycloate, or cycloate. Diethatyl gave less control of common lambsquarters and redroot pigweed than other treatments.

Soil applied herbicides, Hillsboro, 1988. Preplant incorporated herbicides were applied and rototiller incorporated April 25 when the air temp. was 48F, soil temp. at six inches was 43F, wind was north at 20 mph, soil was dry at 0-1 inches, moist at 1-3 inches, and wet at 3-6 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 25. Preemergence herbicides were applied April 25. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Redroot pigweed and green and yellow foxtail control and sugarbeet injury were evaluated June 6.

Treatment	Rate	Sugarbeet injury	Gr.&Ye. Foxtail control	Redroot Pigweed control
	(lb/A)		(%)	
EPTC	2.5	31	98	90
Metolachlor	1.5	0	78	74
Metolachlor	2	10	90	85
EPTC+Cycloate	1.5+1.5	8	96	83
Metolachlor	3	9	90	93
EPTC+Cycloate	2+2	21	98	94
Cycloate	4	6	92	80
Diethatyl	4	4	57	68
Diethatyl (pre)	4	0	19	8
EPTC+Cycloate+Diethatyl	1.5+1.5+4	39	98	98
EPTC+Cycl/Diet (pre)	1.5+1.5/4	21	94	94
Ethofumesate	3	0	85	90
HIGH MEAN		39	98	98
LOW MEAN		0	19	8
EXP MEAN		12	83	80
C.V. %		61	11	10
LSD 5%		11	14	12
LSD 1%		15	18	16
# OF REPS		4	4	4

Summary

EPTC at 2.5 lb/A, EPTC+cycloate at 2+2 lb/A, EPTC+cycloate+diethatyl at 1.5+1.5+4 lb/A, and EPTC+cycloate/diethatyl (pre) at 1.5+1.5/4 lb/A gave sugarbeet injury over 20%. Only metolachlor at 1.5 lb/A, diethatyl at 4 lb/A, diethatyl (pre) at 4 lb/A, and ethofumesate at 3 lb/A gave less than 90% foxtail spp. control. Only metolachlor at 1.5 lb/A, diethatyl at 4 lb/A, and diethatyl (pre) at 4 lb/A gave less than 80% redroot pigweed control.

Soil applied herbicides, Mooreton, 1988. Preplant incorporated herbicides were applied and rototiller incorporated April 21 when the air temp. was 59F, soil temp. at six inches was 49F, wind was northwest at 8-12 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. Preemergence herbicides were applied April 21. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Yellow foxtail control and sugarbeet injury were evaluated June 6.

Treatment	Rate	Sugarbeet injury	Yellow Foxtail control
	(lb/A)	---------- (%)	----------
EPTC	2.5	26	98
Metolachlor	1.5	1	84
Metolachlor	2	13	90
EPTC+Cycloate	1.5+1.5	9	97
Metolachlor	3	14	97
EPTC+Cycloate	2+2	26	98
Cycloate	4	0	91
Diethatyl	4	3	63
Diethatyl (pre)	4	0	0
EPTC+Cycloate+Diethatyl	1.5+1.5+4	38	99
EPTC+Cycl/Diet (pre)	1.5+1.5/4	31	98
Ethofumesate	3	0	51
HIGH MEAN		38	99
LOW MEAN		0	0
EXP MEAN		13	80
C.V. %		33	7
LSD 5%		6	8
LSD 1%		8	11
# OF REPS		4	4

Summary

EPTC+cycloate+diethatyl at 1.5+1.5+4 caused greater sugarbeet injury than all other treatments. EPTC at 2.5 lb/A, EPTC+cycloate at 2+2 lb/A, and EPTC+cycloate/diethatyl (pre) caused greater sugarbeet injury than all other treatments except EPTC+cycloate+diethatyl. All treatments except metolachlor at 1.5 lb/A, diethatyl at 4 lb/A, diethatyl (pre) at 4 lb/A, and ethofumesate at 3 lb/A gave 90% or greater control of yellow foxtail.

Soil applied herbicides, Raymond, 1988. Preplant incorporated herbicides were applied and rototiller incorporated April 20 when the air temp. was 59F, soil temp. at six inches was 54F, wind was northwest at 8-12 mph, soil was dry at 0-1 inch, moist at 1-3 inches, and wet at 3-6 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 20. Preemergence herbicides were applied April 20. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Green and yellow foxtail control and sugarbeet injury were evaluated May 23.

Treatment	Rate	Sugarbeet injury	Gr & Ye Foxtail control
	(lb/A)	---------- (%)	---------
EPTC	2.5	0	76
Metolachlor	1.5	0	30
Metolachlor	2	0	45
EPTC+Cycloate	1.5+1.5	0	71
Metolachlor	3	0	70
EPTC+Cycloate	2+2	0	76
Cycloate	4	0	50
Diethatyl	4	0	14
Diethatyl (pre)	4	0	0
EPTC+Cycloate+Diethatyl	1.5+1.5+4	0	83
EPTC+Cycloate/Diet (pre)	1.5+1.5/4	0	89
Ethofumesate	3	0	33
HIGH MEAN		0	89
LOW MEAN		0	0
EXP MEAN		0	53
C.V. %		0	21
LSD 5%		NS	16
LSD 1%		NS	22
# OF REPS		4	4

Summary

None of the treatments caused sugarbeet injury. The control of foxtail spp. was less than expected from the treatments. However, the organic matter at this location was 9.7% and the weed density was high. This may explain the lack of efficacy by the herbicides.

Soil applied herbicides, Robbin, 1988. Preplant incorporated herbicides were applied and rototiller incorporated May 3 when the air temp. was 72F, soil temp. at six inches was 53F, wind was north at 10-15 mph, soil was dry at 0-2 inches and moist at 2-4 inches. The rototiller was operated four inches deep for treatments containing EPTC or cycloate and two inches deep for all other PPI treatments. 'Interstate Puressa II' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3. Preemergence herbicides were applied May 3. All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Redroot pigweed and green foxtail control were evaluated June 25.

Treatment	Rate	Redroot Pigweed control	Green Foxtail control
	(lb/A)	---------- (%)	---------
EPTC	2.5	59	98
Metolachlor	1.5	74	80
Metolachlor	2	83	85
EPTC+Cycloate	1.5+1.5	59	96
Metolachlor	3	93	89
EPTC+Cycloate	2+2	71	99
Cycloate	4	35	88
Diethatyl	4	79	71
Diethatyl (pre)	4	0	26
EPTC+Cycloate+Diethatyl	1.5+1.5+4	95	97
EPTC+Cycl/Diet (pre)	1.5+1.5/4	88	97
Ethofumesate	3	78	82
HIGH MEAN		95	99
LOW MEAN		0	26
EXP MEAN		68	84
C.V. %		11	9
LSD 5%		10	10
LSD 1%		14	14
# OF REPS		4	4

Summary

Only metolachlor at 3 lb/A and EPTC+cycloate+diethatyl at 1.5+1.5+4 lb/A gave over 90% redroot pigweed control. Only metolachlor at 1.5 and 2 lb/A, diethatyl at 4 lb/A, diethatyl (pre) at 4 lb/A, and ethofumesate at 3 lb/A gave green foxtail control less than 86%.

Soil applied plus postemergence herbicides, Bathgate, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep May 3. 'Interstate Puressa II' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3. Preemergence herbicides were applied May 3. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 31 and June 7 respectively. All treatments containing clopyralid were applied June 7. The final portion of treatments with three postemergence applications was applied June 13.

	Date of Application			
	May 3	May 31	June 7	June 13
Time of day	---	12:45 pm	11:00 am	12:30 pm
Sky	---	sunny	sunny	mostly sunny
Air temperature (°F)	55	92	93	83
Soil temp. (°F at 6 in)	53	71	74	70
Relative Humidity (%)	---	46	38	37
Wind Velocity (mph)	8-12	20	8-12	10
Wind Direction	north	south	southeast	north
Dry Soil (inches)	0-2	0-2	0-3	0-3
Moist Soil (inches)	2-4	2-4	3-5	3-5
Wet Soil (inches)	below 4	below 4	below 5	below 5
Sugarbeets	---	cotyl-2 lf	4-8 lf	6-8 lf
Redroot pigweed	---	cotyl-2 lf	2-6 lf	6 lf-3" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Sugarbeet injury and redroot pigweed control were evaluated June 25.

Treatment*	Rate	Sugarbeet injury	Redroot Pigweed control
	(lb/A)	------- (%)	-------
Desmedipham/Desmedipham	0.25/0.33	9	83
Desmed/Desmed/Desmed	0.25/0.33/0.5	18	98
Desm/Desm+Sethoxy/Desm	0.25/0.33+0.2/0.5	15	97
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	21	94
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	13	98
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	15	97
De/De+Clpy/De+Seth+Dash	0.25/0.33+0.09/0.5+0.2+0.25G	20	98
Des/Des/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	11	83
Des/Des/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	10	84
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.25	6	58
Clopyralid+Endothall	0.09+0.5	0	0
Clopyralid+Endothall	0.19+0.5	0	0
Clopyralid+Endothall	0.09+0.75	0	0

(continued on next page)

Soil applied plus postemergence herbicides, Bathgate, 1988. (continued)

Treatment*	Rate (lb/A)	Sugarbeet injury (%)	Redroot Pigweed control
Clopyralid+Seth+Dash	0.09+0.2+0.25G	0	0
Clopyralid+Seth+Dash	0.14+0.2+0.25G	0	4
Clopyralid+Seth+Dash	0.19+0.2+0.25G	0	13
Clopyralid+Sethoxydim	0.09+0.2	0	0
Clopyralid+Sethoxydim	0.14+0.2	0	0
Clopyralid+Sethoxydim	0.19+0.2	0	3
EPTC+Cycl(ppi)/Desmedipham	1.5+1.5/0.33	16	74
Diethatyl(pre)/Desmedipham	4/0.33	0	38
EPTC+Cycl(ppi)/Desm/Desm	1.5+1.5/0.25/0.33	22	96
Diet(pre)/Desm/Desm	4/0.25/0.33	5	85
EPTC+Cyc(ppi)/Desm/Desm/Desm	1.5+1.5/0.25/0.33/0.5	31	99
Diet(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	21	98
EPTC+Cyc(ppi)/Des/Des+Clpy/Des+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	38	99
Diet(pre)/Des/Des+Clpy/Des+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	20	98
HIGH MEAN		38	99
LOW MEAN		0	0
EXP MEAN		11	58
C.V. %		35	6
LSD 5%		5	5
LSD 1%		7	7
# OF REPS		4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Two applications of desmedipham over EPTC+cycloate gave greater sugarbeet injury and redroot pigweed control than desmedipham alone.

Soil applied plus postemergence herbicides, Clara City, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep April 19. 'KW 3265' sugarbeet was seeded in 22 inch rows April 20. Preemergence herbicides were applied April 19. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 12 and May 18 respectively. All treatments containing clopyralid were applied May 18. The final portion of treatments with three postemergence applications was applied June 2.

	Date of Application			
	April 19	May 12	May 18	June 2
Time of day	---	12:15 pm	12:00 pm	11:00 am
Sky	---	sunny	---	---
Air temperature (°F)	63	90	71	90
Soil temp. (°F at 6 in)	49	65	60(at 4")	---
Relative Humidity (%)	---	27	24	34
Wind Velocity (mph)	8-12	15	10-12	0
Wind Direction	north	west	southeast	---
Dry Soil (inches)	0-1	0-1	---	---
Moist Soil (inches)	1-3	1-4	---	---
Wet Soil (inches)	below 3	below 4	---	---
Sugarbeet	---	cotyl-2 lf	2-4 lf	6-8 lf
Green and Yellow Foxtail	---	2-3 leaf (1" tall)	1.5" tall	6" tall
Redroot Pigweed	---	cotyl-4 leaf	2-6 leaf	4 to 8" tall
Common Lambsquarters	---	2-4lf(1" tall)	6 leaf	6 to 10" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Redroot pigweed, common lambsquarters, and green and yellow foxtail control and sugarbeet injury were evaluated June 17.

Treatment*	Rate	Sgbt inj	Grft Yeft cntl	Rrpw cntl	Colq cntl
	(lb/A)		(%)		
Desmedipham/Desmedipham	0.25/0.33	13	8	54	91
Desmed/Desmed/Desmed	0.25/0.33/0.5	13	20	88	98
Desm/Desm+Sethoxy/Desm	0.25/0.33+0.2/0.5	26	98	78	95
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	19	91	87	97
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	25	96	89	98
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	15	63	92	97
De/De+Clpy/De+Se+Dash	0.25/0.33+0.09/0.5+0.2+0.25G	19	93	96	99
Des/Des/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	8	98	56	96
Des/Des/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	6	97	51	92
Desmed+Endo/Desmed+Endo	0.25+0.25/0.33+0.25	5	0	61	75
Clopyralid+Endothall	0.09+0.5	0	0	5	26
Clopyralid+Endothall	0.19+0.5	1	0	20	64
Clopyralid+Endothall	0.09+0.75	0	0	5	29

(continued on next page)

Soil applied plus postemergence herbicides, Clara City, 1988. (continued)

Treatment*	Rate (lb/A)	Sgbt inj	Grft Yeft cntl	Rrpw cntl	Colq cntl
		(%)			
Clopyralid+Sethoxydim+Dash	0.09+0.2+0.25G	4	96	15	58
Clopyralid+Sethoxydim+Dash	0.14+0.2+0.25G	5	98	18	54
Clopyralid+Sethoxydim+Dash	0.19+0.2+0.25G	8	98	34	73
Clopyralid+Sethoxydim	0.09+0.2	0	96	10	27
Clopyralid+Sethoxydim	0.14+0.2	0	82	15	45
Clopyralid+Sethoxydim	0.19+0.2	5	93	9	56
EPTC+Cycl(ppi)/Desmedipham	1.5+1.5/0.33	16	76	59	95
Diethatyl(pre)/Desmedipham	4/0.33	14	36	85	81
EPTC+Cycl(ppi)/Des/Des	1.5+1.5/0.25/0.33	30	84	69	94
Diet(pre)/Desm/Desm	4/0.25/0.33	8	46	78	94
EP+Cy(ppi)/Desm/Desm/Desm	1.5+1.5/0.25/0.33/0.5	31	87	92	99
Diet(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	15	61	96	95
EP+Cy(ppi)/Des/Des+Clpy/Des+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	34	99	96	98
Diet(pre)/Des/Des+Clpy/Des+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	28	98	97	99
HIGH MEAN		34	99	97	99
LOW MEAN		0	0	5	26
EXP MEAN		13	66	57	78
C.V. %		53	16	18	12
LSD 5%		9	15	15	13
LSD 1%		13	20	19	17
# OF REPS		4	4	4	4

* OC = BASF Booster Plus E
* Dash = BASF surfactant

Summary

Desmedipham applied two or three times over EPTC+cycloate caused more sugarbeet injury than desmedipham alone. Desmedipham+endothall applied twice gave less control of common lambsquarters than desmedipham applied twice. Clopyralid+sethoxydim+Dash gave common lambsquarters control greater than clopyralid+sethoxydim.

Soil applied plus postemergence herbicides, Crookston, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep April 26. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 26. Preemergence herbicides were applied April 26. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 23 and May 27 respectively. All single application postemergence treatments were applied May 27. The final portion of treatments with three postemergence applications was applied June 6.

	Date of Application			
	April 26	May 23	May 27	June 6
Time of day	---	11:30 am	5:00 pm	12:45 pm
Sky	---	sunny	overcast	sunny
Air temperature (°F)	52	82	79	90
Soil temp. (°F at 6 in)	40	60	74	78
Relative Humidity (%)	---	26	26	34
Wind Speed	5-10	5-10	2-4	15
Wind Direction	west	east	north	south
Dry Soil (inches)	0-1	0-1	0-2	0-2
Moist Soil (inches)	1-3	1-4	2-4	2-4
Wet Soil (inches)	below 3	below 4	below 4	below 4
Sugarbeet	---	cotyl-2 lf	2-4 lf	6-10 lf
Common Lambsquarters	---	cotyl-6 lf	2 lf-2" tall	1-6" tall
Redroot pigweed	---	cotyl	cotyl-2 lf	4 lf-3" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Common lambsquarters and redroot pigweed control and sugarbeet injury were evaluated June 13.

Treatment*	Rate	Sgbt inj	Colq cntl	Rrpw cntl
	(lb/A)	--------	(%)	-------
Desmedipham	0.33	0	73	70
Desmedipham/Desmedipham	0.25/0.33	8	98	94
Desmed/Desmed/Desmed	0.25/0.33/0.5	9	98	98
Des&Phen/Des&Phen/Des&Phen	0.25/0.33/0.5	22	99	99
De/De+Clpy/De+Seth+Dash	0.25/0.33+0.14/0.5+0.2+0.25G	26	99	99
Desmed/Desmed+Fluazifop-P	0.25/0.33+0.19	11	95	94
Desmed/Desmed+Sethoxydim	0.25/0.33+0.2	9	94	93
Fluazifop-P+OC	0.19+0.25G	0	0	0
Sethoxydim+Dash	0.2+0.25G	0	0	0
Clopyralid	0.09	0	0	0
Clopyralid	0.14	0	4	0
Clopyralid	0.19	0	10	0
Clopyralid+Endothall	0.09+0.5	0	0	0
Clopyralid+Endothall	0.19+0.5	0	5	0
Clopyralid+Endothall	0.09+0.75	0	6	6
Clopyralid+Sethoxydim+OC	0.09+0.2+0.25G	0	1	0
Clopyralid+Sethoxydim+OC	0.14+0.2+0.25G	0	53	9
Clopyralid+Sethoxydim+OC	0.19+0.2+0.25G	0	54	8

(continued on next page)

Soil applied plus postemergence herbicides, Crookston, 1988. (continued)

Treatment*	Rate (lb/A)	Sgbt inj	Colq cntl	Rrpw cntl
		--------	(%)	-------
Desmed/Desmed+Clopyralid	0.25/0.33+0.09	5	97	91
Desmed/Desmed+Clopyralid	0.25/0.33+0.19	0	97	92
Desmed/Desmed/Desmed+Clopyralid	0.25/0.33/0.5+0.09	15	98	99
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.25	0	93	85
EPTC+Cycloate(ppi)/Desmedipham	1.5+2/0.33	43	99	99
EPTC+Cycloate(ppi)/Desm/Desm	1.5+2/0.25/0.33	41	99	99
EPTC+Cycloate(ppi)/Des/Des/Des	1.5+2/0.25/0.33/0.5	54	99	99
Diethatyl(pre)/Desmedipham	4/0.33	0	68	85
Diethatyl(pre)/Desm/Desm	4/0.25/0.33	5	95	96
Diethatyl(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	24	99	99
Diet(pre)/Desm/Desm+Clpy/Desm+Seth+Dash	4/0.25/0.33+0.14/0.5+0.2+0.25G	25	98	99
HIGH MEAN		54	99	99
LOW MEAN		0	0	0
EXP MEAN		10	63	59
C.V. %		56	10	11
LSD 5%		8	9	9
LSD 1%		11	11	12
# OF REPS		4	4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Three applications of desmedipham+phenmedipham caused greater sugarbeet injury than three applications of desmedipham. Sugarbeets treated with EPTC+cycloate and desmedipham were injured more than sugarbeets only treated with desmedipham. Also, diethatyl followed by desm/desm/desm caused greater sugarbeet injury than desm/desm/desm. Two applications of desmedipham gave common lambsquarters and redroot pigweed control superior to one application of desmedipham but similar to three applications of desmedipham. Clopyralid at 0.19 lb/A gave 10% control of common lambsquarters while clopyralid+sethoxydim+Booster Plus E at 0.19+0.2 lb/A + 1 qt/A gave 54% control.

Soil applied plus postemergence herbicides, Hillsboro, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep April 25. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 25. Preemergence herbicides were applied April 25. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 23 and May 27 respectively. All treatments containing clopyralid were applied May 27. The final portion of treatments with three postemergence applications was applied June 16.

	Date of Application			
	April 25	May 23	May 27	June 16
Time of day	---	2:00 pm	11:45 am	11:00 am
Sky	---	sunny	sunny	sunny
Air temperature (°F)	48	84	84	88
Soil temp. (°F at 6 in)	43	63	66	74
Relative Humidity (%)	---	30	47	35
Wind Velocity (mph)	20	8-12	0-5	15
Wind Direction	north	north	east	south
Dry Soil (inches)	0-1	0-1	0-1	0-2
Moist Soil (inches)	1-3	1-3	1-4	2-3
Wet Soil (inches)	below 3	below 3	below 4	below 3
Sugarbeet	---	cotyl-4 lf	cotyl-4 lf	4-10 lf
Green Foxtail	---	2 lf(1" tall)-4 lf(2" tall)	emerging to 5 lf(3" tall)	5 lf(1.5" tall)-5" tall
Redroot pigweed	---	2-4 lf	cotyl-6 lf	4 lf-2.5"tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Green foxtail and redroot pigweed control and sugarbeet injury were evaluated June 20.

Treatment*	Rate	Sgbt inj	Grft cntl	Rrpw cntl
	(lb/A)		(%)	
Desmedipham/Desmedipham	0.25/0.33	0	3	59
Desmed/Desmed/Desmed	0.25/0.33/0.5	25	40	90
Desm/Desm+Sethoxydim/Desm	0.25/0.33+0.2/0.5	33	76	87
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	29	60	90
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	34	92	80
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	31	64	81
De/De+Clpy/De+Seth+Dash	0.25/0.33+0.09/0.5+0.2+0.25G	43	87	81
Des/Des/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	5	98	52
Des/Des/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	5	79	56
Des+Endothall/Des+Endothall	0.25+0.25/0.33+0.25	0	11	26
Clopyralid+Endothall	0.09+0.5	0	15	0
Clopyralid+Endothall	0.19+0.5	0	15	3
Clopyralid+Endothall	0.09+0.75	0	34	0

(continued on next page)

Soil applied plus postemergence herbicides, Hillsboro, 1988. (continued)

Treatment*	Rate	Sgbt inj	Grft cntl	Rrpw cntl
	(lb/A)	--------	(%)	-------
Clopyralid+Sethoxydim+Dash	0.09+0.2+0.25G	0	89	0
Clopyralid+Sethoxydim+Dash	0.14+0.2+0.25G	0	91	0
Clopyralid+Sethoxydim+Dash	0.19+0.2+0.25G	3	91	0
Clopyralid+Sethoxydim	0.09+0.2	0	86	0
Clopyralid+Sethoxydim	0.14+0.2	0	88	0
Clopyralid+Sethoxydim	0.19+0.2	0	85	0
EPTC+Cycl(ppi)/Desmedipham	1.5+1.5/0.33	45	92	91
Diethatyl(pre)/Desmedipham	4/0.33	0	40	68
EPTC+Cycl(ppi)/Desm/Desm	1.5+1.5/0.25/0.33	49	96	95
Diet(pre)/Desm/Desm	4/0.25/0.33	0	54	63
EPTC+Cyc(ppi)/Des/Des/Des	1.5+1.5/0.25/0.33/0.5	66	98	98
Diet(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	30	59	88
EPTC+Cyc(ppi)/Des/Des+Clpy/Des+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	70	99	98
Diet(pre)/Des/Des+Clpy/Des+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	33	94	87
HIGH MEAN		70	99	98
LOW MEAN		0	3	0
EXP MEAN		18	67	51
C.V. %		37	16	14
LSD 5%		10	15	10
LSD 1%		13	20	14
# OF REPS		4	4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Postemergence herbicides over EPTC+cycloate caused greater sugarbeet injury and gave better weed control than postemergence herbicides alone. Postemergence herbicides over preemergence diethatyl gave sugarbeet injury and redroot pigweed control similar to postemergence herbicides alone possibly because rainfall was inadequate to activate the diethatyl. Three applications of desmedipham gave greater sugarbeet injury and redroot pigweed control than two applications.

Soil applied plus postemergence herbicides, Mooreton, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep April 21. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 21. Preemergence herbicides were applied April 21. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 13 and May 20 respectively. All treatments containing clopyralid were applied May 20. The final portion of treatments with three postemergence applications was applied June 1.

	Date of Application			
	April 21	May 13	May 20	June 1
Time of day	---	2:00 pm	3:00 pm	1:00 pm
Sky	---	sunny	partly cloudy	mostly sunny
Air temperature (°F)	59	58	70	88
Soil temp. (°F at 6 in)	49	60	64	78
Relative Humidity (%)	---	52	64	55
Wind Velocity (mph)	8-12	3-6	10-15	15
Wind Direction	northwest	southeast	northeast	south
Dry Soil (inches)	0-2	0-2	0-1	0-2
Moist Soil (inches)	2-4	2-6	1-4	2-4
Wet Soil (inches)	below 4	below 6	below 4	below 4
Sugarbeet	---	cotyl-2 lf	2 lf	6-8 lf
Green Foxtail	---	emerging to 1" tall(2lf)	3-4 leaf (1-1.5" tall)	3 to 5 inches tall
Wild Oats	---	1 to 2" tall	2 to 4" tall	3 to 6" tall
Common Lambsquarters	---	cotyl-2 lf	6-8 leaf	3 to 6" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Green foxtail, wild oats, and common lambsquarters control and sugarbeet injury were evaluated June 28.

Treatment*	Rate	Sgbt inj	Grft cntl	Wioa cntl	Colq cntl
	(lb/A)			(%)	
Desmedipham/Desmedipham	0.25/0.33	0	16	0	50
Desmed/Desmed/Desmed	0.25/0.33/0.5	0	38	0	86
Desm/Desm+Sethoxydim/Desm	0.25/0.33+0.2/0.5	0	79	98	89
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	0	74	99	93
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	0	76	66	86
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	0	54	50	87
Des/Des+Clpy/Des+Seth+Dash	0.25/0.33+0.09/.5+.2+.25G	0	78	76	90
Desm/Desm/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	0	97	96	48
Desm/Desm/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	0	92	99	58
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.25	0	2	9	53
Clopyralid+Endothall	0.09+0.5	0	9	0	15
Clopyralid+Endothall	0.19+0.5	0	18	0	60
Clopyralid+Endothall	0.09+0.75	0	18	8	0

(continued on next page)

Soil applied plus postemergence herbicides, Mooreton, 1988. (continued)

Treatment*	Rate (lb/A)	Sgbt inj	Grft cntl	Wioa cntl	Colq cntl
		---	---	(%) ---	---
Clopyralid+Sethoxydim+Dash	0.09+0.2+0.25G	0	88	99	32
Clopyralid+Sethoxydim+Dash	0.14+0.2+0.25G	0	84	99	49
Clopyralid+Sethoxydim+Dash	0.19+0.2+0.25G	0	84	99	55
Clopyralid+Sethoxydim	0.09+0.2	0	83	93	20
Clopyralid+Sethoxydim	0.14+0.2	0	79	99	46
Clopyralid+Sethoxydim	0.19+0.2	0	76	83	58
EPTC+Cycl(ppi)/Desmedipham	1.5+1.5/0.33	4	95	91	95
Diethatyl(pre)/Desmedipham	4/0.33	0	9	0	11
EPTC+Cycl(ppi)/Desm/Desm	1.5+1.5/0.25/0.33	3	96	97	98
Diet(pre)/Desm/Desm	4/0.25/0.33	0	45	33	53
EP+Cy(ppi)/Desm/Desm/Desm	1.5+1.5/0.25/0.33/0.5	10	97	99	99
Diet(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	0	48	23	90
EP+Cy(ppi)/Desm/Desm+Clpy/Desm+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	10	98	99	99
Diet(pre)/Desm/Desm+Clpy/Desm+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	0	79	66	91
HIGH MEAN		10	98	99	99
LOW MEAN		0	9	0	0
EXP MEAN		1	63	62	63
C.V. %		386	12	17	19
LSD 5%		5	11	15	17
LSD 1%		7	15	19	23
# OF REPS		4	4	4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Sethoxydim and fluazifop-P gave similar control of green foxtail and wild oats when not tank mixed with desmedipham. However, green foxtail and wild oats control from fluazifop-P was antagonized more than sethoxydim when tank mixed with desmedipham.

Soil applied plus postemergence herbicides, Raymond, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep April 20. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 20. Preemergence herbicides were applied April 20. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied May 12 and May 18 respectively. All treatments containing clopyralid were applied May 18. The final portion of treatments with three postemergence applications was applied June 2.

	Date of Application			
	April 20	May 12	May 18	June 2
Time of day	---	1:30 pm	8:30 am	10:00 am
Air temperature (°F)	59	90	54	85
Soil temp. (°F at 6 in)	54	65	55(at 4 in)	74
Relative Humidity (%)	---	27	48	40
Wind Velocity (mph)	8-12	20	0-8	0
Wind Direction	northwest	west	southeast	---
Soil Moisture	good	fair	fair	poor
Sugarbeet	---	cotyl-2 lf	2-4 lf	6-8 lf
Common Lambsquarters	---	4 lf(1" tall)	4-6 lf	8-10" tall
Redroot pigweed	---	2 lf	4 lf	8-10" tall
Marshelder	---	cotyl-2 lf	2-4 lf	6-9" tall
Green and Yellow Foxtail	---	2-3lf(.5-1"tall)	2-4" tall	6-8" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Common lambsquarters, redroot pigweed, marshelder, and green and yellow foxtail control and sugarbeet injury were evaluated June 17.

Treatment*	Rate	Sgbt inj	Colq cntl	Rrpw cntl	Mael cntl	Fxtl cntl
	(lb/A)	----------		(%)		---------
Desmedipham/Desmedipham	0.25/0.33	0	92	88	94	10
Desmed/Desmed/Desmed	0.25/0.33/0.5	0	95	96	99	30
Desm/Desm+Sethoxydim/Desm	0.25/0.33+0.2/0.5	0	96	77	98	74
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	4	96	65	99	48
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	8	97	90	98	84
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	0	98	92	97	64
De/De+Clpy/De+Se+Dash	0.25/0.33+0.09/0.5+0.2+0.25G	11	97	89	99	94
Des/Des/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	0	92	59	97	95
Des/Des/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	0	60	61	70	64
Desmed+Endothall/Desm+Endo	0.25+0.25/0.33+0.25	0	33	77	96	0
Clopyralid+Endothall	0.09+0.5	0	0	0	99	0
Clopyralid+Endothall	0.19+0.5	0	8	0	99	0
Clopyralid+Endothall	0.09+0.75	0	3	0	99	8

(continued on next page)

Soil applied plus postemergence herbicides, Raymond, 1988. (continued)

Treatment*	Rate	Sgbt inj	Colq cntl	Rrpw cntl	Mael cntl	Fxtl cntl
	(lb/A)	----------		(%)		---------
Clopyralid+Sethoxydim+Dash	0.09+0.2+0.25G	0	10	0	99	95
Clopyralid+Sethoxydim+Dash	0.14+0.2+0.25G	0	49	0	99	96
Clopyralid+Sethoxydim+Dash	0.19+0.2+0.25G	0	51	0	99	89
Clopyralid+Sethoxydim	0.09+0.2	0	0	0	99	87
Clopyralid+Sethoxydim	0.14+0.2	0	8	0	99	92
Clopyralid+Sethoxydim	0.19+0.2	0	50	4	99	71
EPTC+Cycloate(ppi)/Desmedipham	1.5+1.5/0.33	6	95	50	99	56
Diethatyl(pre)/Desmedipham	4/0.33	0	68	83	82	8
EPTC+Cycloate(ppi)/Desm/Desm	1.5+1.5/0.25/0.33	3	97	43	99	66
Diethatyl(pre)/Desm/Desm	4/0.25/0.33	0	90	75	98	39
EPTC+Cycl(ppi)/Des/Des/Des	1.5+1.5/0.25/0.33/0.5	16	98	73	99	73
Diethatyl(pre)/Des/Des/Des	4/0.25/0.33/0.5	0	97	86	97	21
EPTC+Cycl(ppi)/Des/Des+Clpy/Des+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	21	99	93	99	96
Diethatyl(pre)/Des/Des+Clpy/Des+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	3	96	93	99	88
HIGH MEAN		21	99	96	99	96
LOW MEAN		0	0	0	70	0
EXP MEAN		3	66	51	97	57
C.V. %		229	11	22	5	23
LSD 5%		8	10	16	7	19
LSD 1%		11	13	21	9	25
# OF REPS		4	4	4	4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Two applications of desmedipham followed by fluazifop-P+oil concentrate gave less control of broadleaf weeds than two applications of desmedipham. Two applications of desmedipham followed by sethoxydim+Dash gave less control of redroot pigweed than two applications of desmedipham. Desmedipham + endothall applied twice gave less control of common lambsquarters than desmedipham applied twice. All treatments including clopyralid gave essentially complete control of marshelder.

Soil applied plus postemergence herbicides, Robbin, 1988. Preplant incorporated herbicides were applied and rototiller incorporated four inches deep May 3. 'Interstate Puressa II' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 3. Preemergence herbicides were applied May 3. All soil applied herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots. Postemergence treatments containing desmedipham at 0.25 lb/A and desmedipham at 0.33 lb/A were applied June 7 and June 13 respectively. All treatments containing clopyralid were applied June 13. The final portion of treatments with three postemergence applications was applied June 20.

	Date of Application			
	May 3	June 7	June 13	June 20
Time of day	---	8:30 am	3:00 pm	1:00 pm
Sky	---	sunny	mostly sunny	sunny
Air temperature (°F)	72	81	88	92
Soil temp. (°F at 6 in)	53	73	76	78
Relative Humidity (%)	---	48	33	26
Wind Velocity (mph)	10-15	5-8	5-10	10-15
Wind Direction	north	south	north	south
Dry Soil (inches)	0-2	0-2	0-2	0-2
Moist Soil (inches)	2-4	2-5	2-5	2-6
Wet Soil (inches)	below 4	below 5	below 5	below 6
Green Foxtail	---	emerging to 3 lf(1" tall)	3 lf(.5" tall)-2" tall	1-4" tall
Redroot pigweed	---	cotyl-4 lf	4-8 lf	1-4" tall

Postemergence herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Green foxtail and redroot pigweed control were evaluated June 29.

Treatment*	Rate (lb/A)	Redroot Pigweed control (%)	Green Foxtail control (%)
Desmedipham/Desmedipham	0.25/0.33	81	46
Desmed/Desmed/Desmed	0.25/0.33/0.5	89	48
Desm/Desm+Sethoxydim/Desm	0.25/0.33+0.2/0.5	92	97
Desm/Desm+Flua-P/Desm	0.25/0.33+0.19/0.5	91	69
Des/Des/Des+Seth+Dash	0.25/0.33/0.5+0.2+0.25G	94	97
Des/Des/Des+Flua-P+OC	0.25/0.33/0.5+0.19+0.25G	94	75
De/De+Clpy/De+Seth+Dash	0.25/0.33+0.09/0.5+0.2+0.25G	91	96
Des/Des/Sethoxydim+Dash	0.25/0.33/0.2+0.25G	74	95
Des/Des/Fluazifop-P+OC	0.25/0.33/0.2+0.25G	83	64
Desm+Endothall/Desm+Endothall	0.25+0.25/0.33+0.25	68	56
Clopyralid+Endothall	0.09+0.5	3	40
Clopyralid+Endothall	0.19+0.5	0	50
Clopyralid+Endothall	0.09+0.75	0	45

(continued on next page)

Soil applied plus postemergence herbicides, Robbin, 1988. (continued)

Treatment*	Rate (lb/A)	Redroot Pigweed control (%)	Green Foxtail control (%)
Clopyralid+Seth+Dash	0.09+0.2+0.25G	0	99
Clopyralid+Seth+Dash	0.14+0.2+0.25G	0	99
Clopyralid+Seth+Dash	0.19+0.2+0.25G	0	99
Clopyralid+Sethoxydim	0.09+0.2	0	98
Clopyralid+Sethoxydim	0.14+0.2	0	98
Clopyralid+Sethoxydim	0.19+0.2	0	98
EPTC+Cycl(ppi)/Desmedipham	1.5+1.5/0.33	78	93
Diethatyl(pre)/Desmedipham	4/0.33	64	58
EPTC+Cycl(ppi)/Desm/Desm	1.5+1.5/0.25/0.33	95	96
Diet(pre)/Desm/Desm	4/0.25/0.33	93	77
EPTC+Cyc(ppi)/Desm/Desm/Desm	1.5+1.5/0.25/0.33/0.5	98	99
Diet(pre)/Desm/Desm/Desm	4/0.25/0.33/0.5	95	82
EPTC+Cyc(ppi)/Des/Des+Clpy/Des+Seth+Dash	1.5+1.5/0.25/0.33+0.09/0.5+0.2+0.25G	98	99
Diet(pre)/Des/Des+Clpy/Des+Seth+Dash	4/0.25/0.33+0.09/0.5+0.2+0.25G	93	96
HIGH MEAN		98	99
LOW MEAN		0	40
EXP MEAN		58	79
C.V. %		7	9
LSD 5%		6	10
LSD 1%		8	13
# OF REPS		4	4

* OC = Agway Booster Plus E
* Dash = BASF surfactant

Summary

Clopyralid did not antagonize green foxtail control from sethoxydim. Clopyralid+sethoxydim with no oil additive gave excellent green foxtail control. Sethoxydim gave greater control of green foxtail than fluazifop-P. EPTC+cycloate or preemergence diethatyl followed by two or three desmedipham applications gave greater redroot pigweed control than desmedipham alone.

Common cocklebur control, Raymond, 1988. 'KW 3394' sugarbeet was seeded in 22 inch rows May 19. The first half of split application treatments was applied 9:00 am June 9 when the air temp. was 72F, soil temp. at four inches was 65F, relative humidity was 24%, wind was southeast at 10-12 mph, soil was dry, sugarbeets were 4-6 leaf, and cocklebur were 4-6 leaf. The second half of split treatments and all single application treatments were applied 9:00 am June 14 when the air temp. was 69F, soil temp. at four inches was 62F, relative humidity was 32%, wind was northwest at 8-10 mph, soil was very dry, sugarbeets were 6-10 leaf, and cocklebur were 8-10 leaf. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips. Sugarbeet injury and common cocklebur control were evaluated June 17.

Treatment*	Rate (lb/A)	Sugarbeet injury (%)	Common Cocklebur control (%)
Clopyralid	0.06	0	96
Clopyralid	0.125	0	96
Clopyralid	0.19	0	96
Clopyralid+OC	0.06+0.25G	0	96
Clopyralid+OC	0.125+0.25G	3	96
Clopyralid+OC	0.19+0.25G	3	96
Des/Des+Clopyralid	0.33/0.5+0.06	25	98
Des/Des+Clopyralid	0.33/0.5+0.125	26	98
Des/Des+Clopyralid	0.33/0.5+0.19	28	98
De&Ph/De&Ph+Clopyralid	0.33/0.5+0.06	27	98
De&Ph/De&Ph+Clopyralid	0.33/0.5+0.125	28	98
De&Ph/De&Ph+Clopyralid	0.33/0.5+0.19	27	98
Endothall+Clopyralid	0.5+0.06	11	97
Endothall+Clopyralid	0.5+0.125	8	97
Endothall+Clopyralid	0.5+0.19	10	97
Endothall+Clopyralid	0.75+0.125	16	98
HIGH MEAN		28	98
LOW MEAN		0	96
EXP MEAN		13	97
C.V. %		37	1
LSD 5%		7	1
LSD 1%		9	1
# OF REPS		4	4

* OC = Agway Booster Plus E

Summary

All treatments gave excellent control of common cocklebur. Desmedipham or desmedipham&phenmedipham caused greater sugarbeet injury than other treatments.

Effect of herbicides on sugarbeet root rot, Hector, 1988. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots and rototiller incorporated April 20 when the air temp. was 50F, soil temp. at six inches was 46F, wind was north at 10-15 mph, soil was dry at 0-1 inch, moist at 1-3 inches, and wet below 3 inches. The rototiller was set four inches deep for treatments containing EPTC and cycloate and two inches deep for all other PPI treatments. 'Maribo Ultramono' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 20. The first half of split application postemergence treatments were applied 5:00 pm May 12 when the sky was cloudy, air temp. was 85F, soil temp. at six inches was 71F, relative humidity was 23%, wind was west at 20-25 mph, soil was dry at 0-1 inch, moist at 1-4 inches, wet below 4 inches, sugarbeets were cotyledon to 2 leaf, common lambsquarters were 2-4 leaf, redroot pigweed were cotyledon to 2 leaf, and green and yellow foxtail were 1-2 leaf. The second half of split postemergence applications and all single application postemergence treatments were applied 2:00 pm May 18 when the air temp. was 80F, soil temp. at six inches was 70F, soil was dry, sugarbeets were 2-4 leaf, common lambsquarters were 2-6 leaf, redroot pigweed were 2-4 leaf, and green and yellow foxtail were 1-3 leaf. All postemergence treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Common lambsquarters, redroot pigweed, and green and yellow foxtail control and sugarbeet injury were evaluated June 23. Ten sugarbeets per plot were rated June 23 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	Sgbt inj	Colq cntl	Rrpw cntl	G&Y Fxtl cntl	Disease index
	(lb/A)	----------		(%)	----------	
EPTC	2	0	0	5	68	2.10
EPTC	3	0	0	18	70	2.07
Cycloate	4	0	0	10	65	1.72
EPTC+Cycloate	2+2	0	45	36	86	1.55
Diethatyl	6	0	0	59	60	2.01
Ethofumesate	3.5	0	23	49	20	2.05
Metolachlor	2	0	0	41	89	1.80
Metolachlor	3	0	15	56	85	1.80
Untreated Check	0	0	0	0	0	1.86
Des&Phen/Des&Phen	0.33/0.5	1	85	69	34	2.08
Sethoxydim+Dash	0.2+0.25G	0	0	0	94	1.76
Fluazifop-P+OC	0.19+0.25G	0	0	0	89	1.81
Clopyralid	0.19	0	29	0	0	1.85
Endothall	0.75	0	0	0	20	1.95
Desmedipham/Desmed	0.33/0.5	0	88	76	23	2.11
C.V. %		775	88	45	33	17.56
LSD 5%		NS	24	18	25	NS
LSD 1%		NS	32	24	34	NS
# OF REPS		4	4	4	4	4

* OC = Agway Booster Plus E; Dash = BASF surfactant

SUMMARY: EPTC+cycloate gave common lambsquarters control and redroot pigweed control superior to EPTC alone or cycloate alone. Metolachlor at 3 lb/A gave less common lambsquarters control, greater redroot pigweed control, and similar foxtail control compared to EPTC+cycloate. Herbicides had no influence on the disease level on the sugarbeet roots.

Trifluralin application at different growth stages, Amenia, 1988. Diethatyl + cycloate+diallate (3+3+1 lb a.i./A) was applied to entire plot area and incorporated with an Alloway 'Seed better' April 15. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Counter 15G (10 lb/A) was applied during planting using a modified in-furrow applicator. Sugarbeets were hand weeded June 10 and maintained weed free throughout the growing season. Herbicide treatments were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots on the dates listed below.

Date	Sky	Time of Day	6 inch Air Temp °F	6 inch Soil Temp °F	Rel Hum (%)	Wind Veloc (mph)	Wind Direct	Soil Moisture (inches)	Sgbt leaf Stage
June 3	sunny	10:30am	95	78	33	5-8	south	0-3=dry;3-5=moist	ctyl-2
June 10	sunny	9:00am	81	72	28	10-15	SE	0-4=dry;4-6=moist	2-8
June 17	sunny	9:30am	75	74	59	15-20	south	0-1=dry;1-5=moist	4-10
June 24	----	9:00am	78	78	67	0-5	south	0-3=moist;3-6=wet	6-12
July 1	cloudy	9:45am	70	72	56	2-5	west	0-3=dry;3-6=moist	8-14

All herbicide treatments were incorporated within two hours of application using an Alloway cultivator with knives and rolling cut-away disks. A John Deere two bar rotary hoe and a Melroe five bar spring tooth harrow were used for their respective treatments. Rotary hoe and harrow incorporation treatments for the June 3, June 10, June 17, and June 24 herbicide applications were done June 24. The July 1 incorporation treatments were done following herbicide application and cultivation July 1. The center two rows of each 40 foot plot were counted and harvested September 30.

Treatment	Rate (lb/A)	Method of Incorpor.	Herbicide Application Date	Sgbt Popul (#/80ft)	Sucrose (%)	Loss to Mol (%)	Root Yield (ton/A)	Impur Index	Extract Sucrose (lb/A)
Trifluralin	(0.75)	Rotary Hoe	(June 3)	57	15.8	1.9	14.9	890	4068
Trifluralin	(0.75)	Harrow	(June 3)	63	15.8	1.8	14.8	830	4088
Trifluralin	(0.75)	Cult. Alone	(June 3)	54	16.2	1.8	12.9	823	3675
Trifluralin	(1.5)	Rotary Hoe	(June 3)	55	15.4	2.0	12.8	931	3414
Trifluralin	(1.5)	Harrow	(June 3)	41	15.0	2.0	10.9	954	2813
Trifluralin	(1.5)	Cult. Alone	(June 3)	60	15.6	1.8	12.9	830	3578
Trifluralin	(0.75)	Rotary Hoe	(June 10)	52	15.8	1.9	12.3	870	3365
Trifluralin	(0.75)	Harrow	(June 10)	66	15.4	1.9	14.6	915	3906
Trifluralin	(0.75)	Cult. Alone	(June 10)	53	15.4	2.6	13.6	1246	3490
Trifluralin	(1.5)	Rotary Hoe	(June 10)	39	15.2	2.1	9.9	1002	2591
Trifluralin	(1.5)	Harrow	(June 10)	52	15.2	1.9	11.5	921	3097
Trifluralin	(1.5)	Cult. Alone	(June 10)	50	15.7	2.0	11.2	929	3057
Trifluralin	(0.75)	Rotary Hoe	(June 17)	54	15.2	1.9	12.5	896	3284
Trifluralin	(0.75)	Harrow	(June 17)	50	16.0	1.7	12.2	794	3442
Trifluralin	(0.75)	Cult. Alone	(June 17)	59	15.5	1.9	14.1	882	3796
Trifluralin	(1.5)	Rotary Hoe	(June 17)	69	16.0	1.9	14.2	847	3955
Trifluralin	(1.5)	Harrow	(June 17)	45	15.4	1.9	11.5	893	3079
Trifluralin	(1.5)	Cult. Alone	(June 17)	66	16.1	1.8	14.7	828	4155

(continued on next page)

Trifluralin application at different growth stages, Amenia, 1988. (continued)

Treatment	Rate (lb/A)	Method of Incorpor.	Herbicide Application Date	Sgbt Popul (#/80ft)	Sucrose (%)	Loss to Mol (%)	Root Yield (ton/A)	Impur Index	Extract Sucrose (lb/A)
Trifluralin(0.75)		Rotary Hoe	(June 24)	51	16.0	1.7	12.5	761	3560
Trifluralin(0.75)		Harrow	(June 24)	64	15.7	1.8	15.0	853	4104
Trifluralin(0.75)		Cult. Alone	(June 24)	59	15.9	1.8	14.4	825	4020
Trifluralin (1.5)		Rotary Hoe	(June 24)	55	15.6	1.8	13.2	853	3600
Trifluralin (1.5)		Harrow	(June 24)	72	15.5	1.9	14.7	879	4012
Trifluralin (1.5)		Cult. Alone	(June 24)	63	16.1	1.8	14.5	812	4120
Trifluralin(0.75)		Rotary Hoe	(July 1)	52	15.5	1.8	12.6	861	3402
Trifluralin(0.75)		Harrow	(July 1)	63	16.1	1.8	13.5	810	3822
Trifluralin(0.75)		Cult. Alone	(July 1)	63	16.0	1.9	14.6	903	4076
Trifluralin (1.5)		Rotary Hoe	(July 1)	59	15.7	1.9	13.5	881	3678
Trifluralin (1.5)		Harrow	(July 1)	58	15.4	1.8	13.1	859	3566
Trifluralin (1.5)		Cult. Alone	(July 1)	63	15.6	1.8	13.5	871	3713
HIGH MEAN				72	16.2	2.6	15.0	1246	4155
LOW MEAN				39	15.0	1.7	9.9	761	2591
EXP MEAN				57	15.7	1.9	13.2	882	3617
C.V. %				30	3.6	15.9	19.7	18	23
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 treatments had no significant effect on sugarbeet yield or population.

Simulated herbicide drift on sugarbeets, Amenia, 1988. Diethatyl+cycloate+diallate (3+3+1 lb a.i./A) was applied to entire plot area and incorporated with an Alloway 'Seed better' April 15. 'Hilleshog 5135' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 21. 'Hilleshog 5135' sugarbeet was reseeded May 23 due to poor emergence of April 21 seeding. Counter 15G (10 lb/A) was applied during planting using a modified in-furrow applicator. Sethoxydim+Dash (0.2 lb a.i./A+1 qt/A) was applied to entire experiment May 24 to control wild oats and foxtail species. The early application herbicide treatments were applied 1:30 pm June 10 when the air temp. was 92F, soil temp. at six inches was 78F, relative humidity was 20%, wind was south at 15-20 mph, soil was dry at 0-4 inches, and sugarbeets were in the 2-8 leaf stage. Late application treatments were applied 10:00 am June 24 when the sky was mostly sunny, air temp. was 81F, soil temp. at six inches was 78F, relative humidity was 63%, wind was south at 0-5 mph, soil was dry at 0-3 inches, moist at 3-6 inches, and sugarbeets were in the 6-12 leaf stage. All herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots. Plots were cultivated June 27. Sugarbeets were hand weeded June 27 and maintained weed free thoughout the growing season. Sugarbeet injury was evaluated July 1. Sugarbeets from the center two rows of 30 foot plots were counted July 18 and harvested September 29.

Treatment	Rate (lb/A)	Sgbt inj (%)	Sgbt Popl (#/60ft)	Sucrose (%)	Loss to Mol (%)	Root Yield (T/A)	Impur Index	Extrac Sucros (lb/A)
DPX-M6316+X-77 (June 10)	0.016+0.25%	99	2	12.4	2.2	0.3	1314	61
DPX-M6316+X-77 (June 10)	0.008+0.25%	99	2	12.6	2.3	0.9	1357	184
DPX-M6316+X-77 (June 10)	0.004+0.25%	99	11	12.8	2.2	2.2	1238	452
DPX-M6316+X-77 (June 10)	0.002+0.25%	97	21	13.5	2.0	3.2	1089	733
DPX-M6316+X-77 (June 10)	0.001+0.25%	79	52	14.9	1.9	5.9	958	1512
AC 222,293 (June 10)	0.2	88	23	14.0	2.0	3.9	1029	919
AC 222,293 (June 10)	0.1	56	83	15.7	1.8	8.6	824	2355
AC 222,293 (June 10)	0.05	28	68	15.2	1.9	8.3	901	2188
AC 222,293 (June 10)	0.025	6	73	15.5	1.7	8.8	825	2396
Bromoxynil&MCPA (June 10)	0.12+0.12	59	50	15.2	1.8	6.8	884	1790
Bromoxynil&MCPA (June 10)	0.06+0.06	49	55	15.3	1.9	8.1	920	2166
Bromoxynil&MCPA (June 10)	0.03+0.03	16	80	16.1	1.8	10.2	839	2869
Bromoxynil-RP (June 10)	0.12	65	36	15.2	2.0	5.9	937	1547
Bromoxynil-RP (June 10)	0.06	35	65	15.4	1.8	8.4	828	2241
Bromoxynil-RP (June 10)	0.03	21	85	15.7	1.8	9.6	837	2644

(continued on next page)

Simulated herbicide drift on sugarbeets, Amenia, 1988. (continued)

Treatment	Rate (lb/A)	Sgbt inj (%)	Sgbt Popl (#/60ft)	Sucrose (%)	Loss to Mol (%)	Root Yield (T/A)	Impur Index	Extrac Sucros (lb/A)
DPX-M6316+X-77 (June 24)	0.004+0.25%	44	40	13.1	2.0	1.9	1114	417
DPX-M6316+X-77 (June 24)	0.002+0.25%	40	72	14.5	1.8	4.5	904	1141
DPX-M6316+X-77 (June 24)	0.001+0.25%	31	72	14.5	1.9	5.5	932	1368
DPX-M6316+X-77(June 24)	0.0005+0.25%	23	69	15.2	1.9	9.1	908	2383
DPX-M6316+X-77(June 24)	0.00025+0.25%	11	72	15.6	1.8	9.4	851	2549
AC 222,293 (June 24)	0.2	39	65	14.5	1.9	5.3	936	1325
AC 222,293 (June 24)	0.1	31	48	15.1	1.8	8.0	884	2110
AC 222,293 (June 24)	0.05	14	74	15.5	1.8	9.2	854	2498
AC 222,293 (June 24)	0.025	1	78	16.1	1.8	9.3	807	2648
Bromoxynil&MCPA (June 24)	0.12+0.12	60	57	15.0	1.9	6.7	908	1756
Bromoxynil&MCPA (June 24)	0.06+0.06	46	54	15.1	1.9	7.8	901	2044
Bromoxynil&MCPA (June 24)	0.03+0.03	25	61	15.8	1.9	8.9	860	2454
Bromoxynil-RP (June 24)	0.12	35	63	15.7	1.7	9.9	810	2725
Bromoxynil-RP (June 24)	0.06	28	67	15.5	1.8	8.2	855	2232
Bromoxynil-RP (June 24)	0.03	23	107	16.0	1.7	8.1	795	2282
HIGH MEAN		99	107	16.1	2.3	10.2	1357	2869
LOW MEAN		1	2	12.4	1.7	0.3	795	61
EXP MEAN		45	57	14.9	1.9	6.8	937	1800
C.V. %		20	32	3.7	6.8	18.3	9	20
LSD 5%		13	25	0.8	0.2	1.7	114	496
LSD 1%		17	33	1.0	0.2	2.3	151	657
# OF REPS		4	4	4	4	4	4	4

Summary

This experiment did not include a true untreated check. AC 222,293 at 0.025 lb/A caused negligible sugarbeet injury so this treatment was used as a basis of comparison. DPX-M6316 caused significant sugarbeet yield losses at rates of 0.001 lb/A or higher when applied on June 10 or June 24. AC 222,293 at 0.2 lb/A applied June 10 or 0.1 and 0.2 lb/A applied June 24 caused significant yield loss. Bromoxynil+MCPA at 0.12+0.12 lb/A applied June 10 or 0.06+0.06 and 0.12+0.12 lb/A on June 24 caused significant yield loss. Tons per acre, percent sucrose and extractable sucrose per acre were all affected by the herbicides. Injury symptoms from DPX-M6316 and AC 222,293 were identical.

Simulated herbicide drift on sugarbeets, Amenia, 1988. Diethatyl+cycloate (3+3 lb a.i./A) was applied to entire plot area and incorporated with an Alloway 'Seed better' April 18. Maribo Ultramono sugarbeet was seeded 1.25 inches deep in 22 inch rows April 18. Counter 15G (10 lb/A) was applied during planting using a modified in-furrow applicator. Plots were cultivated June 27. Sugarbeets were hand thinned to an eight inch spacing June 28. Sugarbeets were hand weeded June 28 and maintained weed free throughout the growing season. Herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots 1:30 pm June 30 when the air temp. was 84F, soil temp. at six inches was 78F, relative humidity was 30%, wind was east at 5-10 mph, soil was dry at 0-3 inches, moist at 3-6 inches, and sugarbeets were in the 12-18 leaf stage. Sugarbeet injury was evaluated July 16. Sugarbeets from the center two rows of 35 foot plots were counted and harvested September 27.

Treatment	Rate	Sgbt inj	Harvest Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extract Sucrose
	(lb/A)	(%)	(#/70ft)	(%)	(%)	(T/A)		(lb/A)
DPX-M6316+X-77	0.0001+0.25%	0	56	16.1	1.6	13.3	740	3788
DPX-M6316+X-77	0.00025+0.25%	4	59	15.7	1.6	12.5	737	3492
DPX-M6316+X-77	0.0005+0.25%	44	48	14.1	1.9	8.4	987	2030
DPX-M6316+X-77	0.001+0.25%	70	27	12.6	1.9	4.2	1120	884
DPX-M6316+X-77	0.002+0.25%	81	5	12.0	1.9	0.5	1186	103
AC 222,293	0.025	0	61	15.4	1.7	13.4	819	3622
AC 222,293	0.05	8	53	15.1	1.9	13.1	904	3409
AC 222,293	0.1	39	54	14.8	1.8	11.0	863	2821
DPX-M6316+Diclofop	0.0001+0.004	0	58	15.5	1.7	13.8	804	3750
DPX-M6316+Diclofop	0.00025+0.008	1	57	15.5	1.6	12.3	761	3395
DPX-M6316+Diclofop	0.0005+0.015	1	52	15.5	1.8	13.1	854	3575
DPX-M6316+Diclofop	0.001+0.03	11	42	15.1	1.9	11.0	891	2848
DPX-M6316+Difenzoquat	0.0001+0.004	0	58	15.2	1.7	12.7	842	3399
DPX-M6316+Difenzoquat	0.00025+0.008	0	62	16.0	1.7	14.9	799	4183
DPX-M6316+Difenzoquat	0.0005+0.015	1	62	15.4	1.7	13.2	814	3582
DPX-M6316+Difenzoquat	0.001+0.03	16	64	14.7	1.9	13.4	958	3360
DPX-L5300	0.0005	0	64	15.8	1.7	14.4	798	4002
Untreated Check	0	0	53	16.1	1.6	13.8	739	3945
C.V. %		21	13	4.0	7.6	11.8	11	13
LSD 5%		5	10	0.8	0.2	1.9	130	585
LSD 1%		6	13	1.1	0.3	2.6	173	780
# OF REPS		4	4	4	4	4	4	4

Summary

DPX-M6316 at 0.0005 lb/A or greater caused a reduction in % sucrose, T/A, and extractable sucrose/A. AC 222,293 at 0.1 lb/A caused less yield loss than DPX-M6316 at 0.0005 lb/A. DPX-M6316 in combination with diclofop or difenzoquat caused less sugarbeet injury than DPX-M6316. However, DPX-M6316 was applied with X-77 surfactant while the combinations were applied without surfactant. DPX-L5300 caused less sugarbeet injury than DPX-M6316 but DPX-L5300 was applied without surfactant. The lack of surfactant probably reduced sugarbeet injury from DPX-L5300 and may have reduced sugarbeet injury from DPX-M6316 in combination with diclofop or difenzoquat.

Herbicides on weed free sugarbeets, Fargo, 1988. Diethatyl+cycloate (4+3 lb a.i./A) was applied to entire plot area and incorporated with an Alloway 'Seed better' April 12. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 6. Plots were cultivated June 1. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots 9:30 am June 1 when the sky was mostly cloudy, air temp. was 75F, soil temp. at six inches was 70F, relative humidity was 70%, wind was south at 10-15 mph, soil was dry at 0-1 inch, moist at 1-3 inches, wet at 3-6 inches, and sugarbeets were in the 4-6 leaf stage. Sugarbeets were hand thinned to an eight inch spacing June 2. Sugarbeets were hand weeded June 2 and maintained weed free throughout the growing season. Sugarbeet injury was evaluated June 30. The center two rows of 28 foot plots were counted and harvested October 3.

Treatment*	Rate	Harvest Sgbt inj	Harvest Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extrac Sucros
	(lb/A)	(%)	(#/56ft)	(%)	(%)	(T/A)		(lb/A)
Untreated Check	0	0	74	16.3	2.2	24.6	984	6819
Sethoxydim+Dash	0.25+0.25G	0	65	16.2	2.2	24.7	972	6825
Sethoxydim+Dash	0.5+0.25G	0	59	15.7	2.3	22.7	1060	6014
Sethoxydim+Dash+28%N	0.25+0.25G+1G	0	72	16.2	2.2	25.2	1016	6908
Sethoxydim+Dash+28%N	0.5+0.25G+1G	0	69	16.1	2.2	23.5	1010	6386
Clopyralid	0.125	3	73	16.5	2.1	24.4	912	6940
Clopyralid	0.25	3	65	16.2	2.2	22.6	1005	6190
Clopyralid	0.5	8	65	16.1	2.2	22.7	988	6206
Seth+Clpy+Dash	0.25+0.25+0.25G	5	68	16.1	2.3	22.3	1043	6091
Seth+Clpy+Dash	0.25+0.5+0.25G	16	65	16.3	2.3	20.6	1020	5696
Seth+Clpy+Dash+28%N	.25+.25+.25G+1G	5	64	16.1	2.3	21.8	1043	5898
Seth+Clpy+Dash+28%N	.25+.5+.25G+1G	18	67	16.2	2.2	21.0	995	5795
Endothall	0.75	4	65	16.4	2.3	23.8	1010	6620
Endothall+Clopyralid	0.5+0.19	3	65	16.2	2.2	22.7	991	6248
Endothall+Clopyralid	0.75+0.19	1	70	16.4	2.2	22.6	974	6320
Desmedipham	1	26	55	16.1	2.2	21.0	977	5763
Desmedipham+Clopyralid	1+0.19	27	55	16.3	2.1	19.8	967	5531
C.V. %		45	8	3.7	5.5	7.8	8	8
LSD 5%		4	8	NS	NS	2.5	NS	714
LSD 1%		6	10	NS	NS	3.4	NS	953
# OF REPS		4	4	4	4	4	4	4

* 28%N = 28% N solution containing urea and NH_4NO_3
* Dash = adjuvant from BASF

Summary

Sugarbeets treated with sethoxydim+Dash at 0.5 lb/A+1 qt/A had a lower plant population and less extractable sucrose/A than untreated sugarbeets. However, sugarbeets treated with sethoxydim+Dash+28%N had plant population and yield similar to untreated sugarbeets. Since 28%N would not be expected to safen the herbicide treatment, the observed yield loss from sethoxydim+Dash may be due to some unknown factor rather than treatment effect. All treatments including sethoxydim+clopyralid+Dash caused reduced extractable sucrose/A compared to the untreated check. Desmedipham and desmedipham + clopyralid also caused yield loss.

Herbicides on weed free sugarbeets, St. Thomas, 1988. Preplant incorporated herbicides were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center four rows of six row plots May 9 when the air temp. was 76F, soil temp. at six inches was 58F, wind was north at 10-15 mph, soil was dry at 0-1 inch, moist at 1-2 inches, and wet at 3-4 inches. A rototiller set two inches deep was used to incorporate PPI herbicide treatments. 'Hilleshog Monoricca' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 9. 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 through 8001 nozzle tips to the center four rows of six row plots 3:00 pm May 31 when the sky was sunny, air temp. was 94F, soil temp. at six inches was 84F, relative humidity was 44%, wind was south at 15-20 mph, soil was dry at 0-1 inch, moist at 1-2 inches, wet at 3-4 inches, and sugarbeets were in the 2 leaf stage. Sugarbeets were hand weeded June 7 and maintained weed free throughout growing season. Sugarbeets were hand thinned to an eight inch spacing June 7. Plots were cultivated June 3 and June 20. Sugarbeet injury was evaluated June 10. The center two rows of each 34 foot plot were counted and harvested September 20.

		Harvest			Loss			
		Sgbt	Sgbt		to	Root	Impur	Extrac
Treatment*	Rate	inj	Popl	Sucr	Mol	Yield	Index	Sucros
	(lb/A)	(%)	(#/68ft)	(%)	(%)	(T/A)		(lb/A)
RO17-3664+OC	0.14+0.25G	0	40	14.8	2.3	20.9	1128	5126
Untreated Check	0	0	65	14.1	2.3	23.2	1211	5360
Endothall+Clopyralid	0.75+0.25	13	49	14.4	2.6	22.0	1302	5100
Sethoxydim+Dash	0.25+0.25G	0	57	15.1	2.4	20.1	1147	5033
Sethoxydim+Dash	0.5+0.25G	0	55	15.3	2.3	21.5	1103	5483
Sethoxydim+OC	0.25+0.25G	0	60	15.2	2.4	19.0	1125	4797
Sethoxydim+OC	0.5+0.25G	0	58	15.2	2.4	22.3	1147	5619
Sethoxydim+Sun-It	0.25+0.25G	0	60	14.4	2.4	22.3	1197	5254
Sethoxydim+Sun-It	0.5+0.25G	2	63	15.0	2.5	22.6	1204	5542
Clopyralid	0.125	0	60	15.0	2.3	22.5	1140	5600
Clopyralid	0.25	7	53	15.3	2.4	22.5	1160	5695
Clopyralid	0.5	18	47	14.6	2.5	19.6	1263	4625
Sethoxydim+Dash+28%N	0.25+0.25G+1G	0	55	15.1	2.5	23.8	1195	5928
Sethoxydim+Dash+28%N	0.5+0.25G+1G	2	55	15.5	2.3	20.2	1092	5254
Sethox+Clpy+OC	0.2+0.25+0.25G	12	41	14.1	2.6	20.8	1365	4664
Sethox+Clpy+OC	0.2+0.5+0.25G	22	50	14.0	2.7	23.4	1441	5133
Sethox+Clpy+Dash	0.2+0.25+0.25G	10	44	15.2	2.5	21.9	1225	5450
Sethox+Clpy+Dash	0.2+0.5+0.25G	20	46	14.1	2.5	19.3	1325	4391
Sethox+Clpy+Sun-It	0.2+0.25+0.25G	7	54	14.4	2.5	21.0	1273	4870
Sethox+Clpy+Sun-It	0.2+0.5+0.25G	25	45	15.1	2.5	17.9	1237	4395
Seth+Clpy+Dash+28%N	0.2+0.25+0.25G+1G	13	39	14.7	2.5	19.3	1254	4616
Seth+Clpy+Dash+28%N	0.2+0.5+0.25G+1G	32	41	14.7	2.7	16.7	1323	3944
Untreated Check	0	0	61	15.4	2.3	20.8	1093	5362
Metolachlor (ppi)	2	10	48	14.0	2.6	21.6	1397	4803
Metolachlor (ppi)	3	15	39	14.4	2.6	18.5	1328	4298
Metolachlor (ppi)	4	23	48	14.9	2.6	20.3	1260	4909

(continued on next page)

Herbicides on weed free sugarbeets, St. Thomas, 1988. (continued)

Treatment*	Rate	Harvest Sgbt inj	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extrac Sucros
	(lb/A)	(%)	(#/68ft)	(%)	(%)	(T/A)		(lb/A)
Diethatyl (ppi)	6	12	48	14.7	2.5	18.7	1237	4484
Trifluralin (ppi)	0.25	32	35	15.0	2.5	16.9	1225	4104
Ethalfluralin (ppi)	0.25	42	33	14.6	2.4	14.5	1200	3473
2,4-D	0.06	22	40	14.1	2.5	16.1	1312	3654
AC 222,293	0.025	5	56	15.1	2.5	20.7	1216	5110
AC 222,293	0.05	20	52	15.4	2.5	20.2	1170	5112
AC 222,293	0.1	43	51	14.2	2.4	19.8	1262	4559
HIGH MEAN		43	65	15.5	2.7	23.8	1441	5928
LOW MEAN		0	33	14.0	2.3	14.5	1092	3473
EXP MEAN		12	50	14.8	2.5	20.3	1229	4901
C.V. %		33	14	4.1	7.0	10.6	10	12
LSD 5%		7	11	1.0	NS	3.5	192	923
LSD 1%		9	15	NS	NS	4.6	NS	1225
# OF REPS		3	3	3	3	3	3	3

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

Summary

The average of the two untreated check means was used as a basis of comparison in this experiment. Sugarbeets treated with metolachlor at 3 lb/A yielded less extractable sucrose/A than the untreated check while sugarbeets treated with metolachlor at 4 lb/A yielded similarly to the untreated check. This is not logical so perhaps unknown factors other than the treatment caused the observed reduction in yield. Trifluralin at 0.25 lb/A, ethalfluralin at 0.25 lb/A, and 2,4-D at 0.06 lb/A caused a reduction in root yield and extractable sucrose/A. Sethoxydim+Dash+28%N at 0.5 lb/A+ 1 qt/A+ 1 gal/A and sethoxydim+clopyralid+Booster Plus E at 0.2+0.5 lb/A + 1 qt/A did not affect sugarbeet yield. However, sethoxydim+clopyralid+Dash at 0.2+0.5 lb/A+ 1 qt/A, sethoxydim + clopyralid + Sun-It at 0.2 + 0.5 lb/A + 1 qt/A, and sethoxydim + clopyralid+Dash+28%N at 0.2+0.5 lb/A + 1 qt/A + 1 gal/A reduced extractable sucrose/A as compared to the untreated check.

Time of application of sethoxydim and clopyralid plus additives, Amenia, 1988. Diethatyl+cycloate+diallate (3+3+1 lb a.i./A) was applied to entire plot area and incorporated with an Alloway 'Seed better' April 15. 'Mitsui Monohikari' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Counter 15G (10 lb/A) was applied during planting using a modified in-furrow applicator. Sugarbeets were hand weeded June 10 and maintained weed free throughout the growing season. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center four rows of six row plots on the dates listed below.

Date	Day	Sky	Time of Day	6 inch Air Temp °F	6 inch Soil Temp °F	Rel Hum (%)	Wind Veloc (mph)	Wind Direct	Soil Moisture (inches)	Sgbt leaf Stage
June 3	(D1)	sunny	12:30	95	78	33	5-8	south	0-3=dry;3-5=moist	ctyl-2
June 10	(D2)	sunny	10:00	81	72	28	10-15	south	0-4=dry;4-6=moist	2-8
June 16	(D3)	sunny	2:00	76	74	42	5-8	SE	0-1=dry;1-5=moist	4-10
June 24	(D4)	sunny	10:45	85	78	57	0-5	south	0-3=moist;3-6=wet	6-12
July 1	(D5)	cloudy	10:30	70	72	56	2-5	west	0-3=dry;3-6=moist	8-14

Plots were cultivated June 10 and June 24. The center two rows of each 35 foot plot were counted July 25 and harvested September 30.

Treatment*	Rate (lb/A)	Sgbt Popl (#/70ft)	Sucrose (%)	Loss to Mol (%)	Root Yield (ton/A)	Impur Index	Extrac Sucros (lb/A)
Clopyralid (D1)	0.19	66	15.9	1.8	14.6	839	4051
Clopyralid (D1)	0.38	55	15.1	1.9	11.5	924	2984
Sethoxydim+Sun-It (D1)	0.25+0.25G	60	15.5	1.9	12.1	910	3244
Sethoxydim+Sun-It (D1)	0.5+0.25G	55	16.1	1.8	13.2	823	3715
Sethoxydim+Dash (D1)	0.25+0.25G	60	15.9	1.7	13.6	783	3788
Sethoxydim+Dash (D1)	0.5+0.25G	63	15.7	1.8	13.3	849	3660
Sethoxydim+Dash+28%N (D1)	0.5+0.25G+1G	57	15.7	1.8	12.8	834	3526
Clpy+Seth+Dash+28%N (D1)	0.19+0.5+0.25G+1G	65	15.8	2.0	14.1	909	3856
Untreated Check		69	15.5	1.8	13.1	822	3557
Desmed (D1,2,3,4,5)	0.25/0.33/0.33/0.5/0.5	58	15.7	1.8	11.7	856	3214
Desmedipam (D1,3,5)	0.25/0.33/0.5	62	15.7	1.9	13.4	869	3660
Desmedipham (D3)	0.5	66	15.6	1.9	13.4	891	3635
Clopyralid (D2)	0.19	71	15.4	1.9	13.7	899	3646
Clopyralid (D2)	0.38	65	15.6	2.0	12.9	929	3449
Sethoxydim+Sun-It (D2)	0.25+0.25G	69	15.7	1.8	14.4	842	3943
Sethoxydim+Sun-It (D2)	0.5+0.25G	71	15.8	1.7	13.8	774	3837
Sethoxydim+Dash (D2)	0.25+0.25G	63	15.6	1.8	12.5	851	3402
Sethoxydim+Dash (D2)	0.5+0.25G	64	16.0	1.8	13.8	811	3871
Sethoxydim+Dash+28%N (D2)	0.5+0.25G+1G	58	16.2	1.7	13.2	753	3806
Clpy+Seth+Dash+28%N (D2)	0.19+0.5+0.25G+1G	55	14.9	2.0	12.1	974	3081

(continued on next page)

Time of application of sethoxydim and clopyralid plus additives, Amenia, 1988. (continued)

Treatment*	Rate	Sgbt Popl	Sucrose	Loss to Mol	Root Yield	Impur Index	Extrac Sucros
	(lb/A)	(#/70ft)	(%)	(%)	(ton/A)		(lb/A)
Untreated Check		54	15.5	1.9	12.6	901	3364
Clopyralid (D3)	0.19	53	15.0	1.9	10.6	947	2737
Clopyralid (D3)	0.38	56	15.2	1.9	11.5	932	3022
Sethoxydim+Sun-It (D3)	0.25+0.25G	61	15.6	1.9	13.8	908	3742
Sethoxydim+Sun-It (D3)	0.5+0.25G	76	15.7	1.8	13.1	823	3609
Sethoxydim+Dash (D3)	0.25+0.25G	60	15.8	1.8	14.3	845	3942
Sethoxydim+Dash (D3)	0.5+0.25G	62	15.5	1.9	13.9	878	3753
Sethoxydim+Dash+28%N (D3)	0.5+0.25G+1G	51	15.8	1.7	11.7	789	3269
Clpy+Seth+Dash+28%N (D3)	0.19+0.5+0.25G+1G	66	15.9	1.8	13.2	823	3651
Clopyralid (D4)	0.19	70	15.7	1.8	12.7	850	3471
Clopyralid (D4)	0.38	60	15.5	1.9	12.0	911	3189
Sethoxydim+Sun-It (D4)	0.25+0.25G	56	15.5	1.9	12.7	896	3432
Sethoxydim+Sun-It (D4)	0.5+0.25G	57	15.7	1.8	11.8	829	3251
Sethoxydim+Dash (D4)	0.25+0.25G	68	15.7	1.9	13.3	873	3663
Sethoxydim+Dash (D4)	0.5+0.25G	54	15.4	1.8	12.0	857	3250
Sethoxydim+Dash+28%N (D4)	0.5+0.25G+1G	61	15.6	1.8	12.7	847	3497
Clpy+Seth+Dash+28%N (D4)	0.19+0.5+0.25G+1G	61	15.2	1.9	11.8	925	3117
Clopyralid (D5)	0.19	64	15.5	1.9	11.7	890	3161
Clopyralid (D5)	0.38	60	14.9	2.0	9.5	959	2422
Sethoxydim+Sun-It (D5)	0.25+0.25G	67	15.7	1.9	12.4	861	3382
Sethoxydim+Sun-It (D5)	0.5+0.25G	64	15.7	1.8	11.5	831	3156
Sethoxydim+Dash (D5)	0.25+0.25G	49	15.1	1.9	11.6	926	3016
Sethoxydim+Dash (D5)	0.5+0.25G	88	15.9	1.7	13.4	802	3758
Sethoxydim+Dash+28%N (D5)	0.5+0.25G+1G	56	15.7	1.8	12.5	837	3412
Clpy+Seth+Dash+28%N (D5)	0.19+0.5+0.25G+1G	80	15.0	2.0	11.4	977	2935
HIGH MEAN		88	16.2	2.0	14.6	977	4051
LOW MEAN		49	14.9	1.7	9.5	753	2422
EXP MEAN		62	15.6	1.8	12.7	868	3447
C.V. %		25	3.5	7.0	15.2	9	18
LSD 5%		NS	NS	0.2	NS	111	NS
LSD 1%		NS	NS	NS	NS	145	NS
# OF REPS		4	4	4	4	4	4

* Sun-It = Agsco sunflower methyl ester
* 28%N = 28% N solution containing urea and NH_4NO_3
* Dash = BASF surfactant

Summary

The treatments had no significant effect on sugarbeet yield or population.

Multispecies screening of preplant incorporated, preemergence, and post-emergence herbicides, Fargo (NW section 22), 1988. Preplant incorporated herbicide treatments were applied and rototiller incorporated May 18 when the sky was sunny, air temp. was 88F, soil temp. at six inches was 68F, wind was southwest at 25-35 mph, soil was dry at 0-2 inches and moist at 2-4 inches. The rototiller was operated four inches deep for EPTC and cycloate and two inches deep for all other PPI herbicides. 'Wheaton' wheat, 'Robust' barley, 'ND810104' oats, 'Cando' durum, 'Linton' flax, 'S541' safflower, common lentils, 'Topaz' canola, 'Kirby' mustard, 'Siberian' foxtail millet, 'McCall' soybean, 'Hyden' navy bean, 'Intersate 201' corn, 'Interstate 3001' sunflower, 'Maribo Ultramono' sugarbeet, wild buckwheat, redroot pigweed, kochia, and common lambsquarters were seeded in strips across the herbicide plots May 18. Preemergence herbicide treatments were applied May 20 when the air temp. was 73F, soil temp. at six inches was 68F, relative humidity was 54%, wind was northwest at 5-8 mph, soil was dry at 0-1 inch and moist at 1-6 inches. All soil applied treatments were applied in 17 gpa water at 40 psi through 8002 nozzle tips to the center 7 feet of 11 foot plots. Postemergence herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center 7 feet of 11 foot plots 9:00 am June 9 when the sky was sunny, air temp. was 70F, soil temp. at six inches was 70F, relative humidity was 33%, wind was south at 12-18 mph, soil was dry at 0-2 inches and moist at 2-4 inches, green foxtail was 0.5 to 2 inches tall, and kochia was 0.5 to 2.5 inches tall. Kochia and green foxtail control were evaluated in all three experiments July 14. All other species either did not emerge because of dry soil conditions or were crowded out by the high density of green foxtail and kochia.

Preplant incorporated herbicides

Treatment	Rate	Kochia control	Green Foxtail control
	(lb/A)	(%)	(%)
SAN-582H	1.25	0	82
SAN-582H	1.75	10	95
Isoxaben	0.08	63	0
Imazethapyr	0.03	99	94
Imazethapyr	0.06	99	97
Cyanazine-L	2	87	47
Alachlor	3	0	82
Metolachlor	3	0	96
EPTC	4	18	99
Cycloate	4	0	91
Clomazone	0.75	72	53
Trifluralin	0.75	93	95
Ethalfluralin	0.75	91	97
A-1237	0.125	98	87
Metribuzin-DF	0.375	91	50
AC 222,293	0.25	50	18
DPX-A7881-22	0.02	86	27
DPX-V9360-34	0.02	7	0
CGA-136872	0.02	98	78
C.V. %		18	14
LSD 5%		17	16
LSD 1%		22	21
# OF REPS		3	3

(continued on next page)

(continued)

Treatment*	Rate (lb/A)	Kochia control (%)	Green Foxtail control (%)
Preemergence herbicides			
Propachlor	5	0	83
Metolachlor	3	0	68
Alachlor	3	27	57
Chloramben	3	99	97
Pendimethalin	1.5	48	32
A-1237	0.062	88	23
A-1237	0.125	97	82
SAN-582H	1.25	13	70
SAN-582H	1.75	15	71
C.V. %		29	27
LSD 5%		22	31
LSD 1%		30	42
# OF REPS		3	3
Postemergence herbicides			
DPX-M6316+X-77	0.016+0.25%	93	0
DPX-L5300+X-77	0.016+0.25%	99	7
DPX-A7881-22+X-77	0.016+0.25%	0	0
DPX-A7881-22+X-77	0.031+0.25%	28	32
DPX-V9360-34+X-77	0.016+0.25%	32	93
DPX-V9360-34+X-77	0.031+0.25%	45	90
Imazethapyr+X-77	0.03+0.25%	68	85
Imazethapyr+X-77	0.06+0.25%	80	83
Clopyralid	0.1	0	0
Fluroxypyr	0.1	96	0
Fomesafen+X-77	0.2+0.25%	15	0
Lactofen+X-77	0.18+0.25%	33	0
Bentazon+PO	0.75+0.25G	82	0
Acifluorfen+X-77	0.375+0.25%	0	13
Bent+Acif+X-77	0.6+0.25+0.25%	43	0
Bromoxynil	0.25	80	0
Dicamba	0.12	86	0
2,4-D	0.25	58	0
2,4-DB	0.5	0	0
Glyphosate+X-77	0.25+0.25%	80	97
Paraquat+X-77	0.5+0.25%	62	90
A-1237	0.016	88	0
A-1237	0.031	98	0
C-4243	0.03	73	0
C-4243	0.06	81	0
S-23121	0.004	0	0
S-23121	0.018	0	0
S-63596+X-77	0.044+0.05%	0	0
S-63596+X-77	0.088+0.05%	0	67
CGA-136872	0.016	12	35
CGA-136872	0.031	45	60
C.V. %		28	44
LSD 5%		22	18
LSD 1%		29	23
# OF REPS		3	3

* X-77 = non-ionic surfactant from Chevron Chemical Co.
* PO = petroleum oil adjuvant from BASF (Booster Plus E)

Injury to sugarbeets and other crops from herbicide carryover. Dexter, Alan G., John D. Nalewaja, and Dallas E. Peterson. The objective of these experiments was to detect phytotoxic soil residual in 1988 from herbicides applied in 1987. Experiments were established on a silty clay with 4.0% organic matter and pH 8.0 approximately 5 miles north of Fargo, ND. 'Marshall' wheat was seeded at 75 lb/A in one experiment and 'McCall' soybean was seeded in 6-inch rows at 69 lb/A in the other experiment on June 2, 1987. Herbicides were applied to both experiments from 3:00 to 4:00 pm June 24, 1987 when the air temperature was 73 F, six-inch soil temperature was 71 F, relative humidity was 54% and the soil was dry at 0 to 1 inch, moist at 1 to 2 inches, and wet at 2 to 4 inches. At application, soybeans were from the cotyledon to two trifoliolate stage and wheat was six inches tall. Herbicides were applied in 8.5 gpa of water at 40 psi through 8001 nozzles to the center 7 feet of 14 by 45 foot plots arranged in a randomized complete block design with four replications. A chisel plow was used for fall tillage in 1987 and a field cultivator was used for seedbed preparation in the spring of 1988. 'McCall' soybean, 'N.D. 810104' oats, 'Linton' flax, and 'Maribo Ultramono' sugarbeet were seeded in the wheat experiment and 'Wheaton' wheat, 'Interstate 201' corn, 'Linton' flax, and 'Maribo Ultramono' sugarbeet were seeded in the soybean experiment across the herbicide treated blocks on May 18 when the soil was dry at 0 to 2 inches and moist at 2 to 4 inches. Rain totalling 0.9 inches fell from May 19 through May 22, 1988. Total rain from April through August of 1987 was 10.3 inches compared to normal of 12.7 inches. A natural dense population of redroot pigweed and yellow foxtail emerged in the experiments. Crop injury and weed control were evaluated June 11 and June 27 except yellow foxtail was evaluated only on June 11.

DPX-L5300 at 0.03 lb/A applied in 1987 caused slight visible injury to soybeans and controlled redroot pigweed and yellow foxtail in 1988. Soybeans and redroot pigweed exhibited less injury on June 11 than on June 27. AC 222,293 at 0.3 lb/A applied in 1987 injured soybean, sugarbeet, and oats, and controlled redroot pigweed in 1988 while AC 222,293 at 0.6 lb/A injured or controlled all species. DPX-M6316 applied in 1987 did not significantly injure the species evaluated in 1988.

Imazethapyr at 0.06 and 0.12 lb/A applied in 1987 injured flax, wheat, sugarbeet and controlled redroot pigweed and yellow foxtail in 1988. Imazethapyr at 0.12 lb/A injured corn while 0.06 lb/A did not. Injury from imazethapyr to flax and wheat tended to be greater on June 27 than on June 11. Fomesafen at 0.5 lb/A applied in 1987 injured flax and sugarbeet and controlled redroot pigweed and yellow foxtail in 1988. Fomesafen at 0.25 lb/A only affected redroot pigweed and yellow foxtail. Lactofen and acifluorfen did not injure the species evaluated in 1988. (Dept. of Crop and Weed Sciences, published with the approval of the Agric. Exp. Stn., North Dakota State Univ. Fargo)

Table 1. Crop injury and weed control in 1988 from herbicides applied to wheat in 1987. (Dexter, Nalewaja, and Peterson).

1987 treatment	Rate	Soybean 6/11	Soybean 6/27	Flax 6/11	Flax 6/27	Sugarbeet 6/11	Sugarbeet 6/27	Oats 6/11	Oats 6/27	Rrpw 6/11	Rrpw 6/27	Yeft 6/11
	(lb/A)	(% injury, 1988)								(% control, 1988)		
DPX-M6316	0.015	0	0	0	0	0	0	0	0	0	0	0
DPX-M6316	0.03	0	0	0	0	0	0	0	0	0	5	0
DPX-L5300	0.015	0	0	0	0	0	0	0	0	0	0	0
DPX-L5300	0.03	13	0	5	0	0	0	0	0	68	30	23
AC 222,293	0.3	3	14	4	0	39	65	0	11	86	85	15
AC 222,293	0.6	28	24	50	26	99	91	8	40	96	95	30
Untreated Check	-	0	0	0	0	0	0	0	0	0	0	0
Mean		6	5	8	4	20	22	1	7	36	31	10
LSD (0.05)		8	14	9	NS	25	15	NS	11	10	22	23

Table 2. Crop injury and weed control in 1988 from herbicides applied to soybean in 1987. (Dexter, Nalewaja, and Peterson).

1987 treatment	Rate	Corn		Flax		Wheat		Sugarbeet		Rrpw		Yeft
		6/11	6/27	6/11	6/27	6/11	6/27	6/11	6/27	6/11	6/27	6/11
	(lb/A)	(% injury, 1988)								(% control, 1988)		
Imazethapyr	0.06	1	4	91	96	0	19	99	99	99	99	97
Imazethapyr	0.12	23	21	97	99	24	31	99	99	99	97	99
Fomesafen	0.25	0	0	3	0	0	4	8	3	65	57	28
Fomesafen	0.5	0	0	43	19	4	5	63	50	91	88	74
Lactofen	0.2	0	0	0	0	0	0	0	0	0	0	0
Lactofen	0.4	0	0	0	0	0	0	0	0	0	3	0
Acifluorfen	0.38	0	0	0	0	0	0	0	0	0	0	0
Acifluorfen	0.75	0	0	0	0	0	0	0	0	0	0	0
Untreated Check	.	0	0	0	0	0	0	0	0	0	0	0
Mean		3	3	26	24	3	7	30	28	39	38	33
LSD (0.05)		3	8	13	18	9	14	12	13	9	5	18

Three species evaluation of the effect of additives on antagonism, Amenia, 1988. 'Siberian' foxtail millet, 'Wheaton' wheat, and 'ND810104' oats were seeded in adjacent six foot strips across the herbicide plots May 23. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to a 7.33 foot strip through the center of 11 foot plots and across the three grass species. Herbicide application was between 10:00 am and 1:00 pm June 22 when the air temp. was 84F, soil temp. at six inches was 79F, relative humidity was 35%, wind was north at 10-20 mph, sky was partly cloudy, soil was dry at 0-1 inches, moist at 1-6 inches, foxtail millet was 8 inches tall, wheat was 6 inches tall, and oats was 7 inches tall. Foxtail millet, wheat, and oats control was evaluated July 11.

Treatment	Rate (lb/A)	Ftmi inj (%)	Wheat inj (%)	Oats inj (%)
DPX-Y6202	0.05	37	82	48
DPX-Y6202	0.1	68	94	88
RO17-3664+Booster Plus E	0.035+0.25G	0	0	0
RO17-3664+Booster Plus E	0.07+0.25G	0	10	0
RO17-3664+Booster Plus E	0.105+0.25G	13	50	0
RO17-3664+Booster Plus E	0.14+0.25G	40	58	10
Fluazifop-P+Booster Plus E	0.09+0.25G	45	92	79
Fluazifop-P+Booster Plus E	0.188+0.25G	57	97	98
Sethoxydim+Dash	0.1+0.25G	83	92	91
Sethoxydim+Dash	0.2+0.25G	96	98	98
Sethoxydim+Clopyralid+Booster Plus E	0.1+0.2+0.25G	65	67	60
Sethoxydim+Clopyralid+Booster Plus E	0.2+0.2+0.25G	93	95	93
Sethoxydim+Clopyralid+Dash	0.1+0.2+0.25G	85	95	87
Sethoxydim+Clopyralid+Dash	0.2+0.2+0.25G	96	98	98
Sethoxydim+Clopy+Sun-It	0.1+0.2+0.25G	81	88	85
Sethoxydim+Clopy+Sun-It	0.2+0.2+0.25G	92	94	93
Seth+Clopy+Dash+28%N	0.1+0.2+0.25G+1G	85	94	92
Seth+Clopy+Dash+28%N	0.2+0.2+0.25G+1G	92	98	95
Seth+Desmedipham+Booster Plus E	0.1+1+0.25G	42	55	35
Seth+Desmedipham+Booster Plus E	0.2+1+0.25G	67	77	74
Seth+Desmedipham+Booster Plus E	0.3+1+0.25G	89	88	84
Seth+Desmedipham+Booster Plus E	0.4+1+0.25G	92	95	91
Seth+Desmedipham+Booster Plus E	0.5+1+0.25G	92	94	91
Seth+Desmedipham+Dash	0.1+1+0.25G	52	70	63
Seth+Desmedipham+Dash	0.2+1+0.25G	68	75	73
Seth+Desmedipham+Dash	0.3+1+0.25G	86	90	86
Seth+Desmedipham+Dash	0.4+1+0.25G	95	96	91
Seth+Desmedipham+Dash	0.5+1+0.25G	93	94	93
Seth+Desmedipham+Sun-It	0.1+1+0.25G	65	73	60
Seth+Desmedipham+Sun-It	0.2+1+0.25G	83	83	79
Seth+Desmedipham+Sun-It	0.3+1+0.25G	90	94	87
Seth+Desmedipham+Sun-It	0.4+1+0.25G	94	97	93
Seth+Desmedipham+Sun-It	0.5+1+0.25G	95	97	96
Sethoxydim+Desmedipham	0.1+1	33	28	17
Sethoxydim+Desmedipham	0.2+1	45	60	57
Sethoxydim+Desmedipham	0.3+1	67	75	73
Sethoxydim+Desmedipham	0.4+1	80	83	87
Sethoxydim+Desmedipham	0.5+1	86	89	84
Flua-P+Desmedipham+Booster Plus E	0.09+1+0.25G	23	78	67
Flua-P+Desmedipham+Booster Plus E	0.188+1+0.25G	40	92	88
Flua-P+Desmedipham+Booster Plus E	0.28+1+0.25G	48	96	97

(continued on next page)

Three species evaluation of the effect of additives on antagonism, Amenia, 1988. (continued)

Treatment	Rate (lb/A)	Ftmi inj (%)	Wheat inj (%)	Oats inj (%)
Fluazifop-P+Herbimax	0.09+0.25G	33	96	98
Fluazifop-P+Herbimax	0.188+0.25G	57	98	99
Fluazifop-P+LI-700	0.09+0.25G	23	85	86
Fluazifop-P+LI-700	0.188+0.25G	45	94	97
Fluazifop-P+Stollers	0.09+0.25G	22	74	48
Fluazifop-P+Stollers	0.188+0.25G	32	92	91
Fluazifop-P+Desmedipham	0.09+1	8	67	50
Fluazifop-P+Desmedipham	0.188+1	27	86	78
Fluazifop-P+Desmedipham	0.28+1	45	92	99
Sethoxydim+Sun-It	0.1+0.25G	79	88	83
Sethoxydim+Sun-It	0.2+0.25G	97	97	99
Sethoxydim+Booster Plus E	0.1+0.25G	83	85	79
Sethoxydim+Booster Plus E	0.2+0.25G	94	96	96
Sethoxydim+Herbimax	0.1+0.25G	80	77	78
Sethoxydim+Herbimax	0.2+0.25G	95	95	93
Sethoxydim+LI-700	0.1+0.25G	60	62	43
Sethoxydim+LI-700	0.2+0.25G	88	90	93
Sethoxydim+Stollers	0.1+0.25G	77	80	76
Sethoxydim+Stollers	0.2+0.25G	90	94	96
Sethoxydim	0.1	45	25	10
Sethoxydim	0.2	82	77	82
Fluazifop-P	0.09	38	83	67
Fluazifop-P	0.188	48	95	95
RO17-3664+Desmed+Booster Plus E	0.105+1+0.25G	8	10	13
Sethoxydim+Desmedipham+Herbimax	0.1+1+0.25G	62	62	53
Sethoxydim+Desmedipham+LI-700	0.1+1+0.25G	28	30	17
Sethoxydim+Desmedipham+Stollers	0.1+1+0.25G	62	62	42
Fluazifop-P+Clopyralid+Booster Plus E	0.09+0.2+0.25G	35	93	77
HIGH MEAN		97	98	99
LOW MEAN		0	0	0
EXP MEAN		62	79	72
C.V. %		14	8	11
LSD 5%		14	10	13
LSD 1%		19	13	17
# OF REPS		3	3	3

Summary

DPX-Y6202 at 0.1 lb/A and fluazifop-P at 0.188 lb/A + Herbimax gave less foxtail millet control than sethoxydim+Dash at 0.1 lb/A + 1 qt/A. RO17-3664 + Booster Plus E gave poor control of all three species. Sethoxydim+clopyralid +Dash gave grass control similar to sethoxydim+Dash. Sethoxydim+desmedipham + Dash at 0.3 + 1 lb/A + 1 qt/A gave grass control similar to sethoxydim+Dash at 0.1 lb/A + 1 qt/A. Sethoxydim+LI-700 gave or tended to give less grass control than sethoxydim + other additives. Desmedipham antagonized grass control from sethoxydim and fluazifop-P regardless of additive. Fluazifop-P + Herbimax at 0.09 lb/A + 1 qt/A gave or tended to give grass control superior to fluazifop-P at 0.09 lb/A + other additives.

Broadleaf herbicides plus additives, Amenia, 1988. Bioassay strips of 'Linton' flax, 'McCall' soybean, 'Beta 6186' sugarbeet, and 'Kirby' mustard were seeded in adjacent six foot strips across the herbicide plots May 23. Sethoxydim (0.2 lb ai/A) plus Bio-Veg crop oil (1 qt/A) was applied to all bioassay strips June 10 to control foxtail and wild oats. Herbicide treatments were applied between 9:00 am and 1:00 pm June 16 when the sky was mostly sunny, air temp. was 76F, soil temp. at six inches was 74F, relative humidity was 42%, wind was southeast at 2-6 mph, soil was dry at 0-1 inches, moist at 1-5 inches, wet below 5 inches, common lambsquarters were 6 leaf to 3 inches tall, mustard was 4 leaf (1.5 inches tall) to 8 leaf (3 inches tall), flax was 2-3 inches tall, and soybeans had 2 to 3 trifoliolate leaves. The sugarbeet seed did not emerge due to dry soil conditions at planting. All herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzle tips to the center 7.33 feet of 11 foot plots. Common lambsquarters, flax, tame mustard, and soybean control were evaluated July 2.

Treatment*	Rate (lb/A)	Colq cntl	Flax cntl	Tamu cntl	Soyb cntl
		----------	(%)	----------	
Desmedipham	0.25	30	9	44	3
Desmedipham	0.5	22	12	35	3
Desmedipham	1	48	24	60	9
Desmedipham+Dalapon	0.25+1	29	28	53	56
Desmedipham+Dalapon	0.5+1	26	19	53	56
Desmedipham+Dalapon	1+1	65	65	71	64
Desmedipham+Ethofumesate	0.25+1.1	63	60	72	65
Desmedipham+Ethofumesate	0.5+1.1	83	65	79	68
Desmedipham+Ethofumesate	1+1.1	92	78	87	78
Desmedipham+Ethofumesate	0.25+0.56	53	38	59	53
Desmedipham+Ethofumesate	0.5+0.56	73	45	63	56
Desmedipham+Ethofumesate	1+0.56	70	65	89	70
Desmedipham+Ethofumesate	0.25+0.19	13	13	43	36
Desmedipham+Ethofumesate	0.5+0.19	36	23	60	45
Desmedipham+Ethofumesate	1+0.19	70	61	76	59
Desmedipham+Spraymate	0.25+0.25G	6	0	18	3
Desmedipham+Spraymate	0.5+0.25G	21	14	41	3
Desmedipham+Spraymate	1+0.25G	49	15	54	9
Pyrazon	3.7	0	0	10	4
Pyrazon+Dash	3.7+0.25G	11	5	44	18
Pyrazon+Dash+28%N	3.7+0.25G+1G	30	20	58	39
Desmedipham+Pyrazon	0.25+3.7	0	5	36	18
Desmedipham+Pyrazon	0.5+3.7	10	8	26	13
Desmedipham+Pyrazon	1+3.7	66	39	64	24
Desm+Pyrazon+Dash	0.25+3.7+0.25G	29	14	59	25
Desm+Pyrazon+Dash	0.5+3.7+0.25G	55	31	68	29
Desm+Pyrazon+Dash	1+3.7+0.25G	73	63	88	53
Desm+Pyra+BAS-090025	0.25+3.7+0.25G	54	31	76	60
Desm+Pyra+BAS-090025	0.5+3.7+0.25G	74	60	80	55
Desm+Pyra+BAS-090025	1+3.7+0.25G	80	75	85	59
Desm+Pyrazon+Sun-It	0.25+3.7+0.25G	9	11	58	30
Desm+Pyrazon+Sun-It	0.5+3.7+0.25G	38	33	72	45
Desm+Pyrazon+Sun-It	1+3.7+0.25G	85	66	78	66

(continued on next page)

Broadleaf herbicides plus additives, Amenia, 1988. (continued)

Treatment*	Rate (lb/A)	Colq cntl	Flax cntl	Tamu cntl	Soyb cntl
			(%)		
Desm+Pyrazon+Etho	0.25+3.7+0.56	65	40	84	85
Desm+Pyrazon+Etho	0.5+3.7+0.56	79	58	92	82
Desm+Pyrazon+Etho	1+3.7+0.56	90	71	92	83
Desm+Pyrazon+Dalapon	0.25+3.7+1	40	16	53	55
Desm+Pyrazon+Dalapon	0.5+3.7+1	66	30	71	68
Desm+Pyrazon+Dalapon	1+3.7+1	71	35	71	65
Desm+Pyra+Dash+28%N	0.25+3.7+0.25G+1G	21	16	62	24
Desm+Pyra+Dash+28%N	0.5+3.7+0.25G+1G	66	46	73	43
Desm+Pyra+Dash+28%N	1+3.7+0.25G+1G	68	55	75	50
Clopyralid	0.06	0	0	0	87
Clopyralid	0.125	18	0	0	96
Clopyralid	0.19	19	0	0	99
Clopyralid+OC	0.06+0.25G	13	0	0	90
Clopyralid+OC	0.125+0.25G	26	0	0	99
Clopyralid+OC+28%N	0.06+0.25G+1G	20	0	0	96
Clopyralid+OC+28%N	0.125+0.25G+1G	30	0	0	99
Desmedipham+Trigger	0.25+.03125G	8	5	26	13
Desmedipham+Trigger	0.5+.03125G	18	13	28	9
Desmedipham+Trigger	1+.03125G	60	38	60	16
Desmedipham+Nu-Film-P	0.25+0.048G	24	6	27	0
Desmedipham+Nu-Film-P	0.5+0.048G	53	28	53	23
Desmedipham+Nu-Film-P	1+0.048G	74	45	60	39
HIGH MEAN		92	78	92	99
LOW MEAN		0	0	0	0
EXP MEAN		43	29	52	47
C.V. %		32	34	20	22
LSD 5%		19	14	14	14
LSD 1%		26	18	19	19
# OF REPS		4	4	4	4

* OC = Agway Booster Plus E
* Sun-It = Agsco sunflower methyl ester
* 28%N = 28% N solution containing urea and NH_4NO_3
* Dash = BASF surfactant

Summary

Sugarbeet populations were insufficient for evaluation. Trigger did not affect test species control from desmedipham. Ethofumesate increased test species control from desmedipham more than dalapon. Ethofumesate at 1.1 lb/A increased or tended to increase control from desmedipham more than ethofumesate at 0.56 lb/A and 0.56 lb/A generally was more effective than 0.19 lb/A. Desmedipham+pyrazon gave control similar to desmedipham alone. BAS-090025 increased or tended to increase control from desmedipham+pyrazon more than Dash or Sun-It. Desmedipham+pyrazon+ethofumesate tended to give greater control than desmedipham+pyrazon+BAS-090025.

Wild oats control in Wheat, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Treatments (S1) were applied to 2-to 3-leaf wheat and wild oats on May 13 with 45F, 40% RH, no wind, and a clear sky. Treatments (S2) were applied to 5-leaf wheat and wild oats on May 26 with 72F, 65% RH, and 8 mph wind. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 22 and wild oats density exceeded 10 plants/sq. ft.

Treatment	Rate (oz/A)	Wheat injury (%)	Wild Oat control (%)
Diclofop(S1)	12	0	45
Diclofop(S1)	16	0	79
Diclofop+PO(S1)	12+0.125G	1	90
Diclofop+MS(S1)	12+0.125G	3	89
AC222293(S1)	4	1	87
AC222293(S1)	5	4	90
AC222293(S1)	6	4	93
AC222293+PO(S1)	4+0.125G	0	96
AC222293+MS(S1)	4+0.125G	3	98
Diclofop(S2)	16	0	58
Diclofop+PO(S2)	16+0.125G	0	69
Diclofop+MS(S2)	16+0.125G	4	75
AC222293(S2)	4	3	94
AC222293(S2)	6	9	94
AC222293(S2)	8	6	98
AC222293+PO(S2)	4+0.125G	5	92
AC222293+MS(S2)	4+0.125G	5	95
Difenzoquat(S2)	10	5	94
Difenzoquat(S2)	12	6	98
HOE-7113-04H(S2)	2.6	3	90
HOE-7125-01H(S2)	11	1	87
Untreated	0	0	0
HIGH MEAN		9	98
LOW MEAN		0	0
EXP MEAN		3	82
C.V. %		142	11
LSD 5%		NS	13
LSD 1%		NS	17
# OF REPS		4	4

Summary

Adjuvants enhanced or tended to enhance wild oats control with diclofop and AC-222293 applied at the 2-leaf stage. AC-222293, difenzoquat, HOE-7113-04H, and HOE-7125-01H all gave 87% or more wild oats control without important injury to wheat. At the 4-leaf stage adjuvants did not enhance wild oats control with AC-222293, but tended to enhance diclofop. Grain yield was not obtained because the drought stress caused variable stands and limited growth.

Wild oats control in wheat, Langdon 1988. 'Coteau' Hard Red spring wheat was seeded on May 6. S1 treatments were to 3-leaf wheat 2-leaf wild oats and green foxtail on May 26. S2 treatments were to 4.5-leaf wheat and wild oats on June 1. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type sprayer to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Entire plot area was treated with cholosulforon + 2,4-D in early June. Evaluation was on July 20

Treatment	Rate (oz/A)	Wheat injury (%)	Yield (bu/A)	Twt (lb/bu)	Wioa (% control)	Grft (% control)
Diclofop(S1)	12	0	26.4	59.0	76	88
Diclofop(S1)	16	0	30.1	59.5	81	86
Diclofop+PO(S1)	12+0.125G	0	23.6	60.8	85	89
Diclofop+MS(S1)	12+0.125G	0	25.8	60.0	83	85
AC 222,293(S1)	4	0	21.7	60.4	95	30
AC 222,293(S1)	5	0	25.5	62.4	96	33
AC 222,293(S1)	6	1	22.2	60.6	97	39
AC 222,293+PO(S1)	4+0.125G	0	28.7	59.5	98	25
AC 222,293+MS(S1)	4+0.125G	1	25.2	58.8	98	46
Diclofop(S2)	16	0	22.2	58.4	61	69
Diclofop+PO(S2)	16+0.125G	1	22.2	58.3	66	71
Diclofop+MS(S2)	16+0.125G	0	23.6	58.3	78	75
AC 222,293(S2)	4	0	22.7	58.6	88	34
AC 222,293(S2)	6	3	23.9	58.6	91	35
AC 222,293(S2)	8	0	26.6	59.1	95	48
AC 222,293+PO(S2)	4+0.125G	3	25.3	57.6	90	46
AC 222,293+MS(S2)	4+0.125G	0	24.7	58.1	88	58
Difenzoquat+Feno&2,4-D&MCPA(S2)	5+5.5	5	20.0	58.6	88	70
Difenzoquat(S2)	12	13	20.2	58.3	98	5
HOE-7113-04H(S2)	2.6	0	25.2	58.3	67	91
HOE-7125-01H(S2)	11	0	23.7	58.9	72	92
Untreated	0	0	22.5	59.9	0	0
HIGH MEAN		13	30.1	62.4	98	92
LOW MEAN		0	20.0	57.6	0	0
EXP MEAN		1	24.2	59.2	81	55
C.V. %		226	20.6	2.6	12	35
LSD 5%		4	NS	2.1	14	27
LSD 1%		5	NS	2.8	19	36
# OF REPS		4	4	4	4	4

[a] G in the rate column is for gallons per acre.

Summary

Wild oats control with diclofop was enhanced by methylated seed oil (MS=Sun-it) at the second application and tended to be enhanced by both petroleum oil (PO-11N+17% Atplus 300F) and MS at the first application. Green foxtail control with diclofop was not enhanced by adjuvants. HOE-7113-04H(Puma) and HOE-7125--1H(tiller) gave greater than 90% control of green foxtail. The apparent green foxtail control with AC 222,293 indicates a possible interaction with the chlorsulforon and 2,4-D which was applied for broadleaf weed control. Adjuvants did not enhance wild oats control with AC 222,293. However MS tended to enhance green foxtail control with AC 222,293. Yield was not increased by weed control because wild oats infestation was sparce and the foxtail was partly controlled by the chlorsulfuron applied over the entire plot area.

Wild oats control in Wheat, Minot 1988. 'Stoa' Hard Red Wheat was seeded on April 28. Treatments (S1) were applied to 4-leaf wheat and 2- to 4-leaf wild oats and green foxtail on May 25 with 80 F, and 10 mph wind at application. Treatments (S2) were applied to 5-leaf wheat, 3.5- to 5.5-leaf wild oats, and 3 to 4 inch tall common lambsquarter on June 2 with 70 F, 3 mph wind, and cloudy sky at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 19. Green foxtail density was variable and other weeds exceeded 3 plants/sq. ft.

Treatment	Rate	Wht inj	Wioa	Grft	Colq	Yield	TestWt
	(oz/A)	(%)	---(% control)--			(bu/A)	(lb/bu)
Diclofop(S1)	12	0	45	61	0	11.3	56.5
Diclofop(S1)	16	0	63	79	0	10.6	58.0
Diclofop+PO(S1)	12+0.125G	0	66	77	0	10.0	56.4
Diclofop+MS(S1)	12+0.125G	0	68	71	0	11.4	57.6
AC 222,293(S1)	4	1	92	11	0	13.1	57.6
AC 222,293(S1)	5	2	94	10	0	10.9	55.7
AC 222,293(S1)	6	1	94	0	4	12.2	57.2
AC 222,293+PO(S1)	4+0.125G	1	97	10	13	13.5	57.2
AC 222,293+MS(S1)	4+0.125G	0	97	0	0	11.3	56.5
Diclofop(S2)	16	0	43	60	0	10.1	57.8
Diclofop+PO(S2)	16+0.125G	1	54	66	0	9.8	57.8
Diclofop+MS(S2)	16+0.125G	0	56	74	0	8.9	57.5
AC222293(S2)	4	1	80	0	9	8.8	57.4
AC222293(S2)	6	2	89	0	0	9.8	55.5
AC222293(S2)	8	6	96	14	23	11.9	56.8
AC222293+PO(S2)	4+0.125G	1	80	0	0	8.2	55.1
AC222293+MS(S2)	4+0.125G	1	85	0	13	9.2	56.9
Difenzoquat(S2)	10	20	92	0	0	9.0	56.0
Difenzoquat(S2)	12	38	93	0	0	9.2	57.3
HOE-7113-04H(S2)	2.6	0	51	65	0	9.2	56.9
HOE-7125-01H(S2)	11	0	14	53	99	9.3	59.8
Untreated	0	0	0	0	0	7.3	56.3
HIGH MEAN		38	97	79	99	13.5	59.8
LOW MEAN		0	0	0	0	7.3	55.1
EXP MEAN		3	70	30	7	10.2	57.0
C.V. %		124	17	46	80	24.3	2.7
LSD 5%		6	17	19	8	NS	NS
LSD 1%		8	22	26	11	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

Difenzoquat caused visiable injury to the Stoa wheat in this experiment. Petroleum oil with 17% Atplus emulsifier (PO) and methylated seed oil (MS) tended to enhance wild oats and green foxtail control from diclofop. Wild oats control with AC 222,293 tended to be enhanced by both adjuvants with the (S1) applications and only with MS at the (S2) application. Yields were low because of the drought, but generally related to wild oats control.

Wild oats control in wheat, Williston 1986. 'Len' Hard Red Spring wheat was seeded on April 29. Treatments (S1) were applied to 2- to 3-leaf wheat and wild oats, 2- to 3-leaf green foxtail and broadleaf weeds less than 2 inch tall on May 19 with 45 F, 55% relative humidity, clear sky, and a 2 mph wind at treatment and a high of 75 F. Treatments (S2) were to 4-leaf wheat and wild oats, 2- to 6 -leaf green foxtail, and broadleaf weed less than 2 inch tall on May 267 with 72 F, 30% relative humidity, and clear sky at treatment and a high of 92 F. Treatments were applied with a plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block with four replications Evaluation was on July 12.

Treatment	Rate	Wioa	Grft	Ruth	KOCZ	Colq	Inj	Wheat Yield	TW
	(oz/A)	------(% control)-------					(%)	(bu/A)	(lb/bu)
Diclofop(S1)	12	40	49	0	0	0	0	3.6	57.8
Diclofop (S1)	16	49	61	0	0	0	0	3.9	58.6
Diclofop+PO(S1)	12+0.125G	82	81	0	0	0	0	4.3	58.4
Diclofop+MS(S1)	12+0.125G	86	88	0	0	0	0	3.4	58.7
AC 222,293(S1)	4	97	0	36	55	27	0	4.8	58.6
AC 222,293(S1)	5	96	5	36	36	7	0	4.6	59.5
AC 222,293(S1)	6	99	10	61	75	33	0	4.9	60.1
AC 222,293+PO(S1)	4+0.125G	99	0	60	49	7	0	4.9	60.0
AC 222,293+MS(S1)	4+0.125G	99	36	59	68	3	4	5.3	60.1
Diclofop(S2)	16	30	51	0	0	0	0	3.3	59.0
Diclofop+PO(S2)	16+0.125G	45	74	0	0	0	0	3.6	58.3
Diclofop+MS(S2)	16+0.125G	39	65	0	0	0	0	3.9	68.3
AC 222,293(S2)	4	97	8	0	0	5	0	3.0	58.7
AC 222,293(S2)	6	97	0	23	25	17	0	4.2	59.2
AC 222,293(S2)	8	98	0	38	29	0	0	4.3	59.4
AC 222,293+PO(S2)	4+0.125G	99	13	24	20	33	3	4.3	59.6
AC 222,293+MS(S2)	4+0.125G	97	15	24	5	10	0	4.3	59.2
Difenzoquat(S2)	10	82	10	0	0	22	13	2.7	57.6
Difenzoquat(S2)	12	91	0	0	0	0	10	2.4	57.9
HOE-7113-04H(S2)	2.6	80	95	0	0	33	0	4.2	59.0
HOE-7125-01H(S2)	11	5	89	54	69	96	0	3.7	60.0
Untreated	0	0	0	0	0	0	0	3.5	58.8
HIGH MEAN		99	95	61	75	96	13	5.3	60.1
LOW MEAN		0	0	0	0	0	0	2.4	57.6
EXP MEAN		73	34	19	20	13	1	3.9	58.9
C.V. %		26	49	51	120	127	289	26.3	
LSD 5%		26	23	14	33	28	5	1.5	
LSD 1%		35	31	18	44	37	7	NS	
# OF REPS		4	4	4	4	4	4	4	1

Summary

Len wheat was injured by difenzoquat which tended to reduce yield. However, yield was low regardless of treatments because of drought and high temperature. Wild oats and green foxtail control with diclofop was enhanced by petroleum oil (PO) and methylated seed oil (MS) adjuvants. AC 222,293 gave 95% or more wild oats control regardless of rates or adjuvants. HOE-7113 gave 80% or more wild oats and green foxtail control and HOE-7125 green foxtail control.

Antagonism of wild oats control, Williston-1988. 'Len' Hard Red Spring wheat was seeded on April 29. All treatments, except difenzoquat, were applied to 3.5-leaf wheat and wild oats, 3-to 5-leaf green foxtail, and less than 2 inch tall Russian thistle, kochia, and common lambsquarters on May 24 with 62 F, 48% RH, clear sky and a 2 mph wind at treatment and a high of 89 F. Difenzoquat treatments were to 4-leaf wheat, 3.5-leaf wild oats, 3-to 6-leaf green foxtail and broadleaf weeds less than 2 inch tall on May 26 with 65 F, 39% RH, cloudy sky, and 5 mph wind at treatment and a high of 85 F. Treatments were applied in 8.5 gpa at 35 psi to a 8 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 12. Infestation of wild oats, kochia, and common lambsquarters was sparse and other weed moderate. Harvest for yield was from 80 sq ft on July 25.

Treatment	Rate	Wioa	Gf	Ruth	KOCZ	Colq	Inj	Wheat Yld	TW
	(oz/A)	------(% control)-----					(%)	bu/A	lb/bu
DPX-R9674+X-77	0.45+0.25%	0	21	97	99	99	0	5.1	60
DPX-L5300+X-77	0.25+0.25%	0	28	94	99	99	0	4.2	60
DPX-M6316+X-77	0.375+0.25%	0	9	98	88	99	0	4.7	60
HOE-7125-01H	11	8	65	50	35	72	0	3.9	59
HOE-7125-01H+DPX-R9674	11+0.45	3	55	98	99	99	0	4.8	61
HOE-7125-01H+DPX-L5300	11+0.25	0	69	84	98	98	0	4.6	60
HOE-7125-01H+DPX-M6316	11+0.25	4	68	97	73	98	0	4.3	61
HOE-7125-01H+Metsulfuron	11+0.1	29	48	99	99	99	0	4.4	60
HOE-7125-01H+Chlorsulfuron	11+0.25	4	53	97	99	99	0	3.9	60
HOE-7113-04H	2.6	56	97	0	0	0	0	2.8	57
HOE-7113-04H+DPX-R9674	2.6+0.45	15	70	98	99	99	0	4.2	61
HOE-7113-04H+DPX-L5300	2.6+0.25	15	60	95	99	99	0	4.2	60
HOE-7113-04H+DPX-M6316	2.6+0.25	24	88	96	85	97	0	4.0	60
HOE-7113-04H+Metsulfuron	2.6+0.1	16	84	95	99	99	0	4.9	60
HOE-7113-04H+Chlorsulfuron	2.6+0.25	31	40	93	97	98	0	4.2	61
Diclofop+PO	12+0.125G	65	91	18	13	23	0	3.6	58
Diclofop+DPX-R9674+PO	12+0.45+0.125G	6	30	94	99	99	0	4.4	61
Diclofop+DPX-L5300+PO	12+0.25+0.125G	0	26	92	98	99	0	4.2	61
Diclofop+DPX-M6316+PO	12+0.375+0.125G	40	39	97	98	99	0	4.5	60
Diclofop+DPX-R9674+MS	12+0.45+0.125G	40	25	97	98	99	0	4.5	61
Diclofop+DPX-L5300+MS	12+0.25+0.125G	13	28	78	97	99	0	4.5	60
Diclofop+DPX-M6316+MS	12+0.375+0.125G	15	41	97	96	98	0	3.8	61
AC 222,293	6	96	13	63	35	39	0	4.4	59
AC 222,293+DPX-R9674	6+0.45	98	16	81	97	98	0	4.6	60
AC 222,293+DPX-L5300	6+0.25	99	23	73	97	97	0	4.9	59
AC 222,293+DPX-M6316	6+0.25	99	35	76	94	55	0	4.7	60
Difenzoquat	12	99	0	0	0	0	38	1.4	60
Difenzoquat+DPX-R9674	12+0.45	85	0	97	92	98	51	2.6	60
Difenzoquat+DPX-L5300	12+0.25	71	0	81	97	97	44	2.7	58
Difenzoquat+DPX-M6316	12+0.25	84	10	94	72	67	35	2.9	59
Untreated	0	0	0	0	0	0	0	2.5	56
C.V. %		50	43	15	17	19	83	20.3	
LSD 5%		25	24	16	19	22	6	1.2	

Summary

Wild oats and green foxtail control with HOE-7113-04H, and diclofop was or tended to be reduced when any of the sulfonylurea broadleaf controlherbicides were in the spray mixture. Wild oats control with difenzoquat and green foxtail with HOE-7125-01H also tended to be reduced by the sulfonylureas. Sulfonylurea control of broadleaf weeds generally was not influenced by wild oats control herbicides, except for Russian thistle control with AC 222,293, and difenzoquat with DPX-M6316 for common lambsquarters. Wheat yields were low because of the drought.

Antagonism of Wild oats control, Minot 1988. 'Stoa' Hard Red Spring wheat was seeded on April 28. Treatments were applied to 3.5- to 4-leaf wheat, 2- to 4-leaf wild oats, and 2- to 5-leaf green foxtail on May 25 with 80 F, 10 mph wind, and clear sky at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 19. All weeds at about 1 plant per sq ft.

Treatment	Rate	Wht inj	Wioa	Gf	Rrpw	Colq	YLD	DKG	TW
	(oz/A)	(%)	---(% control)---				(bu/A)	(%)	(lb/bu)
DPX-R9674+X-77	0.45+0.25%	0	6	0	97	98	9.8	3.8	58.8
DPX-L5300+X-77	0.25+0.25%	0	35	14	36	99	11.6	2.4	57.5
DPX-M6316+X-77	0.375+0.25%	0	0	0	97	94	9.5	5.0	58.0
HOE-7125-01H	11	5	46	91	91	99	9.4	3.5	58.5
HOE-7125-01H+DPX-R9674	11+0.45	0	18	62	95	99	8.9	5.7	58.2
HOE-7125-01H+DPX-L5300	11+0.25	1	20	62	96	99	8.5	5.9	58.6
HOE-7125-01H+DPX-M6316	11+0.25	5	28	89	87	99	9.0	6.2	58.5
HOE-7125-01H+Metsulfuron	11+0.1	0	26	68	98	99	12.0	2.9	59.5
HOE-7125-01H+Chlorsulfuron	11+0.25	4	34	30	94	99	10.6	3.9	58.6
HOE-7113-04H	2.6	1	81	94	0	0	9.3	1.3	56.0
HOE-7113-04H+DPX-R9674	2.6+0.45	0	50	66	99	99	13.0	3.0	58.9
HOE-7113-04H+DPX-L5300	2.6+0.25	3	46	63	8	99	10.4	3.0	58.1
HOE-7113-04H+DPX-M6316	2.6+0.25	3	60	86	96	98	11.5	2.7	59.4
HOE-7113-04H+Metsulfuron	2.6+0.1	1	40	74	96	99	12.3	2.6	59.0
HOE-7113-04H+Chlorsulfuron	2.6+0.25	0	48	51	99	98	12.7	2.8	59.7
Diclofop+PO	12+0.125G	3	62	68	0	5	9.1	2.7	56.9
Diclofop+DPX-R9674+PO	12+0.45+0.125G	3	33	45	92	99	11.6	2.5	59.8
Diclofop+DPX-L5300+PO	12+0.25+0.125G	0	45	36	40	99	11.5	2.9	59.5
Diclofop+DPX-M6316+PO	12+0.375+0.125G	0	45	38	96	96	10.0	3.4	59.1
Diclofop+DPX-R9674+MS	12+0.45+0.125G	0	51	51	94	99	11.0	1.6	59.0
Diclofop+DPX-L5300+MS	12+0.25+0.125G	0	31	38	13	99	12.0	2.7	60.0
Diclofop+DPX-M6316+MS	12+0.375+0.125G	3	51	43	91	99	9.9	3.1	59.9
AC 222,293	6	0	96	6	20	6	12.3	.5	57.2
AC 222,293+DPX-R9674	6+0.45	0	90	8	90	78	11.8	.9	58.9
AC 222,293+DPX-L5300	6+0.25	0	96	8	0	61	11.7	1.2	58.3
AC 222,293+DPX-M6316	6+0.25	0	95	10	95	74	12.4	1.0	59.2
Difenzoquat	12	4	87	8	0	0	10.6	2.1	57.0
Difenzoquat+DPX-R9674	12+0.45	6	63	5	99	98	12.4	2.5	59.3
Difenzoquat+DPX-L5300	12+0.25	3	78	3	0	99	10.3	1.6	58.7
Difenzoquat+DPX-M6316	12+0.25	3	77	4	84	90	10.7	3.3	59.4
Untreated	0	0	0	0	0	0	9.3	1.8	58.7
C.V. %		245	30	31	16	6	23.9	44.4	1.6
LSD 5%		NS	21	17	17	7	NS	1.8	1.3
# OF REPS		4	4	4	3	4	4	4	4

a Wht=Wheat, inj=injury, Wioa=Wildoats, Gf=Green foxtail, Colq=Common lambsquarter, YLD=Yield, DKG=Dockage, TW=Test Weight;

Summary

All sulfonylurea herbicides generally antagonized wild oats and foxtail control from HOE-7126-01H(Tiller), HOE-7113-04H(Puma), and diclofop. DPX-M6316 generally was the least antagonistic of sulfonylurea, especially when considering antogonism of green foxtail. Wild oats control from difenzoquat tended to be reduced by the sulfonylurea. Common lambsquarters control was less when sulfonylurea herbicides were applied with AC 222,293 than when alone or with other wild oats control herbicides. DPX-L5300 did not adequately control redroot pigweed.

Antagonism of wild oats control, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inches deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Treatments were applied to 4-leaf wild oats and wheat on May 24 with 72 F, 50% RH, and a 3 mph wind. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on June 22 and 27 and wild oats exceeded 10 plants/sq. ft.. Wheat yield or wheat injury ratings were not obtained because drought stress masked any crop injury and what stand was variable.

Treatment	Rate	-June 22- Wild Oats	-June 27- Wild Oats
	(oz/A)	-----(% control)-----	
DPX-R9674+X-77	0.45+0.25%	4	1
DPX-L5300+X-77	0.25+0.25%	10	20
DPX-M6316+X-77	0.375+0.25%	4	0
HOE-7125-01H	11	60	44
HOE-7125-01H+DPX-R9674	11+0.45	23	14
HOE-7125-01H+DPX-L5300	11+0.25	29	18
HOE-7125-01H+DPX-M6316	11+0.25	54	43
HOE-7113-04H	2.6	85	79
HOE-7113-04H+DPX-R9674	2.6+0.45	69	61
HOE-7113-04H+DPX-L5300	2.6+0.25	64	50
HOE-7113-04H+DPX-M6316	2.6+0.25	76	70
Diclofop+PO	12+0.125G	30	20
Diclofop+DPX-R9674+PO	12+0.45+0.125G	20	21
Diclofop+DPX-L5300+PO	12+0.25+0.125G	24	15
Diclofop+DPX-M6316+PO	12+0.375+0.125G	38	29
Diclofop+DPX-R9674+MS	12+0.45+0.125G	28	16
Diclofop+DPX-L5300+MS	12+0.25+0.125G	28	16
Diclofop+DPX-M6316+MS	12+0.375+0.125G	40	13
AC222293	6	89	81
AC 222,293+DPX-R9674	6+0.45	89	79
AC 222,293+DPX-L5300	6+0.25	87	77
AC 222,293+DPX-M6316	6+0.25	85	73
Difenzoquat	12	95	84
Difenzoquat+DPX-R9674	12+0.45	94	83
Difenzoquat+DPX-L5300	12+0.25	93	84
Difenzoquat+DPX-M6316	12+0.25	96	88
C.V. %		19	25
LSD 5%		14	16
# OF REPS		4	4

Summary

Wild oats control with HOE-7125-01H and HOE-7113-04H was antagonized by DPX-R9674 and DPX-L5300 and only tended to be antagonized by DPX-M6316. Wild oats control with AC 222,293 or difenzoquat was not antogonized by the three DPX compounds. Diclofop gave too little wild oats control for detection of antagonism from the DPX compounds in the experiment.

AC 222,293 plus bromoxynil and surfactant, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Two experiments were conducted, one with all treatments and one half the bromoxynil rate of that used in experiment 2. Treatments were applied to 4-leaf wheat and wild oats on May 23 with 72 F, 70 RH, and 3 mph wind at application for the complete experiment. The second experiment was to 5-leaf wheat and wild oats on May 26 with 70 F, 65% RH and 8 mph wind. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation of the complete experiment was on June 27 and experiment 2 on June 22. Wild oats density exceeded 3 plants/sq ft in both experiments and wheat was drought stressed and variable.

Treatment	Rate	Brox rate Exp. 2	Wild Oats control	Exp. 2 Wht inj	Exp. 2 Wild Oats control
	(oz/A)			(%)	
AC 222,293	5		78	0	90
AC 222,293+X-77	5+0.25%		84	1	98
Bromoxynil	2	4	3	0	0
AC 222,293+Brox	5+1	2	73	0	90
AC 222,293+Brox	5+1.5	3	73	3	90
AC 222,293+Brox	5+2	4	67	1	96
AC 222,293+Brox+X-77	5+1+0.25%	2	81	0	94
AC 222,293+Brox+X-77	5+1.5+0.25%	3	77	1	93
AC 222,293+Brox+X-77	5+2+0.25%	4	70	1	94
AC 222,293+Brox+X-77	5+1+1%	2	75	0	96
AC 222,293+Brox+X-77	5+1.5+1%	3	72	3	95
AC 222,293+Brox+X-77	5+2+1%	4	71	0	96
AC 222,293+24-Ddea	5+8		44	-	-
AC 222,293+24-Ddea+NaHCO3	5+8+24		58	-	-
AC293+24-Ddea+NaHCO3+AMS	5+8+24+32		48	-	-
AC293+24-Ddea+AMS	5+8+32		31	-	-
AC 222,293+NaHCO3	5+24		74	-	-
AC 222,293+AMS	5+32		75	-	-
AC 222,293+24-Dbee	5+8		68	-	-
Untreated	0		1	-	-
C.V. %			10	271	4
LSD 5%			9	NS	3
# OF REPS			4	4	4

Summary

Bromoxyonil (Buctril) did not antagonize wild oats control with AC 222,293 in either experiment. However wild oats control tended to decrease as bromoxyonil rate increased regardless of surfactant in the complete experiment. Wild oats control was more then 90% with all treatment in experiment 2. Wild oats control with AC-222293 was antagonized by 2,4-D(dea), but not by sodium bicarbonate, ammonium sulfate(AMS), or 2,4-D butoxyethyl ester(bee). Sodium bicarbonate and/or AMS did not overcome the antogonism caused by 2,4-Ddea.

Diclofop plus adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Treatments were applied to 4-leaf wheat and wild oats on May 23 with 72 F, 70% RH, and a 3 mph wind at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluations were on June 27. Wheat injury was not evaluated because drought stress masked any treatment effects and what stand was variable.

Treatment	Rate (oz/A)	Wild Oats control (%)
Diclofop	8	9
Diclofop	10	10
Diclofop	12	36
Diclofop	16	43
Diclofop+PO	8+0.12G	30
Diclofop+PO	10+0.12G	48
Diclofop+PO	12+0.12G	50
Diclofop+PO	16+0.12G	55
Diclofop+MS	8+0.12G	33
Diclofop+MS	10+0.12G	39
Diclofop+MS	12+0.12G	51
Diclofop+MS	16+0.12G	66
Diclofop+AG-2	8+0.12G	44
Diclofop+AG-2	10+0.12G	33
Diclofop+AG-2	12+0.12G	45
Diclofop+AG-2	16+0.12G	53
Untreated	0	0
HIGH MEAN		66
LOW MEAN		0
EXP MEAN		38
C.V. %		34
LSD 5%		19
LSD 1%		25
# OF REPS		4

Summary

The three adjuvants all enhanced wild oats control with diclofop. The petroleum oil with 17% Atplus (PO) was simuliar to the methylated seed oil(MS=Sun-it). AG-2 adjuvant caused diclofop to give simuliar wild oats control at all diclofop rates. Averaged of one diclofop rates wild oats control was 24, 46, 47, and 44 % with none, petroleum oil, methylated seed oil, and AG-2.

Wild oats and broadleaf herbicide combinations, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Treatments were applied to 4-leaf wheat and wild oats on May 24 with 70 F, 50% RH and 3 mph wind at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on June 22. Wild oats density exceeded 3 plants/sq ft and wheat stand was variable and drought stressed.

Treatment	Rate (oz/A)	Wild Oats (% control)
Diclofop	12	34
Diclofop+Brox&MCPA	12+17.5	26
Diclofop+Acif	12+4	25
Diclofop+Fluroxypyr	12+2	35
Diclofop+BAS514	12+3	36
AC222293	5	87
AC222293+Clopyralid	5+1.5	89
AC222293+Clpy&2=4-D	5+9.5	73
AC222293+Fluroxypyr	5+2	88
AC222293+Acif	5+4	61
AC222293+BAS514	5+3	73
Difenzoquat	10	69
Difenzoquat+Clopyralid	10+1.5	87
Difenzoquat+Clpy&2=4-D	10+9.5	80
Difenzoquat+Acif	10+4	76
Difenzoquat+BAS514	10+3	76
Difenzoquat+Fluroxypyr	10+2	86
Untreated	0	0
C.V. %		20
LSD 5%		17
LSD 1%		23
# OF REPS		4

Summary

None of the treatment cause any visable injury to wheat. Wheat was not harvested for grain yield because of drought stress and a variable stand. Wild oat control with diclofop was low which probably masked any possible antagonism from the broadleaf control herbicides. AC 222,293 was or tended to be antagonized by clopyralid plus 2,4-D, aciflurofen, and BAS-514; but not by clopyralid alone or fluroxypyr. Wild oats control with difenzoquat was simuliar in mixture with all broadleaf control herbicides, but tended to be higher then when difenzoquat was applied alone. The low control of wild oats with difenzoquat alone may have been a chance occurance because of an only 40% value in replication three.

Antagonism of diclofop by various compounds, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. Treatments were applied to 4-leaf wheat and wild oats on May 20 with 65 F, 60% RH, and 15 mph wind at application. 2,4-Ddea was diethanolamine and 2,4-Dbee was butoxyethyl ester. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on June 27. Wild oats density exceeded 2 plants/sq ft and wheat stand was variable because of drought stress.

Treatment	Rate (oz/A)	Wild oats (% control)	Wht inj (%)
Diclofop	12	53	0
Diclofop+28%N	12+1G	58	0
Diclofop+24-Ddea	12+8	14	0
Diclofop+24-Ddea+28%N	12+8+1G	3	0
Diclofop+24-Dbee	12+8	1	0
Diclofop+24-Dbee+28%N	12+8+1G	9	0
Diclofop+NaHCO3	12+16	39	0
Diclofop+NaHCO3+28%N	12+16+1G	47	0
Diclofop+24-Ddea+NaHCO3	12+8+16	18	0
Dicl+24-Ddea+NaHCO3+28%N	12+8+16+1G	11	0
Dicl+24-Dbee+NaHCO3	12+8+16	1	0
Dicl+24-Dbee+NaHCO3+28%N	12+8+16+1G	6	0
Untreated	0	0	0
HIGH MEAN		58	0
LOW MEAN		0	0
EXP MEAN		20	0
C.V. %		37	0
LSD 5%		11	NS
LSD 1%		14	NS
# OF REPS		4	4

Summary

Wild oats control level was low reducing the potential for antagonism by the various compounds. 2,4-Ddea or 2,4-Dbee antogonism of diclofop was not overcome by the 28% N fertilizer in the spray mixture. Sodium bicarbonate antagonized wild oats control with diclofop and the antagonism was overcome by 28 % N fertilizer. Sodium bicarbonate did not influence the antagonism caused by 2,4-Ddea or bee.

Evaluation of herbicides for wild oats control, Fargo 1988. 'Wheaton" Hard Red Spring wheat was seeded 2.5 inch deep in 7 inch spaced rows on April 12. Emergence of wheat was poor because of dry soil conditions. The 2-3 lf treatments were applied to 3-leaf wild oats and wheat on May 16 with 55 F, 40% RH, no wind and clear sky at application. The 5-leaf treatments were applied on May 26 with 70 F, 65% RH, and 5 mph wind. All treatments were applied in 8.5 gpa at 34 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was June 27. Wild oats density exceeded 5 plants/sq ft and wheat stand was variable and drought stressed which prevented accurate evaluation.

Treatment	Stage	Rate (oz/A)	Wild Oats (% control)
Diclofop+COC	(2-3lf)	12+0.12G	40
Diclofop&Brox&MCPA	(2-3lf)	17.4	45
HOE-7125-01H	(2-3lf)	11	77
HOE-7113-04H	(2-3lf)	2.6	97
AC 222,293	(2-3lf)	6	96
RH-0898+PO	(2-3lf)	1.2+0.12G	41
RH-0898+PO	(2-3lf)	1.2+0.25G	73
RH-0898+MS	(2-3lf)	1.2+0.12G	69
RH-0898+MS	(2-3lf)	1.2+0.25G	89
RH-0898+AG-2	(2-3lf)	1.2+0.12G	30
RH-0898+PO	(2-3lf)	1.6+0.12G	51
RH-0898+MS	(2-3lf)	1.6+0.12G	78
HOE-7125-01H	(5lf)	11	48
HOE-7113-04H	(5lf)	2.6	61
Feno&24-D&MCPA	(5lf)	10.6	45
Feno&24-D&MCPA	(5lf)	12.5	61
Difenzoquat	(5lf)	10	92
Untreated		0	0
C.V. %			13
LSD 5%			12
LSD 1%			15
# OF REPS			4

Summary

HOE-7113-04H at 2.6 oz/A gave greater wild oats control then HOE 7125-01H at 11 oz/A at both stages of application. The methylated seed oil (MS-Sun-it) enhanced wild oats control with RH-0898 more than the petroleum oil adjuvant (PO-Atplus 411F).

Adjuvants with AC 222,293, Williston 1988. 'Len' Hard Red Spring wheat was seeded on April 29. Treatments were applied to 3.5-leaf wheat, 3-leaf wild oats, 2- to 5-leaf green foxtail, and less than 2 inch tall broadleaf weeds on May 23 with 70 F, 13% RH, clear sky, and a 6 mph wind. The herbicides were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on July 13. Wild oats, kochia, and common lambsquarters infestations were sparce, green foxtail moderate, and Russian thistle dense.

Treatment	Rate	Wioa	Grft	Ruth	KOCZ	Colq	inj	Tw	Yield
	(oz/A)	-------(% control)-------					(%)	(lb)	(bu)
AC 222,293	5	94	21	58	67	43	1	60.9	5.4
AC 222,293+LI-700	5+0.25G	94	13	60	38	39	3	60.5	5.0
AC 222,293+MS	5+0.25G	94	0	56	0	0	3	60.6	5.1
AC 222,293+AG-2	5+0.25G	94	6	50	0	0	5	59.8	4.3
AC 222,293+PO	5+0.25G	94	0	56	38	5	1	60.3	4.9
AC 222,293+2,4-Ddea	5+8	88	5	89	85	95	1	61.1	5.2
AC 222,293+2,4-Ddea+NaHCO3	5+8+16	89	15	50	83	93	0	60.5	5.7
AC 222,293+2,4-Ddea+NaHCO3+AMS	5+8+16+32	88	8	91	70	89	0	60.9	5.3
AC 222,293+2,4-Ddea AMS	5+8+32	64	0	80	90	95	0	60.7	6.0
AC 222,293+NaHCO3	5+16	95	0	69	63	76	1	60.5	5.2
AC 222,293+AMS	5+32	95	0	63	48	44	3	60.2	5.3
AC 222,293+AMS+NaHCO3	5+32+16	95	0	61	68	78	3	60.3	5.9
UNTREATED	0	0	0	0	0	0	0	60.4	5.4
HIGH MEAN		95	21	91	90	95	5	61.1	6.0
LOW MEAN		0	0	0	0	0	0	59.8	4.3
EXP MEAN		83	5	59	50	50	2	60.5	5.3
C.V. %		12	11	30	47	32	221		19.7
LSD 5%		15	NS	26	51	23	NS		NS
LSD 1%		20	NS	34	NS	31	NS		NS
# OF REPS		4	4	4	2	4	4	1	4

Summary

2,4-D + ammonium sulfate (AMS) reduced and 2,4-D alone or with sodium bicarbonate and ammonium sulfate tended to reduce wild oats control with AC 222, 293. Thus, the sodium bicarbonate overcame the antagonism of the ammonium sulfate with 2,4-D. Sodium bicarbonate with 2,4-D reduced Russian thistle control, but ammonium sulfate overcame the antagonism. 2,4-D with AC 222, 293 enhanced kochia and common lambsquarter control, regardless of other salts present.

Wild oats control evaluation, Langdon 1988. 'Coteau' Hard Red Spring wheat was seeded on May 6. The first treatments (2) were to 3 -leaf wheat and 1 to 3 leaf wild oats and green foxtail on May 26. The second treatments (4) were to 4 to 5 leaf wheat and wild oats on June 1. The entire plot area was treated with chlorsulfuron at 0.19 oz/A + 2,4-D at 4 oz/A on June 12. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 nozzles to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on July 20.

Treatment	Rate	Inj	Wioat	Grft	Wheat Yield	Wheat Tswt
	(lb/A)	(%)	(% control)		(bu/A)	(lb/bu)
Untreated		0	0	0	13.5	59.4
HOE-7125 (4lf)	0.66	1	59	92	16.6	58.9
HOE-7125 (4lf)	0.78	0	71	96	19.1	58.5
HOE-7113 (2lf)	0.16	0	92	95	21.8	59.9
HOE-7113 (4lf)	0.16	0	64	95	16.4	58.8
Diclofop&Brax&MCPA (2lf)	0.12	0	56	59	16.7	58.8
Diclofop+PO (2lf)	0.75+1pt	1	72	77	21.7	58.6
Diclofop+DPX-M6316+PO (2lf)	0.75+0.016+1pt	1	80	68	18.0	59.0
Difenzoquat (4lf)	1.0	13	97	0	14.1	57.8
AC 222,293 (2lf)	0.38	3	99	58	22.0	59.5
HOE-7125 (4lf)	0.33	0	40	81	16.2	58.9
HOE-7125 (4lf)	0.39	1	59	92	17.7	58.5
HOE-7113 (2lf)	0.08	0	55	83	20.6	58.3
HOE-7113 (4lf)	0.08	0	38	93	16.9	57.6
HIGH MEAN		13	99	96	22.0	59.9
LOW MEAN		0	0	0	13.5	57.6
EXP MEAN		1	63	71	17.9	58.7
C.V. %		147	19	13	15.9	1.4
LSD 5%		3	17	13	4.1	1.2
LSD 1%		4	23	17	5.5	NS
# OF REPS		4	4	4	4	4

Summary

Wheat yield was not influenced by the degree of wild oats or green foxtail control. Green foxtail control was greater with HOE-7125 or HOE-7113 than with diclofop; regardless of stage at application. Wild oats control exceeded 90% with HOE-7113, AC 222,293, and difenzoquat.

Wild oat control in durum wheat, Minot 1988. Postemergence herbicides were evaluated for wild oat and green foxtail control in durum wheat. 'Lloyd' durum was seeded April 29 in Williams loam soil with pH 6.6 and 4% organic matter. Treatments were applied with a bicycle wheel plot sprayer delivering 8.5 gpa at 35 psi on May 23 (S1) to 3 to 3.3 leaf wheat, 1 to 3 leaf green foxtail and wild oats with sunny sky and 80 F and on June 1 (S2) to 5 to 5.5 leaf wheat, 3 to 6 leaf green foxtail and 3 to 5 leaf wild oats with cloudy sky and 70 F. Green foxtail was drought stressed at the time of treatment. Initial rainfall after treatment was 1.06 inches on June 14 and only 3.39 inches of rain fell from May 23 to July 20. Wheat injury and weed control evaluations were made on June 23 (Eval 1) and July 21 (Eval 2). The experiment was a randomized complete block design with four replicates and experimental units were 10 X 18 sq ft. Wheat was harvested from a 4 X 18 sq ft. area on July 28.

Treatment		Rate	Durum wheat Yld	Tswt	Injury Evaluations 1	2	Weed control Wioa Evaluations 1	2	Grft Evaluations 1	2
		(lb/A)	(bu/A)	(lb/bu)	----------		(%)		--------	
Diclofop+PO	(S1)	.75+.125G	8.4	57.9	6	1	79	76	41	30
Dicl+DPX-M6316+PO	(S1)	1+.016+.125G	8.6	60.0	8	6	76	65	29	16
Dicl&Brox&MCPA	(S1)	0.8+0.25+0.05	6.9	60.3	3	0	46	34	6	9
Imazamethabenz	(S1)	0.25	7.7	59.4	1	3	99	94	20	0
Imazamethabenz	(S1)	0.38	10.8	58.6	4	3	99	98	10	0
HOE7113-04H	(S1)	0.16	6.9	58.7	18	8	85	71	68	64
HOE7113-04H	(S2)	0.16	6.7	58.9	10	5	71	50	16	18
HOE7125-02H	(S2)	0.66	5.7	58.7	10	8	43	15	11	16
HOE7125-02H	(S2)	0.78	4.6	59.8	14	14	58	29	16	19
HOE7125-02H	(S2)	1.0	5.4	56.5	34	35	90	81	4	0
Control			5.5	58.1	0	0	0	0	0	0
C.V. %			23.0	1.0	66	83	20	16	56	41
LSD 5%			2.3	1.3	9	9	20	13	16	9
F-TRT			4.9	7.3	9	11	19	52	12	35

a PO = Paraffin base petroleum oil with 17% surfactant blend; Dicl = diclofop; Brox = bromoxynil; & = formulated mixture which was 1:0.31:0.06 for diclofop & bromoxynil & MCPA;

Summary

'Lloyd' durum wheat was injured initially by HOE 7113-04H, HOE 7125-02H, and difenzoquat, however, only HOE 7125-02H and difenzoquat caused wheat injury greater than 10% by the July 21 evaluation. Wheat treated with HOE 7125-02H and difenzoquat yielded less than all other treatments and 5.1 to 6.2 bushels less than the wheat treated with imazamethbenz at 0.38 lb/A. Difenzoquat treated wheat had the lowest test weight, 56.5 lb/bu, indicating crop injury which influenced the grain filling process. Green foxtail control was reduced by heat and drought stress and was generally poor with all treatments. The second wild oat control evaluation was lower than the first indicating an incomplete kill of the wild oats with all treatments except imazamethabenz. Diclofop & bromoxynil & MCPA and HOE 7125-02H gave less than 35% wild oat control on the second evaluation.

Wild oats herbicides with adjuvants, Prosper 1988. 'Wheaton' HRS wheat, 'ND810104' oats, and siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 34 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5-to 6-leaf wheat, oats, and foxtail millet on June 20 with 95 F, 50% RH, and clear sky. Evaluations were on July 22 and August 11. Data was not taken on injury to wheat because none was obvious.

Treatment	Rate	----July 22---- Ftmi	Oats	---August 11--- Fxtl	Oats
	(%)	----------(% control)----------			
Diclofop	12	47	39	32	36
Diclofop+PO	12+0.12G	57	46	36	37
Diclofop+MSC	12+0.12G	53	54	35	54
Diclofop+AG-2	12+0.12G	58	52	43	40
Diclofop+28%	12+1G	49	52	35	34
Diclofop+SCI-40	12+0.25%	54	48	42	41
Diclofop+Inhance	12+0.12G	47	31	31	26
Diclofop+LI-700	12+0.25%	44	32	29	35
Diclofop+X-77	12+0.25%	53	56	34	37
Untreated	0	0	0	0	0
AC 222,293	4	3	85	0	96
AC 222,293+PO	4+0.12G	10	92	13	97
AC 222,293+MSC	4+0.12G	11	91	5	97
AC 222,293+AG-2	4+0.12G	13	88	6	94
AC 222,293+28%	4+1G	9	89	9	98
AC 222,293+SCI-40	0.25%	6	89	0	95
AC 222,293+Inhance	0.12G	6	86	5	95
AC 222,293+LI-700	4+0.25%	4	83	3	96
AC 222,293+X-77	4+0.25%	6	90	3	99
Untreated	0	0	0	0	0
Difenzoquat	10	6	80	9	96
Difenzoquat+PO	10+0.12G	6	76	3	90
Difenzoquat+MSC	10+0.12G	10	81	4	95
Difenzoquat+AG-2	10+0.12G	10	80	6	96
Difenzoquat+28%	10+1G	10	81	3	96
Difenzoquat+SCI-40	0.25%	8	82	5	94
Difenzoquat+Inhance	0.12G	6	82	0	96
Difenzoquat+LI-700	10+0.25%	13	82	9	95
Difenzoquat+X-77	10+0.25%	5	80	1	96
Untreated	0	0	0	0	0
C.V. %		28	11	45	9
LSD 5%		8	10	8	9
# OF REPS		4	4	4	4

Summary

Diclofop control of oats and foxtail millet was low probably because of the drought and the advanced growth stage at treatment. However control of oats and foxtail millet tended to be enhanced by both petroleum oil with 17% Atplus 300 F (PO) and methylated seed oil with 15% emulsifier (MSC). AC-222293 gave a high degree of oats control, with certain adjuvants tended to enhance control at the early evaluation. Difenzoquat control of wild oats was not influenced by adjuvants.

Hard Red Spring wheat cultivar response to herbicides, Minot 1988. Triallate at 1.0 lb/A was applied to an 80 inch band of moist soil and incorporated with a rototiller and cultiweeder and Hard Red Spring wheat varieteis were seeded 2.5 inches deep on April 21. Wheat stand reduction was evaluated on May 19. One shot at 3.5 pts/acre was applied for weed control on May 21. Difenzoquat at 1.0 lb/A, DPX-L5300 at 0.5 oz ai/A. and DPX-R9674 at 0.9 oz ai/A were applied to 5.0 leaf wheat on June 1, with a cloudy sky and 70 F. Metsulfuron at 0.06 oz ai/A was applied to 5.2 leaf wheat on June 3, with a sunny sky and 90 F. Difenzoquat injury was evaluated on June 17 and all the postemergence herbicide injury on July 8. Data are for unreplicated cultivars.

Cultivar	Triallate	Difenzoquat		DPX-L5300	DPX-R9674	Metsulfuron
		June 17	July 8			
	(% Std red)	---(% injury to Hard Red Spring wheat)---				
Alex	20	35	10	0	5	0
Kenyon	10	5	0	0	0	0
Roblin	0	25	20	0	0	0
Columbus	0	5	0	0	5	0
Lew	0	75	25	0	0	5
Coteau	0	10	5	0	0	0
Stoa	5	5	5	0	0	0
Butte 86	0	10	10	0	0	0
Amidon	10	25	10	5	0	0
Laura	0	35	10	0	0	0
Baart	0	5	0	5	0	0
Cutless	15	20	5	10	5	5
Rambo	0	10	0	0	0	0
Len	0	75	15	5	0	0
Marshall	15	10	0	10	0	0
Wheaton	0	5	0	10	5	5
Prospect	20	20	10	10	0	0
2369	0	20	5	5	0	0
2385	0	20	30	10	10	0
Norak	0	25	15	15	0	15
Leif	0	35	15	5	0	0
Celtic	0	75	20	0	0	0
Norseman	0	55	15	10	0	0
Nordic	0	15	5	10	0	0
Telemark	5	20	5	5	0	0
Tammy	0	5	0	5	0	5
Westbred 926	0	80	90	0	0	0
ND640	5	15	0	0	0	0
ND651	5	5	0	0	5	5
ND652	0	15	5	0	0	0
ND618	20	20	5	0	0	0
ND626	0	50	15	0	0	0
ND649	10	25	5	0	0	0
ND650	5	15	5	0	0	0
Mn81110	10	5	0	0	0	0
Mn82354	0	5	0	0	0	0
2375	5	40	50	5	0	0
W2501	5	35	15	0	10	0
W2502	25	15	5	5	5	0
HS84-873	5	35	0	5	5	0

Summary

Triallate caused an initial stand reduction of some varieties however these stand reductions were not detectable at the later evaluation. Cultivars with greater than 20% injury from difenzoquat at the late evaluation were Lew, 2385, Westbred 926, and 2375. Sulfonyl urea herbicides did not cause important injury to Hard Red Spring wheat cultivars.

Oats cultivar response to sulfonyl urea herbicides, Minot 1988. Oat cultivars were seeded on April 21. Bromoxynil at 4 oz/A + MCPA at 4 oz/A were applied for weed control on May 21. DPX-L5300 at 0.5 oz ai/A and DPX-R9674 at 0.9 oz ai/A were applied on 8.5 gpa at 35 psi to 5.0 leaf oats on June 1 with a cloudy sky and 70 F. Metsulfuron at 0.06 oz ai/A was applied to 5.2 leaf oats on June 3 with a sunny sky and 90 F. Oat injury evaluations were on June 17 and July 22. Data are for observations of injury to cultivars which were not replicated.

	DPX=L5300		DPX-R9674		Metsulfuron	
Cultivar	June 17	July 22	June 17	July 22	June 17	July 22
	(% injury on oats)					
Border	60	10	10	0	25	0
Monida	75	10	25	5	25	5
Otana	65	10	10	5	30	15
Moore	65	15	20	5	35	15
Proat	75	20	35	0	30	0
Pierce	80	20	40	0	35	25
Steele	60	15	45	5	35	10
Valley	75	15	60	0	45	15
Tibor	60	15	40	0	40	10
Robert	65	15	35	0	40	10
Riel	55	20	30	0	50	10
Dumont	55	20	30	0	35	10
Fidler	50	15	25	0	30	10
Kelsey	50	15	25	0	25	10
Hytest	55	15	30	0	25	10
Sandy	65	15	30	0	40	5
Porter	85	40	75	20	80	35
ND810104	60	20	15	0	50	10
Mean	64	16	32	2	37	11

Summary

Oat cultivars were initially injured by all herbicides tested especially DPX-L5300. The July 22 evaluations indicate that the cultivars had recovered considerably from the initial injury. Porter appears to be the most susceptable cultivar to the sulfonyl urea herbicides.

Durum wheat variety response to herbicides, Minot 1988. Triallate at 1.0 lb/A was applied to an 80 inch band of moist soil and incorporated with a rototiller and a cultiweeder and durum wheat varieties were seeded 2.5 inches deep on April 21. Durum stand reduction was evaluated on May 19. One shot (diclofop & bromoxynil & MCPA) at 3.5 pts/acre was applied for weed control on May 21. Difenzoquat at 1.0 lb/A, DPX-L5300 at 0.5 oz ai/A, and DPX-R9674 at 0.9 oz ai/A were applied to 5-leaf durum on June 1 with a cloudy sky and 70 F. Metsulfuron at 0.06 oz ai/A was applied to 5.2 leaf wheat on June 3 with a sunny sky and 90 F. Difenzoquat injury was evaluated on June 17 and all the postemergence herbicide injury evaluations were on July 8. The data represent visual evaluations of cultivars which were not replicated.

Variety	Triallate	Difenzoquat		DPX-L5300	DPX-R9674	Metsulfuron
		June 17	July 8			
	(std.red.)	(% injury)				
Rugby	5	20	5	5	5	0
Ward	0	10	0	5	5	0
Arcola	5	25	10	0	0	0
Kyle	0	70	40	0	0	0
Medora	0	20	10	10	5	0
Sceptre	0	15	5	10	0	0
Monroe	10	15	10	5	0	0
Renville	0	10	5	0	0	0
Vic	0	20	10	15	0	0
Fjord	0	40	20	0	0	5
Stockholm	5	5	0	15	5	5
Laker	0	60	15	10	5	5
Lloyd	0	10	0	25	5	0
Cando	0	5	5	0	5	5
D8261	5	20	10	35	10	5
D8291	0	15	10	5	0	0
D8370	10	15	10	5	5	0
D8374	0	40	15	20	5	0
D8380	10	30	5	10	0	0
D83103	0	25	5	0	0	0
D84130	5	25	10	0	0	5
D84134	0	5	5	0	5	5
D8302	10	5	15	5	5	5
D8434	0	20	5	25	20	10
D8458	0	15	5	0	5	0
D8459	5	20	5	0	5	0
D8460	5	10	5	0	5	0
D8475	0	10	0	5	10	0
D8479	0	10	0	5	5	0
FA883-323	5	15	5	5	0	0
Mean	3	20	8	7	4	2

Summary

Triallate caused a slight stand reduction of certain durum varieties, however these reductions were not visable late in the season. Difenzoquat caused injury early to many varieties but most varieties recovered with time. Kyle and Fjord were the only varieties to have 20% or greater injury on July 8. DPX-L5300 caused injury of 20% or greater on Lloyd, D8261, D8374, and D8434. D8434 was injured 20% by DPX-R9674 while all other varieties were generally unaffected by DPX-R9674 and Metsulfuron.

Wheat cultivar response to herbicides, Williston 1988. Hard Red Spring wheat varieties were seeded on April 25, durum varieties on April 26. Difenzoquat was applied at 1 lb ai/A to wheat that was in the 3.5 to 4 leaf stage of growth on May 23. Difenzoquat was applied with a tractor mounted sprayer delivering 8.5 gpa at 30 psi . Weather conditions at treatment were as follows: wind SSE at 6 mph, 71 F, 14% RH, clear sky, soil dry. Experiment was on a max loam soil having a PH of 6.4 and an organic matter content of 2.1%. Evaluation was late in June. Severe drought tended to mask the effect of herbicide.

Difenzoquat					
Wheat cultivar	Crop injury	Wheat cultivar	Crop injury	Wheat cultivar	Crop injury
HRS	(%)	HRS	(%)	HRS	(%)
Waldron	15	Coteau	0	Alex	0
Butte 86	0	Stoa	0	Columbus	0
Kenyon	0	Amidon	0	Robin	20
Laura	0	Cutless	0	Lew	0
Lancer	0	Leader	10	Fortuna	0
Thatcher	0	ND 640	0	ND 651	10
ND 652	10	ND 618	0	ND 626	15
ND 649	0	ND650	0	Len	30
Marshall	0	Wheaton	0	2369	20
2385	10	2375	0	Norak	10
Leif	0	Norseman	20	Celtic	0
Nordic	0	Telemark	10	Tammy	10
Prospect	0	Westbred 926	70	Rambo	10
Newana	0	Glenmam	0	MT 7926	0
MT 8402	10	MN 81110	10	MN 82354	10
W 2501	0	W 2502	0	HS 84-873	0
Durum		Durum		Durum	
Ward	0	Crosby	0	Rugby	10
Renville	10	Vic	30	Monroe	20
Medora	10	Septre	10	Kyle	15
Arcola	15	Fjord	0	Cando	0
Lloyd	20	Laker	10	Stockholm	15
D 8261	10	D 8291	0	FA 883-323	0
D 8302	10	D 8370	10	D 8374	30
D 8380	10	D 83130	0	D 8434	30
D 8458	15	D 8459	15	D 8460	25
D 8475	15	D 8479	40	D 84130	30
D 84134	10	Wakooma	20		

Summary

Plants were drought stressed which reduced the response to difenzoquat, but injury symptons occurred for certain cultivars as shown in the table. DPX-L5300 and DPX-R9674 were also applied to all the above cultivars of Hard Red Spring wheat and durum on the same day, with the same equipment and weather conditions, and the same growth stages at the difenzoquat application. DPX-L5300 was applied at 0.5 oz ai/A and DPX-R9674 applied at 0.9 oz ai/A. DPX-L5300 appeared to have delayed maturity slightly on only Kyle durum and ND 649 and Rambo HRS wheat. DPX-R9674 caused no visible crop injury to any cultivar.

Small grain response to herbicides, Fargo 1988. The treatments consisting of commercial triallate plus trifluralin granules (Buckle) were applied and once incorporated on October 26, 1987. Treatments were applied with Valmar air flow granular applicator. 'Wheaton','Alex', Alex treated with a protectant from monsanto (MON 5500), and'Coteau' Hard Red Spring wheat; 'Rugby' Durum wheat and 'Robust' barley were seeded on April 15, 1988. The plot area was treated with 2,4-D at 6 oz/A to control broadleaf weeds when the crops were tillering, June 6. The area was free of wild oats and only had a sparce foxtail infestation. Injury evaluations were on June 22. The herbicides were applied to 20 by 30 ft plots and the crops were seeded across the plots.

Treatment		Wm	Alx	AlxTr	Cot	Rug	Rbt	Wm	Alx	Alxtr	Cot	Rug	Rbt
	(oz/A)	(% injury)						(bu/A)					
Trif+Triallate	5.3+16	9	20	10	8	10	4	15.8	12.8	16.7	18.6	13.0	24.6
Trif+Triallate	6.7+20	21	43	23	26	21	16	15.3	16.2	15.3	17.4	14.1	22.8
Trif+Triallate	10.6+32	50	78	49	34	40	24	10.8	9.4	12.3	17.2	14.9	20.1
Untreated	0	0	3	0	0	0	0	12.7	18.9	15.0	17.1	12.8	25.2
HIGH MEAN		50	78	49	34	40	24	15.8	18.9	16.7	18.6	14.9	25.2
LOW MEAN		0	3	0	0	0	0	10.8	9.4	12.3	17.1	12.8	20.1
EXP MEAN		20	36	20	17	18	11	13.7	14.3	14.8	17.6	13.7	23.2
C.V. %		67	32	40	82	59	90	15.4	33.0	19.4	9.5	21.8	12.4
LSD 5%		22	18	13	22	17	16	3.4	NS	NS	NS	NS	NS
LSD 1%		31	26	19	NS	24	NS	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4	4	4	4	4

a Wm=Wheaton, Alx=Alex, AlxTr=Alex treated, Cot=Coteau, Rug=Rugby durum, and Rbt=Robust barley;

Summary

Triallate plus trifluralin at commercial rates (16+5.3 oz/A) did not cause important injury to any of the small grain cultivars. These herbicides at twice the commercial rate caused severe injury to untreated 'Alex' wheat, but not to Mon 5500 treated Alex wheat. The soil was extremely dry at seeding which would have increased the amount of herbicide residual, but also reduced "activation" of the herbicides during seed emergence.

Broadleaf weed control in wheat, Williston 1988. 'Len' Hard Red Spring wheat was seeded on April 29. Treatments were applied to 3.5-leaf wheat, 2- to 3-leaf green foxtail, and broadleaf weeds less than 2 inch tall on May 23 and 26 with 55 to 60 F, 30% relative humidity and 5 mph wind at application and a high of 86 F. Treatments were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on June 28 and July 15. Weed infestations were sparce for wild oats and kochia, medium for green foxtail, and dense for Russian thistle. Harvest was from 80 sq ft on July 25.

Treatment	Rate	June 28			July 15			Wheat		
		Grft	Ruth	KOCZ	Grft	Ruth	KOCZ	Inj	Yield	Tw
	(%)	(% control)						(%)	(bu/A)	(lb/bu)
2,4-Ddea	6	0	95	29	0	84	25	1	3.1	60.6
MCPAda	6	0	58	5	0	24	13	0	2.8	59.8
2,4-Ddea+X-77	6	0	97	63	0	91	60	1	4.3	60.5
Dicamba+2,4-Ddea	1.5+4	0	92	89	6	86	78	4	3.6	61.1
Dicamba+MCPAdma	1.5+4	0	89	79	0	80	80	8	3.3	60.6
Picl+2,4-Ddea	0.25+6	0	94	39	13	91	51	6	3.3	60.7
Bromoxynil&MCPA	6	0	86	45	0	76	66	4	2.9	60.6
Bromoxynil&MCPA	8	0	95	85	0	86	88	0	3.8	60.5
DPX-M6316+X-77	0.25	0	98	53	9	95	44	2	3.4	60.4
DPX-L5300+X-77	0.125	0	95	95	0	85	97	4	3.4	60.8
DPX-L5300+2,4-Ddea+X-77	0.125+4	0	96	95	8	85	95	3	3.2	60.9
DPX-L5300+Dicamba+X-77	0.125+1+	0	96	99	8	91	97	4	3.1	61.1
DPX-M6316+DPX-L5300+X-77	0.3+0.125	20	98	92	13	95	84	1	3.6	60.9
Metsulfuron+X-77	0.062	28	99	99	35	99	98	0	4.5	60.8
Metsulfuron+2,4-Ddea+X-77	0.062+4	0	99	98	23	99	93	0	5.0	60.6
Clopyralid&2,4-D	9.5	0	94	26	0	90	20	1	4.2	60.9
Fluroxypyr	1.5	0	55	95	6	41	91	0	3.7	60.6
Fluroxypyr+2,4-Ddea	1.5+6	0	94	97	29	90	96	4	4.0	60.9
Diclofop+Bromoxynil	12+4	45	90	82	68	78	80	0	4.2	60.6
Fenoxaprop&2,4-D&MCPA	6.8	0	66	19	19	48	28	4	3.3	60.4
Untreated Check	0	0	0	0	0	0	0	0	2.3	58.0
HIGH MEAN		45	99	99	68	99	98	8	5.0	61.1
LOW MEAN		0	0	0	0	0	0	0	2.3	58.0
EXP MEAN		4	85	66	11	77	66	2	3.6	60.5
C.V. %		221	12	26	135	13	31	150	24.2	
LSD 5%		20	14	24	21	15	28	5	1.2	
LSD 1%		NS	19	32	28	19	38	NS	NS	
# OF REPS		2	4	4	4	4	4	4	4	1

Summary

None of the herbicides cause important injury to wheat. Diclofop + bromoxynil gave the greatest green foxtail control which was only 45% at the first and 67% at the second evaluation. X-77 with 2,4-Ddea enhanced kochia control and tended to enhance Russian thistle control. DPX-M6316 was less effective than the other sulfonylureas in controlling kochia, but equal in controlling Russian thistle. Fluroxypyr gave more than 90% season long kochia control. Wheat yield was low because of drought conditions.

Broadleaf weed control in wheat, Langdon, 1988. 'Marshall' Hard Red Spring wheat was seeded on May 6. Treatments were applied to 5-leaf wheat, cotyledon to 4-leaf ladysthumb, and 2.5-leaf wild buckwheat on June 1. Treatments 1 through 15 were applied prior to a 0.09 inch rain between 2:30 and 4:00 PM. Treatments 16 through 20 were applied after the rain at 6:00 PM. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 20. The stand of ladysthumb was dense with more than 1 plant/sq ft and wild oats less then 1 plant/sq yd.

Treatment	Rate	Wheat inj	Yield	Tswt	Wioa	Ladys-thumb
	(oz/A)	(%)	(bu/A)	(lb/bu)	(% control)	
2,4-Ddea	6	0	43.0	61.4	0	54
MCPAdma	6	0	43.5	60.5	0	41
2,4-Ddea+X-77	6+0.25%	0	40.6	60.1	0	73
Dicamba+2,4-Ddea	1.5+4	0	40.5	60.5	0	70
Dicamba+MCPAdma	1.5+4	0	39.4	59.9	0	59
Picloram+2,4-Ddea	0.25+6	0	40.3	61.1	0	53
Bromoxynil&MCPA	6	1	39.2	60.1	5	97
Bromoxynil&MCPA	8	0	31.5	61.0	0	99
DPX-M6316+X-77	0.25+0.25%	0	36.2	61.3	0	71
DPX-L5300+X-77	0.125+0.25%	0	33.6	60.3	0	49
DPX-L5300+2,4-Ddea+X-77	0.125+4+0.25%	0	37.2	60.8	0	20
DPX-L5300+Dicamba+X-77	0.125+1+0.25%	0	36.9	61.4	0	45
DPX-M6316+DPX-L5300+X-77	0.3+0.125+0.25%	0	38.4	61.0	0	78
Metsulfuron+X-77	0.062+0.25%	0	35.5	60.4	5	45
Metsulfuron+2,4-Ddea+X-77	0.062+4+0.25%	0	33.2	61.0	6	68
Clopyralid&24-D	9.5	0	39.2	60.1	0	97
Fluroxypyr	1.5	0	38.3	60.6	0	86
Fluroxypyr+2,4-Ddea	1.5+6	0	42.2	61.1	0	96
Diclofop+Bromoxynil	12+4	0	42.6	60.8	82	90
Fenoxyprop&24-D&MCPA	6.8	5	42.4	60.8	85	71
Untreated	0	0	40.0	60.4	0	0
C.V. %		351	17.4	1.9	39	21
LSD 5%		1	NS	NS	5	19
LSD 1%		2	NS	NS	6	26
# OF REPS		4	4	4	4	4

Summary

None of the treatments caused important injury to wheat Diclofop + bromoxynil and Fenoxaprop+2,4-D+MCPA gave similar wild oats control. Ladysthumb control was 90% or more with bromoxynil treatments, clopyralid plus 2,4-D, and fluoroxypyr plus 2,4-D. Wheat grain yield and test weight were not influenced by herbicide treatments.

Broadleaf weed control in oats, Minot 1988. 'Dumont' oats was seed on May 7. Treatments were applied to 4-leaf oats; 1- to 2-inch tall common lambsquarter, prostrate pigweed, and green foxtail; and 1- to 3-inch tall Russian thistle, and Kochia on June 1 with 75 F and calm wind. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 24 plots. The experiment was randomized complete block with four replications. Evaluation was on July 18. Density of all weeds exceeded 1 plant/sq. ft.

Treatment	Rate	Oat inj	Grft	KOCZ	Colq	Ruth	Oat YLD	Oat TW
	(oz/A)	(%)	----(% control)----				(bu/A)	(lb/bu)
2,4-Ddea	6	8	0	54	90	84	18.1	25.7
MCPAdma	6	3	0	30	88	18	12.8	23.8
2,4-Ddea+X-77	6+0.25%	10	0	84	98	96	19.4	29.5
Dicamba+2,4-Ddea	1.5+4	20	3	85	94	84	18.3	26.8
Dicamba+MCPAdma	1.5+4	13	0	93	97	64	15.0	25.3
Picl+2,4-Ddea	0.25+6	8	0	59	99	84	17.0	26.2
Bromoxynil&MCPA	6	5	5	70	98	72	16.0	29.9
Bromoxynil&MCPA	8	9	0	80	99	82	15.3	28.1
DPX-M6316+X-77	0.25+0.25%	3	9	88	78	95	20.1	32.0
DPX-L5300+X-77	0.125+0.25%	15	14	94	91	81	16.7	30.8
DPX-L5300+2,4-Ddea+X-77	0.125+4+0.25%	6	13	98	98	91	18.1	29.5
DPX-L5300+Dicamba+X-77	0.125+1+0.25%	13	23	96	93	89	24.0	28.1
DPX-M6316+DPX-L5300+X-77	0.3+0.125+0.25%	3	0	96	97	98	20.7	32.2
Metsulfuron+X-77	0.062+0.25%	8	5	98	98	99	24.1	31.2
Metsulfuron+2,4-Ddea+X-77	0.062+4+0.25%	0	10	99	99	99	24.1	32.3
Clopyralid&2,4-D	9.5	15	5	76	98	91	14.1	27.5
Fluroxypyr	1.5	11	0	96	0	0	13.5	22.7
Fluroxypyr+2,4-Ddea	1.5+6	13	15	96	99	94	17.0	28.8
Diclofop+Bromoxynil	12+4	32	49	34	89	83	19.6	26.6
Fenoxaprop&2,4-D&MCPA	6.8	43	51	71	99	74	16.8	28.4
Untreated	0	0	0	0	0	0	14.5	23.4
Propanil&MCPA	19.0	0	29	40	98	8	28.0	24.9
Propanil&MCPA+Bromoxynil	19+2	0	44	65	99	82	39.6	32.0
C.V. %		93	98	16	5	15	41.4	6.0
LSD 5%		13	16	17	7	15	11.2	2.4
LSD 1%		18	22	22	9	20	14.9	3.2
# OF REPS		4	4	4	4	4	4	4

Summary

All herbicides, except fluroxypyr, gave 90% or more common lambsquarters control. Diclofop and fenoxoprop only gave about 50% green foxtail control probably because of emergence after treatment because of a late season rain. DPX-65300+2,4-D or +DPX-M6316, metsulforan alone or with 2,4-D, and fluroxypyr+2,4-D gave 90% or more control of all broadleaf weeds. DPX-L5300 was more effective than DPX-M6316 in controlling Kochia and common lambsquarter but DPX-M6316 was more effective than DPX-L5300 on Russian thistle. Oat yields and test weight generally related to the degree of weed control.

Broadleaf weed control in wheat, Carrington 1988. 'Stoa' Hard Red Spring wheat was seeded on May 9. Treatments were applied to 5-leaf wheat, 2- to 3-leaf green foxtail, and 3 inch tall common lambsquarters on June 9. Plants were drought stressed and high temperatures were 84 to 96 F for 1 week after treatment. Treatments were applied in 8.3 gpa at 3.5 psi with a bicycle type plot sprayer delivery to 8 by 24 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 15. Weed densities were less than 1 plant/2 sq yds.

Treatment	Rate (oz/A)	Wheat injury (%)	Grft (% control)	Colq (% control)
2,4-Ddea	6	0	0	82
MCPAdma	6	0	0	78
2,4-Ddea+X-77	6+0.25%	0	0	94
Dicamba+2,4-Ddea	1.5+4	0	0	86
Dicamba+MCPAdma	1.5+4	0	0	82
Picloram+2,4-Ddea	0.25+6	0	0	99
Bromoxynil&MCPA	6	0	0	96
Bromoxynil&MCPA	8	0	0	92
DPX-M6316+X-77	0.25+0.25%	0	0	59
DPX-L5300+X-77	0.125+0.25%	1	0	94
DPX-L5300+2,4-Ddea+X-77	0.125+4+0.25%	0	0	91
DPX-L5300+Dicamba+X-77	0.125+1+0.25%	0	0	99
DPX-M6316+DPX-L5300+X-77	0.3+0.125+0.25%	0	0	95
Metsulfuron+X-77	0.062+0.25%	1	1	67
Metsulfuron+2,4-Ddea+X-77	0.062+4+0.25%	1	0	83
Clopyralid&2,4-D	9.5	0	0	99
Fluroxypyr	1.5	0	0	0
Fluroxypyr+2,4-Ddea	1.5+6	0	0	99
Diclofop+Bromoxynil	12+4	0	33	59
Fenoxyprop&2,4-D&MCPA	6.8	1	86	99
Untreated Check	0	0	0	0
C.V. %		447	43	19
LSD 5%		NS	3	21
LSD 1%		NS	5	28
# OF REPS		4	4	4

Summary

None of the herbicide treatment caused any visable injury to wheat. Green foxtail control with fenoxaprop+2,4-D+MCPA (Tiller) was more than 80% while with diclofop+bromoxynil only 33%. Common lambsquarter control exceed 80% with most herbicide treatments, except MCPA, DPX-M6316, metsulfuron, fluroxypyr, and bromoxynil applied with diclofop.

Broadleaf weed control in wheat, Casselton 1988. 'Stoa' wheat was seeded on April 14. Treatments were applied to 4-leaf wheat and foxtail; and 1-to 3-inch tall common lambsquarters and wild mustard on June 1, with 88 F, 50% RH, and dry soil at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on June 15. Weed densities were sparce and variable. Many weeds had apparently died from the drought as populations were high at treatment. Wheat grain yeild was not taken because the drought stress masked any differences from treatment and caused variation in growth whithin replications.

Treatment	Rate	Wheat injury	KOCZ	Wimu	Colq
	(oz/A)	(%)	---(% control)--		
2,4-Ddea	6	3	70	98	99
MCPAdma	6	3	50	99	99
2,4-Ddea+X-77	6+0.25%	0	78	99	99
Dicamba+2,4-Ddea	1.5+4	6	93	99	98
Dicamba+MCPAdma	1.5+4	8	90	99	99
Picloram+2,4-Ddea	0.25+6	0	60	99	99
Bromoxynil&MCPA	6	1	60	99	99
Bromoxynil&MCPA	8	0	80	99	99
DPX-M6316+X-77	0.25+0.25%	0	80	81	65
DPX-L5300+X-77	0.125+0.25%	1	60	82	75
DPX-L5300+2,4-Ddea+X-77	0.125+4+0.25%	0	95	99	97
DPX-L5300+Dicamba+X-77	0.125+1+0.25%	1	80	89	86
DPX-M6316+DPX-L5300+X-77	0.3+0.125+0.25%	1	95	93	96
Metsulfuron+X-77	0.062+0.25%	5	85	95	82
Metsulfuron+2,4-Ddea+X-77	0.062+4+0.25%	3	0	99	95
Clopyralid&2,4-D	9.5	0	0	99	99
Fluroxypyr	1.5	0	70	50	15
Fluroxypyr+2,4-Ddea	1.5+6	1	95	99	97
Diclofop+Bromoxynil	12+4	1	0	99	98
Fenoxaprop&2,4-D&MCPA	6.8	0	0	99	99
Untreated	0	0	0	0	0
C.V. %		141		13	11
LSD 5%		3		17	13
LSD 1%		4		22	18
# OF REPS		4	1	4	4

Summary

All herbicides gave 85% or more common lambsquaters control, except DPX-M6316, DPX-L5300, metsulfuron and fluroxypyr. None of the herbicide treatments caused visable injury to wheat. Kochia was only present in one replication, but control only exceeded 90% with dicamba treatments, DPX-L5300+2,4-D, or DPX-L5300 + DPX-M6313, and fluroxypyr+2,4-D.

Broadleaf weed control in wheat with sulfonylureas, Casselton 1988. 'Stoa' Wheat was seeded on April 14. Treatments were applied to 4-leaf wheat and foxtail; and 1-to 3-inch tall common lambsquarter and wild mustard on June 1, with 88 F, 50% RH, and dry soil at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation on August 1. Weed densities were sparce and variable. Many weeds had apparently died from the drought as populations were high at treatment. Wheat grain yield was not taken because the drought stress masked any differences from treatment and cause variation in growth whithin replications.

Treatment	Rate	Wheat injury	KOCZ	Colq
	(oz/A)	(%)	-(% control)-	
DPX-R9674+X-77	0.125+0.25%	1	95	94
DPX-R9674+X-77	0.225+0.25%	0	97	98
DPX-R9674+X-77	0.30+0.25%	0	95	98
DPX-R9674+X-77	0.37+0.25%	1	99	97
DPX-R9674+X-77	0.45+0.25%	0	97	98
DPX-R9674+2,4-Ddea+X-77	0.30+4+0.25%	3	99	99
DPX-R9674+Dicamba+X-77	0.30+1+0.25%	0	99	96
DPX-L5300+X-77	0.125+0.25%	1	95	97
DPX-L5300+X-77	0.187+0.25%	0	97	97
DPX-L5300+X-77	0.25+0.25%	0	81	99
DPX-L5300+2,4-Ddea+X-77	0.125+4+0.25%	0	99	99
DPX-L5300+Dicamba+X-77	0.125+1+0.25%	3	99	98
Bromoxynil	4	0	83	99
Bromoxynil&MCPA	4	0	84	95
Bromoxynil&MCPA	8	0	86	99
Bromoxynil+DPX-R9674+X-77	2+0.12+0.25%	3	94	97
Bromoxynil+DPX-R9674+X-77	2+0.06+0.25%	0	82	94
Bromoxynil+DPX-R9674+X-77	3+0.12+0.25%	0	95	98
Bromoxynil+DPX-R9674+X-77	3+0.06+0.25%	3	95	96
AC 222,293	5	0	0	8
AC 222,293+Bromoxynil&MCPA	5+4	1	95	99
2,4-Dbee	6	4	99	99
Dicamba+MCPA	1.5+6	3	98	99
C.V. %		272	12	4
LSD 5%		NS	15	5
LSD 1%		NS	19	7
# OF REPS		4	4	4

Summary

None of the herbicide treatments caused visable injury to wheat. Control of both kochia and common lambsquarter was high with nearly all treatments. The extreme drought caused death to weed even in untreated areas. The extreme stress for moisture plus the herbicide stress may have accented the high level of weed control.

Fluroxypyr for weed control in wheat, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on April 14. Treatments were applied to 4-to 5-leaf wheat, 4- to 6-inch tall common lambsquarter and 2 inch tall wild mustard and redroot pigweed on June 2 with 80 F, 60% RH, no wind at application. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 21. All weeds exceeded 5 plants/sq. ft.

Treatment	Rate	Wheat injury	Vosf	Rrpw	Colq	KOCZ
	(oz/A)	(%)	------(% control)-----			
Fluroxypyr	1	0	85	25	0	98
Fluroxypyr	1.5	0	92	41	0	99
Fluroxypyr	2	0	94	34	8	99
Fluroxypyr+2,4-Ddea	1+6	0	99	95	99	99
Fluroxypyr+2,4-Ddea	1.5+6	0	99	99	99	99
2,4-Ddea	6	0	98	96	96	73
Fluroxypyr+MCPA-dma	1+6	0	98	87	99	95
Fluroxypyr+MCPA-dma	1.5+6	3	98	92	97	96
MCPA-dma	6	0	99	87	99	72
Fluroxypyr+Picloram+2,4-Ddea	1+0.25+6	1	99	99	99	99
Fluroxypyr+Picloram+2,4-Ddea	1.5+0.25+6	0	99	99	99	99
Picloram+2,4-Ddea	0.25+6	0	99	99	99	90
Fluroxypyr+Clopyralid&2,4-D	1+7	0	99	96	99	99
Fluroxypyr+Clopyralid&2,4-D	1+9.5	1	99	98	99	99
Clopyralid&2,4-D	9.5	0	99	98	99	85
Dicamba+MCPA-dma	1+6	0	98	99	99	96
Bromoxynil&MCPA	8	0	99	96	99	87
C.V. %		493	2	14	5	10
LSD 5%		NS	3	16	6	13
LSD 1%		NS	4	21	8	17
# OF REPS		4	4	4	4	4

Summary

Fluroxypyr at 1 oz/A gave 85% control of volunteer sunflower and 98% control of kochia. Fluroxypyr did not give adequate control of redroot pigweed or common lambsquarter at any rate evaluated. Fluroxypyr in combination with MCPA or 2,4-D gave greater then 95% control of all weeds. However, any of these herbicides applied alone did not give 95% control of all weeds. Dicamba+MCPA also gave 95% or more control of all weeds. Wheat was not harvested for yield because of inadequate growth and stand variabilty caused by an extreme drought.

Preemergence foxtail control in wheat, Fargo, 1988. 'Wheaton' Hard Red Spring was seeded on May 16, and treatment were applied to a moist surface soil which was dry below on May 19 with 60 F, 65 RH, and cloudy sky. Treatments were applied in 17 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide strip the length of 10 by 24 ft. plots. A rain occurred within 1 h after treatments were applied. Evaluations for wheat injury and weed control were on June 20, July 26,and August 18. All weeds exceeded 1 plant/sq. ft., except redroot pigweed. The experiment was a randomized complete block with 4 replications. Wheat was not harvested for grain yield because of extreme drought and poor wheat growth.

		-------June 20-------				----July 26----			Aug 18
Treatment	Rate	Wht	Grft	KOCZ	Rrpw	Wht	KOCZ	Grft	KOCZ
	(oz/A)	----------(% control)----------							
A-1237(pe)	0.24	0	38	64	0	0	36	11	24
A-1237(pe)	0.50	0	71	86	35	0	75	29	49
A-1237(pe)	1	0	95	94	85	0	89	65	74
C-4243(pe)	0.24	0	9	71	0	0	35	4	51
C-4243(pe)	0.50	0	24	84	0	0	76	28	41
C-4243(pe)	1	0	40	84	0	0	81	26	72
Propachlor(pe)	48	0	61	33	0	0	0	13	48
Untreated	0	0	0	0	0	0	0	0	20
HIGH MEAN		0	95	94	85	0	89	65	74
LOW MEAN		0	0	0	0	0	0	0	20
EXP MEAN		0	42	64	15	0	49	22	47
C.V. %		0	38	19	50	0	21	45	53
LSD 5%		NS	23	18	18	NS	15	15	NS
LSD 1%		NS	32	25	26	NS	21	20	NS
# OF REPS		4	4	4	2	4	4	4	4

SUMMARY

A-1237 and C-4243 give good early foxtail and kochia control. However, late season weed control was not adequate probably because of lack of competition from the wheat with the drought.

Postemergence foxtail control in wheat, Fargo, 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on May 16. The treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi. The 2-leaf treatments were applied to 3-leaf wheat and green foxtail and 0.75 to 4 inch tall broadleaf weeds on June 6 with 90F, 35% RH, clear sky, 20 mph wind and dry soil conditions. The 5-leaf treatments were applied to 5-leaf foxtail and 4 inch kochia on June 15 with 72F. The experiment was a randomized complete block with four replications. Treatments were applied to an 8 ft wide strip the length of 10 by 24 ft plots. Evaluation was on June 29 and July 26. Weeds exceeded 5 plants/sq. ft. Plants were severely drought stressed throughout the season.

Treatment			June 29			July 26		
			Wht	Grft	KOCZ	Wht	KOCZ	Fxtl
		(oz/A)	(% control)					
HOE-7113-04H	(2lf)	1.28	3	75	35	0	9	68
HOE-7113-04H	(5lf)	1.28	3	48	15	1	15	82
Feno&24-D&MCPA	(5lf)	5.3	3	44	68	0	63	58
Feno&24-D&MCPA	(2lf)	5.3	3	54	56	0	51	43
Feno&24-D&MCPA	(5lf)	6.2	3	0	33	5	38	31
Feno&24-D&MCPA	(2lf)	6.2	0	13	63	3	39	30
A-1237	(2lf)	0.24	26	55	95	36	83	20
A-1237	(2lf)	0.50	18	30	82	35	80	10
B-4243	(2lf)	0.24	5	9	26	5	23	19
C-4243	(2lf)	0.50	0	5	5	1	21	18
Propanil&MCPA	(2lf)	19	0	33	46	0	17	18
Diclofop+Brox	(2lf)	12+4	0	14	5	0	20	28
BAS-51400H+BAS-090	(2lf)	4+0.25G	11	84	76	14	59	88
BAS-51400H+MSC	(2lf)	4+0.25G	3	83	64	1	59	69
BAS514+DPX-M6316+MSC	(2lf)	4+0.25+0.25G	4	56	85	3	87	75
BAS514+DPX-M6316+BAS090	(2lf)	4+0.25+0.25G	15	78	96	0	92	79
Untreated		0	0	0	0	0	0	0
HIGH MEAN			26	84	96	36	92	88
LOW MEAN			0	0	0	0	0	0
EXP MEAN			6	40	50	6	44	43
C.V. %			121	46	32	124	33	34
LSD 5%			9	26	23	11	21	21
LSD 1%			13	35	30	14	28	28
# OF REPS			4	4	4	4	4	4

Summary

BAS-514 applied with MSC or BAS-090 and HOE -7113 controlled green foxtail without causing important injury to wheat. DPX-M6316 tended to reduce green foxtail and increase kochia control when applied with BAS-514. A-1237 caused severe contact injury to wheat shortly after treatment and injury persisted throughout the season.

2,4-D diethanolamine with carbonates Exp 1, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded April 14, to dry soil. Treatments were applied to 4-to-5 leaf wheat, 2-to-4 leaf redroot pigweed, and 1-to-6 inch common lambsquarter on June 3 with 88 F, 60% RH, and 10 mph wind. Treatments were on 8.5 gpa at 35 psi applied with a bicycle wheel type plot sprayer to an 8 ft. wide strip the length of 30 by 10 ft. plots. The experiment was a randomized complete block with four replications. Evaluations were on June 21 and July 25. Weed infestations exceeded 5 pr sq. yd., except for kochia which was variable.

Treatment	Rate	---June 21---			---July 25---			Wheat yield
		Wht	Rrpw	Colq	Wht	KOCZ	Rrpw	
	(oz/A)	---------(% control)--------						(Bu/A)
2,4-Ddea	6	1	88	97	0	83	98	20.7
2,4-Ddea+NaHCO3	6+16	0	53	45	0	13	52	19.5
2,4-Ddea+Na2CO3	6+16	0	30	58	0	38	66	19.4
2,4-Ddea+NaHCO3+28%N	6+16+1G	0	93	96	0	73	99	19.9
2,4-Ddea+Na2CO3+28%N	6+16+1G	0	94	99	3	65	98	19.7
2,4-Ddea+NaHCO3+SCI-40	6+16+0.25%	0	54	55	0	35	75	18.5
2,4-Ddea+Na2CO3+SCI-40	6+16+0.25%	0	43	41	0	31	63	17.5
2,4-Ddea+NaHCO3+LI-700	6+16+0.25%	0	61	81	0	45	83	20.0
2,4-Ddea+Na2CO3+LI-700	6+16+0.25%	0	73	91	1	33	87	17.4
2,4-Ddea+NaHCO3+MS	6+16+0.25G	0	95	97	0	89	97	20.7
2,4-Ddea+Na2CO3+MS	6+16+0.25G	0	97	100	0	92	98	19.8
2,4-Ddea+NaHCO3+AG-2	6+16+0.25G	1	99	99	1	85	99	22.8
2,4-Ddea+Na2CO3+AG-2	6+16+0.25G	0	99	99	1	70	99	19.9
2,4-Ddea+NaHCO3+PO	6+16+0.25G	1	97	99	1	54	99	19.2
2,4-Ddea+Na2CO3+PO	6+16+0.25G	0	97	99	0	67	99	18.9
2,4-Ddea+NaHCO3+X-77	6+16+0.25%	0	72	98	0	46	95	18.9
2,4-Ddea+Na2CO3+X-77	6+16+0.25%	0	75	97	1	51	94	18.4
2,4-Ddea+NaHCO3+MS+28%N	6+16+0.25G+1G	3	99	99	1	86	99	18.7
2,4-Ddea+Na2CO3+MS+28%N	6+16+0.25G+1G	4	99	99	0	92	99	19.3
Untreated	0	0	0	0	0	0	0	17.4
HIGH MEAN		4	99	100	3	92	99	22.8
LOW MEAN		0	0	0	0	0	0	17.4
EXP MEAN		0	77	84	0	59	86	19.2
C.V. %		334	11	11	336	37	15	12.0
LSD 5%		NS	12	13	NS	31	18	NS
LSD 1%		NS	15	17	NS	41	24	NS
# OF REPS		4	4	4	4	4	4	4

Summary

Redroot pigweed, common lambsquarter, and kochia control with 2,4-Ddea was antagonized by sodium bicorbonate or carbonate in the spray solution. Ammonium nitrate, methylated seed oil (MS), petroleum oil, AG-2, and Inhance all overcame the antagonism caused by the carbonates in the solution.

2,4-D diethanolamine with carbonates Exp 2, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded on May 16 to dry soil. Treatments were applied to 4- to 5-leaf wheat, 4- to 6-inch tall redroot pigweed, and kochia on June 13 Treatments were in 8.5 gpa at 35 psi applied with a bicycle wheel type plot sprayer to a 8 ft. wide strip the length of 24 by 10 ft. plots The experiment was a randomized complete block with four replications. Evaluations were on June 30 and August 18. Injury to wheat was not evaluated because of drought stress. Kochia and redroot pigweed infestations generally exceeded 5 plant per square yard, but were variable.

Treatment	Rate	June 30		August 18	
		KOCZ	Rrpw	KOCZ	Rrpw
	(oz/A)	-------(% control)------			
2,4-Ddea	6	64	75	35	63
2,4-Ddea+NaHCO3	6+16	26	25	31	33
2,4-Ddea+Na2CO3	6+16	48	54	08	34
2,4-Ddea+NaHCO3+28%N	6+16+1G	45	54	11	76
2,4-Ddea+Na2CO3+28%N	6+16+1G	55	62	51	69
2,4-Ddea+NaHCO3+SCI-40	6+16+0.25%	13	15	38	44
2,4-Ddea+Na2CO3+SCI-40	6+16+0.25%	15	48	05	56
2,4-Ddea+NaHCO3+LI-700	6+16+0.25%	29	26	18	53
2,4-Ddea+Na2CO3+LI-700	6+16+0.25%	33	51	24	45
2,4-Ddea+NaHCO3+MS	6+16+0.25G	83	73	63	45
2,4-Ddea+Na2CO3+MS	6+16+0.25G	82	76	75	51
2,4-Ddea+NaHCO3+AG-2	6+16+0.25G	72	79	61	65
2,4-Ddea+Na2CO3+AG-2	6+16+0.25G	73	78	60	73
2,4-Ddea+NaHCO3+PO	6+16+0.25G	65	75	60	75
2,4-Ddea+Na2CO3+PO	6+16+0.25G	64	69	51	75
2,4-Ddea+NaHCO3+X-77	6+16+0.25%	44	48	28	28
2,4-Ddea+Na2CO3+X-77	6+16+0.25%	54	61	40	34
2,4-Ddea+NaHCO3+MS+28%N	6+16+0.25G+1G	97	94	90	93
2,4-Ddea+Na2CO3+MS+28%N	6+16+0.25G+1G	95	97	86	90
Untreated	0	0	0	0	0
HIGH MEAN		97	97	90	93
LOW MEAN		0	0	0	0
EXP MEAN		55	60	43	56
C.V. %		30	24	38	28
LSD 5%		23	20	23	22
LSD 1%		31	27	31	29
# OF REPS		4	4	4	4

Summary

Both kochia and redroot pigweed control with 2,4-Ddea was antagonized by sodium carbonate or sodium bicarbonate. The antongonism generally tended to be greater from bicarbonate than carbonate. The oil adjuvants and Inhance overcame to antagonism of 2,4-D caused by both bicarbonate and carbonate. Methylated seed oil (MS) with 28%N liquid fertilizer tended to enhance weed control with 2,4-Ddea more than any other adjuvants.

Kochia control with 2,4-D, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded on May 16 to dry soil. Treatments were applied to 4- to 5-leaf wheat, 4- to 6-inch tall redroot pigweed, and kochia on June 13 with 83 F, 60% RH, and 10 mph wind. Treatments were in 8.5 gpa at 35 psi applied with a bicycle wheel type plot sprayer to a 8 ft. wide strip the length of 24 by 10 ft. plots. The experiment was a randomized complete block with four replications. Evaluations were on June 29 and August 18. Injury to wheat was not evaluated because of drought stress. Kochia and redroot pigweed infestations generally exceeded 5 plant per square yard, but were variable.

Treatment	Rate	June 29			August 18	
		Rrpw	KOCZ	Wimu	KOCZ	Rrpw
	(oz/A)	--(% control)--			(% control)	
2,4-Ddea	6	60	50	99	64	60
2,4-Dbee	6	93	93	99	84	88
2,4-Ddea+X-77	6+0.25%	76	65	99	71	81
2,4-Dbee+X-77	6+0.25%	90	90	99	80	80
2,4-Ddea+PO	6+0.25G	68	72	99	61	70
2,4-Dbee+PO	6+0.25G	94	95	97	84	85
2,4-Ddea+MSC	6+0.25G	89	89	99	79	92
2,4-Dbee+MSC	6+0.25G	94	94	99	79	94
2,4-Ddea+AG-2	6+0.25G	81	90	99	83	92
2,4-Dbee+AG-2	6+0.25G	92	94	99	80	89
2,4-Ddea+SCI-40	6+0.25%	46	43	98	30	39
2,4-Dbee+SCI-40	6+0.25%	88	92	99	83	86
2,4-Ddea+LI-700	6+0.25%	54	58	98	57	76
2,4-Dbee+LI-700	6+0.25%	90	94	99	87	92
2,4-Ddea+INHANCE	6+0.25G	66	79	99	69	74
2,4-Dbee+INHANCE	6+0.25G	87	93	99	54	63
2,4-Ddea+28%N	6+1G	58	54	99	39	56
2,4-Dbee+28%N	6+1G	83	82	99	79	89
Brox&MCPA	8	68	83	99	80	70
Untreated	0	0	0	0	0	0
HIGH MEAN		94	95	99	87	94
LOW MEAN		0	0	0	0	0
EXP MEAN		74	75	94	67	74
C.V. %		18	17	1	22	22
LSD 5%		19	18	1	21	23
LSD 1%		25	24	2	28	31
# OF REPS		4	4	4	4	4

Summary

2,4-D butoxyethanol ester (bee) gave greater kochia and redroot pigweed control than the 2,4-D diethanolamine (dea). Adjuvants with 2,4-Ddea did not enhance weed control, except 28% nitrogen fertilzer tended to reduce control with the 2,4-Dbee at the early evaluation. 2,4-Ddea applied with methylated seed oil (MSC) or AG-2 gave weed control equal to that with 2,4-Dbee. Wild mustard was controlled by all treatments.

Carbonate antogonism of 2,4-D, Exp 1. Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded April 14 to dry soil. Treatments were applied to 4-to 5-leaf wheat, 2-to 4-leaf redroot pigweed, and to 6 inch tall common lambsquarter on June 3. Treatments were in 8.5 gpa at 35 psi applied with a bicycle wheel type plot sprayer to an 8 ft. wide strip the length of 30 by 10 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on June 22 and July 25. Weed infestations exceeded 5 pr sq. yd., except for kochia which was variable.

Treatment	Rate	June 22				July 25			Wheat yield
		Wht inj	Rrpw	Colq	KOCZ	Wht inj	Rrpw	Colq	
	(oz/A)	(%)	-(% control)-			(%)	(% control)		(Bu/A)
2,4-Ddea	6	0	93	99	87	0	78	99	17.3
2,4-Dbee	6	0	95	99	94	0	91	99	16.4
2,4-Ddea+NaHCO3	6+1	0	85	99	81	0	74	79	16.6
2,4-Dbee+NaHCO3	6+1	0	97	99	98	0	93	99	12.2
2,4-Ddea+Na2CO3	6+1	0	82	99	83	0	76	96	16.5
2,4-Dbee+Na2CO3	6+1	0	97	99	98	1	92	99	15.7
2,4-Ddea+NaHCO3	6+16	0	35	99	27	0	3	73	15.8
2,4-Dbee+NaHCO3	6+16	0	96	97	97	1	86	99	13.9
2,4-Ddea+Na2CO3	6+16	0	33	91	18	1	3	25	14.0
2,4-Dbee+Na2CO3	6+16	2	98	98	96	0	91	99	16.0
2,4-Ddea+X-77	6+0.25%	0	83	99	90	0	89	98	15.3
2,4-Dbee+X-77	6+0.25%	2	97	99	98	1	86	99	14.8
Untreated	0	0	0	0	0	0	0	0	15.0
HIGH MEAN		2	98	99	98	1	93	99	17.3
LOW MEAN		0	0	0	0	0	0	0	12.2
EXP MEAN		0	76	91	74	0	66	82	15.3
C.V. %		451	8	3	11	321	13	13	13.3
LSD 5%		NS	10	5	14	NS	12	16	NS
LSD 1%		NS	14	7	19	NS	16	21	NS
# OF REPS		3	3	3	3	4	4	4	4

Summary

Carbonates at 1 oz/A in a 2,4-D diethanolamine spray mixture, tended to reduce weed control, but carbonates at 16 oz/A signifantly reduced weed control. Weed control with 2,4-D butoxyethyl ester was not influenced by carbonates. Surfactant X-77 did not enhance weed control with either 2,4-Ddea or 2,4-Dbee.

Carbonate antagonism of 2,4-D, Exp 2. Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on May 16. Treatments were applied to 4- to 5-leaf wheat, 4-leaf redroot pigweed, and 4- to 6-inch tall kochia on June 10 with 82F, 45% RH, and 15 mph wind. Treatments were in 5.8 gpa at 35 psi applied with a bicycle wheel type plot sprayer to 8 ft wide strip the length of 10 by 24 ft plots. The experiment was a randomized complete block with three replications. Evaluations were on July 1, 27, and August 18. Kochia plants exceeded 1 plant pr sq. ft and redroot pigweed was variable.

Treatment	Rate	--July 1-		----July 27----			-August 18-	
		Wht inj	KOCZ	Wht inj	KOCZ	Rrpw	Wht inj	KOCZ
	(oz/A)	(%)	(% control)	(%)	(% control)		(%)	(% control)
2,4-Ddea	6	0	73	0	51	69	0	29
2,4-Dbee	6	5	89	0	80	88	0	71
2,4-Ddea+NaHCO3	6+1	0	30	0	18	38	0	18
2,4-Dbee+NaHCO3	6+1	3	86	1	74	87	6	79
2,4-Ddea+Na2CO3	6+1	0	38	1	26	34	2	23
2,4-Dbee+Na2CO3	6+1	0	87	0	75	70	4	80
2,4-Ddea+NaHCO3	6+16	0	5	0	6	25	0	0
2,4-Dbee+NaHCO3	6+16	4	85	0	69	86	1	72
2,4-Ddea+Na2CO3	6+16	0	5	0	0	5	0	5
2,4-Dbee+Na2CO3	6+16	0	71	0	65	89	1	50
2,4-Ddea+X-77	6+0.25%	1	82	0	58	72	0	73
2,4-Dbee+X-77	6+0.25%	3	87	0	75	91	1	64
Untreated	0	0	0	0	0	0	0	0
HIGH MEAN		5	89	1	80	91	6	80
LOW MEAN		0	0	0	0	0	0	0
EXP MEAN		1	57	0	46	58	1	43
C.V. %		240	17	517	30	23	222	29
LSD 5%		NS	14	NS	19	19	4	18
LSD 1%		NS	18	NS	26	25	NS	24
# OF REPS		4	4	4	4	4	4	4

Summary

Weed control with 2,4-D diethanolamine (dea) was antagonized by both sodium bicarbonate and sodium carbonate in the spray mixture at both 1 and 16 oz/A. Weed control with 2,4-D butoxyethyl ester (bee) was not influenced by carbonates in the spray. Weed control was greater with 2,4-Dbee them 2,4-Ddea. Surfactant X-77 with 2,4-Ddea tended to increase weed control, but not when with 2,4-Dbee.

Sodium bicarbonate antagonism of 2,4-D, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to late tiller grass species and 6 to 8 inch tall redroot pigweed on July 1 with 71 F, 63% RH and no wind.

Treatment	Rate (oz/A)	July 13				July 21			
		Fomi	Wht	Oats	Rrpw	Fomi	Wht	Oats	Rrpw
		(% control)							
2,4-Ddea	4	10	0	3	45	15	0	0	38
2,4-Ddea+WK	4+0.25%	10	0	4	55	13	0	4	55
2,4-Ddea+PO	4+0.25G	15	0	6	65	13	0	5	50
2,4-Ddea+AG2	4+0.25G	20	1	13	66	38	1	5	63
2,4-Ddea+NaHCO3	4+8	0	0	0	8	1	0	0	1
2,4-Ddea+NaHCO3+WK	4+8+0.25%	5	0	3	35	11	0	3	25
2,4-Ddea+NaHCO3+PO	4+8+0.25G	14	0	4	56	19	0	3	53
2,4-Ddea+NaHCO3+AG2	4+8+0.25G	9	0	3	53	33	0	3	63
2,4-Ddea	16	29	3	11	64	30	0	5	73
2,4-Ddea+WK	16+0.25%	35	3	15	71	55	1	6	75
2,4-Ddea+PO	16+0.25G	65	6	21	88	73	6	18	90
2,4-Ddea+AG2	16+0.25G	70	10	23	91	80	5	14	90
2,4-Ddea+NaHCO3	16+8	16	0	5	21	14	0	0	33
2,4-Ddea+NaHCO3+WK	16+8+0.25%	10	0	3	39	9	0	0	33
2,4-Ddea+NaHCO3+PO	16+8+0.25G	16	0	6	64	30	0	3	60
2,4-Ddea+NaHCO3+AG2	16+8+0.25G	30	0	5	71	35	0	4	68
Untreated	0	0	0	0	0	0	0	0	0
HIGH MEAN		70	10	23	91	80	6	18	90
LOW MEAN		0	0	0	0	0	0	0	0
EXP MEAN		21	1	7	52	27	1	4	51
C.V. %		50	173	54	26	48	319	89	26
LSD 5%		15	3	6	19	19	4	5	19
LSD 1%		20	4	7	26	25	NS	7	25
# OF REPS		4	4	4	4	4	4	4	4

Summary

In general redroot pigweed control was enhanced more by Ag-2 than PO (petroleum oil with 17% Atplus 300F) or surfactant X-77 as Adjuvants with 2,4-D applied alone or in the presence of sodium bicarbonate. None of the adjuvants overcame the antagonism caused by sodium bicarbonate of 2,4-D for redroot pigweed control. Injury from 2,4-D to wheat ,oats, and millet related to the level of redroot pigweed control.

BAS 514 for weed control in wheat Exp 1. Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on April 14. Treatments were applied to 5- to 6-leaf wheat, 2- to 3-inch tall kochia and common lambsquarter, and 6- to 8-leaf volunteer sunflower on June 6 with 85F, 35% RH, cloudless sky, and a 12 mph wind. Treatments were applied in 8.5 gpa at 35 psi with bicycle wheel type plot sprayer to 8 ft wide area the length of 10 by 30 ft plots. Plants drought stressed at treatment. The experiment was a randomized complete block with four replications. Evaluations were on June 22 and July 25.

Treatment		June 22					July 26		
		Wht inj	Rrpw	Colq	KOCZ	Vosf	Wht inj	KOCZ	Rrpw
	(oz/A)	(%)	(% control)				(%)	(% control)	
BAS514	2	0	13	45	40	30	0	41	60
BAS514+BAS-090	2+0.25G	0	50	53	53	50	1	38	69
BAS514+PO	2+0.25G	0	50	28	60	35	0	60	85
BAS514+MS	2+0.25G	0	58	15	43	38	0	46	83
BAS514+SO	2+0.25G	0	15	0	35	33	1	34	38
BAS514	4	0	45	15	35	15	1	31	45
BAS514+BAS-090	4+0.25G	0	50	0	63	38	1	49	57
BAS514+PO	4+0.25G	5	63	43	68	50	1	34	69
BAS514+MS	4+0.25G	3	73	0	48	43	1	38	80
BAS514+SO	4+0.25G	3	38	55	65	55	0	61	64
BAS514	8	0	69	48	33	38	0	38	53
BAS514+BAS-090	8+0.25G	5	73	48	63	63	2	68	68
BAS514+PO	8+0.25G	3	20	15	55	50	1	42	64
BAS514+MS	8+0.25G	0	35	23	45	55	3	40	52
BAS514+SO	8+0.25G	5	45	10	40	48	1	48	60
Untreated	0	0	0	0	15	10	0	0	0
HIGH MEAN		5	73	55	68	63	3	68	85
LOW MEAN		0	0	0	15	10	0	0	0
EXP MEAN		1	43	25	47	40	1	42	59
C.V. %		205	49	90	37	38	150	22	23
LSD 5%		NS	NS	NS	NS	NS	1	13	20
LSD 1%		NS	NS	NS	NS	NS	2	17	26
# OF REPS		2	2	2	2	2	4	4	4

Summary

Weed species were variable making evaluation difficult. However, none of the treatment indicated any distinct advantages to the level of control obtained.

BAS-514 for weed control in wheat Exp. 2, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on May 16. Treatments were applied to 3-leaf wheat and green foxtail, 0.75- to 4-inch tall kochia, and 6-leaf wild mustard on June 6 with 90 F, 35% RH, sunny sky, 20 mph wind and dry soil. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 24 ft plots. Evaluations were on June 30 and August 5. Kochia and green foxtail exceeded 1 plant/sq. ft. The experiment was a randomized complete block with three replications. Adjuvants were all at 1 qt/A (0.25G). PO=petroleum oil 11N plus 17% Atplus 300 F, MS=Sun-it, and SO=soybean oil with 15% T-Mulz VO.

Treatment	Rate	----June 30----			----August 5---		
		Wht inj	Grft	KOCZ	Wht inj	KOCZ	Grft
	(oz/A)	(%)	(% control)		(%)	(% control)	
BAS514	2	0	35	15	0	4	36
BAS514+BAS-090	2+0.25G	12	93	83	3	63	94
BAS514+PO	2+0.25G	1	79	38	0	20	90
BAS514+MS	2+0.25G	0	74	53	0	28	88
BAS514+SO	2+0.25G	3	85	51	0	15	88
BAS514	4	4	61	25	0	14	74
BAS514+BAS-090	4+0.25G	11	95	81	11	67	96
BAS514+PO	4+0.25G	0	63	28	1	13	94
BAS514+MS	4+0.25G	3	87	71	1	38	94
BAS514+SO	4+0.25G	3	90	73	0	35	96
BAS514	8	0	56	41	1	23	78
BAS514+BAS-090	8+0.25G	5	94	86	1	65	96
BAS514+PO	8+0.25G	3	89	71	0	41	94
BAS514+MS	8+0.25G	3	87	68	1	40	93
BAS514+SO	8+0.25G	5	91	58	3	39	97
C.V. %		140	16	22	167	30	9
LSD 5%		6	17	17	3	13	10
LSD 1%		9	23	22	4	18	14
# OF REPS		4	4	4	4	4	4

Summary

BAS-514 AT 2 to 8 oz/A gave greater then 80% control of green foxtail without important injury to wheat. The BAS-090 adjuvant tended to enhance green foxtail control with BAS-514 more then the other adjuvants at the June 30 evaluation. All adjuvants simularly enhanced BAS-514 at the August 5 evaluation. Kochia control did not exceed 67% with any treatment at the August 5 evaluation. Green foxtail control increased but kochia control decreased from the early to late evaluation which probably reflects kochia's greater drought tolerance.

S-23121 for broadleaf weed control in wheat, Fargo 1988. 'Wheaton' Hard Red Spring wheat was seeded to dry soil on May 16. The 2-leaf (2-lf) treatments were applied to cotyledonary to 2-leaf weeds on June 2 with 80 F, 60% RH, and no wind. The 5-lf treatments were to 4-to 5-leaf wheat, 3-to 4-leaf foxtail, 4-leaf redroot pigweed, and 2 to 6 inch tall kochia on June 10 with 75 F, 55% RH, and 12 mph wind. Treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 24 ft plots. The experiment was a randomized complete block with four replications and evaluated June 15, June 24, and July 27. Weeds exceeded 3 plants/sq. ft. except wild mustard stand was sparse and variable. Wheat stand was sparse and variable making the June 29 evaluations meaningless.

Treatment	Rate	June 16				June 29				July 27		
		Wht	Rrpw	Wm	KOCZ	Wht	Rrpw	KOCZ	Wimu	Wh	KOCZ	Rrpw
	(oz/A)	(% control)										
S-23121(2-3lf)	0.143	3	89	64	33	8	67	21	63	3	14	66
S-23121(2-3lf)	0.214	8	92	84	39	5	86	60	56	0	18	71
S-23121(5lf)	0.072	3	28	18	0	0	23	10	13	0	40	45
S-23121(5lf)	0.143	9	35	32	18	3	50	23	44	3	60	50
S-23121+X-77(5lf)	0.143+0.25%	30	73	61	68	5	53	58	38	0	58	73
S-23121(5lf)	0.214	8	51	41	28	1	64	48	68	3	40	46
S-23121(5lf)	0.286	9	78	79	60	6	73	65	73	0	70	65
S-23121+2,4-Ddea(5lf)	0.072+3.7	8	70	81	59	13	83	74	97	0	55	84
S-23121+2,4-Ddea(5lf)	0.143+3.7	8	70	84	84	8	87	84	97	3	76	88
S-23121+2,4-Ddea(5lf)	0.214+3.7	13	84	87	79	9	92	87	95	0	83	94
S-23121+MCPA-dma(5lf)	0.072+4	10	58	81	61	7	69	54	90	1	40	88
S-23121+MCPA-dma(5lf)	0.143+4	6	75	80	54	5	86	45	90	0	36	88
S-23121+MCPA-dma(5lf)	0.214+4	9	74	76	43	3	79	75	95	0	57	79
DPX-M6316+X-77	0.25+0.25%	16	69	82	61	14	96	98	96	0	95	99
Bromoxynil	4	0	45	76	40	5	44	46	89	3	49	31
Bromoxynil&MCPA	8	6	73	95	80	0	70	80	99	0	81	72
2,4-Ddea	3.7	0	35	68	30	3	69	63	91	0	61	86
2,4-Ddea	7.2	1	63	91	41	11	90	80	98	0	59	93
MCPA-dma	3.7	0	28	83	18	8	62	45	98	0	44	78
MCPA-dma	7.2	1	34	91	13	10	68	59	98	0	52	80
Untreated	0	0	0	0	0	0	0	0	0	0	0	0
C.V. %		83	27	21	40	113	22	29	11	325	32	20
LSD 5%		8	22	20	24	NS	20	23	12	NS	24	20
LSD 1%		11	30	27	33	NS	27	31	16	NS	31	27
# OF REPS		4	4	4	4	4	4	4	4	4	4	4

Summary

S-23121 gave greater control of weeds when applied to small weeds with the June 2 than the larger weeds with the June 10 applications, at the June 16 evaluation. Wild mustard control was not adequate with S-23121, but was controlled when 2,4-D or MCPA were added to S-23121. Redroot pigweed was the most suseptable to S-23121, of the weeds present. None of the treatments adequately controlled all weeds with the 5-leaf applications. Surfactant X-77 generally enhanced weed control with S-23121. The extremly dry conditions probably reduced weed control with all treatments.

Preemergence weed control in wheat, Williston 1988. Preplant incorporated (PPI) treatments were applied, and twice field cultivator incorporated, and 'Butte' Hard Red Spring wheat seeded on May 25 with 60 F, 25% RH, clear sky, 5 mph wind, and a dry soil surface. Preemergence incorporated (PEI) treatments were applied and twice harrow incorporated on May 26 with 56 F, 29% RH, clear sky, a 4 mph wind, and dry soil. Treatments were applied with a tractor-mounted plot sprayer delivering 17 gpa at 35 psi to an 8 ft width the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications.

Treatment		Rate	Grft	Rrpw	Ruth	Std Red	Wheat Inj	Wheat Tw	Wheat Yield
		(oz/A)	--(% control)-			(%)	(%)	(lb/bu)	(bu/A)
Chlorsulfuron	PPI	0.25	33	84	73	0	0	52.7	3.2
Chlorsulfuron	PPI	0.50	58	95	80	0	0	53.1	5.3
Trifluralin	PPI	5	59	20	5	53	11	47.4	2.2
Trifluralin	PEI	8	50	0	6	16	9	48.5	2.9
Chlorsulfuron	PEI	0.25	0	89	55	3	0	50.9	3.0
Chlorsulfuron	PEI	0.50	18	95	65	0	3	51.3	3.7
Chlorsulfuron+Trifluralin	PEI	0.25+8	58	93	56	6	5	50.1	3.2
Untreated		0	0	0	0	0	0	62.2	3.6
HIGH MEAN			59	95	80	53	11	53.1	5.3
LOW MEAN			0	0	0	0	0	47.4	2.2
EXP MEAN			34	59	43	10	3	50.8	3.4
C.V. %			67	27	44	89	77		36.2
LSD 5%			34	24	28	13	4		NS
LSD 1%			46	32	38	17	5		NS
# OF REPS			4	4	4	4	4	1	4

Summary

Chlorsulfuron preplant incorporated gave greater green foxtail and tended to give greater Russian thistle control then when preemergence incorporated. None of the treatments gave adequate green foxtail control which may be a result of the drought. Chlorsulfuron gave 84% or more redroot pigweed control, regardless of incorporation method. Trifluralin at 5 or 8 oz/A applied alone preplant incorporated reduced wheat stand.

Small grain response to postemergence herbicides, Fargo 1988. The crop cultivars were seeded in adjacent 18 ft wide strips. The Alex cultivar was seeded untreated and treated with Mon 5500 at % w/w. Treatments were applied to 3- to 4-leaf crops on June 2 with 80 F, 60% RH and no wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa to an 8 ft wide area across the crops. Evaluation of crop injury was on June 28. The area was nearly free of weeds. The plots were 10 ft wide which gave a 4 ft area for reference in determining injury.

Treatment	Rate	Wh	Alx	AlxTr	Cot	Rug	Rbt	Wh	Alx	AlxTr	Cot	Rug	Rbt
	(oz/A)	(% injury)						(bu/A)					
S-23121	0.23	0	0	0	0	0	0	15.4	22.2	17.9	16.6	11.4	22.1
Feno&2,4-D+MCPA	12	0	0	0	3	32	7	20.6	25.4	21.4	19.8	9.5	31.8
DPX-R9674	0.75	0	0	0	0	0	0	19.4	23.9	21.4	20.1	10.9	31.3
HIGH MEAN		0	0	0	3	32	7	20.6	25.4	21.4	20.1	11.4	31.8
LOW MEAN		0	0	0	0	0	0	15.4	22.2	17.9	16.6	9.5	22.1
EXP MEAN		0	0	0	1	11	2	18.5	23.9	20.2	18.9	10.6	28.4
C.V. %		0	0	0	300	69	300	22.6	5.7	13.0	14.4	26.9	14.0
LSD 5%		NS	NS	NS	NS	16	NS	NS	NS	NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS	27	NS	NS	NS	NS	NS	NS	NS
# OF REPS		3	3	3	3	3	3	3	3	3	3	3	3

a= Wh=Wheaton, Alx=Alex, AlxTr=Alex Treated, Cot=Coteau, Rug=Rugby durum, and Rbt=Robust barley;

Summary

Fenoxaprop & 2,4-D & MCPA (Tiller) caused visual injury to Rugby durum. However, the yield of Rugby durum treated with Tiller was similar to that with other treatments which did not cause injury. The experiment did not contain an untreated treatment for yield because of limited space. The experiment was adjacent to "Small grain response to herbicides" experiment with yields from untreated areas which could be used for comparison.

CGA-131036 fall and spring applied on small grains, Williston 1988. Fall treatments were to bare summerfallow soil with 6.6 pH, and 1.7% organic matter on October 12, 1987 with 45 F, 65% RH, clear sky, 5 mph wind, and dry soil surface. The area was field cultivated prior to seeding 'Monroe'durum, 'Otana' oats, and 'Bowman' barley on May 13. Spring treatments were to 3- to 3.5-leaf crops, 1- to 5-leaf green foxtail, and less than 1 inch tall Russian thistle on June 1 with 61 F, 26% RH, clear sky, and a 4 mph wind. The treatments were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the various crops. Evaluation was for weed control across the three crops. Harvest was from 64 sq ft area for each crop on August 3.

Treatment/Time		Rate	Grft	Ruth	Wheat TW	Wheat Yield	Oats TW	Oats Yield	Barley TW	Barley Yield
		(gm/ha)	(% control)		(lb/bu)	(bu/A)	(lb/bu)	(bu/A)	(lb/bu)	(bu/A)
CGA-121036	Fall	7.5	0	5	60.5	4.2	32.0	15.8	46.6	11.7
CGA-121036	Fall	10.0	0	9	59.9	4.4	30.2	17.6	45.1	12.0
CGA-121036	Fall	20.0	0	25	60.0	4.4	31.4	20.6	47.3	13.8
CGA-121036	Fall	30.0	5	31	60.8	4.9	30.4	21.5	46.5	12.7
Chlorsulfuron	Fall	20.0	48	74	60.8	5.1	30.7	20.4	47.0	15.0
Control	Fall	0.0	0	0	60.2	4.8	30.4	17.7	46.1	13.6
CGA-121036	Spring	7.5	0	40	61.5	5.1	31.5	19.1	47.0	11.4
CGA-121036	Spring	10.0	5	38	60.4	4.6	29.8	19.0	46.9	12.0
CGA-121036	Spring	20.0	4	74	61.5	5.3	29.7	21.5	47.8	13.3
CGA-121036	Spring	30.0	13	84	60.9	3.9	31.4	19.9	46.3	11.4
Chlorsulfuron	Spring	20.0	51	88	61.6	5.7	31.9	16.6	47.5	10.1
Control	Spring	0.0	0	0	60.8	5.2	32.3	17.5	46.3	10.5
C.V.%			90	46		33.4		20.2		25.3
LSD 5%			14	26		NS		NS		NS
LSD 1%			18	35		NS		NS		NS
# Of Reps			4	4	1	4	1	4	1	4

Summary

None of the treatment caused injury to any of the crops so individual treatment ratings are not presented in the table. Crop yield or seed test weight was not influenced by the herbicide treatments. Chlorsulfuron gave greater green foxtail control then CGA-121036 regardless if fall or spring applied. CGA-13036 gave greater Russian thistle control when applied postemergence in the spring then in the previous fall as a preemergence treatment and was similar to chlorsulfuron as a postemergence treatment.

Fenoxaprop and HOE-7113 in Durum and HRS wheat, Langdon 1988. 'Cando' durum and 'Butte 86' Hard Red Spring wheat were seeded on May 16. The wheat was seeded at 95 lb/A and contained 5 lb of 'Robust' barley as a bioassay species. Treatments were applied to 6 -leaf wheat on June 10. Herbicides were applied with a bicycle wheel type plot sprayer delivering 8.3 gpa at 40 psi through an 8001 nozzle. The soil in the area was variable which influenced yields. Two replications for fenoxaprop and three for untreated and HOE-7113.

		Butte 86			Cando		
Treatment	Rate	Wht inj	yield	Tswt	Wht inj	yield	Tswt
	(oz/A)	(%)	(bu/A)	(lb/bu)	(%)	(bu/A)	(lb/bu)
Fenoxaprop	2.6	25	27.8	58.0	87	3.2	--
HOE-7113	2.6	5	33.7	57.8	2	39.4	58.4
Untreated		0	38.1	60.0	0	42.6	58.5

Summary

Data was not subjected to statistical analysis because there were only two replications for some treatment. However, fenoxaprop caused more injury to Cando durum than Butte 86. HOE-7113 (Puma) did not cause important injury to either Butte 86 Hard Red Spring wheat or to Cando durum. The area was relatively free of weeds.

Harrowing for weed control, Langdon 1988. 'Coteau' Hard Red Spring wheat was seeded on May 6. The wild oats, wheat, and green foxtail were all at similar leaf stage for a given harrowing treatment. Harrowing was with 10 ft wide Melroe flex tine harrow at 4 mph. The herbicide treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to a 6.7 ft wide area. The entire area was treated with chlorsulfuron at 0.19 oz/A + 2,4-D at 4 oz/A on June 12. Plots were 12 ft wide. Weed control evaluation on July 26.

Treatment[a]	Rate (oz/A)	Inj (%)	Wioa (% control)	Grft (% control)	Yield (bu/A)	Tswt (lb/bu)
Diclofop+DPX-M6316+PO	16+0.25	0	72	45	15.5	58.6
Check		0	0	0	11.1	58.3
1 harrow at right angle to rows(2.5 leaf)		26	36	63	11.7	57.9
1 harrow at right angle to rows(3 leaf)		18	34	70	11.8	57.0
1 harrow at right angle to rows(4 leaf)		21	36	60	12.0	58.1
1 harrow at right angle to rows(5 leaf)		41	46	53	8.4	56.4
1 harrow with rows+dcfp+DPX-M6316+PO(2.5lf)	16+0.25	18	83	64	14.3	59.5
1 harrow with rows(2.5lf)		19	39	53	11.3	58.5
1st with rows(2.5 lf)then across(2.5lf)		35	54	46	10.5	57.0
1st with rows(2.5 lf)then across(3lf)		46	53	64	10.2	56.8
1st with rows(2.5 lf)then across(4lf)		46	39	53	9.2	56.3
1st with rows(2.5 lf)then across(5lf)		39	56	44	9.6	57.3
HIGH MEAN		46	83	70	15.5	59.5
LOW MEAN		0	0	0	8.4	56.3
EXP MEAN		26	46	51	11.3	57.6
C.V. %		58	32	32	24.3	1.9
LSD 5%		22	21	23	4.0	1.6
LSD 1%		29	28	31	NS	2.1
# OF REPS		4	4	4	4	4

[a] PO=petroleum oil aft 1 oz/A.

Summary

Wheat yield was not influenced by any of the treatments for weed control, regardless of mechanical chemical or both mechanical and chemical. However the harrowing treatments generally injured the wheat. The various times or directions of harrowing did not greatly influence wild oats or green foxtail control, but were generally as effective as diclofop + DPX-M316 in controlling green foxtail. Wild oats control tend to be the highest with the harrowing + herbicide treatment.

Green foxtail control in wheat, Minot 1988. An experiment was conducted to evaluate herbicides for green foxtail control in Hard Red Spring wheat on a Williams loam soil with a pH 6.6 and 4% OM. Preplant incorporated (PPI) treatments were applied and incorporated into the top 2 inches of soil with a S-tine cultiweeder, 'Stoa" Hard Red Spring wheat was seeded, preemergence incorporated (PEI) treatments were applied to moist soil and incorporated 2 X with a spring tooth harrow and preemergence (PE) treatments were applied to the soil surface on May 13. The first rain after treatment was 1.06 inch on June 14. The postemergence (S1) treatments were applied to 3.0 leaf wheat, 0.5 to 2.0 inch green foxtail, and 0.5 to 1.0 inch common lambsquarter and Russian thistle. on June 1 with cloudy sky and 75 F. The (S2) treatments were applied to 5 leaf wheat, 0.5 to 4.0 inch green foxtail, and 1.0 to 4.0 inch common lambsquarter and Russian thistle on June 13 with clear sky and 80 F. Treatments were applied with a bicycle wheel type plot sprayer delivering either 17 or 8.5 gpa at 35 psi for the soil applied or postemergence treatments, respectively. Stand reduction for the preemergence treatments was evaluated on June 7 and green foxtail, common lambsquarter and Russiam thistle control was evaluated on June 28 and on July 21. The experiment was a randomized complete block design with four replications and experimental units were 10 X 18 sq ft. A 4 X 18 sq ft area of wheat was harvested for yield on August 4.

Treatment		Rate	Wheat			Grft			
			Yld	Std.red.	Inj	6/28	7/21	Colq	Ruth
		(oz/A)	(bu/A)	(%)	(%)	----(% control)----			
Chlorsulfuron	(PPI)	0.25	6.3	1	1	39	30	80	61
Chorsulfuron	(PPI)	0.50	6.5	0	0	64	60	88	66
Trifluralin	(PEI)	8.0	8.7	4	0	66	66	56	48
Clsu+Trif	(PEI)	0.25+8	8.3	0	0	75	79	79	70
Clsu+Trif	(PEI)	0.25+16	6.9	5	1	88	92	70	55
Chlorsulfuron	(PE)	0.25	5.5	0	3	13	19	51	53
Chlorsulfuron	(PE)	0.50	4.5	0	1	18	16	64	64
Clsu+R11[a]	(S1)	0.25+.25%	5.2	0	3	50	38	98	98
Clsu+Dicl	(S1)	0.25+12	4.4	0	8	63	54	98	95
Diclofop	(S1)	12.0	6.0	0	3	59	48	1	1
HOE7113-04H	(S1)	1.28	6.6	0	5	89	73	0	0
HOE7113-04H	(S2)	1.28	5.0	0	10	89	81	0	0
HOE7125-02H	(S2)	5.25	4.5	0	11	81	75	91	84
HOE7125-02H	(S2)	6.25	3.9	0	10	85	75	93	93
Check			4.8	0	0	0	0	0	0
C.V. %			34.7	314	106	25	28	20	30
LSD 5%			2.9	3	6	21	22	17	22

a R11 = surfactant with 90% ai;

Summary

The soil applied treatments caused minimal wheat stand reduction. Chlorsulfuron + diclofop, HOE 7113-04H (S2) and HOE 7125-02H caused significant wheat injury but only tended to reduce wheat grain yields. Wheat treated with trifluralin (PEI) at 8 oz/A alone yielded significantly more than the check and several other treatments despite only fair green foxtail and broadleaf weed control. Chlorsulfuron applied postemergence gave the highest control of common lambsquarter and Russian thistle while chlorsulfuron + trifluralin, HOE 7113-04H and HOE 7125-02H gave the highest green foxtail control. Green foxtail control was less with surface applied chlorsulfuron (PE) compared with other applications methods. Minimal rainfall and excessive temperatures during May and June following planting probably accounted for the generally poor weed control.

Weed control in flax, Fargo 1988. 'Linton' flax was seeded to dry soil on May 17. Treatments were applied to 3- to 8-inch tall flax, 2- to 6-leaf redroot pigweed, kochia, wild mustard, and foxtail on June 7 with 85 F, 48% RH and 10 mph wind at application. The second treatment of splits (/) was on June 10 with 75 F, 60% RH, and 10 mph wind at application. Plants were within the stages given for the first treatments. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 24 ft plots. The experiment was randomized complete block with four replications. Evaluations were on June 29 and July 18. Green foxtail density was about 1 plant/sq ft and other weeds about 5/sq ft.

		June 29				July 18		
Treatment	Rate	Flax inj	Grft	Rrpw	Wimu	Grft	Rrpw	Flax inj
	(oz/A)	(%)	-------(% control)------					(%)
Diclofop+Bromoxynil	12+4	10	95	85	98	97	64	2
Diclofop+Bromoxynil+PO	12+4+0.12G	9	99	72	99	98	48	0
Diclofop+Bromoxynil+MS	12+4+0.12G	5	99	66	98	99	36	2
Bent+MCPA+PO/Seth+MS	8+4+0.25G/2+0.25G	12	95	74	99	99	82	9
Bent+Brox+PO/Seth+MS	8+4+0.25G/2+0.25G	8	95	43	99	99	49	7
Sethoxydim+BCH/MCPA-bee	2+0.25G/4	25	97	80	99	99	74	11
Sethoxydim+MS/MCPA-bee	2+0.25G/4	26	97	89	98	99	77	17
Sethoxydim+MCPA-bee+BCH	2+4+0.25G	18	99	79	99	99	78	2
Sethoxydim+MCPA-bee+MS	2+4+0.25G	10	93	75	99	99	81	6
Seth+MCPA-bee+BCH/MCPA-bee	2+4+0.25G/4	30	96	87	99	98	93	17
Seth+MCPA-bee+MS/MCPA-bee	2+4+0.25G/4	34	95	88	99	98	94	34
Sethoxydim+MCPA-bee+BCH	2+8+0.25G	6	92	83	99	99	90	2
Sethoxydim+MCPA-bee+MS	2+8+0.25G	13	95	91	99	99	94	1
Sethoxydim+Bromoxynil+BCH	2+4+0.25G	4	95	65	95	99	29	0
Sethoxydim+Bromoxynil+MS	2+4+0.25G	9	95	46	92	99	21	0
Sethoxydim+Brox&MCPA+BCH	2+8+0.25G	8	98	90	99	99	78	0
Sethoxydim+Brox&MCPA+MS	2+8+0.25G	5	95	79	99	99	67	0
Untreated	0	0	0	0	0	0	0	0
C.V. %		59	5	23	3	1	16	127
LSD 5%		11	6	23	4	2	15	11
LSD 1%		14	8	31	5	3	20	15
# OF REPS		4	4	4	4	4	4	4

Summary

The MCPA bee (butoxyethyl ester) injured flax when applied on June 10 following a June 7 application of sethoxydim or sethoxydim + MCPA bee with BCH (Dash adjuvant from BASF) or MS (Sun-it methylated seed oil + emulsifier). Sethoxydim + MCPA bee with these adjuvants did not injure flax treated on June 7. Green foxtail was controlled by all herbicide treatments. MCPA at 8 oz/A was equal to MCPA as a 4+4 oz/A split application for redroot pigweed control, with either BCH or MS.

Weed control in flax, Carrington 1988. 'Linton' flax was seeded on May 10. Treatments were applied on June 9 except for second applications of split (/) treatments which were on June 15. Conditions for 1 week after treatment were 84 to 96 F and drought stress. Flax was 5- to 6-inch tall, green foxtail 2- to 3-leaf, wild oats 6-leaf, and broadleaf weeds 3 inch tall at treatment. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 8 by 20 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 15. Green foxtail density exceeded 6 plants/sq ft, but other species were less dense and variable.

Treatment	Rate	Flax inj	Wioa	Grft	Rrpw
	(oz/A)	(%)	---(% control)----		
Diclofop+Bromoxynil	12+4	1	54	61	50
Diclofop+Bromoxynil+PO	12+4+0.12G	0	29	65	53
Diclofop+Bromoxynil+MS	12+4+0.12G	5	51	69	67
Bent+MCPA+PO/Seth+MS	8+4+0.25G/2+0.25G	0	8	10	33
Bent+Brox+PO/Seth+MS	8+4+0.25G/2+0.25G	6	9	39	45
Sethoxydim+BCH/MCPA-bee	2+0.25G/4	3	34	48	67
Sethoxydim+MS/MCPA-bee	2+0.25G/4	0	23	58	53
Sethoxydim+MCPA-bee+BCH	2+4+0.25G	0	16	50	57
Sethoxydim+MCPA-bee+MS	2+4+0.25G	4	15	49	63
Seth+MCPA-bee+BCH/MCPA-bee	2+4+0.25G/4	3	19	51	77
Seth+MCPA-bee+MS/MCPA-bee	2+4+0.25G/4	9	10	66	88
Sethoxydim+MCPA-bee+BCH	2+8+0.25G	0	3	60	82
Sethoxydim+MCPA-bee+MS	2+8+0.25G	9	9	54	65
Sethoxydim+Bromoxynil+BCH	2+4+0.25G	3	15	33	27
Sethoxydim+Bromoxynil+MS	2+4+0.25G	3	5	35	35
Sethoxydim+Bromoxynil&MCPA+BCH	2+8+0.25G	6	5	18	55
Sethoxydim+Bromoxynil&MCPA+MS	2+8+0.25G	1	11	44	45
C.V. %		165	100	38	34
LSD 5%		NS	25	24	30
LSD 1%		NS	33	32	41
# OF REPS		4	4	4	3

Summary

None of the herbicides caused any important injury to flax or gave adequate control of wild oats and green foxtail. The drought stress and 300 ppm sodium bicarbonate in the spray water may have contributed to the lack of grass species control with sethoxydim. BCH (adjuvant from BASF-Dash) and MS (methylated seed oil adjuvant Sun-it) were similar as adjuvants with the various herbicide treatments. MCPA butoxyethyl ester (bee) at 4+4 oz/A split application did not exceed MCPA bee at 8 oz/A as a single application for redroot pigweed control.

Weed control in flax, Williston 1988. 'Flor' flax was seeded on May 13. Treatments were applied to 3 inch tall flax, 3-leaf to tillering green foxtail, 2- to 4-inch tall Russian thistle, and other broadleaf weeds 2- to 4-inch tall on June 9 with 69 F, 35% RH, clear sky, and a 7 mph wind. High temperature for June 9 was 90 F. The second treatments following the / were on June 13 with 58 F, 55% RH, cloudy sky, and a 5 mph wind. The temperature for June 13 was 81 F. Treatments were applied with a tractor mounted plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replication. Weed infestations were dense for Russian thistle, moderate for green foxtail and common lambsquarters, and sparse for redroot pigweed and kochia. Evaluation was on July 18. Harvest was from 80 sq ft on August 16.

Treatment	Rate	Grft	Ruth	Rrpw	Colq	KOCZ	Flax Inj	Yield	Tswt
	(oz/A)	-------(% control)------					(%)	(bu/A)	(lb/bu)
Diclofop+Bromoxynil	12+4	15	71	61	83	63	4	1.8	41.7
Diclofop+Bromoxynil+PO	12+4+0.12G	31	86	56	85	94	3	2.4	51.7
Diclofop+Bromoxynil+MS	12+4+0.12G	26	81	56	90	78	3	1.6	51.2
Bent+MCPA+PO/Seth+MS	8+4/2	11	15	33	71	0	0		
Bent+Bromoxynil+PO/Seth+MS	8+4/2	0	70	40	93	60	0	1.5	51.5
Sethoxydim+BCH/MCPA-bee	2/4	59	18	33	90	54	8		
Sethoxydim+MS/MCPA-bee	2/4	94	0	31	93	70	0		
Sethoxydim+MCPA-bee+BCH	2+4	94	35	66	86	46	0		
Sethoxydim+MCPA-bee+MS	2+4	94	39	58	94	39	8	3.2	50.8
Seth+MCPA-bee+BCH/MCPA-bee	2+4/4	92	55	72	95	95	10		
Seth+MCPA-bee+MS/MCPA-bee	2+4/4	94	33	48	94	71	10		
Sethoxydim+MCPA-bee+BCH	2+8	90	49	91	90	94	6	2.4	50.8
Sethoxydim+MCPA-bee+MS	2+8	93	66	34	95	78	6	4.7	52.5
Sethoxydim+Bromoxynil+BCH	2+4	95	81	81	94	85	4	3.1	51.6
Sethoxydim+Bromoxynil+MS	2+4	83	83	35	84	80	6		
Seth+Bromoxynil&MCPA+BCH	2+8	95	74	49	95	84	5	3.9	51.8
Seth+Bromoxynil&MCPA+MS	2+8	93	88	41	93	59	3	4.5	50.4
Untreated	0	0	0	0	0	0	0		
C.V. %		12	33	55	17	48	129	22.5	
LSD 5%		11	24	40	20	43	NS	1.0	
LSD 1%		15	32	53	27	58	NS	1.3	
# OF REPS		4	4	4	4	4	4	4	1

a Missing data was for plots not harvested because of excessive weed competition

Summary

None of the treatments caused important injury to flax. Bentazon as a treatment 4 days before sethoxydim antagonized green foxtail control. Treatments with bromoxynil gave the greatest Russian thistle control and control tended higher when bromoxynil was with methylated seed oil petroleum oil alone. Redroot pigweed and kochia control was too variable to determine differences among treatments.

Weed control in flax, Minot 1988. 'Neche' flax was seeded on May 6. Treatments were applied to 3 inch tall flax, 1- to 3-inch tall kochia, 1- to 4-inch diameter Russian thistle, and 0.5- to 2.5-inch tall green foxtail on June 1 with 70 F, cloudy sky, and no wind. The second treatment of the split applications (after 1) were on June 3. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 24 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 14. Weed densities exceeded 5 plants/sq ft for all species.

Treatment	Rate	Flax inj	Grft	Ruth	KOCZ
	(oz/A)	(%)	---(% control)--		
Diclofop+Bromoxynil	12+4	3	19	83	55
Diclofop+Bromoxynil+PO	12+4+0.12G	0	23	88	49
Diclofop+Bromoxynil+MS	12+4+0.12G	0	26	86	44
Bentazon+MCPA+PO/Sethoxydim+MS	8+4+0.25G/2+0.25G	0	77	79	48
Bentazon+Bromoxynil+PO/Sethoxydim+MS	8+4+0.25G/2+0.25G	0	43	89	88
Sethoxydim+BCH/MCPA-bee	2+0.25G/4	0	80	20	31
Sethoxydim+MS/MCPA-bee	2+0.25G/4	0	83	30	35
Sethoxydim+MCPA-bee+BCH	2+4+0.25G	0	68	39	44
Sethoxydim+MCPA-bee+MS	2+4+0.25G	0	75	49	50
Sethoxydim+MCPA-bee+BCH/MCPA-bee	2+4+0.25G/4	0	86	66	46
Sethoxydim+MCPA-bee+MS/MCPA-bee	2+4+0.25G/4	0	83	76	48
Sethoxydim+MCPA-bee+BCH	2+8+0.25G	4	70	68	59
Sethoxydim+MCPA-bee+MS	2+8+0.25G	6	62	74	61
Sethoxydim+Bromoxynil+BCH	2+4+0.25G	0	70	82	64
Sethoxydim+Bromoxynil+MS	2+4+0.25G	0	81	85	63
Sethoxydim+Bromoxynil&MCPA+BCH	2+8+0.25G	0	80	88	63
Sethoxydim+Bromoxynil&MCPA+MS	2+8+0.25G	4	72	94	65
Untreated	0	0	0	0	0
C.V. %		275	27	19	38
LSD 5%		4	23	18	27
LSD 1%		NS	31	24	36
# OF REPS		4	4	4	4

Summary

None of the herbicides caused injury to flax. Green foxtail control was greater with sethoxydim than with diclofop treatments. BCH (adjuvant from BASF-Dash) was similar to MS (methylated seed oil adjuvant Sun-it) for grass species control with sethoxydim. Bromoxynil and Bentazon treatments tended to give the greatest Russian thistle control. MCPA bee (butoxyethyl ester) 4+4 oz/A as a split application was simuliar to MCPA bee at 8 oz/A as one application for controlling Russian thistle and kochia. Russian thistle control tended to be greater with treatments containing MS than BCH adjuvant. Kochia control was the greatest with the Bentazon plus bromoxynil treatment.

Acifluorfen for Flax desiccation, Casselton 1988. Treatment were applied on August 17 with 75 F, 85% RH, and 10 to 15 mph wind. Treatments were to mature 'Foster' flax with green leaves and stems, but no seed balls because of drought and grasshoppers. The 17 gpa treatments were with 8022 and 8.5 gpa with 8001 nozzles on a bicycle wheel type plot sprayer using 35 psi CO2 pressure. Treatments were to 8 ft wide area the length of 30 by 10 ft plots. Evaluation for percut plant desiccation was on August 24 and September 2. The experiment was a randomized complete block with three replications.

Treatment	Spray volume	Rate	August 24		September 2	
			Flax	Colq	Flax	Colq
	(gpa)	(oz/A)	----(% desiccation)---			
Acifluorfen+MS	(8.5)	2+0.25G	94	0	80	12
Acifluorfen+MS	(8.5)	4+0.25G	92	0	81	13
Acifluorfen+MS	(8.5)	8+0.25G	99	22	97	17
Acifluorfen+Dash	(8.5)	4+0.25G	89	33	78	33
Acifluorfen+MS	(17)	2+0.25G	93	0	77	0
Acifluorfen+MS	(17)	4+0.25G	91	0	78	0
Acifluorfen+MS	(17)	8+0.25G	98	3	92	13
Paraquat+X77	(17)	8+0.25%	99	77	98	73
C.V. %			4	122	9	114
LSD 5%			7	36	14	40
LSD 1%			NS	50	NS	NS
# OF REPS			3	3	3	3

Summary

Acifluorfen at 8 oz/A applied with methylated seed (MS) oil was equal to paraquat for desiccation of flax. The differences between the two evaluations may be because of different evaluators as plants probably did not recover with time. The BCH (Dash from BASF) tended to cause less enhancement than MS for flax and less for common lambsquarters desiccation.

Dessication of flax, Minot 1988. 'McGregor' flax was seeded in mid July. Treatments were applied with a bicycle wheel plot sprayer delivering 8.5 or 17 gpa at 35 psi to 18 to 24 inch flax which was near physicalogical maturity on September 14 with 55 F, a sunny sky and no wind. The center 40 inches of the 7.5 X 24 ft plots were treated. Evaluations of flax dry down were made on September 23 and October 3.

Treatment		Rate	Eval 1	Eval 2
			----(% dessicated)----	
Aciflourfen+MS	(8.5 gpa)	2+0.25G	15	18
Aciflourfen+MS	(8.5 gpa)	4+0.25G	15	23
Aciflourfen+MS	(8.5 gpa)	8+0.25G	17	25
Aciflourfen+Dash	(8.5 gpa)	4+0.25G	15	22
Aciflourfen+MS	(17 gpa)	2+0.25G	12	15
Aciflourfen+MS	(17 gpa)	4+0.25G	10	15
Aciflourfen+MS	(17 gpa)	8+0.25G	12	17
Aciflourfen*MS	(17 gpa)	96	32	35
C.V. %			29	18
LSD 5%			8	7
# OF REPS			3	3
F-TRT			6	10

a *MS = The MS was not included in the treatment.

Summary

Treatments did not adequately dessicate flax with the cool conditions of mid to late September. NaClO3 matured the flax bolles quicker than the other treatments however it did not kill the flax plant.

Weed control in flax, Langdon 1988. 'McGregor' flax was seeded on May 10. Treatments were applied to 3 inch tall flax and ladysthumb on June 9, except for the second application of the split (1) treatment which was on June 13. All treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 20 ft plots. The experiment was randomized complete block with four replications. Evaluation was on July 20. Ladysthumb density exceeded 1 plant/sq. ft.

Treatment	Rate (oz/A)	Flax inj (%)	Ladysthumb (% control)	Yield (lb/A)	Flax (%)	Flax yield (lb/A)
Sethoxydim+Bromoxynil+MS	3+4+0.25G	0	38	590	68	393
Sethoxydim+Bromoxynil&MCPA+MS	3+8+0.25G	0	53	873	60	524
Sethoxydim+MCPA-bee+MS/MCPA(1-3d)	3+4+0.25G/4	5	45	914	55	497
Sethoxydim+MCPA-bee+MS	3+8+0.25G	4	53	909	48	436
Sethoxydimoxydim+MS	3+0.25G	0	25	950	39	368
Diclofop+Bromoxynil	12+4	0	5	1003	38	380
Picloram+MCPA-dma	0.25+4	1	48	938	65	606
Picloram+MCPA-dma+Sethoxydim+MS	0.25+4+3+0.25G	3	52	840	45	380
Metsulfuron+X-77	0.05+0.25%	6	96	762	98	742
DPX-R9674+X-77	0.25+0.25%	20	76	597	64	389
DPX-M6316+MCPAdma	0.15+4	7	88	651	94	614
Untreated		0	0	1015	31	320
		113	33	16	15	22
C.V. %		6	21	188	13	148
LSD 5%		8	29	253	17	200
LSD 1%		4	4	4	4	4
# OF REPS						

Summary

DPX-R9674 caused 20% injury to flax and gave 76% ladysthumb control. However, metsulfuron and DPX-M6316+MCPA gave 96 and 88% ladysthumb control respectively without causing important injury to flax. None of the other herbicide treatments gave adequate ladysthumb control. The percent flax in the harvested sample was generally highest for treatments which gave the greatest ladysthumb control.

Flax variety response to sulfonyl urea herbicides, Minot 1988. Flax was seeded May 10 on fallow which had been fertilized for a 50 bu/A wheat yield goal. Sethoxydim 4.5 oz/A + Sun-it oil at 1 qt/A was applied for grass weed control. DPX-L5300 at 0.5 oz ai/A and DPX-R9674 at 0.9 oz ai/A were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to 2.5 inch flax with a cloudy sky and 70 F on June 1. Metsulfuron was applied with the same method to 2.5 inch flax with a sunny sky and 90 F on June 3. All sulfonyl urea herbicides were applied with 0.25% V/V R-11 surfactant. Injury evaluations were made on June 17. The treatments were not replicated and data represent one observation.

Variety	Flax injury		
	DPX-L5300	DPX-R9674	Metslufuron
	(% injury)		
U 605	55	60	25
U 605	50	60	25
Clark	60	50	40
Flor	60	50	50
Linton	80	80	40
McGregor	40	40	25
Neche	80	70	55
NorLin	55	60	30
NorMan	80	75	45
Verne	50	50	30
Mean	55	54	33

Summary

All flax varieties were injured initially by the sulfonyl urea herbicides. Metsulfuron caused the least injury of the herbicides tested. Flax was stunted, yellowed, and delayed in maturity 2 to 3 weeks. Late June and early July rains resulted in vigorous branching and flowering of the treated flax which may have increased flax yield potential. The plots were not harvested for yield.

Weed control in sunflower, Carrington 1988. Preplant incorporated (ppi) treatments were applied and rototiller incorporated into dry soil and 'Sigco 465A' sunflower planted on June 6. Preemergence (PE) treatment was applied on June 7. The first rain after treatment occurred on June 12. Postemergence (p1) treatments were to 2- to 8-leaf sunflower, green foxtail 3-leaf and 3 inch tall redroot pigweed on July 5. Postemergence (p2) treatments were applied on July 7. Herbicides were applied with a bicycle wheel type plot sprayer delivering 17 gpa for ppi and pe treatments and 8.5 gpa for the postemergence treatment at 35 psi. Plots were 8 by 25 ft and the experiment was a randomized complete block with four replications. Evaluated July 15. Sunflowers variable in size and weed variable in density.

Treatment	Rate (oz/A)	Sufl inj (%)	Grft	Rrpw
			---(% control)--	
EPTC (ppi)	40	35	99	99
Trifluralin (ppi)	12	0	98	99
Ethalfluralin (ppi)	12	0	98	98
Pendimethalin (ppi)	20	0	98	98
Pendimethalin+AC 222,293 (ppi)	20+5	0	99	99
Trifluralin+Chloramben-W (ppi)	12+32	0	98	98
EPTC+Chloramben-W (ppi)	40+32	3	98	99
Trifluralin+RE40885 (ppi)	12+8	0	93	95
Alachlor(pe)	40	0	89	97
Pendimethalin(ppi)/AC 222,293(p1)	20/3	3	98	99
Pendimethalin(ppi)/AC 222,293(p2)	20/3	20	99	99
Pendimethalin(ppi)/Aciflurofen(p1)	20/2	4	99	99
Pendimethalin(ppi)/Aciflurofen(p1)	20/3	15	98	99
Sethoxydim+AC 222,293+MS(p1)	3+3+0.25G	15	68	28
Sethoxydim+Aciflurofen+MS(p1)	3+2+0.25G	45	60	88
		106	5	6
C.V. %		13	6	7
LSD 5%		18	8	10
LSD 1%		4	4	4
# OF REPS				

Summary

EPTC (ppi), AC 222,293 (p2), and aciflurofen + MS (p1) MS=(methylated seed oil, Sun-it) all caused 20% or more injury to sunflower. All preplant incorporated and preemergence herbicide treatmemts gave 89% or more control of green foxtail and redroot pigweed.

Weed control in sunflower, Minot 1988. Preplant soil incorporated (ppi) treatments applied and twice (first immediately and second after 20 minutes) cultivator incorported 3 inch deep on May 23 to mostly dry soil. Pioneer 6440 sunflower seeded and preemergence (pe) treatment applied on May 26. P1 treatments were applied to 6- to 7-inch tall sunflower (8-leaf) and weeds just emerging to 1 or 2 true leaves on June 22 with 75 F, high humidity, and no wind. P2 treatments were applied to 18- to 25-inch tall sunflower, and 2- to 8-inch tall weeds in early bud stage on July 8 with 70 F, 10 mph wind, and good growing conditions. Treatments were applied to an 8 ft wide area the length of 10 by 25 ft plots with a bicycle wheel type plot sprayer delivering 17 gpa for the ppi and pe and 8.5 gpa for the postemergence (P1&P2) treatments, at 35 psi. The experiment was a randomized complete block with four replications. Evaluation was on July 18. All weeds densities were greater then 1 plant/sq ft.

Treatment	Rate	Sufl inj	Grft	Rrpw	Rrpw	Colq	Tamu
	(oz/A)	(%)	-------(% control)----------				
EPTC(ppi)	40	0	97	96	92	91	86
Trifluralin(ppi)	12	0	98	97	98	93	0
Ethalfluralin(ppi)	12	1	98	99	99	99	16
Pendimethalin(ppi)	20	0	98	97	95	89	5
Pendimethalin+AC 222,293(ppi)	20+5	0	97	99	97	98	98
Trifluralin+Chloramben-W	12+32	15	98	99	98	96	89
EPTC+Chloramben-W	40+32	8	98	98	98	97	95
Trifluralin+RE40885(ppi)	12+8	5	97	99	97	98	94
Alachlor(pe)	40	0	78	86	85	61	25
Pend(ppi)/AC 222,293(p1)	20/3	0	96	99	95	99	99
Pend(ppi)/AC 222,293(p2)	20/3	16	98	98	94	93	85
Pend(ppi)/Acif(p1)	20/2	0	98	99	97	93	56
Pend(ppi)/Acif(p1)	20/3	1	97	99	99	97	77
Seth+AC 222,293+MS(p1)	3+3+0.25G	2	91	60	34	41	99
Seth+Acif+MS(p1)	3+2+0.25G	11	88	80	81	65	95
Untreated	d	0	0	0	0	0	0
C.V. %		232	3	5	10	16	19
LSD 5%		NS	4	7	12	18	18
LSD 1%		NS	5	9	15	24	24
# OF REPS		4	4	4	4	4	4

Summary

AC 222,293 (Assert) caused greater injury at the second postemergence then the first application. Green foxtail control was 88% or more with all herbicide treatments except Alachlor. Wild mustard control was more than 84% with EPTC, all AC 222,293 treatments, RE-40885, and aciflurofen+MS Ms=(methylated seed oil adjuvant, Sun-it). Redroot pigweed, prostrate pigweed, and common lambsquarter were adequately (> 85%) controlled by all treatment except AC 222,293+sethoxydim, aciflurofen+sethoxydim, and alachlor for common lambsquarter.

Weed control in sunflower, Williston 1988. Preplant soil incorperated (ppi) treatments were applied and field cultivator incorporated twice on May 18 with 60 F, 40% RH, dry soil and a 7 mph wind. 'Pioneer 6440' sunflower was seeded and preemergence (pe) treatment applied on May 19 with 62 F, 18% RH, dry soil, and a 6 mph wind. Postemergence (p1) treatments were applied to emerging to 8-leaf sunflower (mostly 6 leaves), 3-leaf to tillering green foxtail, 0.5 inch tall redroot pigweed, and 1 to 3 inch tall Russian thistle, and tame yellow mustard (Tamu) on June 13 with 64 F, 45% RH, and 7 mph wind. Postemergence (p2) treatments were applied to 8- to 10-leaf sunflowers, 6 inch tall to flowering tame mustard, 4 to 6 inch tall redroot pigweed and Russian thistle, and 2-leaf to tillering green foxtail on June 22 with 68 F, 60% RH, cloudy sky, dry soil, and no wind. Herbicides were applied with a tractor-mounted plot sprayer delivering 17 gpa at 35 psi for the preplant and preemergence and 8.5 gpa at 35 psi for the postemergence treatments. Treatment was to an 8 ft area over the two center rows of four row plots the 25 ft length of the plots. Weed control evaluation was on July 24.

Treatment	Rate (oz/A)	Sufl inj (%)	Grft	Ruth	Tamu	Rrpw
			----(% control)----			
EPTC(ppi)	40	4	95	24	55	90
Trifluralin(ppi)	12	0	89	60	11	99
Ethalfluralin(ppi)	12	1	95	65	19	94
Pendimethalin(ppi)	20	0	36	20	0	35
Pendimethalin+AC 222,293(ppi)	20+5	1	79	66	56	95
Trifluralin+Chloramben-W(ppi)	12+32	0	96	91	33	97
EPTC+Chloramben-W(ppi)	40+32	0	97	78	85	96
Trifluralin+RE-40885(ppi)	12+8	1	96	92	43	94
Alachlor(pe)	40	0	63	8	0	24
Pendimethalin(ppi)/AC 222,293(p1)	20/3	1	91	75	94	94
Pendimethalin(ppi)/AC 222,293(p2)	20/3	0	94	80	96	91
Pendimethalin(ppi)/Aciflurofen(p1)	20/2	3	91	64	79	89
Pendimethalin(ppi)/Aciflurofen(p1)	20/3	4	91	76	71	90
Sethoxydim+AC 222,293+MS(p1)	3+3+0.25G	5	94	73	95	43
Sethoxydim+Aciflurofen+MS(p1)	3+2+0.25G	8	89	79	80	85
Untreated		0	0	0	0	0
		202	8	30	39	17
C.V. %		NS	9	25	28	28
LSD 5%		4	4	4	4	4
# OF REPS						

Summary

None of the herbicides caused important injury to sunflower. AC 222, 293 at 3 oz/A applied postemergence gave more than 90% control of tame mustard, but only 56% when applied preplant incorporated at 5 oz/A. Green foxtail control with sethoxydim tended to be less when sethoxydim was with aciflurofen than AC 222,293. The low level of weed control with pendimethalin applied alone indicates a possible error as in other experiments control of most weeds has been similar to that with trifluralin. Aciflurofen was similar to AC 222, 293 for Russian thistle control; more effective than AC 222,293 for tame mustard control; and less effective than AC 222,293 for redroot pigweed control, when applied postemergence with sethoxydim and methylated seed oil adjuvant (MS).

Weed control in sunflower, Casselton 1988. Preplant incorporated (ppi) treatments were applied and twice incorporated with a field cultivator plus harrow 3 inch deep in mallow soil on May 3. 'Interstate' 3001 sunflower was seeded and preemergence alachlor applied on May 4. P1 treatments were applied to 2- to 10-leaf sunflower, 6- to 10-inch tall wild mustard, 10 inch tall kochia, and 4- to 6-leaf foxtail on June 20 with 88 F, 40% RH, and 10 mph wind. P2 treatment was on June 28. Treatments were applied to an 8 ft wide area the length of 10 by 25 ft plots with a bicycle wheel type plot sprayer delivering 17 gpa for the ppi and pe and 8.5 gpa for the postemergence treatments. The experiment was a randomized complete block with four replications. Evaluation was difficult as weeds were dying in untreated areas because of drought, July 5. Weed density was about 1 plant/sq ft for each species.

Treatment	Rate	Sufl inj	Fxtl	KOCZ	Wimu
	(oz/A)	(%)	---(% control)----		
EPTC (ppi)	40	0	94	73	33
Trifluralin(ppi)	12	0	98	91	10
Ethalfluralin(ppi)	12	0	99	92	21
Pendimethalin(ppi)	0	0	96	84	15
Pendimethalin+AC 222,293(ppi)	20+5	0	94	78	70
Trifluralin+Chloramben-W(ppi)	12+32	0	94	90	88
EPTC+Chloramben-W(ppi)	40+32	0	97	92	84
Trifluralin+RE40885(ppi)	12+8	0	95	89	79
Alachlor(pe)	40	0	49	20	15
Pendimethalin(ppi)/AC 222,293(p1)	20/3	3	94	87	94
Pendimethalin(ppi)/AC 222,293(p2)	20/3	6	97	86	84
Pendimethalin(ppi)/Aciflurofen(p1)	20/2	3	96	71	85
Pendimethalin(ppi)/Aciflurofen(p1)	20/3	1	99	87	87
Sethoxydim+AC 222,293+MS(p1)	3+3+0.25G	30	75	30	96
Sethoxydim+Aciflurofen+MS(p1)	3+2+0.25G	19	92	63	99
C.V. %		95	8	15	24
LSD 5%		5	10	15	20
LSD 1%		7	13	20	27
# OF REPS		4	4	4	4

Summary

Aciflurofen and AC 222,293 applied with MS (methylated seed oil adjuvant, Sun-it) injured sunflower. Green foxtail control exceed 90% with all treatment except alachlor and sethoxydim + AC 222,293 + MS. Sethoxydim with aciflurofen + MS gave 92% green foxtail control. Either AC 222,293 was antogonistic to sethoxydim or aciflurofen enhanced green foxtail control. Wild mustard control exceeded 80% with all postemergence herbicides and preplant incorporated chloramben. RE-40885 gave 79% wild mustard control even though emulsion instability occurred when mixed with trifluralin. Trifluralin and ethalfluralin were the only herbicides to give more than 90% kochia control.

Postemergence AC-222293 in sunflower, Fargo 1988. 'Interstate' 3001 sunflower was seeded on May 18 to an area where wild oats had been seeded on the previous day. The wild oats did not emerge because of seed dormancy or dry soil conditions. Treatments were applied to 6- to 8-leaf sunflower, 5-leaf green foxtail, and 4- to 6-inch tall redroot pigweed on June 20 with 94 F, 35% RH, and 10 mph wind. The second application of split (/) treatments were on June 23. Herbicide treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block with three replications. Evaluation was on July 27.

Treatment	Rate	Sufl inj	Grft	Rrpw
	(oz/A)	(%)	--(% control)--	
AC 222,293	1.5	15	13	53
AC 222,293+Sethoxydim+BCH	2+1.5+0.25G	16	78	53
AC 222,293+Sethoxydim+BCH	2+3+0.25G	32	87	63
AC 222,293+Sethoxydim+BCH	3+1.5+0.25G	20	78	79
AC 222,293+Sethoxydim+BCH	3+2.4+0.25G	7	50	58
AC 222,293/Sethoxydim+BCH	3/2.4+0.25G	37	84	84
AC 222,293+Sethoxydim+BCH+28%	3+2.4+0.25G+1G	42	85	78
AC 222,293+Sethoxydim+BCH	4+3+0.25G	13	84	52
AC 222,293+Sethoxydim+BCH	6+2.4+0.25G	62	80	65
AC 222,293/Sethoxydim+BCH	6/2.4+0.25G	40	75	77
AC 222,293+Sethoxydim+BCH+28%	6+2.4+0.25G+1G	51	73	62
AC 222,293	3	8	22	34
AC 222,293	6	15	13	38
Sethoxydim+BCH	1.5+0.25G	3	80	0
Sethoxydim+BCH	2.4+0.25G	3	91	0
Untreated	0	0	0	0
C.V. %		75	19	43
LSD 5%		28	20	36
LSD 1%		38	26	48
# OF REPS		3	3	3

Summary

Injury to sunflower was quite severe from AC 222,293 at 6 oz/A when applied in combination with sethoxydim and BCH (adjuvant from BASF-Dash). Green foxtail control was simuliar with sethoxydim applied seperately or with AC 222,293, except for treatment No. 5 which varied greatly among replications indicating a possible application error. Thus, AC 222,293 did not appear to antognize foxtail control with sethoxydim. Redroot pigweed control was too variable for interpretation of differences among the values.

AC 222,293 on weed free sunflower, Casselton 1988. 'Interstate 3001' sunflower was seeded on May 18. Weeds were removed by hand pulling within the row and by wheel hoe in between rows shortly after emergence. Treatments were applied to sunflower with 2- to 6-leaves on June 6, 4- to 10-leaves on June 16, 10- to 16-leaves on July 12, buds on July 22, and flowers on August 4. The sunflower plants in replication one were next to a shelterbelt and larger than in the other replications at each treatment date. Refer to weather data in the first section of this report for environmental at times associated with the various treatments. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide (2 rows) area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on September 2. Estimates were made as to malformed heads and yield reduction. Yields were not taken because of depredation by birds.

Treatment	Rate	Height reduction	Malformed heads	Yield loss
	(oz/A)	(inch)	-------(%)-------	
AC 222,293(2 to 6 lf)	6	8	59	56
AC 222,293(4 to 10 lf)	6	4	15	12
AC 222,293(10 to 16 lf)	6	6	56	59
AC 222,293(bud to flowers)	6	1	0	1
AC 222,293(late flowering)	6	2	0	4
Untreated	0	0	0	0
C.V. %		70	75	80
LSD 5%		3	24	27
LSD 1%		5	34	37
# OF REPS		4	4	4

Summary

Injury from AC 222,293 did not relate to sunflower stage at treatment. The injurious June 6 application were when the day before , of, and after treatment had maximum temperatures of 96 to 100 F. The non-injurious June 16 treatments had a maximum temperatures of: 78 F on June 15, 79 F on June 16, and 90 F on June 17. The injurious July 12 treatments had maximum temperatures of: 81 F on July 11, 88 F on July 12,and 90 F on July 13. The maximum temperature was 93 on July 22 and 97 on July 23. High temperatures at the vegetative stages may have contributed to the injury. Relative humidity was simuliar at all treatments, between 40 and 60%.

Weed control in soybean, Carrington 1988 Preplant incorporated (ppi) treatments applied and rototiller incorporated on June 1, 'McCall' soybean planted on June 3 and preemergence treatments applied on June 7. A 0.34 inch rain occurred on June 12. Postemergence (P) treatment were to 1- to 2-trifoliolate soybeans, 4-leaf green foxtail and 8 inch tall redroot pigweed on June 24 and p1 treatments were applied on June 24. Treatments were applied to an 8 ft wide area the length of 8 by 25 ft plots with a bicycle wheel type plot sprayer delivering 17 gpa for the ppi and pe and 8.5 gpa for the post emergence (p & p1) treatments, at 35 psi. The experiment was a randomized complete block with four replications. Evaluation was on July 15. Weed density was more than 2 plants/sq ft for all species.

Treatment	Rate (oz/A)	Soybean injury (%)	Grft (% control)	Rrpw (% control)
Trifluralin(ppi)	12	0	99	98
Ethalfluralin(ppi)	12	0	98	98
Pendimethalin(ppi)	20	0	98	97
Trifluralin+Metribuzin-F(ppi)	12+3	0	97	97
Pendimethalin+Imazethapyr(ppi)	14+1	0	98	99
Trifluralin+Imazethapyr(ppi)	12+1	0	98	99
Ethalfluralin+Imazethapyr(ppi)	12+1	0	99	99
Imazethapyr(ppi)	1	0	90	99
Alachlor(pe)	40	0	40	24
Metolachlor(pe)	40	0	55	24
Fenoxaprop+PO/Acifluorfen+Bent(p/p1)	2+0.25G/2+8	1	80	45
Sethoxydim+BCH/Acifluorfen+Bent(p/p1)	3+0.2G/2+8	1	95	40
Fluazifop+PO/Acifluorfen+Bent(p/p1)	3+0.25G/2+8	0	68	40
Sethoxydim+Acifluorfen+Bent+BCH(p)	3+2+8+0.25G	4	81	64
Fluazifop+Acifluorfen+Bent+PO(p)	3+2+8+0.25G	1	59	51
Fenoxaprop+Acifluorfen+Bent+PO(p)	2+2+8+0.25G	1	43	59
Sethoxydim+BCH/Imazethapyr(p/p1+)	3+0.25G/1	0	87	60
Sethoxydim+BCH/Acifluorfen+X-77(p/p1)	3+0.25G/6+0.25%	4	94	65
Sethoxydim+BCH/Bent+PO(p/p1)	3+0.25G/12+0.25G	0	94	39
Sethoxydim+BCH/Lactofen+PO(p/p1)	3+0.25G/3+0.06G	1	94	64
Imazethapyr(p)	1	1	66	47
Imazethapyr+PO(p)	1+0.25G	0	82	86
Imazethapyr+MS(p)	1+0.25G	0	78	80
Untreated	0	0	0	0
		267	13	17
C.V. %		2	14	16
LSD 5%		NS	19	21
LSD 1%		4	4	4
# OF REPS				

Summary

None of the herbicides caused important injury to soybean. Fenoxaprop, sethoxydim, and fluazifop control of green foxtail was antagonized when applications were in tank mixture with bentazon + acifluorfen. BCH (adjuvant from BASF, Dash) did not overcome bentazon + acifluorfen antogonism. The Dinitroanalines, preplant incorporated, gave 97% or more green foxtail and redroot pigweed control. None of the postemergence or preemergence (pe) treatments gave adequate redroot pigweed control. However, postemergence treatments were to large plants. Imazethapyr postemergence with adjuvants gave 80% or more control of redroot pigweed

Preemergence weed control in soybean, Casselton 1988. Preplant soil incorporated (ppi) treatments were applied and field cultivator plus harrow incorporated twice 3 inches deep, 'McCall' soybean seeded and preemergence (pe) treatments applied on May 5. The soil was moderately moist and mallow; and the climate was 75 F, 30% RH, clear sky, and no wind at treatment. Treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations was on July 5. Weed densities were foxtail (green and yellow) 1 /sq ft and kochia more than 2/sq ft. Plants all severely drought stressed.

Treatment	Rate (oz/A)	Soybean injury (%)	Grft -(% control)-	KOCZ
Trifluralin(ppi)	16	0	95	92
Ethalfluralin(ppi)	15	0	98	93
Pendimethalin(ppi)	20	0	95	89
Trifluralin + Metribuzin-DF(ppi)	16 + 3	0	95	93
Trifluralin + Imazethapyr(ppi)	16 + 1	0	98	99
Pendimethalin + Imazethapyr(ppi)	14 + 1	0	96	99
Ethalfluralin + Imazethapyr(ppi)	15 + 1	0	99	95
Clomazone + Chloramben(ppi)	8 + 24	0	89	92
Alachlor + Metribuzin-DF(ppi)	40 + 3	0	79	74
Metolachlor + Metribuzin-DF(ppi)	40 + 3	0	78	58
Metolachlor + Imazethapyr(ppi)	40 + 1	0	92	97
Imazethapyr(ppi)	1	0	66	96
Chloramben(pe)	48	0	83	89
Imazethapyr(pe)	1	0	56	96
Untreated	0	0	0	0
C.V. %		0	11	10
LSD 5%		NS	13	12
LSD 1%		NS	17	16
# OF REPS		4	4	4

Summary

None of the herbicides caused injury to soybean. All dinitroanaline herbicide treatments gave 95% or more foxtail control. Treatments containing imazethapyr all gave 95% or more kochia control.

Postemergence weed control in soybean, Casselton 1988. 'McCall' soybean was seeded on May 5. Treatments were applied to 1- to 2-trifolialate soybeans, 1 to 3 inch tall kochia, and 5- to 6-leaf green and yellow foxtail on June 16 with 60 F, 35% RH, and no wind at treatment. The second treatment of split (/) applications was on June 20 with 88 F, 40% RH, and 5 to 10 mph wind. Plant size had not changed from the June 16 treatment. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 12. Soybean injury was not observed for any herbicide, but injury was not evaluated for all plots because the drought stress masked possible symptoms.

Treatment	Rate (oz/A)	KOCZ	Fxtl
		--(% control)-	
Sethoxydim+MSC/Acifluorfen+Bentazon	3+0.25G/2+8	8	87
Sethoxydim+Acifluorfen+Bentazon+MSC	3+2+8+0.25G	71	79
Sethoxydim+Acifluorfen+Bentazon+BCH	3+2+8+0.25G	73	85
Fluazifop+PO/Acifluorfen+Bentazon	3+0.25G/2+8	10	46
Fluazifop+Acifluorfen+Bentazon+PO	3+2+8+0.25G	60	44
Fluazifop+Acifluorfen+Bentazon+MSC	3+2+8+0.25G	82	60
Fluazifop+Acifluorfen+Bentazon+AG-2	3+2+8+0.25G	70	55
Fenoxaprop+PO	2.4+0.25G	0	74
Quizalofop+PO	1.2+0.25G	0	77
Fenoxaprop+Bentazon+PO	2.4+16+0.25G	90	72
Quizalofop+Bentazon+PO	1.2+16+0.25G	86	60
Sethoxydim+Lactofen+PO	3+3+0.25G	46	89
Imazethapyr	1	9	42
Imazethapyr+MSC	1+0.25G	98	75
Untreated	0	0	0
C.V. %		23	25
LSD 5%		16	23
LSD 1%		21	30
# OF REPS		4	4

Summary

Kochia control with aciflurofen + bentazon, bentazon, and imazethapyr was enhanced by adjuvants. Kochia control was 98% with imazethapyr at 1 oz/A plus MS (Methylated seed oil adjuvant, Sun-it) compared to 9% control with imazethapyr alone. Green and yellow foxtail control was too variable with the drought to determine differences in antagonism of grass control herbicides or enhancement from various adjuvants.

Herbicide combinations postemergence in soybean, Casselton 1988. 'McCall' soybean was seeded on May 5. Treatments were applied to one to two trifolialate soybean, 5- to 6-leaf green and yellow foxtail, and 1 to 3 inch tall kochia on June 20 with 80 F, 40% RH, and 5 to 10 mph wind. The second treatment of the split (/) treatments was on June 23 with 80 F, 60% RH, and 10 mph wind. Plants were similar at the second split as first application. Plants were extremely drought stressed when treated. Treatments were applied in 8.5 gpa at 35 psi with a bicycle wheel type plot sprayer to an 8 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 12. Soybean injury was not evident from any treatments. G in the rate column is for gallons/A; BCH = adjuvants from BASF, Dash; MS = methylated seed oil, Sunit; PO = petroleu, all adjuvant; 28%N = 28% liquid nitrogen fertilizer and; RP = product from Rhone Poulenc.

Treatment	Rate (oz/A)	KOCZ	Fxtl
		(% control)	
Bent+Acif+Seth+BCH+28%N	8+24+2.4+0.25G+1G	64	79
Bent+Acif+PO/Seth+BCH+28%N	8+2+0.25G/2.4+0.25G+1G	19	70
Bent+Acif+PO/Bent+Seth+BCH+28%N	8+2+0.25G/8+2.4+0.25G+1G	69	56
Bent+Acif+BCH/Bent+Seth+BCH+28%N	8+2+0.25G/8+2.4+0.25G+1G	91	73
Bent+Acif+MS/Bent+Seth+MS+28%N	8+2+0.25G/8+2.4+0.25G+1G	75	66
Bent+Acif+28%N/Bent+Seth+BCH+28%N	8+2+0.25G/8+2.4+0.25G+1G	83	64
Bent+Acif+PO/Bent+Acif+Seth+BCH+28%N	8+2+0.25G/8+1+2.4+0.25G+1G	78	70
Bent+Acif+PO/Acif+Seth+BCH+28%N	8+2+0.25G/1+2.4+0.25G+1G	60	63
Bentazon+Acifluorfen-RP+PO/Feno+PO	8+2+0.25G/2+2.4+0.25G+1G	64	62
Bentazon+Acifluorfen-RP+Feno+PO	8+2+0.25G/2.4+0.25G	16	62
Bentazon+Acifluorfen-RP+PO/Flua+PO	8+2+2.4+0.25G	16	60
Bentazon+Acifluorfen-RP+Fluazifop+PO	8+2+0.25G/3+0.25G	5	70
Lactofen+PO/Sethoxydim+BCH	8+2+3+0.25G	20	56
Acifluorfen-RP+X-77/Sethoxydim+BCH	3+0.06G/2.4+0.25G	45	65
Bentazon+Fenoxaprop+PO	6+0.25%/2.4+0.25G	3	71
Bentazon+Quizalofop+PO	16+2.4+0.25G	28	49
Bentazon/Quizalofop+PO	16+1.2+0.25G	34	51
Imazethapyr	16/1.2+0.25G	10	40
Imazethapyr+PO	1	5	52
Imazethapyr+MS	1+0.25G	53	48
Imazethapyr+AG-2	1+0.25G	73	61
Untreated	1+0.25G	73	50
	0	0	0
C.V. %		33	25
LSD 5%		20	20
LSD 1%		27	27
# OF REPS		4	4

Summary

Foxtail density was sparce and infestation variable making detailed comparison among treatment impossible. Kochia was not adequately controlled by any of the herbicide treatments.

Bentazon with adjuvants, Casselton 1988. 'McCall' soybean was seeded to moderately dry soil on May 6. Treatments were applied to 1 to 3 trifolialate soybeans, 1 to 4 inch tall kochia on June 17 with 78 F, 50% RH, clear sky, and no wind. Herbicide treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on July 1 and 28.

Treatment	Rate (oz/A)	July 1 Sobe	July 1 KOCZ	July28 KOCZ
		---(% control)--		
		0	19	20
Bentazon	8	1	13	18
Bentazon	16	3	81	64
Bentazon+MSC	8+0.12G	0	83	82
Bentazon+MSC	8+0.25G	1	50	51
Bentazon+PO	8+0.12G	0	65	64
Bentazon+PO	8+0.25G	0	79	79
Bentazon+AG-2	8+0.12G	3	85	76
Bentazon+AG-2	8+0.25G	0	48	48
Bentazon+X-77	8+0.25%	3	50	39
Bentazon+LI-700	8+0.25%	9	55	44
Bentazon+WK	8+0.25%	4	38	14
Bentazon+NaHCO3	8+16	5	77	64
Bentazon+NaHCO3+X-77	8+16+0.25%	9	85	82
HIGH MEAN		0	13	14
LOW MEAN		2	57	51
EXP MEAN		188	25	29
C.V. %		NS	21	21
LSD 5%		NS	28	29
LSD 1%		4	4	4
# OF REPS				

Summary

None of the treatments caused important injury to soybeans. Plants were extremely drought stressed at treatment. MSC (methylated seed oil from Agsco) and AG-2 in combination with bentazon at 8 oz/A gave greater kochia control then bentazon applied alone at 16 oz/A or at 8 oz/A with X-77, WK, PO, or LI-700. Sodium bicarbonate did not influence kochia control with bentazon, but increased control when with X-77 in the spray mixture.

Imazethapyr with adjuvants, Casselton 1988. 'McCall' soybean was seeded to moderately dry soil on May 6. Treatments were applied to 1 to 3 trifoliolate soybeans, 1 to 4 inch tall kochia on June 17 with 78 F, 50% RH, clear sky, and no wind. Herbicide treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on July 1 and 28.

Treatment	Rate	July 1			July 28
		Sobe	KOCZ	Grft	KOCZ
	(oz/A)	(% control)			
Imazethapyr	0.25	0	19	15	19
Imazethapyr+X-77	0.25+0.25%	1	87	53	78
Imazethapyr+MSC	0.25+0.12G	0	93	71	84
Imazethapyr+MSC	0.25+0.25G	0	98	86	93
Imazethapyr+PO	0.25+0.12G	1	88	73	76
Imazethapyr+PO	0.25+0.25G	0	92	78	83
Imazethapyr+AG-2	0.25+0.12G	0	95	70	87
Imazethapyr+AG-2	0.25+0.25G	3	95	75	87
Untreated	0	0	3	0	0
Imazethapyr	0.5	1	33	36	23
Imazethapyr+X-77	0.5+0.25%	5	87	45	89
Imazethapyr+MSC	0.5+0.12G	0	97	62	94
Imazethapyr+MSC	0.5+0.25G	0	98	65	94
Imazethapyr+PO	0.5+0.12G	1	93	55	88
Imazethapyr+PO	0.5+0.25G	0	93	77	91
Imazethapyr+AG-2	0.5+0.12G	1	97	84	92
Imazethapyr+AG-2	0.5+0.25G	1	98	88	94
Untreated	0	0	0	0	0
HIGH MEAN		5	98	88	94
LOW MEAN		0	0	0	0
EXP MEAN		1	76	57	71
C.V. %		266	7	34	8
LSD 5%		NS	7	27	8
LSD 1%		NS	9	37	10
# OF REPS		4	4	4	4

Summary

None of the treatments caused important injury to soybeans. Green foxtail stand was sparse and variable so that differences among adjuvants with imazethapyr was not detectable, except that control was generally less when X-77 was the adjuvant. All adjuvants with imazethapyr enhanced kochia control with MSC (methylated seed oil from Agsco) and AG-2 causing the most enhancement.

Dash volume with sethoxydim plus bentazon, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat, oats, and foxtail millet on June 27 with 95 F, 50% RH, and clear sky. The second application (after /) were on June 30 with 80 F and partly cloudy sky. Evaluations were on July 8 and August 10.

Treatment	Rate (lb/A)	July 8			August 10		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Bent+COC/Seth+COC	1+0.25G/0.15+0.25G	65	70	76	78	96	94
Bent+COC/Seth+Dash	1+0.25G/0.15+0.25G	62	68	75	76	91	95
Bent+COC/Seth+MS	1+0.25G/0.15+0.25G	62	60	73	76	95	98
Bent+Seth+COC	1+0.15+0.25G	28	18	10	13	23	16
Bent+Seth+Dash	1+0.15+0.25G	30	47	22	30	70	35
Bent+Seth+MS	1+0.15+0.25G	27	51	29	42	78	45
Bent+Seth+Dash+28%	1+0.15+0.25G+1G	59	74	68	57	87	64
Bent+Seth+MS+28%	1+0.15+0.25G+1G	68	76	72	72	91	60
Bent+Seth+Dash	1+0.15+0.375G	26	53	26	33	76	39
Bent+Seth+MS	1+0.15+0.375G	44	63	26	41	81	33
Bent+Seth+Dash+28%	1+0.15+0.375G+1G	48	75	67	56	89	65
Bent+Seth+MS+28%	1+0.15+0.375G+1G	63	78	77	74	95	83
Bent+Seth+Dash	1+0.15+0.5G	48	64	19	33	76	21
Bent+Seth+MS	1+0.15+0.5G	37	50	25	37	69	21
C.V. %		14	14	19	15	8	13
LSD 5%		9	12	13	11	9	10
LSD 1%		13	16	18	14	12	14
# OF REPS		4	4	4	4	4	4

Summary

Bentazon was antagonistic to grass control with sethoxydim regardless of adjuvant or volume of adjuvant. The inclusion of 28% N liquid fertilizer with Dash (adjuvant from BASF) or MS (Sun-it from Agsco) generally overcame the antagonism from bentazon.

Postemergence broadleaf weed control in dry bean, Casselton 1988. 'Upland' dry bean was seeded on May 5. Treatments were applied to first trifolialate dry bean, 3 to 8 inch tall kochia, and 2 to 6 inch tall wild mustard on June 21 with 95 F, 60 % RH, and 5 to 10 mph wind. Plants were extremelly drought stressed at treatment. No treatments were applied for grass species control as only a few were present. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block with four replication. Evaluation was on July 12. Injury to beans was not present or evaluated because the drought stress masked any injury.

Treatment	Rate (oz/A)	KOCZ (control %)
Acifluorfen	7	0
Acifluorfen	2	0
Acifluorfen	4	0
Acifluorfen+28%N	6	3
Acifluorfen+28%N	1+1G	3
Acifluorfen+OC	2+1G	5
Acifluorfen+OC	1+0.25G	7
Bentazon+OC	2+0.25G	15
Bentazon+OC	8+0.25G	35
Bentazon+OC	12+0.25G	36
Bentazon+28%N	16+0.25G	60
Acifluorfen+Bentazon	12+1G	41
Acifluorfen+Bentazon	1+8	19
Acifluorfen+Bentazon+PO	1+12	18
Acifluorfen+Bentazon+PO	1+8+0.25G	25
Acifluorfen+Bentazon	1+12+0.25G	43
Acifluorfen+Bentazon	2+8	15
Acifluorfen+Bentazon+28%N	2+12	13
Acifluorfen+Bentazon+PO	2+12+1G	55
Acifluorfen+Bentazon+PO	2+8+0.25G	54
Acifluorfen+Bentazon+PO/Acifluorfen+PO	2+12+0.25G	44
Acifluorfen+Bentazon+PO/Acifluorfen+PO	1+12+0.25G/1+0.25G	41
IMEP+MS	1+12+0.25G/2+0.25G	54
Untreated	1+0.25G	83
	0	0
C.V. %		
LSD 5%		40
LSD 1%		15
# OF REPS		20
		4

Summary

None of the treatments gave adequate kochia control. The greatest kochia control was 83% with imazethapyr at 1 oz/A plus MS (methylated seed oil adjuvant, Sun-it).

Weed control with imazethapyr in dry bean, Casselton 1988. Preplant soil incorporated (ppi) treatments applied and twice field cultivator plus harrow incorporated 3 inches deep, 'Upland' dry bean seeded, and preemergence treatments applied to a mallow moderately moist soil on May 5. Postemergence treatments (p) were to second trifolialate beans, 1 to 3 inch tall kochia, and 5- to 6-leaf yellow foxtail on June 20 with 80 F, 40 % RH, 5 to 10 mph wind. Treatments were applied to an 8 ft wide area the length of 10 by 25 plots with a bicycle wheel type plot sprayer delivering 17 gpa for the ppi and pe and 8.5 gpa for the postemetgence treatments, at 35 psi. The experiment was a randomized complete block with four replications. Evaluation was on July 5. Weed density more than 2 plants/sq ft, except for wild mustard which was sparce and variable.

Treatment	Rate (oz/A)	Bean injury (%)	Yeft	KOCZ	Wimu
			---(% control)--		
EPTC+Chloramben(ppi)	48+32	0	97	98	80
Pendimethalin(ppi)	20	1	98	63	25
Imazethapyr(ppi)	0.75	0	49	84	65
Imazethapyr(ppi)	1	1	70	93	58
Imazethapyr+Pendimethalin(ppi)	0.75+20	4	98	68	28
Imazethapyr+Pendimethalin(ppi)	1+20	0	99	99	94
Trifluralin(ppi)/Bentazon(p)	16/12	0	99	81	94
Pendimethalin(ppi)/Imazethapyr(p)	20/0.75	0	94	86	97
Pendimethalin(ppi)/Imazethapyr(p)	20/1	5	98	68	90
Pendimethalin(ppi)/Bentazon(p)	20/12	0	96	73	90
Imazethapyr(pe)	0.75	0	29	73	82
Imazethapyr(pe)	1	6	23	67	45
Metolachlor+Imazethapyr(pe)	40+0.75	4	72	64	53
Metolachlor+Imazethapyr(pe)	40+1	0	71	83	75
Metolachlor(pe)	40	8	70	0	9
Imazethapyr(p)	0.75	11	35	18	83
Imazethapyr(p)	1	5	31	21	90
Imazethapyr+MS(p)	0.75+0.25G	14	63	93	98
Untreated	0	0	0	0	0
C.V. %		200	19	23	29
LSD 5%		9	19	21	27
LSD 1%		NS	25	28	36
# OF REPS		4	4	4	4

Summary

None of the herbicides caused important injury to dry beans. Yellow foxtail was controlled with herbicide treatments containing, EPTC, trifluralin, or pendimethalin. Imazethapyr alone did not give adequate (¢75%) yellow foxtail control regardless of method of application. Kochia control was 90% or more with EPTC + chloramben, and imazethapyr at 1 oz/A alone or with pendimethylin preplant incorporated, and imazethapyr at 0.75 oz/A + MS (methylated seed oil adjuvant-Sun-it) postemergence. Wild mustard control was 90% or more with all postemergence bentazon and imazethapyr treatments, except imazethapyr applied alone at 0.75 oz/A. MS with postemergence imazethapyr enhanced or tended to enhance control of all weed species.

Weed control in corn, Casselton, 1988. An experiment was conducted to evaluate broad-spectrum weed control in corn. Preplant incorporated (PPI) treatments were applied and field cultivator plus harrow incorporated twice in the opposite direction to a 3 inch depth on May 3, 1988. 'Interstate 201' corn was seeded and preemergence (PE) treatments were applied May 4. Soil was mellow with adequate soil moisture at seeding time. Early postemergence (EP) treatments were applied to 1 to 3 leaf (2 to 6 inch) corn, 2 to 4 leaf green foxtail, and 1 to 3 inch kochia on June 1 with cloudy skies, 70 F, and 50% relative humidity. Postemergence (P) treatments were applied to 3 to 5 leaf (6 to 12 inch) corn, 4 leaf to tillering green foxtail, and 2 to 6 inch kochia on June 10 with sunny skies, 85 F, and 25% 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. Corn injury and green foxtail and kochia control were evaluated on June 20, with a second evaluation of kochia control on July 25.

Treatment[a]	Rate	June 20			July 25
		Corn injury	Green foxtail	Kochia	Kochia
	(oz/A)	(%)	(% control)		
EPTC&S+Cyanazine(PPI)	64+32	0	81	74	84
EPTC&S&E+Cyanazine(PPI)	64+32	0	80	80	86
EPTC&S+Cyanazine+Atrazine(PPI)	64+24+8	1	75	82	87
Alachlor+Atrazine(PPI)	40+12	0	69	66	73
Alachlor+PPG-4000(PPI)	40+14.5	0	42	72	85
Metolachlor+Cyanazine(PE)	40+32	1	45	25	53
Alachlor+Cyanazine(PE)	40+32	0	49	45	54
Alachlor+Atrazine(PE)	40+12	1	80	66	64
Alachlor+PPG-4000(PE)	40+14.5	0	60	53	46
Propachlor+Cyanazine(PE)	64+32	0	75	70	68
Pendimethalin+Cyanazine(PE)	16+32	1	51	59	55
Pendimethalin+Atrazine(PE)	12+12	0	33	40	61
Pendimethalin+PPG-4000(PE)	24+14.5	0	43	55	55
Pendimethalin+PPG-4000(EP)	24+14.5	0	28	15	36
Propachlor(PE)/Pyridate+Atrazine(EP)	64/7+9.5	1	87	95	96
Propachlor(PE)/Pyridate+Atrazine(P)	64/7+9.5	5	92	97	97
Pyridate+Cyanazine(EP)	64/9.5+9.5	0	95	98	98
Propachlor(PE)/Bentazon+Atrazine+PO(EP)	14.5+20	11	78	94	92
Propachlor(PE)/Bentazon+Atrazine+PO(EP)	64/7+7+0.25G	0	89	98	98
Propachlor(PE)/Dicamba+Atrazine(EP)	64/8+8+0.25G	0	89	98	98
Propachlor(PE)/Bromoxynil+Atrazine(EP)	64/7+13	0	86	98	98
Propachlor(PE)/Bromoxynil+Atrazine(EP)	64/3+6	4	88	96	96
Propachlor(PE)/Bromoxynil+Metribuzin(EP)	64/4+8	3	90	98	98
Propachlor(PE)/Bromoxynil(EP)	64/4+4	11	86	98	97
Propachlor(PE)/Bromoxynil(EP)	64/4	3	87	95	94
Propachlor(PE)/Bromoxynil+28%N(EP)	64/6	7	85	94	91
Propachlor(PE)/Clopyralid&2,4-D-amine(P)	64/4+1G	2	81	93	95
Propachlor(PE)/2,4-D-ester(P)	64/1.5+8	1	70	43	53
Propachlor(PE)/Dicamba(P)	64/8	1	72	91	90
Cyanazine(EP)	64/4	0	82	75	92
Cyanazine+SO(EP)	32	9	85	54	61
Cyanazine+Atrazine+SO(EP)	19+0.25G	15	90	95	92
	15+5+0.25G	9	91	95	95
C.V. %		157	22	18	12
LSD 5%		6	19	18	12

[a] S = dichlormid safener; E = diethotate extender; & = formulated mixture; PO = petroleum oil with 17% emulsifier; SO = soybean oil with 15% emulsifier; G in the rate column represents gallons/acre.

Summary

Plant growth, herbicide efficacy, and evaluation of the plots were adversely influenced by extremely hot, dry conditions and possible trifluralin carryover from the previous season. None of the treatments caused greater than 15% corn injury. Preemergence herbicide treatments provided less control than expected probably due to inadequate moisture. Preemergence propachlor plus postemergence pryridate plus atrazine tended to provide the highest green foxtail control. Several treatments that included postemergence herbicides provided 90% or greater kochia control at both evaluation dates. Cyanazine at 19 oz/A plus vegetable oil gave more injury, but provided better weed control than cyanazine alone at 32 oz/A. 2,4-D ester gave more than 35% greater kochia control than the clopyralid plus 2,4-D amine prepackage mixture at equivalent 2,4-D rates.

Weed control in corn, Carrington, 1988: 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 'Top Farm 1185' corn was seeded on June 5. Preemergence (PE) treatments were applied June 8. PPI and PE treatments were applied to dry soil with air temperatures of 80 F and above. A 0.50 inch rain occurred within 12 hours after the preemergence treatments. Postemergence (P) treatments were applied to 4 to 5 leaf corn, 2.5 leaf green foxtail, and 4 to 6 leaf redroot pigweed on June 20. Temperatures exceeded 90 F the day of and the day following postemergence treatments. 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 15.

Treatment[a]	Rate (oz/A)	Corn injury (%)	Green foxtail (% control)	Redroot pigweed (% control)
EPTC&S+Cyanazine(PPI)	64+32	0	97	97
Butylate&S+Cyanazine(PPI)	64+32	0	97	98
Metolachlor+Cyanazine(PE)	40+32	1	73	79
Alachlor+Cyanazine(PE)	40+32	0	91	96
Propachlor+Cyanazine(PE)	64+32	0	90	87
Pendimethalin+Cyanazine(PE)	16+32	1	66	50
Pendimethalin&Atrazine(PE)	12+12	6	54	40
Propachlor(PE)/Pyridate+Atrazine(P)	64/7+9.5	0	93	96
Propachlor(PE)/Pyridate+Atrazine(P)	64/9.5+9.5	0	87	96
Pyridate+Cyanazine(P)	14.5+20	25	48	75
Propachlor(PE)/Bentazon&Atrazine+PO(P)	64/8+8+0.25G	0	85	95
Propachlor(PE)/Dicamba&Atrazine(P)	64/7+13	0	81	97
Propachlor(PE)/Bromoxynil&Atrazine(P)	64/3+6	1	83	85
Propachlor(PE)/Bromoxynil(P)	64/6	1	81	92
Propachlor(PE)/Clopyralid&2,4-D-amine(P)	64/1.5+8	0	83	86
Propachlor(PE)/2,4-D-ester(P)	64/8	0	92	91
Propachlor(PE)/Dicamba(P)	64/4	0	85	91
Cyanazine(P)	32	8	46	16
Cyanazine+SO(P)	19+0.25G	19	55	56
Cyanazine&Atrazine+SO(P)	15+5+0.25G	16	36	63
DPX-V9360+PO(P)	0.5+0.25G	23	84	90
DPX-V9360+PO(P)	1.0+0.25G	16	89	97
CGA-136872+X-77(P)	0.33+0.25%	10	43	69
CGA-136872+X-77(P)	0.5+0.25%	23	49	75
Atrazine+DPX-M6316+SO(P)	8+0.12+0.25%	16	46	99
		96	17	13
C.V. %		9	17	14
LSD 5%				

[a] S = dichlormid safener; & = formulated mixture; PO = petroleum oil with 17% emulsifier; SO = soybean oil with 15% emulsifier.

Summary

Treatments containing postemergence cyanazine, DPX-V9360, CGA-136872, and DPX-M6316 caused corn injury. However, corn injury from postemergence herbicides was difficult to differentiate from pretreatment weed competition. EPTC&S and butylate&S tended to provide better green foxtail control than the other treatments. DPX-V9360 gave 84 to 89% green foxtail control and CGA-136872 gave 43 to 49% green foxtail control at the rates evaluated. Several herbicide treatments gave good redroot pigweed control.

Postemergence weed control in corn, Casselton, 1988. An experiment was conducted to evaluate grass and broadleaf weed control with several foliar applied herbicides in 'Interstate 201' corn seeded May 4. Early postemergence (EP) treatments were applied to 1 to 3 (2 to 6 inch) leaf corn, 2 to 4 leaf green foxtail, and 1 to 3 inch kochia on June 1 with cloudy skies, 40 F, and 50% relative humidity. Postemergence (P) treatments were applied to 3 to 5 leaf (6 to 12 inch) corn, 5 leaf to tillering green foxtail, and 2 to 6 inch kochia on June 10 with clear skies, 85 F, and 25% 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 8.5 gpa at 35 psi to the middle two rows of the four row plots. Corn and weeds were exhibiting drought symptoms at both dates of application. The experiment was a randomized complete block with four replications. Corn injury and weed control were evaluated June 20, July 1, and July 25.

Treatment[a]	Rate (oz/A)	June 20 Corn injury (%)	June 20 Grft (% control)	June 20 KOCZ (% control)	July 1 Grft (% control)	July 1 KOCZ (% control)	July 25 KOCZ (% control)
DPX-V9360+PO(EP)	0.25+0.25G	1	84	91	81	91	85
DPX-V9360+PO(EP)	0.5+0.25G	0	88	95	93	96	94
DPX-V9360+PO(EP)	0.75+0.25G	4	94	98	96	97	97
DPX-V9360+PO(EP)	1.0+0.25G	8	90	97	96	98	95
DPX-V9360+PO(P)	0.25+0.25G	1	46	69	87	84	78
DPX-V9360+PO(P)	0.5+0.25G	8	51	73	94	93	89
DPX-V9360+PO(P)	0.75+0.25G	6	59	78	91	92	90
DPX-V9360+PO(P)	1.0+0.25G	5	43	58	86	93	89
CGA-136872+X-77(EP)	0.33+0.25%	1	75	91	68	89	85
CGA-136872+X-77(EP)	0.5+0.25%	8	65	91	68	90	87
CGA-136872+X-77(P)	0.33+0.25%	10	46	65	74	86	72
CGA-136872+X-77(P)	0.5+0.25%	4	45	58	76	83	76
Cyanazine+DPX-M6316+SO(EP)	24+0.25+0.25G	16	93	99	80	99	98
Atrazine+DPX-M6316+SO(EP)	8+0.12+0.25G	5	53	99	21	98	97
Cyanazine(EP)	32	3	88	30	50	30	55
Cyanazine+SO(EP)	19+0.25G	14	91	98	80	97	96
Cyanazine&Atrazine+SO(EP)	15+5+0.25G	15	91	99	78	96	96
C.V. %		92	20	12	16	5	6
LSD 5%		8	19	13	17	6	7

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

Summary

Plant growth and herbicide efficacy were influenced by extremely hot dry conditions and possible trifluralin carryover from the previous season. Treatments containing cyanazine and soybean oil caused 14 to 16% injury. None of the other treatments caused important injury. DPX-V9360 provided better green foxtail control than CGA-136872 at the rates evaluated. Green foxtail control was less with the second evaluation than the first evaluation with the triazine herbicides, but was similar for both evaluation dates with DPX-V9360 and CGA-136872. DPX-V9360 and CGA-136872 provided greater than 70% kochia control with all application rates and times at the late evaluations. DPX-M6316 plus atrazine or cyanazine gave 97% or better kochia control. Cyanazine at 19 oz/A plus soybean oil provide 40% greater kochia control than cyanazine alone at 32 oz/A.

Weed control in grain sorghum, Carrington, 1988. An experiment was conducted to evaluate broad-spectrum weed control in grain sorghum with soil applied and postemergence treatments. Preplant incorporated (PPI) treatments were applied and roto-tiller incorporated prior to seeding of flurazole safener treated Dekalb 'DK 18' grain sorghum on June 7. Preemergence (PE) treatments were applied June 13. Precipitation totaling 0.34 inch was received between the preplant incorporated and preemergence treatments. Precipitation for 2 weeks after preemergence treatments was 1.29 inch. Postemergence treatments were applied to 3 to 4 leaf grain sorghum and seedling green foxtail and redroot pigweed on July 5. The maximum temperature on July 5 was 100 F and 0.30 inch of rain was received approximately 8 hours after the postemergence treatments were applied. All treatments were applied with a bicycle wheel type plot sprayer delivering 17 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 four replications. Grain sorghum injury and weed control were evaluated July 15.

Treatment[a]	Rate	Grain sorghum injury	Green foxtail	Redroot pigweed
	(oz/A)	(%)	---(% control)--	
Atrazine+Alachlor(PPI)	12+32	0	78	98
Propazine+Alachlor(PPI)	12+32	0	70	95
Cyanazine+Alachlor(PPI)	32+32	0	91	98
Cyanazine+Metolachlor(PPI)	32+32	0	87	98
Cyanazine&Atrazine(PPI)	32+12	0	94	98
Atrazine+Alachlor(PE)	12+32	0	85	94
Cyanazine+Alachlor(PE)	32+32	0	92	96
Propachlor+Cyanazine(PE)	48+24	0	82	91
BAS-51400(PE)	16	0	95	60
BAS-51400+MS(P)	8+0.25G	0	80	10
Propachlor(PE)/2,4-D(P)	48/8	0	89	91
Propachlor(PE)/Dicamba(P)	48/4	0	88	94
Propachlor(PE)/Bromoxynil(P)	48/6	8	80	92
Propachlor(PE)/Bromoxynil&Atrazine(P)	48/4+8	5	84	99
Propachlor(PE)/Bentazon&Atrazine(P)	48/8+8	1	86	97
C.V. %		160	9	9
LSD 5%		2	10	11

[a] & = formulated mixture; MS = methylated vegetable oil with 15% emulsifier.

Summary

None of the treatments caused important grain sorghum injury. All treatments provided 70% or greater green foxtail control. Preemergence BAS-51400 gave 95% green foxtail control. All treatments except BAS-51400 provided greater than 90% redroot pigweed control. Preemergence BAS-51400 at 16 oz/A gave better weed control than postemergence BAS-51400 at 8 oz/A plus methylated vegetable oil.

Postemergence weed control in canola, Langdon 1988. 'Westor' canola was seeded on May 16. Treatments were applied to 4- to 5-leaf canola, emerging to 8-leaf ladysthumb, 4 inch wild mustard, and 1- to 2-leaf wild buckwheat on June 2. Treatments were applied with a bicycle wheel type plot sprayer delivering 7.8 gpa at 35 psi to 8 by 23 ft plots. The experiment was a randomized complete block with four replications. Evaluation was on July 20.

Treatment	Rate	Canola injury	Vol wheat	Ladys- thumb	Yield	Test weight	Canola	Canola yield
	(oz/A)	(%)	(% control)		(lb/A)	(bu/lb)	(%)	(lb/A)
DPX-A7881-22(2-4lf)	0.17	11	0	45	366.5	49.0	97	354.2
DPX-A7881-22	0.33	0	0	50	720.5	50.0	90	648.5
DPX-A7881-22	0.50	13	0	71	276.5	49.0	88	243.0
DPX-A7881-22	0.67	3	0	76	476.0	50.0	93	444.4
DPX-A7881-22+X-77	0.17+0.25%	18	0	39	669.0	29.0	96	644.6
DPX-A7881-22+X-77	0.33+0.25%	5	0	45	590.5	51.0	97	574.1
DPX-A7881-22+MS	0.17+0.25G	4	0	72	513.0	50.0	99	505.4
DPX-A7881-22+MS	0.33+0.25G	6	0	70	410.0	49.5	94	386.0
DPX-A7881-22+Seth+MS	0.17+3+0.25	30	97	50	514.5	50.0	95	488.8
DPX-A7881-22+Seth+MS	0.33+3+0.25	40	97	62	118.0	.0	90	106.2
DPX-A7881-22+Flua+MS	0.17+3+0.25	16	99	59	446.0	49.0	95	423.7
DPX-A7881-22+Flua+MS	0.33+3+0.25	18	99	68	489.5	49.5	98	477.8
Sethoxydim+MS	3+0.25G	0	99	21	529.5	48.0	94	502.0
Fluazifop+MS	3+0.25G	8	99	5	601.0	48.5	94	578.0
AC222293	3	54	13	34	57.5	.0	55	31.8
Benazolin	8	5	0	49	692.0	50.5	94	656.4
IMEP	1	78	0	46	33.0	.0	15	5.1
Clopyralid	1.5	0	0	23	752.0	48.0	80	603.1
Clopyralid	3	8	0	30	278.5	47.5	95	264.6
BAS-514+MSF	8+0.25G	60	5	30	195.0	.0	73	140.0
Untreated	0	0	0	9	478.0	49.0	94	447.9
HIGH MEAN		78	99	76	752.0	51.0	99	656.4
LOW MEAN		0	0	5	33.0	.0	15	5.1
EXP MEAN		18	29	45	438.4	38.9	87	406.0
C.V. %		69	20	36	43.8	15.9	5	47.4
LSD 5%		17	8	23	400.4	12.9	10	401.5
LSD 1%		23	11	31	NS	17.6	13	NS
# OF REPS		4	4	4	2	2	2	2

Summary

Canola had adequate tolerance with DPX-A7881, except when applied with methylated sunflower oil adjuvant (MS) in combination with sethoxydim. DPX-A7881 injury to canola was less than 19% when applied alone, with adjuvants, or adjuvant plus fluazifop. Clopyralid and benasolin did not injure canola. DPX-A7881 control of ladysthumb was enhanced by the MS adjuvant, but not by surfactant X-77. Yields were taken from only two replications and were variable. However, treatments which caused severe injury resulted in low canola yield.

Preemergence weed control in Canola, Langdon 1988. Preplant (PPI) treatments applied and rototiller incorporated 3 inch deep, 'Westor' canola seeded at 7 lb/A + 0.5 lb ai/A Furadan CRIO, and preemergence incorporated (PEI) treatment applied and harrow incorporated twice on May 16. A 0.15 inch rain occurred on May 19. Treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi to 8 by 25 ft plots. The experiment was a randomized complete block with four replications. Evaluations were on July 20. Harvest was from 64 sq ft area.

Treatment	Rate (oz/A)	St.Red. (%)	Inj (%)	Ladys-thumb (% control)	Total yield (lb/A)	Test weight (lb/bu)	Canola (%)	Canola yield (lb/A)
Trifluralin PPI	12	0	0	83	745	48.9	84	630
Ethalfluralin PPI	13	16	6	89	630	48.8	86	542
Pendimethalin PPI	20	5	3	77	876	48.6	85	747
Trifluralin PPI	16	5	4	87	863	49.3	88	747
Ethalfluralin PPI	18	13	8	86	850	47.9	86	742
Pendimethalin PPI	24	5	4	83	758	49.4	86	645
Trifluralin PEI	12	0	0	66	1036	47.1	76	799
Ethalfluralin PEI	13	5	9	68	1020	48.4	79	819
Pendimethalin PEI	20	3	1	28	1053	46.5	70	720
Pendimethalin PE	20	0	0	19	1034	44.5	68	706
Pendimethalin PE	24	3	8	29	702	47.1	79	549
Untreated	0	0	0	0	881	43.6	55	447
HIGH MEAN		16	9	89	1053	49.4	88	819
LOW MEAN		0	0	0	630	43.6	55	447
EXP MEAN		4	3	59	871	47.5	78	674
C.V. %		154	148	20	27	3.9	12	
LSD 5%		10	NS	18	NS	2.7	14	NS
LSD 1%		NS	NS	24	NS	3.6	19	NS
# OF REPS		4	4	4	4	4	4	4

Total yield is canola plus ladysthumb seed, % canola is a visual estimate based on hand separated samples of the total yield, and canola yield is the yield corrected for ladysthumb using the % canola values.

Summary

Ladysthumb was greater with preplant incorporated herbicides than preemergence incorporated on surface applied. The higher rates of the dinitroanalines for acceptable ladysthumb control, but control was still less than 90%. The amount of ladysthumb control related to the percent canola in the harvested sample.

Weed control in safflower, Williston 1988. Preplant soil incorporated treatments were applied and twice field cultivator incorporated and 'Finch' safflower planted on May 19 with 55 F, 30% RH, cloudy sky, a 3 mph wind, and dry soil. Postemergence treatments were to 2- to 12-leaf stage safflower, 2- to 4-leaf green foxtail (some tillering, 6 inches tall), 4 to 6 inch tall wild mustard and Russian thistle, and 6 to 7 inch tall redroot pigweed on June 22. Treatments were applied with a tractor-mounted plot sprayer delivering 17 gpa for preemergence treatments and 8.5 gpa for postemergence treatments at 35 psi to an 8 ft width the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replications. Evaluation was on July 20. Injury ratings or yield were not taken because of a variable wild mustard and redroot pigweed moderate, and green foxtail sparce. Surf = Activator 90 and PO = petroleum oil.

Treatment		Rate	Grft	Ruth	Wimu	Rrpw	Colq
		(oz/A)	(% control)				
Trifluralin	PPI	12	90	48	23	84	97
Trifluralin	PPI	16	96	78	13	91	99
Ethafluralin	PPI	20	96	76	24	95	99
Trifluralin+EPTC	PPI	12+48	98	69	86	95	99
Pendimethalin	PPI	16	88	18	30	85	95
RE 40885	PPI	6	73	50	49	73	97
RE 40885	PPI	8	76	76	47	71	97
RE 40885	PPI	12	85	79	69	79	97
RE 40885	PPI	16	89	88	61	89	97
RE 40885+Trifluralin	PPI	12+8	79	65	44	83	97
RE 40885+Sethoxydim+PO	PPI+P	12+3+0.25G	89	85	81	79	95
RE 40885+Sethoxydim+PO	PPI+P	8+3+0.25G	87	78	55	81	95
Trifluralin+Chlorsulfuron	PPI	8+.0.25G	85	58	70	95	97
RE 40885+Sethoxydim+PO	P	4+3+0.25G	94	19	89	71	97
DPX-M6316+Activator 90	P	0.25+0.25%V	6	93	70	96	99
DPX-M6316+Sethoxydim+PO	P	0.125+3+0.25G	93	95	80	98	99
DPX-M6316+Sethoxydim+PO	P	0.167+3+0.25G	89	88	91	98	97
DPX-M6316+Activator 90	P	0.167+0.25%	0	96	77	98	99
Chlorosulfuron+Activator 90	P	0.167+0.25%	16	97	99	99	99
AC 222,293	P	6	14	45	89	20	38
Chlorosulfuron+Sethoxydim+PO	P	0.167+3+0.25G	68	82	73	92	97
Sethoxydim+PO	P	4+0.25G	93	0	0	0	0
Fluazifop+PO	P	4+0.125G	84	0	0	0	0
Untreated		0	0	0	0	0	0
C.V. %			13	30	55	15	13
LSD 5%			13	26	42	16	23
LSD 1%			17	24	56	21	31
# OF REPS			4	4	4	4	2

Summary

Green foxtail control with sethoxydim was reduced by chlorsulfuron in the spray, but not by DPX-M6316. The greatest Russian thistle and wild mustard control was with the sulfonylurea herbicides. RE-40885 at 8 oz/A or more gave 75% or more Russian thistle control. Russian thistle control was increased from 47 to 77% when trifluralin rate was increased from 12 to 16 oz/A. Common lambsquarter was adequately controlled by all herbicides except AC 222,293, sethoxydim, and fluazifop. Redroot pigweed was adequately controlled by the dinitroanilines and sulfonylureas.

Annual forage crops response to herbicides, Minot 1988. PPI treatments were applied to moist soil and cultiweed incorporated twice, forage crops were seeded and PE treatments applied to the surface June 16. Preemergence treatments were applied in 17 gpa at 35 psi with sunny skies and 70 F. Postemergence treatments were applied in 8.5 gpa at 35 psi to 4.3 to 4.8 leaf 'Kramer' triticale and speltz, 8 inch Mil Hy '100'pearl millet, 'Piper' sudangrass, sudan sorghum cross and 6 inch 'Cerise' proso millet and 7 inch 'Manta' foxtail millet with a sunny sky and 80 F on July. Only two replicates were evaluated because of possible sethoxydim drift from an adjacent field.

Herbicide		Rate	Rrpw	Trit	Spel	Pemi	Prmi	Fomi	Sugr	Hygr	Foso	Suso
		(oz/A)	(%)	----------(% injury)----------								
Triallate	PPI	16	0	10	10	0	0	0	35	35	55	25
Trifluralin	PPI	12	90	85	75	99	99	99	99	99	97	99
Cyanazine-L	PPI	16	28	63	15	3	18	20	3	0	0	0
Propachlor	PE	48	5	23	8	48	93	90	13	5	0	0
Dicamba	P	4	92	10	13	8	10	25	15	5	5	5
2,4-D dma	P	8	85	3	3	3	3	18	3	0	0	0
MCPA dma	P	8	30	0	3	5	5	28	18	20	8	15
Imazamethabenz	P	6	8	0	5	5	0	7	13	13	25	25
Diclofop	P	12	0	0	3	45	20	63	13	40	53	63
Brox&MCPA	P	8	60	0	0	5	0	10	3	3	5	8
Bromoxynil	P	4	30	0	3	10	3	3	15	3	3	5
DPX-M6316+R11	P	0.375	99	0	0	35	50	78	85	83	83	83
C.V. %			25	50	64	33	24	24	48	50	36	33
LSD 5%			24	18	16	16	13	10	27	27	22	20
# OF REPS			2	2	2	2	2	2	2	2	2	2
F-TRT			25	25	16	33	72	34	14	15	24	29

a Rrpw = Redroot pigweed control; Trit = Triticale; Spel = Speltz; Pemi = Pearl millet; Prmi = Proso millet; Fomi = Foxtail millet; Sugr = Sudan grass; Hysd = Hybrid sudan; Foso = Forage sorghum; Suso = Sudan sorghum;.
b R-11 = Surfactant applied at 0.25% v/v.

Summary

Trifluralin, dicamba, 2,4-D, and DPX+M6316 controlled redroot pigweed 85% or greater. Trifluralin severly reduced stands of all crops tested. Cyaniazine reduced the stand of triticale 63%. Propachlor reduced the stand of Mil-Hy 100 pearl, Cerise proso millets, and Manta proso millet. Diclofop and DPX-M6316 were injurious to pearl and proso millets. Diclofop was most injurious to proso millet, hybrid sudan grass, forage sorghum and the sudan X sorghum cross. DPX-M6316 injured all the warm season crops tested.

Commercial petroleum oils with sethoxydim, Exp 1, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 4- to 5-leaf wheat and oats on June 2. Evaluations were on June 23 and June 24.

Treatment	Rate (oz/A)	June 23 Wht	June 23 Oats	June 24 Wht	June 24 Oats
		------(% control)-----			
Sethoxydim+PO1(Atplus411F)	1+0.25G	38	40	33	41
Sethoxydim+PO2(Herbimax)	1+0.25G	33	31	43	38
Sethoxydim+PO3(Coop)	1+0.25G	23	24	40	34
Sethoxydim+PO4(Wilbur)	1+0.25G	48	41	53	56
Sethoxydim+PO5(Add-It)	1+0.25G	35	52	18	31
Sethoxydim+PO6(Dash)	1+0.25G	29	34	28	24
Sethoxydim+PO7(Assist)	1+0.25G	38	53	23	30
Sethoxydim+PO8(Zach)	1+0.25G	30	36	46	51
HIGH MEAN		48	53	53	56
LOW MEAN		23	24	18	24
EXP MEAN		34	39	35	38
C.V. %		32	44	52	50
LSD 5%		NS	NS	NS	NS
LSD 1%		NS	NS	NS	NS
# OF REPS		4	4	4	4

Summary

All petroleum oils were similar as adjuvants with sethoxydim. The control obtained with the dry environment was too little to detect differences.

Commercial petroleum oils with sethoxydim, Exp 2, Fargo 1988. 'Wheaton' Hard Red Spring wheat 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat, oats, and foxtail millet on July 6. Evaluation was on August 1 and 24.

Treatment	Rate (oz/A)	August 1			August 24		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Sethoxydim+PO1(Atplus411F)	1+0.25G	75	92	84	80	99	93
Sethoxydim+PO2(Herbimax)	1+0.25G	77	94	88	83	99	98
Sethoxydim+PO3(Coop)	1+0.25G	75	95	86	80	98	96
Sethoxydim+PO4(Wilbur)	1+0.25G	78	94	89	81	99	99
Sethoxydim+PO5(Add-It)	1+0.25G	73	91	79	76	99	90
Sethoxydim+PO6(Dash)	1+0.25G	79	96	87	86	99	98
Sethoxydim+PO7(Assist)	1+0.25G	73	92	78	77	99	89
Sethoxydim+PO8(Zach)	1+0.25G	76	97	88	83	99	98
C.V. %		5	3	5	5	1	2
LSD 5%		NS	NS	6	NS	NS	3
# OF REPS		4	4	4	4	4	4

Summary

All petroleum oils were similar with sethoxydim for control of grass species. Oats control tended to be less with assist and Add-it than other oils.

Commercial petroleum oils with fluazifop, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreaten area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat and oats and 6- to 7-leaf foxtail millet on June 24 with 75 F. Evaluation July 11 and August 5.

Treatment	Rate	July 11			August 5		
	(oz/A)	Fomi	Wht	Oats	Fxmi	Wht	Oats
		(% control)					
Flua+PO1(Atplus411F)	0.75+0.25G	23	78	72	28	96	90
Flua+PO2(Herbimax)	0.75+0.25G	22	79	72	25	97	95
Flua+PO3(Coop)	0.75+0.25G	17	76	72	21	96	86
Flua+PO4(Wilbur)	0.75+0.25G	26	76	75	28	96	90
Flua+PO5(Add-It)	0.75+0.25G	12	77	75	11	96	91
Flua+PO6(Dash)	0.75+0.25G	27	77	76	25	96	93
Flua+PO7(Assist)	0.75+0.25G	25	78	71	24	93	89
Flua+PO8(Zach)	0.75+0.25G	20	77	76	25	98	96
HIGH MEAN		27	79	76	28	98	96
LOW MEAN		12	76	71	11	93	86
EXP MEAN		21	77	74	23	96	91
C.V. %		43	4	8	19	2	5
LSD 5%		NS	NS	NS	6	NS	NS
LSD 1%		NS	NS	NS	9	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

All petroleum oil were similar as adjuvants with fluazifop.

Commercial petroleum oils with DPX-Y6202, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat and oats and jointing foxtail millet on July 6 with 82 F, and 50% RH, 1.5h after a light rain. Evaluations were on August 1 and 24.

Treatment	Rate (oz/A)	August 1			August 24		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
DPX-Y6202+PO1(Atplus411F)	0.4+0.25G	67	99	68	35	97	55
DPX-Y6202+PO2(Herbimax)	0.4+0.25G	71	99	78	37	99	77
DPX-Y6202+PO3(Coop)	0.4+0.25G	72	99	72	36	99	76
DPX-Y6202+PO4(Wilbur)	0.4+0.25G	69	99	77	43	99	81
DPX-Y6202+PO5(Add-It)	0.4+0.25G	71	99	76	43	99	78
DPX-Y6202+PO6(Dash)	0.4+0.25G	74	99	81	59	99	95
DPX-Y6202+PO7(Assist)	0.4+0.25G	65	98	64	36	99	65
DPX-Y6202+PO8(Zach)	0.4+0.25G	67	99	72	38	99	79
C.V. %		6	0	9	20	2	15
LSD 5%		NS	NS	9	12	NS	17
# OF REPS		4	4	4	4	4	4

Summary

Assist and Add-it tended to be less effective than the other adjuvants for oats control with DPX-Y6202.

Sethoxydim formulations with adjuvants, Exp 1, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 4- to 6-leaf wheat, oats, and foxtail millet on June 21 with 87 F. Evaluations were on July 8 and August 4.

Treatment	Rate[a] (lb/A)	July 8			August 4		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Sethoxydim+OC	0.1+0.25G	78	77	73	93	76	77
Sethoxydim+BCH[b]	0.1+0.25G	3	0	4	0	0	0
Sethoxydim+BCH	0.1+0.5G	82	82	83	97	94	98
Sethoxydim+OC	0.125+0.25G	81	79	78	95	85	81
Sethoxydim+BCH	0.125+0.25G	82	86	86	96	98	99
Sethoxydim+BCH	0.125+0.5G	85	86	85	96	98	96
Sethoxydim+OC	0.15+0.25G	84	85	83	97	99	98
Sethoxydim+BCH	0.15+0.25G	88	89	90	98	99	99
Sethoxydim+BCH	0.15+0.5G	90	92	91	99	99	99
BAS-0562-16H	0.1	82	81	79	94	89	87
BAS-0562-16H+OC	0.1+0.25G	80	82	83	96	98	99
BAS-0562-16H+BCH	0.1+0.25G	82	86	83	97	99	99
BAS-0562-16H	0.125	85	88	90	98	99	99
BAS-0562-16H+OC	0.125+0.25G	82	82	81	98	99	99
BAS-0562-16H+BCH	0.125+0.25G	85	86	86	99	99	99
BAS-0562-16H	0.15	83	85	85	97	99	99
BAS-0562-16H+OC	0.15+0.25G	87	88	89	99	99	99
BAS-0562-16H+BCH	0.15+0.125G	89	94	94	99	99	99
BAS-0562-16H+BCH	0.15+0.25G	89	93	96	99	99	99
Fluazifop+PO	0.15+0.25G	72	93	94	44	99	99
HIGH MEAN		90	94	96	99	99	99
LOW MEAN		3	0	4	0	0	0
EXP MEAN		79	82	82	90	91	91
C.V. %		6	5	5	3	3	4
LSD 5%		6	6	6	3	4	5
LSD 1%		8	8	8	4	6	7
# OF REPS		4	4	4	4	4	4

a G in the rate column is for gallon/A.
b Sethoxydim probably was not a part of the treatment.

Summary

BAS-0562 without an adjuvant generally gave similar grass species control as sethoxydim with BCH (adjuvant from BASF, Dash). BCH only enhanced BAS-0562 at certain rate for specific grass species.

Sethoxydim formulation with adjuvants, Exp 2, Fargo 1988. 'McCall' soybeans were seeded to an area with a natural infestation of yellow foxtail on May 19. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area the length of 10 by 25 ft plots. Treatments were applied to first trifoliolate soybeans and 3- to 4-leaf foxtail on June 22. Evaluation was on July 14.

Treatment	Rate (lb/A)	Soybean Injury (%)	Grft (% control)
Sethoxydim+OC	0.1+0.25G	4	94
Sethoxydim+BCH	0.1+0.25G	4	97
Sethoxydim+BCH	0.1+0.5G	4	89
Sethoxydim+OC	0.125+0.25G	3	98
Sethoxydim+BCH	0.125+0.25G	4	99
Sethoxydim+BCH	0.125+0.5G	4	97
Sethoxydim+OC	0.15+0.25G	4	97
Sethoxydim+BCH	0.15+0.25G	3	99
Sethoxydim+BCH	0.15+0.5G	5	99
BAS-0562-16H	0.1	4	95
BAS-0562-16H+OC	0.1+0.25G	4	95
BAS-0562-16H+BCH	0.1+0.25G	3	96
BAS-0562-16H	0.125	3	96
BAS-0562-16H+OC	0.125+0.25G	4	98
BAS-0562-16H+BCH	0.125+0.25G	4	98
BAS-0562-16H	0.15	4	98
BAS-0562-16H+OC	0.15+0.25G	3	99
BAS-0562-16H+BCH	0.15+0.125G	4	96
BAS-0562-16H+BCH	0.15+0.25G	3	99
Fluazifop+PO	0.15+0.25G	4	95
HIGH MEAN		5	99
LOW MEAN		3	89
EXP MEAN		4	97
C.V. %		32	4
LSD 5%		NS	5
LSD 1%		NS	NS
# OF REPS		4	4

Summary

None of the treatments caused important injury to soybean. All treatment similarly gave 89% or more control of yellow foxtail.

Sethoxydim time-of-day application, Exp 1, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf wheat and oats on June 7 with clear sky and 87 F at 8:00 am, 98 F at 2:00 pm, and 85 F at 8:00 pm applications. Evaluation was on June 22.

Treatment		Rate (oz/A)	Wheat	Oats
			(% control)	
Sethoxydim+PO	(8 am)	1+0.25G	77	40
Sethoxydim+MSC	(8 am)	1+0.25G	87	80
Sethoxydim+BCH	(8 am)	1+0.25G	87	79
Sethoxydim+PO	(8 am)	1+0.25G	34	11
Sethoxydim+AG2	(8 am)	1+0.25G	78	49
Sethoxydim+PO	(2 pm)	1+0.25G	82	53
Sethoxydim+MSC	(2 pm)	1+0.25G	89	87
Sethoxydim+BCH	(2 pm)	1+0.25G	93	86
Sethoxydim+PO	(2 pm)	1+0.25G	80	53
Sethoxydim+AG2	(2 pm)	1+0.25G	87	80
Sethoxydim+PO	(8 pm)	1+0.25G	88	76
Sethoxydim+MSC	(8 pm)	1+0.25G	91	91
Sethoxydim+BCH	(8 pm)	1+0.25G	92	90
Sethoxydim+PO	(8 pm)	1+0.25G	87	75
Sethoxydim+AG2	(8 pm)	1+0.25G	89	83
HIGH MEAN			93	91
LOW MEAN			34	11
EXP MEAN			83	69
C.V. %			13	14
LSD 5%			15	13
LSD 1%			21	18
# OF REPS			4	4

Summary

Sethoxydim control of wheat and oats generally increased from 8:00 am to 8:00 pm applications when PO (petroleum oil 11N plus 77% Atplus), SOTM (once refined soybean oil with 15% T-Mulz vo) or AG2 were the adjuvants. Time of application did not influence control when MSC (methylated seed oil) or BCH (adjuvant from BASF, Dash) were the adjuvants. Oats control, averaged over time of sehoxydim application was 56% with PO, 86% with MSC, 83% with BCH, and 46% with AG2.

Sethoxydim time-of-day application, Exp 2, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf species on June 28 with a clear sky and 75 F at 8:00 am, partly cloudy sky and 85 F at 2:00 pm, and partly cloudy sky and 68 F at 8:00 pm applications. Evaluation was on July 19 and August 10.

Treatment	Rate (oz/A)	July 19			August 10		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Seth+PO (8 am)	1+0.25G	65	75	70	74	97	87
Seth+MSC (8 am)	1+0.25G	64	76	78	75	98	95
Seth+BCH (8 am)	1+0.25G	68	78	81	76	99	96
Seth+PO (8 am)	1+0.25G	57	64	56	68	86	84
Seth+AG2 (8 am)	1+0.25G	58	74	70	73	97	83
Seth+PO (2 pm)	1+0.25G	60	73	72	75	97	87
Seth+MSC (2 pm)	1+0.25G	58	76	77	74	98	97
Seth+BCH (2 pm)	1+0.25G	64	77	78	75	99	98
Seth+PO (2 pm)	1+0.25G	46	51	60	67	82	80
Seth+AG2 (2 pm)	1+0.25G	50	68	72	71	96	88
Seth+PO (8 pm)	1+0.25G	63	74	72	76	99	90
Seth+MSC (8 pm)	1+0.25G	73	78	78	76	98	96
Seth+BCH (8 pm)	1+0.25G	68	78	79	77	99	98
Seth+PO (8 pm)	1+0.25G	62	73	65	75	92	78
Seth+AG2 (8 pm)	1+0.25G	66	77	76	75	99	91
HIGH MEAN		73	78	81	77	99	98
LOW MEAN		46	51	56	67	82	78
EXP MEAN		61	73	72	74	96	90
C.V. %		10	6	8	3	4	6
LSD 5%		9	6	8	3	5	8
LSD 1%		11	8	11	4	7	10
# OF REPS		4	4	4	4	4	4

Summary

Time-of-day that sethoxydim was applied did not influence grass species control regardless of adjuvants. Grass control was greatest with MSC (methylated seed oil) and BCH (adjuvant from BASF, Dash) adjuvants.

Sethoxydim mixing method, Exp 1, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND 810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatment were applied to 4- to 5-leaf wheat and oats on June 3 with 85 F. Evaluation was on June 23.

Treatment	Rate (oz/A)	Wheat	Oats
		(% control)	
Sethoxydim+BCH (at trt)	1+0.25G	54	69
Sethoxydim+BCH (Form. 24H)	1+0.25G	36	33
Sethoxydim+BCH (Form.+H2O 12H)	1+0.25G	56	71
Sethoxydim+BCH (Form.+H2O 24H)	1+0.25G	38	31
Sethoxydim+MS (at trt)	1+0.25G	76	83
Sethoxydim+MS (Form. 24H)	1+0.25G	45	63
Sethoxydim+MS (Form.+H2O 12H)	1+0.25G	50	67
Sethoxydim+MS (Form.+H2O 24H)	1+0.25G	46	54
Sethoxydim+MSC (at trt)	1+0.25G	60	73
Sethoxydim+MSC (Form. 24H)	1+0.25G	58	72
Sethoxydim+MSC (Form.+H2O 12H)	1+0.25G	58	64
Sethoxydim+MSC (Form.+H2O 24H)	1+0.25G	51	69
HIGH MEAN		76	83
LOW MEAN		36	31
EXP MEAN		52	62
C.V. %		27	29
LSD 5%		20	26
LSD 1%		NS	35
# OF REPS		4	4

Summary

Sethoxydim mixed with BCH (adjuvant from BASF, Dash) as formulants or formulants plus water for 24h before application reduced grass control compared to sethoxydim mixed and applied immediately or after 12h. Sethoxydim mixed with MS (methylated seed oil, Sun-it) as formulations or with water for 12h or more before application reduced control compared to application immediatly after mixing. Pre-mixing sethoxydim with MSC did not reduce grass control. However, MS gave or tended to give greater grass control than the other adjuvants with sethoxydim.

Sethoxydim mixing method, Exp.2, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat and oats on June 28 with 85 F. Evaluation was on July 18 and August 10.

Treatment	Rate (oz/A)	July 18			August 10		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Seth+BCH (at trt)	1+0.25G	64	77	79	75	99	92
Seth+BCH (Form. 24H)	1+0.25G	62	77	79	74	99	92
Seth+BCH (Form.+H2O 12H)	1+0.25G	63	79	76	76	98	94
Seth+BCH (Form.+H2O 24H)	1+0.25G	68	78	78	76	99	96
Seth+MS (at trt)	1+0.25G	60	76	73	74	98	87
Seth+MS (Form. 24H)	1+0.25G	65	76	76	74	98	88
Seth+MS (Form.+H2O 12H)	1+0.25G	65	77	76	75	98	91
Seth+MS (Form.+H2O 24H)	1+0.25G	58	70	75	74	98	89
Seth+MSC (at trt)	1+0.25G	67	77	75	76	98	89
Seth+MSC (Form. 24H)	1+0.25G	67	79	74	76	98	88
Seth+MSC (Form.+H2O 12H)	1+0.25G	63	77	75	75	98	90
Seth+MSC (Form.+H2O 24H)	1+0.25G	67	76	78	77	98	94
HIGH MEAN		68	79	79	77	99	96
LOW MEAN		58	70	73	74	98	87
EXP MEAN		64	76	76	75	98	91
C.V. %		5	3	3	3	1	4
LSD 5%		5	3	NS	NS	1	5
LSD 1%		7	5	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4

Summary

Sethoxydim with all adjuvants gave similar grass species control regardless if mixed as formulation or with water for 24h before application.

Sethoxydim formulations and bentazon antagonism, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 4- to 6-leaf wheat, oats, and foxtail millet on June 21 with 87 F. Evaluation was July 11.

Treatment	Rate (lb/A)	Fomi	Wht	Oats
		--(% control)--		
Sethoxydim+PO	0.1+0.25G	80	81	77
Sethoxydim+PO	0.15+0.25G	86	88	90
Seth+Bent+PO+UAN	0.1+0.75+0.25G+1G	73	63	50
Seth+Bent+PO+UAN	0.15+0.75+0.25G+1G	76	78	78
Sethoxydim+Dash	0.1+0.5G	82	85	85
Sethoxydim+Dash	0.15+0.5G	93	92	91
Seth+Bent+Dash+UAN	0.1+0.75+0.5G+1G	79	79	75
Seth+Bent+Dash+UAN	0.15+0.75+0.5G+1G	84	86	80
BAS-562-16H	0.1	80	76	73
BAS-562-16H	0.15	84	87	90
BAS-562-16H+Bent+UAN	0.1+0.75+1G	74	71	54
BAS-562-16H+Bent+UAN	0.15+0.75+1G	82	82	79
BAS-562-16H+Dash	0.1+0.25G	91	97	97
BAS-562-16H+Dash	0.15+0.25G	88	91	93
BAS562+Bent+Dash+UAN	0.1+0.75+0.25G+1G	77	76	77
BAS562+Bent+Dash+UAN	0.15+0.75+0.25G+1G	81	85	83
HIGH MEAN		93	97	97
LOW MEAN		73	63	50
EXP MEAN		82	82	79
C.V. %		5	6	11
LSD 5%		6	7	12
LSD 1%		8	9	16
# OF REPS		4	4	4

Summary

Sethoxydim + PO or + PO and DASH and BAS-562-16H alone or + DASH were similarly antagonized by bentazon + UAN. Sethoxydim + PO and BAS-562-16H alone gave similar grass species control. PO = petroleum oil with 17% Atplus 300 F, Dash = an adjuvant from BASF, and UAN = a urea + ammonium nitrate fertilizer.

Sethoxydim plus adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 4- to 5-leaf wheat and oats on June 3 with 85 F and clear sky. Evaluation was on June 24 and July 19.

Treatment	Rate (oz/A)	Wht	Oats	Wht	Oats
		-----(% control)----			
		11	23	5	0
Sethoxydim+PO	0.5+0.25G	44	55	19	16
Sethoxydim+PO	1+0.25G	80	78	45	38
Sethoxydim+PO	1.5+0.25G	28	40	9	9
Sethoxydim+MSC	0.5+0.25G	71	78	26	25
Sethoxydim+MSC	1+0.25G	91	93	68	63
Sethoxydim+MSC	1.5+0.25G	30	38	6	3
Sethoxydim+AG-2	0.5+0.25G	61	77	30	33
Sethoxydim+AG-2	1+0.25G	77	82	46	35
Sethoxydim+AG-2	1.5+0.25G	44	46	16	8
Sethoxydim+BCH	0.5+0.25G	77	84	51	56
Sethoxydim+BCH	1+0.25G	91	91	80	85
Sethoxydim+BCH	1.5+0.25G	91	93	80	85
HIGH MEAN		11	23	5	0
LOW MEAN		59	65	33	31
EXP MEAN		21	19	20	25
C.V. %		18	18	10	11
LSD 5%		24	24	13	15
LSD 1%		4	4	4	4
# OF REPS					

Summary

Control of wheat and oats with sethoxydim with MSC or BCH was similar at the first evaluation, but greater with BCH at the second evaluation. MSC and BCH both were more effective as adjuvants than PO or AG-2.

Fluazifop plus adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft area between treated areas to aid evaluation. Treatments were applied to jointing wheat, oats, and foxtail millet on July 8 with 85 F and partly cloudy sky. Evaluation were on August 2.

Treatment	Rate (oz/A)	Wht	Fomi	Oats
		--(% control)--		
Fluazifop+PO	0.25+0.25G	6	19	8
Fluazifop+PO	0.5+0.25G	9	65	19
Fluazifop+PO	1+0.25G	35	86	68
Fluazifop+MSC	0.25+0.25G	6	16	11
Fluazifop+MSC	0.5+0.25G	11	75	53
Fluazifop+MSC	1+0.25G	36	85	69
Fluazifop+AG-2	0.25+0.25G	3	18	8
Fluazifop+AG-2	0.5+0.25G	15	40	15
Fluazifop+AG-2	1+0.25G	40	82	68
Fluazifop+BCH	0.25+0.25G	0	21	6
Fluazifop+BCH	0.5+0.25G	11	69	30
Fluazifop+BCH	1+0.25G	46	85	65
HIGH MEAN		46	86	69
LOW MEAN		0	16	6
EXP MEAN		18	55	35
C.V. %		31	16	21
LSD 5%		8	13	11
LSD 1%		11	17	14
# OF REPS		4	4	4

Summary

Grass species control with fluazifop was similar with all adjuvants. However, fluazifop at 0.5 oz/A tended to give greater control when with MSC than the other adjuvants.

Clethodim plus adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat, "ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 4- to 6-leaf wheat, oats, and foxtail millet on June 22 with 83 F and partly cloudy sky. Evaluation was on July 7 and August 8.

Treatment	Rate (oz/A)	July 7			August 8		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Clethodim+PO	0.25+0.25G	71	64	54	66	67	38
Clethodim+PO	0.5+0.25G	79	77	80	81	79	92
Clethodim+PO	0.75+0.25G	83	86	90	85	98	99
Clethodim+MSC	0.25+0.25G	77	78	78	64	67	95
Clethodim+MSC	0.5+0.25G	81	84	87	77	96	99
Clethodim+MSC	0.75+0.25G	85	89	95	85	99	99
Clethodim+AG-2	0.25+0.25G	72	74	74	61	67	60
Clethodim+AG-2	0.5+0.25G	78	79	80	68	79	97
Clethodim+AG-2	0.75+0.25G	80	87	88	77	99	99
Clethodim+BCH	0.25+0.25G	77	77	76	70	88	93
Clethodim+BCH	0.5+0.25G	82	90	92	86	99	99
Clethodim+BCH	0.75+0.25G	82	90	91	83	99	99
Clethodim+MS	0.25+0.3%	75	78	80	67	77	91
Clethodim+MS	0.5+0.3%	81	86	88	81	98	99
Clethodim+MS	0.75+0.3%	83	88	92	83	99	99
HIGH MEAN		85	90	95	86	99	99
LOW MEAN		71	64	54	61	67	38
EXP MEAN		79	82	83	75	87	90
C.V. %		4	5	8	7	7	6
LSD 5%		4	6	10	8	8	8
LSD 1%		5	8	13	11	11	11
# OF REPS		4	4	4	4	4	4

Summary

MSC, BCH, and MS similarly enhanced grass species control with clethodim. PO and AG-2 were generally less effective than the above adjuvants with clethodim at 0.5 oz/A.

DPX-Y6202 plus adjuvants, Exp 1, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to jointing wheat, oats, and foxtail millet on July 5 with 103 F, 30% RH, and partly cloudy sky. Evaluation was on July 29 and August 22.

Treatment	Rate	July 29			August 22		
	(oz/A)	Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
DPX-Y6202-38+PO	0.12+0.25G	43	86	9	21	96	24
DPX-Y6202-38+PO	0.38+0.25G	70	99	34	35	99	52
DPX-Y6202-38+PO	0.75+0.25G	84	99	73	67	99	74
DPX-Y6202-38+MSC	0.12+0.25G	18	81	7	11	90	16
DPX-Y6202-38+MSC	0.38+0.25G	64	99	30	32	99	41
DPX-Y6202-38+MSC	0.75+0.25G	79	99	76	45	99	82
DPX-Y6202-38+AG-2	0.12+0.25G	28	63	13	6	58	16
DPX-Y6202-38+AG-2	0.38+0.25G	65	99	27	30	99	41
DPX-Y6202-38+AG-2	0.75+0.25G	78	99	75	36	99	69
DPX-Y6202-38+BCH	0.12+0.25G	25	78	6	9	89	11
DPX-Y6202-38+BCH	0.38+0.25G	74	99	63	41	99	68
DPX-Y6202-38+BCH	0.75+0.25G	89	99	86	74	99	83
DPX-Y6202-38+SOC-TM	0.12+0.25G	5	17	8	3	15	5
DPX-Y6202-38+SOC-TM	0.38+0.25G	21	31	8	8	70	7
DPX-Y6202-38+SOC-TM	0.75+0.25G	59	84	20	28	96	14
HIGH MEAN		89	99	86	74	99	83
LOW MEAN		5	17	6	3	15	5
EXP MEAN		53	82	35	30	87	40
C.V. %		10	10	13	19	9	22
LSD 5%		8	12	6	8	11	12
LSD 1%		11	15	9	11	14	17
# OF REPS		4	4	4	4	4	4

Summary

PO (petroleum oil with 17% Atplus 300F), MSC (methylated seed oil from Agsco), and BCH (adjuvant from BASF, DASH) all were similar as adjuvants with DPX-Y6202. AG-2 was less effective then the above as an adjuvant only at the lowest DPX-Y6202 rate for wheat. SOC-TM (canola oil with 15% T-Mulz VO) was ineffective as an adjuvant with DPX-Y6202.

DPX-Y202 plus adjuvants, Exp 2, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to jointing to boot wheat, oats, and foxtail millet on July 12 with 73 F, 60% RH and partly cloudy sky. Evaluation was on August 8 and 29.

Treatment	Rate (oz/A)	August 8			August 29		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
DPX-Y6202-38+PO	0.12+0.25G	9	8	5	10	23	14
DPX-Y6202-38+PO	0.38+0.25G	58	54	50	39	64	37
DPX-Y6202-38+PO	0.75+0.25G	70	70	74	55	64	62
DPX-Y6202-38+MSC	0.12+0.25G	3	8	6	8	22	11
DPX-Y6202-38+MSC	0.38+0.25G	44	48	46	33	49	32
DPX-Y6202-38+MSC	0.75+0.25G	65	70	71	49	66	56
DPX-Y6202-38+AG-2	0.12+0.25G	4	6	4	5	18	9
DPX-Y6202-38+AG-2	0.38+0.25G	29	34	10	24	43	19
DPX-Y6202-38+AG-2	0.75+0.25G	63	36	43	42	53	43
DPX-Y6202-38+BCH	0.12+0.25G	20	16	13	8	25	16
DPX-Y6202-38+BCH	0.38+0.25G	55	71	71	42	64	50
DPX-Y6202-38+BCH	0.75+0.25G	69	71	77	63	63	64
DPX-Y6202-38+SOC-TM	0.12+0.25G	0	7	0	3	14	6
DPX-Y6202-38+SOC-TM	0.38+0.25G	3	10	5	1	26	11
DPX-Y6202-38+SOC-TM	0.75+0.25G	10	26	13	5	41	18
HIGH MEAN		70	71	77	63	66	64
LOW MEAN		0	6	0	1	14	6
EXP MEAN		33	36	32	26	42	30
C.V. %		12	20	22	16	20	25
LSD 5%		6	10	10	6	12	11
LSD 1%		7	14	13	8	16	14
# OF REPS		4	4	4	4	4	4

Summary

Results from experiment 2 were in close agreement with those from experiment 1, but the level of control was less than in experiment 1. The lower control in experimemt 2 may have reflected the more mature plants or the lower temperatures at treatment. PO, MSC, and BCH were all similar as adjuvants with DPX-Y6202. AG-2 tended to be less effective then the above adjuvants. SOC-TM was ineffective as an adjuvant with DPX-Y6202.

Fenoxaprop plus adjuvants, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 5- to 6-leaf wheat, oats, and foxtail millet on July 5 with 103 F, 30% RH, and partly cloudy sky. Evaluation was on August 2 and 23.

Treatment	Rate	August 2			August 23		
	(oz/A)	Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Fenoxaprop+PO	0.5+0.25G	36	9	5	23	31	11
Fenoxaprop+PO	1+0.25G	65	12	18	42	48	27
Fenoxaprop+PO	1.5+0.25G	69	11	23	45	46	36
Fenoxaprop+MSC	0.5+0.25G	45	10	12	28	34	14
Fenoxaprop+MSC	1+0.25G	53	13	18	43	47	33
Fenoxaprop+MSC	1.5+0.25G	64	10	21	49	41	29
Fenoxaprop+AG-2	0.5+0.25G	41	6	5	22	29	24
Fenoxaprop+AG-2	1+0.25G	59	10	16	44	46	29
Fenoxaprop+AG-2	1.5+0.25G	67	13	35	46	46	44
Fenoxaprop+BCH	0.5+0.25G	57	12	9	37	38	29
Fenoxaprop+BCH	1+0.25G	63	11	23	38	45	32
Fenoxaprop+BCH	1.5+0.25G	70	19	29	50	55	36
C.V. %		10	41	34	11	20	21
LSD 5%		8	NS	9	6	12	9
LSD 1%		11	NS	12	9	16	11
# OF REPS		4	4	4	4	4	4

Summary

All adjuvants were similar with fenoxaprop for the control of wheat, oats and foxtail millet. The rates probably were to low for the large plant. The high temperature at treatment apparently did not enhance phytotoxicity of fenoxaprop.

Haloxyfop plus adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf wheat, oats, and foxtail millet on June 10 with 89 F, 50% RH and clear sky. Evaluation were on June 24 and July 19.

Treatment	Rate (oz/A)	June 24 Wht	June 24 Oats	July 19 Wht	July 19 Oats
		-----(% control)----			
Haloxyfop+PO	0.25+0.25G	39	50	14	11
Haloxyfop+PO	0.50+0.25G	75	78	76	82
Haloxyfop+PO	0.75+0.25G	86	89	90	97
Haloxyfop+MSC	0.25+0.25G	61	75	64	77
Haloxyfop+MSC	0.50+0.25G	84	85	92	98
Haloxyfop+MSC	0.75+0.25G	84	91	95	98
Haloxyfop+AG-2	0.25+0.25G	64	75	60	71
Haloxyfop+AG-2	0.50+0.25G	81	88	89	98
Haloxyfop+AG-2	0.75+0.25G	86	90	95	99
Haloxyfop+BCH	0.25+0.25G	65	69	51	60
Haloxyfop+BCH	0.50+0.25G	70	78	90	92
Haloxyfop+BCH	0.75+0.25G	86	92	93	99
C.V. %		13	11	11	11
LSD 5%		14	12	12	12
LSD 1%		18	16	17	17
# OF REPS		4	4	4	4

Summary

MSC (methylated seed oil adjuvant from Agsco) and AG-2 were similar and more effective as adjuvants then PO (petrolium oil 11N with 17% Atplus 300F) with haloxyfop for grass species control. BCH (adjuvant from BASF-DASH) was intermediate to PO and MSC or AG-2.

Sethoxydim with NaHCO3 or Na2CO3, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf wheat and oats on June 6 with 98 F, 28% RH, and clear sky. Evaluations were on June 24 and July 20.

Treatment	Salt (ppm)	Rate (oz/A)	June 24 Wht	June 24 Oats	July 20 Wht	July 20 Oats
			-----(% control)----			
Seth+PO		1.5+0.25G	75	74	23	14
Seth+PO+NaHCO3	(500)	1.5+0.25G+0.5	74	56	30	18
Seth+PO+NaHCO3	(1000)	1.5+0.25G+1	62	33	17	6
Seth+PO+NaHCO3	(4000)	1.5+0.25G+4	34	28	10	3
Seth+PO+NaHCO3	(16000)	1.5+0.25G+16	18	13	8	3
Seth+PO+Na2CO3	(500)	1.5+0.25G+0.5	64	53	21	12
Seth+PO+Na2CO3	(1000)	1.5+0.25G+1	58	44	15	7
Seth+PO+Na2CO3	(4000)	1.5+0.25G+4	11	8	6	3
Seth+PO+Na2CO3	(16000)	1.5+0.25G+16	0	0	4	1
Seth+PO		3+0.25G	91	89	73	61
Seth+PO+NaHCO3	(500)	3+0.25G+0.5	86	82	43	31
Seth+PO+NaHCO3	(1000)	3+0.25G+1	81	79	30	24
Seth+PO+NaHCO3	(4000)	3+0.25G+4	76	61	23	15
Seth+PO+NaHCO3	(16000)	3+0.25G+16	68	51	33	11
Seth+PO+Na2CO3	(500)	3+0.25G+0.5	83	78	44	33
Seth+PO+Na2CO3	(1000)	3+0.25G+1	80	76	39	25
Seth+PO+Na2CO3	(4000)	3+0.25G+4	65	36	20	9
Seth+PO+Na2CO3	(16000)	3+0.25G+16	33	30	6	3
Seth+PO+28%N		1.5+0.25G+0.06G	77	67	25	15
Seth+PO+NaHCO3	(500)+28%N	1.5+0.25G+0.5+0.06G	80	76	39	20
Seth+PO+NaHCO3	(1000)+28%N	1.5+0.25G+1+0.06G	81	74	48	28
Seth+PO+NaHCO3	(4000)+28%N	1.5+0.25G+4+0.06G	85	83	52	36
Seth+PO+NaHCO3	(16000)+28%N	1.5+0.25G+16+0.06G	38	34	9	3
Seth+PO+Na2CO3	(500)+28%N	1.5+0.25G+0.5+0.06G	84	80	51	40
Seth+PO+Na2CO3	(1000)+28%N	1.5+0.25G+1+0.06G	80	78	41	33
Seth+PO+Na2CO3	(4000)+28%N	1.5+0.25G+4+0.06G	65	43	17	6
Seth+PO+Na2CO3	(16000)+28%N	1.5+0.25G+16+0.06G	0	0	0	0
Seth+PO+28%N		3+0.25G+0.25G	94	94	92	92
Seth+PO+NaHCO3	(500)+28%N	3+0.25G+0.5+0.25G	95	95	95	95
Seth+PO+NaHCO3	(1000)+28%N	3+0.25G+1+0.25G	93	94	93	94
Seth+PO+NaHCO3	(4000)+28%N	3+0.25G+4+0.25G	94	93	93	93
Seth+PO+NaHCO3	(16000)+28%N	3+0.25G+16+0.25G	95	96	96	97
Seth+PO+Na2CO3	(500)+28%N	3+0.25G+0.5+0.25G	96	96	97	97
Seth+PO+Na2CO3	(1000)+28%N	3+0.25G+1+0.25G	96	95	98	98
Seth+PO+Na2CO3	(4000)+28%N	3+0.25G+4+0.25G	95	94	97	97
Seth+PO+Na2CO3	(16000)+28%N	3+0.25G+16+0.25G	80	78	33	17
C.V. %			8	12	22	18
LSD 5%			8	10	13	9
# OF REPS			4	4	4	4

Summary

Antagonism of sethoxydim was greater by Na2CO3 than NaHCO3 in the spray mixture. Antagonism began with the lowest amount of carbonates, 500 ppm, and increased as concentration increased. Generally 0.066 gpa 28%N overcame 4000 ppm NaHCO3 and 1000 ppm Na2CO3 antagonisms of sethoxydim at 1.5 oz/A. 28%N at 0.25G overcame antagonism of sethoxydim at 3 oz/A caused by 16000 ppm NaHCO3 and 4000 ppm Na2CO3.

DPX-R9674 with adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat, Fl sunflower, 'McCall' soybean and redroot pigweed were seeded in 6 ft wide adjacent strips as bioassay species on May 18. Treatments were applied to 6- to 8-leaf redroot pigweed and sunflower, 4- to 6-leaf wheat, and 3 trifolialate soybeans on June 15 with 72 F and partly cloudy sky. Application was with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area of 10 ft wide plots across the various species. The experiment was a randomized complete block with four replications. Evaluations were on June 28 and July 21.

Treatment	Rate (oz/A)	June 28				July 21			
		Rrpw	Vosf	Wht	KOCZ	Soy	Wht	Vosf	Rrpw
		(% control)							
DPX-R9674+X-77	0.06+0.25%	82	85	8	91	4	10	77	91
DPX-R9674+MSC	0.06+0.12G	88	94	11	95	5	11	85	86
DPX-R9674+MSC	0.06+0.25G	86	97	8	95	5	8	94	88
DPX-R9674+PO	0.06+0.12G	76	92	4	87	2	4	83	82
DPX-R9674+PO	0.06+0.25G	80	94	10	90	6	6	87	84
DPX-R9674+AG-2	0.06+0.12G	87	95	6	94	5	6	85	80
DPX-R9674+AG-2	0.06+0.25G	88	95	13	95	3	6	89	88
Untreated	0	0	0	0	0	0	0	0	0
DPX-R9674+X-77	0.12+0.25%	87	95	11	96	5	9	93	91
DPX-R9674+MSC	0.12+0.12G	89	99	11	98	3	10	99	92
DPX-R9674+MSC	0.12+0.25G	90	99	14	97	6	7	99	97
DPX-R9674+PO	0.12+0.12G	88	96	13	93	5	5	95	88
DPX-R9674+PO	0.12+0.25G	86	96	15	94	3	7	97	95
DPX-R9674+AG-2	0.12+0.12G	89	98	11	97	5	5	94	93
DPX-R9674+AG-2	0.12+0.25G	92	98	13	95	5	5	98	94
Untreated	0	0	0	0	0	0	0	0	0
DPX-R9674+X-77	0.25+0.25%	94	99	11	99	3	9	99	97
HIGH MEAN		94	99	15	99	6	11	99	97
LOW MEAN		0	0	0	0	0	0	0	0
EXP MEAN		54	60	7	59	3	4	57	56
C.V. %		7	5	81	4	69	110	8	7
LSD 5%		5	4	8	4	3	7	7	6
LSD 1%		7	6	10	5	3	9	9	8
# OF REPS		4	4	4	4	4	4	4	4

Summary

DPX-49674 at 0.12 oz/A gave similar control of a species regardless of adjuvants. In general species control with DPX-R9674 was or tended to be greater with MSC or AG-2 than X-77 or PO adjuvants.

2,4-D with adjuvants, Fargo 1988. 'Wheaton' Hard Red Spring wheat, F1 sunflower, 'McCall' soybean and redroot pigweed were seeded in 6 ft wide adjacent strips as bioassay species on May 18. Treatments were applied to 2 to 3 trifoliolate soybean, 6- to 8-leaf wheat on June 8 with 72 F and partly cloudy sky. Application was with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area of 10 ft wide plots across the various species. The experiment was a randomized complete block with four replications. Evaluations were on June 28 and July 21.

Treatment	Rate (oz/A)	July 28				July 21		
		Rrpw	KOCZ	Vosf	Wht	Wht	Vosf	Rrpw
		(% control)						
2,4-Ddea	3	48	31	70	5	4	88	91
2,4-Ddea	6	85	72	85	5	6	91	95
2,4-Ddea+MSC	3+0.12G	79	69	87	5	7	98	94
2,4-Ddea+MSC	3+0.25G	86	87	89	10	10	99	92
2,4-Ddea+PO	3+0.12G	82	73	81	6	8	97	93
2,4-Ddea+PO	3+0.25G	84	73	85	9	2	98	89
2,4-Ddea+AG-2	3+0.12G	83	75	90	8	2	94	87
2,4-Ddea+AG-2	3+0.25G	88	86	89	13	7	97	96
2,4-Ddea+X-77	3+0.25%	75	73	85	9	11	96	92
2,4-Dbee	3	89	78	90	13	14	98	96
2,4-Dbee	6	96	91	94	8	2	99	99
2,4-Dbee+MSC	3+0.12G	86	78	90	11	9	97	95
2,4-Dbee+MSC	3+0.25G	86	85	91	8	14	98	93
2,4-Dbee+PO	3+0.12G	65	55	85	11	9	93	89
2,4-Dbee+PO	3+0.25G	89	77	90	11	14	98	98
2,4-Dbee+AG-2	3+0.12G	88	86	92	11	12	98	98
2,4-Dbee+AG-2	3+0.25G	94	89	92	13	8	98	98
2,4-Dbee+X-77	3+0.25%	88	73	91	9	8	98	93
Brox-RP	3	39	41	95	13	30	93	73
Brox-RP	6	58	69	98	9	55	96	78
Brox-RP+MSC	3+0.12G	34	41	97	8	43	92	71
Brox-RP+MSC	3+0.25G	55	63	95	9	53	93	79
Brox-RP+PO	3+0.12G	34	39	95	4	64	89	65
Brox-RP+PO	3+0.25G	63	44	92	10	31	91	76
Brox-RP+AG-2	3+0.12G	61	56	94	8	28	93	68
Brox-RP+AG-2	3+0.25G	64	58	96	11	41	94	58
Brox-RP+X-77	3+0.25%	36	45	96	9	12	88	64
C.V. %		14	16	6	68	67	7	11
LSD 5%		14	15	7	NS	17	NS	13
LSD 1%		18	20	10	NS	23	NS	17
# OF REPS		4	4	4	4	4	4	4

Summary

Species control with 2,4-D butoxyethyl ester (bee) was not enhanced by adjuvants. In general control of the species by 2,4-D diethanalomine (dea) was enhanced by all adjuvants and enhancement tended to be greater with 0.25G (1 qt/A) than 0.12G (1 pt/A) adjuvant. MSC and PO adjuvants at 0.25G with bromoxynil at 3 oz/A gave similar species control to bromoxynil alone at 6 oz/A. X-77 surfactant at 0.25% or oil adjuvants at 0.12G did not enhance bromoxynil phytotoxicity to the species.

Sethoxydim with adjuvants and antagonism, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf wheat and oats on June 7 with 98 F, 28% RH, and clear Sky. Evaluation was on June 24.

Treatment	Rate[a] (oz/A)	Wheat	Oats
		(% control)	
		64	63
Sethoxydim+PO	1+0.25G	77	79
Sethoxydim+PO+28%	1+0.25G+1G	0	0
Sethoxydim+PO+Bent	1+0.25G+16	8	9
Sethoxydim+PO+NaHCO3	1+0.25G+16	4	6
Sethoxydim+PO+Na2CO3	1+0.25G+16	15	22
Sethoxydim+PO+Bent+28%	1+0.25G+16+1G	76	78
Sethoxydim+PO+NaHCO3+28%	1+0.25G+16+1G	76	79
Sethoxydim+PO+Na2CO3+28%	1+0.25G+16+1G	82	83
Sethoxydim+MS	1+0.25G	85	84
Sethoxydim+MS+28%	1+0.25G+1G	13	18
Sethoxydim+MS+Bent	1+0.25G+16	48	50
Sethoxydim+MS+NaHCO3	1+0.25G+16	24	29
Sethoxydim+MS+Na2CO3	1+0.25G+16	78	75
Sethoxydim+MS+Bent+28%	1+0.25G+16+1G	81	84
Sethoxydim+MS+NaHCO3+28%	1+0.25G+16+1G	83	84
Sethoxydim+MS+Na2CO3+28%	1+0.25G+16+1G	79	83
Sethoxydim+BCH	1+0.25G	59	65
Sethoxydim+BCH+28%	1+0.25G+1G	14	19
Sethoxydim+BCH+Bent	1+0.25G+16	18	19
Sethoxydim+BCH+NaHCO3	1+0.25G+16	3	9
Sethoxydim+BCH+Na2CO3	1+0.25G+16	55	49
Sethoxydim+BCH+Bent+28%	1+0.25G+16+1G	73	76
Sethoxydim+BCH+NaHCO3+28%	1+0.25G+16+1G	77	82
Sethoxydim+BCH+Na2CO3+28%	1+0.25G+16+1G		
		21	19
C.V. %		14	14
LSD 5%		19	18
LSD 1%		4	4
# OF REPS			

a G in the rate column is for gallon per acre.

Summary

Sethoxydim with PO was enhanced by 28%N, but 28%N antagonized grass control when sethoxydim was with BCH. Bentazon, NaHCO3, and Na2CO3 were highly antagonistic to grass control with sethoxydim regardless of oil adjuvant. The 28%N at 1 gpa only partly overcame bentazon antagonism of sethoxydim, regardless of oil adjuvants. However, MS with 28%N overcame more of the bentazon antogonism of sethoxydim than other oils with 28%N. The antagonism of sethoxydim caused by NaHCO3 and Na2CO3 was overcome by 28%N with all of the oil adjuvants.

Fluazifop with adjuvants and antagonism, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to 4- to 6-leaf wheat, oats, and foxtail millet on June 24 with 92 F, 60% RH and clear sky. Evaluations were on July 14 and August 9.

Treatment	Rate	July 14			August 9		
	(oz/A)	Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Fluazifop+PO	1+0.25G	44	79	67	30	94	76
Fluazifop+PO+28%	1+0.25G+1G	41	78	74	26	96	79
Fluazifop+PO+Bent	1+0.25G+16	13	65	53	5	72	58
Fluazifop+PO+NaHCO3	1+0.25G+16	44	81	70	26	95	69
Fluazifop+PO+Na2CO3	1+0.25G+16	46	81	73	26	97	73
Fluazifop+PO+Bent+28%	1+0.25G+16+1G	6	76	61	5	91	70
Fluazifop+PO+NaHCO3+28%	1+0.25G+16+1G	45	80	80	21	95	78
Fluazifop+PO+Na2CO3+28%	1+0.25G+16+1G	48	80	80	28	95	87
Fluazifop+MS	1+0.25G	34	81	70	26	94	82
Fluazifop+MS+28%	1+0.25G+1G	43	78	70	28	98	89
Fluazifop+MS+Bent	1+0.25G+16	9	66	55	5	78	39
Fluazifop+MS+NaHCO3	1+0.25G+16	37	73	55	16	91	74
Fluazifop+MS+Na2CO3	1+0.25G+16	40	79	79	26	98	91
Fluazifop+MS+Bent+28%	1+0.25G+16+1G	11	70	57	8	81	74
Fluazifop+MS+NaHCO3+28%	1+0.25G+16+1G	37	84	77	23	97	90
Fluazifop+MS+Na2CO3+28%	1+0.25G+16+1G	38	78	65	24	91	83
Fluazifop+BCH	1+0.25G	50	81	84	28	93	89
Fluazifop+BCH+28%	1+0.25G+1G	51	79	77	36	97	92
Fluazifop+BCH+Bent	1+0.25G+16	12	79	81	7	90	86
Fluazifop+BCH+NaHCO3	1+0.25G+16	52	80	81	26	96	91
Fluazifop+BCH+Na2CO3	1+0.25G+16	47	84	84	33	99	97
Fluazifop+BCH+Bent+28%	1+0.25G+16+1G	6	69	56	0	83	67
Fluazifop+BCH+NaHCO3+28%	1+0.25G+16+1G	31	80	81	25	96	90
Fluazifop+BCH+Na2CO3+28%	1+0.25G+16+1G	32	79	76	24	94	85
C.V. %		40	9	19	33	8	17
LSD 5%		19	10	19	10	10	19
LSD 1%		26	13	26	13	13	25
# OF REPS		4	4	4	4	4	4

Summary

PO (petroleum oil 11N with 17% Atplus 300F), MS (methylated seed oil, Sun-it), and BCH (adjuvant from BASF, Dash) with fluazifop all gave similar grass species control. 28%N with fluazifop and the oil adjuvants did not influence grass control compared to fluazifop with only the oil adjuvants. NaHCO3 or Na2CO3 alone with the oil adjuvants or with 28%N did not influence grass species control with fluazifop. Bentazon generally antagonized grass control from fluazifop. However, the antagonism was less evident for wheat and oats control then for foxtail millet and with BCH than the MS or PO. 28%N with bentazon partly overcame the antagonism from bentazon, which was dependant on the species and the oil adjuvant.

Adjuvants with fluazifop, Fargo 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Fargo, ND on May 31. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied early jointing wheat, oats, and foxtail millet on July 7 with 103 F, 30% RH and partly cloudy sky. Evaluations were on July 29 and August 23.

Treatment	Rate (oz/A)	July 29			August 23		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Fluazifop+PO	1+0.25G	10	92	69	16	99	53
Fluazifop+BCH	1+0.25G	11	91	62	11	99	72
Fluazifop+MSC	1+0.25G	8	92	77	9	99	78
Fluazifop+Inhance	1+0.25G	5	90	60	6	99	48
Fluazifop+LI-700	1+0.25G	9	86	73	10	98	51
Fluazifop+X-77	1+0.25G	6	83	39	8	98	26
Fluazifop+AG-2	1+0.25G	13	91	77	13	99	82
Fluazifop+SCI-40	1+0.25G	1	91	38	5	99	31
Fluazifop+SOTM	1+0.25G	9	89	44	2	98	31
		62	4	18	46	1	31
C.V. %		NS	5	15	6	NS	24
LSD 5%		NS	NS	21	8	NS	33
LSD 1%		4	4	4	4	4	4
# OF REPS							

Summary

The control of foxtail millet was too low and of wheat too high for determination of differences among adjuvants. Fluazifop gave greater oats control when applied with MSC (methylated seed oil from Agsco), AG-2, and BCH (adjuvant from BASF) than with any other adjuvant at the final evaluation (August 23).

Adjuvants with sethoxydim, Fargo 1988. 'Wheaton' Hard Red Spring wheat and 'ND810104' oats were seeded as bioassay species in adjacent 10 ft wide strips at Fargo, ND on April 28. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluations. Treatments were applied to 5- to 6-leaf wheat and oats on June 20 with 84 F, 50% RH, and clear sky. Evaluation was on June 28.

Treatment	Rate (oz/A)	Wheat	Oats
		(% control)	
Sethoxydim+PO	1+0.25G	78	77
Sethoxydim+BCH	1+0.25G	84	83
Sethoxydim+MSC	1+0.25G	81	80
Sethoxydim+Inhance	1+0.25G	66	64
Sethoxydim+LI-700	1+0.25%	56	44
Sethoxydim+X-77	1+0.25G	58	53
Sethoxydim+AG-2	1+0.25G	77	76
Sethoxydim+SCI-40	1+0.25G	57	57
Sethoxydim+SOTM	1+0.25G	66	67
C.V. %		8	11
LSD 5%		8	11
LSD 1%		11	14
# OF REPS		4	4

Summary

Wheat and oats control with sethoxydim was greater with BCH (adjuvant from BASF, Dash) and MSC (methylated seed oil from Agsco) adjuvant than the other adjuvants. PO (petroleum oil 11N with 17% Atplus 300F) and AG-2 were similar, but more effective than SOTM (soybean oil with 5.5% T-Mulz VO), LI-700, X-77, or SCI-40 as adjuvants with sethoxydim.

Glyphosate with adjuvants, Prosper 1988.-102 'Wheaton' Hard Red Spring wheat, "ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied 5- to 6-leaf wheat, oats and foxtail millet on June 30 with 80 F, 60% RH, and partly cloudy sky. Distilled water was the carrier. Evaluations were on July 8 and August 4.

Treatment	Rate (oz/A)	July 8			August 4		
		Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Glyphosate(DH20)	3	93	86	81	99	92	96
Glyphosate(DH20)+X-77	3+0.25%	92	88	86	97	97	99
Glyphosate(DH20)+LI-700	3+0.25%	90	87	84	97	98	99
Glyphosate(DH20)+28%	3+1G	91	92	88	97	99	99
Glyphosate(DH20)+AMS	3+24	91	90	84	99	98	99
Glyphosate(DH20)+AG-2	3+0.25G	79	85	82	97	96	97
Glyphosate(DH20)+MSC	3+0.25G	85	79	77	97	96	99
Glyphosate(DH20)+AG-2-C1	3+0.25G	82	83	81	96	96	98
Glyphosate(DH20)+AG-2-C2	3+0.25G	80	80	79	95	93	98
Glyphosate(DH20)+MSC-C1	3+0.25G	87	88	86	96	98	99
Glyphosate(DH20)+MSC-C2	3+0.25G	62	69	75	92	83	90
Glyphosate+NaHCO3	3+16	63	59	57	97	20	68
Glyphosate+NaHCO3+X-77	3+16+0.25%	61	69	56	96	47	76
Glyphosate+NaHCO3+LI-700	3+16+0.25%	70	70	65	93	63	66
Glyphosate+NaHCO3+28%	3+16+1G	92	95	91	98	99	99
Glyphosate+NaHCO3+AMS	3+16+24	90	90	88	98	98	99
Glyphosate+NaHCO3+AG-2	3+16+0.25G	76	71	71	94	53	73
Glyphosate+NaHCO3+MSC	3+16+0.25G	74	73	66	96	70	68
Glyphosate+NaHCO3+AG-2-C1	3+16+0.25G	83	80	71	95	68	77
Glyphosate+NaHCO3+AG-2-C2	3+16+0.25G	79	84	73	90	84	90
Glyphosate+NaHCO3+MSC-C1	3+16+0.25G	68	71	67	93	54	72
Glyphosate+NaHCO3+MSC-C2	3+16+0.25G	79	80	76	88	76	91
Glyphosate+Na2CO3	3+16	71	72	70	85	53	77
Glyphosate+Na2CO3+X-77	3+16+0.25%	69	72	68	91	57	85
Glyphosate+Na2CO3+LI-700	3+16+0.25%	71	73	73	90	54	79
Glyphosate+Na2CO3+28%	3+16+1G	96	96	90	99	99	99
Glyphosate+Na2CO3+AMS	3+16+24	90	90	86	99	97	99
Glyphosate+Na2CO3+AG-2	3+16+0.25G	80	76	72	98	45	71
Glyphosate+Na2CO3+MSC	3+16+0.25G	74	68	62	97	38	53
Glyphosate+Na2CO3+AG-2-C1	3+16+0.25G	71	64	58	97	33	58
Glyphosate+Na2CO3+AG-2-C2	3+16+0.25G	57	55	52	94	31	45
Glyphosate+Na2CO3+MSC-C1	3+16+0.25G	57	63	53	98	54	69
Glyphosate+Na2CO3+MSC-C2	3+16+0.25G	70	69	65	94	62	78
C.V. %		12	10	15	4	20	11
LSD 5%		13	11	15	5	20	13
# OF REPS		4	4	4	4	4	4

Summary

NaHCO3 or Na2CO3 in the spray carrier reduced grass species control from glyphosate. Adjuvants with glyphosate in distilled water (DH20) did not influence grass control at the August 4 evaluation. At the July 8 evaluation none of the adjuvants enhanced grass control, but AG-2 and MSC containing treatments tended to reduce grass control compared to that with glyphosate alone. Ammonium sulfate (AMS) and 28%N in the spray overcame the antagonism for control of all grass species from glyphosate caused by NaHCO3 and Na2CO3.

Paraquat with adjuvants, Prosper 1988. 'Wheaton' Hard Red Spring wheat, 'ND810104' oats, and Siberian foxtail millet were seeded as bioassay species in adjacent 6 ft wide strips at Prosper, ND on May 23. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to an 8 ft wide area across the bioassay species. Plots were 10 ft wide to provide a 4 ft untreated area between treated areas to aid evaluation. Treatments were applied to tillering wheat, oats, and foxtail millet on July 1 with 73 F. and cloudy sky. Evaluation was on July 13 and August 9.

Treatment	Rate	July 13			August 9		
	(oz/A)	Fomi	Wht	Oats	Fomi	Wht	Oats
		(% control)					
Paraquat	5	84	75	64	31	3	4
Paraquat+X-77	5+0.25%	80	81	91	16	35	90
Paraquat+LI-700	5+0.25%	82	86	94	33	56	94
Paraquat+28%	5+1G	81	76	71	20	7	3
Paraquat+AMS	5+24	80	76	75	28	9	6
Paraquat+AG-2	5+0.25G	76	82	96	16	41	99
Paraquat+MSC	5+0.25G	75	79	84	11	18	56
Paraquat+AG-2-C1	5+0.25G	76	84	94	8	32	99
Paraquat+AG-2-C2	5+0.25G	73	83	89	3	30	84
Paraquat+MSC-C1	5+0.25G	76	85	90	9	26	74
Paraquat+MSC-C2	5+16	77	80	91	9	39	95
Paraquat+NaHCO3	5+16+0.25%	81	78	76	38	8	13
Paraquat+NaHCO3+X-77	5+16+0.25%	78	80	80	19	16	45
Paraquat+NaHCO3+LI-700	5+16+1G	79	81	82	22	14	14
Paraquat+NaHCO3+28%	5+16+24	79	77	79	28	6	13
Paraquat+NaHCO3+AMS	5+16+0.25G	81	76	77	36	8	6
Paraquat+NaHCO3+AG-2	5+16+0.25G	74	76	76	15	7	4
Paraquat+NaHCO3+MSC	5+16+0.25G	74	77	75	11	7	8
Paraquat+NaHCO3+AG-2-C1	5+16+0.25G	77	76	74	12	16	11
Paraquat+NaHCO3+AG-2-C2	5+16+0.25G	70	73	71	6	6	4
Paraquat+NaHCO3+MSC-C1	5+16+0.25G	72	76	69	6	6	3
Paraquat+NaHCO3+MSC-C2	5+16	73	74	63	10	8	9
Paraquat+Na2CO3	5+16+0.25%	78	80	80	21	37	45
Paraquat+Na2CO3+X-77	5+16+0.25%	70	81	84	6	20	46
Paraquat+Na2CO3+LI-700	5+16+1G	79	81	82	23	34	43
Paraquat+Na2CO3+28%	5+16+24	78	78	80	28	11	6
Paraquat+Na2CO3+AMS	5+16+0.25G	81	78	77	26	6	9
Paraquat+Na2CO3+AG-2	5+16+0.25G	75	80	76	16	9	5
Paraquat+Na2CO3+MSC	5+16+0.25G	69	78	75	9	25	5
Paraquat+Na2CO3+AG-2-C1	5+16+0.25G	77	79	72	13	14	6
Paraquat+Na2CO3+AG-2-C2	5+16+0.25G	71	80	68	12	11	3
Paraquat+Na2CO3+MSC-C1	5+16+0.25G	71	76	66	10	5	0
Paraquat+Na2CO3+MSC-C2	5+16+0.25G	76	77	71	16	18	9
C.V. %		5	3	7	44	51	43
LSD 5%		6	4	7	10	13	18
# OF REPS		4	4	4	4	4	4

Summary

NaHCO3 or Na2CO3 in the paraquat spray did not influence grass species control. Grass species control with paraquat was not greatly influenced by adjuvants.

Fluroxypyr alone and with auxin herbicides 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 when applied once, when applied with auxin herbicides, and when applied in a repetitive treatment program.

The experiment was established and original herbicide treatments were applied in 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 rather than during true flower as picloram. The herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The retreatments were applied as a split-block treatment with three replications. The original whole plots were 15 by 56 ft, and the retreatment subplots were 10 by 15 ft. Retreatments were applied in mid-July 1987 and 1988. Evaluations were based on visible 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 (data not shown). Control was similar when fluroxypyr at 0.25 or 0.5 lb/A was applied alone or with dicamba, picloram, or 2,4-D.

No treatment provided satisfactory leafy spurge control in June 1988, 11 months following the first retreatment (Table). Picloram at 1 lb/A provided the best leafy spurge control of the original treatments (44%) when averaged over retreatments. Picloram at 0.5 lb/A or fluroxypyr plus picloram at 0.5 + 0.25 lb/A were the best retreatments, but control averaged 41 and 40%, respectively, when averaged over original treatments.

Control increased to an average of 95% with all retreatments except picloram alone at 0.25 and 0.5 lb/A following the second application in July 1988 (Table 1). Leafy spurge was under severe drought stress and generally was 12 inches or less tall at the time of retreatment. Picloram alone appeared to be absorbed poorly as many plants showed little visible injury 2 MAT. Although fluroxypyr alone or fluroxypyr plus dicamba, picloram, or 2,4-D generally provided similar or less leafy spurge control than picloram or picloram plus 2,4-D in 1987, fluroxypyr alone was much better than picloram alone under dry conditions in 1988. Fluroxypyr at 0.5 lb/A averaged 95% control as a retreatment compared to 50 and 70% with picloram at 0.25 or 0.5 lb/A, respectively. Fluroxypyr may be useful in a retreatment program, especially in areas where picloram cannot be used or in late-season treatments during dry conditions. (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).

Original treatment	Rate (lb/A)	Retreatment/rate (lb/A) 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	Control	Mean
		(% control June 1988)[a]							
Fluroxypyr	0.5	30	28	29	43	34	10	3	25
Fluroxypyr	1	26	28	42	34	46	23	9	30
Fluroxypyr + picloram	0.25 + 0.25	25	17	54	33	49	25	2	29
Fluroxypyr + picloram	0.5 + 0.25	11	32	39	35	42	16	3	26
Fluroxypyr + 2,4-D	0.5 + 1	42	12	34	22	37	42	0	27
Fluroxypyr + dicamba	0.25 + 0.25	22	25	40	17	53	39	15	30
Picloram + 2,4-D	0.25 + 1	20	17	42	16	41	27	13	25
Picloram	1	40	35	43	45	47	65	30	44
Control		29	9	45	32	12	18	0	22
Mean		27	23	41	31	40	29	10	
LSD (0.05)		whole plot = 12; subplots = 10; whole plot x subplot = 25							
		(% control Sept. 1988)							
Fluroxypyr	0.5	98	63	76	95	77	96	8	73
Fluroxypyr	1	95	50	72	92	98	97	32	77
Fluroxypyr + picloram	0.25 + 0.25	98	43	64	97	97	91	3	70
Fluroxypyr + picloram	0.5 + 0.25	96	49	69	96	97	98	10	74
Fluroxypyr + 2,4-D	0.5 + 1	94	33	65	93	98	94	4	69
Fluroxypyr + dicamba	0.25 + 0.25	99	63	71	99	98	97	13	77
Picloram + 2,4-D	0.25 + 1	78	68	76	95	79	96	0	70
Picloram	1	95	46	66	96	95	92	21	73
Control		99	37	72	98	99	98	0	74
Mean		95	50	70	96	93	96	10	
LSD (0.05)		whole plot = NS; subplots = 7; whole plot x subplot = 23							

[a]Evaluated prior to second retreatment in July, 1988.

Evaluation of sulfometuron applied in mid-summer and fall 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 from mid-July to mid-September for leafy spurge control.

All 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. The sulfometuron experiment establishment dates in 1986 and leafy spurge growth stages were: 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 Chaffee and Dickinson and at 8 oz/A at Valley City. Evaluations were based on visible percent stand reduction as compared to the control.

Sulfometuron plus auxin herbicide treatments applied in July near Chaffee provided 82 to 100% top growth control 1 month after treatment (MAT) (Table 1). 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 whether sulfometuron was applied alone or with an auxin herbicide prior to the picloram retreatment (62%). Control decreased rapidly and no treatment provided satisfactory leafy spurge control in 1988.

Leafy spurge control tended to be better when sulfometuron plus an auxin herbicide was applied in August or September (Table 2) compared to 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. The dicamba and 2,4-D rate had little effect on control over the ranges evaluated, but control tended to increase as the picloram application rate increased. Long-term control was much higher at Valley City compared to the other two locations. The best treatment for long-term control at Valley City was sulfometuron plus picloram at 2 + 16 oz/A which averaged 80% 22 MAT compared to 32% control with picloram at 16 oz/A alone. Retreatment with picloram at 4 or 8 oz/A increased leafy spurge control at Chaffee and Valley City but not at Dickinson. In general, control was similar regardless of the original sulfometuron treatment rate. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105)

Table 1. Leafy spurge control by sulfometuron plus auxin herbicides applied in July at Chaffee, ND (Lym and Messersmith).

Treatment	Rate	Evaluation date								
		Aug 86	May 87		Aug 87		May 88		Aug 88	
		Control	Control	Grass injury	Control	Retreatment[a]	Control	Retreatment[a]	Control	Retreatment[a]
	(oz/A)	(%)								
Sulfometuron + picloram	0.5 + 8	100	40	11	15	52	6	16	0	10
Sulfometuron + dicamba	0.5 + 16	83	5	0	7	54	10	16	7	6
Sulfometuron + 2,4-D	1 + 8	97	18	3	8	53	10	43	1	19
Sulfometuron + picloram	1 + 8	99	60	20	16	54	10	27	6	13
Sulfometuron + dicamba	1 + 16	82	47	11	14	76	4	28	0	6
Sulfometuron + picloram	2 + 32	99	97	30	60	66	53	65	38	35
Sulfometuron + dicamba	2 + 128	100	96	49	59	69	26	37	11	15
Sulfometuron	1	31	18	10	7	66	6	41	1	9
Sulfometuron	2	13	16	15	8	72	0	33	3	19
Control	0	0	0	0	0	48	0	26	0	11
LSD(0.05)		15	32	21	22	NS	NS	NS	NS	24

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

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

Treatment	Rate (oz/A)	Evaluation date: May 87 Control (%)	May 87 Grass injury (%)	Aug 87 Control (%)	Aug 87 Grass injury (%)	June 88 Control (%)	June 88 Retreatment (%)	Sept 88 Retreatment (%)
Chaffee								
Sulfometuron + picloram	0.5 + 8	89	35	15	..	5	78	11
Sulfometuron + dicamba	0.5 + 16	68	8	16	..	13	72	10
Sulfometuron + 2,4-D	1 + 8	35	83	1	..	0	44	11
Sulfometuron + picloram	1 + 8	95	46	32	..	8	67	16
Sulfometuron + dicamba	1 + 16	81	36	17	..	5	78	11
Sulfometuron + picloram	2 + 32	94	56	70	..	29	68	12
Sulfometuron + dicamba	2 + 128	95	53	56	..	8	78	16
Fosamine	64	43	15	9	..	3	78	16
Fosamine	96	56	13	20	..	6	70	12
Control	..	0	0	0	..	0	63	10
LSD (0.05)		29	19	28		NS	NS	NS
Dickinson								
Sulfometuron + 2,4-D	0.5 + 16	55	61	23	33	0	3	
Sulfometuron + picloram	0.5 + 12	97	71	67	26	1	25	..
Sulfometuron + 2,4-D	2 + 16	75	73	26	33	1	16	..
Sulfometuron + 2,4-D	2 + 32	78	70	29	33	4	14	..
Sulfometuron + picloram	2 + 8	95	89	83	60	11	14	..
Sulfometuron + picloram	2 + 12	99	94	90	80	8	36	..
Sulfometuron + picloram	2 + 16	99	98	93	91	20	39	..
LSD (0.05)		20	29	22	24	NS	NS	..
Valley City								
Sulfometuron + 2,4-D	0.5 + 16	41	0	11	0	6	96	20
Sulfometuron + 2,4-D	0.5 + 32	57	0	9	0	1	91	19
Sulfometuron + picloram	0.5 + 8	96	7	39	0	3	98	43
Sulfometuron + picloram	0.5 + 12	98	3	68	0	15	99	36
Sulfometuron + picloram	0.5 + 16	99	4	81	0	16	99	51
Sulfometuron + 2,4-D	1 + 16	90	5	26	0	5	94	29
Sulfometuron + 2,4-D	1 + 32	93	6	41	0	8	99	34
Sulfometuron + picloram	1 + 8	99	8	85	0	36	97	37
Sulfometuron + picloram	1 + 12	99	6	88	0	34	96	53
Sulfometuron + picloram	1 + 16	99	8	86	0	45	99	43
Sulfometuron + 2,4-D	2 + 16	97	34	68	4	10	99	57
Sulfometuron + 2,4-D	2 + 32	99	29	73	14	13	98	52
Sulfometuron + picloram	2 + 8	99	49	97	20	52	100	68
Sulfometuron + picloram	2 + 12	99	41	95	0	45	100	75
Sulfometuron + picloram	2 + 16	99	37	98	20	80	99	65
Picloram	16	99	0	63	0	32	97	25
Control	..	..	..	..	..	0	98	29
LSD (0.05)		12	22	22	20	22	7	38

[a] Picloram at 4 oz/A applied as a split-block treatment to the back one-third of each plot in Aug 1987 at Chaffee and Dickinson and at 8 oz/A at Valley City.

Sulfometuron applied alone and with auxin herbicides as an annual treatment 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 these experiments was to evaluate sulfometuron alone and in combination with auxin herbicides for leafy spurge control.

The first 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 4 oz/A was applied in August 1986 and 1987, as a split-block treatment to the back one-third of each plot to evaluate sulfometuron as a pretreatment to picloram. Picloram at 8 oz/A was applied to the front one third of each plot in August 1987. Evaluations were based on visible 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 had slightly chlorotic leaves during the growing season but root bud elongation was inhibited when evaluated in August. 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 1).

Leafy spurge control increased following retreatment with picloram at 4 oz/A, sometimes to 100% control, (Table 1). In August 1987, control averaged 81 and 67% 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. Control averaged 82 and 75% for the spring and fall treatments, respectively, in August 1988 12 months following the second retreatment of picloram at 4 oz/A. Control was similar among sulfometuron treatments applied in 1985 and retreated with picloram in 1986 and 1987 and picloram retreatments alone.

An experiment to evaluate leafy spurge control from sulfometuron plus auxin herbicides applied annually spring or fall was established on very mature leafy spurge stands near Chaffee and Dickinson, ND. Treatments were applied as described previously in June or late-August to early September in 1986, 1987, and 1988. Leafy spurge was in the true flower or fall regrowth stages when the original treatments were applied but was in the vegetative growth stage when the treatments were reapplied the following growing seasons.

Leafy spurge control averaged 36 and 68% at Chaffee and Dickinson, respectively, following three spring applications of sulfometuron plus an auxin herbicide (Table 2). Sulfometuron at 1 or 2 oz/A alone resulted in only 13% control after three applications averaged over both locations. Control was similar regardless which auxin herbicide was applied with sulfometuron and there was little grass injury.

Leafy spurge control was higher when annual sulfometuron treatments were applied in the fall compared to the spring (Table 2). Control in the spring averaged 98% following two applications of sulfometuron plus picloram or sulfometuron plus dicamba. Control had decreased to an average of 86 and 61% by fall at Dickinson and Chaffee, respectively. Sulfometuron alone or applied with 2,4-D generally provided poor leafy spurge control. Grass injury also was higher following fall compared to spring sulfometuron applications and averaged 87% The grass began to recover at Chaffee and injury had decreased to 23% in August 1988 but could not be evaluated at Dickinson because severe drought conditions prevented grass reestablishment.

Sulfometuron applied with picloram or dicamba in the fall has provided better leafy spurge control than either auxin herbicide applied alone at similar rates. Grass was injured severely when sulfometuron was fall applied but did recover by the following growing season. Sulfometuron in combination with an auxin herbicide could be used in a leafy spurge management program to provide initial control but probably should not be applied annually because of the potential for grass injury. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105)

Table 1. Leafy spurge control with sulfometuron applied either alone or with various auxin herbicides near Hunter, ND (Lym and Messersmith).

Application date/ treatment	Rate (oz/A)	Evaluation date: Aug 1985	May 1986	Aug 1986	May 1987 Single	May 1987 Retreat[a]	August 1987 Single	August 1987 Retreat[a]	May 88 Single	May 88 Picloram retreat 4 oz/A[a]	May 88 Picloram retreat 8 oz/A[b]	August 88 Picloram retreat 4 oz/A[a]	August 88 Picloram retreat 8 oz/A[b]
		(% control)											
June 27, 1985													
Sulfometuron	1	0	6	0	0	87	5	63	0	98	97	76	49
Sulfometuron	1.5	0	63	25	12	88	17	85	20	97	93	80	71
Sulfometuron	2	0	36	6	3	87	10	82	3	98	87	73	54
Sulfometuron + 2,4-D	1 + 16	95	76	26	8	84	24	64	18	94	92	77	54
Sulfometuron + dicamba	1 + 32	96	85	40	35	98	55	86	33	99	95	78	63
Sulfometuron + picloram	1 + 8	70	96	59	51	100	67	94	33	100	94	88	71
Sulfometuron + metsulfuron	2 + 0.5	0	60	24	0	98	5	93	5	99	77	94	54
Control	..	0	0	0	0	63	0	55	4	97	93	89	61
LSD (0.05)		25	22	26	25	31	20	31	25	NS	NS	NS	NS
September 4, 1985													
Sulfometuron	0.5	..	16	0	0	54	0	40	0	99	..	54	..
Sulfometuron	1	..	95	7	23	77	21	56	1	99	..	76	..
Sulfometuron + 2,4-D	1 + 16	..	99	17	3	92	8	72	0	99	..	77	..
Sulfometuron + dicamba	1 + 32	..	97	23	15	91	13	73	8	100	..	82	..
Sulfometuron + picloram	1 + 8	..	99	74	33	83	38	83	5	100	..	83	..
Sulfometuron + 2,4-D	0.5 + 16	..	95	24	21	87	26	62	8	99	..	85	..
Sulfometuron + dicamba	0.5 + 32	..	97	51	19	83	19	84	2	100	..	81	..
Sulfometuron + picloram	0.5 + 8	..	99	40	17	86	27	71	6	100	..	64	..
Sulfometuron + metsulfuron	2 + 0.5	..	88	13	0	83	0	62	0	99	..	72	..
DPX-L5300	1	..	44	6	4	76	4	49	3	100	..	77	..
Control	..	..	0	0	0	73	0	38	0	99	..	70	..
LSD (0.05)			26	30	36	29	32	NS	NS	NS		NS	

[a] Picloram at 4 oz/A applied as a split-block to the back one-third of each plot in August 1986 and 1987.

[b] Picloram at 8 oz/A applied as a split-block to the front one-third of each plot in August 1987.

Table 2. Leafy spurge control with sulfometuron applied annually either alone and in combination with dicamba, picloram, and 2,4-D applied in the spring and fall at two locations in North Dakota (Lym and Messersmith).

Treatment and application date[a]	Rate	Chaffee				Dickinson		
		May 1988		Aug 1988		June 1988		Sept 1988
			Grass		Grass		Grass	
	(oz/A)	Control	injury	Control	injury	Control	injury	Control[b]
		(%)						
Spring								
Sulfometuron	1	1	6	0	0	0	25	32
Sulfometuron	2	4	43	3	0	5	21	17
Sulfometuron + picloram	1 + 8	39	11	39	9	64	25	79
Sulfometuron + dicamba	1 + 32	33	26	28	14	27	16	67
Sulfometuron + 2,4-D	1 + 16	15	10	42	15	5	16	59
Fall								
Sulfometuron	1	27	70	0	5	49	88	15
Sulfometuron	2	69	96	0	12	55	92	9
Sulfometuron + picloram	1 + 8	99	93	73	51	98	100	82
Sulfometuron + dicamba	1 + 32	97	85	48	28	98	95	94
Sulfometuron + 2,4-D	1 + 16	71	91	13	17	66	56	27
Picloram	32	99	41	78	11	99	44	94
LSD (0.05)		18	33	25	23	18	25	28

[a] Applied annually in 1986, 1987, and 1988.

[b] Grass injury was not evaluated at Dickinson in Sept. 1988 due to severe drought conditions.

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 of water contamination. However, these areas provide a 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 both for leafy spurge control and for 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 5 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. Plots were 12 by 24 ft arranged in a randomized complete block design with four replications. Evaluations were based on visible 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. Leafy spurge control declined to 50% or less by June 1988 but very little grass had reestablished.

Sulfometuron alone did not control leafy spurge, however, control was improved consistently when sulfometuron was applied with glyphosate regardless of rate or treatment date (Table 1). Leafy spurge control averaged 97% 12 MAT with sulfometuron plus glyphosate at 1 or 2 + 17 oz/A but in general declined rapidly the second year after treatment. Leafy spurge control with sulfometuron plus 2,4-D declined rapidly following the 12 month evaluation. Picloram, applied with the CDA at a picloram:water concentration of 1:7 (v/v), provided nearly 100% leafy spurge control with no grass injury. Control averaged 75% in August 1988 following application in June 1986 or 1987 but only 57% when applied in September. 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 the treatment caused 64% grass injury (Table 2). Increasing the amitrole rate to 8 lb/A increased grass injury but not leafy spurge control which averaged 78% 27 MAT. Unfortunately, amitrole no longer is cleared for use near water. Fosamine at 8 lb/A provided 90 and 74% leafy

spurge control 12 and 27 MAT, respectively. 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 (oz/A)	Aug 86 Control	May 87 Control	May 87 Grass injury	Aug 87 Control	Aug 87 Grass injury	June 88 Control	June 88 Grass injury	Aug 88 Control	Aug 88 Grass injury
		(%)								
June 26, 1986										
Glyphosate	8.5	9	92	88	79	..	46	70	33	71
Glyphosate	17	41	96	98	94	..	53	89	54	91
Sulfometuron	0.5	15	0	0	29	..	4	0	26	0
Sulfometuron	1	9	0	0	19	..	0	0	14	0
Sulfometuron	2	9	28	15	19	..	4	0	12	10
Sulfometuron + glyphosate	0.5 + 8.5	13	98	98	90	..	58	63	50	68
Sulfometuron + glyphosate	1 + 8.5	13	96	99	95	..	75	96	81	95
Sulfometuron + glyphosate	2 + 8.5	24	99	96	85	..	71	70	66	94
Picloram (CDA)	1:7[a]	99	95	0	85	..	76	0	79	0
LSD (0.05)		19	8	14	23	..	28	31	27	24
September 3, 1986										
Glyphosate	17	..	65	99	54	..	22	98	10	94
Sulfometuron + glyphosate	2 + 17	..	99	99	89	..	63	99	55	75
Sulfometuron + 2,4-D	2 + 17	..	69	66	51	..	6	29	1	25
Picloram (CDA)	1:7[a]	..	86	9	66	..	67	0	57	0
LSD (0.05)			26	17	31	..	29	21	25	40
June 16, 1987										
Glyphosate	8.5	..	..	..	13	98	36	89	18	99
Glyphosate	17	..	..	..	30	98	76	94	36	100
Sulfometuron + glyphosate	0.5 + 8.5	..	..	..	9	83	21	60	9	88
Sulfometuron + glyphosate	1 + 8.5	..	..	..	12	86	51	83	31	96
Sulfometuron + glyphosate	2 + 8.5	..	..	..	36	76	24	87	11	84
Sulfometuron + 2,4-D	1 + 17	..	..	..	95	48	55	40	46	23
Sulfometuron + 2,4-D	2 + 17	..	..	..	99	63	41	14	34	51
Picloram (CDA)	1:7[a]	..	..	..	96	0	80	0	71	0
LSD (0.05)					12	25	18	20	16	23

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

Table 2. Leafy spurge control along ditchbanks, Fargo, ND.

Treatment	Rate	Aug 86	May 87[a]		Aug 87	June 88		Aug 88	
				Grass			Grass		Grass
	(lb/A)	Control	Control	injury	Control	Control	injury	Control	injury
		(%)							
Amitrole	2	99	69	23	80	63	8	71	11
Amitrole	4	100	91	64	95	82	36	75	26
Amitrole	8	100	87	81	96	78	40	78	30
Fosamine	2	5	14	3	59	54	5	39	4
Fosamine	4	19	58	10	55	59	3	60	3
Fosamine	8	40	90	57	82	74	18	73	13
LSD (0.05)		19	17	42	28	27	23	27	NS

[a] 2,4-D at 1 lb/A applied in June 1987 to control seedlings.

Leafy spurge control with various herbicide combinations applied alone or with spray additives. Lym, Rodney G., and Calvin G. Messersmith. The relatively high cost of herbicides limits their use on pasture and rangeland for leafy spurge control, especially when applied at rates that are in excess of $5 to $10/A. Previous research at North Dakota State University has shown that picloram plus 2,4-D at 0.25 + 1 lb/A applied annually is more cost-effective than high rates of herbicides applied once. Picloram or 2,4-D applied alone at relative low rates did not provide satisfactory leafy spurge control. The purpose of this research was to evaluate various herbicide combinations applied alone or with spray additives for leafy spurge control.

Three experiments were established in a dense leafy spurge infestation growing along railroad tracks in West Fargo. The first two were established on June 9, 1987, when leafy spurge was in the true flower growth stage, and the third on September 1, during fall regrowth. A fourth experiment was established on June 16, 1987, near Valley City with leafy spurge in the seed-set growth stage. A retreatment of picloram at 8 oz/A was applied in June 1988 as a split-block treatment to the back one-third of each plot at Valley City. All 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. Evaluations were based on visible percent stand reduction as compared to the control.

Picloram plus 2,4-D or picloram applied with methylated sunflower oil, with NH_4SO_4 (liquid or granular formulations), or at pH 4.7 buffered with citric acid did not provide satisfactory leafy spurge control (Table 1). Though not evaluated in this experiment, leafy spurge control from similar herbicide treatments applied without additives in adjacent experiments provided better initial and long-term control. Visual observations indicated that inclusion of additives caused rapid desiccation of the upper leaves. The plants recovered quickly and regrowth from the lower portion of the stems resumed. Leafy spurge control with fosamine applied alone or with sulfometuron also was lower than expected and may be due to application during low relative humidity (30%). Fosamine provides fair to good leafy spurge control if applied when relative humidity is high.

Sulfometuron applied with picloram, fluroxypyr, or various formulations of 2,4-D generally provided leafy spurge control similar to the same herbicides applied alone (Table 2). Subsequent research has shown sulfometuron increases leafy spurge control when applied with these herbicides in the fall but not in the spring, when this experiment was established. Leafy spurge control with sulfometuron plus fluroxypyr or picloram decreased as the fluroxypyr rate increased, but increased with increasing rates of picloram.

In August 1987, sulfometuron at 1 to 2 oz/A applied with picloram at 8 oz/A or 2,4-D at 16 oz/A provided an average of 94% leafy spurge control but only 61% when applied with dicamba at 16 oz/A (Table 3). The average control at Valley City was much higher than with similar treatments applied at West Fargo (Table 2). The increase could be due to application at a later growth stage at Valley City than West Fargo, or different experimental conditions during treatment. It was 90 F with 50% relative humidity at Valley City during application compared to 77 F and 30% relative humidity, at West Fargo. The soil pH and organic matter was similar at the two locations.

Dicamba plus sulfometuron at 16 + 2 oz/A and all sulfometuron plus picloram treatments provided good leafy spurge control 12 months after treatment (Table 3). Control declined rapidly, thereafter, and no treatment provided satisfactory control by August 1988 even with a picloram retreatment. In general, no herbicide combination treatment or additive provided longer-term or more cost-effective leafy spurge control than picloram plus 2,4-D.

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

Table 1. Leafy spurge control with various herbicides and additives spring or fall applied at West Fargo, ND (Lym and Messersmith).

Treatment	Rate (oz/A)	1987 Application/evaluation date: June 9 — Aug 87	June 9 — May 88	September 1 — May 88
		(%)		
Picloram + 2,4-D + MSW[a]	4 + 16 + 16	27	6	22
Picloram + 2,4-D + MSW[a]	8 + 16 + 16	15	8	23
Picloram + MSW[a]	4 + 16	33	0	..
Picloram + MSW[a]	8 + 16	25	6	34
Picloram + sulfometuron + MSW[a]	8 + 1 + 16	47	18	..
Fosamine	64	0	14	..
Fosamine	96	13	40	..
Fosamine + sulfometuron	64 + 1	6	13	..
Fosamine + sulfometuron	16 + 1	6	0	..
Dicamba + MSW[a]	32 + 16	24	13	36
Picloram + 2,4-D + NH_4SO_4[b]	4 + 16 + 0.13	..	..	15
Picloram + 2,4-D + NH_4SO_4[b]	8 + 16 + 0.13	..	..	21
Picloram + 2,4-D + NH_4SO_4[c]	4 + 16 + 40	..	..	4
Picloram + 2,4-D + NH_4SO_4[c]	8 + 16 + 40	..	..	23
Picloram + 2,4-D + citric acid[d]	4 + 16	..	..	11
Picloram + 2,4-D + citric acid[d]	8 + 16	..	..	10
LSD (0.05)		20	15	NS

[a] MSW = Methylated sunflower oil plus sponto 4K-3158 emulsifier.
[b] 8-0-0-9 liquid fertilizer equivalent to N and S at 0.2 lb/A respectively.
[c] Equivalent to 2.5 lb N/A.
[d] Spray solution buffered to pH 4.7.

Table 2. Leafy spurge control with sulfometuron plus various auxin herbicides at West Fargo, ND (Lym and Messersmith).

Treatment	Rate (oz/A)	Evaluation date[a] 9 Aug 87	24 May 88
		(%)	
Picloram + sulfometuron	4 + 1	6	13
Picloram + sulfometuron	8 + 1	9	5
Picloram + sulfometuron	12 + 1	14	17
Picloram + sulfometuron	16 + 1	49	44
Picloram + sulfometuron	4 + 1.5	0	11
Picloram + sulfometuron	8 + 1.5	22	23
Picloram + sulfometuron	12 + 1.5	54	37
Picloram + sulfometuron	16 + 1.5	65	48
Picloram + sulfometuron	4 + 2	7	0
Picloram + sulfometuron	8 + 2	33	3
Picloram + sulfometuron	12 + 2	29	61
2,4-D alkanolamine + sulfometuron	16 + 2	60	74
2,4-D alkanolamine + sulfometuron	8 + 1	7	4
2,4-D alkanolamine + sulfometuron	16 + 1	6	0
2,4-D alkanolamine + sulfometuron	32 + 1	9	0
2,4-D alkanolamine + sulfometuron	8 + 1.5	14	0
2,4-D alkanolamine + sulfometuron	16 + 1.5	20	3
2,4-D alkanolamine + sulfometuron	34 + 1.5	16	0
2,4-D alkanolamine + sulfometuron	8 + 2	17	3
2,4-D alkanolamine + sulfometuron	16 + 2	16	0
2,4-D mixed amine[a] + sulfometuron	32 + 2	14	7
2,4-D ester[b] + 2,4-DP + dicamba + sulfometuron	16 + 1	6	0
Picloram	2 + 2 + 0.5	13	0
Picloram	8	9	4
2,4-D alkanolamine	16	59	35
Fluroxypyr + sulfometuron	16	6	5
Fluroxypyr + sulfometuron	4 + 1	78	48
Fluroxypyr + sulfometuron	8 + 1	38	13
Fluroxypyr	16 + 1	49	5
LSD (0.05)	16	32	13
		25	24

[a] Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine)-EH 736.
[b] 2,4-D isooctyl ester:2,4-DP butoxyethanol ester:dicamba (4:4:1)-EH 680.

Table 3. Leafy spurge control with sulfometuron applied with picloram, 2,4-D, or dicamba at Valley City, ND (Lym and Messersmith).

Treatment	Rate (oz/A)	Evaluation date			
		Aug 87	June 88	Aug 88	
				Original	Retreatment[a]
		(%)			
Picloram + sulfometuron	8 + 1	98	88	19	25
Picloram + sulfometuron	8 + 1.5	99	87	26	39
Picloram + sulfometuron	8 + 2	92	95	15	26
2,4-D alkanolamine + sulfometuron	16 + 1	89	15	8	32
2-4-D alkanolamine + sulfometuron	16 + 1.5	89	26	12	29
2,4-D alkanolamine + sulfometuron	16 + 2	98	56	11	22
Dicamba + sulfometuron	16 + 1	54	34	3	35
Dicamba + sulfometuron	16 + 1.5	45	11	1	40
Dicamba + sulfometuron	16 + 2	84	80	15	36
Untreated	..	0	0	0	28
LSD (0.05)		28	25	NS	NS

[a] Picloram at 8 oz/A applied on June 2, 1988, to the back one-third of each plot.

Picloram and 2,4-D combination treatments for long-term leafy spurge management. Lym, Rodney G., and Calvin G. Messersmith. Picloram is an effective herbicide for leafy spurge control, especially when applied at rates from 1 to 2 lb/A. However, the high cost of picloram at 2 lb/A makes it uneconomical for treating large acreages of pasture and rangeland. Research by North Dakota State University has shown 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, beginning at Dickinson on August 25, 1981, at Sheldon on September 1, 1981, and at Valley City on June 11, 1982. 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 was applied biannually (both spring and fall). Picloram treatments were applied in late August 1981 and in June of 1982 through 1988. The Sheldon location was discontinued following the fall evaluations in 1985. Thus, the Dickinson site has received eight picloram and picloram plus 2,4-D treatments and 15 2,4-D treatments, while the Valley City site has received seven and 14 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 42, 67 and 69% leafy spurge control, respectively, 84 months after the original treatment (Table). Control had increased slightly compared to the previous year reversing a trend towards decreased control the last 2 years. 2,4-D at 1 to 2 lb/A alone provided an average of 59% control of leafy spurge after biannual applications for 7 years.

Leafy spurge control 84 months after treatment (MAT) increased by an average of 41, 24, and 26% 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 (Table). This increase (30%) was nearly twice as much in 1988 compared to the average (18%) increase the previous year. Visual observation indicated picloram alone was not absorbed well in 1988 as many plants showed little herbicide injury which was probably due to hot dry conditions during application. The greatest enhancement with 2,4-D plus picloram seems to be with 2,4-D at 1 lb/A and picloram at 0.28 lb/A. 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.

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. However, control declined an average of 10% between the 72 and 81 MAT evaluations for all picloram treatments. This indicates leafy spurge could reestablish quickly even after treatment for 7 years, although some of the reestablishment was due to invasion from border rows and control plots. An annual treatment would be needed to maintain control on a field scale, but perhaps more economical treatments than picloram would 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).

Herbicide	Rate (lb/A)	Months after treatment[a] 12	24	36	48	60	72	81	84
		(% control)							
Picloram	0.25	39	48	48	58	49	38	38	42
Picloram	0.38	65	62	52	77	69	62	51	67
Picloram	0.5	65	71	81	86	77	71	60	69
2,4-D bian	1	22	30	38	50	39	28	29	59
2,4-D bian	1.5	22	24	26	45	49	35	35	60
2,4-D bian	2	19	30	26	54	54	26	37	57
Pic + 2,4-D	0.25 + 1	52	66	63	85	73	87	70	83
Pic + 2,4-D	0.25 + 1.5	58	66	70	85	77	85	65	84
Pic + 2,4-D	0.25 + 2	57	62	66	83	76	76	67	81
Pic + 2,4-D	0.38 + 1	69	72	70	90	84	82	72	89
Pic + 2,4-D	0.38 + 1.5	68	74	76	93	84	87	76	92
Pic + 2,4-D	0.38 + 2	68	59	76	91	86	90	81	93
Pic + 2,4-D	0.5 + 1	71	75	84	94	87	90	83	95
Pic + 2,4-D	0.5 + 1.5	64	73	80	97	91	93	89	95
Pic + 2,4-D	0.5 + 2	76	75	81	95	91	93	86	95
LSD (0.05)		18	14	19	14	14	13	14	13

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

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 plus 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 plus 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 plus 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 at 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 were 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 12, 24, 47 and 59% leafy spurge control, respectively, as a spring-applied treatment at Hunter and Valley City 48 months after treatment (MAT) (Table). Fall-applied treatments at Sheyenne and Valley City resulted in poor leafy spurge control and were discontinued following the 24 MAT evaluation. 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. Spring-applied treatments generally maintained control all season and regrowth was typically 0 to 3 inches tall when a killing frost occurred.

Leafy spurge control 48 months after spring-applied treatment averaged 36% with picloram alone and increased slightly to 40% when picloram was applied with 2,4-D (Table). This increase is much less than previously reported when 2,4-D at 1 to 2 lb/A was applied with picloram. Picloram at 0.5 lb/A plus 2,4-D averaged 73% leafy spurge control compared to 59% with picloram at 0.5 lb/A alone and was the best treatment evaluated.

Leafy spurge control averaged 26% 48 months after the initial treatment at Dickinson compared to 41% at Hunter and Valley City (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 had received above average precipitation for the first 36 months of the experiment and leafy spurge may be growing more vigorously than previously.

In general, leafy spurge control increased when 2,4-D was applied with picloram at 0.25 to 0.5 lb/A as a spring applied but not as a fall-applied treatment. The 2,4-D application rate did not affect leafy spurge control with picloram. Picloram at 0.25 to 0.5 lb/A plus 2,4-D at 1 lb/A remains the most cost effective application rate for an annual leafy spurge control program. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo, 58105)

Table. Leafy spurge control in 1988 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		Dickinson		Valley City		Mean[a]	Sheyenne-1987	Valley City 1986/1987				Mean[b]
Treatment	Rate	Aug 87	May 88	Sept 87	June 88	Aug 87	June 88	1988	May 30	Aug 24	June 3	Aug 20	May 20	
	(lb/A)	(% control)												
Picloram	0.12	3	0	2	13	55	23	12	42	0	3	0	1	0
Picloram	0.25	27	12	17	9	62	35	24	67	0	25	1	0	1
Picloram	0.38	67	39	64	29	81	54	47	74	9	56	3	2	6
Picloram	0.5	79	53	74	25	82	64	59	89	16	92	38	43	27
Picloram + 2,4-D	0.12 + 0.12	22	3	3	13	57	21	12	72	0	32	8	17	4
Picloram + 2,4-D	0.12 + 0.25	12	3	3	8	55	7	5	62	8	12	0	0	4
Picloram + 2,4-D	0.12 + 0.5	10	0	7	15	61	27	14	67	2	7	0	0	1
Picloram + 2,4-D	0.25 + 0.12	73	28	40	11	70	28	28	70	5	19	1	0	3
Picloram + 2,4-D	0.25 + 0.25	55	36	42	30	71	34	33	64	0	18	1	0	1
Picloram + 2,4-D	0.25 + 0.5	25	19	30	28	73	23	21	58	2	35	6	6	4
Picloram + 2,4-D	0.38 + 0.12	69	44	45	15	81	49	47	81	15	56	11	14	13
Picloram + 2,4-D	0.38 + 0.25	87	62	84	25	82	63	61	75	6	48	3	4	4
Picloram + 2,4-D	0.38 + 0.5	44	31	52	37	88	59	45	89	18	64	3	4	10
Picloram + 2,4-D	0.5 + 0.12	92	72	94	33	86	78	74	78	15	75	8	8	11
Picloram + 2,4-D	0.5 + 0.25	90	69	87	46	83	78	74	93	22	89	18	19	20
Picloram + 2,4-D	0.5 + 0.5	80	59	79	49	94	82	71	94	18	81	15	7	17
Picloram + 2,4-D	0.25 + 1.0	40	21	22	35	82	46	34	92	12	63	6	7	9
LSD (0.05)		31	26	26	24	19	25	12	28	NS	31	15	18	11

[a] Average control at Hunter and Valley City 48 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 applied annually. 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 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 visible percent stand reduction as compared to the control.

Picloram + 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 + 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 yr 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. Treatments were applied annually as previously described in the spring or fall through 1988.

Leafy spurge control was similar regardless of the 2,4-D formulation applied with picloram + dicamba in the spring (Table 2). Control was only 20% when averaged across all treatments and both locations 1 yr after the second application. This is much lower than would be expected with picloram + 2,4-D at 0.25 + 1 lb/A which averages 60% or more based on long-term observations.

Leafy spurge control with picloram at 0.5 lb/A averaged 32% 1 yr following the second fall application (Table 2). Control improved to 49% when applied with dicamba at 2 lb/A. Leafy spurge control with picloram + dicamba was not improved by adding 2,4-D regardless of the 2,4-D formulation.

In general, leafy spurge control was similar with all 2,4-D formulations in combination with picloram and dicamba. However, the 2,4-D mixed amine formulation occasionally did provide better leafy spurge control in a combination treatment than the alkanolamine or ester formulations. These experiments will be continued 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, 58105)

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

Location/ application date Treatment	Rate (lb/A)	Months after treatment 3	12	15	24	27
		(% 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)-EH 736.

Table 2. Leafy spurge control with picloram applied with dicamba and various formulations of 2,4-D applied annually since 1986 for leafy spurge control (Lym and Messersmith).

Application date/ treatment	Rate (lb/A)	Location/1988 evaluation date: Valley City June	Valley City Aug	Dickinson June	Dickinson Sept	Sheyenne June	Sheyenne Sept	Mean[a]
		(% control)						
Spring								
2,4-D mixed amine +[b] dicamba+picloram	0.25+1.25	24	63	10	79	..	..	17
2,4-D mixed amine+[b] dicamba+picloram	2+0.5+0.25	17	59	26	88	..	..	22
2,4-D mixed amine+[b] picloram+dicamba	1+0.5+0.12	15	52	12	76	..	..	13
2,4-D alkanolamine+ dicamba+picloram	2+1+0.25	25	54	18	84	..	..	22
Dicamba+picloram	1+0.25	32	56	20	86	..	..	26
LSD (0.05)		NS	NS	NS	NS			NS
Fall								
2,4-D mixed amine +[b] dicamba+picloram	2+1+0.25	84	31	66	8	73	38	26
2,4-D alkanolamine+ dicamba+picloram	2+1+0.25	89	29	..	..	73	54	42
2,4-D mixed amine +[b] dicamba+picloram	4+2+0.5	96	61	94	45	93	67	56
2,4-D ester[c] + 2,4-DP +picloram +dicamba	2+2+0.5+0.25	74	14	49	8	74	46	22
2,4-D ester[c] + 2,4-DP +picloram +dicamba	2+2+0.5+0.5	96	47	82	35	93	67	50
2,4-D alkanolamine+ dicamba+picloram	4+2+0.5	94	50	81	39	90	61	50
Dicamba+picloram	2+0.5	95	41	93	51	83	56	49
Picloram	0.5	95	46	57	15	65	33	32
LSD (0.05)		6	20	32	36	17	27	11

[a] Mean 24 months after first treatment.

[b] Mixed amine salts of 2,4-D (2:1 dimethylamine:diethanolamine)-EH 736.

[c] 2,4-D isooctyl ester:2,4-DP butoxyethanol ester:dicamba (4:4:1)-EH 680.

Late-season leafy spurge control with sulfometuron and picloram. Lym, Rodney G. and Calvin G. Messersmith. Previous research has shown the best time to apply herbicides for leafy spurge control is the true flower growth stage in mid-June or during fall regrowth. Late-fall treatments generally provide good control of many perennial weeds, but leafy spurge shows more visible changes due to cold temperatures and changes in daylength than most other perennial weeds. Many landowners often are unable to treat all of the infestations present before a light frost occurs and/or the leaves lose chlorophyll and turn red. The purpose of this research was to determine if frost or changes in leafy physiology prior to herbicide application would prevent satisfactory leafy spurge control the following growing season.

The experiment was established in dense leafy spurge stands at West Fargo and Hunter, ND in 1987. Treatments were applied on four dates from September 1 to October 14, and leafy spurge ranged from vigorous fall regrowth to senescence (Table 1). Fall 1987 was warmer than average as there were no temperatures colder than 38 F in September, and the coldest overnight temperatures during the experiment were 31 and 24 F on October 2 and 7, respectively. The herbicides were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 by 30 ft in a randomized complete block design with four replications. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

Leafy spurge control was better at Hunter than West Fargo regardless of treatment on application date (Table 2). The environmental conditions were similar at the two locations, except leafy spurge at Hunter was growing more vigorously, probably due to higher soil moisture available than at West Fargo. Leafy spurge control at West Fargo was similar when herbicides were applied on September 1 and 15, and averaged 73% in May 1988. Leafy spurge leaves had turned red by September 15 but were firmly attached to the stem (Table 1). However, the plants were beginning to defoliate when the treatments were applied on October 1 and the stems were bare by October 14. Control declined accordingly and averaged only 49 and 30%, respectively. Leafy spurge control with picloram at 16 oz/A tended to be better than with sulfometuron plus picloram at 1 + 8 oz/A, but both treatments were better than picloram plus 2,4-D at 8 + 16 oz/A. The plots were burned during a grass fire in July 1988 and could not be reevaluated.

Leafy spurge leaves at Hunter had turned red by September 15, but did not defoliate during the experiment despite the temperature dropping to 24 F on October 7 (Table 1). Leafy spurge control was similar in May 1988 regardless of treatment date at Hunter except for picloram plus 2,4-D at 8 + 16 oz/A which averaged only 36% control when applied on October 1 (Table 2). The reason for the decline is not known, since this treatment was applied prior to frost and the October 15 treatment averaged 81% control. Sulfometuron plus picloram at 1 + 8 oz/A and picloram at 16 oz/A provided better long-term control than picloram plus 2,4-D at 8 + 16 oz/A when applied on September 15 or later.

Soil and air temperature (including below 32 F) and relative humidity did not affect leafy spurge control with these herbicides. Good control can be expected the following spring if fall treatments are applied when leafy spurge leaves are green or red but still firmly attached to the stem. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo, 58105).

Table 1. Growth and environmental conditions during late-season leafy spurge control treatments (Lym and Messersmith).

1987 treatment date	West Fargo Leafy spurge Stems	Leaves	Temperature Air	Soil 1 inch	Relative humidity	Hunter Leafy spurge Stems	Leaves	Temperature Air	Soil 1 inch	Relative humidity
			----(F)----		(%)			----(F)----		(%)
September 1	branched green		68	70	51	branched slightly red		67	71	53
September 15	red	red	81	74	45	yellow	red	79	72	58
October 1	red	senes-cence	59	60	65	red	red	61	60	60
October 15	bare	-	50	48	60	red	red	48	48	60

Table 2. Leafy spurge control from late-season herbicide treatments (Lym and Messersmith).

Location/ treatment	Rate (oz/A)	Sept 1 May	Sept 1 Aug	Sept 15 May	Sept 15 Aug	Oct 1 May	Oct 1 Aug	Oct 15 May	Oct 15 Aug
West Fargo									
Picloram + 2,4-D Sulfometuron	8 + 16	54	..	60	..	24	..	10	..
+ picloram	1 + 8	54	..	80	..	56	..	43	..
Picloram	16	77	..	94	..	67	..	38	..
LSD (0.05) May = 38									
Hunter									
Picloram + 2,4-D Sulfometuron	8 + 16	92	47	91	18	36	0	81	23
+ picloram	1 + 8	100	59	99	79	98	39	93	61
Picloram	16	94	57	92	42	91	38	86	56
LSD (0.05) May = 26; Aug = 25									

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. Sulfometuron + picloram at 0.08 + 0.5 lb/A were applied to previously untreated plots in June or August, 1988. 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 and every year thereafter. 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 1988 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 5 yr across all treatments was 4301 lb/A at Dickinson and 9043 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 $114/A and $81/A at Valley City and of $34/A and $43/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 78% in 1987 (Table) as a spring applied treatment. Much below average precipitation was received at both locations in 1988 but timely rains in June at both locations resulted in average forage production. 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 7142 lb/A was only slightly less than the spring average of 8282 lb/A.

Picloram at 2 lb/A provided good leafy spurge control and a slight economic gain at Valley City, but an average loss of $114/A 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. (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		Re-treatment time				1987 Control		Yield[a]		Total net return[b]
Herbicide	Rate (lb/A)	Herbicide	Rate (lb/A)	Year	Cost ($/A)	June	Aug	Forage	Leafy spurge	
						---(%)---		--(lb/A)---		($/A)
Valley City										
Spring 1984		Spring								
2,4-D	2	2,4-D	2[c]	84-88	30	16	28	9622	3723	114
Picloram	0.25	Picloram	0.25							
+ 2,4-D	+1	+ 2,4-D	+1[c]	84-88	70	58	67	10251	1971	84
Picloram	2	Picloram	2[d]	88	164	68	99	11401	1571	7
Dicamba	8	Dicamba	8[d]	85-87	384	58	93	10841	1986	(-221)
Sulfometuron	0.08									
+ picloram	+0.5	..	...	88	20	..	43	2347	1679	15
Fall 1983		Fall								
2,4-D	2	2,4-D	2[c]	84-88	30	6	4	7427	6596	81
Picloram	0.25	Picloram	0.25							
+ 2,4-D	+1	+ 2,4-D	+1[c]	84-88	70	69	22	9722	3417	76
Picloram	2	Picloram	2[d]	85	164	96	84	10988	292	0
Dicamba	8	Dicamba	8[d]	86	192	86	69	10788	762	(-30)
		Control				0	0	9352	7706	
LSD (0.05)						18	13	2079	1665	
Dickinson										
Spring 1984		Spring								
2,4-D	2	2,4-D	2[c]	84-87	30	7	40	4268	529	34
Picloram	0.25	Picloram	0.25							
+ 2,4-D	+1	+ 2,4-D	+1[c]	84-87	70	49	89	6312	158	24
Picloram	2	Picloram	2[d]	86,87	246	60	99	6177	122	(-153)
Dicamba	8	Dicamba	8[d]	85-87	384	43	99	5063	352	(-308)
Sulfometuron	0.08									
+ picloram	+0.5	..	...	88	20	..	11	1189	479	(-2)
Fall 1983		Fall								
2,4-D	2	2,4-D	2[c]	84-87	30	10	11	4927	1382	43
Picloram	0.25	Picloram	0.25							
+ 2,4-D	+1	+ 2,4-D	+1[c]	84-87	70	21	22	4561	1269	(-2)
Picloram	2	Picloram	2[d]	86	164	84	68	5971	47	(-74)
Dicamba	8	Dicamba	8[d]	85,86	288	77	64	5604	109	(-204)
		Control				0	0	4117	2882	
LSD (0.05)						17	20	797	484	

[a] Total production of 1984 through 1988 harvest.
[b] Total net return for 1984 through 1988. Fall 1988 treatment cost is not subtracted from net return.
[c] Annual retreatment.
[d] Applied when control declines to less than 70%.

Leafy spurge control following a nine-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 1988. Evaluations are based on visual percent stand reduction as compared to the control.

Previously, leafy spurge control has been higher from spring than fall-applied treatments (data not shown). However, control averaged 33 and 46% from the spring- and fall-applied treatments, respectively, in 1988 (Table). Leafy spurge was drought stressed when the treatments were applied in 1988 from very dry and hot conditions which probably resulted in poor herbicide absorption.

Post-harvest treatments for field bindweed control. Lym, Rodney G. Previous research has shown that dicamba fall applied provides good field bindweed control the following growing season. Field bindweed is a problem weed in western North Dakota, especially where minimum till and strip-fallow farming are common practices. The purpose of these experiments was to evaluate several herbicides as single and combination treatments for late-season field bindweed control.

Two experiments were established on September 10, 1987, on a dense stand of field bindweed near the Ranch Headquarters of the Dickinson Experiment Station. The herbicides were applied in 6- to 8-inch corn stubble which had been harvested 7 days prior to treatment. The field bindweed was in the vegetative growth stage with 8 to 10 inch long stems and was growing vigorously. The herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 9 by 30 ft in a randomized complete block design with four replications. The weather was overcast, 68 F, 50% relative humidity with a soil temperature of 66 F at 4 inches. 'Bowman' 2-row barley was seeded in April 1988, but due to severe heat and drought was not harvested. Field bindweed control and barley injury evaluations were based on a visual estimate of percent stand reduction as compared to the control.

The first experiment evaluated dicamba applied either alone or with various auxin herbicides or glyphosate and various picolinic acids for field bindweed control. Dicamba at 64 oz/A and glyphosate plus dicamba at 90 + 44 oz/A provided 79 and 70% field bindweed control, respectively, 9 months after treatment (MAT) (Table). Barley injury averaged 86% with dicamba at 64 oz/A but declined to an average of 26 and 16% when applied at 32 oz/A alone or at 16 oz/A with 2,4-D, respectively. Glyphosate plus dicamba at 45 + 22 oz/A tended to provide better field bindweed control (64%) than dicamba alone at 32 oz/A (41%). Treatments that included picloram applied at 4 oz/A caused severe auxin injury to the barley after heading but did provide the best season-long field bindweed control (data not shown). The addition of triclopyr and/or 2,4-D to picloram or dicamba did not increase control compared to the herbicides applied alone at similar rates.

The second experiment compared fluroxypyr alone and with auxin herbicides for field bindweed control. Field bindweed control averaged only 20% 9 MAT regardless of the fluroxypyr application rate but improved to 41% when applied with 2,4-D (Table). Dicamba plus 2,4-D at 16 + 16 oz/A and glyphosate plus 2,4-D at 64 + 58 oz/A provided similar field bindweed control, averaging 59%. Dicamba at 32 oz/A provided 71% field bindweed control but also 71% barley injury.

Dicamba at 32 to 64 oz/A, picloram at 2 to 4 oz/A and glyphosate plus dicamba at 45 + 22 oz/A provided fair field bindweed control 9 MAT, but only the glyphosate plus dicamba treatment did not injure barley severely. Severe drought occurred in 1988 with 70% below average precipitation received from September 1987 to August 1988. The dry conditions probably accentuated injury to the barley crop from these treatments. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo).

Table. Field bindweed control from several post-harvest herbicide treatments applied in September 1987 (Lym).

Treatment	Rate (oz/A)	Evaluation June 1988	
		Control	Barley injury
		(%)	
Experiment One			
Triclopyr + picloram + 2,4-D[a]	8 + 0.5 + 8	10	3
Triclopyr + picloram + 2,4-D[a]	8 + 0.5 + 16	15	9
Triclopyr + picloram + 2,4-D[a]	8 + 4 + 8	34	18
Triclopyr + picloram + 2,4-D[a]	8 + 4 + 16	10	13
Triclopyr + picloram + 2,4-D[a]	16 + 0.5 + 8	35	6
Triclopyr + picloram + 2,4-D[a]	16 + 0.5 + 16	6	13
Triclopyr + picloram + 2,4-D[a]	16 + 4 + 8	19	12
Triclopyr + picloram + 2,4-D[a]	16 + 4 + 16	28	19
Triclopyr + picloram + 2,4-D[a]	12 + 2.2 + 12	18	10
Triclopyr + picloram + 2,4-D[a]	17 + 2.2 + 12	40	11
Triclopyr + picloram + 2,4-D[a]	7 + 2.2 + 12	35	13
Triclopyr + picloram + 2,4-D[a]	12 + 4.4 + 12	31	16
Triclopyr + picloram + 2,4-D[a]	12 + 0.12 + 12	31	5
Triclopyr + picloram + 2,4-D[a]	12 + 2.2 + 17	18	8
Triclopyr + picloram + 2,4-D[a]	12 + 2.2 + 7	23	10
Glyphosate + 2,4-D[b]	64 + 58	20	4
Dicamba + 2,4-D[a] + X-77	16 + 16 + 0.5%	45	16
Dicamba + X-77	32 + 0.5%	41	26
Dicamba + X-77	64 + 0.5%	79	86
2,4-D mixed amine[c] + picloram + dicamba	32 + 4 + 16	31	23
2,4-D[a] + picloram + dicamba	32 + 4 + 16	50	16
Picloram + dicamba	4 + 16	51	13
2,4-D ester[d] + 2,4-DP + dicamba	160 + 160 + 4	49	53
2,4-D ester[d] + 2,4-DP + dicamba + picloram	160 + 160 + 40 + 4	49	66
Glyphosate + dicamba	45 + 22	64	14
Glyphosate + dicamba	90 + 44	70	45
Glyphosate + 2,4-D[a] + dicamba	64 + 58 + 8	37	4
LSD (0.05)		35	13
Experiment Two			
Fluroxypyr	2	14	3
Fluroxypyr	4	5	4
Fluroxypyr	6	41	11
Fluroxypyr + 2,4-D[a]	2 + 16	34	6
Picloram + 2,4-D[a]	1 + 16	23	6
Picloram + dicamba	1 + 16	41	11
Dicamba + 2,4-D[a]	16 + 16	59	
Dicamba	32	71	71
Glyphosate + 2,4-D[b]	64 + 58	58	0
LSD (0.05)		24	10

a 2,4-D alkanolamine.
b 2,4-D isopropylamine.
c Mixed amine salts of 2,4-D (2:1 v/v diethylamine:diethanolamine)-EH736.
d 2,4-D isoctylester:2,4-DP butoxyethanol ester:dicamba (4:4:1 v/v/v)-EH680.

Triazine-tridiphane mixtures for postemergence grass control in corn, Fargo, 1988. Interstate 201 corn was planted 2 inches deep on May 5 at 22,000 seeds per acre. Silty clay soil was conventionally prepared. Herbicides were applied May 28 when relative humidity was 87%, air temperature was 83 F, corn was 2.5 to 3.5-leaf (mostly 3.5-leaf), wild oats were 1 to 2.5-leaf and 2 to 4-inches tall, and yellow foxtail was 1 to 2-leaf and 0.25 to 1-inch tall. Soil conditions were moist with no plant stress evident at time of spraying. Treatments were applied using a bicycle wheel sprayer delivering 8.5 gpa with 8001 nozzles and 40 psi. Estimates of percent corn injury and weed control were taken on June 6 during significant drought stress. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Corn injury	Wioa	Yeft
		--------(%)-------		
Cyanazine	1.5	11	52	73
Atrazine+Cyanazine	0.125+1.375	11	73	73
Atrazine+Cyanazine	0.25+1.25	11	83	75
Atrazine+Cyanazine	0.375+1.125	12	84	77
Atrazine+Cyanazine	0.5+1	11	83	75
Tridiphane+Cyanazine	0.75+0.75	11	84	73
Tridiphane+Atrazine+Cyanazine	0.5+1.5	12	95	92
Tridiphane+Atrazine+Cyanazine	0.5+0.125+1.375	11	97	87
Tridiphane+Atrazine+Cyanazine	0.5+0.25+1.25	13	98	92
Tridiphane+Atrazine+Cyanazine	0.5+0.375+1.125	13	99	94
Tridiphane+Atrazine+Cyanazine	0.5+0.5+1	12	98	92
Tridiphane+Cyanazine	0.5+0.75+0.75	12	100	89
Tridiphane+Atrazine+Cyanazine	0.75+1.5	13	98	95
Tridiphane+Atrazine+Cyanazine	0.75+0.125+1.375	14	100	94
Tridiphane+Atrazine+Cyanazine	0.75+0.25+1.25	13	100	93
Tridiphane+Atrazine+Cyanazine	0.75+0.375+1.125	13	100	94
Tridiphane+Atrazine+Cyanazine	0.75+0.5+1	13	99	90
Control	0.75+0.75+0.75	11	100	95
	0	4	0	0
C.V. %		15	5	5
LSD 5%		2	6	6

[a]All treatments were applied with 1 qt/A of a soybean oil concentrate containing 15% emulsifier; dry flowable formulations of both cyanazine and atrazine were used.

Summary. Tridiphane generally increased corn injury although only by 2 to 3%. Wild oat control by cyanazine alone was increased when part of the cyanazine was replaced with atrazine in a tank mixture, although maximum control by cyanazine-atrazine combinations in the absence of tridiphane was 85%. Essentially complete control of wild oats was achieved when cyanazine-atrazine combinations were mixed with tridiphane. Foxtail control without tridiphane was about 75%, regardless of the proportion of atrazine in the mixture. The addition of tridiphane to cyanazine-atrazine combinations increased control to about 90 to 95%.

Corn plantback following imazaquin and imazethapyr in no-till soybeans, Fargo, 1988. 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, 1987 using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 35 psi. McCall soybeans were seeded on June 3 using a Hiniker no-till planter. Soil type was a silty clay with pH of ~8 and organic matter of ~5%. Interstate 201 corn was planted on May 5, 1988 into undisturbed soybean stubble using a Hiniker no-till planter (planting depth = 2 inches, population = 22,000 seeds per acre). Corn was observed for potential injury up untill plants were 4 to 5 feet tall. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

1987 treatment applied to soybeans	Rate (oz/A)	1988 corn injury ----(%)----
Imazaquin(F)	1.25	0
Imazaquin(F)	1.5	0
Imazaquin(F)	2	0
Imazaquin+X-77(EPP)	1+0.5%	0
Imazaquin+X-77(EPP)	1.25+0.5%	0
Imazaquin+X-77(EPP)	1.5+0.5%	0
Imazaquin+X-77(EPP)	2+0.5%	0
Imazaquin(Pre)	1	0
Imazaquin(Pre)	1.25	0
Imazaquin(Pre)	1.5	0
Imazaquin(Pre)	2	0
Imazethapyr(F)	2	0
Imazethapyr(F)	3	0
Imazethapyr(F)	4	0
Imazethapyr+X-77(EPP)	1.5+0.5%	0
Imazethapyr+X-77(EPP)	2+0.5%	0
Imazethapyr+X-77(EPP)	3+0.5%	0
Imazethapyr+X-77(EPP)	4+0.5%	0
Imazethapyr(Pre)	1.5	0
Imazethapyr(Pre)	2	0
Imazethapyr(Pre)	3	0
Imazethapyr(Pre)	4	0
Imazaquin+Imazethapyr(F)	1+1.5	0
Imazaquin+Imazethapyr(F)	1.25+2	0
Imazaquin+Imazethapyr+X-77(EPP)	1+1.5+0.5%	0
Imazaquin+Imazethapyr+X-77(EPP)	1.25+2+0.5%	0
Imazaquin+Imazethapyr(Pre)	1+1.5	0
Imazaquin+Imazethapyr(Pre)	1.25+2	0
Control	0	0

Summary. None of the treatments caused visually observable injury to corn planted 12 to 13 months after application until no-till conditions.

Weed control economics in minimum till and no-till soybeans, Fargo. The experiment was established in 1988 as a multi-year study on a silty clay soil having a pH of 7.8 and organic matter of 5%. Treatments were arranged as a split plot with three tillage-row spacing combinations serving as main plots and herbicide systems constituting sub-plots. Minimum till plots were chisel plowed in late October 1987. McCall soybeans were seeded 1 to 1.5 inches deep at 58 lbs/A on May 25 using a Hiniker no-till planter for 30-inch rows and a Haybuster drill for 7-inch rows. Herbicides were applied using a bicycle wheel sprayer delivering 8.5 gal/A for all treatments involving glyphosate or sethoxydim and 17 gal/A for all other treatments. All

Table 1. Rates and dates of herbicide applications[a].

Base herbicide treatment			As-needed burndown treatment			Follow-up post-emergence treatment		
Herbicide	Rate (lb/A)	Date	Herbicide	Rate (lb/A)	Date	Herbicide	Rate (lb/A)	Date
TILLED, 30-INCH ROWS								
Trif+Metr(PPI)	1+0.2	5/24	None	-	-	Sethoxydm	0.15	6/22
Trif+Imep(PPI)	1+0.063	5/24	None	-	-	Sethoxydm	0.15	6/22
Trif+Clom(PPI)	1+0.75	5/24	None	-	-	Sethoxydm	0.15	6/22
Trif+Clam(PPI)	1+2.5	5/24	None	-	-	Sethoxydm	0.15	6/22
Seth(Po)/	0.2/	6/13						
Bent+Acif(Po)	0.75+0.13	6/20	None	-	-	None	-	-
HWC - Trif+ Imep+Clom(PPI)	0.75+ 0.05+0.5	5/24	None	-	-	Sethoxydm	0.2	6/22
NO-TILL, 30-INCH ROWS								
Imazethapyr(EPP)	0.063	4/27	Glyphosat	0.19	5/26	None	-	-
Cyanazine(EPP)/	3/	4/27						
Sethoxydim(Po)	0.15	6/13	Glyphosat	0.19	5/26	Acifluorf	0.25	6/20
Metribuzin(EPP)/	0.25/	4/27						
Sethoxydim(Po)	0.15	6/13	Paraquat	0.5	5/26	Acifluorf	0.25	6/20
Metribuzin(Pre)/	0.2/	5/26						
Sethoxydim(Po)	0.15	6/13	Paraquat	0.5	5/26	Bentazon+ Acifluor	0.75+ 0.13	6/20
Sethoxydim(Po)/	0.2/	6/13						
Bent+Acif(Po)	0.75+0.13	6/20	Paraquat	0.5	5/26	None	-	-
HWC - Pend+ Imep+Clom(EPP)	2/ 0.05+0.5	4/27	Glyphosat	0.19	5/26	Sethoxydm	0.2	6/22
NO-TILL, 7-INCH ROWS								
Imazethapyr(EPP)	0.063	4/27	Glyphosat	0.19	5/26	None	-	-
Cyanazine(EPP)/	3/	4/27						
Sethoxydim(Po)	0.15	6/13	Glyphosat	0.19	5/26	Acifluorf	0.25	6/20
Metribuzin(EPP)/	0.25/	4/27						
Sethoxydim(Po)	0.15	6/13	Paraquat	0.5	5/26	Bentazon+ Acifluor	0.75+ 0.13	6/20
Metribuzin(Pre)/	0.2/	5/26						
Sethoxydim(Po)	0.15	6/13	Paraquat	0.5	5/26	Bentazon+ Acifluor	0.75+ 0.13	6/20
Sethoxydim(Po)/	0.2/	6/13						
Bent+Acif(Po)	0.75+0.13	6/20	Paraquat	0.5	5/26	None	-	-
HWC - Pend+ Imep+Clom(EPP)	2+ 0.05+0.5	4/27	Glyphosat	0.19	5/26	Sethoxydm	0.2	6/22

[a]See Table 4 for information on spray adjuvants used; EPP = early preplant; PPI = preplant incorporated; Pre = preemergence; Po = postemergence; HWC = hand weeded.

Continued on next four pages

postemergence (planned or as-needed) and burndown treatments were applied only as required and at a rate deemed necessary by the investigator. Rates and dates of all herbicide applications are given in Table 1. All 30-inch row plots were cultivated on July 11. Broadleaf weeds taller than 6 inches and foxtail plants of any size found within a plot were counted just prior to harvest. Grain yields were machine harvested on October 7 and values adjusted to 12% moisture.

Summary. A follow-up treatment of sethoxydim was needed in minimum till plots even though trifluralin had been applied. Significant amounts of foxtail emerged despite trifluralin treatment probably because of the severe drought. Under more normal conditions, a follow-up postemergence treatment for foxtail following trifluralin generally would not be required. Those treatments requiring a follow-up postemergence application of acifluorfen were infested with redroot pigweed and common lambsquarters while plots receiving acifluorfen plus bentazon had significant amounts of kochia in addition to pigweed and lambsquarters.

Among no-till treatments, early preplant cyanazine or imazethapyr provided essentially complete at-planting broadleaf control such that a low rate of glyphosate sufficed as a burndown to control emerged yellow foxtail. Treatments receiving early preplant metribuzin or no early preplant herbicide were treated with a preemergence burndown of paraquat due to infestations of kochia, lambsquarters, and foxtail.

When comparing tilled with no-till weed control systems, no-till yields were significantly higher than yields obtained with tillage (under 30-inch rows) (Table 2). Minimum till plots averaged 9.3 while no-till plots averaged 11.2 bushels per acre. Although herbicide treatments were not always the same between tillage system, the two treatments that were represented in both tillages ("total post" program and the handweeded check) showed about 2.5 bushels per acre higher yields under no-till. This tillage effect on grain yield was probably due to the moisture savings achieved through avoidance of tillage. The drought of 1988 was quite severe and yields of both tillage systems were low. Under moisture conditions normally received in the Red River Valley, the yield advantage of no-till soybeans could potentially be greater. Fewer weeds were present at harvest in no-till than in minimum till. Paradoxically, this may reflect the fact that soil-applied treatments in minimum till provided better broadleaf control than was obtained by no-till soil-applied treatments. As a consequence, most of the no-till treatments received a follow-up broadleaf spray while infestations in minimum till were considered too light to justify a follow-up spray given the capability of cultivation. Imazethapyr plus one cultivation controlled broadleaf weeds and foxtail sufficiently to preclude a follow-up herbicide treatment.

No yield differential was evident between 30-inch and 7-inch row spacings (Table 3). The 7-inch rows had more weeds (kochia, in particular) at the end of the season than did 30-inch rows. This probably was due to the lack of cultivation in the narrow rows and the poor canopy closure due to severe drought.

Net returns (considering variable production costs only) tended to be higher for no-till than minimum till. The option of cultivating probably gave a significant advantage to no-till 30-inch rows by keeping herbicide costs or yield losses due to weeds to a minimum. Cultivation has not been traditionally practiced in no-till yet when no-tilling into small grain or other light stubble, it should be possible to cultivate no-till row crops without significant damage. Labor costs were not part of the variable cost rates used in this economic analysis. If included, the cost of labor would tend to decrease the profitability of minimum till more so than no-till. Treatments involving imazethapyr showed highest net return. This herbicide is not yet registered, though it is expected to be priced in the vacinity of $15.00 per acre, perhaps more. A cost of $15.00 per acre was assumed for this analysis.

Table 2. Weed control and grain yield of minimum till and no-till soybeans.

Base Herbicide treatment		Weeds present at harvest					Grain
Herbicide	Rate	Yeft	KOCZ	Rrpw	Colq	All	yield
	(lb/A)	----(Plants per 100 m^2)----					(Bu/A)
TILLED (30-inch rows)							
Trifluralin+Metribuzin(PPI)	1+0.2	9	13	32	17	71	9.0
Trifluralin+Imazethapyr(PPI)	1+0.063	3	5	18	7	33	11.1
Trifluralin+Clomazone(PPI)	1+0.75	0	18	57	8	83	9.1
Trifluralin+Chloramben(PPI)	1+2.5	1	14	24	7	46	8.4
Seth(Po)/Bentazon+Acifluor(Po)	0.2/0.75+0.13	0	44	141	198	383	8.2
Hand-weeded check[a]	-	-	-	-	-	-	10.1
LSD 5% (Treatment within a tillage)		NS	25	NS	NS	83	NS
NO-TILL (30-inch rows)							
Imazethapyr(EPP)	0.063	3	1	0	1	6	12.0
Cyanazine(EPP)/Sethoxydim(Po)	3/0.15	3	0	5	0	8	11.3
Metribuzin(EPP)/Sethoxydim(Po)	0.25/0.15	0	1	8	4	13	10.2
Metribuzin(Pre)/Sethoxydim(Po)	0.2/0.15	8	5	30	2	44	10.5
Seth(Po)/Bentazon+Acifluor(Po)	0.2/0.75+0.13	0	22	39	7	69	10.6
Hand-weeded check[b]	-	-	-	-	-	-	12.5
LSD 5% (Treatment within a tillage)		NS	NS	NS	NS	36	NS
Tillage effect		NS	*	NS	NS	**	**

[a]Handweeded check was treated with trifluralin + imazethapyr + clomazone (PPI) at 0.75 + 0.05 + 0.5 lb/A plus hand weeding.
[b]Handweeded check was treated with pendimethalin + imazethapyr + clomazone (EPP) at 1.5 + 0.05 + 0.5 lb/A plus hand weeding.

Table 3. Weed control and grain yield of no-till soybeans planted in 30-inch and 7-inch rows.

Base Herbicide treatment		Weeds present at harvest					Grain
Herbicide	Rate	Yeft	KOCZ	Rrpw	Colq	All	yield
	(lb/A)	----(Plants per 100 m^2)----					(Bu/A)
30-INCH ROWS (No-till)							
Imazethapyr(EPP)	0.063	3	1	0	1	6	12.0
Cyanazine(EPP)/Sethoxydim(Po)	3/0.15	3	0	5	0	8	11.3
Metribuzin(EPP)/Sethoxydim(Po)	0.25/0.15	0	1	8	4	13	10.2
Metribuzin(Pre)/Sethoxydim(Po)	0.2/0.15	8	5	30	2	44	10.5
Seth(Po)/Bentazon+Acifluor(Po)	0.2/0.75+0.13	0	22	39	7	69	10.6
Handweeded checka	-	-	-	-	-	-	12.5
LSD 5% (Treatment within a tillage)		NS	NS	NS	NS	36	NS
7-INCH ROWS (Tilled)							
Imazethapyr(EPP)	0.063	6	4	2	4	15	11.4
Cyanazine(EPP)/Sethoxydim(Po)	3/0.15	13	2	24	0	39	10.4
Metribuzin(EPP)/Sethoxydim(Po)	0.25/0.15	11	17	36	5	68	11.6
Metribuzin(Pre)/Sethoxydim(Po)	0.2/0.15	12	29	63	4	108	10.7
Seth(Po)/Bentazon+Acifluor(Po)	0.2/0.75+0.13	1	67	207	17	292	9.0
Handweeded check[a]	-	-	-	-	-	-	10.0
LSD 5% (Treatment within a tillage)		NS	42	NS	NS	210	NS
Tillage effect		NS	*	NS	NS	*	NS

[a]Handweeded check was treated with pendimethalin + imazethapyr + clomazone (EPP) at 1.5 + 0.05 + 0.5 lb/A plus hand weeding.

Table 4. Herbicide and adjuvant costs for minimum till and no-till weed systems.

Base treatment			Burndown treatment			Follow-up post treatment		
Herbicide or adjuvant	Rate[a]	Cost ($/A)	Herbicide or adjuvant	Rate[a]	Cost ($/A)	Herbicide or adjuvant	Rate[a]	Cost ($/A)
TILLED, 30-INCH ROWS								
Trifluralin	1	6.38	None	-	-	Sethoxydim	0.15	8.64
Metribuzin	0.2	5.13				Oil conc.	1 qt	1.25
Trifluralin	1	6.38	None	-	-	Sethoxydim	0.15	8.64
Imazethapyr	0.063	15.00				Oil conc.	1 qt	1.25
Trifluralin	1	6.38	None	-	-	Sethoxydim	0.15	8.64
Clomazone	0.75	12.00				Oil conc.	1 qt	1.25
Trifluralin	1	6.38	None	-	-	Sethoxydim	0.15	8.64
Chloramben	2.5	21.83				Oil conc.	1 qt	1.25
Sethoxydim	0.2	11.52	None	-	-	None	-	-
Oil conc.	1 qt	1.25						
Bentazon	0.75	9.26						
Acifluorfen	0.13	2.84						
X-77 surf.	0.5%	.62						
NO-TILL, 30-INCH ROWS								
Imazethapyr	0.063	15.00	Glyphosate	0.19	3.78	None	-	-
			X-77 surf	0.25%	.31			
Cyanazine	3	13.88	Glyphosate	0.19	3.78	Acifluorfen	0.25	5.69
Sethoxydim	0.15	8.64	X-77 surf	0.25%	.31	X-77	0.5%	.62
Dash	1 qt	1.63						
Metribuzin	0.25	6.41	Paraquat	0.5	10.42	Acifluorfen	0.25	5.69
Sethoxydim	0.15	8.64	X-77	0.5%	.62	X-77	0.5%	.62
Dash	1 qt	1.63						
Metribuzin	0.2	5.13	Paraquat	0.5	10.42	Bentazon	0.75	9.26
Sethoxydim	0.15	8.64	X-77	0.5%	.62	Acifluorfen	0.25	5.69
Dash	1 qt	1.63				X-77	0.5%	.62
Sethoxydim	0.2	11.52	Paraquat	0.5	10.42	None	-	-
Oil conc.	1 qt	1.25	X-77	0.5%	.62			
Bentazon	0.75	9.26						
Acifluorfen	0.13	2.84						
X-77 surf.	0.5%	.62						
NO-TILL, 7-INCH ROWS								
All treatments same as no-till, 30-inch rows except metribuzin early preplant:								
Metribuzin	0.2	5.13	Paraquat	0.5	10.42	Bentazon	0.75	9.26
Sethoxydim	0.15	8.64	X-77	0.5%	.62	Acifluorfen	0.25	5.69
Dash	1 qt					X-77	0.5%	.62

Table 5. Economic analysis for weed control systems in minimum till and no-till soybeans.

Base herbicide treatment		Variable production costs[a]					
Herbicide	Rate (lb/A)	Total chemical ($/A)	Herbicide appl. and incorp. ($/A)	Culti-vation ($/A)	Chisel plowing ($/A)	Crop value ($/A)	Net return ($/A)
TILLED, 30-INCH ROWS							
Trif+Metr(PPI)	1+0.2	21.40	6.04	2.00	3.45	58.50	25.61
Trif+Imep(PPI)	1+0.063	21.38	6.04	2.00	3.45	72.15	39.28
Trif+Clom(PPI)	1+0.75	28.27	6.04	2.00	3.45	59.15	19.39
Trif+Clam(PPI)	1+2.5	38.10	6.04	2.00	3.45	54.60	5.01
Seth(Po)/ Bent+Acif(Po)	0.2/ 0.75+0.13	25.49	1.24	2.00	3.45	53.30	21.12
NO-TILL, 30-INCH ROWS							
Imazethapyr(EPP)	0.063	19.09	1.86	2.00	0	78.00	55.05
Cyanazine(EPP)/ Sethoxydim(Po)	3/ 0.15	34.55	2.48	2.00	0	73.45	34.42
Metribuzin(EPP)/ Sethoxydim(Po)	0.25/ 0.15	34.03	2.48	2.00	0	66.30	27.79
Metribuzin(Pre)/ Sethoxydim(Po)	0.2/ 0.15	42.01	1.86	2.00	0	68.25	22.38
Sethoxydim(Po)/ Bent+Acif(Po)	0.2/ 0.75+0.13	36.53	1.24	2.00	0	68.90	29.13
NO-TILL, 7-INCH ROWS							
Imazethapyr(EPP)	0.063	19.09	1.86	0	0	74.10	53.15
Cyanazine(EPP)/ Sethoxydim(Po)	3/ 0.15	34.55	2.48	0	0	67.60	30.57
Metribuzin(EPP)/ Sethoxydim(Po)	0.25/ 0.15	42.01	2.48	0	0	75.40	30.91
Metribuzin(Pre)/ Sethoxydim(Po)	0.2/ 0.15	42.01	1.86	0	0	69.55	25.68
Sethoxydim(Po)/ Bent+Acif(Po)	0.2/ 0.75+0.13	36.53	1.24	0	0	58.50	20.73

[a] Variable cost rates derived from University of Minnesota values reduced by 30% (Minnesota values assume a farmer owns all new equipment). Included in variable cost rates is equipment overhead, repairs, maintenance, and fuel. Labor is not included. Spraying cost was $.62/A per operation, herbicide incorporation cost was $2.40/A per pass, cultivation cost was $2.00/A.

[b] 1988 soybeans were valued at $6.50 per bushel.

Carryover injury to wheat by clomazone applied in soybeans, Casselton, 1988. Fall and spring treatments were applied October 17, 1986 and June 3, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. All plots were double-pass incorporated (field cultivator, 3-inch tillage depth) immediately after herbicide application except for the minimum till preemergence treatments which received one tillage pass before spraying and no tillage after spraying. 'McCall' soybeans were planted in 22-inch rows on June 4. On June 5, the entire experimental area received metribuzin plus alachlor (0.2 + 3 lb/A) for general weed control. Soybeans were bulk-harvested October 2, 1987. Treatment tillage was done on October 22, 1987 using a moldboard plow (6-inch depth) for plowed plots and a chisel plow (25 to 40% residue remaining) for minimum till plots. On April 14, 1988, the tilled blocks received a single pass with a field cultivator (with drag harrow). 'Stoa' wheat was planted 1.5 inches deep on April 14 at 90 lbs/A. The entire experimental area received diclofop plus DPX-M6316 (1 + 0.031 lb/A) for control of foxtail and broadleaf weeds. Visual estimates of percent wheat injury (yellowing and bleaching of foliage) were taken on May 23 when the crop was 3 to 4-leaf and plots were combine harvested on August 4. Plot size was 12.5 by 25 feet and the experiment was a randomized complete block design with a split-plot arrangement of treatments. Soil type was a Beardon silty clay with pH 8.0 and 5% organic matter.

Clomazone application timing	Clomazone rate	Wheat injury 1988[a]				Wheat grain yield 1988[a]			
			Min. till				Min. till		
		Plow	PPI	Pre	No-till	Plow	PPI	Pre	No-till
	(lb/A)	(%)				(bu/A)			
-	0	0	0	0	0	15	22	20	21
Fall 1986	0.5	-	2	-	-	-	19	-	-
	0.75	-	5	-	-	-	21	-	-
	1.0	-	13	-	-	-	22	-	-
	1.25	-	22	-	-	-	20	-	-
	1.5	-	25	-	-	-	19	-	-
	2.0	-	48	-	-	-	15	-	-
Spring 1987	0.5	10	11	11	8	18	22	20	25
	0.75	25	22	21	24	17	21	24	16
	1.0	39	38	23	24	17	21	24	27
	1.25	46	46	43	29	11	10	19	14
	1.5	58	66	53	42	11	11	10	17
	2.0	77	75	73	58	5	13	13	12
LSD(5%) RatexTillage		13				11			

[a]Tillage effect was not significant for wheat injury and grain yield; rate effect was significant for both wheat injury and grain yield.

Summary. Severe drought in 1988 limited grain yield potential and probably masked much of the effect of clomazone carryover on yield. Generally, grain yield in 1988 seemed to be reduced by clomazone applied in the spring of 1987 at rates of 1.25 lb/A and above. Such was not the case, however, for clomazone applied in the fall of 1986 (done only in minimum till with preplant incorporated clomazone). Fall-applied clomazone likewise caused less carryover injury to wheat than did spring-applied treatments. Carryover injury with spring-applied treatments ranged between about 10% for a 0.5 lb/A application rate to about 60 to 75% for a 2 lb/A rate of clomazone.

Carryover injury to wheat by clomazone applied in soybeans, Carrington, 1988. Fall and spring treatments were applied October 30, 1986 and May 29, respectively, using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. All plots were double-pass incorporated (field cultivator, 3-inch tillage depth) immediately after herbicide application except for the minimum till preemergence treatments which received two tillage passes before spraying and no tillage after spraying. 'McCall' soybeans were planted in 30-inch rows on May 30. On June 5, the entire experimental area received metribuzin plus alachlor (0.2 + 3 lb/A) for general weed control. Soybeans were bulk-harvested October 2, 1987. Treatment tillage was done on April 13, 1988 using a moldboard plow (6-inch depth) for plowed plots and a field cultivator (40 to 60% residue remaining) for minimum till plots. 'Stoa' wheat was planted 1.5 inches deep on April 13 at 63 lbs/A. The entire experimental area received diclofop plus DPX-M6316 (1 + 0.031 lb/A) for control of foxtail and broadleaf weeds. On May 5, 135 lbs/A of N was surface applied as urea. Visual estimates of percent wheat injury (yellowing and bleaching of foliage) were taken on May 19 when the crop was 2 to 2.5-leaf and plots were combine harvested on August 4. Plot size was 12.5 by 25 ft and the experiment was a randomized complete block design with a split-plot arrangement of treatments. Soil type was a loam with pH 6.3 and 3.0% organic matter.

Clomazone application timing	Clomazone rate	Wheat injury 1988[a]				Wheat grain yield 1988			
			Min. till				Min. till		
	(lb/A)	Plow	PPI	Pre	No-till	Plow	PPI	Pre	No-till
		----------(%)----------				----------(bu/A)----------			
-	0	0	0	0	0	25	23	24	27
Fall 1986	0.5	-	0	-	-	-	17	-	-
	0.75	-	0	-	-	-	21	-	-
	1.0	-	1	-	-	-	25	-	-
	1.25	-	0	-	-	-	22	-	-
	1.5	-	0	-	-	-	20	-	-
	2.0	-	3	-	-	-	26	-	-
Spring 1987	0.5	1	0	1	1	27	20	25	26
	0.75	2	1	3	1	25	21	23	22
	1.0	5	4	4	2	26	27	22	28
	1.25	12	1	10	8	26	23	24	24
	1.5	11	2	6	5	24	24	28	21
	2.0	18	9	19	8	26	23	24	20
LSD(5%) RatexTillage		------6------				------NS------			

[a]Rate and tillage effects were both significant for wheat injury.

Summary. Severe drought in 1988 limited wheat yield potential and may have masked any effect of clomazone carryover on yield. Wheat yields were not affected by clomazone applied from 12 to 19 months earlier. Wheat injury by clomazone was generally greater with higher clomazone application rates, although percent chlorosis never exceeded 20% even at the 2 lb/A rate of clomazone. Greatest injury was apparent where moldboard plowing preceeded planting of spring wheat. Fall-applied clomazone produced almost no visually detectable wheat injury.

Fall and EPP imazethapyr and BAS514 in no-till soybeans, Minot, 1988. Fall (F), early preplant (EPP), and preemergence (Pre) treatments were applied October 14, 1987, April 18, and May 18, 1988, respectively, using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. At the early preplant application, kochia was 0.25 to 0.38-inch tall and greenflower pepperweed had 1 to 2-inch diameter rosettes. McCall soybeans were seeded 1.5-inches deep into durum stubble in 30-inch rows on May 19 using a Buffalo Till planter. Weed control was evaluated immediately prior to planting. The entire experimental area was treated immediately after planting with glyphosate at 1 lb/A to control existing vegetation. Visual estimates of percent soybean injury and weed control were taken July 13. Soil type was a loam having a pH of 6.2 and 2.6% organic matter. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	At planting					8 weeks after planting					
		KOCZ	Grft	Colq	Wimu	Gfpw	KOCZ	Grft	Ruth	Rrpw	Colq	Wimu
	(lb/A)	(% control)										
Imazethapyr(EPP)	0.063	91	37	99	100	17	100	82	87	100	100	98
Imazethapyr(EPP)	0.074	84	71	96	100	-	91	86	92	100	100	100
Imazethapyr(Pre)	0.063	-	-	-	-	-	87	95	68	100	100	100
Imazethapyr+Pend(F)	0.063+2	99	84	98	95	30	100	79	100	100	100	100
Imazethapyr+Pend(F)	0.074+2	99	87	100	100	43	100	83	99	100	100	100
Imep+Pend(EPP)	0.063+2	97	98	99	100	78	100	97	100	100	100	100
Imep+Pend(EPP)	0.074+2	99	98	100	96	94	100	94	99	100	100	100
Imep+Pend(Pre)	0.063+2	-	-	-	-	-	-	99	79	100	99	100
BAS514(EPP)	0.75	32	100	62	32	-	100	98	99	53	90	8
BAS514(EPP)	1	82	100	92	62	27	-	98	99	59	85	19
BAS514(EPP)	1.5	55	100	98	46	14	100	100	97	87	98	23
BAS514(Pre)	1	-	-	-	-	-	52	99	70	85	95	28
BAS514+Imep(F)	0.75+0.063	98	92	98	97	36	-	82	100	100	100	100
BAS514+Imep(EPP)	0.5+0.047	93	100	95	97	-	100	95	100	100	100	100
BAS514+Imep(EPP)	0.75+0.063	87	100	97	99	-	-	98	99	100	100	98
BAS514+Imep(Pre)	0.75+0.063	-	-	-	-	-	66	100	81	100	100	100
BAS514+Cyan(F)	1+2	100	99	99	99	63	100	93	99	64	100	67
BAS514+Cyan(EPP)	1+2	95	100	98	100	-	100	99	100	96	100	100
BAS514+Metr(EPP)	0.75+0.3	96	100	100	100	25	100	96	94	78	94	73
Control	0	-	-	-	-	-	0	0	0	0	0	0
C.V. %		17	10	7	17	47	12	4	9	13	5	13
LSD 5%		21	13	10	21	29	15	5	11	16	6	14

[a]Dry flowable formulations of both cyanazine and metribuzin were used.

Summary. Treatments involving BAS514 and imazethapyr appeared to provide less than complete at-planting kochia control when applied EPP but fall applications generally were superior. The addition of a surfactant or oil concentrate to these EPP treatments probably would have improved performance since the kochia population was at least partially emerged at the time of application. All EPP applications of BAS514 gave 100% control of green foxtail at planting. Mid-season evaluations showed that BAS514 provided excellent control of Russian thistle, kochia, and foxtail, good to excellent control of common lambsquarters, good control of redroot pigweed, and poor control of wild mustard. Imazethapyr gave excellent control of pigweed, mustard, and lambsquarters, good to excellent control of kochia, and about 85% control of foxtail and Russian thistle. For broadleaf weeds, EPP applications were generally superior to Pre treatments, although foxtail seemed to be controlled more effectively by Pre applications. Fall treatments generally were not as effective as spring applications. No soybean injury was observed with any of the treatments.

Fall and EPP imazethapyr and BAS514 in no-till soybeans, Carrington, 1988. Fall (F), early preplant (EPP), and preemergence (Pre) treatments were applied October 21, 1987, April 19, and May 19, 1988, respectively, using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. Foxtail was primarily yellow with about 20 to 30% green foxtail and was not emerged at the time of EPP applications. Maple Amber soybeans were seeded 1.5-inches deep into barley stubble in 30-inch rows on May 19 using a John Deere MaxEmerge planter. Foxtail control was evaluated prior to planting. The entire experimental area was treated immediately after planting with glyphosate at 1 lb/A to control existing vegetation. Visual estimates of percent soybean injury and foxtail control were taken on July 15. Soil type was a loam with 3.6% organic matter. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment	Rate	At planting	8 weeks after planting	
		Fxtl	SBInj	Fxtl
	(lb/A)	------(% control)------		
Imazethapyr(EPP)	0.063	49	0	63
Imazethapyr(EPP)	0.074	19	0	57
Imazethapyr(Pre)	0.063	-	0	72
Imazethapyr+Pendimethalin(F)	0.063+2	86	0	82
Imazethapyr+Pendimethalin(F)	0.074+2	91	0	87
Imazethapyr+Pendimethalin(EPP)	0.063+2	96	0	85
Imazethapyr+Pendimethalin(EPP)	0.074+2	96	0	85
Imazethapyr+Pendimethalin(Pre)	0.063+2	-	0	92
BAS514(EPP)	0.75	57	0	56
BAS514(EPP)	1	33	0	67
BAS514(EPP)	1.5	64	0	71
BAS514(Pre)	1	-	0	58
BAS514+Imazethapyr(F)	0.75+0.063	54	0	45
BAS514+Imazethapyr(EPP)	0.5+0.047	26	0	67
BAS514+Imazethapyr(EPP)	0.75+0.063	64	0	75
BAS514+Imazethapyr(Pre)	0.75+0.063	-	0	68
BAS514+Cyanazine-DF(F)	1+2	55	0	43
BAS514+Cyanazine-DF(EPP)	1+2	69	0	80
BAS514+Metribuzin-DF(EPP)	0.75+0.3	58	0	61
Control	0	-	0	0
C.V. %		26	0	18
LSD 5%		22	NS	17

Summary. No treatments provided satisfactory control of foxtail at planting time except imazethapyr plus pendimethalin. These combinations along with BAS514 + cyanazine (EPP) were the only treatments giving 80% or greater foxtail control 8 weeks after planting. Treatments applied in the fall generally provided inferior foxtail control than EPP or Pre treamtents. No clear difference was observed between the performance of EPP and Pre treatments. None of the treatments appeared to injure soybeans. Foxtail plants present in the plots at the July 15 evaluation were almost entirely yellow foxtail. Though control of green and yellow foxtail was not evaluated separately, it was apparent that green foxtail was being controlled more readily than yellow foxtail by all treatments.

Early preplant cyanazine in no-till soybeans, Fargo, 1988. Early preplant treatments were applied April 21 (4WPP = 4 weeks preplant), April 28 (3WPP), and May 5 (2WPP), and preemergence (Pre) treatments were applied May 20 using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. Kochia at the 4WPP, 3WPP, and 2WPP timings was 0.25 to 0.38 inch, 0.5, and 0.5 inch tall, respectively. Postemergence treatments of sethoxydim were applied June 16 when air temperature was 70 F and relative humidity was 35%. McCall soybeans were seeded 1.5-inches-deep into a trashy surface in 30-inch rows on May 20 using a Hiniker no-till planter. The entire experimental area was treated immediately after planting with paraquat plus diquat at 0.5 + 0.5 lb/A to control existing vegetation. Soil type was silty clay having a pH of 7.8 and 5% organic matter. Visual estimates of percent soybean injury and weed control were taken on May 20 immediately before planting and on July 8. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Eval. May 20 KOCZ	Evaluated July 8 Soybean injury	Yeft	KOCZ
		---(% injury or control)--			
Cyan-L+OC(4WPP)/Seth+OC(Po)	2.5+1Q/0.2+1Q	94	0	-	94
Cyan-L+OC(4WPP)/Seth+OC(Po)	3+1Q/0.2+1Q	99	0	94	98
Cyan-L+OC(4WPP)/Seth+OC(Po)	3.5+1Q/0.2+1Q	99	0	-	100
Cyan-L+OC(3WPP)/Seth+OC(Po)	2.5+1Q/0.2+1Q	96	0	85	84
Cyan-L+OC(3WPP)/Seth+OC(Po)	3+1Q/0.2+1Q	100	0	-	-
Cyan-L+OC(3WPP)/Seth+OC(Po)	3.5+1Q/0.2+1Q	99	0	-	-
Cyan-L+OC(2WPP)/Seth+OC(Po)	2.5+1Q/0.2+1Q	99	0	87	95
Cyan-L+OC(2WPP)/Seth+OC(Po)	3+1Q/0.2+1Q	100	0	95	98
Cyan-L+OC(2WPP)/Seth+OC(Po)	3.5+1Q/0.2+1Q	99	0	88	100
Cyan-L+OC(Pre)/Seth+OC(Po)	2.5+1Q/0.2+1Q	-	0	-	97
Cyan-L+OC(Pre)/Seth+OC(Po)	3+1Q/0.2+1Q	-	0	88	99
Cyan-L+OC(Pre)/Seth+OC(Po)	3.5+1Q/0.2+1Q	-	0	-	100
Control	0	-	0	0	0
C.V. %		1	0	7	6
LSD 5%		2	NS	8	8

[a]Cyan-L = flowable formulation of cyanazine; OC = petroleum oil concentrate containing 17% emulsifier; 1Q = 1 quart per acre.

Summary. Complete preplant burndown of kochia was achieved by 3 to 3.5 lb/A of cyanazine flowable mixed with a petroleum oil concentrate. Cyanazine at 2.5 lb/A allowed a low percentage of kochia escapes when applied at the 4WPP and 3WPP timings. Drought conditions prevailed during these preplant treatments and kochia densities were high enough to completely cover the ground surface. Thus, excellent preplant burndown by cyanazine was obtained despite dense, drought-stressed plants. Cyanazine also provided excellent mid-season kochia control with the exception of the 84% control observed with cyanazine at 2.5 lb/A applied 3WPP. No soybean injury was detected.

Early preplant treatments in no-till soybeans, Fargo, 1988. Early preplant (EPP) treatments were applied April 21 when kochia was 0.25 to 0.38-inch tall in a dense population (drought stressed). McCall soybeans were seeded 1.5 to 2-inches deep into untilled soybean stubble using a Hiniker no-till planter. Visual estimates of percent kochia control were obtained just prior to planting. Preemergence (Pre) treatments were applied May 20. All treatments were applied with a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. On May 23, the entire experimental area was treated with paraquat + diquat at 0.5 + 0.5 lb/A to control existing vegetation. Soil type was silty clay having pH 7.9 and 5% organic matter. Estimates of percent crop injury and weed control were obtained on June 30. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate[a]	Eval. 5/20	Evaluated June 30			
		KOCZ	Soybean injury	KOCZ	Rrpw	Yeft
	(lb/A)	---(% injury or control)----				
Imazethapyr+X77(EPP)	0.063+0.25%	68	1	100	100	88
Imazethapyr+X77(EPP)	0.078+0.25%	73	3	100	100	89
Imazethapyr(Pre)	0.063	-	13	100	100	94
Imep+Pendimethalin+X77(EPP)	0.063+2+0.25%	80	0	98	100	94
Imep+Pendimethalin+X77(EPP)	0.078+2+0.25%	83	0	100	99	94
Imazethapyr+Pendimethalin(Pre)	0.063+2	-	3	100	100	95
BAS514+BAS090(EPP)	0.75+1Q	-	0	-	-	31
BAS514+BAS090(EPP)	1+1Q	64	1	95	36	70
BAS514+BAS090(EPP)	1.5+1Q	55	3	97	79	49
BAS514(Pre)	1	-	0	99	85	72
Imazethapyr+BAS514+BAS090(EPP)	0.047+0.5+1Q	87	0	99	99	74
Imazethapyr+BAS514+BAS090(EPP)	0.063+0.75+1Q	85	3	98	100	92
Imazethapyr+BAS514(Pre)	0.047+0.5	-	4	98	99	91
Metribuzin+Pendimethalin+X77(EPP)	0.25+2+0.25%	85	0	47	13	8
Metribuzin+Pendimethalin(Pre)	0.25+2	-	0	90	98	47
Metribuzin+Metolachlor(Pre)	0.25+2.5	-	1	92	86	39
S-53482+OC(EPP)	0.066+1Q	70	0	20	6	1
S-53482(Pre)	0.066	-	7	19	54	3
S-53482+Pendimethalin+OC(EPP)	0.044+2+1Q	69	0	3	1	13
S-53482+Pendimethalin+OC(EPP)	0.066+2+1Q	70	0	26	11	13
S-53482+Pendimethalin(Pre)	0.044+2	-	0	-	-	13
S-53482+Pendimethalin(Pre)	0.066+2	-	0	-	-	6
Control	0	-	0	0	0	0
C.V. %		18	264	15	8	38
LSD 5%		19	6	16	8	27

[a]BAS090 = BASF surfactant of proprietary composition; dry flowable formulation of metribuzin was used; OC = petroleum oil concentrate containing 17% emulsifier; 1Q = 1 quart per acre.

Summary. None of the early preplant treatments provided kochia control at planting time sufficient to alleviate the need for a burndown herbicide. Control of kochia and redroot pigweed was essentially 100% for imazethapyr treatments when evaluated on June 30. BAS514 similarly provided 95 to 100% kochia control but only about 80 to 85% control of pigweed. S-53482 gave poor control of these broadleaf species. Treatments yielding good to excellent yellow foxtail control involved imazethapyr alone or in combination with either BAS514 or pendimethalin. Over 5% soybean injury was observed with imazethapyr and S-53482 treatments but these results were not consistent across comparable treatments and injury symptoms may have been complicated by drought.

Burndown treatments for no-till soybeans, Carrington, 1988. Maple Amber soybeans were planted 1.5 inches deep into barley stubble on May 19 using a John Deere Max-Emerge planter. Burndown treatments were applied after planting on May 19 when air temperature was 82 F with cloudy skies and 65% relative humidity. Surface soil was somewhat dry although weeds did not appear to be drought stressed. Weed stages were as follows: foxtail (yellow with 20 to 30% green foxtail) 1 to 3-leaf, 0.25 to 1-inch tall; horseweed 1.5 to 3-inch tall; kochia 1 to 2-inch tall; common lambsquarters 2-inch tall, several-leaf; wild buckwheat 2 to 3-leaf, 1 to 2-inch tall. All plots received 0.2 lb/A sethoxydim plus 1 qt/A petroleum oil concentrate on June 7 when temperature was 93 F, RH was 35%, and foxtail was 2 to 4 inches tall in plots having received a burndown treatment (5 to 8-inch in check plots). Bentazon + acifluorfen + X77 (0.75 lb/A + 0.125 lb/A + 0.1%) was applied to all plots on June 13 when soybeans were 1 to 2 trifoliolate, temperature was 84 F, RH was low, and conditions were dry. Plots were again evaluated on July 15. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. Soil type was a loam. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Burndown treatment[a]	Rate	Evaluated June 7					Evaluated July 15					
		Fxtl	Howe	KOCZ	Colq	Wibw	Soybean injury	Fxtl	KOCZ	Wibw	Howe	Colq
	(lb/A)	(% injury or control)										
Acif+2,4-D +Dash+28%UAN	.125+.5 +1Q+1G	68	96	87	100	100	0	73	92	98	100	97
Acif+2,4-D +Dash+28%UAN	.25+.5 +1Q+1G	77	96	100	100	100	0	70	95	99	99	98
Seth+2,4-D +Dash+28%UAN	.1+.5 +1Q+1G	90	95	94	100	80	0	73	90	74	100	99
Seth+2,4-D+Acif +Dash+28%UAN	.1+.5+.125 +1Q+1G	85	95	98	100	99	0	66	95	98	100	96
Acif+2,4-D +OC+28%UAN	.125+.5 +1Q+1G	67	97	97	100	99	0	69	94	98	100	99
Seth+2,4-D +OC+28%UAN	.1+.5 +1Q+1G	88	95	84	99	77	0	73	91	58	100	100
Seth+2,4-D+Acif +OC+28%UAN	.1+.5+.125 +1Q+1G	88	96	99	100	99	0	69	96	97	100	99
Glyt&2,4-D+AS	.28&.25+2.5	89	98	100	98	97	0	62	99	99	99	97
Control	0	0	0	0	0	0	0	93	7	21	3	53
C.V. %		7	2	11	1	1	0	9	6	6	2	5
LSD 5%		8	2	13	1	2	NS	10	8	8	3	6

[a]The butoxyethyl ester formulation of 2,4-D was used; Glyt&2,4-D = Landmaster II herbicide; 28%UAN = 28% urea ammonium nitrate solution; OC = petroleum oil concentrate containing 17% emulsifier; AS = ammonium sulfate; Dash = BASF surfactant of proprietary composition.

Summary. No soybean injury was evident at the June 7 evaluation. Acifluorfen at 0.125 or 0.25 lb/A did not provide foxtail burndown that was equivalent to that provided by sethoxydim or glyphosate. Foxtail burndown by sethoxydim or glyphosate was only about 90%, probably because of barley stubble and chaff which appeared to have shielded small foxtail seedlings from spray. Burndown of horseweed appeared to be primarily due to 2,4-D and was essentially complete. Burndown of lambsquarters was excellent for all treatments while effective burndown of wild buckwheat and kochia seemed to require acifluorfen in addition to 2,4-D. Fair to poor control of foxtail at the July evaluation seemed to reflect regrowth following incomplete kill by the June 7 sethoxydim treatment. Superior foxtail control (93%) observed in the control plots on July 15 was apparently due to competition from dense populations of the broadleaf species.

Cyanazine injury in no-till sunflowers and soybeans, Minot, 1988. Fall (F) treatments were applied October 14, 1987 and early preplant treatments were applied April 18 (4 weeks preplant = 4WPP), April 25 (3WPP), and May 3, 1988 (2WPP). Herbicides were applied with a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. Northrup King 265 sunflowers and McCall soybeans were seeded 1.5-inches deep into durum stubble in 30-inch rows on May 17 using a Buffalo Till planter. Direction of planting was perpendicular to the plots and five rows of each crop were seeded into each plot. Soil type was a loam with pH 6.2 and 2.6% organic matter. The entire experimental area was treated immediately after planting with glyphosate plus 2,4-D at 2.25 + 0.25 lb/A to control existing vegetation. Visual estimates of percent sunflower and soybean injury were taken on June 13 when sunflowers were 5-leaf and 5 inches tall and soybeans had 1 to 2 trifoliolate leaves. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Sunflower injury (%)	Soybean injury (%)
Cyanazine+Pendimethalin(2WPP)	2.5+2	0	0
Cyanazine+Pendimethalin(3WPP)	2.5+2	0	0
Cyanazine+Pendimethalin(4WPP)	2.5+2	0	0
Cyanazine+Pendimethalin(2WPP)	3+2	0	0
Cyanazine+Pendimethalin(3WPP)	3+2	0	0
Cyanazine+Pendimethalin(4WPP)	3+2	0	0
Cyanazine+Pendimethalin(F)	3+2	0	0
Cyanazine+Pendimethalin(2WPP)	3.5+2	0	0
Cyanazine+Pendimethalin(3WPP)	3.5+2	0	0
Cyanazine+Pendimethalin(4WPP)	3.5+2	0	0
Cyanazine+Pendimethalin(F)	3.5+2	0	0
Cyanazine+Pendimethalin(2WPP)	4+2	0	0
Cyanazine+Pendimethalin(3WPP)	4+2	0	0
Cyanazine+Pendimethalin(4WPP)	4+2	0	0
Cyanazine+Pendimethalin(F)	4+2	0	1
		0	1
C.V. %			
LSD 5%		0	612
		NS	NS

[a]Dry flowable formulation of cyanazine was used.

Summary. No injury attributable to cyanazine was observed. Low levels of rainfall experienced this year would be expected to cause only minimal movement of cyanazine into the soil profile and may explain the lack of crop injury.

Fall and EPP cyanazine and RE-40885 in no-till sunflowers, Minot, 1988. Fall (F), early preplant (EPP), and preemergence (Pre) treatments were applied October 14, 1987, April 18, and May 18, 1988, respectively, using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. Greenflower pepperweed had 0.5 to 2-inch-diam rosettes and kochia was 0.25 to 0.38-inch tall at the time of EPP applications. Northrup King 265 sunflowers were seeded 1.5-inches deep into durum stubble in 30-inch rows on May 17 using a Buffalo Till planter. Soil type was a loam with pH 6.2 and 2.6% organic matter. The entire experimental area was treated immediately after planting with glyphosate plus 2,4-D at 2.25 + 0.25 lb/A to control existing vegetation. Visual estimates of percent sunflower injury and weed control were taken on May 17 immediately before planting and on July 14. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

		Evaluated May 17					Evaluated July 14						
Treatment[a]	Rate	Grft	KOCZ	Wimu	Colq	Gfpw	Sufl inj	Grft	KOCZ	Wimu	Ruth	Rrpw	Colq
	(lb/A)	(% sunflower injury or weed control)											
Cyanazine+Pend(F)	2.5+2	78	100	99	100	48	0	63	99	100	13	42	84
Cyanazine+Pend(F)	3+2.5	85	100	100	100	68	0	70	100	-	11	46	90
Cyanazine+Pend(EPP)	2+2	96	100	100	100	61	0	91	100	98	43	90	94
Cyanazine+Pend(EPP)	2.5+2	98	100	100	100	50	0	88	97	-	43	83	87
Cyanazine+Pend(EPP)	3+2.5	97	100	100	100	62	0	94	-	100	43	88	84
Cyanazine+Trif(F)	2.5+1.25	25	100	99	100	-	0	44	97	-	13	53	63
RE-40885+Pend(F)	1+2	78	97	99	96	16	0	-	-	-	-	-	-
RE-40885+Pend(F)	1.25+2.5	84	96	100	96	-	0	47	69	83	14	69	65
RE-40885+Pend(EPP)	1+1.5	97	95	100	100	-	0	68	92	97	30	81	82
RE-40885+Pend(EPP)	1+2	99	97	100	100	37	0	77	94	-	30	89	65
RE-40885+Pend(EPP)	1.25+2.5	98	95	100	100	40	0	83	100	-	38	87	87
RE-40885+Oryz(EPP)	1+1.25	96	71	100	65	-	0	82	-	98	34	92	79
RE-40885+Pend(Pre)	1+1.5	-	-	-	-	-	0	67	24	-	10	71	69
Control	0	-	-	-	-	-	0	0	0	0	0	0	0
C.V. %		6	8	1	14	36	0	20	21	11	79	28	26
LSD 5%		8	11	NS	19	26	NS	19	24	13	28	28	27

[a]The dry flowable formulation of cyanazine was used; the emulsifiable concentrate of trifluralin was used.

Summary. Fall treatments of cyanazine plus pendimethalin or RE-40885 plus pendimethalin generally provided control inferior to that achieved with early preplant applications. A formulation of RE-40885 having inadequate mixing qualities was used for fall applications and may have adversely affected efficacy of these treatments. Fall-applied trifluralin (plus cyanazine) gave poor foxtail control. Essentially complete control of all species at planting time was achieved by several combinations of cyanazine plus pendimethalin or RE-40885 plus pendimethalin applied early preplant. These treatment combinations provided good to excellent mid-season control of broadleaf species except Russian thistle and mostly 80 to 90% control of foxtail. None of the treatments caused visually detectable sunflower injury.

Fall and EPP cyanazine and RE-40885 in no-till sunflowers, Carrington, 1988. Fall (F), early preplant (EPP), and preemergence (Pre) treatments were applied October 21, 1987, April 19, and May 19, 1988, respectively, using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. Foxtail was primarily yellow with about 20 to 30% green foxtail and was not emerged at the time of EPP applications. Interstate 897 sunflowers were seeded 1.5-inches deep into barley stubble in 30-inch rows on May 19 using a John Deere MaxEmerge planter. The entire experimental area was treated immediately after planting with glyphosate at 1 lb/A to control existing vegetation. Visual estimates of percent sunflower injury and foxtail control were taken on July 15. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Sunflower injury	Fxtl
	(lb/A)	-------(%)------	
Cyanazine+Pendimethalin(F)	2.5+2	0	56
Cyanazine+Pendimethalin(F)	3+2.5	0	74
Cyanazine+Pendimethalin(EPP)	2+2	0	88
Cyanazine+Pendimethalin(EPP)	2.5+2	0	80
Cyanazine+Pendimethalin(EPP)	3+2.5	0	87
Cyanazine+Trifluralin(F)	2.5+1.25	0	14
RE-40885+Pendimethalin(F)	1+2	0	40
RE-40885+Pendimethalin(F)	1.25+2.5	0	56
RE-40885+Pendimethalin(EPP)	1+1.5	0	70
RE-40885+Pendimethalin(EPP)	1+2	0	78
RE-40885+Pendimethalin(EPP)	1.25+2.5	0	81
RE-40885+Oryzalin(EPP)	1+1.25	0	72
RE-40885+Pendimethalin(Pre)	1+1.5	0	70
Control	0	0	0
C.V. %		0	21
LSD 5%		NS	19

[a]The dry flowable formulation of cyanazine was used; the emulsifiable concentrate of trifluralin was used.

Summary. Fall applications provided fair to poor control of foxtail. A formulation of RE-40885 having inadequate mixing qualities was used for fall applications and may have adversely affected efficacy of these treatments. Fall-applied, non-incorporated trifluralin (plus cyanazine) gave almost no control of foxtail. The most effective treatments in the study were mixtures of cyanazine plus pendimethalin applied early preplant. None of the treatments caused visually detectable sunflower injury. Green foxtail appeared to be much more readily controlled throughout the experiment than yellow foxtail; nearly all the uncontrolled foxtail in the plots was yellow foxtail while the check strips between plots contained about 20 to 30% green foxtail.

Early preplant treatments in no-till sunflowers, Fargo, 1988. Early preplant treatments were applied April 22 (6 weeks preplant = 6WPP), April 28 (5WPP), and May 5 (4WPP), preemergence (Pre) treatments were applied June 2, and postemergence (Po) treatments were applied June 16 using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles (soil-applied treatments) or 8.5 gpa with 8001 nozzles (sethoxydim treatments). Spray pressure was 40 psi. Sethoxydim was applied to 3 to 4-leaf foxtail (mostly yellow with some green foxtail) when air temperature was 70 F and relative humidity was 35%. Kochia was 0.5 to 1-inch tall at the 4WPP treatment but was not emerged for earlier treatments. Interstate 3001 sunflowers were seeded 1.5-inches deep into wheat stubble using a Hiniker no-till planter set at 30-inch rows and 22,000 seeds per acre. The entire experimental area was treated with paraquat plus diquat (0.5 + 0.5 lb/A) on June 2 to control existing vegetation. Soil type was a silty clay with pH 7.8 and 5% organic matter. Visual estimates of percent kochia control were taken on May 20 and plots were evaluated again on July 12. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Eval. May 20 KOCZ	Evaluated July 12 Sunfl. injury	SF stand reduction	SF height reduction	Fxtl
				(%)		
RE-40885+Pendimethalin+X7(6WPP)	1+2+0.5%	70	0	11	4	64
RE-40885+Pendimethalin(Pre)	1+2	-	0	0	3	31
RE-40885+Pend+X77(6WPP)	0.75+2+0.5%	73	0	0	0	55
RE-40885+Pend(Pre)	0.75+2	-	0	0	0	36
RE-40885+Pend+X77(6WPP)	0.5+2+0.5%	48	0	0	0	44
RE-40885+Pend(Pre)	0.5+2	-	0	0	2	39
Cyanazine(6WPP)/Sethoxydim(Po)	3/0.2	90	0	4	4	81
Cyanazine(6WPP)/Sethoxydim(Po)	3.5/0.2	93	0	0	0	82
Cyanazine(5WPP)/Sethoxydim(Po)	3.5/0.2	97	0	7	11	86
Cyanazine(4WPP)/Sethoxydim(Po)	3.5/0.2	100	0	3	5	87
Cyanazine(Pre)/Sethoxydim(Po)	3/0.2	-	0	42	32	84
Cyanazine(Pre)/Sethoxydim(Po)	3.5/0.2	-	0	48	35	87
Control	0	-	0	0	0	0
C.V. %		20	0	111	86	27
LSD 5%		13	NS	14	9	23

[a]Dry flowable formulation of cyanazine was used; cyanazine and sethoxydim were applied with 1 qt/A of a petroleum oil concentrate containing 17% emulsifier.

Summary. Over 90% control of kochia at planting time was provided by early preplant applications of cyanazine, while similarly-applied mixtures of RE-40885 plus pendimethalin gave only 70% control. Reductions in sunflower stand and height were severe with preemergence applications of cyanazine and appeared to be evident with certain early preplant cyanazine treatments and the high rate of RE-40885 plus pendimethalin applied early preplant.

Fall-applied herbicides in chemical fallow, Minot, 1988. Treatments were applied October 14, 1987 into durum stubble using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Soil type was a loam with pH 6.2 and 2.6% organic matter. Visual estimates of percent control were taken on July 14, 1988. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment	Rate	Weed control				
		Grft	KOCZ	Gfpw	Ruth	Colq
	(lb/A)	----------(%)----------				
BAS-514	0.75	97	84	19	92	51
BAS-514	1	97	68	13	94	78
BAS-514	1.5	99	99	19	96	92
BAS-514	2	100	99	15	100	93
BAS-514+Chlorsulfuron	0.75+0.015	86	100	35	99	100
BAS-514+Chlorsulfuron	1+0.015	94	100	51	100	100
BAS-514+Chlorsulfuron	1.5+0.015	97	100	48	100	100
BAS-514+CGA-131036	1+0.015	90	99	35	95	78
BAS-514+Atrazine-DF	1+0.75	81	99	32	97	97
BAS-514+Atrazine-DF	1.5+0.75	96	100	51	97	97
BAS-514+Atrazine-DF	2+0.75	97	99	47	99	95
Chlorsulfuron	0.015	0	100	44	33	99
CGA-131036	0.015	0	86	25	0	46
CGA-131036	0.023	0	98	44	0	65
Clomazone	0.75	0	0	4	0	18
Clomazone	1	13	25	0	0	23
Clomazone+Chlorsulfuron	0.75+0.015	3	74	31	5	75
Clomazone+Chlorsulfuron	1+0.015	0	100	29	6	100
BAS-514+Clomazone	1+0.75	91	93	23	77	86
BAS-514+Clomazone	1.5+1	98	96	13	94	95
Control	0	0	0	0	0	0
C.V. %		12	21	71	10	30
LSD 5%		10	24	28	9	32

Summary. BAS-514 alone provided nearly complete control of green foxtail at all rates evaluated but control was generally antagonized by mixing with other herbicides. BAS-514 alone at 1.5 and 2 lb/A provided acceptable control of kochia and Russian thistle although excellent control of these species at lower BAS-514 rates and excellent control of common lambsquarters required tank-mixing with either atrazine or chlorsulfuron. Clomazone performed poorly, perhaps because of dry conditions prevailing through the duration of the experiment. None of the treatments controlled the winter annual greenflower pepperweed.

Longevity of soil-applied herbicides in fallow, Minot, 1988. Treatments were applied April 19 onto durum stubble using a bicycle wheel sprayer delivering 17 gpa with 8002 nozzles and 40 psi. At time of spraying, kochia was 0.25 to 0.38-inch tall and greenflower pepperweed had 1 to 2-inch-diameter rosettes. Soil type was a loam with pH 6.2 and 2.6% organic matter. On May 26, estimates of percent weed control were taken. Weed sizes and populations in the checks on May 26 were as follows: green foxtail 1 to 2-leaf, light infestation; kochia 0.5 to 2-inch tall, heavy; common lambsquarters 0.5 to 2-inch tall, medium to heavy; Russian thistle 1 to 2-inch tall, light; greenflower pepperweed 2 to 6-inch tall, light to medium. On June 1 the entire experimental area was treated with glyphosate plus 2,4-D (1.5 + 0.75) to kill all vegetation. On July 14, weed control was again evaluated. Weed sizes and populations in the checks on July 14 were as follows: foxtail 4 to 5-inches tall, dense; kochia 2 to 5-inches tall, light to medium; redroot pigweed 1 to 4-inches tall, light. On July 20, the entire experimental area was sprayed with glyphosate plus 2,4-D (0.38 plus 0.35 lb/A) to kill all vegetation. No further weed emergence occurred the rest of the season. Plot size was 20 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Evaluated May 26					Eval. July 14		
		Grft	KOCZ	Ruth	Colq	Gfpw	Grft	KOCZ	Rrpw
	(lb/A)	(%)							
BAS514	1	100	74	98	87	30	98	100	50
BAS514	1.5	100	69	100	96	33	98	100	85
BAS514	2	100	71	100	98	28	100	100	91
BAS514+Chlorsulfuron	1+0.015	100	93	98	100	71	96	100	100
BAS514+Chlorsulfuron	1.5+0.015	100	92	98	100	80	99	100	100
BAS514+Chlorsulfuron	2+0.015	100	94	100	100	77	100	100	100
Clomazone+Atrazine	0.5+0.5	28	100	100	100	57	54	100	91
BAS514+Clomazone	1.5+0.5	100	90	99	100	37	99	100	91
BAS514+Clomazone+Atra	1.5+0.5+0.5	100	100	100	100	51	100	100	99
Control	0	0	0	0	0	0	0	0	0
C.V. %		2	5	2	3	31	9	0	9
LSD 5%		3	6	3	4	21	10	NS	10

[a]All treatments were applied with a petroleum oil concentrate containing 17% emulsifier; wettable powder formulation of atrazine was used.

Summary. BAS514 provided excellent control of green foxtail at both the May and the July evaluation dates. BAS514 also controlled Russian thistle and gave nearly complete control of common lambsquarters when applied at 1.5 to 2 lb/A. Redroot pigweed control by BAS514 was not adequate for fallow. Kochia was completely controlled by BAS514 at the July evaluation but not at the May evaluation. The only treatments giving complete kochia control in May were those containing 0.5 lb/A atrazine. The combination of clomazone plus atrazine (0.5 + 0.5 lb/A) provided complete control of kochia, Russian thistle, and common lambsquarters but failed to control green foxtail at either evaluation date. Clomazone plus atrazine also gave only about 90% control of redroot pigweed which may not be adequate for a fallow situation. None of the treatments controlled the winter annual greenflower pepperweed.

BAS514 and clomazone for weed control in fallow, Page, 1988. Treatments were applied April 20 using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Soil type was a loam with pH 7.4 and 8.6% organic matter. Soil surface was mostly bare with small amounts of barley residue. Visual estimates of percent green foxtail control were taken on June 7. Plot size was 20 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Green foxtail control (%)
BAS514	1	65
BAS514	1.5	67
BAS514	2	72
BAS514+Chlorsulfuron	1+0.015	62
BAS514+Chlorsulfuron	1.5+0.015	64
BAS514+Chlorsulfuron	2+0.015	73
Clomazone+Atrazine	0.5+0.5	37
BAS514+Clomazone	1.5+0.5	71
BAS514+Clomazone+Atrazine	1.5+0.5+0.5	74
Clomazone	0.75	40
Control	0	0
C.V. %		15
LSD 5%		12

[a]Wettable powder formulation of atrazine was used.

Summary. None of the treatments provided acceptable control of foxtail. Conditions were very dry and the surface was quite powdery during April and much of May. Insufficent moisture for herbicide activation probably accounted for the failure of these treatments.

Postemergence treatments in fallow, Minot, 1988. Treatments were applied May 26 into durum stubble using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. At time of spraying (6 to 7:30 pm), air temperature was 82 F, relative humidity was 60%, and skies were sunny. Reasonably good soil surface moisture was present and weeds did not appear to be under stress. Weed stages at application were as follows: kochia was 0.5 to 3 inches tall, Russian thistle was 1 to 2.5 inches tall, and common lambsquarters was 0.5 to 2 inches tall. Visual estimates of percent control were taken on June 13. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Weed control		
		KOCZ	Ruth	Colq
	(lb/A)	-------(%)-------		
Paraquat	0.38	98	100	91
Paraquat	0.5	99	100	98
Para&Flfp&Diur	0.38&0.06&0.02	99	100	95
Para&Flfp&Diur	0.5&0.08&0.027	98	100	98
Paraquat+Diuron	0.38+0.1	98	100	94
Paraquat+Diuron	0.5+0.1	100	100	96
Paraquat+Cyanazine	0.38+0.25	99	100	99
Paraquat+Cyanazine	0.5+0.25	100	100	97
Paraquat+Cyanazine	0.38+0.5	99	100	99
Paraquat+Cyanazine	0.38+1	99	100	98
Paraquat+Cyanazine	0.25+1	96	100	99
Para&Flfp&Diur+Cyanazine	0.38&0.06&0.02+0.5	99	100	100
Para&Flfp&Diur+Cyanazine	0.38&0.06&0.02+1	99	100	100
Para&Flfp&Diur+Cyanazine	0.25&0.04&0.013+1	98	100	99
Para&Flfp&Diur+2,4-D	0.38&0.06&0.02+.25	100	100	100
Para&Flfp&Diur+2,4-D	0.5&0.08&0.027+.25	100	100	100
Para&Flfp&Diur+Clsu	0.38&0.06&0.02+.0125	100	100	100
Glyphosate&2,4-D	0.28&0.25	99	99	100
Glyphosate&2,4-D+AS	0.28&0.25+2.5	100	100	100
Glyphosate&Dicamba	0.28&0.125	99	100	100
Control	0	0	0	0
C.V. %		1	1	2
LSD 5%		2	1	2

[a]All treatments containing paraquat were mixed with 0.5% X-77 surfactant; Paraquat = Cyclone; Para&Flfp&Diur = Cyclone TEC; dry flowable formulation of cyanazine was used; butoxyethyl ester formulation of 2,4-D was used; Glyphosate&2,4-D = Landmaster II; AS = ammonium sulfate; Glyphosate&Dicamba = Fallowmaster.

Summary. All treatments provided nearly complete control of kochia, Russian thistle, and common lambsquarters. Very hot weather in the days following spraying may have contributed to the high percentage control, particularly with treatments involving paraquat. Green foxtail was present in this experiment but could not be evaluated because this species had almost completely succumbed to the hot, dry weather.

Postemergence treatments in fallow, Carrington, 1988. Treatments were applied May 5 in barley stubble using a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. Spraying conditions included relative humidity of 55%, air temperature of 85 F, sunny skies, and a low to moderate level of moisture stress apparent. Kochia was 1 to 2-inches tall, foxtail (mostly yellow with about 30% green foxtail) was 2 to 4-leaf and 0.5 to 1.5-inch tall, wild buckwheat was 2 to 5-leaf and 0.5 to 2-inches tall, common lambsquarters was 1 to 2-inches tall, and horseweed was 2 to 5-inches tall. Spraying was done between 9 and 11 a.m. Visual estimates of percent control were taken on June 14. Plot size was 10 by 25 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate (lb/A)	Weed control				
		KOCZ	Fxtl	Wibw	Colq	Howe
		(%)				
Glyphosate&2,4-D	0.188&0.17	90	72	70	-	85
Glyphosate&2,4-D+AS	0.188&0.17+2.5	86	80	77	98	86
Glyphosate&2,4-D	0.25&0.22	99	80	70	100	87
Glyphosate&2,4-D+AS	0.25&0.22+2.5	95	82	81	100	94
Glyphosate	0.375&0.33	100	77	90	100	94
Glyphosate	0.25	72	82	62	83	67
Paraquat+Diquat	0.375	95	76	80	97	75
Paraquat+Diquat	0.188+0.188	71	61	55	57	82
Paraquat+Diuron+Diquat	0.25+0.25	90	73	73	94	94
Paraquat+Diuron+Diquat	0.188+0.1+0.188	91	68	67	77	77
Paraquat	0.25+0.1+0.25	92	74	84	90	89
Paraquat	0.375	90	79	62	86	97
Paraquat+Diuron	0.5	98	69	64	92	100
Paraquat+Diuron	0.375+0.1	93	65	65	95	97
Paraquat+Cyanazine	0.5+0.1	93	68	59	100	98
Paraquat+Cyanazine	0.375+0.25	91	74	61	98	97
Paraquat&Fluazifop&Diuron	0.5+0.25	88	74	73	98	100
Paraquat&Fluazifop&Diuron	0.375&0.06&0.02	86	81	49	-	81
Para&Flfp&Diur+2,4-D	0.5&0.08&0.027	98	87	64	94	99
Para&Flfp&Diur+2,4-D	0.375&0.06&0.02+0.25	100	73	57	-	96
Control	0.5&0.08&0.027+0.25	99	82	74	99	96
	0	0	0	0	0	0
C.V. %		10	13	25	9	7
LSD 5%		13	13	23	11	9

[a]All treatments containing paraquat were applied with X-77 surfactant at 0.5% and the two treatments with glyphosate alone were applied with X-77 at 0.25%; Glyphosate&2,4-D = Landmaster II; Para&Flfp&Diur = Cyclone TEC; butoxyethyl ester formulation of 2,4-D was used; dry flowable formulation of cyanazine used; Paraquat = Cyclone; AS = ammonium sulfate.

Comments. None of the treatments gave acceptable burndown of foxtail and wild buckwheat. Foxtail control was probably limited by swaths of heavy chaff (deposited by the combine in 1987) that apparently protected smaller foxtail seedlings from spray. Diuron and ammonium sulfate did not consistently enhance the activity of paraquat and glyphosate, respectively.

Burndown of four-leaf oats, wheat, and foxtail millet, Fargo, 1988. Treatments were applied June 21 when oats (exper. variety 810814), wheat (Wheaton), and Siberian foxtail millet was 4-leaf, and redroot pigweed was 0.5 to 2-inches tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. At time of spraying, air temperature was 94 F and relative humidity was 65%. Plants appeared to be under some degree of drought stress at time of spraying. Visual estimates of percent control were taken on July 5. Plot size was 10 by 18 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate (lb/A)	Percent control			
		Oats	Wheat	Ftmi	Rrpw
		----------(%)---------			
HOE-00661+X77	1+0.5%	100	99	100	100
HOE-00661+X77+AS	1+0.5%+2.5	100	99	100	100
HOE-00661+X77	0.75+0.5%	98	92	99	98
HOE-00661+X77+AS	0.75+0.5%+2.5	97	93	100	99
Glyphosate&2,4-D+AS	0.188&0.17+2.5	98	99	97	100
Glyphosate&2,4-D+AS	0.25&0.22+2.5	99	99	99	99
Glyphosate&2,4-D+AS	0.375&0.33+2.5	99	99	100	100
Glyphosate+X77+AS	0.188+0.25%+2.5	100	100	100	99
Glyphosate+X77+AS	0.25+0.25%+2.5	100	100	99	99
Glyphosate+X77+AS	0.375+0.25%+2.5	100	100	99	99
Glyphosate+X77+AS	0.5+0.25%+2.5	100	100	100	100
Paraquat+X77	0.25+0.5%	87	93	69	99
Paraquat+X77	0.375+0.5%	91	95	74	100
Paraquat+X77	0.5+0.5%	95	98	80	100
Paraquat&Diuron+X77	0.375&0.015+0.5%	98	99	91	100
Paraquat&Diuron+X77	0.5&0.02+0.5%	97	98	93	99
Paraquat&Fluazifop&Diuron+X77	0.375&0.06&0.02+0.5%	96	97	88	98
Paraquat&Fluazifop&Diuron+X77	0.5&0.083&0.027+0.5%	97	97	92	100
Paraquat&Diuron+Diquat+X77	0.25&0.01+0.25+0.5%	94	96	86	100
Control	0	0	0	0	0
C.V. %		2	2	3	1
LSD 5%		3	3	4	1

[a]Glyphosate&2,4-D = Landmaster II; AS = ammonium sulfate; Paraquat = Cyclone; Paraquat&Diuron = Surefire TEC; Paraquat&Fluazifop&Diuron = Cyclone TEC; dry flowable formulation of cyanazine was used.

Summary. HOE-00661 at 1 lb/A provided complete control of all species, though the 0.75 lb/A rate was not as effective on wheat. All rates of glyphosate and Landmaster II gave essentially complete control of all species. Complete burndown with paraquat was achieved only with redroot pigweed and with the 0.5 lb/A rate on wheat. The inclusion of diuron (Surefire TEC) or fluazifop plus diuron (Cyclone TEC) tended to improve control over paraquat alone, particularly with foxtail millet.

Burndown of boot-stage oats, wheat, and foxtail millet, Fargo, 1988. Treatments were applied July 11 when oats (exper. variety 810814) were 14 inches tall, late boot to early heading, wheat (Wheaton) was 12 inches tall, late boot to early heading, Siberian foxtail millet was 16 inches tall, early boot, and redroot pigweed was 6 to 12 inches tall. Herbicides were applied with a bicycle wheel sprayer delivering 8.5 gal/A with 8001 nozzles and 40 psi. At time of spraying, air temperature was 71 F and relative humidity was about 50%. Plants had grown up under significant drought stress and were under stress at time of spraying. Visual estimates of percent control were taken on July 21. Plot size was 10 by 18 ft and the experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	Percent control			
		Oats	Wheat	Ftmi	Rrpw
	(lb/A)	----------(%)---------			
HOE-00661+X77	1+0.5%	87	97	98	99
HOE-00661+X77+AS	1+0.5%+2.5	94	97	99	99
Glyphosate&2,4-D+AS	0.188&0.17+2.5	42	61	75	70
Glyphosate&2,4-D+AS	0.25&0.22+2.5	45	62	87	70
Glyphosate&2,4-D+AS	0.375&0.33+2.5	54	72	93	79
Glyphosate+X77+AS	0.188+0.25%+2.5	35	63	78	39
Glyphosate+X77+AS	0.25+0.25%+2.5	39	70	88	50
Glyphosate+X77+AS	0.375+0.25%+2.5	52	84	95	71
Glyphosate+X77+AS	0.5+0.25%+2.5	71	92	95	83
Paraquat+X77	0.25+0.5%	89	90	87	84
Paraquat+X77	0.375+0.5%	93	94	90	91
Paraquat+X77	0.5+0.5%	98	95	93	91
Paraquat&Diuron+X77	0.375&0.015+0.5%	96	95	86	90
Paraquat&Diuron+X77	0.5&0.02+0.5%	97	95	88	89
Para&Flfp&Diur+X77	0.375&0.06&0.02+0.5%	98	96	89	87
Para&Flfp&Diur+X77	0.5&0.083&0.027+0.5%	99	97	90	92
Para&Diur+Diquat+X77	0.25&0.01+0.25+0.5%	98	95	89	89
Paraquat+Cyanazine+X77	0.375+0.25+0.5%	97	95	90	85
Control	0	0	0	0	0
C.V. %		9	7	4	8
LSD 5%		9	8	5	9

[a]Glyphosate&2,4-D = Landmaster II; AS = ammonium sulfate; Paraquat = Cyclone; Paraquat&Diuron = Surefire TEC; Para&Flfp&Diur = Cyclone TEC; dry flowable formulation of cyanazine was used.

Summary. Treatments involving glyphosate did not provide adequate burndown of any species with the marginal exception of the 0.375 and 0.5 glyphosate rates on foxtail millet. HOE-00661 gave nearly complete control of wheat, foxtail millet, and redroot pigweed, and 94% control of oats when mixed with ammonium sulfate. The best paraquat treatments gave nearly complete control of oats, about 95% control of wheat, and about 90% control of both foxtail millet and redroot pigweed. Diuron did not appear to increase the activity of paraquat, though the addition of either fluazifop or diquat did improve control in some cases.

Carryover injury to wheat by clomazone applied in fallow, Minot, 1988. Fall and spring treatments were applied October 9, 1986 and May 22, respectively, in untilled durum stubble using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Chlorsulfuron (0.33 oz/A) was applied over the entire experimental area in late fall of 1986 for weed control in 1987. 'Seward' winter wheat was seeded 1.5 inches deep (without tillage) on September 11, 1987. Fifty pounds of 11-52-0 was applied in the seed row at planting. Visual estimates of percent wheat injury (yellowing and bleaching of foliage) were taken on October 15, 1987 when winter wheat was in the 5-leaf stage. Tilled blocks were disked once (4-inches deep) on April 20, followed on the same day by planting of 'Stoa' spring wheat (1.5 inches deep) in both tilled and no-till plots, fertilized as above. Visual estimates of percent wheat injury were taken on May 18 when the spring wheat was 2.5 to 3-leaf and winter wheat was tillering and 5 to 8-inches tall. Winter wheat plots were combine harvested on July 20 and spring wheat was harvested July 28, 1988. Plot size was 16.5 by 25 feet and the experiment was a randomized complete block design with a split-plot arrangement of treatments. Soil type was a loam with pH 6.8 and 2.8% organic matter.

Wheat tillage system	Clomazone application timing	Clomazone rate	Spring wheat[a]		Winter wheat			
					Injury			
			Injury	Grain yield	Fall	Spring	Stand reduction	Grain yield
		(lb/A)	(%)	(bu/A)	----------(%)----------			(bu/A)
No-till	-	0	0	27	0	0	0	18
	Fall	0.5	-	-	0	1	25	21
		0.75	2	26	0	2	4	24
		1.0	3	24	0	5	6	21
		1.25	4	27	0	12	23	19
		1.5	5	26	0	14	17	22
		2.0	7	25	-	-	-	-
	Spring	0.5	2	23	-	-	-	-
		0.75	4	25	-	-	-	-
		1.0	6	26	-	-	-	-
		1.25	11	26	-	-	-	-
		1.5	11	25	-	-	-	-
		2.0	18	24	-	-	-	-
			LSD (0.05)	Rate	NS	8	NS	NS
Tilled	-	0	0	21	-	-	-	-
	Fall	0.75	4	22	-	-	-	-
		1.0	9	22	-	-	-	-
		1.25	9	24	-	-	-	-
		1.5	17	21	-	-	-	-
		2.0	32	23	-	-	-	-
	Spring	0.5	5	20	-	-	-	-
		0.75	12	20	-	-	-	-
		1.0	23	21	-	-	-	-
		1.25	33	22	-	-	-	-
		1.5	44	25	-	-	-	-
		2.0	43	22	-	-	-	-
LSD (0.05) Rate x Tillage			8	NS				

[a]There was a significant effect of tillage for spring wheat grain yield (no-till outyielded tilled plots) and a significant tillage and clomazone rate effect for spring wheat injury.

See next page for summary

See previous page for data

Summary. Injury to spring wheat planted in 1988 was greater when clomazone was applied in the spring of 1987 than when applied in the fall of 1986. Injury by clomazone residues in the soil was also greater when spring wheat was planted under tilled versus no-till conditions. This was probably due to the ability of wheat seedlings to more rapidly grow beneath the shallow zone of clomazone residues in no-till; with disking to a 4-inch depth, clomazone was distributed deeper and wheat roots thus were exposed over a longer period. Evidence supporting this interpretation was the observation of much higher injury in one drill row in no-till plots. Digging seedlings in this highly-injured row revealed that this row had been seeded at a depth of about 0.5 inches instead of 1.5 inches for the other rows. Injury to spring wheat by clomazone residues was estimated as high as 43% but grain yield was not significantly affected. Low yields due to drought may have masked yield reductions attributable to clomazone residues. Winter wheat sustained low levels of visible injury due to clomazone residues but, as with spring wheat, yields were not affected.

Carryover injury to wheat by clomazone applied in fallow, Williston, 1988. Fall and spring treatments were applied October 8, 1986 and May 18, respectively, in untilled wheat stubble using a bicycle wheel sprayer delivering 17 gal/A with 8002 nozzles and 40 psi. Chlorsulfuron (0.25 oz/A) was applied over the entire experimental area in late fall of 1986 for weed control in 1987. 'Seward' winter wheat was seeded 1.5 inches deep (without tillage) on September 8, 1987. Fifty pounds of 18-46-0 was applied in the seed row at planting. Visual estimates of percent wheat injury (yellowing and bleaching of foliage) were taken on October 14, 1987 when winter wheat was in the 5-leaf stage. Tilled blocks were tilled once with a field cultivator (3-inches deep) on April 26, followed on the same day by planting of 'Stoa' spring wheat (1.5 inches deep) in both tilled and no-till plots. The entire experimental area received diclofop (1 lb/A) for control of foxtail. Visual estimates of percent wheat injury were taken on May 17 when the spring wheat was 2.5 to 3-leaf and winter wheat was tillering and 5 to 8-inches tall. Plots were combine harvested on July 20. Plot size was 16.5 by 25 feet and the experiment was a randomized complete block design with a split-plot arrangement of treatments. Soil type was a fine sandy loam with pH 6.5 and 2% organic matter.

Clomazone application timing	Clomazone rate	Spring wheat[a]		Winter wheat			
		Injury	Grain yield	Injury		Stand reduction	Grain yield
				Fall	Spring		
	(lb/A)	(%)	(bu/A)	----------(%)----------			(bu/A)
-	0	0	4.5	0	0	0	3.1
Fall	0.5	-	-	1	0	2	4.5
	0.75	1	6.5	2	0	4	4.0
	1.0	2	5.4	1	0	1	4.4
	1.25	4	6.0	3	1	1	3.7
	1.5	3	6.2	5	2	5	3.9
	2.0	11	4.2	-	-	-	-
Spring	0.5	2	5.8	-	-	-	-
	0.75	4	5.5	-	-	-	-
	1.0	11	3.7	-	-	-	-
	1.25	17	4.4	-	-	-	-
	1.5	23	4.9	-	-	-	-
	2.0	36	4.7	-	-	-	-
LSD (0.05) Rate		10	NS	NS	NS	NS	NS

[a]Tillage effect was not significant for both injury and grain yield; data are combined across tillage.

Summary. Injury to spring wheat planted in 1988 following fall 1986 applications of clomazone was low and ranged to 11% for the 2 lb/A rate of clomazone. Clomazone applied in the spring of 1987, however, caused significantly greater injury to spring wheat planted one year later. This injury, which ranged up to 36% for the 2 lb/A rate of clomazone, was not reflected in reduced yield. Grain yields in 1988 were severely limited by drought, a situation that probably precluded the expression of grain yield reductions by carryover residues of clomazone. Injury and stand reductions in winter wheat were only mildly affected by clomazone residues. As with spring wheat, grain yield of winter wheat was low due to drought and was not affected by clomazone residues in the soil.

False chamomile control on fallow and noncrop land, Mohall, 1988. Postemergence herbicides were screened for winter annual false chamomile control on fallow or wetland areas near Mohall. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi to 8 to 14 inch and budding false chamomile on June 2 with sunny skies and 85 F. Visual estimates of percent control were taken on July 26.

Treatment[a]	Rate (oz/A)	False chamomile control (%)
Chlorsulfuron+X-77	0.25+0.25%	91
Metsulfuron+X-77	0.06+0.25%	96
Metsulfuron+2,4-D-bee+X-77	0.06+2+0.25%	91
Sulfometuron+X-77	1.5+0.25%	29
Sulfometuron+2,4-D-bee+X-77	1.5+16+0.25%	51
DPX-M6316+X-77	0.25+0.25%	21
DPX-M6316+X-77	0.5+0.25%	28
DPX-L5300+X-77	0.125+0.25%	58
DPX-L5300+X-77	0.25+0.25%	75
DPX-M6316&DPX-L5300+X-77	0.17&0.08+0.25%	50
DPX-M6316&DPX-L5300+X-77	0.33&0.17+0.25%	71
CGA-131036+X-77	0.25+0.25%	76
Clopyralid+X-77	3+0.25%	28
Imazethapyr+X-77	1+0.25%	23
C.V. %		13
LSD 5%		11

[a]bee = butoxyethanol ester; DPX-M6316&DPX-L5300 = DPX-R9674.

Summary. Chlorsulfuron, metsulfuron, and metsulfuron plus 2,4-D gave 91% or higher control of winter annual false chamomile. CGA-131036 gave 15% lower control than metsulfuron or chlorsulfuron. DPX-M6316 and sulfometuron gave less chamomile control than all other sulfonylurea herbicides. Clopyralid and imazethapyr did not adequately control false chamomile.

Paraquat and sethoxydim plus 2,4-D for no-till burndown, Fargo, 1988. Treatments were applied May 10 (early), May 26 (mid), and June 2 (late) when kochia was 0.5 to 1.5, 3 to 6, and 8 to 14 inches tall, respectively. A second flush of 0.5 to 3 inch tall kochia was also present on June 2. Wild oats were 3 to 6-leaf and tillering (4 to 10 inches tall) on May 26 and green foxtail was 2 to 3-leaf on June 2. Herbicides were applied with a bicycle wheel spayer delivering 17 gal/A with 8002 nozzles and 35 psi for treatments involving paraquat and diquat, and 8.5 gal/A with 8001 nozzles and 35 psi for all other treatments. Environmental conditions were as follows: on May 10, relative humidity (RH) was 17%, air temperature was 69 F, and wind was 10 to 12 mph; on May 26, RH was 57%, air temp was 71 F, and wind was 4 to 8 mph; on June 2, RH was 59%, air temp was 81 F, and wind was 0 to 2 mph. Visual estimates of percent control were taken on June 3 (24 days after treatment) for the early application, June 20 (25 DAT) for the mid application, and June 24 (22 DAT) for the late application. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate[a]	Early	Mid		Late	
		KOCZ	KOCZ	Wioa	KOCZ	Grft
	(lb/A)	---------(% control)--------				
Paraquat+X77	0.5+0.5%	87	94	85	80	71
Paraquat+X77	0.375+0.5%	83	89	58	76	57
Paraquat+X77	0.25+0.5%	85	86	48	45	44
Paraquat+Diuron+X77	0.5+0.1+0.5%	91	98	84	81	83
Paraquat+Diuron+X77	0.375+0.1+0.5%	85	88	45	76	71
Paraquat+Diuron+X77	0.25+0.1+0.5%	83	90	41	59	67
Paraquat+Diuron+X77	0.188+0.1+0.5%	83	86	23	52	56
Paraquat+2,4-D-bee+X77	0.25+0.25+0.5%	94	90	38	88	71
Para+2,4-D-bee+Diuron+X77	0.25+0.25+0.1+0.5%	95	95	36	84	77
Diquat+X77	0.5+0.5%	25	86	13	45	46
Diquat+2,4-D-bee+X77	0.25+0.25+0.5%	92	87	18	69	61
Paraquat+Diquat+X77	0.25+0.25+0.5%	82	90	48	68	70
Paraquat+Diquat+X77	0.188+0.188+0.5%	82	86	30	63	57
Sethoxydim+2,4-D-bee+OC	0.1+0.5+0.25G	94	83	75	75	79
Sethoxydim+2,4-D-bee+OC	0.05+0.5+0.25G	95	77	62	80	81
Sethoxydim+2,4-D-bee+OC	0.025+0.5+0.25G	94	89	30	79	45
Seth+2,4-D-bee+28%UAN+OC	0.1+0.5+1G+0.25G	92	80	82	77	84
Seth+2,4-D-bee+28%UAN+OC	0.075+0.5+1G+0.25G	96	86	75	74	76
Seth+2,4-D-bee+28%UAN+OC	0.05+0.5+1G+0.25G	94	84	58	78	78
Seth+2,4-D-bee+Dash	0.1+0.5+0.25G	94	77	85	75	79
Seth+2,4-D-bee+Dash	0.075+0.5+0.25G	93	75	81	78	82
Seth+2,4-D-bee+Dash	0.05+0.5+0.25G	88	85	84	77	80
Control	0	0	0	0	0	0
LSD 5%		7	10	17	11	18

[a]X77 = X-77 surfactant; 2,4-D-bee = butoxyethyl ester; OC = petroleum oil with 17% emulsifier; 28%UAN = 28% urea ammonium nitrate solution; Dash = trade name of BASF surfactant of proprietary composition; G = gallons per acre (i.e. 0.25G = 1 quart per acre).

Summary. Paraquat and diquat were most efficacious on kochia when applied to 3 to 6-inch plants; 8 to 14-inch kochia were least controlled by these herbicides. Sethoxydim plus 2,4-D mixtures, however, gave highest kochia control when applied to the smallest plants. Control of wild oats or foxtail was inadequate on all treat-treatments. Diuron tended to increase control by paraquat but enhancement was neither dramatic nor consistent. 2,4-D provided significant enhancement of kochia control by paraquat when compared to paraquat alone.

Paraquat and sethoxydim plus 2,4-D for no-till burndown, Pillsbury, 1988. Treatments were applied June 1 (early), June 10 (mid), and June 16 (late) when green foxtail was in the 1 to 4-leaf, 4 to 5-leaf (tillering, 6 to 9 inches tall), and 5-leaf (7 to 12 inches tall) stage, respectively. Redroot pigweed was in the 6 to 10-leaf stage on June 16. Herbicides were applied with a bicycle wheel spayer delivering 17 gal/A with 8002 nozzles and 35 psi for treatments involving paraquat and diquat, and 8.5 gal/A with 8001 nozzles and 35 psi for all other treatments. Environmental conditions for these dates were as follows: on June 1, relative humidity (RH) was 48%, air temperature was 87 F, and wind was 6 to 10 mph; on June 10, RH was 34%, air temp was 80 F, and wind was 15 mph, gusting to 25 mph; on June 16, RH was 44%, air temp was 76 F, and wind was 10 to 12 mph. Visual estimates of percent control were taken on June 17 (16 days after treatment) for the early application, June 24 (14 DAT) for the mid application, and June 29 (13 DAT) for the late application. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Early	Mid	Late	
		Grft	Grft	Grft	Rrpw
	(lb/A)	(% control)			
Paraquat+X77	0.5+0.5%	85	71	73	-
Paraquat+X77	0.375+0.5%	86	70	65	-
Paraquat+X77	0.25+0.5%	82	43	54	37*
Paraquat+Diuron+X77	0.5+0.1+0.5%	96	76	80	-
Paraquat+Diuron+X77	0.375+0.1+0.5%	88	73	79	56*
Paraquat+Diuron+X77	0.25+0.1+0.5%	87	55	80	45
Paraquat+2,4-D-bee+X77	0.1875+0.1+0.5%	81	34	73	53
Para+2,4-D-bee+Diuron+X77	0.25+0.25+0.5%	79	48	60	68*
Seth+2,4-D-bee+OC	0.25+0.25+0.1+0.5%	87	53	69	80*
Seth+2,4-D-bee+OC	0.1+0.5+0.25G	90	63	58	65
Seth+2,4-D-bee+OC	0.05+0.5+0.25G	82	40	41	57*
Seth+2,4-D-bee+28%UAN+OC	0.025+0.5+0.25G	61	25	39	59
Seth+2,4-D-bee+28%UAN+OC	0.1+0.5+1G+0.25G	95	69	57	68*
Seth+2,4-D-bee+28%UAN+OC	0.075+0.5+1G+0.25G	87	58	55	68*
Seth+2,4-D-bee+Dash	0.05+0.5+1G+0.25G	81	48	53	71*
Seth+2,4-D-bee+Dash	0.1+0.5+0.25G	85	63	64	55
Seth+2,4-D-bee+Dash	0.075+0.5+0.25G	94	70	58	-
Diquat+X77	0.05+0.5+0.25G	82	54	49	54
Diquat+2,4-D-bee+X77	0.5+0.5%	78	31	48	-
Paraquat+Diquat+X77	0.25+0.25+0.5%	56	26	51	61*
Paraquat+Diquat+X77	0.25+0.25+0.5%	91	58	66	-
Control	0.188+0.188+0.5%	83	45	53	36
	0	0	0	0	0
LSD 5% for comparisons involving no *		12	18	12	20
LSD 5% for comparisons involving one *					21
LSD 5% for comparisons involving two *					23

[a] X77 = X-77 surfactant; 2,4-D-bee = butoxyethyl ester; OC = petroleum oil with 17% emulsifier; 28%UAN = 28% urea ammonium nitrate solution; Dash = trade name of BASF surfactant of proprietary composition; G = gallons per acre (i.e. 0.25G = 1 quart per acre).

Summary. Treatments applied on 5-leaf and larger green foxtail (mid and late application timings) provided only fair to poor control. The early application generally gave better control although few treatments showed control percentages of mid-90s or above. Diuron appeared to enhance control by paraquat. Dash and 28% urea ammonium nitrate did not appear to enhance foxtail control by sethoxydim plus 2,4-D combinations. Foxtail control by diquat or diquat plus paraquat combinations was comparable to control provided by paraquat alone at equivalent rates of herbicide.

Glyphosate and HOE-00661 for no-till burndown, Fargo, 1988. Treatments were applied May 10 (early), May 26 (mid), and June 2 (late) when kochia was 0.5 to 1.5, 1.5 to 5, and 8 to 14 inches tall, respectively. A second flush of kochia was present on June 2 and was 0.5 to 3 inches tall. Wild oats were 3 to 4-leaf (5 to 8 inches tall) on May 26 and green foxtail was 2 to 3-leaf on June 2. Herbicides were applied with a bicycle wheel spayer 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 were as follows: on May 10, relative humidity (RH) was 17%, air temperature was 69 F, and wind was 10 to 12 mph; on May 26, RH was 57%, air temp was 71 F, and wind was 4 to 8 mph; on June 2, RH was 59%, air temp was 81 F, and wind was 0 to 2 mph. Visual estimates of percent control were taken on June 3 (24 days after treatment) for the early application, June 20 (25 DAT) for the mid application, and June 24 (22 DAT) for the late application. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Early	Mid		Late	
		KOCZ	KOCZ	Wioa	KOCZ	Grft
	(lb/A)	--------(% control)--------				
Glyphosate+X77	0.5+0.5%	72	98	-	96	84
Glyphosate+X77	0.375+0.5%	71	96	97*	92	78
Glyphosate+X77	0.25+0.5%	50	93	94	77	65
Glyphosate+AS+X77	0.5+2.5+0.5%	73	97	96	94	85
Glyphosate+AS+X77	0.375+2.5+0.5%	76	93	94	95	82
Glyphosate+AS+X77	0.25+2.5+0.5%	37	91	91*	86	75
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	94	99	-	97	81*
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	93	98	74	93	76
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	93	98	-	93	86
Glyt&2,4-D+2,4-D-dma+AS	0.375&0.33+0.17+2.5	94	98	97	93	75
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	95	100	-	96	84
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	85	77	-	96	86
HOE-00661+X77	1+0.5%	51	91	48*	85	70
HOE-00661+X77	0.75+0.5%	36	85	49*	81	73
HOE-00661+X77	0.5+0.5%	45	64	-	67	60
HOE-00661+Glyphosate+X77	0.75+0.25+0.5%	72	86	53*	65	58*
HOE-00661+Glyphosate+X77	0.75+0.188+0.5%	58	86	66*	78	65
HOE-00661+Glyphosate+X77	0.5+0.25+0.5%	34	77	46	76	60
HOE-00661+Glyphosate+X77	0.5+0.188+0.5%	46	80	43*	78	67
HOE-00661+Glyphosate+X77	0.375+0.25+0.5%	19	73	34*	73	71
HOE-00661+Glyphosate+AS+X77	0.375+0.25+2.5+0.5%	34	99	95	76	65
HOE-00661+Glyphosate+X77	0.375+0.188+0.5%	35	69	43*	69	67
Control	0	0	0	0	0	0
LSD 5% for comparisons involving no *		22	6	19	9	17
LSD 5% for comparisons involving one *				21		18
LSD 5% for comparisons involving two *				22		20

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

Summary. The only treatments providing greater than 90% control of 0.5 to 1.5 inch kochia were those involving glyphosate plus 2,4-D. Later kochia stages were more easily controlled and greater than 90% control was achieved with glyphosate or glyphosate plus 2,4-D. Wild oats were controlled most effectively by glyphosate. excellent foxtail burndown was not provided by any treatments. Control was often enhanced by addition of ammonium sulfate. Glyphosate applied with HOE-00661 generally gave less control than equal amounts of glyphosate applied alone.

Glyphosate and HOE-00661 for no-till burndown, Pillsbury, 1988. Treatments were applied June 1 (early) and June 9 (late) when green foxtail was 1 to 4-leaf and 4 to 5-leaf and tillering (6 to 9 inches tall), respectively. Redroot pigweed was in the 5 to 8-leaf stage on June 9. 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 were as follows: on June 1, relative humidity (RH) was 48%, air temperature was 87 F, and wind was 3 to 6 mph; on June 9, RH was 39%, air temp was 69 F, and wind was 10 to 12 mph with gusts of 20 to 25. Visual estimates of percent control were taken on June 17 (16 days after treatment) for the early application and June 24 (15 DAT) for the late application. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate	Weed control		
		Early	Late	
	(lb/A)	Grft	Grft	Rrpw
		-------	(%)	-------
Glyphosate+X77	0.5+0.5%	73	92	90*
Glyphosate+X77	0.375+0.5%	78	87	93*
Glyphosate+X77	0.25+0.5%	70	73	66
Glyphosate+AS+X77	0.5+2.5+0.5%	77	96	95
Glyphosate+AS+X77	0.375+2.5+0.5%	77	94	91
Glyphosate+AS+X77	0.25+2.5+0.5%	74	83	-
Glyt&2,4-D+2,4-D-dma	0.375&0.33+0.17	75	83	88
Glyt&2,4-D+2,4-D-dma	0.25&0.22+0.28	72	70	66*
Glyt&2,4-D+2,4-D-dma	0.188&0.17+0.33	71	73	60
Glyt&2,4-D+2,4-D-dma+AS	0.375&0.33+0.17+2.5	79	83	90
Glyt&2,4-D+2,4-D-dma+AS	0.25&0.22+0.28+2.5	72	85	83
Glyt&2,4-D+2,4-D-dma+AS	0.188&0.17+0.33+2.5	73	78	75*
HOE-00661+X77	1+0.5%	71	77	69*
HOE-00661+X77	0.75+0.5%	70	65	53
HOE-00661+X77	0.5+0.5%	63	46	39
HOE-00661+Glyphosate+X77	0.75+0.25+0.5%	75	60	58
HOE-00661+Glyphosate+X77	0.75+0.188+0.5%	75	57	43
HOE-00661+Glyphosate+X77	0.5+0.25+0.5%	72	54	45
HOE-00661+Glyphosate+X77	0.5+0.188+0.5%	67	46	53
HOE-00661+Glyphosate+X77	0.375+0.25+0.5%	71	58	76
HOE-00661+Glyphosate+AS+X77	0.375+0.25+2.5+0.5%	68	70	-
HOE-00661+Glyphosate+X77	0.375+0.188+0.5%	68	43	39*
Control	0	0	0	0
LSD 5% for comparisons involving no *		5	13	22
LSD 5% for comparisons involving one *				24
LSD 5% for comparisons involving two *				26

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

Summary. All treatments provided between about 65 and 80% green foxtail control at the early application timing. Greater foxtail control was achieved at the late application, although control percentages as high as the mid-90s were obtained only with the highest rates of glyphosate plus ammonium sulfate. HOE-00661 appeared to antagonize the effect of glyphosate on green foxtail. Best control of redroot pigweed was obtained with glyphosate or glyphosate plus ammonium sulfate.

Burndown efficacy of residual herbicides, Fargo and Pillsbury, 1988. At Pillsbury, cyanazine treatments were applied on June 1 when green foxtail was 1 to 4-leaf, while imazethapyr and linuron were applied June 10 when green foxtail was 4 to 5-leaf with some tillering. Environmental conditions at Pillsbury were as follows: on June 1, relative humidity (RH) was 48%, air temperature was 87 F, and wind was 10 to 12 mph; on June 10, RH was 34%, air temp was 80 F, and wind was 15 mph with gusts to 25 mph. At Fargo, cyanazine treatments were applied June 2 when green foxtail was 2 to 4-leaf, kochia was 0.5 to 8 inches tall, and redroot pigweed was 2 to 4-leaf. Imazethapyr and linuron were applied at Fargo on June 9 when green foxtail was 4 to 6-leaf, kochia was 4 to 14 inches tall, and redroot pigweed was 4 to 6-leaf. Environmental conditions at Fargo were as follows: on June 2, RH was 40%, air temp was 90 F, and wind was 0 to 2 mph; on June 9, RH was 39%, air temp was 67 F, and wind was 8 to 12 mph. 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 June 29 at Pillsbury and June 30 at Fargo. Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Weed control (%) Fargo Grft	Fargo KOCZ	Fargo Rrpw	Pillsbury Grft
Cyanazine-L+OC	2+0.25G	59	80*	72	50
Cyanazine-L+Dash	2+0.25G	40	59*	47	48
Cyanazine-L+OC	2.5+0.25G	78	83*	69	39
Cyanazine-L+Dash	2.5+0.25G	69	77*	70	49
Cyanazine-L+OC	3+0.25G	67	87	87	42
Cyanazine-L+Dash	3+0.25G	66	88*	73	61
Imazethapyr+X77	0.063+0.5%	84	77	87	61
Imazethapyr+OC	0.063+0.25G	85	71*	87	65
Imazethapyr+Dash	0.063+0.25G	90	84	85	69
Imazethapyr+X77	0.094+0.5%	87	73	86	70
Linuron+X77	0.75+0.5%	43	64*	69*	26
Linuron+OC	0.75+0.25G	55	88	92	25
Linuron+Dash	0.75+0.25G	39	70	81	31
Linuron+X77	1.25+0.5%	63	83	95	26
Linuron+OC	1.25+0.25G	61	83	90	44
Linuron+Dash	1.25+0.25G	69	87*	94*	31
Control	0	0	0	0	0
LSD 5% for comparisons involving no *		21	12	21	21
LSD 5% for comparisons involving one *			13	23	
LSD 5% for comparisons involving two *			14	24	

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

Summary. None of the treatments provided acceptable burndown of green foxtail. Kochia control was generally higher than foxtail control but did not exceed 90% for any of the treatments. Redroot pigweed control from 90 to 95% was achieved with 1.25 lb/A of linuron. No clear differences were apparent between control obtained with oil adjuvant, X-77, or Dash.

Antagonism of glyphosate burndown by residual herbicides, Fargo, 1988. Treatments were applied June 2 when wild oats were 4 to 5-leaf and tillering and foxtail (mostly green with some yellow foxtail) was 2 to 3-leaf. 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 94 F, relative humidity was 32%, and wind was 0 to 4 mph. Visual estimates of percent weed control were taken on June 24 (22 days after treatment). Plot size was 10 by 25 ft and the experiment was a randomized complete block design having four replications.

Treatment[a]	Rate (lb/A)	Weed control Wioa	Fxtl[a]
		----(%)-----	
Glyphosate	0.375	78	83
Glyphosate	0.25	56	73
Metolachlor+Glyphosate	2.5+0.375	71	78
Metolachlor+Glyphosate	2.5+0.25	58	69
Alachlor+Glyphosate	2.5+0.375	77	81
Alachlor+Glyphosate	2.5+0.25	63	68
Alachlor-MT+Glyphosate	2.5+0.375	33	35
Alachlor-MT+Glyphosate	2.5+0.25	30	34
Propachlor+Glyphosate	4+0.375	37	49
Propachlor+Glyphosate	4+0.25	52	45
Pendimethalin+Glyphosate	1.5+0.375	71	78
Pendimethalin+Glyphosate	1.5+0.25	56	69
Chloramben+Glyphosate	2.5+0.375	61	74
Chloramben+Glyphosate	2.5+0.25	45	60
Metribuzin+Glyphosate	0.375+0.375	71	77
Metribuzin+Glyphosate	0.375+0.25	55	63
Imazethapyr+Glyphosate	0.063+0.375	82	89
Imazethapyr+Glyphosate	0.063+0.25	63	78
Imazethapyr+Glyphosate	0.063+0.188	59	69
Imazethapyr	0.063	35	44
Cinmethylin+Glyphosate	1.25+0.375	81	88
Cinmethylin+Glyphosate	1.25+0.25	71	79
Control	0	0	0
LSD 5%		12	11

[a] X-77 surfactant was tank-mixed with all treatments at 0.5%; Alachlor-MT = microencapsulated formulation of alachlor (Lasso MicroTech); Fxtl = predominantly green foxtail with some yellow foxtail.

Summary. Wild oat control by glyphosate was reduced substantially by alachlor-MT and propachlor and to a lesser extent by chloramben. Similar results were obtained with foxtail control.

Common milkweed control on fallow, Minot 1988. Treatments were applied with a bicycle wheel plot sprayer delivering 8.5 gpa at 35 psi to post flowering 20 to 30 inch common milkweed on July 20 with sunny skies and 70 F and 10 to 15 mph NW winds. Evaluations were made on August 4.

Treatment	Rate	Milkweed
	(lb/A)	(% control)
2,4-D bee	2	36
Dicamba	1	71
2,4-D dma + Dicamba	1+0.25	26
2,4-Dp & 2,4-D & Dicamba	2.25	64
2,4-Dp	1	20
Clopyralid & 2,4-D	1.2	13
Triclopyr & 2,4-D	3	84
Picloram	0.5	86
Sulfometuron + X-77	0.0625+0.25%	5
DPX-L5300 + X-77	0.015+0.25%	4
DPX-L5300 + X-77	0.0625+0.25%	5
Fluroxypyr	0.125	44
Fluroxypyr	0.25	63
Glyphosate + X-77	1.5+0.25%	56
C.V. %		31
LSD 5%		18
F-TRT		22

a bee = butoxyethanol ester; Clopyralid & 2,4-D = Curtail; Triclopyr & 2,4-D = Crossbow; Fluroxypr = Starane; X-77 = surfactant;

Summary

Evaluations in the year of treatment indicate that picloram and triclopyr & 2,4-D cause the most initial injury to common milkweed and the sulfonyl urea herbicides the least. An evaluation during the spring of 1989 will be made of the treated areas to determine herbicide effectiveness for common milkweed control the year following treatment.