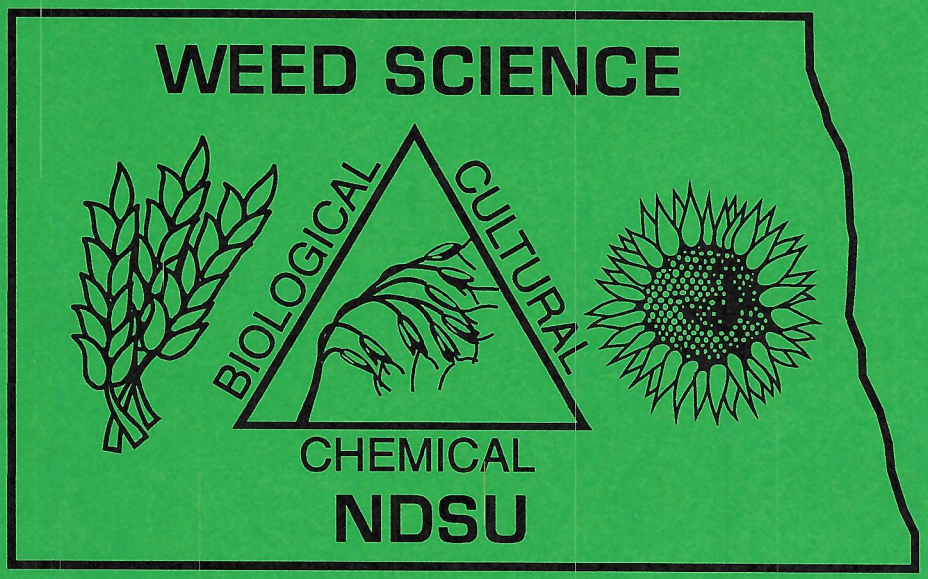
1997
NORTH DAKOTA
Weed Control Research



Weed Research Projects, Department of Crop and Weed Sciences
NORTH DAKOTA STATE UNIVERSITY
Fargo, N.D. 58105

NOT FOR PUBLICATION

SUMMARY OF 1997
WEED CONTROL EXPERIMENTS

Plant Sciences Department
North Dakota State University
Fargo, North Dakota

A. G. Dexter
R. G. Lym
C. G. Messersmith
J. D. Nalewaja
R. K. Zollinger

Research Scientists
A. J. Fischer
S. Grzes
F. A. Manthey
P. Milkowski

Research Specialists
K. M. Christianson
J. D. Davidson
S. A. Fitterer
J. L. Luecke

Technicians
M. G. Ciernia
S. F. Mark
R. F. Roach

Graduate Research Assistants
E. R. Bergeson
D. E. Bruns
D. C. Hauf
D. M. Mackle
C. M. Mayo
J. A. Nelson
B. K. Ramsdale
P. Zohu

Experiments conducted in cooperation with:
Mark Bredehoeft, Southern Minnesota Beet Sugar Cooperative
Brad Brummond, Walsh County Extension Service
Patrick Carr, Dickinson Research Center
Greg Endres, Carrington Research Extension Cneter
Eric Eriksmoen, Hettinger Research Extension Center
Terry Gregoire, NDSU Extension Service
Burton Johnson, North Dakota State University
Glenn Martin, Dickinson Research Center
Duane Preston, Potato Research Farm, Grand Forks, ND
Neil Riveland, Williston Research Center
Blaine Schatz, Carrington Research Extension Center
Dale Seibert, Richland County Extension Service
Tom Teigen, Agronomy Seed Farm at Casselton and Prosper
Mark Zarnstorff, North Central Res/Ext Center at Minot
Steve Zwinger, Carrington Research Extension Center

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
Weed control in small grain, alfalfa, canola, and application technology, titles II
Weed control in corn, potato, soybean, dry bean, and sunflower, titles III
Perennial weed control, titles V
Climatic data, Carrington VI
Climatic data, Casselton. VII
Climatic data, Crookston VIII
Climatic data, Dickinson IX
Climatic data, Fargo. X
Climatic data, Hettinger. XI
Climatic data, Minot XII
Climatic data, Olivia XIII
Climatic data, Prosper. XIV
Climatic data, St. Thomas. XV
Climatic data, Williston. XVI
Soil Characteristics XVII
Key to abbreviations XVIII
List of adjuvants XX
List of herbicides tested. XXII

Gold Section: **Sugarbeet Weed Control**

Soil applied herbicides plus postemergence herbicides applied with high pressure, Fargo 1
Soil applied, lay-by and postemergence herbicides, Crookston 2-3
Soil applied, lay-by and postemergence herbicides, Renville 4
Preemergence herbicide burndown, Crookston 5
Postemergence herbicides, Arthur 6
Postemergence herbicides, Buffalo Lake 7
Postemergence herbicide rates, Crookston 8-9
Postemergence herbicide rates, Fargo 10-11
Postemergence herbicides, Minto 12
Postemergence herbicides, Ortonville 13
Postemergence herbicides, Renville 14
Postemergence herbicides, St. Thomas 15
Postemergence herbicides, Wahpeton 16-17
Smartweed control in sugarbeet, Mahnomen 18
Sugarbeet variety and herbicide interaction, Fargo 19-21
Grass control in sugarbeet, Crookston 22-23
Grass control in sugarbeet, Fargo 24-25
Growth regulators on sugarbeet, Fargo 26
Growth regulators on sugarbeet, St. Thomas 27
Herbicide carryover, Fargo 28-29
V-53482 herbicide safety and carryover, Fargo 30
Glufosinate plus triflusulfuron, Crookston 31
Glufosinate on Liberty Link sugarbeet, Crookston and Fargo 32-36
Time between split applications to Liberty Link sugarbeet, Crookston and Fargo 37-39
Timing of first application to Liberty Link sugarbeet, Crookston and Fargo. 40-44
Herbicides on Liberty Link sugarbeet, Fargo 45
Cultivation of Liberty Link sugarbeet, Crookston and Fargo 46-48
Glyphosate plus triflusulfuron, Crookson 49
Roundup Ready sugarbeet, Crookston and Fargo 50-54
Herbicides on Roundup Ready sugarbeet, Fargo 55
Cultivation of Roundup Ready sugarbeet, Crookston and Fargo. 56-58

Green section: General Weed Control in Small Grains, Alfalfa, Canola, and Application Technology

SMALL GRAIN

Wild oat control, Fargo 1
Wild oat control, Hettinger 2
Wild oat control, Minot 3
Wild oat control, Williston 4
Wild Oat Control in Barley, Ada 5
Antagonism of wild oat control herbicides, Fargo 6
Wild oat control herbicides with Sulfonylureas, Fargo 7
Imazamethabenz plus adjuvants and split applications for wild oat control, Fargo 8
Imazamethabenz spray volume droplet size in wheat, Fargo 9
Tralkoxydim for wild oats control, Fargo 10
Trakoxydim Plus Scoil for Wild Oat Control, Fargo 11
Tralkoxydim with adjuvants, Fargo 12
Achieve for weed control in wheat, Carrington 1997 13
Tralkoxydim grassy weed control in Wheat, Cando 1997 14
HOE-1133 for wild oat and broadleaf weed control, Fargo 15
MON 37500 for wild oat control, Fargo 16
Herbicide split applications with adjuvants, Fargo 17
CGA-184927 control of wild oats in wheat, Fargo 18
Clodinafop for grassy weed control in Wheat, Cando, 1997 19
Hard red spring wheat cultivar response to Avenge, Casselton and Prosper, 1997 . . . 20-22
Tralkoxydim for Foxtail Control, Fargo 23
MON 37500 split applied for foxtail control, Fargo 24
HOE-1133 Antagonism for foxtail Control in Durum, Fargo 25
CGA-184927 in Wheat for Green and Yellow Foxtail Control, Fargo 26
Adjuvants with Foxtail control Herbicides in Durum, Fargo 27
Propanil DG split application, Fargo 1997 28
Small grain cultivar response to trifluralin, Carrington 1997 29-31
Broadleaf Weed Control in Wheat, Fargo 32
Broadleaf Weed Control in Wheat, Carrington 33
Broadleaf Weed Control, Hettinger 34
Broadleaf Weed Control, Minot 35
Bromoxynil and F8426 for Broadleaf Weed Control in Wheat, Fargo 36
Bromoxynil Formulation for Weed Control in Wheat 37
Fluroxypyr for Weed Control in Wheat, Fargo 38
Oat cultivar response to fluroxypyr, Fargo, 1997 39

CRP/Breakout

Perennial grass control in CRP - grazed and no-till, Steele Co., 1996-1997 40
Vegetation control in CRP - grazed plus tilled, Steele Co., 1996-1997 41
Perennial grass control in CRP, (Exp. 1) 1997, Steele Co. 1997 42
Perennial grass control in CRP, (Exp. 2) 1997, Steele Co. 1997 43
Perennial grass control in CRP (Exp. 3) 1997, Steele Co. 1997 44

MISCELLANEOUS CROPS

Clopyralid and Picloram injury in Canola, Devils Lake 1997 45
Preplant, preemergence and postemergence herbicides for weed management in Canola at Minot ND in 1997 46-47
Borage and camelina herbicide screening trial, Carrington 1997 48
Weed control in field pea, Carrington 49-50
Mechanical and/or chemical weed control in field pea, Carrington 1997 51-52

HERBICIDE APPLICATION TECHNOLOGY

Imazamox (Raptor with adjuvants on flax, Soybeans, and Millet , Grand Forks 1997 . . 53
Imazethapyr rate, adjuvants, and droplet size on species, Fargo 54
Imazethapyr spray volume on wheat, flax, and sunflower, Fargo 1997 55
Imazethapyr with Adjuvants, Grand Forks 1997 56
Imazamethabenz with adjuvants and spray volume, Fargo 57
Sethoxydim spray volume and droplet size, Fargo 1997 58
Adjuvants with CGA-184927, Fargo 59
Glyphosate spray volume and droplet size on species, Fargo 60
Quizalofop with adjuvants on oats, proso millet, and foxtail millet, Fargo 1997 61
Nicosulfuron spray volume and AMS, Fargo 1997 62
Spray Volume with Bromoxynil, Fargo 63

Blue section: Weed Control in Corn, Potato, Soybean, Drybean, and Sunflower

CORN

EXP311301A in corn PE, Casselton 1997 1
PPI vs PP incorporated EXP31130A with corn 2
Adjuvants with Nicosulfuron in Corn, Casselton 1997 3
Weed control in corn, 1997, Galchutt 4-5
Glufosinate tolerant corn, 1997, Casselton 6-7
IMI tolerant corn, 1997, Casselton 8-9
PRE weed control in corn, 1997, Casselton 10
Soil applied corn herbicides, 1997, Casselton 11
Weed control in corn, 1997, Casselton 12
Weed control in corn, 1997, Carrington 13
Accent with Placement drift control agent in corn, 1997, Casselton 14
Adjuvants with Accent, 1997, Casselton 15

POTATO

Potato response to Matrix, Prosper, 1997 16
Matrix vs cultivation on potato yield, Prosper, 1997 17
Weed control in potato, Drayton, 1997 18
Weed control in potato, Oakes, 1997 19
Matrix with adjuvants, NW-22, 1997 20
Potato response to Prism, Prosper and Oakes, 1997 21
Potato vine kill, Oakes, 1997 22
Potato vine kill, Prosper, 1997 23

SOYBEAN

POST Weed Control in soybean, Casselton 1997 24
AC-299263 Weed Control in Soybean, Casselton 1997 25
Bentazon with Adjuvants in Soybean, Casselton 1997 26
Soil and POST treatments in soybeans, Barney, 1997 27-28
Soil and POST weed control in soybeans, Casselton, 1997 29-30
Broadleaf weed control in soybean, 1997, Casselton 31
Weed control in soybean, 1997, Casselton 32
Broadleaf weed control in soybeans, 1997, Casselton 33
Roundup Ready soybean, Fargo, 1997 34-35
Adjuvants with Pursuit, 1997, Casselton 36-37
Adjuvants with Raptor, 1997, Casselton 38-39

DRYBEAN

Soil applied weed control in dyrbeans, Casselton, 1997 40
POST weed control in dry beans, Casselton, 1997 41-42
Weed control in dry beans, Minto, 1997 43-44
Dry bean herbicide trial, Carrington 1997 45-46

SUNFLOWER

Quizalofop and Imazamethabenz combination for weed control in Sunflower, Devils Lake 1997 47
Fall treatments in sunflower, NW-22, 1996-1997 48
Fall treatments in sunflower, Cogswell, 1996-1997 49
Spring treatments in sunflower, NW-22, 1997 50
Spring treatments in sunflower, Cogswell, 1997 51
Weed control in sunflower, Prosper, 1997 52
Weed control in sunflower, Carrington, 1997 53
Weed control in sunflower, Minot, 1997 54
Sunflower response to herbicides, Prosper, 1997 55-57
Matrix carryover on sunflower, 1996-1997, Fargo 58
Mechanical weed control in sunflower, Carrington 1997 59-60
Preemergence weed control in sunflower, Carrington 1997 61

Leafy spurge control with glyphosate plus 2,4-D alternated with picloram or dicamba 1-4

Evaluation of AC 263,222 for leafy spurge control 5-8

Picloram plus 2,4-D applied annually for 13 years to control leafy spurge 9-10

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides in a sandy soil 11-13

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides 14-17

Pre- and post-harvest treatments for Canada thistle and perennial sowthistle control in wheat 18-19

Canada thistle control for industrial areas 20-21

Evaluation of AC 263,222 for Canada thistle control 22

Evaluation of AC 263,222 and quinclorac for spotted knapweed control 23-24

General broadleaf weed control in pasture 24-27

Aphthona spp. flea beetle movement along railroad right-of-ways 28-29

Perennial weed control demonstration 30

Herbicides for common milkweed control, Cando, ND, 1997 31

CLIMATIC DATA-, 1997 Carrington																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.01	0.00	0.03	1.20	0.00	0.00	54	36	53	42	85	61	74	57	91	58	67	48
2	0.00	0.00	0.36	0.41	0.00	0.00	43	31	54	34	82	61	62	53	89	60	67	40
3	0.00	0.00	0.00	0.21	0.03	0.00	57	31	62	33	78	59	62	48	85	55	70	37
4	0.22	0.00	0.00	0.00	0.00	0.11	43	31	78	39	84	58	73	46	81	56	75	55
5	0.00	0.00	0.00	0.00	0.18	0.00	31	11	61	41	77	51	69	49	86	54	82	52
6	0.00	0.00	0.00	0.00	0.01	0.00	18	8	70	35	76	48	68	46	83	57	72	49
7	0.00	0.36	0.00	0.48	0.00	0.00	10	4	64	45	81	52	70	54	88	61	84	53
8	0.00	0.09	0.00	0.00	0.06	0.00	18	2	54	34	80	55	72	58	90	60	72	46
9	0.24	0.00	0.03	0.00	0.05	0.00	28	-3	68	30	80	56	79	57	70	53	74	42
10	0.00	0.00	0.00	0.32	0.00	0.00	24	3	80	47	81	48	83	63	68	44	80	48
11	0.21	0.00	0.00	0.22	0.00	0.00	32	5	58	38	82	53	83	64	74	43	76	47
12	0.00	0.01	0.00	0.17	0.00	0.00	34	14	50	34	84	52	81	64	69	44	76	58
13	0.00	0.00	0.00	0.01	0.00	0.00	38	20	62	37	75	50	83	60	74	40	86	52
14	0.00	0.00	0.26	0.00	0.16	0.00	42	29	54	28	82	51	84	59	71	53	66	49
15	0.00	0.01	0.05	0.00	0.10	0.00	34	23	63	21	77	54	88	58	74	56	74	46
16	0.00	0.00	0.07	0.00	0.01	0.47	38	20	80	45	72	46	86	58	63	49	71	53
17	0.00	0.00	0.06	0.00	0.00	0.00	56	29	87	40	66	49	84	55	67	40	75	44
18	0.00	0.00	0.00	0.15	0.00	0.00	62	37	53	34	66	43	81	64	70	48	65	46
19	0.00	0.00	0.00	0.07	0.00	0.00	60	32	50	35	79	53	76	60	75	51	51	34
20	0.00	0.00	0.00	0.00	0.00	0.00	54	36	56	29	76	46	78	56	77	47	60	28
21	0.00	0.03	0.00	0.00	0.00	0.00	57	30	73	38	81	45	80	55	79	48	72	39
22	0.00	0.11	0.30	0.00	0.00	0.00	57	32	70	52	81	50	79	60	83	51	76	42
23	0.00	0.00	0.03	0.00	0.00	0.00	57	32	63	45	78	63	81	62	89	57	73	28
24	0.00	0.00	0.36	0.00	0.00	0.00	59	32	68	39	72	53	89	67	93	51	85	53
25	0.00	0.00	0.00	0.13	0.05	0.00	62	33	62	44	72	50	82	64	83	56	81	43
26	0.00	0.00	0.00	0.00	0.00	0.00	58	42	67	42	81	55	79	62	89	52	83	50
27	0.00	0.00	0.00	0.00	0.00	0.13	55	32	68	40	90	61	75	56	84	53	71	53
28	0.09	0.00	0.00	0.00	0.17	0.00	60	40	71	42	79	59	80	52	76	58	71	48
29	0.00	0.00	0.04	0.00	0.05	0.00	46	29	73	47	73	60	78	54	70	62	70	43
30	0.00	0.00	0.01	0.00	0.00	0.00	50	25	79	43	80	60	77	54	83	53	72	37
31		0.00		0.00	0.58				84	51			83	63	88	55	85	47

CLIMATIC DATA-, 1997 Casselton																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	0.00	0.00	1.69	40	30	48	29	82	50	81	60	75	59	86	59
2	0.00	0.00	0.67	1.28	0.00	0.00	51	32	57	36	88	60	75	55	93	63	72	44
3	0.00	0.00	0.00	0.05	0.00	0.00	47	30	58	32	70	56	64	52	95	61	69	41
4	0.00	0.00	0.00	0.15	0.00	0.00	51	35	62	33	74	52	70	48	86	58	69	52
5	0.29	0.00	0.00	0.00	0.00	0.06	41	30	75	49	87	53	76	44	82	55	74	55
6	1.80	0.00	0.00	0.00	1.34	0.00	31	12	62	34	81	53	70	44	85	55	85	58
7	1.09	0.00	0.00	0.00	0.00	0.00	18	15	72	36	81	54	71	49	85	55	78	52
8	0.00	0.23	0.00	1.16	0.00	0.00	12	16	65	43	82	53	61	54	82	62	83	55
9	0.00	0.05	0.00	0.00	0.00	0.00	15	3	52	28	82	54	72	54	87	61	83	47
10	0.00	0.00	0.00	0.00	0.22	0.00	24	4	62	38	83	54	75	58	76	56	73	45
11	0.00	0.00	0.00	0.32	0.00	0.40	28	13	82	41	84	54	81	67	69	44	82	39
12	0.00	0.19	0.00	0.00	0.01	0.00	37	15	59	32	87	55	85	68	72	50	85	54
13	0.00	0.00	0.00	0.82	0.00	0.00	43	17	59	29	89	55	87	66	71	41	83	54
14	0.00	0.15	0.00	0.03	0.00	0.00	44	33	59	36	83	47	87	61	74	47	85	54
15	0.00	0.00	0.60	0.00	0.00	0.00	49	31	51	30	84	60	86	62	70	55	78	53
16	0.00	0.00	0.00	0.00	0.17	0.28	38	25	56	33	84	50	89	64	75	58	79	53
17	0.00	0.00	0.16	0.00	0.00	0.00	40	29	83	38	74	50	91	61	71	46	76	44
18	0.00	0.01	0.00	0.00	0.00	0.00	57	43	81	43	78	52	87	67	71	44	78	46
19	0.00	0.00	0.28	0.21	0.01	0.00	67	38	61	37	78	55	85	65	71	59	77	45
20	0.00	0.00	0.00	0.01	0.00	0.00	64	36	52	37	82	54	79	62	69	44	54	35
21	0.00	0.00	0.00	0.00	0.00	0.00	52	39	61	32	84	51	79	61	78	51	62	37
22	0.00	0.03	0.78	0.00	0.00	0.00	61	43	74	40	84	64	82	60	78	52	71	46
23	0.00	1.60	1.30	0.00	0.00	0.00	59	39	60	51	87	64	80	57	82	52	73	36
24	0.00	0.23	0.40	0.00	0.00	0.00	59	38	60	43	79	54	82	64	85	54	71	36
25	0.00	0.00	0.00	0.00	0.00	0.00	61	42	69	45	78	54	86	69	90	52	83	49
26	0.00	0.00	0.00	0.06	0.00	0.00	64	47	65	42	79	54	89	66	87	53	83	48
27	0.05	0.00	0.00	0.00	0.00	0.00	65	43	69	42	84	55	88	65	93	58	84	51
28	0.00	0.00	0.00	0.00	0.00	0.30	65	41	71	46	91	59	80	53	88	56	73	46
29	0.08	0.00	0.00	0.00	0.62	0.00	68	42	74	50	78	59	81	55	87	56	80	53
30	0.00	0.00	0.01	0.00	0.08	0.00	54	29	70	49	79	58	81	53	73	58	71	37
31		0.00		0.00	0.00				83	50			82	65	86	53		

CLIMATIC DATA-, 1997 Crookston																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	1.30	0.00	0.00	48	33	55	35	89	60	80	57	91	63	71	40
2	0.00	0.00	0.60	0.87	0.17	0.00	42	30	56	41	66	54	66	51	93	60	69	36
3	0.00	0.00	0.00	0.63	0.00	0.00	50	33	55	35	70	56	58	48	86	56	70	45
4	0.45	0.03	0.00	0.00	0.00	0.05	39	33	73	45	85	54	75	57	81	52	77	57
5	1.12	0.00	0.00	0.08	0.89	0.00	34	9	57	35	78	50	69	44	80	53	83	58
6	1.51	0.00	0.00	0.00	0.00	0.00	32	2	66	43	77	50	66	46	84	56	69	52
7	0.03	0.20	0.00	0.19	0.00	1.10	9	5	58	41	78	51	61	56	83	63	83	54
8	0.00	0.27	0.00	0.00	0.00	0.00	17	5	47	30	80	59	70	51	87	63	76	50
9	0.00	0.00	0.00	0.00	0.06	0.00	23	10	62	36	82	50	75	59	74	44	70	44
10	0.00	0.03	0.00	0.00	0.00	0.00	28	15	77	37	83	55	83	65	67	46	80	48
11	0.00	0.00	0.00	0.04	0.00	0.00	35	20	54	32	86	54	85	71	73	50	79	53
12	0.00	0.01	0.00	1.00	0.00	0.43	38	23	48	27	87	52	78	63	69	41	70	59
13	0.00	0.10	0.00	0.00	0.00	0.00	41	31	46	35	78	44	84	61	73	50	81	54
14	0.00	0.00	0.00	0.05	0.00	0.02	44	25	43	31	83	61	82	59	74	55	72	50
15	0.00	0.00	0.56	0.02	0.15	0.00	30	19	52	34	77	48	88	62	70	57	74	53
16	0.00	0.00	0.00	0.00	0.04	0.88	35	22	73	35	74	54	91	62	68	47	75	47
17	0.00	0.00	0.25	0.00	0.00	0.00	48	31	74	45	76	54	88	63	71	54	75	48
18	0.00	0.05	0.00	0.00	0.00	0.00	56	31	53	37	71	54	84	64	73	56	66	43
19	0.00	0.00	0.47	0.15	0.47	0.01	59	34	52	30	77	55	78	60	65	54	53	35
20	0.00	0.00	0.00	0.00	0.00	0.00	55	34	56	31	79	52	80	59	76	52	60	37
21	0.00	0.00	0.00	0.00	0.05	0.00	60	31	70	50	81	54	81	58	77	48	70	43
22	0.00	0.45	0.00	0.00	0.00	0.00	58	37	56	51	82	60	81	59	78	51	71	33
23	0.01	0.25	2.37	0.00	0.02	0.00	58	32	62	43	80	63	80	63	85	54	68	38
24	0.00	0.00	0.44	0.00	0.00	0.00	59	33	68	43	74	55	89	72	87	66	84	50
25	0.00	0.00	0.00	0.00	0.00	0.00	62	40	66	40	73	56	90	65	86	52	80	50
26	0.01	0.00	0.00	0.00	0.00	0.00	60	39	70	38	81	64	83	61	89	56	80	55
27	0.00	0.00	0.00	0.00	0.00	0.55	55	34	71	45	90	65	78	55	82	52	78	51
28	0.02	0.00	0.15	0.00	0.00	0.00	68	41	75	50	77	59	78	52	80	57	65	50
29	0.00	0.00	0.00	0.00	0.01	0.03	46	27	73	47	79	61	80	52	80	59	57	39
30	0.00	0.00	0.00	0.00	0.00	0.00	46	29	83	47	79	58	82	63	86	57	57	39
31		0.00		0.00	0.03				83	73			75	59	83	60		

CLIMATIC DATA-, 1997 Dickinson																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.15	3.10	0.00	0.00	59	28	57	34	87	54	65	48	93	56	69	52
2	0.00	0.00	0.00	0.10	0.00	0.00	47	27	52	34	81	52	65	47	88	58	74	46
3	0.00	0.00	0.00	0.00	0.00	0.00	63	26	62	27	84	55	69	43	89	60	81	53
4	0.01	0.00	0.00	0.08	0.00	0.01	43	27	76	43	84	54	77	46	88	60	86	54
5	0.01	0.00	0.00	0.00	0.00	0.00	27	19	66	38	82	54	72	52	89	60	83	49
6	0.00	0.07	0.00	0.00	0.00	0.00	20	6	75	37	79	52	78	51	87	54	79	48
7	0.00	0.08	0.00	0.58	0.00	0.00	17	1	62	42	87	58	79	55	88	57	84	55
8	0.00	0.01	0.00	0.00	0.00	0.00	16	12	58	36	85	59	84	53	89	58	74	48
9	0.00	0.00	0.00	0.00	0.00	0.00	19	1	73	32	83	62	90	64	66	44	79	40
10	0.01	0.00	0.00	0.19	0.00	0.00	30	11	75	45	79	55	90	66	67	38	83	49
11	0.00	0.00	0.05	0.00	0.00	0.00	36	6	59	38	74	52	77	62	73	50	75	52
12	0.00	0.00	0.00	0.00	0.00	0.00	41	12	59	32	82	46	80	58	76	52	76	52
13	0.00	0.00	0.33	0.44	0.00	0.00	39	16	60	35	82	55	67	56	80	53	84	49
14	0.00	0.00	0.44	0.00	0.00	0.00	56	27	60	28	81	56	84	53	83	55	71	54
15	0.00	0.00	0.00	0.00	0.02	0.04	46	27	79	32	79	56	89	59	72	57	79	50
16	0.00	0.00	0.00	0.00	0.24	0.00	54	23	80	53	82	54	90	63	58	50	72	46
17	0.00	0.00	0.00	0.00	0.00	0.00	73	36	83	52	78	55	89	66	66	47	80	40
18	0.01	0.26	0.00	0.35	0.04	0.00	69	44	62	32	77	54	81	64	76	53	67	44
19	0.07	0.00	0.00	0.01	0.17	0.00	68	42	47	31	75	52	74	59	76	51	54	35
20	0.02	0.00	0.00	0.00	0.00	0.00	59	38	61	33	75	51	76	56	81	48	67	29
21	0.93	0.28	0.00	0.00	0.01	0.00	43	38	71	43	79	41	75	58	85	55	71	34
22	0.14	0.00	0.10	0.00	0.00	0.00	47	37	66	48	84	56	84	60	90	58	74	40
23	0.11	0.00	0.13	0.00	0.00	0.00	51	39	64	45	77	58	86	67	98	53	77	41
24	0.00	0.00	0.11	1.29	0.11	0.00	56	37	62	48	70	51	92	66	100	58	84	43
25	0.10	0.00	0.00	0.00	0.00	0.00	58	39	61	47	74	45	84	64	85	59	88	44
26	0.02	0.00	0.00	0.11	0.00	0.00	60	37	63	42	88	49	84	60	92	54	92	50
27	0.00	0.00	0.00	0.00	0.00	0.01	66	34	63	46	88	58	76	56	90	62	68	49
28	0.10	0.00	0.23	0.00	0.36	0.00	60	40	51	42	88	59	79	55	89	62	70	48
29	0.00	0.00	0.06	0.00	0.00	0.00	55	32	69	44	82	58	73	57	81	61	75	46
30	0.06	0.00	0.19	0.00	0.00	0.00	58	28	75	40	76	60	67	56	86	49	86	42
31				0.00	0.00								88	65	90	56		

CLIMATIC DATA-, 1997 Fargo

	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.01	0.00	0.00	0.16	0.00	0.47	55	39	57	35	90	63	78	61	90	62	72	51
2	0.00	0.00	0.64	0.02	0.59	0.00	45	34	56	41	75	62	64	55	91	66	68	43
3	0.00	0.00	0.00	0.18	0.00	0.00	53	33	60	32	75	59	55	49	84	65	70	41
4	0.20	0.00	0.00	0.00	0.00	0.01	49	38	76	39	86	56	75	47	80	60	74	57
5	1.33	0.00	0.00	0.00	1.01	0.00	39	25	62	46	78	55	71	48	80	57	84	58
6	0.00	0.29	0.00	0.00	0.01	0.00	25	10	70	38	80	52	68	42	82	55	71	53
7	0.00	0.12	0.00	0.76	0.00	1.16	18	8	63	52	81	55	59	53	81	60	83	54
8	0.00	0.00	0.00	0.00	0.00	0.01	232	10	52	39	82	58	70	58	86	66	79	54
9	0.05	0.00	0.00	0.00	0.24	0.00	24	10	65	30	83	60	74	56	75	56	71	46
10	0.05	0.00	0.00	0.00	0.00	0.00	23	18	82	44	84	61	81	60	67	48	80	48
11	0.03	0.00	0.00	0.09	0.01	0.00	36	29	61	38	86	62	86	68	71	48	78	52
12	0.00	0.00	0.00	0.77	0.02	0.31	39	22	49	32	86	56	84	70	69	48	74	59
13	0.00	0.03	0.00	0.00	0.00	0.00	45	25	57	31	78	55	85	67	73	42	83	63
14	0.00	0.00	0.34	0.00	0.05	0.00	52	33	50	34	85	51	82	61	69	58	79	57
15	0.00	0.00	0.26	0.00	0.03	0.00	43	28	56	34	79	58	89	63	72	57	78	55
16	0.00	0.00	0.00	0.00	0.01	0.29	36	25	79	50	73	54	92	68	65	58	74	55
17	0.00	0.00	0.13	0.00	0.00	0.00	53	27	82	38	78	58	88	62	69	49	77	48
18	0.00	0.00	0.00	0.13	0.00	0.00	64	42	65	40	69	56	83	68	72	50	76	50
19	0.00	0.00	0.60	0.00	0.00	0.00	62	37	51	38	77	58	79	64	66	53	54	44
20	0.00	0.00	0.00	0.00	0.00	0.00	54	39	60	38	78	54	79	61	75	51	61	34
21	0.00	0.00	0.00	0.00	0.00	0.00	61	37	74	40	83	53	79	62	76	49	68	40
22	0.00	0.95	1.27	0.00	0.00	0.00	58	42	62	52	82	58	79	61	80	54	68	48
23	0.00	0.85	0.85	0.00	0.00	0.00	60	45	60	52	86	64	80	62	86	63	69	35
24	0.00	0.00	0.05	0.00	0.00	0.00	61	36	68	46	75	61	85	68	89	56	82	51
25	0.00	0.00	0.00	0.00	0.00	0.00	65	39	65	48	75	56	89	70	85	62	79	46
26	0.15	0.00	0.00	0.22	0.00	0.00	66	47	69	44	84	58	87	68	90	57	82	55
27	0.01	0.00	0.00	0.00	0.00	0.18	56	42	69	48	92	64	79	58	85	59	79	53
28	0.04	0.00	0.02	0.00	0.22	0.24	70	40	73	52	78	64	78	54	84	61	71	54
29	0.01	0.00	0.03	0.00	0.01	0.00	54	33	70	53	75	62	79	54	72	64	67	46
30	0.00	0.00	0.00	0.00	0.00	0.00	46	31	82	46	81	64	81	59	84	59	61	39
31		0.00		0.00	0.51				83	56			72	63	84	56		

CLIMATIC DATA-, 1997 Hettinger																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.14	0.00	0.43	0.00	0.02	56	29	57	35	83	54	74	49	93	56	76	46
2	0.00	0.00	0.00	0.00	0.02	0.00	46	26	49	32	81	51	65	46	90	57	71	46
3	0.00	0.00	0.00	0.00	0.00	0.00	65	26	60	28	82	53	68	44	93	55	79	52
4	0.15	0.00	0.00	0.00	0.00	0.00	46	29	76	40	79	53	76	41	86	60	88	55
5	0.00	0.00	0.00	0.00	0.00	0.00	29	18	66	38	80	52	74	50	86	58	87	46
6	0.00	0.18	0.00	0.00	0.00	0.00	19	4	72	38	76	49	78	51	84	52	84	47
7	0.00	0.11	0.00	0.07	0.00	0.00	17	-2	61	43	84	53	79	55	85	56	86	52
8	0.00	0.00	0.00	0.00	0.10	0.01	14	9	58	33	81	57	84	51	92	53	71	44
9	0.00	0.00	0.00	0.00	0.05	0.00	19	4	71	30	79	59	91	62	70	53	77	38
10	0.00	0.00	0.30	0.13	0.00	0.00	23	7	77	43	76	54	92	64	63	40	80	48
11	0.03	0.00	0.19	0.00	0.00	0.00	28	8	58	36	66	51	78	61	68	52	73	48
12	0.01	0.00	0.05	0.02	0.00	0.00	34	14	58	37	77	45	80	59	78	46	79	55
13	0.00	0.00	0.00	0.00	0.21	0.00	36	13	62	39	77	53	69	53	73	52	87	47
14	0.00	0.00	0.10	0.00	0.00	0.01	50	24	61	28	78	56	86	50	82	55	72	52
15	0.00	0.00	0.03	0.00	0.01	0.02	40	24	73	31	76	52	94	55	74	56	79	52
16	0.00	0.00	0.22	0.00	0.01	0.02	55	21	80	48	82	50	91	57	60	52	72	42
17	0.00	0.02	0.04	0.00	0.00	0.00	68	34	83	51	77	55	90	59	67	51	80	38
18	0.14	0.00	0.77	0.01	0.00	0.00	67	40	57	33	75	52	84	62	73	54	74	51
19	0.05	0.00	0.02	0.01	0.04	0.00	63	35	51	31	73	51	77	64	78	49	55	34
20	0.07	0.00	0.00	0.00	0.00	0.00	62	39	59	29	73	49	77	61	82	47	65	24
21	0.85	0.00	0.18	0.00	0.00	0.01	44	38	75	42	77	44	76	57	83	48	69	37
22	0.88	0.00	0.00	0.00	0.00	0.01	45	38	61	46	86	55	86	60	93	56	63	39
23	0.01	0.00	0.00	0.00	0.00	0.00	54	36	64	49	78	61	84	66	98	51	73	37
24	0.01	0.01	0.37	0.00	0.00	0.00	55	36	55	48	70	50	93	64	97	56	83	44
25	0.00	0.07	0.00	0.16	0.00	0.00	59	36	56	47	71	44	90	65	87	56	85	42
26	0.00	0.03	0.00	0.40	0.00	0.00	58	41	54	43	86	50	87	59	88	56	90	48
27	0.00	0.04	0.00	0.00	0.00	0.01	65	34	57	41	90	56	77	58	87	64	67	44
28	0.10	0.11	0.09	0.00	0.46	0.00	59	39	49	41	87	60	79	55	89	60	70	48
29	0.00	0.00	0.01	0.12	0.00	0.00	56	30	65	40	81	57	64	57	82	56	75	44
30	0.14	0.00	0.75	0.02	0.00	0.00	56	27	71	38	74	53	69	56	83	47	86	39
31		0.00		0.00	0.04				85	52			86	63	96	57		

CLIMATIC DATA-, 1997 Minot																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	0.84	0.28	0.00	51	30	52	39	90	59	63	52	93	57	70	46
2	0.00	0.01	0.00	0.43	0.00	0.00	44	29	56	34	86	55	64	51	87	62	72	41
3	0.00	0.00	0.00	0.00	0.00	0.00	62	29	64	35	87	57	70	46	86	60	76	48
4	0.00	0.00	0.00	0.00	0.00	0.00	41	25	77	42	86	54	74	49	84	56	86	58
5	0.00	0.00	0.00	0.00	0.00	0.00	25	17	62	40	78	52	70	51	89	59	76	54
6	0.00	0.01	0.00	0.00	0.00	0.00	20	12	73	34	78	50	76	45	88	54	75	47
7	0.00	0.01	0.00	0.00	0.00	0.00	12	6	67	41	86	53	78	59	92	62	82	52
8	0.00	0.26	0.00	0.00	0.00	0.00	19	-1	60	33	87	61	84	55	92	61	72	46
9	0.00	0.00	0.00	0.00	0.00	0.00	18	-5	71	33	87	64	90	66	66	42	78	43
10	0.00	0.00	0.00	0.18	0.00	0.00	31	0	77	46	84	58	89	64	71	40	83	52
11	0.00	0.09	0.00	0.54	0.00	0.00	39	14	58	40	83	51	86	61	76	47	81	58
12	0.00	0.00	0.00	0.51	0.00	0.00	44	22	55	35	84	57	77	62	71	47	83	59
13	0.00	0.00	0.00	0.10	0.00	0.00	47	24	58	40	76	55	75	62	80	44	81	50
14	0.00	0.00	0.72	0.00	0.16	0.00	57	31	56	31	86	56	84	58	80	59	68	48
15	0.00	0.00	0.01	0.00	0.09	0.22	40	24	76	24	76	55	89	61	71	56	74	47
16	0.00	0.00	0.47	0.00	0.02	0.21	54	21	79	49	76	48	86	62	63	49	70	47
17	0.00	0.00	0.00	0.00	0.00	0.00	74	37	87	46	67	53	84	62	70	42	74	43
18	0.00	0.09	0.12	0.26	0.02	0.00	67	41	51	34	68	50	81	65	75	52	62	44
19	0.00	0.01	0.00	0.00	0.00	0.00	63	32	50	34	72	52	77	59	79	50	50	36
20	0.00	0.00	0.19	0.00	0.00	0.00	59	38	57	29	72	50	79	54	79	47	65	29
21	0.00	0.11	0.00	0.00	0.00	0.00	57	42	74	39	78	49	82	57	84	49	74	42
22	0.00	0.00	0.67	0.00	0.00	0.00	58	34	69	48	83	54	84	61	90	54	78	44
23	0.00	0.00	0.38	0.12	0.00	0.00	57	38	66	44	76	58	86	67	95	59	79	41
24	0.00	0.00	0.20	0.00	0.00	0.00	58	36	66	43	75	53	90	69	98	56	87	55
25	0.04	0.00	0.00	0.13	0.00	0.00	62	38	64	47	73	49	85	62	85	59	86	45
26	0.04	0.00	0.00	0.00	0.00	0.00	59	35	67	40	85	54	80	60	88	56	85	56
27	0.00	0.00	0.00	0.00	0.45	0.03	61	29	69	34	85	63	77	55	90	57	66	54
28	0.15	0.00	0.00	0.00	0.37	0.00	64	44	66	47	85	61	81	54	86	63	71	52
29	0.00	0.00	0.00	0.00	0.10	0.00	50	31	72	47	78	64	82	57	82	62	73	47
30	0.04	0.00	0.11	0.00	0.00	0.00	59	24	78	47	79	59	74	54	84	54	75	38
31		0.00		0.00	0.00				88	59			90	62	85	56		

CLIMATIC DATA-, 1997 Olivia

	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	0.00	0.00	0.00	55	32	49	28	84	54	82	64	86	63	82	60
2	0.03	0.12	0.00	0.96	0.00	0.00	64	44	63	38	88	59	85	59	90	65	86	55
3	0.05	0.39	0.00	0.01	0.00	0.00	58	32	48	33	85	59	64	53	86	64	72	44
4	0.00	0.00	0.00	0.03	0.00	0.00	55	32	61	32	79	58	61	50	86	61	69	50
5	0.05	0.00	0.00	0.00	0.00	0.00	58	42	72	43	82	59	74	53	86	60	66	58
6	0.43	0.00	0.00	0.01	0.90	0.00	56	22	66	33	85	52	76	47	76	58	86	53
7	0.01	0.00	0.00	0.00	0.00	0.00	22	14	73	39	82	58	71	50	79	57	80	53
8	0.01	0.05	0.00	0.86	0.00	0.21	24	7	59	42	83	56	58	54	80	65	75	62
9	0.00	0.00	0.00	0.00	0.00	0.03	24	11	46	32	82	52	72	50	80	60	77	51
10	0.01	0.00	0.00	0.00	0.07	0.00	33	15	66	35	85	58	78	55	72	49	72	46
11	0.11	0.00	0.00	0.00	0.00	0.00	33	21	82	51	85	58	82	58	67	52	76	48
12	0.00	0.00	0.00	0.00	0.14	0.00	36	22	55	33	85	62	89	63	71	59	75	55
13	0.00	0.00	0.00	0.00	0.03	0.04	45	28	56	26	88	66	90	70	73	46	80	56
14	0.00	0.06	0.00	0.05	0.11	0.00	48	28	48	34	89	54	92	60	70	51	75	50
15	0.01	0.00	0.01	0.00	0.00	0.11	56	30	55	33	87	65	81	59	74	56	82	53
16	0.01	0.00	0.00	0.00	0.00	0.00	39	23	56	35	85	56	94	70	78	64	79	66
17	0.01	0.00	0.00	0.46	0.00	0.85	41	25	84	42	76	53	96	65	84	57	73	48
18	0.00	0.10	0.01	0.10	0.00	0.00	57	34	84	50	85	57	96	65	69	56	77	53
19	0.00	0.00	0.26	0.04	1.04	0.00	58	36	76	39	73	57	82	65	69	57	85	54
20	0.00	0.00	0.01	0.00	1.72	0.00	65	37	56	32	79	59	90	70	64	58	64	41
21	0.16	0.00	0.02	0.03	0.00	0.00	65	42	64	35	85	59	86	67	72	50	63	35
22	0.00	0.00	0.00	1036	0.00	0.00	62	35	71	38	86	60	83	62	77	53	65	41
23	0.01	0.01	0.03	0.02	0.00	0.40	62	41	76	52	86	65	71	63	75	53	55	42
24	0.00	0.12	0.02	0.00	0.00	0.00	52	32	73	54	93	70	80	65	85	58	69	39
25	0.00	0.00	0.94	1.49	0.00	0.00	62	32	65	48	84	60	79	60	78	62	83	42
26	0.00	0.00	0.00	0.00	0.00	0.00	64	43	69	44	81	50	87	71	79	61	83	63
27	0.01	0.00	0.00	0.00	0.00	0.00	64	42	69	41	85	57	88	69	86	63	87	63
28	0.02	0.00	0.00	0.00	0.00	0.00	63	35	68	47	88	67	86	58	83	62	85	49
29	0.03	0.32	1.63	0.00	0.00	0.00	76	38	62	50	88	62	79	55	81	63	72	56
30	0.20	0.00	0.10	0.00	0.27	0.00	70	35	62	46	71	62	78	57	79	62	71	44
31		0.00		0.39	0.00				79	51			77	63	82	55		

CLIMATIC DATA-, 1997 Prosper																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	0.69	0.00	1.39	41	36	54	32	92	60	77	58	89	57	72	52
2	0.00	0.00	0.50	0.06	0.12	0.00	43	29	56	35	72	58	64	53	91	60	69	43
3	0.00	0.00	0.00	0.11	0.03	0.00	46	28	60	31	74	54	56	49	86	62	71	40
4	0.27	0.01	0.00	0.00	0.00	0.03	38	34	76	31	87	52	75	48	79	58	74	55
5	0.00	0.00	0.00	0.02	0.71	0.00	34	22	61	39	81	57	71	49	82	53	86	53
6	0.00	0.00	0.00	0.00	0.01	0.00	22	8	70	33	80	53	68	44	82	53	74	54
7	0.00	0.14	0.00	0.81	0.00	0.39	19	6	64	50	83	52	60	48	80	56	85	54
8	0.00	0.05	0.00	0.00	0.00	0.01	18	7	51	36	83	56	71	58	85	62	81	53
9	0.00	0.00	0.00	0.00	0.15	0.00	32	6	66	30	84	54	74	54	74	56	73	48
10	0.00	0.00	0.00	0.00	0.00	0.00	32	14	82	39	86	53	80	59	68	45	82	45
11	0.00	0.01	0.00	0.12	0.00	0.00	37	11	57	33	86	52	86	67	71	40	78	46
12	0.00	0.02	0.00	0.58	0.01	0.66	49	20	50	27	88	54	84	67	69	45	74	58
13	0.00	0.07	0.00	0.04	0.00	0.00	38	23	61	24	79	53	86	63	72	39	83	60
14	0.00	0.00	0.07	0.00	0.00	0.08	42	28	52	31	85	45	83	60	69	54	76	55
15	0.00	0.00	0.14	0.00	0.14	0.00	39	26	56	32	80	58	88	60	73	57	77	54
16	0.00	0.01	0.00	0.00	0.01	0.13	36	24	82	47	75	51	92	63	65	57	76	53
17	0.00	0.00	0.09	0.00	0.00	0.00	48	27	82	39	78	56	87	60	68	48	78	44
18	0.00	0.00	0.00	0.16	0.00	0.00	62	36	60	38	70	55	83	67	71	44	74	46
19	0.00	0.00	0.06	0.00	0.01	0.00	60	35	52	38	80	56	80	62	66	53	56	43
20	0.00	0.00	0.00	0.00	0.00	0.00	52	37	60	37	80	50	80	60	76	46	62	33
21	0.00	0.00	0.00	0.00	0.00	0.00	59	33	75	31	86	50	80	61	76	49	71	33
22	0.00	0.86	1.49	0.00	0.00	0.00	57	38	61	51	85	52	79	58	80	50	74	43
23	0.00	0.34	0.09	0.00	0.00	0.00	57	39	58	47	85	65	79	55	88	58	72	34
24	0.00	0.00	1.70	0.00	0.00	0.00	59	34	68	44	75	60	85	66	89	52	84	46
25	0.00	0.00	0.00	0.02	0.00	0.00	62	35	65	45	74	54	87	68	86	57	83	48
26	0.00	0.00	0.00	0.13	0.00	0.00	63	38	68	41	83	54	88	62	91	51	85	48
27	0.01	0.00	0.00	0.00	0.00	0.22	56	38	69	38	92	60	78	55	85	58	80	53
28	0.03	0.00	0.03	0.00	0.25	0.07	66	36	74	47	79	63	78	53	84	52	71	53
29	0.00	0.00	0.00	0.00	0.08	0.00	50	31	71	50	75	60	80	52	73	61	69	46
30	0.00	0.00	0.00	0.00	0.01	0.00	46	29	82	49	81	63	80	50	86	54	64	35
31		0.00		0.00	1.62				84	51			73	63	84	51		

CLIMATIC DATA-, 1997 St. Thomas																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	2.25	0.00	0.00	51	35	52	32	91	65	71	54	91	60	72	47
2	0.00	0.00	0.01	1.05	0.05	0.00	39	31	55	37	76	63	66	52	88	61	69	41
3	0.00	0.00	0.00	0.21	0.00	0.00	52	30	58	28	84	57	64	51	87	59	71	37
4	0.05	0.00	0.00	0.00	0.00	0.00	41	27	75	35	82	54	76	49	83	56	78	57
5	0.00	0.00	0.00	0.01	0.30	0.00	27	13	60	42	74	56	65	45	79	56	79	58
6	0.00	0.00	0.00	0.00	0.00	0.00	13	5	63	32	79	56	68	41	86	54	69	55
7	0.00	0.63	0.00	0.10	0.00	0.00	10	3	58	46	80	46	61	51	87	58	87	52
8	0.00	0.08	0.00	0.00	0.00	0.00	14	6	49	34	81	54	69	57	87	60	74	52
9	0.00	0.00	0.00	0.00	0.00	0.00	20	1	67	31	86	60	75	56	72	49	73	48
10	0.00	0.04	0.00	0.00	0.00	0.00	28	9	81	43	87	51	81	60	70	45	83	44
11	0.00	0.22	0.00	0.00	0.00	0.00	36	17	54	37	88	52	83	68	76	44	83	52
12	0.00	0.03	0.00	1.05	0.00	0.12	39	25	50	31	84	54	81	69	71	46	68	60
13	0.00	0.08	0.00	0.36	0.00	0.00	44	26	50	33	74	49	80	63	74	40	86	58
14	0.00	0.00	0.02	0.00	0.08	0.06	43	32	43	31	85	42	81	62	76	54	64	46
15	0.00	0.01	0.08	0.00	0.15	0.00	33	23	52	27	73	54	87	60	71	57	70	40
16	0.00	0.00	0.00	0.00	0.13	0.34	38	21	72	36	74	48	86	59	66	50	73	55
17	0.00	0.02	0.34	0.00	0.00	0.00	49	29	68	35	70	51	85	62	70	49	74	47
18	0.00	0.03	0.00	0.00	0.00	0.00	61	34	48	38	69	44	79	62	75	45	61	43
19	0.00	0.00	0.02	0.03	0.03	0.00	54	35	51	38	75	54	78	64	68	51	55	42
20	0.00	0.00	0.00	0.00	0.11	0.00	50	34	51	31	78	51	79	58	78	51	61	34
21	0.00	0.00	0.00	0.00	0.01	0.00	53	33	69	29	81	46	80	56	76	51	76	38
22	0.00	0.21	0.00	0.00	0.00	0.00	51	33	60	43	82	49	79	59	78	49	68	41
23	0.00	0.00	0.71	0.00	0.01	0.00	55	36	62	46	78	64	787	61	89	59	73	30
24	0.00	0.00	0.07	0.00	0.00	0.00	56	36	65	41	73	59	87	63	90	54	87	59
25	0.01	0.00	0.11	0.70	0.03	0.00	59	36	65	41	73	50	86	67	86	60	81	53
26	0.00	0.00	0.00	0.00	0.00	0.00	54	40	69	41	82	53	80	63	89	58	79	51
27	0.00	0.00	0.00	0.01	0.00	0.17	53	34	72	43	89	60	78	58	81	55	79	54
28	0.00	0.00	0.00	0.00	0.00	0.08	60	38	75	44	81	57	77	53	75	53	66	53
29	0.00	0.00	0.00	0.00	0.00	0.00	48	30	76	45	80	60	79	51	78	62	63	43
30	0.00	0.00	0.00	0.00	0.00	0.00	42	27	82	53	82	52	80	52	86	56	60	38
31		0.00		0.00	0.01		52	32	85	52			78	65	85	55		

CLIMATIC DATA-, 1997 Williston																		
	Precipitation						April		May		June		July		August		September	
Date	April	May	June	July	August	September	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	0.00	0.00	0.00	5.21	0.00	0.00	45	32	52	36	85	59	52	48	92	59	67	49
2	0.00	0.00	0.00	0.03	0.00	0.00	46	29	54	35	78	52	66	49	86	60	76	50
3	0.00	0.00	0.00	0.00	0.01	0.00	58	28	64	33	85	48	72	44	88	61	82	56
4	0.00	0.00	0.00	0.23	0.13	0.00	39	27	70	40	87	55	77	50	89	62	84	62
5	0.00	0.00	0.00	0.00	0.00	0.00	27	21	68	39	83	62	73	52	87	61	79	54
6	0.00	0.00	0.00	0.07	0.00	0.00	24	12	75	41	82	57	80	53	89	57	82	49
7	0.00	0.04	0.00	0.00	0.00	0.00	21	8	66	36	91	63	79	61	92	63	80	54
8	0.00	0.02	0.00	0.00	0.00	0.00	21	5	60	36	91	65	86	57	88	57	72	51
9	0.00	0.00	0.00	0.00	0.00	0.00	26	9	76	33	91	64	93	63	63	53	79	46
10	0.00	0.00	0.00	0.00	0.00	0.00	35	11	76	44	87	58	86	69	71	42	84	51
11	0.00	0.00	0.00	0.42	0.00	0.00	43	15	60	39	84	56	80	62	77	48	73	56
12	0.00	0.00	0.00	0.00	0.00	0.05	49	20	62	34	84	52	81	56	75	48	76	56
13	0.00	0.00	0.00	0.10	0.00	0.00	54	22	60	42	82	60	74	59	84	53	76	52
14	0.00	0.00	0.00	0.00	0.01	0.04	60	30	61	34	87	54	85	58	81	58	71	51
15	0.00	0.00	0.00	0.00	0.05	0.00	47	28	84	35	80	58	90	63	69	57	78	52
16	0.00	0.00	0.01	0.00	0.00	0.04	64	26	82	53	86	55	89	62	65	53	69	46
17	0.00	0.03	0.00	0.05	0.00	0.00	76	41	84	51	779	57	89	62	70	50	74	43
18	0.00	0.01	0.02	1.03	0.00	0.00	69	40	56	33	80	48	81	64	82	57	70	41
19	0.06	0.00	0.02	0.00	0.03	0.00	67	44	48	29	76	45	77	61	79	55	53	32
20	0.00	0.00	0.00	0.00	0.00	0.00	61	39	60	30	76	48	78	54	82	48	66	32
21	0.04	0.01	0.00	0.00	0.00	0.00	52	40	69	43	79	54	82	58	86	52	75	39
22	0.01	0.00	0.18	0.00	0.00	0.00	51	38	66	41	85	60	87	62	90	55	78	40
23	0.04	0.00	0.00	0.03	0.00	0.00	54	41	70	40	75	50	88	70	94	54	78	45
24	0.00	0.00	0.04	0.02	0.00	0.00	58	36	64	50	69	48	90	69	100	60	85	49
25	0.01	0.02	0.00	0.24	0.00	0.00	59	39	63	47	78	52	82	64	84	56	88	46
26	0.06	0.00	0.00	0.00	0.00	0.00	58	31	68	42	93	63	81	57	92	54	86	53
27	0.00	0.00	0.00	0.00	1.45	0.03	65	34	66	44	89	64	79	51	94	59	68	50
28	0.06	0.00	0.00	0.00	0.14	0.00	63	40	62	44	92	60	83	54	83	61	70	45
29	0.00	0.00	0.28	0.00	0.09	0.00	54	31	70	35	83	57	82	58	80	60	74	47
30	0.03	0.00	0.02	0.00	0.00	0.00	60	30	80	44	74		71	58	81	51	84	42
31		0.00		0.00	0.00				90	57			89	63	86	56		

SOIL TEST RESULTS AT VARIOUS WEED EXPERIMENT LOCATIONS						
	Soil texture	Organic matter	pH	lb/A N	PPM P	K
A.K. Ekre Grassland Preserve	Loamy sand	2.9	6.8	3	3	70
Buffalo, ND - Railroad	Loam	3.8	8.0	4	8	355
Camp Grafton, ND	Loamy sand	2.8	7.0	3	3	98
Carrington, ND	Loam	3.6	7.2	Fertilized by test		
Chaffee, ND	Fine sandy loam	6.7	7.4	20	36	950
Cogswell, ND	Silt loam	5.2	7.3	Fertilized by test		
Crookston, MN (post herbicides)	Loam	4.6	8.1	152	20	255
Crookson, MN (transgenic sugarbeet)	Loam	4.1	8.0	152	9	235
Cuba, ND	Sandy loam	7.0	8.2	3	4	100
Drayton, ND	Silty clay loam	5.2	7.8	Fertilized by test		
Fargo, ND (Section 22)	Silty clay	6.0	7.5	190	26	1095
Fargo (sugarbeet experiments)	Silty clay	5.6	7.1	129	26	430
Ft. Ransom, ND	Loam	7.0	6.8	2	3	245
Gardner, ND	Silty clay	4.7	7.5	55	28	470
Jamestown, ND (Pipestem Dam)	Loam	6.8	6.8	28	5	290
Lisbon, ND - Railroad	Silt loam	7.6	7.4	7	10	400
Mahnomen, MN	Loam	4.5	7.8	81	24	200
Minot, ND	Loam	2.7	7.0	Fertilized by test		
Minto, ND	Silty clay	4.2	7.9	337	18	480
Oakes, ND	Sandy loam	2.1	7.1	24	Very high	VH
Prosper, ND	Silty clay loam	3.2	7.0	90	23	315
Sheyenne ND, Grasslands (Insect)	Loamy sand	2.5	6.9	3	7	125
St. Thomas, ND	Silt loam	3.6	8.1	86	22	165
Valley City, ND	Stony loam	9.4	6.7	5	5	1415
Wahpeton, ND	Loam	2.5	7.5	141	20	135
West Fargo, ND	Silty clay	3.6	7.2	8	42	1460
Williston, ND	Loam	2.3	6.8	Fertilized by test		

KEY TO ABBREVIATIONS AND EVALUATIONS

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

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

METHODS

PPI = Preplant incorporated
PEI = Preemergence incorporated
PRE, PE = Preemergence
EPOST = Early postemergence
MPOST = Mid postemergence
LPOST = Late postemergence
LLPOST = Late-late postemergence
P, PO, POST = Postemergence
POSTDIR = Postemergence directed

MISCELLANEOUS

DF = Dry flowable

EC = Emulsifiable concentrate

F = Fall

FL = F = Flowable

S = Spring

L = Liquid flowable

WP = Wettable powder

WDG = Water dispersible granules

G = Granules or gallon/A

SG = Soluble granules

Inc = I = Incorporation

%ir = inju = Percent injury rating

%sr = %std, strd = Percent stand reduction

HT = Plant height

SPK = Spike stage

Tswt = TW = Test weight

Yld = Yield

alk = alkanolamine salt

bee = butoxyethyl ester

dea = diethanolamine salt

dma = dimethylamine salt

SGF = sodium salt

ioe = isooctyl ester

MS, MVO = methylated vegetable oil

PO, OC = Petroleum oil concentrate (17% emulsifier)

SURF = S = Surfactant

NIS = nonionic surfactant

28N, UAN = 28% liquid nitrogen fertilizer

AMS = ammonium sulfate

AMN = ammonium nitrate

ADJUVANT	COMPANY
Esterified vegetable oils/fatty acid	
Class Destiny	Cenex
Dash	BASF
Dash HC	BASF
Hasten	WilFarm
MethOil	Terra
MSO	Loveland
Scoil	AGSCO
Sundance II	Rosens
Sun-It II	AGSCO
W-4971	WilFarm
Esterified vegetable oils & organosilicone surfactant	
Dyne-Amic	Helena
Phase	Loveland
Rivet	Terra
W-1961	WilFarm
Fertilizer & drift retardant	
Array	Rosens
Nonionic surfactants	
Activate Plus	Terra
Activator 90	Loveland
Agra-Wet	Loveland
Amway 80	Amyway
Induce	Helena
Kinetic	Helena
L1-700	Loveland
Optima	Helena
Preference	Loveland
R-11	Wilbur-Ellis
R-900	WilFarm
S-240	Goldshcmidt
S-278	Goldschmidt
Silwet L-77	Loveland
Spray Booster S	Cenex
TF-8036	Zenica
X-77	Loveland
15-S-30	Union Carbide

ADJUVANT	COMPANY
Petroleum oil concentrates	
CL-9715	Cenex
Herbimax	Loveland
Mor-Act	Wilbur-Ellis
Ortech	Rosens
17% COC	Cenex
Prime Oil	Terra
Surfactant & fertilizer blends	
ASM Plus	Terra
Class Act	Cenex
Class Act II	Cenex
Class Act II DB	Cenex
Dispatch AMS	Loveland
Dispatch 2N	Loveland
Impressive HV	Rosen
Sensation	Rosens
Surfate	AGSCO
Water conditioning agent	
Choice	Loveland
Cayuse	Wilbur-Ellis
MSO/PO+fertilizer blends	
CL-9706	Cenex
CL-9711	Cenex
Eth-N-Gard	WilFarm
Unknown	
LI-105	Loveland
ND-4	NDSU
ND-72	NDSU

LIST OF HERBICIDES TESTED IN 1997

Common Name or Code Name	Abbreviation	Company	Formulation	Trade Name
AC263,222		American Cyanamid	2 lb/gal EC	Plateau
AC 299,263, Imazamox	Rptr	American Cyanamid	1 lb/gal EC	Raptor
Acetochlor&Dichlormid	Acet&Dcmd	Zeneca	6.4 lb/gal EC 3.2 lb/gal ME	Surpass TopNotch
Acetochlor&MON 4660	Acet&4660	Monsanto	7 lb/gal EC	Harness
Acifluorfen	Acif, Blzr	BASF	2 lb/gal E,S	Blazer
Acifluorfen		American Cyanamid	2 lb/gal E	Status
Acifluorfen&Bentazon	Acif&Bent	BASF	0.67+3 lb/gal EC	Galaxy
Alachlor	Alac	Monsanto	4 lb/gal MT	Several
Atrazine	Atra	Various	90% DF	Numerous
Atrazine+2,4-D		UAP	3.25 F	Shotgun
Bentazon	Bent, Bsgn	BASF	4 lb/gal S	Basagran
Bentazon+lactofen	V-10059	Valent	32 L	
Bentazon+lactofen	V-10057	Valent	33.9 L	
Bromoxynil	Brox	Rhône-Poulenc	2 lb/gal EC	Buctril/Broclean
Bromoxynil	Brox	CFPI	20 WP	CA 1216
Bromoxynil	Brox	CFPI	80 WP	CA 1797
CGA 248757, Fluthiacet	Actn, Flut	Novartis	75% SG	Action
CGA 277476, Oxasulfuron	Oxas, Expt	Novartis	75% SG	Expert
Chlorsulfuron		DuPont	75% WG	Telar
Clethodim	Clet, Slct	Valent	2 lb/gal 0.94 lb/gal	Select Prism
Clopyralid	Clpy	DowElanco	3 lb/gal S	Stinger
Clopyralid&2,4-D	Clpy&2,4-D	DowElanco	0.38 + 2 lb/ga. S	Curtail
Cloransulam	Clor, FrstRt	DowElanco	84% DF	FirstRate
Cyanazine	Cyan	DuPont	90% DF	Bladex
Cyanazine	Cyan	Griffin	90% DF 4 L	Cy-Pro DF Cy-Pro 4L
Cyanazine+Atrazine	Cy-Pro AT	Griffin	4 F 75 DF	Cy-Pro AT L Cy-Pro AT DF
Cycloate	Cycl	Zeneca	6 lb/gal EC	Ro-Neet
Desmedipham	Desm	AgrEvo	1.3 lb/gal EC	Betanex

Desmedipham & Phenmedipham	Desm&Phen	AgrEvo	0.65+0.65 lb/gal E	Betamix
Desmedipham & Phenmedipham & Ethofumesate	Desm&Phen&Etho	AgrEvo	0.6+0.6+0.6 lb/gal E	Betamix Progress
Diflufenzoypyr		BASF		None
Dicamba	Dica	BASF	4 lb/gal S	Banvel, Clarity
Dimethenamid	Dime, Frtr	BASF	6 lb/gal EC	Frontier
Diclofop	Dcfp	AgrEvo	3 lb/gal EC	Hoelon
Difenzoquat	Dife	American Cyanamid	2 lb/gal S	Avenge
Diflufenzopyr Dicamba	BAS 662	BAS	70% WG	BAS 662
Diquat	Diqu	Zeneca	2 lb/gal S	Diquat
Endothall	Endo	Elf Atochem	3 lb/gal S	Herbicide 273
EPTC	EPTC	Zeneca	7 lb/gal EC 25% G	Eptam
EPTC&Dichlormid	EPTC&Dcmd	Zeneca	6.7 lb/gal EC 25% G	Eradicane
EPTC&Dichlormid& Acetochlor	EPTC&Dcmd& Acet	Zeneca	6.8 EC	DoublePlay
Ethalfluralin	Etha	DowElanco	3 lb/gal EC 10% G	Sonalan
Ethofumesate	Etho	AgrEvo	4 lb/gal F	Nortron
F8426 (carfentrazone)		FMC	50%	Aim/Affinity
Fenoxaprop-P	Fenx-P	AgrEvo	0.79 lb/gal EC	Option II
Fenx-P&2,4-D&MCPA		AgrEvo	0.44+0.58+1.75 lb/gal EC	Tiller
Fenx-P&MCPA		AgrEvo	0.67+4 lb/gal EC	Dakota
Fenx-P&MCPA& Thifensulfuron& Tribenuron		AgrEvo	1.6:7.6:0.187:0.092	Cheyenne
Fluazifop-P	Flfp-P	Zeneca	2 lb/gal EC	Fusilade DX
Fluazifop-P& Fenoxaprop-P	Flfp&Fenx	Zeneca	2+0.66 lb/gal EC	Fusion
Flumetsulam& Metolachlor	Flms&Meto NAF2	DowElanco	0.2+7.47 lb/gal	Broadstrike+Dual
Flumetsulam& Trifluralin	Flms&Trif XRM-5313	DowElanco	0.25+3.4 lb/gal	Broadstrike+Treflan
Flumetsulam& Clopyralid	Flms & Clpy	DowElanco	23.1+62.3% DF	Hornet

Flumetsulam& Clpy&2,4-D	Flms&Clpy &2,4-D	DowElanco	84.3 % DF	Scorpion III
Flumiclorac	Flmc, Rsrc	Valent	0.86 lb/gal EC	Resource
Flumiclorac & lactofen		Valent	3.1 lb/gal/EC	Stellar
Flumioxqzin	V-53482	Valent		
Flyroxypyr	Flur	UAP	1 lb/gal EC	Starane
Fosamine		DuPont	4 lb/gal SL	Krenite
Glufosinate	Gluf, Lbrty	AgrEro	1 lb/gal EC	Liberty
Glyphosate-ipa	Glyt	Monsanto	3 lb ae/gal S	Roundup Ultra/RT, Glyphos
Glyphosate-tms	Glyt	Zeneca	6 lb ai/gal S	Touchdown
Glyphosate&2,4-D		Monsanto	0.9 + 1.5 lb/gal	Landmaster BW
Glyphosate& dicamba		Monsanto	1 + 2.9 lb/gal	Weedmaster
Halosulfuron	Halo, Prmt	Monsanto	75% DF	Permit
Hexazinone	Hexa	DuPont	75% DF 90% SP	Velpar
HOE 1133		Agro	1.275 lb/gal	Perma
Imazaquin	Imqn	American Cyanamid	1.5 lb/gal S	Scepter
Imazethapyr	Imep, Prst	American Cyanamid	2 lb/gal S	Pursuit
Imazethapyr& Pendimethalin	Imep&Pend	American Cyanamid	2.9 EC	Pursuit Plus
Imazamethabenz	Immb	American Cyanamid	2.5 lb/gal EC	Assert
Isoxaflutole	RP 201772	Rhône-Poulenc	75 DF	Balance
Lactofen	Lact	Valent	2 lb/gal S	Cobra
MCPA	MCPA	Rhône-Poulenc	4 lb/gal EC, S	Several, Chiptox
Metolachlor& Benoxacor (active isomer)		Novartis	7.6 lb/gal E	Dual II Magnum
Metolachlor& Atrazine		Novartis	6 lb/gal F	Bicep II
Metolachlor& Benoxacor	Meto&Bxcr	Novartis	7.8 lb/gal EC	Dual II
Metribuzin	Metr	Bayer DuPont	4 lb/gal F, 75% DF 4 lb/gal F, 75% DF	Sencor Lexone
Metsulfuron	Mets	DuPont	60% DF	Ally/Escort
MON-37500		Monsanto	75% DF	
Nicosulfuron	Nico	DuPont	75% DF	Accent

Nicosulfuron+ rimsulfuron+ atrazine		DuPont	89.46	Basis Gold
Nicosulfuron+ rimsulfuron+ clopyralid+ flumetsulam		DuPont	6.2+6.2+51.7 +19.3%	Accent Gold
Oxyfluorfen	Oxyf	Rohm & Haas	1.6 lb/gal EC	Goal
Paraquat	Para	Zeneca	2.5 lb/gal S 2 lb/gal S	Gramoxone Extra Cyclone
Pendimethalin	Pend	American Cyanamid	3.3 lb/gal EC	Prowl
Picloram		DowElanco	2 lb/gal S	Tordon 22K
Picloram&2,4-D		DowElanco	2.54 lb/gal	Tordon 101
Picloram&Triclopyr	Picl&Trcp	DowElanco	3 lb/gal	Access
Primisulfuron		Novartis	64.6 DF	Exceed
Propanil	Prnl	Rhom & Haas	80% DF	Stampede 80 EDF
Prosulfuron	Pros	Novartis	75 DF	Peek
Pyrazon	Pyzn	BASF	4.2 lb/gal F	Pyramin
Quinclorac		BASF	75% WP	Facet
Quizalofop-P	Qufp-P	DuPont	0.88 lb/gal EC	Assure II
Rimsulfuron		DuPont	25% DF	Matrix
Rimsulfuron& Thifensulfuron	Rims&Thif, Bsis	DuPont	75% DF	Basis
Sethoxydim	Seth	BASF	1.5 lb/gal EC 1.0 lb/gal EC	Poast Poast-Plus
Sethoxydim	Prst	American Cyanamid	1.5 lb/gal EC	Prestige
Sulfentrazone		FMC	75% DF	Authority
Sulfometuron	Sume	DuPont	75% DF	Oust
Thiafluamide& Metribuzin		Bayer	68% DF	Axiom
Thifensulfuron	Thif, Pinn, Pncl	DuPont	25% DF	Pinnacle
Thifensulfuron& Chlorimuron	Cnct	DuPont	25% DF	Concert
Thifensulfuron& Tribenuron	Thif&Trib	DuPont	50%+25% DF	Harmony Extra
Tralkoxydim	Tral	Zeneca	80% DF	Achieve
Tribenuron	Trib	DuPont	75% DF	Express
Triallate	Tria	Monsanto	4 lb/gal EC, 10% G	Far-Go
Triflusulfuron	Tfsu	DuPont	50% DF	UpBeet

Triasulfuron	Trsu	Novartis	75% DF	Amber
Triclopyr	Trcp	DowElanco	4 lb/gal EC	Garlon
Trifluralin	Trif	DowElanco	4 lb/gal EC 10% G	Several
2,4-D	2,4-D	Various	Various EC, S, WSP	Numerous
2,4-DB	2,4-DB	Various	2 lb/gal	Numerous

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

Soil applied herbicides plus postemergence herbicides applied with high pressure, Fargo, 1997. (Dexter) EPTC + cycloate was applied and incorporated with a rototiller set to operate four inches deep May 16. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Ethofumesate was applied May 16 after planting. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Postemergence herbicide treatments were applied June 5, June 12 and June 18. All low pressure herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. High pressure treatments were applied to the center four rows of six row plots in 11.7 gpa water at 100 psi through D1.5 disk and #23 core. Sugarbeet injury and redroot pigweed and green foxtail control were evaluated July 8.

Date	May 16	June 5	June 12	June 18
Time of Day	4:30 PM	2:00 PM	10:00 AM	2:00 PM
Air Temp. (°F)	80	84	81	77
6" Soil Temp. (°F)	53	68	68	62
Rel. Humidity (%)	-	38	48	42
Wind Velocity (mph)	11	11	8	10
Cloud Cover (%)	5	5	0	90
Soil Moisture	Good	Good	Fair	Good
Sugarbeet Stage	-	v1.0-v1.5	v1.5-v2.5	v3.5-v4.5
Redroot Pigweed Stage	-	cot-1 leaf	2 to 8 leaf	6 lf-2 inch
Green Foxtail Stage	-	1 to 2 leaf	1 to 2 inch	1.5-4 inch

Treatment*	Rate	Sgbt inj	Rrpw cntl	Grft cntl
	lb/A	%	%	%
Ethofumesate (PRE)/	2			
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	100	98
EPTC+Cycloate (PPI)/	0.9+1.5			
Desm+Tfsu+Clpy+MOil-3 times	0.08+0.004+0.03+1.5%	9	99	98
Ethofumesate (PRE)/	2			
Desmedipham+Triflusulfuron+Clpy-3 times	0.16+0.008+0.06	0	100	95
EPTC+Cycloate (PPI)/	0.9+1.5			
Desm+Tfsu+Clopyralid-3 times	0.16+0.008+0.06	8	98	100
Desm+Tfsu+Clopyralid+MethOil-3 times	0.08+0.004+0.03+1.5%	3	96	83
Desmedipham+Triflusulfuron+Clpy-3 times	0.16+0.008+0.06	0	98	68
Desm+Tfsu+Clpy+MethOil-3 times (high pressure)	0.08+0.004+0.03+1.5%	0	91	65
Desmedipham+Triflusulfuron+Clpy-3 times (high pressure)	0.16+0.008+0.06	0	99	64
EXP MEAN		2	97	84
C.V. %		152	3	9
LSD 5%		5	4	12
LSD 1%		7	6	16
# OF REPS		4	4	4

* Meth Oil = methylated seed oil from Terra.

SUMMARY: All treatments gave less than 10% sugarbeet injury. Desmedipham + triflusulfuron + clopyralid + MethOil applied three times with high spray pressure gave less control of redroot pigweed and green foxtail than the same treatment applied at 40 psi. Desmedipham + triflusulfuron + clopyralid + MethOil at 0.08 + 0.004 + 0.03 lb/A + 1.5% applied three times gave better green foxtail control than desmedipham + triflusulfuron + clopyralid at 0.16 + 0.008 + 0.06 lb/A applied three times suggesting that the MethOil more than doubled the efficacy of the combination on green foxtail.

Soil applied, lay-by and postemergence herbicides, Crookson, 1997. (Dexter) Preplant incorporated herbicides were applied 11:30 am May 14 when the air temperature was 42F, soil temperature at six inches was 42F, wind velocity was 30 mph, cloud cover was 95% and soil moisture was good. A rotctiller set 2 inches deep was used for incorporation. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. Counter 15G insecticide at 12 pound product per acre was applied modified in-furrow at planting. Preemergence herbicide treatments were applied May 14 after planting. The first half of split application postemergence herbicide treatments was 2:30 pm June 13 when the air temperature was 80F, relative humidity was 41%, soil temperature at six inches was 78F, wind velocity was 7 mph, sky was clear, soil moisture was good, sugarbeet was in the v2.1 to v4.9 leaf stage, redroot pigweed was in the 1 to 8 leaf stage, green foxtail was 1 to 3 inches tall and kochia was 0.25 to 1.25 inch rosette diameter. The second half of split application postemergence herbicide treatments was 4:30 pm June 20 when the air temperature was 80F, relative humidity was 51%, soil temperature at six inches was 71F, wind velocity was 5 mph, cloud cover was 5%, soil moisture was good, sugarbeet was in the v2.0 to v8.5 leaf stage, redroot pigweed was in the 1 to 3 inches tall, green foxtail was 3 to 10 inches tall and kochia was 1 to 5 inches tall. All herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was hand weeded and hand thinned to an eight inch spacing July 15. Sugarbeet injury and redroot pigweed, green foxtail and kochia control were evaluated July 10. Sugarbeet from the center two rows of 30 foot plots was harvested September 26.

Treatment*	Rate	Sgbt inj	Rrpw cntl	Grft cntl	Kocz cntl
	lb/A	%	%	%	%
Untreated Check	0	0	0	0	0
Metolachlor-M (PPI)	1.67	8	99	98	66
Metolachlor-M (PPI)	2	14	100	99	55
Ethofumesate (PPI)	3.5	0	100	100	95
Metolachlor-M (Pre)	1.67	0	30	74	16
Metolachlor-M (Pre)	2	3	53	83	10
Ethofumesate (Pre)	3.5	0	58	49	45
Metolachlor-M (POST)	2	0	13	48	8
Metolachlor-M (POST)	2.6	0	71	79	36
Desm+Tfsu+Clpy (POST)	0.25+0.01+0.06	3	96	66	98
Metolachlor-M (PPI)/	1				
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06				
Desm+Tfsu+Clpy	0.25+0.01+0.06	29	100	100	100
Metolochlor-M (PPI)/	1.33				
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06				
Desm+Tfsu+Clpy	0.25+0.01+0.06	30	100	100	100
Desm+Tfsu+Clpy/	0.25+0.01+0.06				
Meto-M+Desm+Tfsu+Clpy	4+0.25+0.01+0.06	3	100	69	100
Desm+Tfsu+Clpy/	0.25+0.01+0.06				
Acet-H+Desm+Tfsu+Clpy	2.5+0.25+0.01+0.06	15	100	75	100
Desm+Tfsu+Clpy/	0.25+0.01+0.06				
Dime+Desm+Tfsu+Clpy	1.46+0.25+0.01+0.06	0	100	85	100
Desm+Tfsu+Clpy/	0.25+0.01+0.06				
Desm+Tfsu+Clpy	0.25+0.01+0.06	1	100	86	100
EXP MEAN		6	76	76	64
C.V. %		76	11	20	29
LSD 5%		7	12	21	26
LSD 1%		9	16	28	35
# OF REPS		4	4	4	4

* Metholachlor-M = Magnum (7.6 lb active ingredient per gallon) formulation of metholachlor; Acet-H = Harness formulation of acetochlor.

Experiment continued on next page.

Treatment*	Rate	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	ton/A		lb/A
Untreated Check	0	15.8	1.6	17.7	761	4944
Metolachlor-M (PPI)	1.67	15.7	1.7	19.3	784	5341
Metolachlor-M (PPI)	2	16.4	1.6	17.7	742	5139
Ethofumesate (PPI)	3.5	16.1	1.6	20.7	727	5916
Metolachlor-M (Pre)	1.67	16.3	1.6	16.2	730	4650
Metolachlor-M (Pre)	2	16.1	1.7	15.6	753	4437
Ethofumesate (Pre)	3.5	16.5	1.6	13.6	720	4047
Metolachlor-M (POST)	2	16.3	1.6	12.6	720	3684
Metolachlor-M (POST)	2.6	16.0	1.6	18.3	732	5181
Desm+Tfsu+Clpy (POST)	0.25+0.01+0.06	16.3	1.6	14.7	704	4277
Metolachlor-M (PPI)/	1					
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06					
Desm+Tfsu+Clpy	0.25+0.01+0.06	15.9	1.6	18.7	763	5255
Metolochlor-M (PPI)/	1.33					
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06					
Desm+Tfsu+Clpy	0.25+0.01+0.06	15.8	1.7	20.4	785	5720
Desm+Tfsu+Clpy/	0.25+0.01+0.06					
Meto-M+Desm+Tfsu+Clpy	4+0.25+0.01+0.06	15.9	1.8	18.2	804	5085
Desm+Tfsu+Clpy/	0.25+0.01+0.06					
Acet-H+Desm+Tfsu+Clpy	2.5+0.25+0.01+0.06	16.3	1.6	18.5	728	5376
Desm+Tfsu+Clpy/	0.25+0.01+0.06					
Dime+Desm+Tfsu+Clpy	1.46+0.25+0.01+0.06	15.6	1.9	19.0	894	5137
Desm+Tfsu+Clpy/	0.25+0.01+0.06					
Desm+Tfsu+Clpy	0.25+0.01+0.06	16.1	1.6	19.3	738	5495
EXP MEAN		16.1	1.6	17.5	755	4980
C.V. %		3.3	6.8	14.8	9	15
LSD 5%		NS	0.2	3.7	NS	1051
LSD 1%		NS	NS	4.9	NS	1404
# OF REPS		4	4	4	4	4

* Metholachlor-M = Magnum (7.6 lb active ingredient per gallon) formulation of metholachlor; Acet-H = Harness formulation of acetochlor.

Summary

Metolachlor PPI and ethofumesate PPI gave better weed control than metolachlor PRE or ethofumesate PRE. Metolachlor PPI at 1.67 lb/A gave weed control similar to metolachlor at 2 lb/A. Metolachlor PPI followed by metolachlor + desmedipham + triflusulfuron + clopyralid caused more sugarbeet injury than other treatments but the yield from these plots was similar to the highest yielding plots. The treated plots produced extractable sucrose similar to the untreated check (hand weeded in mid-July) except plots treated with metolachlor at 2.0 lb/A POST yielded less. In absolute numbers, the plots treated with ethofumesate at 3.5 lb/A PPI yielded the most extractable sucrose, significantly more than metolachlor PRE, ethofumesate PRE, metolachlor at 2.0 lb/A POST and desmedipham + triflusulfuron + clopyralid applied POST one time. Adding acetochlor to the second application of desmedipham + triflusulfuron + clopyralid caused more sugarbeet injury than adding metolachlor or dimethenamid.

Soil applied, lay-by and postemergence herbicides, Renville, 1997. (Dexter) Preplant incorporated herbicides were applied May 12. A rototiller set 2 inches deep was used for incorporation. Sugarbeet was seeded May 12. Preemergence herbicide treatments were applied May 12 after planting. The first half of split application postemergence herbicide treatments was 2:00 pm May 26 when the air temperature was 68F, wind velocity was 0-5 mph, cloud cover was 20%, soil moisture was fair, sugarbeet was in the cotyledon stage, common lambsquarters was in the cotyledon stage and wild proso millet was 0.5 inches tall. The second half of split application postemergence herbicide treatments was 1:00 pm June 2 when the air temperature was 73F, wind velocity was 0-5 mph, cloud cover was 15%, soil moisture was poor, sugarbeet was in the cotyledon to 2 leaf stage, common lambsquarters was in the cotyledon stage to 1 inch tall and wild proso millet was 1 inch tall. All herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and common lambsquarters and wild proso millet control were evaluated June 26.

Treatment*	Rate	Wild Proso Millet control	Common Lambsquarters control
	lb/A	%	%
Hand Weeded Check	0	1	1
Metolachlor-M (PPI)	1.67	61	33
Metolachlor-M (PPI)	2	59	54
Ethofumesate (PPI)	3.5	78	87
Metolachlor-M (Pre)	1.67	4	3
Metolachlor-M (Pre)	2	0	9
Ethofumesate (Pre)	3.5	0	0
Metolachlor-M (POST)	2	0	0
Metolachlor-M (POST)	2.6	0	0
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	8	39
Metolachlor-M (PPI)/	1		
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	51	79
Metolachlor-M (PPI)/	1.33		
Meto-M+Desm+Tfsu+Clpy/	2.6+0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	64	61
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Meto-M+Desm+Tfsu+Clpy	4+0.25+0.01+0.06	38	86
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Acet-H+Desm+Tfsu+Clpy	2.5+0.25+0.01+0.06	13	58
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Dime+Desm+Tfsu+Clpy	1.46+0.25+0.01+0.06	68	80
Desm+Tfsu+Clpy/	0.25+0.01+0.06		
Desm+Tfsu+Clpy	0.25+0.01+0.06	31	84
C.V. %		46	39
LSD 5%		19	23
LSD 1%		26	31
# OF REPS		4	4

* Metholachlor-M = Magnum (7.6 lb active ingredient per gallon) formulation of metholachlor; Acet-H = Harness formulation of acetochlor.

SUMMARY: Metolachlor and ethofumesate gave better weed control when applied PPI rather than PRE. Ethofumesate gave better control of common lambsquarters than metolachlor. Adding metolachlor, acetochlor or dimethenamid to desmedipham + triflusulfuron + clopyralid did not improve common lambsquarters control.

Preemergence herbicide burndown, Crookston, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 14. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Preemergence treatments were applied 2:00 PM May 19 when the air temperature was 50F, soil temperature at six inches was 49F, relative humidity was 49%, wind velocity was 15-20 mph, cloud cover was 100% and soil moisture was good. Postemergence treatments were applied 2:30 PM June 13 when the air temperature was 80F, soil temperature at six inches was 78F, relative humidity was 41%, wind velocity was 7 mph, sky was clear, soil moisture was good, sugarbeet was in the v2.1 to v 4.9 stage, redroot pigweed was in the 1 to 8 leaf stage, green foxtail was 1 to 3 inches tall, common lambsquarters was in the 6 leaf stage to 2 inches tall and kochia had a 0.25 to 1.25 inch rosette diameter. All herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet injury and redroot pigweed and green foxtail control were evaluated June 28 and July 10. Common lambsquarters control was evaluated June 28. Kochia control was evaluated July 10.

		June 28				July 10			
Treatment*	Rate	Sgbt inj	Grft cntl	Rrpw cntl	Colq cntl	Sgbt inj	Rrpw cntl	Kocz cntl	Grft cntl
	lb/A	%	%	%	%	%	%	%	%
Paraquat-Cyclone (PRE)	0.5	0	0	8	5	0	0	0	0
Paraquat-Cyclone+R-11 (POST)	0.5+0.125%	100	100	100	99	100	97	99	98
Glyt-Touchdown+R-11 (PRE)	0.375+0.25%	0	0	8	0	0	0	0	0
Glyt-Touchdown+R-11 (POST)	0.375+0.25%	100	100	98	100	100	94	97	99
Glyphosate-Roundup Ultra (PRE)	0.375	0	0	0	0	0	0	0	0
Glyphosate-Roundup Ultra (POST)	0.375	100	100	100	100	100	95	99	98
EXP MEAN		50	50	52	50	50	48	49	49
C.V. %		0	0	15	8	0	2	2	2
LSD 5%		NS	0	12	6	NS	1	2	2
LSD 1%		NS	0	16	9	NS	2	2	2
# OF REPS		4	4	4	4	4	4	4	4

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

Summary

Very few weeds had emerged when the PRE treatments were applied. POST paraquat and both formulations of glyphosate gave very good weed control.

Postemergence herbicides, Arthur, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 21. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 9, June 16 and June 27. Sethoxydim + Dash HC at 0.35 lb ai/A+1

Date	June 9	June 16	June 27
Time of Day	3:00 PM	3:00 PM	1:00 PM
Air Temp. (°F)	84	79	86
6" Soil Temp. (°F)	78	78	80
Rel. Humidity (%)	35	32	74
Wind Velocity (mph)	15	6	10-15
Cloud Cover (%)	0	50	0
Soil Moisture	Good	Good	Good
Sugarbeet Stage	v1.5-v2.1	v2.0-v4.5	v7.2-v8.2
Common Ragweed Stage	1 inch	3 inch	6 inch
Redroot Pigweed Stage	cot. to 2 leaf	2 to 6 leaf	cot. to 3 inch
Eastern black nightshade	cot. to 2 leaf	2 to 6 leaf	2 lf - 2 inch
Common Lambsquarters	cot. to 4 leaf	4 to 8 leaf	1 to 4 inch

pt/A was applied to the entire plot area June 19. Sugarbeet injury and common ragweed, redroot pigweed, Eastern black nightshade and common lambsquarters control were evaluated July 5.

Treatment*	Rate	Sgbt inj	Cora cntl	Rrpw cntl	Ebns cntl	Colq cntl
	lb/A	%	%	%	%	%
Desm+Triflusulfuron+MethOil-3 times	0.08+0.004+1.5%	0	84	99	98	83
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.015+1.5%	3	97	95	100	95
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	3	100	97	100	97
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	5	100	100	100	100
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	33	81	95	100	84
Desm+Triflusulfuron+Clpy-3 times	0.25+0.0156+0.06	15	100	100	100	100
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	14	99	100	99	99
Desmedipham+Triflusulfuron-3 times	0.16+0.008	4	68	91	93	87
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.03	4	99	100	100	100
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.06	10	100	100	100	98
Desm+Triflusulfuron+Endothall-3 times	0.16+0.008+0.25	30	98	97	100	97
Desm+Tfsu+Clpy+Clet+Moil-3 times	0.08+0.004+0.03+0.032+1.5%	0	99	99	100	93
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	3	99	100	100	98
Desm+Tfsu+Clpy+Qufp+MOil-3 times	0.08+0.004+0.03+0.019+1.5%	3	100	100	100	98
Desm+Tfsu+Clpy+Seth+MOil-3 times	0.08+0.004+0.03+0.067+1.5%	3	100	99	100	99
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	89	100	98	100
Desm&Phen+Tfsu+Clpy+MOil-3 times	0.08+0.004+0.03+1.5%	3	99	95	100	99
Desm&Phen&Etho+Tfsu+Clpy+MOil-3 times	0.08+0.004+0.03+1.5%	0	100	97	100	99
Desmedipham-3 times	0.25/0.33/0.33	5	55	94	100	96
C.V. %		83	14	5	2	6
LSD 5%		8	18	NS	3	8
LSD 1%		11	24	NS	NS	11
# OF REPS		4	4	4	4	4

* MethOil = methylated seed oil from Terra.

SUMMARY: Treatments that included endothall gave more sugarbeet injury than other treatments. The highest tested rates of desmedipham + triflusulfuron or desmedipham + triflusulfuron + clopyralid gave more sugarbeet injury than the reduced rate or the micro rate. Adding clopyralid to desmedipham + triflusulfuron + MethOil improved control of common ragweed and common lambsquarters.

Postemergence herbicides, Buffalo Lake, 1997. (Dexter) 'Hilleshog Resist' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 29. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 15, May 22 and May 29. Sugarbeet injury and common lambsquarters and giant foxtail control were evaluated June 27.

Date	May 15	May 22	May 29
Time of Day	1:00 PM	2:00 PM	12:00 PM
Air Temp. (°F)	48	60	62
6" Soil Temp. (°F)	-	-	-
Rel. Humidity (%)	-	-	-
Wind Velocity (mph)	10-15	5-10	0-5
Cloud Cover (%)	0	30	35
Soil Moisture	Good	Good	Good
Sugarbeet Stage	cotyledon	2 leaf	4 leaf
Kochia	cot - 0.25" ros.	0.5-1" ros.	1 inch
Common Lambsquarters	cotyledon	cot - 0.5 inch	cot - 1.5 inch

Treatment*	Rate	Sgbt inj	Colq cntl	Gift cntl
	lb/A	%	%	%
Desm+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	75	23
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.015+1.5%	0	81	20
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	85	25
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	0	89	30
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	0	80	17
Desm+Tfsu+Clpy-3 times	0.25+0.0156+0.06	0	93	43
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	0	94	23
Desmedipham+Triflusulfuron-3 times	0.16+0.008	0	90	43
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.03	0	93	30
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.06	0	94	17
Desm+Triflusulfuron+Endothall-3 times	0.16+0.008+0.25	0	92	58
Desm+Tfsu+Clpy+Clet+Moil-3 times	0.08+0.004+0.03+0.032+1.5%	0	93	63
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	0	94	93
Desm+Tfsu+Clpy+Qufp+MOil-3 times	0.08+0.004+0.03+0.019+1.5%	0	84	67
Desm+Tfsu+Clpy+Seth+MOil-3 times	0.08+0.004+0.03+0.067+1.5%	0	80	70
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	81	23
Desm&Phen+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	85	25
De&Ph&Et+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	80	33
Desmedipham-3 times	0.25/0.33/0.33	0	85	17
EXP MEAN		0	87	38
C.V. %		0	10	50
LSD 5%		NS	13	31
LSD 1%		NS	NS	42
# OF REPS		4	4	3

* Meth Oil = methylated seed oil from Terra.

Summary

Desmedipham alone gave common lambsquarters control similar to the best of the other treatments. Giant foxtail populations were erratic across the experiment. Treatments including clethodim, quizalofop, or sethoxydim tended to give better grass control than the other treatments.

Postemergence herbicide rates, Crookson, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 30, June 6 and June 13. Sugarbeet injury and redroot pigweed, common lambsquarters and green foxtail control were evaluated June 28.

Date	May 30	June 6	June 13
Time of Day	12:30 PM	3:30 PM	2:30 PM
Air Temp. (°F)	77	78	80
6" Soil Temp. (°F)	64	78	78
Rel. Humidity (%)	57	46	41
Wind Velocity (mph)	5-10	9	7
Cloud Cover (%)	50	20	0
Soil Moisture	Good	Good	Fair
Sugarbeet Stage	v1.1	v1.5-v3.5	v5.3
Redroot Pigweed Stage	cotyledon	cot. - 2 leaf	1 to 2 inch
Common Lambsquarters	cot. to 2 leaf	2 to 4 leaf	2 to 3 inch
Green Foxtail Stage	emerg.-0.5 inch	2 to 4 leaf	3 to 6 inch

Summary

All treatments gave similar sugarbeet injury and common lambsquarters control. Treatments that included clethodim gave 100% green foxtail control, better control than other treatments. All treatments gave similar redroot pigweed control except the treatment that included endothall plus MethOil gave less control. These results indicate no improvement in weed control from increasing rates of triflusulfuron or clopyralid.

Experiment continued on next page.

Postemergence herbicide rates, Crookson, 1997. (continued)

Treatment*	Rate	Sgbt inj	Rrpw cntl	Colq cntl	Grft cntl
	lb/A	%	%	%	%
Desm+Triflusulfuron+MethOil-3 times	0.08+0.004+1.5%	3	94	95	79
Desm+Triflusulfuron+MethOil-3 times	0.08+0.008+1.5%	3	97	98	75
Desm+Triflusulfuron+MethOil-3 times	0.08+0.0156+1.5%	5	97	97	79
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	5	98	100	78
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	3	99	100	69
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	8	87	97	79
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.032+1.5%	0	97	100	100
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	3	96	100	100
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	94	94	78
Desm&Phen+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	95	99	86
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.008+0.03+1.5%	0	96	100	84
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.008+0.06+1.5%	0	97	100	71
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.0156+0.03+1.5%	3	97	100	85
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.0156+0.06+1.5%	0	97	100	79
Desmedipham+Triflusulfuron-3 times	0.16+0.004	0	96	98	70
Desmedipham+Triflusulfuron-3 times	0.16+0.008	0	96	100	69
Desmedipham+Triflusulfuron-3 times	0.16+0.0156	3	95	98	65
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.004+0.03	0	99	100	65
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.004+0.06	3	98	100	46
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.03	5	98	100	68
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.06	0	99	100	64
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.0156+0.03	6	100	99	73
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.0156+0.06	3	100	100	74
Desm+Triflusulfuron+Endothall-3 times	0.16+0.008+0.25	6	97	93	83
Desmedipham+Triflusulfuron-3 times	0.25+0.004	5	100	99	65
Desmedipham+Triflusulfuron-3 times	0.25+0.008	4	97	100	71
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	4	99	98	83
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.004+0.03	5	100	100	70
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.004+0.06	3	100	100	59
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.008+0.03	6	97	100	69
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.008+0.06	3	98	100	78
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.0156+0.03	3	99	100	76
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.0156+0.06	8	99	100	79
EXP MEAN		3	97	99	75
C.V. %		175	3	3	14
LSD 5%		NS	4	NS	15
LSD 1%		NS	6	NS	20
# OF REPS		4	4	4	4

* MethOil = methylated seed oil from Terra.

Postemergence herbicide rates, Fargo, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 4, June 11 and June 18. Sugarbeet injury and redroot pigweed and green foxtail control were evaluated July 8.

Date	June 4	June 11	June 18
Time of Day	3:45 PM	2:00 PM	2:00 PM
Air Temp. (°F)	85	91	77
6" Soil Temp. (°F)	70	63	62
Rel. Humidity (%)	45	21	42
Wind Velocity (mph)	8	10-15	10
Cloud Cover (%)	20	25	90
Soil Moisture	Good	Fair	Good
Sugarbeet Stage	v1.0	v1.0-v3.5	v3.5-v4.5
Redroot Pigweed Stage	cot - 1 leaf	2 to 4 leaf	6 leaf-2 inch
Green Foxtail Stage	1 to 2 leaf	1 to 2 inch	1.5 to 4 inch

Summary

Desmedipham + triflusulfuron + endothall + MethOil gave the greatest sugarbeet injury and the least control of redroot pigweed compared to other treatments. Desmedipham&phenmedipham + triflusulfuron + MethOil gave similar redroot pigweed control and greater green foxtail control than desmedipham + triflusulfuron + MethOil at the same rate. Treatments including clethodim gave nearly total green foxtail control. Increasing rates of triflusulfuron or clopyralid had no significant effect on weed control. However, only four treatments gave less than 95% redroot pigweed control and two of these had triflusulfuron at the lowest rate, 0.004 lb/A and the other two had endothall.

Experiment continued on next page.

Postemergence herbicide rates, Fargo, 1997. (continued)

Treatment*	Rate	Sgbt inj	Rrpw cntl	Grft cntl
	lb/A	%	%	%
Desm+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	94	81
Desm+Tfsu+MethOil-3 times	0.08+0.008+1.5%	0	97	90
Desm+Tfsu+MethOil-3 times	0.08+0.0156+1.5%	0	97	90
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	3	98	85
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	0	97	80
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	24	77	80
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+.004+.03+.032+1.5%	0	96	100
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+.004+.03+.064+1.5%	3	97	99
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	93	91
Desm&Phen+Tfsu+Clpy+MOil-3 times	0.08+0.004+0.03+1.5%	0	97	91
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.008+0.03+1.5%	0	97	91
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.008+0.06+1.5%	3	99	90
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.0156+0.03+1.5%	0	98	91
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.0156+0.06+1.5%	1	99	90
Desm+Tfsu-3 times	0.16+0.004	3	96	81
Desm+Tfsu-3 times	0.16+0.008	3	99	83
Desm+Tfsu-3 times	0.16+0.0156	4	98	91
Desm+Tfsu+Clpy-3 times	0.16+0.004+0.03	0	98	81
Desm+Tfsu+Clpy-3 times	0.16+0.004+0.06	8	98	85
Desm+Tfsu+Clpy-3 times	0.16+0.008+0.03	0	99	81
Desm+Tfsu+Clpy-3 times	0.16+0.008+0.06	0	99	83
Desm+Tfsu+Clpy-3 times	0.16+0.0156+0.03	0	98	91
Desm+Tfsu+Clpy-3 times	0.16+0.0156+0.06	0	100	86
Desm+Tfsu+Endo-3 times	0.16+0.008+0.25	8	93	89
Desm+Tfsu-3 times	0.25+0.004	3	99	89
Desm+Tfsu-3 times	0.25+0.008	6	97	84
Desm+Tfsu-3 times	0.25+0.0156	8	100	90
Desm+Tfsu+Clpy-3 times	0.25+0.004+0.03	1	99	81
Desm+Tfsu+Clpy-3 times	0.25+0.004+0.06	3	98	81
Desm+Tfsu+Clpy-3 times	0.25+0.008+0.03	0	100	88
Desm+Tfsu+Clpy-3 times	0.25+0.008+0.06	3	99	81
Desm+Tfsu+Clpy-3 times	0.25+0.0156+0.03	0	99	92
Desm+Tfsu+Clpy-3 times	0.25+0.0156+0.06	4	99	88
EXP MEAN		3	97	87
C.V. %		135	4	6
LSD 5%		5	5	7
LSD 1%		6	6	9
# OF REPS		4	4	4

* Meth Oil = methylated seed oil from Terra

Postemergence herbicides, Minto, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 28. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 17 and June 25. Sethoxydim + Dash HC at 0.3 lb ai/A + 1 pt/A was applied to all plots June 20. Sugarbeet injury and redroot pigweed control were evaluated July 8.

Date	June 17	June 25
Time of Day	1:30 PM	3:00 PM
Air Temp. (°F)	76	71
6" Soil Temp. (°F)	67	67
Rel. Humidity (%)	63	60
Wind Velocity (mph)	8	17
Cloud Cover (%)	80	85
Soil Moisture	Good	Good
Sugarbeet Stage	v2.0-v4.1	v3.7-v5.5
Redroot Pigweed Stage	2 leaf	4 leaf to 3 inch

Treatment*	Rate	Sgbt inj	Rrpw cntl
	lb/A	%	%
Desm+Tfsu+MethOil-2 times	0.08+0.004+1.5%	0	88
Desm+Tfsu+Clpy+MethOil-2 times	0.08+0.004+0.015+1.5%	10	83
Desm+Tfsu+Clpy+MethOil-2 times	0.08+0.004+0.03+1.5%	0	86
Desm+Tfsu+Clpy+MethOil-2 times	0.08+0.004+0.06+1.5%	5	85
Desm+Tfsu+Endo+MethOil-2 times	0.08+0.004+0.25+1.5%	21	70
Desm+Tfsu+Clopyralid-2 times	0.25+0.0156+0.06	4	90
Desmedipham+Triflusulfuron-2 times	0.25+0.0156	6	88
Desmedipham+Triflusulfuron-2 times	0.16+0.008	0	78
Desm+Tfsu+Clopyralid-2 times	0.16+0.008+0.03	0	80
Desm+Tfsu+Clopyralid-2 times	0.16+0.008+0.06	8	74
Desm+Tfsu+Endothall-2 times	0.16+0.008+0.25	11	68
Desm+Tfsu+Clpy+Clet+Moil-2 times	0.08+0.004+0.03+0.032+1.5%	0	80
Desm+Tfsu+Clpy+Clet+MOil-2 times	0.08+0.004+0.03+0.064+1.5%	3	83
Desm+Tfsu+Clpy+Qufp+MOil-2 times	0.08+0.004+0.03+0.019+1.5%	5	80
Desm+Tfsu+Clpy+Seth+MOil-2 times	0.08+0.004+0.03+0.067+1.5%	3	88
Desm&Phen+Tfsu+MethOil-2 times	0.08+0.004+1.5%	0	79
Desm&Phen+Tfsu+Clpy+MethOil-2 times	0.08+0.004+0.03+1.5%	4	78
Des&Phen&Etho+Tfsu+Clpy+MethOil-2 times	0.08+0.004+0.03+1.5%	6	80
Desmedipham-2 times	0.25/0.33	0	64
C.V. %		112	6
LSD 5%		7	6
LSD 1%		10	9
# OF REPS		4	4

* Meth Oil = methylated seed oil from Terra

SUMMARY: Desmedipham + triflusulfuron + endothall + MethOil gave the greatest sugarbeet injury. Treatments were only applied twice rather than the intended three times due to untimely rains so weed control was poor compared to other experiments. Desmedipham gave less control of redroot pigweed than all other treatments except the two treatments that included endothall. Desmedipham + triflusulfuron + MethOil gave better redroot pigweed control than desmedipham & phenmedipham + triflusulfuron + MethOil. Desmedipham + triflusulfuron + clopyralid + MethOil at 0.08 + 0.004 + 0.03 lb/A + 1.5% gave better control of redroot pigweed than the same herbicide combination at 0.16+0.008+0.06 lb/A (twice the herbicide, no oil).

Postemergence herbicides, Ortonville, 1997. (Dexter) 'ACH 302' sugarbeet was seeded 1.25 inches deep in 22 inch rows April 29. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 15, May 22 and May 29. Sugarbeet injury and kochia and common lambsquarters control were evaluated June 27.

Date	May 15	May 22	May 29
Time of Day	1:00 PM	2:00 PM	12:00 PM
Air Temp. (°F)	48	60	62
6" Soil Temp. (°F)	-	-	-
Rel. Humidity (%)	-	-	-
Wind Velocity (mph)	10-15	5-10	0-5
Cloud Cover (%)	0	30	35
Soil Moisture	Good	Good	Good
Sugarbeet Stage	cotyledon	2 leaf	4 leaf
Kochia	cot - 0.25" ros.	0.5-1" ros.	1 inch
Common Lambsquarters	cotyledon	cot - 0.5 inch	cot - 1.5 inch

Treatment*	Rate	Sgbt inj	Kocz cntl	Colq cntl
	lb/A	%	%	%
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.015+1.5%	0	93	97
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	100	98
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	0	100	98
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	0	93	93
Desmedipham+Tfsu+Clopyralid-3 times	0.25+0.0156+0.06	0	97	82
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	0	100	100
Desmedipham+Triflusulfuron-3 times	0.16+0.008	0	100	93
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.03	0	98	97
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.06	0	100	100
Desm+Triflusulfuron+Endothall-3 times	0.16+0.008+0.25	0	97	100
Desm+Tfsu+Clpy+Clet+Moil-3 times	0.08+0.004+0.03+0.032+1.5%	0	100	97
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	0	75	100
Desm+Tfsu+Clpy+Qufp+MOil-3 times	0.08+0.004+0.03+0.019+1.5%	0	83	100
Desm+Tfsu+Clpy+Seth+MOil-3 times	0.08+0.004+0.03+0.067+1.5%	0	92	98
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	100	100
Desm&Phen+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	97	98
De&Ph&Et+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	0	95	100
Desmedipham-3 times	0.25/0.33/0.33	0	7	99
EXP MEAN		0	90	97
C.V. %		0	11	6
LSD 5%		NS	16	9
LSD 1%		NS	22	NS
# OF REPS		4	3	4

* Meth Oil = methylated seed oil from Terra.

Summary

Desmedipham alone gave nearly total control of common lambsquarters. Kochia populations were erratic across the experiment. All treatments except desmedipham alone gave good kochia control.

Postemergence herbicides, Renville, 1997. (Dexter) 'Beta 5014' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 8. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 26, June 2 and June 9. Sugarbeet injury and redroot pigweed control were evaluated July 10.

Date	May 26	June 2	June 9
Time of Day	2:00 PM	1:00 PM	1:30 PM
Air Temp. (°F)	68	73	76
6" Soil Temp. (°F)	-	-	-
Rel. Humidity (%)	-	-	-
Wind Velocity (mph)	0-5	0-5	0-5
Cloud Cover (%)	20	15	30
Soil Moisture	Fair	Poor	Poor
Sugarbeet Stage	cotyledon	cot. - 2 leaf	2 to 4 leaf
Giant Foxtail Stage	0.5 inch	1 to 1.5 inch	2 to 2.5 inch
Common Lambsquarters	cotyledon	cot. - 1 inch	cot. - 2 inch

Treatment*	Rate	Gift cntl	Colq cntl
	lb/A	%	%
Desm+Triflusulfuron+MethOil-3 times	0.08+0.004+1.5%	43	93
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.015+1.5%	37	92
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	37	92
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	52	96
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	37	92
Desm+Triflusulfuron+Clopyralid-3 times	0.25+0.0156+0.06	43	88
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	43	98
Desmedipham+Triflusulfuron-3 times	0.16+0.008	37	100
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.03	33	91
Desm+Triflusulfuron+Clopyralid-3 times	0.16+0.008+0.06	20	98
Desm+Triflusulfuron+Endothall-3 times	0.16+0.008+0.25	23	93
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.032+1.5%	60	90
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	90	91
Desm+Tfsu+Clpy+Qufp+MOil-3 times	0.08+0.004+0.03+0.019+1.5%	82	92
Desm+Tfsu+Clpy+Seth+MOil-3 times	0.08+0.004+0.03+0.067+1.5%	70	83
Desm&Phen+Triflusulfuron+MethOil-3 times	0.08+0.004+1.5%	62	93
Desm&Phen+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	53	97
Desm&Phen&Etho+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	43	92
Desmedipham-3 times	0.25/0.33/0.33	33	85
EXP MEAN		47	92
C.V. %		32	8
LSD 5%		25	NS
LSD 1%		34	NS
# OF REPS		3	3

* MethOil = methylated seed oil from Terra.

Summary

All treatments gave similar control of common lambsquarters. Clethodim at 0.064 lb/A applied three times in combination with other herbicides gave better control of giant foxtail than clethodim at 0.032 lb/A.

Postemergence herbicides, St. Thomas, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 21. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 9, June 16 and June 24.

Date	June 9	June 16	June 24
Time of Day	3:00 PM	3:00 PM	2:30 PM
Air Temp. (°F)	89	79	73
6" Soil Temp. (°F)	68	72	70
Rel. Humidity (%)	29	32	78
Wind Velocity (mph)	18	6	5
Cloud Cover (%)	0	50	90
Soil Moisture	Fair	Good	Good
Sugarbeet Stage	v1.5-v2.1	v2.0-v4.5	v4.5-v7.8
Redroot Pigweed Stage	2 to 4 leaf	1 to 1.5 inch	2 to 6 inch

Sugarbeet injury and redroot pigweed control were evaluated July 10.

Treatment*	Rate	Sgbt inj	Rrpw cntl
	lb/A	%	%
Desm+Tfsu+MethOil-3 times	0.08+0.004+1.5%	0	100
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.015+1.5%	4	98
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	5	100
Desm+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.06+1.5%	11	99
Desm+Tfsu+Endo+MethOil-3 times	0.08+0.004+0.25+1.5%	28	95
Desm+Tfsu+Clopyralid-3 times	0.25+0.0156+0.06	9	99
Desmedipham+Triflusulfuron-3 times	0.25+0.0156	4	100
Desmedipham+Triflusulfuron-3 times	0.16+0.008	0	98
Desm+Tfsu+Clopyralid-3 times	0.16+0.008+0.03	3	98
Desm+Tfsu+Clopyralid-3 times	0.16+0.008+0.06	5	98
Desm+Tfsu+Endothall-3 times	0.16+0.008+0.25	16	95
Desm+Tfsu+Clpy+Clet+Moil-3 times	0.08+0.004+0.03+0.032+1.5%	0	99
Desm+Tfsu+Clpy+Clet+MOil-3 times	0.08+0.004+0.03+0.064+1.5%	1	100
Desm+Tfsu+Clpy+Qufp+MOil-3 times	0.08+0.004+0.03+0.019+1.5%	0	99
Desm+Tfsu+Clpy+Seth+MOil-3 times	0.08+0.004+0.03+0.067+1.5%	1	100
Desm&Phen+Tfsu+MethOil-3 times	0.08+0.004+1.5%	3	99
Desm&Phen+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	1	99
Desm&Phen&Etho+Tfsu+Clpy+MethOil-3 times	0.08+0.004+0.03+1.5%	8	99
Desmedipham-3 times	0.25/0.33/0.33	9	93
EXP MEAN		6	98
C.V. %		102	2
LSD 5%		8	3
LSD 1%		11	3
# OF REPS		4	4

* Meth Oil = methylated seed oil from Terra

Summary

Desmedipham alone and treatments that included endothall gave less redroot pigweed control than the other treatments. Desmedipham + triflusulfuron + endothall + MethOil caused the greatest sugarbeet injury and desmedipham + triflusulfuron + endothall caused the second greatest injury.

Postemergence herbicides, Wahpeton, 1997. (Dexter) 'Hilleshog Horizon' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 5. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 20, May 27, June 3 and June 10. Sugarbeet injury and wild mustard, redroot pigweed, Pennsylvania smartweed, common lambsquarters and green and yellow foxtail control were evaluated June 21.

Date	May 20	May 27	June 3	June 10
Time of Day	10:00 AM	3:00 PM	10:30 AM	2:30 PM
Air Temp. (°F)	52	68	72	84
6" Soil Temp. (°F)	54	66	68	73
Rel. Humidity (%)	52	47	61	56
Wind Velocity (mph)	5-10	15-20	0	8
Cloud Cover (%)	0	100	100	25
Soil Moisture	Good	Good	Good	Good
Sugarbeet Stage	v1.0	v1.9	v2.1-v4.1	v4.3-v5.5
Wild Mustard	cotyledon	2 to 6 leaf	3 to 6 leaf	1 to 3 inch
Redroot Pigweed Stage	cotyledon	2 leaf	cot - 4 leaf	2 inch
Pennsylvania Smartweed	cotyledon	2 leaf	2 to 6 leaf	4 inch
Common Lambsquarters	cotyledon	2 leaf	4 to 6 leaf	3 inch
Green Foxtail Stage	emerging	3 leaf	4 to 6 leaf	10 inch

Treatment*	Rate	Sgbt inj	Wimu cntl	Rrpw cntl	Pesw cntl	Colq cntl	Gr&Ye Fxtl cntl
	lb/A	%	%	%	%	%	%
Desm+Triflusulfuron+MethOil-4 times	0.08+0.004+1.5%	11	100	99	100	100	84
Desm+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.015+1.5%	11	100	100	100	100	84
Desm+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.03+1.5%	19	100	100	100	100	85
Desm+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.06+1.5%	24	100	100	100	100	84
Desm+Tfsu+Endo+MethOil-4 times	0.08+0.004+0.25+1.5%	23	100	99	100	99	89
Desm+Triflusulfuron+Clopyralid-4 times	0.25+0.0156+0.06	29	100	100	100	100	88
Desmedipham+Triflusulfuron-4 times	0.25+0.0156	26	100	100	100	100	90
Desmedipham+Triflusulfuron-4 times	0.16+0.008	11	100	100	99	100	83
Desm+Triflusulfuron+Clopyralid-4 times	0.16+0.008+0.03	18	100	100	100	100	83
Desm+Triflusulfuron+Clopyralid-4 times	0.16+0.008+0.06	19	100	100	100	100	85
Desm+Triflusulfuron+Endothall-4 times	0.16+0.008+0.25	19	100	100	99	99	89
Desm+Tfsu+Clpy+Clet+MOil-4 times	0.08+0.004+0.03+0.032+1.5%	20	100	100	100	100	99
Desm+Tfsu+Clpy+Clet+MOil-4 times	0.08+0.004+0.03+0.064+1.5%	20	100	100	100	100	100
Desm+Tfsu+Clpy+Qufp+MOil-4 times	0.08+0.004+0.03+0.019+1.5%	18	100	100	100	100	99
Desm+Tfsu+Clpy+Seth+MOil-4 times	0.08+0.004+0.03+0.067+1.5%	20	100	100	100	100	100
Desm&Phen+Triflusulfuron+MethOil-4 times	0.08+0.004+1.5%	11	100	100	100	100	89
Desm&Phen+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.03+1.5%	20	100	100	99	100	89
Desm&Phen&Etho+Tfsu+Clpy+MOil-4 times	0.08+0.004+0.03+1.5%	19	100	99	100	100	86
Desmedipham-4 times	0.25/0.33/0.33/0.33	9	100	99	47	100	81
EXP MEAN		18	100	100	97	100	89
C.V. %		32	0	1	1	1	4
LSD 5%		8	NS	NS	2	1	4
LSD 1%		11	NS	NS	3	1	6
# OF REPS		4	4	4	3	4	4

* MethOil = methylated seed oil from Terra.

Experiment continued on next page.

Summary

Desmedipham + triflusulfuron + clopyralid at 0.25+0.0156+0.06 lb/A caused more sugarbeet injury and gave similar weed control compared to desmedipham + triflusulfuron + clopyralid + MethOil at 0.08+0.004+0.03 lb/A + 1.5%. Desmedipham + triflusulfuron at 0.25 + 0.0156 caused more sugarbeet injury than desmedipham alone at 0.25/0.33/0.33/0.33. All treatments gave nearly total control of wild mustard, redroot pigweed, Pennsylvania smartweed and common lambsquarters except desmedipham gave poor control of Pennsylvania smartweed. Treatments that included clethodim, quizalofop or sethoxydim gave nearly total control of foxtail spp., better control than other treatments.

Smartweed control in sugarbeet, Mahnomen, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 12. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots May 27, June 3, June 10 and June 17. Clethodim + Meth Oil at 0.125 lb ai/A+1 pt/A was applied to the entire plot area May 30. Sugarbeet injury and redroot pigweed, wild mustard and Pennsylvania smartweed control were evaluated June 28.

Date	May 27	June 3	June 10	June 17
Time of Day	10:00 AM	1:30 PM	3:30 PM	2:30 PM
Air Temp. (°F)	72	69	91	75
6" Soil Temp. (°F)	58	62	65	63
Rel. Humidity (%)	32	72	26	61
Wind Velocity (mph)	12	6	15-18	10-15
Cloud Cover (%)	25	100	10	100
Soil Moisture	Good	Good	Fair	Good
Sugarbeet Stage	v1.0	v1.5	v2.5-v4.5	v5.5-v6.3
Redroot Pigweed Stage	cotyledon	cot. to 1 leaf	cot. to 4 leaf	4 leaf to 2 inch
Wild Mustard	cotyledon	cot. to 2 leaf	cot. to 4 leaf	2 to 8 leaf
Pennsylvania Smartweed	cotyledon	cot. to 1 leaf	cot. to 3 leaf	2 to 4 leaf

Treatment*	Rate	Sgbt inj	Rrpw cntl	Wimu cntl	Pesw cntl
	lb/A	%	%	%	%
Desm+Tfsu+MethOil-4 times	0.08+0.004+1.5%	3	100	100	100
Desmedipham+Triflusulfuron-4 times	0.16+0.008	0	100	100	99
Desmedipham+Triflusulfuron-4 times	0.25+0.0156	5	100	100	100
Desm+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.03+1.5%	8	100	100	100
Desm+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.06+1.5%	5	100	100	100
Desm+Tfsu+Clopyralid-4 times	0.16+0.008+0.03	4	100	100	100
Desm+Tfsu+Clopyralid-4 times	0.16+0.008+0.06	5	100	100	100
Desm+Tfsu+Clopyralid-4 times	0.25+0.0156+0.03	11	100	100	100
Desm+Tfsu+Clopyralid-4 times	0.25+0.0156+0.06	15	100	100	100
Desm+Tfsu+Endo+MethOil-4 times	0.08+0.004+0.25+1.5%	45	100	100	100
Desm+Tfsu+Endothall-4 times	0.16+0.008+0.063	6	100	100	100
Desm+Tfsu+Endothall-4 times	0.25+0.0156+0.25	21	99	100	100
Desmedipham+Clopyralid-4 times	0.25+0.06	5	100	100	73
Desmedipham+Endothall-4 times	0.25+0.25	18	89	100	100
Desmedipham-4 times	0.25/0.33/0.33/0.33	11	100	100	50
Desm&Phen+Tfsu+Clpy+MethOil-4 times	0.08+0.004+0.03+1.5%	10	100	100	100
Desm&Phen&Etho+Tfsu+Clpy+MOil-4 times	0.08+0.004+0.03+1.5%	11	98	100	100
Desm+Tfsu+Clpy+Clet+MOil-4 times	0.08+0.004+0.03+0.032+1.5%	3	100	100	100
C.V. %		65	1	0	3
LSD 5%		9	2	NS	4
LSD 1%		13	3	NS	6
# OF REPS		4	4	4	4

* MethOil = methylated seed oil from Terra.

SUMMARY: Desmedipham + triflusulfuron + endothall + MethOil caused very severe sugarbeet injury, approximately twice as much injury as treatments that included endothall but no oil and 4 to 10 times more injury than treatments that included oil but no endothall. Desmedipham + endothall gave less redroot pigweed control than other treatments, even less than desmedipham alone. All treatments gave 100% wild mustard control. Treatments that included triflusulfuron or endothall gave 100% Pennsylvania smartweed control. Desmedipham and desmedipham + clopyralid gave less smartweed control than the other treatments.

Sugarbeet variety and herbicide interaction, Fargo, 1997. (Dexter) Seven sugarbeet varieties were seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18 and June 25. Herbicide treatments were desmedipham & phenmedipham & ethofumesate at 0.33, 0.4 and 0.5 lb ai/A, desmedipham + clopyralid at 0.33 + 0.12, 0.4 + 0.12 and 0.5 + 0.12 lb ai/A, desmedipham + triflusulfuron at 0.33 + 0.02, 0.4 + 0.02 and 0.5 + 0.02 lb ai/A, desmedipham at 0.33, 0.4 and 0.5 lb ai/A and an untreated check. The first portion of each split application herbicide treatment was the lowest of the three listed rates and was applied 2:00 PM June 11 when the air temperature was 91F, soil temperature at six inches was 63F, relative humidity was 21%, wind velocity was 10-15 mph, cloud cover was 25%, soil moisture was fair and sugarbeet was in the v1.5 to v3.5 stage. The second portion of each herbicide treatment (middle rate) was applied 2:00 PM June 18 when the air temperature was 77F, soil temperature at six inches was 62F, relative humidity was 42%, wind velocity was 10 mph, cloud cover was 90%, soil moisture was good and sugarbeet was in the v3.5 to v5.5 stage. The third portion of each herbicide treatment (high rate) was applied 8:00 PM June 25 when the air temperature was 73F, soil temperature at six inches was 75F, relative humidity was 61%, wind velocity was 10 mph, cloud cover was 20%, soil moisture was good and sugarbeet was in the v4.5 to v8.2 stage. Sugarbeet injury was evaluated July 8 and July 19. All plots were cultivated June 12 and June 30 and were hand weeded throughout the growing season. The center two rows from each 35 foot long plot were counted and harvested September 22.

Summary

The purpose of the experiment was not to compare varieties for absolute yield. However, Table 1 provides yield of the varieties averaged over herbicides for reference purposes. Plots treated with herbicides yielded less extractable sucrose than untreated-hand weeded plots (Table 2). Plots treated with desmedipham + clopyralid or desmedipham & phenmedipham & ethofumesate yielded less extractable sucrose than plots treated with desmedipham or desmedipham + triflusulfuron (Table 2). The untreated checks of all varieties yielded similar levels of extractable sucrose (Table 3). All herbicide treatments reduced yield of extractable sucrose, compared to the untreated check, for Monohikari, Glacier, Maribo 9363, Beta 3712 and VDH 66168. Desmedipham did not significantly reduce the yield of Horizon and yield of Maribo 875 was not reduced by desmedipham or desmedipham + triflusulfuron. In absolute yield of extractable sucrose, Horizon yielded the most when treated with desmedipham & phenmedipham & ethofumesate; Beta 3712 yielded the most when treated with desmedipham + clopyralid; and Horizon yielded the most when treated with desmedipham + triflusulfuron or desmedipham.

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1997. (continued)

Table 1. Variety averaged over all herbicide treatments.

Variety	7-08 Sgbt inj	7-19 Sgbt inj	9-22 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	%	%	plts/70'	%	%	ton/A		lb/A
VDH 66168	23	26	88	15.2	1.7	18.8	843	5012
Maribo 9363	25	22	89	15.6	1.7	18.3	786	5030
Beta 3712	29	22	88	15.8	1.6	18.6	782	5202
HM Glacier	30	25	94	15.4	1.8	19.3	851	5180
HM Horizon	29	23	93	15.3	1.7	20.1	823	5400
Maribo 875	21	17	94	15.0	1.9	18.5	912	4793
Monohikari	32	26	93	14.8	1.6	18.3	776	4808
EXP MEAN	27	23	91	15.3	1.7	18.9	825	5061
C.V. %	22	34	9	4.3	10.5	7.8	14	10
LSD 5%	3	4	4	0.3	0.1	0.7	59	252
LSD 1%	4	5	5	0.4	0.1	1.0	77	332
# OF REPS	30	30	30	30	30	30	30	30

Table 2. Herbicide treatment averaged over all varieties.

Herbicide Treatment	7-08 Sgbt inj	7-19 Sgbt inj	9-22 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
	%	%	plts/70'	%	%	ton/A		lb/A
Untreated Check	0	0	94	15.5	1.7	21.1	797	5781
Desmedipham+Clopyralid	37	31	88	15.0	1.8	17.9	868	4704
Desmedipham	29	25	91	15.3	1.7	18.9	820	5081
Desm&Phen&Etho	39	32	93	15.2	1.7	17.8	841	4720
Desmedipham+Triflusulfuron	31	27	91	15.4	1.7	18.5	798	5019
EXP MEAN	27	23	91	15.3	1.7	18.9	825	5061
C.V. %	19	27	7	3.9	9.2	6.4	12	8
LSD 5%	2	3	3	0.3	0.1	0.5	43	173
LSD 1%	3	4	4	0.3	NS	0.7	56	228
# OF REPS	42	42	42	42	42	42	42	42

Experiment continued on next page.

Sugarbeet variety and herbicide interaction, Fargo, 1997. (continued)

Table 3.

Variety	Herbicide	7-08 Sgbt inj	7-19 Sgbt inj	9-22 Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
		%	%	plts/70'	%	%	ton/A		lb/A
Monohikari	Des&Phen&Etho	46	35	94	14.6	1.6	17.7	813	4537
Monohikari	Desm+Clpy	43	35	86	14.6	1.6	16.8	821	4339
Monohikari	Desm+Tfsu	35	29	96	15.2	1.5	18.3	718	4944
Monohikari	Desmedipham	33	31	92	14.7	1.6	17.6	788	4584
Monohikari	Untreated Check	0	0	100	15.0	1.5	21.2	737	5636
HM Glacier	Des&Phen&Etho	43	38	96	15.6	1.7	18.2	820	4985
HM Glacier	Desm+Clpy	41	33	94	15.0	1.9	17.9	912	4628
HM Glacier	Desm+Tfsu	34	27	94	15.4	1.7	18.8	822	5082
HM Glacier	Desmedipham	33	29	92	15.5	1.8	19.3	848	5214
HM Glacier	Untreated Check	0	0	96	15.5	1.8	22.2	850	5990
Maribo 875	Des&Phen&Etho	31	27	97	14.7	2.0	18.0	973	4521
Maribo 875	Desm+Clpy	32	21	93	14.4	2.0	18.0	996	4423
Maribo 875	Desm+Tfsu	23	20	92	15.6	1.7	18.2	816	4996
Maribo 875	Desmedipham	21	17	95	15.2	1.8	18.7	867	4935
Maribo 875	Untreated Check	0	0	95	15.1	1.9	19.5	908	5089
Maribo 9363	Des&Phen&Etho	36	29	93	15.7	1.6	16.5	732	4607
Maribo 9363	Desm+Clpy	33	31	90	15.5	1.7	17.8	812	4845
Maribo 9363	Desm+Tfsu	28	24	93	15.1	1.7	17.6	849	4654
Maribo 9363	Desmedipham	28	25	87	15.6	1.7	19.2	788	5277
Maribo 9363	Untreated Check	0	0	85	15.9	1.6	20.4	750	5768
Beta 3712	Des&Phen&Etho	42	33	86	15.8	1.5	17.1	778	4773
Beta 3712	Desm+Clpy	39	29	86	15.5	1.7	18.3	815	4996
Beta 3712	Desm+Tfsu	36	26	86	15.9	1.6	18.7	762	5250
Beta 3712	Desmedipham	29	23	88	15.9	1.7	17.8	782	5000
Beta 3712	Untreated Check	0	0	95	16.0	1.7	21.1	774	5991
VDH 66168	Des&Phen&Etho	36	37	85	14.7	1.8	17.4	921	4413
VDH 66168	Desm+Clpy	30	36	85	15.2	1.7	18.2	835	4841
VDH 66168	Desm+Tfsu	27	32	90	15.3	1.7	17.8	818	4776
VDH 66168	Desmedipham	24	26	88	15.2	1.8	19.1	861	5036
VDH 66168	Untreated Check	0	0	90	15.7	1.7	21.6	783	5995
HM Horizon	Des&Phen&Etho	37	27	97	15.3	1.8	19.4	846	5202
HM Horizon	Desm+Clpy	41	32	86	15.0	1.8	18.6	887	4854
HM Horizon	Desm+Tfsu	36	28	91	15.5	1.7	19.9	798	5428
HM Horizon	Desmedipham	32	26	97	15.1	1.7	20.8	807	5519
HM Horizon	Untreated Check	0	0	95	15.6	1.7	21.8	775	5998
EXP MEAN		27	23	91	15.3	1.7	18.9	825	5061
C.V. %		21	33	8	4.3	10.3	7.4	14	9
LSD 5%		7	9	9	0.7	0.2	1.6	129	541
LSD 1%		9	12	12	1.0	0.3	2.1	171	713
# OF REPS		6	6	6	6	6	6	6	6

Grass control in sugarbeet, Crookston, 1997. (Dexter) 'Foster' barley at 72 lb/A, 'Valley' oats at 44 lb/A, 'Agri I' navy bean at 143 lb/A, 'Beta 3712' sugarbeet, 'Interstate 6111' sunflower at 57 lb/A and 'Manta' Siberian foxtail millet were seeded in 4 foot strips across the herbicide plots May 13. The first portion of split applied treatments was 2:30 PM May 31 when the air temperature was 80F, relative humidity was 44%, wind velocity was 5-10 mph, cloud cover was 80%, soil temperature at six inches was 65F, soil moisture was good, sugarbeet was in the v1.0 stage, oats was in the 1 leaf stage (3 inches tall), barley was in the 1 leaf stage (3 inches tall), navy bean was in the cotyledon stage, sunflower was in the cotyledon to 2 leaf stage, foxtail millet was in the 1 leaf stage (0.5 to 1 inch tall), wild oats was in the 1 leaf stage (3 to 4 inches tall) and green foxtail was emerging to 0.5 inch tall. The second portion of split applied treatments and all single application treatments were applied 3:30 PM June 6 when the air temperature was 78F, relative humidity was 46%, wind velocity was 9 mph, cloud cover was 20%, soil temperature at six inches was 78F, soil moisture was good, sugarbeet was in the v1.5 to v2.3 stage, oats was in the 3 leaf stage (5 inches tall), barley was in the 3 leaf stage (6 inches tall), navy bean was in the 2 leaf stage, sunflower was in the 4 leaf stage, foxtail millet was in the 3 to 4 leaf stage, wild oats was in the 2 to 3 leaf stage and green foxtail was in the 3 to 4 leaf stage. The third portion of split applied treatments was 2:30 PM June 13 when the air temperature was 80F, relative humidity was 41%, wind velocity was 7 mph, sky was clear, soil temperature at six inches was 78F, soil moisture was fair, sugarbeet was in the v4.1 to v5.5 stage, oats was 8 inches tall, barley was 10 inches tall, navy bean was in the 1 to 2 trifoliolate stage, sunflower was in the 6 to 8 leaf stage, foxtail millet was 6 inches tall, wild oats was 10 inches tall and green foxtail was 2 to 4 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 6.67 feet of 11 foot plots. Sugarbeet, oats, barley, foxtail millet, navy bean, sunflower, wild oats and green foxtail were evaluated July 5.

Summary

Imazamethabenz injured sugarbeet. Sethoxydim at 0.01 lb/A applied three times in combination with other herbicides gave inadequate grass control. Quizalofop at 0.018 applied three times in combination with other herbicides gave less grass control than either rate of clethodim and the high rate of sethoxydim applied three times in combination with the same herbicides. Foxtail millet control from a single application of clethodim plus Scoil was antagonized by desmedipham and desmedipham & phenmedipham but was not antagonized by clopyralid. Treatments that included clopyralid gave nearly total control of navy bean and sunflower.

Experiment continued on next page.

Grass control in sugarbeet, Crookston, 1997. (continued)

Treatment*	Date of (Application)	Rate	Sgbt inj	Oats cntl	Barl cntl	Fomi cntl	Nabe inj	Sufl inj	Wioa cntl	Grft cntl
		lb/A	%	%	%	%	%	%	%	%
Clethodim+Scoil (June 6)		0.063+1%	0	100	100	98	0	0	99	94
Clethodim+Scoil (June 6)		0.075+1%	0	100	100	99	8	3	95	90
Clethodim+Scoil (June 6)		0.094+1%	0	100	100	98	0	5	98	91
Clethodim+Scoil (June 6)		0.125+1%	0	100	100	99	8	9	97	97
Clet+Desm&Phen+Scoil (June 6)		0.094+0.5+1%	0	97	97	87	29	29	96	88
Clet+Clpy+Scoil (June 6)		0.094+0.2+1%	0	99	100	99	99	98	98	91
Clet+Clpy (June 6)		0.125+0.2	0	99	100	98	99	99	97	90
Clet+Desm+Scoil (June 6)		0.094+0.5+1%	0	92	96	74	28	34	92	91
Clet+De&Ph&Et+Scoil (June 6)		0.094+0.5+1%	0	94	95	79	36	31	92	95
Clet+Immb+Scoil (June 6)		0.094+0.19+1%	87	100	100	99	80	13	98	90
Sethoxydim+Scoil (June 6)		0.188+1%	0	98	97	96	0	0	98	79
Sethoxydim-HC+Scoil (June 6)		0.32+1%	0	99	100	99	0	0	97	96
Quizalofop+Scoil (June 6)		0.055+1%	0	99	99	98	0	0	96	85
Quizalofop+Scoil (June 6)		0.069+1%	0	98	98	98	5	0	97	88
Desm+Tfsu+Clpy+Clet+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.031+1.5%	0	100	100	100	100	100	99	98
Desm+Tfsu+Clpy+Clet+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.042+1.5%	0	100	100	100	100	100	100	99
Desm+Tfsu+Clpy+Seth+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.063+1.5%	0	100	99	99	100	100	98	100
Desm+Tfsu+Clpy+Seth+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.01+1.5%	0	51	59	53	99	99	81	89
Desm+Tfsu+Clpy+Qufp+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.018+1.5%	0	88	88	88	99	99	90	99
Desm+Tfsu+Clpy+Qufp+MOil	(May 31,June 6, 13)	0.08+0.004+0.03+0.023+1.5%	0	93	92	91	99	99	93	98
EXP MEAN			4	95	96	92	49	46	95	92
C.V. %			28	7	7	5	14	12	6	7
LSD 5%			2	9	9	7	10	8	8	9
LSD 1%			2	12	12	9	13	10	10	12
# OF REPS			4	4	4	4	4	4	4	4

* MethOil = methylated seed oil from Terra; Sethoxydim-HC = 3.5 lb ai/gal formulation from BASF; Scoil = methylated seed oil from Agsco.

Grass control in sugarbeet, Fargo, 1997. (Dexter) 'Foster' barley at 74 lb/A, 'Valley' oats at 60 lb/A, 'Agri I' navy bean at 131 lb/A, 'Beta 3712' sugarbeet, 'Interstate 6111' sunflower and 'Manta' Siberian foxtail millet at 35 lb/A were seeded in 4 foot strips across the herbicide plots May 16. The first portion of split applied treatments was applied 3:45 PM June 4 when the air temperature was 85F, relative humidity was 45%, wind velocity was 8 mph, cloud cover was 20%, soil temperature at six inches was 70F, soil moisture was good, sugarbeet was in the v1.0 stage, oats was in the 1 leaf stage (4 inches tall), barley was in the 1 leaf stage (3 inches tall), navy bean was in the cotyledon to 2 leaf stage, sunflower was in the cotyledon to 2 leaf stage and green foxtail was in the 1 to 2 leaf stage (0.5 to 1 inch tall). The second portion of split applied treatments and all single application treatments were applied 2:00 PM June 11 when the air temperature was 91F, relative humidity was 21%, wind velocity was 10-15 mph, cloud cover was 25%, soil temperature at six inches was 63F, soil moisture was fair, sugarbeet was in the v1.5 to v3.5 stage, oats was 4 to 5 inches tall, barley was 3 to 4 inches tall, navy bean was in the 2 leaf to 1 trifoliolate stage, sunflower was in the 4 leaf stage and green foxtail was 1 to 2 inches tall. The third portion of split applied treatments was applied 2:00 PM June 18 when the air temperature was 77F, relative humidity was 42%, wind velocity was 10 mph, cloud cover was 90%, soil temperature at six inches was 62F, soil moisture was good, sugarbeet was in the v3.5 to v4.9 stage, oats was 8 to 10 inches tall, barley was 7 to 9 inches tall, navy bean was in the 1 to 2 trifoliolate stage, sunflower was in the 6 leaf stage and green foxtail was 2 to 5 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 6.67 feet of 11 foot plots. Sugarbeet, barley, oats, navy bean, sunflower and green foxtail were evaluated July 7.

Summary

All treatments gave similar control of barley, oats and green foxtail except desmedipham + triflusulfuron + clopyralid + sethoxydim + MetOil at 0.08 + 0.004 + 0.03 + 0.01 lb/A + 1.5% gave less control of oats and green foxtail than other treatments. Sethoxydim at 0.01 lb/A, even applied three times, was not a high enough rate. All treatments that included clopyralid killed navy bean and sunflower. Imazamethabenz injured sugarbeet and navy bean. Desmedipham and desmedipham & phenmedipham injured navy bean and sunflower.

Experiment continued on next page.

Grass control in sugarbeet, Fargo, 1997. (continued)

Treatment*	Date of (Application)	Rate	Sgbt inj	Barl cntl	Oats cntl	Nabe inj	Sufl cntl	Grft cntl
		lb/A	%	%	%	%	%	%
Clethodim+Scoil	(June 11)	0.063+1%	0	100	100	1	2	99
Clethodim+Scoil	(June 11)	0.075+1%	0	100	100	8	8	100
Clethodim+Scoil	(June 11)	0.094+1%	0	100	100	11	18	100
Clethodim+Scoil	(June 11)	0.125+1%	0	100	100	0	0	100
Clet+Desm&Phen+Scoil	(June 11)	0.094+0.5+1%	0	100	99	43	43	99
Clet+Clpy+Scoil	(June 11)	0.094+0.2+1%	0	100	100	100	100	100
Clet+Clpy	(June 11)	0.125+0.2	0	99	99	100	100	100
Clet+Desm+Scoil	(June 11)	0.094+0.5+1%	0	100	99	31	34	99
Clet+De&Ph&Et+Scoil	(June 11)	0.094+0.5+1%	0	100	99	23	33	100
Clet+Immb+Scoil	(June 11)	0.094+0.19+1%	94	100	100	58	10	100
Sethoxydim+Scoil	(June 11)	0.188+1%	0	100	99	8	6	99
Sethoxydim-HC+Scoil	(June 11)	0.32+1%	0	100	100	3	3	100
Quizalofop+Scoil	(June 11)	0.055+1%	0	100	100	3	8	99
Quizalofop+Scoil	(June 11)	0.069+1%	0	100	100	4	4	99
Desm+Tfsu+Clpy+Clet+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.031+1.5%	0	100	100	100	100	100
Desm+Tfsu+Clpy+Clet+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.042+1.5%	0	100	100	100	100	100
Desm+Tfsu+Clpy+Seth+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.063+1.5%	0	100	100	100	100	100
Desm+Tfsu+Clpy+Seth+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.01+1.5%	0	100	61	100	100	80
Desm+Tfsu+Clpy+Qufp+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.018+1.5%	0	99	100	100	100	100
Desm+Tfsu+Clpy+Qufp+MOil	(June 4, 11, 18)	0.08+0.004+0.03+0.023+1.5%	0	100	100	100	100	99
EXP MEAN			5	100	98	50	48	98
C.V. %			12	1	1	15	13	3
LSD 5%			1	NS	1	11	9	4
LSD 1%			1	NS	2	14	12	6
# OF REPS			4	4	4	4	4	4

* MethOil = methylated seed oil from Terra; Sethoxydim-HC = 3.5 lb ai/gal formulation from BASF; Scoil = methylated seed oil from Agsco.

Growth regulators on sugarbeet, Fargo, 1997. (Dexter) Urea fertilizer was applied May 16 and incorporated with a rototiller set 2 inches deep. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham at 0.16 lb ai/A + triflusulfuron at 0.008 lb ai/A + clopyralid at 0.047 lb ai/A + sethoxydim at 0.023 lb ai/A was applied to all plots June 10. Sugarbeet was hand thinned to an 8 inch spacing June 11. Growth regulators were applied 5:30 pm July 14, 3:00 pm August 5 and 1:30 pm August 26 when the air temperature was 85F, 85F, and 89F respectively, relative humidity was 54%, 73%, and 72% respectively, soil temperature at six inches was 75F, 80F, and 78F respectively, wind velocity was 10 mph, 8 mph, and 3 mph respectively, cloud cover was 10%, 85%, and 0% respectively, soil moisture was good at all application times and the sugarbeet canopy was closed when applications began. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was maintained weed free throughout the growing season by hand weeding and row-crop cultivation June 12 and June 30. Sugarbeet from the center two rows of 32 foot long plots was counted and harvested September 23.

Treatment	Date of Application	Rate	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
		lb/A	plts/64'	%	%	ton/A		lb/A
BAS-125+MethOil	July 14	0.09+1.5%	73	15.0	1.8	17.2	860	4476
BAS-125+MethOil	August 5	0.09+1.5%	77	15.9	1.6	18.2	752	5114
BAS-125+MethOil	August 26	0.09+1.5%	81	15.4	1.5	18.3	749	5011
BAS-125+MethOil	July 14	0.27+1.5%	75	15.5	1.6	18.0	749	4923
BAS-125+MethOil	August 5	0.27+1.5%	86	15.2	1.6	19.9	786	5345
BAS-125+MethOil	August 26	0.27+1.5%	80	14.5	1.7	20.2	821	5130
Untreated Check		0	77	15.8	1.7	17.3	777	4829
BAS-125+MethOil/	July 14	0.09+1.5%						
BAS-125+MethOil/	August 5	0.09+1.5%						
BAS-125+MethOil	August 26	0.09+1.5%	77	14.4	1.7	18.7	863	4665
100 lb/A Nitrogen/	May 16							
BAS125+MethOil/	July 14	0.09+1.5%						
BAS125+MethOil/	August 5	0.09+1.5%						
BAS125+MethOil	August 26	0.09+1.5%	67	13.9	1.9	17.6	990	4141
BAS-126+MethOil/	July 14	0.0009+1.5%						
BAS-126+MethOil/	August 5	0.0009+1.5%						
BAS-126+MethOil/	August 26	0.0009+1.5%	73	15.4	1.7	16.1	824	4419
BAS-126+MethOil/	July 14	0.009+1.5%						
BAS-126+MethOil/	August 5	0.009+1.5%						
BAS-126+MethOil	August 26	0.009+1.5%	85	15.1	1.8	18.2	868	4767
Mepq Chloride-PIX/	July 14	0.01						
Mepq Chloride-PIX/	Aug. 5	0.01						
Mepq Chloride-PIX	Aug. 26	0.01	80	15.4	1.8	17.5	850	4694
Mepq Chloride-PIX/	July 14	0.10						
Mepq Chloride-PIX/	Aug. 5	0.10						
Mepq Chloride-PIX	Aug. 26	0.10	77	15.2	1.7	17.3	795	4659
100 lb/A Nitrogen	May 16		63	15.3	1.8	15.8	844	4257
C.V. %			11	5.7	12.3	10.7	16	12
LSD 10%			9	0.9	NS	2.0	NS	593
LSD 5%			11	1.1	NS	2.4	NS	NS
# OF REPS			5	5	5	5	5	5

SUMMARY: BAS-125, BAS-126 and mepiquat chloride (PIX) did not significantly enhance sugarbeet yield or sugar content compared to the untreated check although five BAS-125 treatments had more extractable sucrose per acre than the untreated check.

Growth regulators on sugarbeet, St. Thomas, 1997. (Dexter) Urea fertilizer was applied May 21 and incorporated with a rototiller set 2 inches deep. 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 21. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. Desmedipham at 0.25 lb ai/A was applied to all plots June 9. Sugarbeet was hand thinned to an 8 inch spacing June 17. Growth regulators were applied 10:00 am July 15, 12:00 pm August 5 and 10:00 am August 26 when the air temperature was 80F, 77F, and 76F respectively, relative humidity was 68%, 73%, and 68% respectively, soil temperature at six inches was 73F, 74F, and 74F respectively, wind velocity was 0-5 mph, 8 mph, and 0-2 mph respectively, cloud cover was 25%, 95%, and 0% respectively, soil moisture was good at all application times and the sugarbeet canopy was closed when application began. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sugarbeet was maintained weed free throughout the growing season by hand weeding and row-crop cultivation June 13 and July 17. Sugarbeet from the center two rows of 32 foot long plots was counted and harvested September 30.

Treatment	Date of Application	Rate	Sgbt Popl	Sucr	Loss to Mol	Root Yield	Impur Index	Extr Sucr
		lb/A	plts/64'	%	%	ton/A		lb/A
BAS-125+MethOil	July 14	0.09+1.5%	74	15.6	1.5	16.1	686	4523
BAS-125+MethOil	August 5	0.09+1.5%	75	15.3	1.8	18.2	698	5000
BAS-125+MethOil	August 26	0.09+1.5%	68	14.5	1.5	17.2	739	4252
BAS-125+MethOil	July 14	0.27+1.5%	74	15.4	1.4	18.3	691	5034
BAS-125+MethOil	August 5	0.27+1.5%	70	14.9	1.4	19.1	689	5123
BAS-125+MethOil	August 26	0.27+1.5%	76	14.3	1.5	18.5	761	4702
Untreated Check		0	74	16.0	1.4	20.6	664	5954
BAS-125+MethOil/	July 14	0.09+1.5%						
BAS-125+MethOil/	August 5	0.09+1.5%						
BAS-125+MethOil	August 26	0.09+1.5%	74	14.4	1.5	18.2	762	4637
100 lb/A Nitrogen/	May 21							
BAS125+MethOil/	July 14	0.09+1.5%						
BAS125+MethOil/	August 5	0.09+1.5%						
BAS125+MethOil	August 26	0.09+1.5%	66	14.1	1.7	20.0	863	4890
BAS-126+MethOil/	July 14	0.0009+1.5%						
BAS-126+MethOil/	August 5	0.0009+1.5%						
BAS-126+MethOil	August 26	0.0009+1.5%	78	15.1	1.5	16.8	727	4528
BAS-126+MethOil/	July 14	0.009+1.5%						
BAS-126+MethOil/	August 5	0.009+1.5%						
BAS-126+MethOil	August 26	0.009+1.5%	74	15.8	1.5	19.6	697	5560
Mepq Chloride-PIX/	July 14	0.01						
Mepq Chloride-PIX/	Aug. 5	0.01						
Mepq Chloride-PIX	Aug. 26	0.01	75	15.9	1.4	18.4	663	5259
Mepq Chloride-PIX/	July 14	0.10						
Mepq Chloride-PIX/	Aug. 5	0.10						
Mepq Chloride-PIX	Aug. 26	0.10	73	15.7	1.5	19.5	703	5489
100 lb/A Nitrogen	May 21		66	15.5	1.5	18.1	732	4975
C.V. %			7	3.3	17.3	12.2	10	14
LSD 10%			5	0.5	NS	2.2	70	657
LSD 5%			6	0.6	NS	NS	84	787
# OF REPS			6	6	6	6	6	6

SUMMARY: BAS-125, BAS-126 and mepiquat chloride (PIX) did not enhance sugarbeet yield or sugar content compared to the untreated check. Nitrogen at 100 lb/A and some other treatments reduced sugarbeet yield and sugar contrent.

Herbicide carryover, Fargo, 1996-1997. (Dexter) Preplant incorporated herbicides were applied 11:00 am May 23, 1996 when the air temperature was 59F, relative humidity was 60%, soil temperature at six inches was 50F, wind velocity was 10-16 mph, cloud cover was 100% and soil moisture was good. PPI treatments were incorporated with a rototiller set 3 to 4 inches deep. 'Ozzie' soybean was solid seeded in seven inch rows at 60 pounds per acre May 23. Postemergence treatments were applied 11:00 am June 26, 1996 when the air temperature was 86F, relative humidity was 74%, soil temperature at six inches was 67F, wind velocity was 8 mph, cloud cover was 50%, soil moisture was good and soybean was in the 1 to 2 trifoliolate stage. All herbicides were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center 13 feet of 20 foot wide by 60 foot long plots. Basagran + Ultima + Dash HC at 1 + 0.5 lb ai/A + 1 pint/A was applied to all plots July 1, 1996. Soybean was chopped in September of 1996. Fall 1996 tillage was one pass with a 'Conser-Till' chisel plow at a slow speed and parallel with the direction herbicides were applied. Spring tillage in 1997 was one pass with a 'Kongskilde Triple K' field cultivator operated parallel with the herbicide application direction. '2371' wheat at 90 lb/A, 'Foster' barley at 90 lb/A, 'Beta 3712' sugarbeet, 'Westar' canola at 8 lb/A, 'Interstate 6111' sunflower, 'Agri 1' navy bean at 50 lb/A, and 'NK 2555' corn were seeded in 4 foot wide drill strips across herbicide plots June 9, 1997. Wheat, barley, sugarbeet, canola, sunflower, navy bean, and corn injury was evaluated July 5 and July 23, 1997.

Treatment (trade name)	Method of Applic	Rate	July 5						
			Wht	Barl	Sgbt	Cano	Sufl	Nabe	Corn
		lb/A	% injury						
CGA-277476 (Expert)	POST	0.0705	0	0	0	0	0	6	0
CGA-277476 (Expert)	POST	0.141	0	0	8	5	13	0	0
Picloram (Tordon)	POST	0.0234	0	0	3	0	0	36	3
Cloransulam (First Rate)	PPI	0.03125	29	39	90	89	79	18	33
Sulfentrazone (Authority)	PPI	0.375	0	0	95	0	6	6	0
Isoxaflutole RPA201772 (Balance)	PPI	0.14	0	0	96	36	18	70	0
MON-37500	POST	0.022	9	18	90	15	91	9	31
Rimsulfuron (Matrix)	POST	0.0156	3	3	3	0	0	8	0
Rimsulfuron (Matrix)	POST	0.0234	0	0	3	0	0	3	3
Rimsulfuron (Matrix)	POST	0.0469	3	0	8	4	0	10	0
EXP MEAN			4	6	39	15	21	17	7
C.V. %			118	105	19	92	56	60	112
LSD 5%			7	9	11	20	17	14	11
LSD 1%			10	12	15	27	23	20	15
# OF REPS			4	4	4	4	4	4	4

Experiment continued on next page.

Herbicide carryover, Fargo, 1996-1997. (continued)

Treatment (trade name)	Method of Applic	Rate	July 23						
			Wht	Barl	Sgbt	Cano	Sufl	Nabe	Corn
		lb/A	% injury						
CGA-277476 (Expert)	POST	0.0705	0	0	0	0	0	5	5
CGA-277476 (Expert)	POST	0.141	3	6	10	10	0	5	0
Picloram (Tordon)	POST	0.0234	0	0	16	8	0	68	0
Cloransulam (First Rate)	PPI	0.03125	30	56	95	93	93	33	36
Sulfentrazone (Authority)	PPI	0.375	3	4	98	19	0	0	0
Isoxaflutole RPA201772 (Balance)	PPI	0.14	0	0	97	30	33	88	0
MON-37500	POST	0.022	6	15	80	28	88	3	11
Rimsulfuron (Matrix)	POST	0.0156	0	0	5	0	0	0	0
Rimsulfuron (Matrix)	POST	0.0234	4	3	20	0	0	0	0
Rimsulfuron (Matrix)	POST	0.0469	1	6	10	3	0	0	0
EXP MEAN			5	9	43	19	21	20	5
C.V. %			139	104	33	88	44	47	151
LSD 5%			9	14	20	24	14	14	12
LSD 1%			13	18	28	32	19	19	16
# OF REPS			4	4	4	4	4	4	4

Summary

Picloram, cloransulam, sulfentrazone, isoxaflutole and MON-37500 applied in 1996 injured one or more species seeded in 1997. CGA-277476 and rimsulfuron caused no significant injury. On July 23, picloram only injured navy bean, cloransulam injured all crops, sulfentrazone only injured sugarbeet, isoxaflutole injured all broadleaf crops and MON-37500 injured all crops except wheat, navy bean and corn.

V-53482 herbicide safety and carryover, Fargo, 1997 (Zollinger) An experiment was conducted to evaluate small grain safety to V-53482 herbicide applied PRE. 'ND-2371' wheat, 'Foster' barley, and 'Valley' oat were seeded June 9 and PRE treatments were applied June 11 at 5:30 pm with 85 F air, 101 F soil, 43% RH, 20% clouds, and 3-5 mph wind. Treatments were applied to the entire area of the 20 X 60 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment. This experiment will be continued in 1998 to evaluate carryover of V-53482 and Lightning to numerous crops.

		July 5			
Treatment	Rate	Wheat	Barley	Oat	Grft
	Product/A	% injury			
V-53482	0.094 oz	19	16	24	86
V-53482	0.188 oz	58	48	60	95
V-53482	0.376 oz	75	74	85	98
Lightning	0.056 oz	92	83	90	92
Untreated		0	0	0	0
LSD (0.05)		15	14	15	6

V-53482 is a contact type, cell membrane disrupter (PPO inhibitor) herbicide. This experiment was conducted to determine small grain crop safety to V-53482 PRE for potential labeling in small grains for grass and broadleaf weed control. All rates of V-53482 and Lighting resulted in excessive wheat, barley and oat injury but 86 to 98% green and yellow foxtail control.

Glufosinate plus triflusulfuron, Crookston, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split applied postemergence herbicide treatments was 12:30 PM June 6 when the air temperature was 75F, relative humidity was 55%, soil temperature at six inches was 68F, wind velocity was 10 mph, cloud cover was 40%, soil moisture was good, sugarbeet was in the v1.5 to v2.0 stage, redroot pigweed was in the cotyledon to 2 leaf stage and wild oats was in the 2 to 3 leaf stage (4 inches tall). The second half of split applied treatments was 2:30 PM June 13 when the air temperature was 80F, relative humidity was 41%, soil temperature at six inches was 78F, wind velocity was 7 mph, sky was clear, soil moisture was fair, sugarbeet was in the v4.1 to v5.5 stage, redroot pigweed was in the 4 to 8 leaf stage and wild oats was 6 to 8 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sethoxydim + Dash HC at 0.38 lb ai/A + 1 pint/A was applied June 10 to all plots that were not treated with glufosinate. Sugarbeet injury and redroot pigweed and wild oats control were evaluated July 7.

Treatment	Rate	Sugarbeet injury	Redroot Pigweed control	Wild oats control
	lb\A	%	%	%
Desm+Triflusulfuron+Clpy-2 times / Sethoxydim+Dash HC - June 10	0.33+0.0156+0.09 0.38+0.125G	0	100	100
Tfsu+Glufosinate-2 times	0.0156+0.09	93	96	15
Tfsu+Glufosinate-2 times	0.0156+0.18	100	95	50
Tfsu+Glufosinate-2 times	0.0156+0.27	100	100	64
Tfsu+Glufosinate-2 times	0.0156+0.5	100	100	97
Glufosinate-2 times	0.09	95	76	10
Glufosinate-2 times	0.18	99	90	48
Glufosinate-2 times	0.27	100	94	71
Glufosinate-2 times	0.5	100	96	97
Desmedipham+Clopyralid-2 times / Sethoxydim+Dash HC - June 10	0.5+0.09 0.38+0.125G	0	100	100
C.V. %		4	7	12
LSD 5%		5	10	11
LSD 1%		6	13	15
# OF REPS		4	4	4

SUMMARY: Sugarbeet was not a Liberty Link variety. Triflusulfuron at 0.0156 lb/A + glufosinate at 0.09 lb/A gave better control of redroot pigweed than glufosinate at 0.09 lb/A. Triflusulfuron did not improve control of wild oats or of redroot pigweed when glufosinate rates were 0.18 lb/A or greater. Glufosinate at 0.5 lb/A gave 97% wild oats control but lower tested rates did not provide adequate grass control.

Glufosinate on Liberty Link sugarbeet, Crookston, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 6, June 13, June 17, June 27, July 4, and July 24. Sugarbeet was hand weeded June 13 and hand thinned to an eight inch spacing July 10. Sethoxydim at 0.38 lb ai/A + crop oil at 1% v/v was applied June 10 to all plots that were not treated with glufosinate. Redroot pigweed, green foxtail, wild oats, wild mustard and prostrate pigweed control and sugarbeet injury were evaluated July 17. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 6	June 13	June 17	June 27	July 4	July 24
Time of Day	3:30 PM	2:30 PM	2:00 PM	2:15 PM	8:20 PM	1:30 PM
Air Temp. (°F)	78	80	75	90	72	87
6" Soil Temp. (°F)	78	78	63	75	68	79
Rel. Humidity (%)	46	41	61	59	65	67
Wind Velocity(mph)	9	7	10-15	14	3	5
Cloud Cover (%)	20	0	100	5	5	10
Soil Moisture	Good	Fair	Good	Good	Good	Good
Sugarbeet Stage	v1.0-v1.5	v2.5-v5.5	v3.5-v6.5	v6.5-v8.5	v6.5-v10.5	v11.5-v18.5
Redroot Pigweed	cot-2 lf	1 inch	2 inch	6 to 10 inch	10 to 16 inch	-
Green Foxtail	emerg-2 lf	4 inch	6 inch	10 to 12 inch	10 to 14 inch	-
Wild Oats	2-3 lf (4")	6 to 8 inch	8 to 10 inch	10 to 14 inch	12 to 16 inch	-
Wild mustard	2 leaf	4 leaf	6 to 8 leaf	8 to 10 leaf	12 inch	-
Prostrate Pigweed	cot - 2 leaf	1 inch	2 inch	6 to 10 inch	10 to 12 inch	-

Experiment continued on next page.

Glufosinate on Liberty Link sugarbeet, Crookston, 1997. (continued)

Treatment*	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Wioa cntl	Wimu cntl	Prpw cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.268	June 6											
Glufosinate	0.268	June 17											
Glufosinate	0.268	June 27	0	100	100	100	100	100	64	16.2	21.0	654	6122
Glufosinate	0.357	June 6											
Glufosinate	0.357	June 17											
Glufosinate	0.357	June 27	0	100	100	100	100	100	67	15.9	22.9	729	6475
Gluf+AMS	0.268+2	June 6											
Gluf+AMS	0.268+2	June 17											
Gluf+AMS	0.268+2	June 27	0	100	100	100	100	100	67	15.7	20.7	719	5804
Glufosinate	0.268	June 13											
Glufosinate	0.268	July 4											
Glufosinate	0.268	July 25	0	98	100	89	100	96	69	15.6	22.0	753	6097
Glufosinate	0.357	June 13											
Glufosinate	0.357	July 4											
Glufosinate	0.357	July 25	0	98	100	93	100	99	70	16.0	22.6	669	6499
Gluf+AMS	0.268+2	June 13											
Gluf+AMS	0.268+2	July 4											
Gluf+AMS	0.268+2	July 25	0	99	100	95	100	100	70	15.7	22.7	705	6366
Des&Phen&Eth	0.25	June 6											
Seth+Scoil	0.25+1%	June 10											
Des&Phen&Eth	0.33	June 13											
Des&Phen&Eth	0.33	June 20	5	95	100	100	100	99	61	15.1	20.5	791	5462
Hand Weeded Check			0	100	100	100	100	100	58	16.0	19.4	665	5602
EXP MEAN			1	99	100	97	100	99	66	15.8	21.5	711	6053
C.V. %			0	2	0	1	0	2	10	2.9	6.0	9	7
LSD 10%			NS	2	NS	2	NS	2	NS	0.5	1.6	75	483
LSD 5%			NS	2	NS	2	NS	NS	NS	NS	1.9	NS	585
# OF REPS			4	4	4	4	4	4	4	4	4	4	4

* Scoil=methylated seed oil from Agsco; AMS=ammonium sulfate.

Glufosinate on Liberty Link sugarbeet, Fargo, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18, June 20, June 26, July 1, July 9 and July 30. Sugarbeet was hand weeded June 30

Date	June 11	June 18	June 20	June 26	July 1	July 9	July 30
Time of Day	3:30 PM	2:00 PM	11:00 AM	3:30 PM	9:30 AM	2.30 PM	9:30 AM
Air Temp. (°F)	91	77	75	85	74	79	75
6" Soil Temp. (°F)	63	62	68	70	71	66	75
Rel. Humidity (%)	21	42	62	39	78	64	62
Wind Velocity(mph)	10-15	10	3	8	8	15	6
Cloud Cover (%)	25	90	10	20	100	5	5
Soil Moisture	Fair	Good	Good	Good	Good	Good	Fair
Sugarbeet Stage	v1.0-v2.7	v2.0-v6.1	v2.0-v6.5	v5.5-v10.5	v6.5-v10.5	v8.5-v12.5	v17.5-v22.5
Redroot Pigweed	cot-1 inch	1 inch	1 to 2 inch	5 to 6 inch	12 inch	13 inch	26 inch
Green Foxtail	2 to 3 leaf	2 - 4 inch	2 lf- 6 inch	10-12 inch	10-14 inch	12-14 inch	22 inch
Prostrate Spurge	cot-2 leaf	1-2" diam.	1-2" diam.	2-4" diam.	4" diam.	4-6" diam.	10-14"diam.

and hand thinned to an eight inch spacing July 9. Redroot pigweed, green foxtail and prostrate spurge control and sugarbeet injury were evaluated July 18. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Experiment continued on next page.

Glufosinate on Liberty Link sugarbeet, Fargo, 1997. (continued)

Treatment*	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Prsp cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.268	June 11									
Glufosinate	0.268	June 20									
Glufosinate	0.268	July 1	0	99	99	100	51	13.8	23.6	1144	5464
Glufosinate	0.357	June 11									
Glufosinate	0.357	June 20									
Glufosinate	0.357	July 1	0	100	100	100	55	13.9	26.1	1136	6010
Gluf+AMS	0.268+2	June 11									
Gluf+AMS	0.268+2	June 20									
Gluf+AMS	0.268+2	July 1	0	100	100	100	47	13.8	23.3	1114	5377
Glufosinate	0.268	June 18									
Glufosinate	0.268	July 9									
Glufosinate	0.268	July 30	0	100	100	100	43	13.6	21.9	1166	4909
Glufosinate	0.357	June 18									
Glufosinate	0.357	July 9									
Glufosinate	0.357	July 30	0	99	100	100	44	13.4	22.1	1137	4918
Gluf+AMS	0.268+2	June 18									
Gluf+AMS	0.268+2	July 9									
Gluf+AMS	0.268+2	July 30	0	100	100	100	41	13.4	18.8	1109	4209
Des&Phen&Eth	0.25	June 11									
Des&Phen&Eth	0.33	June 18									
Des&Phen&Eth	0.33	June 26									
Seth+Scoil	0.25+1%	July 1	0	98	100	100	43	13.1	19.0	1213	4091
Hand Weeded Check			0	100	100	100	51	13.3	20.6	1169	4493
EXP MEAN			0	99	100	100	47	13.5	21.9	1148	4934
C.V. %			0	2	1	0	14	4.2	10.0	9	14
LSD 10%			NS	NS	NS	NS	8	NS	2.7	NS	818
LSD 5%			NS	NS	NS	NS	NS	NS	3.2	NS	989
# OF REPS			4	4	4	4	4	4	4	4	4

* Scoil=methylated seed oil from Agsco; AMS=ammonium sulfate.

Glufosinate on Liberty Link sugarbeet, Crookston and Fargo combined, 1997. (Dexter)

Treatment*	Rate	Sgbt Stage at Applic.	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.268	coty								
Glufosinate	0.268	coty+10 day								
Glufosinate	0.268	coty+20 day	0	99	99	57	15.0	22.3	899	5793
Glufosinate	0.357	coty								
Glufosinate	0.357	coty+10 day								
Glufosinate	0.357	coty+20 day	0	100	100	61	14.9	24.5	933	6243
Gluf+AMS	0.268+2	coty								
Gluf+AMS	0.268+2	coty+10 day								
Gluf+AMS	0.268+2	coty+20 day	0	100	100	57	14.8	22.0	916	5591
Glufosinate	0.268	coty+7 day								
Glufosinate	0.268	coty+28 day								
Glufosinate	0.268	coty+49 day	0	99	100	56	14.6	22.0	960	5503
Glufosinate	0.357	coty+7 day								
Glufosinate	0.357	coty+28 day								
Glufosinate	0.357	coty+49 day	0	98	100	57	14.7	22.4	903	5709
Gluf+AMS	0.268+2	coty+7 day								
Gluf+AMS	0.268+2	coty+28 day								
Gluf+AMS	0.268+2	coty+49 day	0	99	100	55	14.5	20.8	907	5288
Desm&Phen&Etho	0.25	coty								
Desm&Phen&Etho	0.33	coty+7 day								
Desm&Phen&Etho	0.33	coty+14 day								
Seth+Scoil	0.25+1%	coty+20 day	3	96	100	52	14.1	19.7	1002	4776
Hand Weeded Check			0	100	100	54	14.6	20.0	917	5047
EXP MEAN			0	99	100	56	14.6	21.7	929	5494
C.V. %			302	2	1	13	3.4	9.7	9	11
LSD 10%			1	1	NS	NS	0.4	1.8	NS	505
LSD 5%			1	2	NS	NS	NS	2.1	NS	605
# OF REPS			8	8	8	8	8	8	8	8

* Scoil=methylated seed oil from Agsco; AMS=ammonium sulfate.

Summary

Plots treated with glufosinate yielded more extractable sucrose than hand weeded plots or plots treated with conventional herbicides although the differences were not always significant. Plots treated with glufosinate plus ammonium sulfate tended to yield less than plots treated with the equivalent rate and timing of glufosinate alone. Plots treated with glufosinate at 0.357 lb/A three times starting at the cotyledon stage of sugarbeet yielded more than plots treated with glufosinate at 0.357 lb/A three times starting seven days after the cotyledon stage.

Time between split applications to Liberty Link sugarbeet, Crookston, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 6, June 13, June 17, June 20, June 27 and July 4. Sugarbeet was hand weeded June 13 and hand thinned to an eight inch spacing

Date	June 6	June 13	June 17	June 20	June 27	July 4
Time of Day	3:30 PM	2:30 PM	2:00 PM	4:30 PM	2:15 PM	8:20 PM
Air Temp. (°F)	78	80	75	80	90	72
6" Soil Temp. (°F)	78	78	63	71	75	68
Rel. Humidity (%)	46	41	61	51	59	65
Wind Velocity(mph)	9	7	10-15	5	14	3
Cloud Cover (%)	20	0	100	5	5	5
Soil Moisture	Good	Fair	Good	Good	Good	Good
Sugarbeet Stage	v1.0-v1.5	v2.5-v5.5	v3.5-v6.1	v4.2-v6.5	v6.5-v8.5	v6.5-v10.5
Redroot Pigweed	cot-2 lf	1 inch	2 inch	2 to 4 inch	6 to 10 inch	10 to 16 inch
Green Foxtail	emerg-2 lf	4 inch	4 to 6 inch	3 to 6 inch	10 to 12 inch	10 to 14 inch
Wild Oats	2-3 lf (4")	6 to 8 inch	10 to 12 inch	12 inch	10 to 15 inch	12 to 20 inch
Wild mustard	2 leaf	4 leaf	6 leaf	8 leaf	10 leaf	12 to 14 leaf
Prostrate Pigweed	cot - 2 leaf	1 inch	2 inch	2 to 4 inch	6 to 10 inch	12 inch

July 10. Sethoxydim at 0.38 lb ai/A + crop oil at 1% v/v was applied June 10 to all plots that were not treated with glufosinate. Redroot pigweed, green foxtail, wild oats, wild mustard and prostrate pigweed control and sugarbeet injury were evaluated July 17. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Treatment	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Wioa cntl	Wimu cntl	Prpw cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	%	%	$	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	June 6											
Glufosinate	0.36	June 13											
Glufosinate	0.36	June 20	0	98	98	99	100	99	69	15.8	22.1	731	6199
Glufosinate	0.36	June 6											
Glufosinate	0.36	June 17											
Glufosinate	0.36	June 27	0	100	100	100	100	100	67	15.9	22.1	714	6285
Glufosinate	0.36	June 6											
Glufosinate	0.36	June 20											
Glufosinate	0.36	July 4	0	100	100	100	100	100	72	15.6	23.3	703	6471
Glufosinate	0.36	June 6											
Glufosinate	0.36	June 27	0	99	100	93	100	98	65	15.7	22.1	713	6221
Hand Weeded Check			1	100	100	100	100	100	55	15.6	19.8	708	5533
Desm+Tfsu+Clpy													
0.25+0.01+0.06		June 6											
Sethoxydim+COC													
0.38+1%		June 10											
Desm+Tfsu+Clpy													
0.25+0.01+0.06		June 13											
Desm+Tfsu+Clpy													
0.25+0.01+0.06		June 20	3	100	100	100	100	100	55	15.6	19.9	703	5543
EXP MEAN			1	100	100	99	100	100	64	15.7	21.6	712	6042
C.V. %			205	1	1	1	0	1	11	2.5	7.0	11	8
LSD 10%			1	NS	1	1	NS	NS	7	NS	1.5	NS	459
LSD 5%			2	NS	NS	2	NS	NS	8	NS	1.8	NS	553
# OF REPS			6	6	6	6	6	6	6	6	6	6	6

Time between split applications to Liberty Link sugarbeet, Fargo, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18, June 20, June 26, July 1 and July 9. Sugarbeet was hand weeded

Date	June11	June 18	June 20	June 26	July 1	July 9
Time of Day	2:00 PM	2:00 PM	11:00 AM	3:30 PM	9:30 AM	2:30 PM
Air Temp. (°F)	91	77	75	85	74	79
6" Soil Temp. (°F)	63	62	68	70	71	66
Rel. Humidity (%)	21	42	62	39	78	64
Wind Velocity(mph)	10-15	10	3	8	8	15
Cloud Cover (%)	25	90	10	20	100	5
Soil Moisture	Fair	Good	Good	Good	Good	Good
Sugarbeet Stage	v1.0-v2.7	v2.0-v6.1	v2.0-v6.2	v5.5-v10.5	v6.5-v10.5	v8.5-v12.5
Redroot Pigweed	cot-1 inch	1 inch	1 to 2 inch	5 to 6 inch	12 inch	13 inch
Green Foxtail	2 to 3 leaf	2 to 4 inch	3 to 6 inch	10 to 12 inch	0 to 14 inch	10 to 15 inch

June 30 and hand thinned to an eight inch spacing July 9. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 18. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Treatment	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	June 11								
Glufosinate	0.36	June 18								
Glufosinate	0.36	June 26	0	100	100	54	14.0	23.2	1080	5449
Glufosinate	0.36	June 11								
Glufosinate	0.36	June 20								
Glufosinate	0.36	July 1	0	100	100	50	14.3	22.5	1033	5419
Glufosinate	0.36	June 11								
Glufosinate	0.36	June 26								
Glufosinate	0.36	July 9	0	100	100	49	13.6	22.3	1123	5048
Glufosinate	0.36	June 11								
Glufosinate	0.36	July 1	0	100	100	47	14.2	21.8	1025	5257
Hand Weeded Check			0	100	100	43	13.9	20.0	1054	4650
Desm+Tfsu+Clpy										
0.25+0.01+0.06		June 11								
Desm+Tfsu+Clpy										
0.25+0.01+0.06		June 18								
Desm+Tfsu+Clpy										
0.25+0.01+0.06		June 26								
Sethoxydim+COC										
0.38+1%		June 30	0	100	100	41	13.8	18.5	1054	4292
EXP MEAN			0	100	100	47	13.9	21.4	1061	5019
C.V. %			0	0	0	12	3.4	12.7	9	13
LSD 10%			NS	NS	NS	6	NS	2.7	NS	661
LSD 5%			NS	NS	NS	7	NS	3.2	NS	797
# OF REPS			6	6	6	6	6	6	6	6

Time between split applications to Liberty Link sugarbeet, Crookston and Fargo combined, 1997. (Dexter)

Treatment	Rate	Sgbt Stage at Applic.	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	cotyledon								
Glufosinate	0.36	cot+7day								
Glufosinate	0.36	cot+14day	0	99	99	61	14.9	22.6	905	5824
Glufosinate	0.36	cotyledon								
Glufosinate	0.36	cot+10day								
Glufosinate	0.36	cot+20day	0	100	100	59	15.1	22.3	873	5852
Glufosinate	0.36	cotyledon								
Glufosinate	0.36	cot+15day								
Glufosinate	0.36	cot+29day	0	100	100	61	14.6	22.8	913	5760
Glufosinate	0.36	cotyledon								
Glufosinate	0.36	cot+20day	0	100	100	56	15.0	22.0	869	5739
Hand Weeded Check			0	100	100	49	14.7	19.9	881	5092
Desm+Tfsu+Clpy										
0.25+0.01+0.06		cotyledon								
Desm+Tfsu+Clpy										
0.25+0.01+0.06		cot+7day								
Desm+Tfsu+Clpy										
0.25+0.01+0.06		cot+14day								
Sethoxydim+COC										
0.38+1%			2	100	100	48	14.7	19.2	878	4918
EXP MEAN			0	100	100	56	14.8	21.5	887	5531
C.V. %			342	1	1	12	2.8	10.0	10	10
LSD 10%			1	NS	1	4	0.3	1.5	NS	387
LSD 5%			1	NS	NS	5	0.3	1.8	NS	464
# OF REPS			12	12	12	12	12	12	12	12

Summary

All treatments gave excellent weed control. All plots treated with glufosinate yielded more extractable sucrose than the hand weeded check plots or plots treated with conventional herbicides. Yield was similar among all glufosinate treatments regardless of application timing.

Timing of first application to Liberty Link sugarbeet, Crookston, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 6, June 13, June 20, June 27, July 4, July 10 and July 17. Sugarbeet was hand thinned to an eight inch spacing July 10.

Date	June 6	June 13	June 20	June 27	July 4	July 10	July 17
Time of Day	3:30 PM	12:00 PM	4:30 PM	2:15 PM	8:20 PM	1:40 PM	12:40 PM
Air Temp. (°F)	78	80	80	90	72	81	85
6" Soil Temp. (°F)	78	78	71	75	68	69	74
Rel. Humidity (%)	46	41	51	59	65	76	54
Wind Velocity(mph)	9	7	5	14	3	15	4
Cloud Cover (%)	20	5	5	5	5	5	5
Soil Moisture	Good	Fair	Good	Good	Good	Good	Good
Sugarbeet Stage	v1.0-v1.5	v2.5-v5.5	v4.2-v6.5	v6.5-v8.5	v6.5-v10.5	v10.5-v11.5	v11.5-v13.5
Redroot Pigweed	cot-2 lf	1 inch	2 to 4 inch	6-10 inch	10-16 inch	12-18 inch	36 inch
Green Foxtail	emerg-2 lf	4 inch	3 to 6 inch	10-12 inch	10-14 inch	12-18 inch	36 inch
Wild Oats	2-3 lf(4")	6 to 8 inch	12 inch	10-15 inch	12-20 inch	15-24 inch	36 inch

Sethoxydim at 0.38 lb ai/A + crop oil at 1% v/v was applied June 17 to all plots that were not treated with glufosinate. Redroot pigweed, green foxtail and wild oats control and sugarbeet injury were evaluated July 22. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Experiment continued on next page.

Timing of first application to Liberty Link sugarbeet, Crookston, 1997. (continued)

Treatment	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Wioa cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	June 6									
Glufosinate	0.36	June 13									
Glufosinate	0.36	June 20	0	100	100	100	66	15.4	22.6	776	6164
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 6									
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 13									
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 20	0	100	100	100	54	15.7	18.1	757	5024
Hand Weeded Check	0	June 6	0	100	100	100	52	15.7	18.5	710	5172
Glufosinate	0.36	June 13									
Glufosinate	0.36	June 20									
Glufosinate	0.36	June 27	0	100	100	100	58	16.0	21.4	694	6128
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 13									
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 20									
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 27	1	98	100	100	52	15.3	18.7	762	5057
Hand Weeded Check	0	June 13	0	100	100	100	46	15.4	18.9	757	5159
Glufosinate	0.36	June 20									
Glufosinate	0.36	June 27									
Glufosinate	0.36	July 4	0	100	100	100	63	15.6	18.8	733	5233
Desm+Tfsu+Clpy	0.33+0.0156+0.06	June 20									
Desm+Tfsu+Clpy	0.33+0.0156+0.06	June 27									
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 4	1	88	100	100	54	15.2	17.0	742	4544
Hand Weeded Check	0	June 20	0	100	100	100	54	15.1	18.5	702	4997
Glufosinate	0.36	June 27									
Glufosinate	0.36	July 4									
Glufosinate	0.36	July 11	0	100	100	100	67	15.2	19.7	727	5328
Desm+Tfsu+Clpy	0.33+0.0156+0.06	June 27									
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 4									
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 11	3	60	100	100	59	15.3	16.3	716	4509
Hand Weeded Check	0	June 27	0	100	100	100	49	15.4	18.0	731	4891
Glufosinate	0.36	July 4									
Glufosinate	0.36	July 11									
Glufosinate	0.36	July 18	5	100	100	100	62	15.1	18.2	759	4863
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 4									
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 11									
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 18	5	28	100	100	52	15.0	14.9	774	3971
Hand Weeded Check	0	July 4	0	100	100	100	52	15.2	16.8	722	4555
EXP MEAN			1	92	100	100	56	15.4	18.4	738	5040
C.V. %			159	13	0	0	15	3.8	12.4	12	12
LSD 10%			1	11	NS	NS	8	NS	2.2	NS	604
LSD 5%			2	14	NS	NS	10	NS	2.6	NS	723
# OF REPS			6	6	6	6	6	6	6	6	6

Timing of first application to Liberty Link sugarbeet, Fargo, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18, June 26, July 1, July 9, July 16 and July 23. Sugarbeet was hand thinned to an eight inch spacing July 9. Sethoxydim at 0.38 lb ai/A + crop oil at 1% v/v was applied June 22 to all plots that were not treated with glufosinate. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 18. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 11	June 18	June 26	July 1	July 9	July 16	July 23
Time of Day	3:30 PM	2:00 PM	3:30 PM	9:30 AM	2.30 PM	10:15 AM	6:30 PM
Air Temp. (°F)	91	77	85	74	79	76	80
6" Soil Temp. (°F)	63	62	70	71	66	75	79
Rel. Humidity (%)	21	42	39	78	64	87	65
Wind Velocity(mph)	10-15	10	8	8	15	4	5
Cloud Cover (%)	25	90	20	100	5	100	5
Soil Moisture	Fair	Good	Good	Good	Good	Good	Good
Sugarbeet Stage	v1.0-v2.7	v2.0-v6.1	v5.5-v10.5	v6.5-v10.5	v8.5-v12.5	v11.5-v14.5	v13.5-v18.5
Redroot Pigweed	cot-1 inch	1 inch	5 to 6 inch	12 inch	13 inch	24 inch	28 inch
Green Foxtail	2-3 leaf	2-4 inch	10-12 inch	10-14 inch	12 inch	25 inch	28 inch

Experiment continued on next page.

Timing of first application to Liberty Link sugarbeet, Fargo, 1997. (continued)

Treatment	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	June 11								
Glufosinate	0.36	June 18								
Glufosinate	0.36	June 26	0	100	100	50	14.3	23.8	1026	5741
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 11								
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 18								
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 26	1	100	100	37	13.6	17.7	1134	4015
Hand Weeded Check	0	June 11	0	100	100	36	14.1	19.4	1017	4658
Glufosinate	0.36	June 18								
Glufosinate	0.36	June 26								
Glufosinate	0.36	July 2	0	100	100	40	14.1	21.1	1013	5047
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 18								
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 26								
Desm+Tfsu+Clpy	0.25+0.01+0.06	July 2	2	100	100	34	14.0	18.4	1072	4347
Hand Weeded Check	0	June 18	0	100	100	35	13.9	20.1	1051	4715
Glufosinate	0.36	June 26								
Glufosinate	0.36	July 2								
Glufosinate	0.36	July 9	0	100	100	47	13.7	23.4	1089	5366
Desm+Tfsu+Clpy	0.33+0.0156+0.06	June 26								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 2								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 9	0	98	100	37	13.7	19.9	1093	4586
Hand Weeded Check	0	June 26	0	100	100	38	14.0	20.2	1022	4808
Glufosinate	0.36	July 2								
Glufosinate	0.36	July 9								
Glufosinate	0.36	July 16	0	100	100	46	13.7	22.6	1124	5131
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 2								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 9								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	July 16	0	94	100	42	13.8	21.3	1078	4911
Hand Weeded Check	0	July 2	0	100	100	36	13.9	20.3	1080	4759
Glufosinate	0.36	July 9								
Glufosinate	0.36	July 16								
Glufosinate	0.36	July 23	0	100	98	45	14.0	21.5	996	5115
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 9								
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 16								
Desm+Tfsu+Clpy	0.5+0.0156+0.09	July 23	0	90	100	46	13.8	19.3	1069	4475
Hand Weeded Check	0	July 9	0	100	100	43	13.9	20.9	1073	4867
EXP MEAN			0	99	100	41	13.9	20.7	1062	4836
C.V. %			525	3	1	18	3.0	11.5	9	13
LSD 10%			1	3	1	7	NS	2.3	NS	611
LSD 5%			1	4	1	9	NS	2.7	NS	732
# OF REPS			6	6	6	6	6	6	6	6

Timing of first application to Liberty Link sugarbeet, Crookston and Fargo combined, 1997. (Dexter)

Treatment	Rate	Sgbt Stage At Applic.	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate	0.36	cot								
Glufosinate	0.36	cot+1wk								
Glufosinate	0.36	cot+2wk	0	100	100	58	14.8	23.2	901	5953
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+1wk								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+2wk	0	100	100	45	14.6	17.9	945	4519
Hand Weeded Check	0	cot	0	100	100	44	14.9	19.0	864	4915
Glufosinate	0.36	cot+1wk								
Glufosinate	0.36	cot+2wk								
Glufosinate	0.36	cot+3wk	0	100	100	49	15.0	21.2	853	5588
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+1wk								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+2wk								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+3wk	2	99	100	43	14.7	18.6	917	4702
Hand Weeded Check	0	cot+1wk	0	100	100	41	14.7	19.5	904	4937
Glufosinate	0.36	cot+2wk								
Glufosinate	0.36	cot+3wk								
Glufosinate	0.36	cot+4wk	0	100	100	55	14.7	21.1	911	5300
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+2wk								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+3wk								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+4wk	0	93	100	46	14.4	18.4	918	4565
Hand Weeded Check	0	cot+2wk	0	100	100	46	14.6	19.4	862	4903
Glufosinate	0.36	cot+3wk								
Glufosinate	0.36	cot+4wk								
Glufosinate	0.36	cot+5wk	0	100	100	56	14.4	21.2	926	5230
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+3wk								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+4wk								
Desm+Tfsu+Clpy	0.33+0.0156+0.06	cot+5wk	1	77	100	50	14.5	18.8	897	4710
Hand Weeded Check	0	cot+3wk	0	100	100	43	14.6	19.1	906	4825
Glufosinate	0.36	cot+4wk								
Glufosinate	0.36	cot+5wk								
Glufosinate	0.36	cot+6wk	3	100	99	53	14.5	19.9	877	4989
Desm+Tfsu+Clpy	0.5+0.0156+0.09	cot+4wk								
Desm+Tfsu+Clpy	0.5+0.0156+0.09	cot+5wk								
Desm+Tfsu+Clpy	0.5+0.0156+0.09	cot+6wk	3	59	100	49	14.4	17.1	922	4223
Hand Weeded Check	0	cot+4wk	0	100	100	48	14.5	18.9	897	4711
C.V. %			279	13	1	16	3.4	12.4	10	13
LSD 10%			1	8	0	5	NS	1.6	NS	442
LSD 5%			1	10	0	6	NS	1.9	NS	528
# OF REPS			12	12	12	12	12	12	12	12

SUMMARY: Plots treated with glufosinate yielded more extractable sucrose than hand weeded plots or plots treated with conventional herbicides although the differences were not always significant. The yield of glufosinate treated sugarbeet declined as the first herbicide application was delayed. Delaying the start of hand weeding or conventional herbicide treatment had less effect on yield than delaying glyphosate application.

Herbicides on Liberty Link sugarbeet, Fargo, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18 and June 26. Sugarbeet was hand weeded June 30 and hand thinned to an eight inch spacing July 9. Redroot pigweed, green foxtail and prostrate spurge control and sugarbeet injury were evaluated July 19. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 11	June 18	June 26
Time of Day	2:00 PM	2:00 PM	3:30 PM
Air Temp. (°F)	91	77	85
6" Soil Temp. (°F)	63	62	70
Rel. Humidity (%)	21	42	39
Wind Velocity (mph)	10-15	10	8
Cloud Cover (%)	25	90	20
Soil Moisture	Fair	Good	Good
Sugarbeet Stage	v1.0-v2.7	v2.0-v6.1	v5.5-v10.5
Redroot Pigweed Stage	cot to 1 inch	1 inch	5 to 6 inches
Green Foxtail Stage	2 to 3 leaf	2 to 4 inches	10 to 12 inches

Treatment	Rate	Sgbt inj	Rrpw cntl	Grft cntl	Prsp cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	%	%	plt/60'	%	ton/A		lb/A
Glufosinate-3 times	0.27	0	100	100	100	43	13.4	19.5	1125	4348
Glufosinate-3 times	0.36	0	100	100	100	39	13.3	18.0	1211	3995
Hand Weeded Check	0	0	100	100	100	36	13.7	16.2	1085	3722
Desm+Tfsu+Clpy-3 times	0.16+0.008+0.05	1	100	100	100	40	13.7	16.8	1086	3868
Desm+Tfsu+Clpy-3 times	0.33+0.0156+0.08	3	100	100	100	39	13.7	16.6	1121	3790
EXP MEAN		1	100	100	100	39	13.5	17.4	1126	3944
C.V. %		211	0	0	0	21	5.1	22.2	11	27
LSD 10%		NS	NS	NS	NS	NS	NS	NS	NS	NS
LSD 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS
# OF REPS		4	4	4	4	4	4	4	4	4

Summary

All measured parameters were similar in this experiment.

Cultivation of Liberty Link sugarbeet, Crookston, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Glufosinate at 0.36 lb ai/A was applied to all plots June 13, July 10 and July 21. Plots receiving two cultivations were cultivated May 28 and June 27. Plots receiving five cultivations were cultivated May 28, June 18, June 27, July 17 and July 30. Sugarbeet was hand thinned to an eight inch spacing July 10 and hand weeded July 16. Redroot pigweed, green foxtail, prostrate pigweed and wild oats control and sugarbeet injury were evaluated July 17. Sugarbeet from the center two rows of 35 foot plots was counted and harvested October 1.

Date	June 13	July 10	July 21
Time of Day	2:30 PM	1:30 PM	12:30 PM
Air Temp. (°F)	80	81	77
6" Soil Temp. (°F)	78	69	71
Rel. Humidity (%)	41	76	63
Wind Velocity (mph)	7	15	2
Cloud Cover (%)	0	5	50
Soil Moisture	Fair	Good	Good
Sugarbeet Stage	v2.5-v5.5	v10.5-v11.5	v14.5-v19.5
Redroot Pigweed Stage	2 to 8 leaf	6 to 10 inches	1 to 13 inches
Green Foxtail Stage	1 to 4 inches	3 to 7 inches	10 inches
Prostrate Pigweed	2 to 8 leaf	6 to 10 inches	1 to 13 inches
Wild Oats	4 to 5 inches	8 to 15 inches	12 to 18 inches

Number of Cultivations	Sgbt inj	Rrpw cntl	Grft cntl	Prpw cntl	Wioa cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	98	98	98	98	82	15.1	18.1	778	4833
Two Cultivations	0	99	98	96	98	82	14.6	16.5	813	4225
Five Cultivations	0	100	98	98	99	75	14.7	15.9	810	4117
EXP MEAN	0	99	98	97	99	80	14.8	16.8	801	4392
C.V. %	0	2	3	2	1	6	4.6	7.8	12	13
LSD 10%	NS	NS	NS	NS	NS	5	NS	1.4	NS	NS
LSD 5%	NS	NS	NS	NS	NS	6	NS	1.7	NS	NS
# OF REPS	6	6	6	6	6	6	6	6	6	6

Cultivation of Liberty Link sugarbeet, Fargo, 1997. (Dexter) 'Liberty Link' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 19. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Glufosinate at 0.5 lb ai/A was applied to all plots June 18, July 9 and July 23. Plots receiving two cultivations were cultivated June 18

Date	June 18	July 9	July 23
Time of Day	2:00 PM	2:30 PM	6:30 PM
Air Temp. (°F)	77	79	80
6" Soil Temp. (°F)	62	66	79
Rel. Humidity (%)	42	64	65
Wind Velocity (mph)	10	15	5
Cloud Cover (%)	90	5	5
Soil Moisture	Good	Good	Good
Sugarbeet Stage	v2.0-v6.1	v8.5-v12.5	v13.5-v18.5
Redroot Pigweed Stage	1 inch tall	-	-
Green Foxtail Stage	2 to 4 inches	-	-

and July 7. Plots receiving five cultivations were cultivated June 18, June 30, July 7, July 10 and July 15. Sugarbeet was hand thinned to an eight inch spacing and hand weeded June 26. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 23. Sugarbeet from the center two rows of 35 foot plots was counted and harvested October 1.

Number of Cultivations	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	100	100	64	13.7	22.8	1037	5282
Two Cultivations	0	100	100	63	13.7	21.5	1134	4860
Five Cultivations	0	100	100	61	13.9	20.9	1038	4899
EXP MEAN	0	100	100	63	13.7	21.7	1070	5014
C.V. %	0	0	0	11	1.9	8.2	6	8
LSD 10%	NS	NS	NS	NS	NS	NS	72	NS
LSD 5%	NS	NS	NS	NS	NS	NS	NS	NS
# OF REPS	6	6	6	6	6	6	6	6

Cultivation of Liberty Link sugarbeet, Fargo and Crookston combined, 1997.
(Dexter)

Number of Cultivations	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	99	99	73	14.4	20.4	908	5057
Two Cultivations	0	100	99	72	14.1	19.0	974	4543
Five Cultivations	0	100	99	68	14.3	18.4	924	4508
EXP MEAN	0	100	99	71	14.3	19.3	935	4703
C.V. %	0	1	2	8	3.6	7.8	9	10
LSD 10%	NS	NS	NS	4	NS	1.1	NS	338
LSD 5%	NS	NS	NS	NS	NS	1.3	NS	409
# OF REPS	12	12	12	12	12	12	12	12

Summary

Plots cultivated two or five times yielded less than plots that were not cultivated.

Glyphosate plus triflusulfuron, Crookston, 1997. (Dexter) 'Beta 3712' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 13. Counter 15G insecticide at 12 pounds product per acre was applied modified in-furrow at planting. The first half of split applied postemergence herbicide treatments was 12:30 PM June 6 when the air temperature was 75F, relative humidity was 55%, soil temperature at six inches was 68F, wind velocity was 10 mph, cloud cover was 40%, soil moisture was good, sugarbeet was in the v1.5 to v2.0 stage, redroot pigweed was in the cotyledon to 2 leaf stage and wild oats was in the 2 to 3 leaf stage (4 inches tall). The second half of split applied treatments was 2:30 PM June 13 when the air temperature was 80F, relative humidity was 41%, soil temperature at six inches was 78F, wind velocity was 7 mph, sky was clear, soil moisture was fair, sugarbeet was in the v4.1 to v5.5 stage, redroot pigweed was in the 4 to 8 leaf stage and wild oats was 6 to 8 inches tall. All treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots. Sethoxydim + Dash HC at 0.38 lb ai/A + 1 pint/A was applied June 10 to all plots that were not treated with glyphosate. Sugarbeet injury and redroot pigweed and wild oats control were evaluated July 7.

Treatment	Rate	Sugarbeet injury	Redroot Pigweed control	Wild oats control
	lb/A	%	%	%
Desm+Tfsu+Clpy-2 times / Sethoxydim+Dash HC - June 10	0.33+0.0156+0.09 0.38+0.125G	0	100	100
Triflusulfuron+Glyphosate-2 times	0.0156+0.09	98	96	21
Triflusulfuron+Glyphosate-2 times	0.0156+0.19	100	100	95
Triflusulfuron+Glyphosate-2 times	0.0156+0.375	100	100	99
Triflusulfuron+Glyphosate-2 times	0.0156+0.75	100	100	100
Glyphosate-2 times	0.09	100	94	41
Glyphosate-2 times	0.19	100	99	92
Glyphosate-2 times	0.375	100	100	99
Glyphosate-2 times	0.75	100	99	100
Desmedipham+Clopyralid-2 times / Sethoxydim+Dash HC - June 10	0.5+0.09 0.38+0.125G	0	100	100
EXP MEAN		80	99	85
C.V. %		1	1	8
LSD 5%		1	2	9
LSD 1%		2	2	13
# OF REPS		4	4	4

SUMMARY: Sugarbeet was not a Roundup Ready variety. Triflusulfuron did not significantly improve redroot pigweed or wild oats control when combined with glyphosate. Glyphosate at 0.09 lb/A gave poor wild oats control and less control of redroot pigweed than other treatments. Glyphosate at 0.19 lb/A gave less wild oats control than higher glyphosate rates.

Roundup Ready sugarbeet, Crookston, 1997. (Dexter) 'Roundup Ready' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 6, June 13, June 20, June 27 and July 4. Sugarbeet was hand weeded June 17 and hand thinned to an eight inch spacing July 10. Sethoxydim at 0.38 lb ai/A + crop oil at 1% v/v was applied June 10 to all plots that were not treated with glyphosate. Redroot pigweed, green foxtail, wild oats, common lambsquarters and kochia control and sugarbeet injury were evaluated July 17. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 6	June 13	June 20	June 27	July 4
Time of Day	12:00 PM	2:30 PM	4:30 PM	2:15 PM	8:20 PM
Air Temp. (°F)	74	80	80	90	72
6" Soil Temp. (°F)	79	78	71	75	68
Rel. Humidity (%)	58	41	51	59	65
Wind Velocity(mph)	5	7	5	13	3
Cloud Cover (%)	35	0	5	5	5
Soil Moisture	Good	Fair	Good	Good	Good
Sugarbeet Stage	v1.0-v1.5	v3.5-v4.9	v2.0-v8.5	v6.5-v9.5	v6.5-v10.5
Redroot Pigweed	cot-2 lf	2 to 8 leaf	1 to 3 inch	10 to 16 inch	10 to 16 inch
Green Foxtail	emerg-2 lf	1 to 3 inch	3 to 8 inch	10 to 14 inch	10 to 14 inch
Wild Oats	2-3 lf (4")	6 inch	12 inch	12 to 16 inch	15 to 18 inch
Common Lambsquarters	2 to 4 leaf	4 to 8 leaf	2 to 3 inch	3 to 5 inch	6 to 12 inch
Kochia	1/4 to 1/2" ros.	1 inch ros.	1 to 5 inch	3 to 8 inch	6 to 12 inch

Experiment continued on next page.

Roundup Ready sugarbeet, Crookston, 1997. (continued)

Date of Treatment*	Sgbt Rrpw Rate	Grft Wioa Applic.	inj	Colq cntl	Kocz cntl	Sgbt cntl	cntl	Root cntl	Impur Popl	Extr Sucr	Yield	Index	Sucr
	lb/A		%	%	%	%	%	%	plt/60'	%	ton/A		lb/A
Glyphosate	0.75	June 6											
Glyphosate	0.75	June 20											
Glyphosate	0.75	July 4	0	100	100	100	100	100	69	14.1	31.4	1028	7467
Glyphosate	0.75	June 13											
Glyphosate	0.75	June 27	0	100	100	100	100	100	70	14.5	30.4	953	7557
Glyphosate	0.75	June 6											
Glyphosate	0.75	June 27	0	100	100	100	100	100	66	14.2	27.6	1018	6645
Glyt+Acet-H	0.75+2.5	June 6	9	99	96	99	97	96	73	14.3	30.2	980	7359
Glyt+Acet-H	0.75+2.5	June 6											
Glyphosate	0.75	June 27	10	100	100	100	100	100	69	14.2	30.1	961	7318
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 6											
Seth-Ultima	0.38	June 10											
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 13											
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 20	5	100	100	100	100	100	73	14.0	27.2	1036	6423
Hand Weeded Check			0	100	100	100	100	100	76	13.9	29.4	1034	6874
EXP MEAN			3	100	99	100	100	99	71	14.2	29.5	1002	7092
C.V. %			50	1	1	1	1	2	7	2.8	10.4	7	10
LSD 10%			2	NS	1	NS	1	2	NS	NS	NS	NS	NS
LSD 5%			3	NS	1	NS	1	NS	NS	NS	NS	NS	NS
# OF REPS			4	4	4	4	4	4	4	4	4	4	4

* Acet-H = 'Harness' formulation of acetochlor.

Roundup Ready sugarbeet, Fargo, 1997. (Dexter) 'Roundup Ready' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18, June 26, July 1 and July 9. Sugarbeet was hand weeded June 30 and hand thinned to an eight inch spacing July 9. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 18. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 11	June 18	June 26	July 1	July 9
Time of Day	2:00 PM	2:00 PM	3:30 PM	9:30 AM	2:30 PM
Air Temp. (°F)	91	77	85	74	79
6" Soil Temp. (°F)	63	62	70	71	66
Rel. Humidity (%)	21	42	39	78	64
Wind Velocity(mph)	10-15	10	8	8	15
Cloud Cover (%)	25	90	20	100	5
Soil Moisture	Fair	Good	Good	Good	Good
Sugarbeet Stage	v1.1-v2.5	v2.0-v4.5	v6.5-v8.5	v7.5-v11.5	v9.5-v12.5
Redroot Pigweed	cot-4 leaf	3 lf to 2.5 inch	4 to 6 inch	10 to 12 inch	12 to 18 inch
Green Foxtail	2 to 3 leaf	2 to 6 inch	6 to 10 inch	8 to 12 inch	14 to 18 inch

Experiment continued on next page.

Roundup Ready sugarbeet, Fargo, 1997. (continued)

Treatment*	Rate	Date of Applic.	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glyphosate	0.75	June 11								
Glyphosate	0.75	June 26								
Glyphosate	0.75	July 9	0	100	100	70	14.6	24.7	1019	6117
Glyphosate	0.75	June 26								
Glyphosate	0.75	July 9	0	100	100	61	15.1	23.8	951	6149
Glyphosate	0.75	June 11								
Glyphosate	0.75	July 1	0	100	100	63	14.8	22.6	1024	5693
Glyt+Acet-H	0.75+2.5	June 11	15	100	100	61	14.1	20.3	1139	4734
Glyt+Acet-H	0.75+2.5	June 11								
Glyphosate	0.75	July 1	15	100	100	53	14.8	20.0	1004	5037
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 11								
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 18								
Desm+Tfsu+Clpy	0.25+0.01+0.06	June 26								
Seth-Ultima	0.38	July 9	6	100	100	71	14.3	21.5	1106	5094
Hand Weeded Check			0	100	100	68	14.9	22.5	975	5725
EXP MEAN			5	100	100	64	14.6	22.2	1031	5507
C.V. %			43	0	0	7	3.8	7.4	12	10
LSD 10%			3	NS	NS	5	NS	2.0	NS	641
LSD 5%			3	NS	NS	7	NS	2.4	NS	776
# OF REPS			4	4	4	4	4	4	4	4

* Acet-H = 'Harness' formulation of acetochlor.

Roundup Ready sugarbeet, Crookston and Fargo combined, 1997. (Dexter)

Treatment*	Rate	Sgbt Stage at Applic.	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A		%	%	%	plt/60'	%	ton/A		lb/A
Glyphosate	0.75	cotyledon								
Glyphosate	0.75	cot+14day								
Glyphosate	0.75	cot+28day	0	100	100	69	14.3	28.0	1024	6792
Glyphosate	0.75	cot+14day								
Glyphosate	0.75	cot+28day	0	100	100	65	14.8	27.1	952	6853
Glyphosate	0.75	cotyledon								
Glyphosate	0.75	cot+20day	0	100	100	65	14.5	25.1	1021	6169
Glyt+Acet-H	0.75+2.5	cotyledon	12	99	98	67	14.2	25.3	1059	6046
Glyt+Acet-H	0.75+2.5	cotyledon								
Glyphosate	0.75	cot+20day	13	100	100	61	14.5	25.1	983	6177
Desm+Tfsu+Clpy	0.25+0.01+0.06	cotyledon								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+7day								
Desm+Tfsu+Clpy	0.25+0.01+0.06	cot+14day								
Seth-Ultima	0.2	cot+28day	6	100	100	72	14.1	24.3	1071	5758
Hand Weeded Check			0	100	100	72	14.4	25.9	1005	6299
EXP MEAN			4	100	100	67	14.4	25.8	1016	6299
C.V. %			54	1	1	8	3.4	9.7	10	11
LSD 10%			2	NS	1	5	NS	2.1	NS	561
LSD 5%			2	NS	1	6	NS	NS	NS	672
# OF REPS			8	8	8	8	8	8	8	8

* Acet-H = 'Harness' formulation of acetochlor.

Summary

Plots treated with acetochlor plus glyphosate yielded less extractable sucrose than the plots treated with glyphosate three times or glyphosate twice at the cotyledon + 14 days and the cotyledon + 28 days sugarbeet stages. Plots treated with glyphosate at the cotyledon and cotyledon + 20 day stages yielded less than plots treated at the cotyledon + 14 days and cotyledon + 28 days stages. The hand weeded check plots yielded less but not significantly less than the best two glyphosate treatments.

Herbicides on Roundup Ready sugarbeet, Fargo, 1997. (Dexter) 'Roundup Ready' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Herbicide treatments were applied in 8.5 gpa water at 40 psi through 8001 nozzles to the center four rows of six row plots June 11, June 18 and June 26. Sugarbeet was hand weeded June 26 and hand thinned to an eight inch spacing July 9. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 18. Sugarbeet from the center two rows of 30 foot plots was counted and harvested October 1.

Date	June 11	June 18	June 26
Time of Day	2:00 PM	2:00 PM	3:30 PM
Air Temp. (°F)	91	77	85
6" Soil Temp. (°F)	63	62	70
Rel. Humidity (%)	21	42	39
Wind Velocity (mph)	10-15	10	8
Cloud Cover (%)	25	90	20
Soil Moisture	Fair	Good	Good
Sugarbeet Stage	v1.1-v2.5	v2.0-v4.5	v6.5-v8.5
Redroot Pigweed Stage	cot to 4 leaf	3 leaf - 2.5 inches	4 to 6 inches
Green Foxtail Stage	2 to 3 leaf	2 to 6 inches	6 to 10 inches

Treatment	Rate	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucr	Root Yield	Impur Index	Extr Sucr
	lb/A	%	%	%	plt/60'	%	ton/A		lb/A
Glyphosate-3 times	0.56	0	100	100	72	14.7	22.6	1017	5657
Glyphosate-3 times	0.75	0	100	100	71	14.7	22.3	1009	5538
Hand Weeded Check	0	0	100	100	72	14.9	19.5	968	4938
Desm+Tfsu+Clpy-3 times	0.16+0.008+0.05	0	96	100	77	14.9	18.7	972	4741
Desm+Tfsu+Clpy-3 times	0.33+0.0156+0.08	3	99	100	75	15.1	17.9	976	4607
EXP MEAN		1	99	100	73	14.8	20.2	988	5096
C.V. %		258	2	0	10	3.3	10.1	12	9
LSD 10%		2	2	NS	NS	NS	2.6	NS	587
LSD 5%		NS	2	NS	NS	NS	3.1	NS	718
# OF REPS		4	4	4	4	4	4	4	4

Summary

Plots treated with glyphosate yielded more extractable sucrose than hand weeded plots or plots treated with conventional herbicides. Yield was similar from hand weeded plots and plots treated with conventional herbicides.

Cultivation of Roundup Ready sugarbeet, Crookston, 1997. (Dexter) 'Roundup Ready' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 20. Counter 15G insecticide at 12 pounds product per acre was applied in a 5 inch band over the row at planting. Glyphosate at 0.56 lb ai/A was applied to all plots June 13, July 10 and July 21. Plots receiving two cultivations were cultivated

Date	June 13	July 10	July 21
Time of Day	2:30 PM	1:40 PM	12:30 PM
Air Temp. (°F)	80	81	77
6" Soil Temp. (°F)	78	69	71
Rel. Humidity (%)	41	76	63
Wind Velocity (mph)	7	15	2
Cloud Cover (%)	0	5	50
Soil Moisture	Fair	Good	Good
Sugarbeet Stage	v3.5-v4.9	v11.5-v18.5	v19.0-v27.0
Redroot Pigweed Stage	2 to 8 leaf	-	-
Green Foxtail Stage	1 to 2 inches	-	-

May 28 and June 27. Plots receiving five cultivations were cultivated May 28, June 18, June 27, July 17 and July 30. Sugarbeet was hand thinned to an eight inch spacing July 10. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 17. Sugarbeet from the center two rows of 35 foot plots was counted and harvested October 1.

Number of Cultivations	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	100	100	105	14.4	23.5	945	5825
Two Cultivations	0	100	100	99	14.4	24.3	949	6025
Five Cultivations	0	100	100	93	14.3	22.4	940	5471
EXP MEAN	0	100	100	99	14.4	23.4	945	5773
C.V. %	0	0	0	7	3.6	7.4	9	10
LSD 10%	NS	NS	NS	7	NS	NS	NS	NS
LSD 5%	NS	NS	NS	9	NS	NS	NS	NS
# OF REPS	6	6	6	6	6	6	6	6

Cultivation of Roundup Ready sugarbeet, Fargo, 1997. (Dexter) 'Roundup Ready' sugarbeet was seeded 1.25 inches deep in 22 inch rows May 16. Counter 15G insecticide at 6 pounds product per acre was applied in a 5 inch band over the row at planting. Glyphosate at 0.56 lb ai/A was applied to all plots June 18, July 9 and July 23. Plots receiving two cultivations were cultivated June 18

Date	June 18	July 9	July 23
Time of Day	2:00 PM	2:30 PM	6:30 PM
Air Temp. (°F)	77	79	80
6" Soil Temp. (°F)	62	66	79
Rel. Humidity (%)	42	64	65
Wind Velocity (mph)	10	15	5
Cloud Cover (%)	90	5	5
Soil Moisture	Good	Good	Good
Sugarbeet Stage	v2.0-v4.5	v7.5-v11.5	v13.5-v21.5
Redroot Pigweed Stage	3 leaf to 2.5 inches	-	-
Green Foxtail Stage	2 to 6 inches	-	-

and July 7. Plots receiving five cultivations were cultivated June 18, June 30, July 7, July 10 and July 15. Sugarbeet was hand thinned to an eight inch spacing June 26. Redroot pigweed and green foxtail control and sugarbeet injury were evaluated July 23. Sugarbeet from the center two rows of 35 foot plots was counted and harvested October 1.

Number of Cultivations	Sgbt inj	Rrpw cntl	Grft cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	100	100	88	15.2	24.8	871	6567
Two Cultivations	0	100	100	82	14.5	24.0	1063	5837
Five Cultivations	0	100	100	80	14.8	22.2	1016	5562
EXP MEAN	0	100	100	83	14.8	23.7	983	5988
C.V. %	0	0	0	4	3.8	5.3	11	6
LSD 10%	NS	NS	NS	4	NS	1.3	109	387
LSD 5%	NS	NS	NS	5	NS	1.6	135	477
# OF REPS	6	6	6	6	6	6	6	6

Cultivation of Roundup Ready sugarbeet, Crookston and Fargo combined, 1997.
(Dexter)

Number of Cultivations	Sgbt inj	Rrpw cntl	Fxtl cntl	Sgbt Popl	Sucrose	Root Yield	Impur Index	Extract Sucrose
	%	%	%	plt/70'	%	ton/A		lb/A
No Cultivation	0	100	100	97	14.8	24.1	908	6196
Two Cultivations	0	100	100	91	14.5	24.2	1006	5931
Five Cultivations	0	100	100	87	14.5	22.3	978	5516
EXP MEAN	0	100	100	91	14.6	23.5	964	5881
C.V. %	0	0	0	6	3.8	6.5	11	9
LSD 10%	NS	NS	NS	4	NS	1.1	73	374
LSD 5%	NS	NS	NS	5	NS	1.3	NS	451
# OF REPS	12	12	12	12	12	12	12	12

Summary

Plots cultivated five times yielded less than plots cultivated twice or not at all.

Wild Oat Control, Fargo. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1-to 3-leaf wheat and wild oat, less than 1 leaf wild buckwheat, 2 leaf foxtail and wild mustard and less than 2 leaf common lambsquarters on June 4 with 80 F, 50% RH, partly cloudy sky, and 5 mph wind. Split treatments (6d) were applied to 4- to 5-leaf wheat, 2- to 4-leaf wild oat, 3-leaf wild buckwheat, 3- to 4-leaf foxtail, and 6-leaf wild mustard on June 10 with 60 F, 40% RH, and clear sky. All treatments were applied with a bicycle- wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density exceeded 200 plants/yd^2.

Treatment	Rate	6-16			7-29			8-18
		Wht	Wioa	Wimu	Wht	Wioa	Fxtl	Yield
	oz/A				%			bu/A
Diclofop+Bromoxynil+PO	16+4+.12G	11	86	98	0	50	52	18
Diclofop+PO(2lf) /Diclofop+Bromoxynil+PO(6d)	8+0.25G /8+4+0.12G	4	95	98	0	77	95	29
Imazamethabenz+Thif&Trib+X-77	5+0.22+0.25%	6	90	99	0	85	8	28
Imazamethabenz+X-77(2lf) /Imazamethabenz+Thif&Trib+X-77(6d)	2+0.25% /2+0.22+0.25%	10	87	99	0	87	10	29
Difenzoquat+Thif&Trib(6d)	12+0.22	21	78	98	2	83	10	22
Difenzoquat/Dife+Thif&Trib(6d)	5+/5+0.22	14	89	99	0	58	43	21
Tralkoxydim+Bromoxynil&MCPA+TF+AMS	2.9+8+0.5%+24	7	96	99	0	82	50	29
MON37500+ND72	0.37+1%	31	94	99	1	79	49	28
MON37500+ND72(2lf) /MON37500+Thif&Trib+ND72(6d)	0.18+1% /0.18+0.22+1%	59	96	99	5	96	85	27
HOE-1133+MCPA-ioe	1.6+4	4	95	99	0	85	85	30
Tiller	9.3	7	93	99	0	69	79	23
Cheyenne+Thifensulfuron&Trib	7.3+.22	5	85	99	0	44	82	19
CGA-184927+Bromoxynil&MCPA+Score	0.4+8+1%	9	85	99	0	55	61	19
Untreated	0	0	0	0	0	0	0	8
C.V. %		47	4	1	153	18	42	21
LSD 5%		9	5	1	1	17	30	7
# of Reps		4	4	4	4	4	4	4

Wild oat control from split applications of diclofop and MON 37500 was greater than from one treatment at twice the rate. However, split application of imazamethabenz or difenzoquat did not consistantly enhance wild oat control. MON-37500 when split applied severly injured wheat, but did not reduce wheat grain yield compared to other treatments giving similar weed control without important injury to wheat. Split application of diclofop and MON 37500 also gave foxtail control equal to that from Tiller, Cheyenne, and HOE-1133 (Puma). Wheat grain yield related to wild oat control and effective control increased yield more than three fold. Broadleaf control herbicides used in combination with wild oat control herbicides were selected to be nonantagonistic with the wild oat herbicides. However, some antagonism may have occurred.

Wild Oat Control, Hettinger, 1997. (Ericksmoen) 'Kulm' hard red sping wheat was seeded April 29. Treatments were applied to 3-leaf wheat and 2- to 3.5- leaf wild oat on June 2 with 66 F, 55% RH, and 2 mph wind. Split (6d) treatments were applied to 6-leaf wheat, and 3-to 5-leaf wild oat on June 12 with 51 F, 97% RH, and no wind. All treatments were applied with a tractor-mounted plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was more than 200 plants/yd^2.

Treatment	Rate	7/29 Wht	7/29 Wioa	8-15 Yield
	oz/A	——	% ——	bu/A
Diclofop+Bromoxynil+PO	16+4+.12G	0	52	22
Diclofop+PO(2lf)	8+.25G			
/Diclofop+Bromoxynil+PO(6d)	/8+4+.12G	6	75	20
Imazamethabenz+Thif&Trib+X-77	5+.22+.25%	6	90	27
Imazamethabenz+X-77(2lf)	2+.25%			
/Imazamethabenz+Thif&Trib+X-77(6d)	/2+.22+.25%	12	86	24
Difenzoquat+Thif&Trib+X-77(6d)	12+.22+.25%	18	94	21
Difenzoquat+X-77	5+.25%			
/Difenzoquat+Thif&Trib+X-77(6d)	/5+.22+.25%	10	88	22
Tralkoxydim+Brox&MCPA+TF+AMS	2.9+8+.5%+24	3	85	23
MON37500+ND72	.37+1%	5	94	25
MON37500+ND72(2lf)	0.18+1%			
/MON37500+Thif&Trib+ND72(6d)	/.18+.22+1%	8	96	26
HOE-1133+MCPA-ioe	1.6+4	6	78	18
Tiller	9.3	8	76	18
Cheyenne+Thif&Trib	7.3+.22	1	77	23
CGA-184927+Brox&MCPA+Score	0.4+8+1%	1	54	20
Untreated	0	0	0	15
C.V. %		105	11	26
LSD 5%		9	11	NS
# OF REPS		4	4	4

Diclofop applied as two treatments separated by 6 days increased wild oat control compared to one treatment at the same total rate. Split application of imazamethabenz or difenzoquat did not enhance wild oat control beyond one application. Wild oat infestation was dense, but MON 37500, imazamethabenz + thifensulfuron & tribenuron, difenzoquat + thifensulfuron & tribenuron and MON 37500 provided 90% or more wild oat control. None of the herbicides caused important injury to wheat. Wheat yield was increased by 6 to 12 bu/A by effective wild oat control.

Wild Oat Control, Minot 1997. (Zarnstorff) 'Amidon' hard red spring wheat was seeded May 5. Treatments were applied to 3- to 4-leaf wheat and 1- to 4-leaf wild oat on May 30 with 50 F, 57% RH, clear sky and 5 mph wind. Second treatments were applied on June 6 with 58 F, 65% RH, and 5 mph wind. All treatments were applied with a bicycle wheel-type-plot sprayer delivering 8.5 gpa at 35 psi to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 20. Wild oat density exceeded 200 plants/yd^2.

Treatment	Rate	7-10		8-20
		Wht	Wioa	Yield
	oz/A	— % —		bu/A
Diclofop+Bromoxynil+PO	16+4+.12G	0	56	11
Diclofop+PO(2lf)	8+.25G			
/Diclofop+Bromoxynil+PO(6d)	/8+4+.12G	0	48	13
Imazamethabenz+Thif&Trib+X-77	5+.22+.25%	0	32	11
Imazamethabenz+X-77(2lf)	2+.25%			
/Imazamethabenz+Thif&Trib+X-77(6d)	/2+.22+.25%	13	69	10
Difenzoquat+Thif&Trib+X-77(6d)	12+.22+.25%	4	68	13
Difenzoquat+X-77	5+.25%			
/Difenzoquat+Thif&Trib+X-77(6d)	/5+.22+.25%	13	80	14
Tralkoxydim+Bromoxynil&MCPA+TF+AMS	2.9+8+.5%+24	1	91	15
MON37500+ND72	.37+1%	6	86	17
MON37500+ND72(2lf)	0.18+1%			
/MON37500+Thif&Trib+ND72(6d)	/.18+.22+1%	14	94	15
HOE-1133+MCPA-ioe	1.6+4	0	65	11
Tiller	9.3	1	62	10
Cheyenne+Thif&Trib	7.3+.22	0	13	9
CGA-184927+Bromoxynil&MCPA+Score	0.4+8+1%	0	4	7
Untreated	0	0	0	9
C.V. %		134	18	24
LSD 5%		7	15	4
# OF REPS		4	4	4

None of the herbicides caused important injury to wheat, split application of diclofop did not enhance wild oat control which is contrary to results at Fargo and Hettinger. The lack in response may indicate plants that were low resistant. Tralkoxydim and MON 37500 were the most effective herbicides for wild oat control. Split application of MON 37500 tended to enhance wild oat control compared to one application at the same total rate. Wheat yields were not greatly increased by wild oat control probably reflecting the drought conditions and early competition from the dense wild oats.

Wild Oat Control, Williston. (Riveland) Drought conditions in April, May, and June caused a poor stand establishment of crop and weeds. Following a 5 inch rain July 1 and 2 weeds and some wheat emerged. Treatments were applied to 4-leaf wheat, 3-leaf wild oat, and 6 inch kochia on July 21 with 79 F, 65% RH, and calm wind. Second treatments were applied to 5- to 6-leaf wheat, 5-leaf wild oat and 10- to 12 inch kochia on July 28 with 51 F, 70% RH, and calm wind. All treatments were applied with a bicycle type sprayer with wind shield mounted on a G-Allis Chalmers tractor delivering 8.6 gpa at 32 psi through 8001 flat fan nozzles on July 21 treatments and 10001 flat fan nozzles on July 28 treatments. Area was 7 ft wide the length of 10 by 24 ft plots. The experiment was a randomized complete block design with four replicates.

		8-21			9-30		
Treatment	Rate	Grft	Wioa	KOCZ	Grft	Wioa	KOCZ
	oz/A			%			
Diclofop+Bromoxynil+PO	16+4+.12	44	60	49	64	28	73
Diclofop+PO(21f)	8+.25G						
/Diclofop+Bromoxynil+PO(6d)	/8+4+.12G	56	61	44	49	61	75
Imazamethabenz+Thif&Trib+X-77	5+.22+.25%	0	88	33	0	75	40
Imazamethabenz+X-77(21f)	2+.25%						
/Imazamethabenz+Thif&Trib+X-77(6d)	/2+.22+.25%	0	92	68	0	93	73
Dife+Thif&Trib+X-77(6d)	12+.22+.25%	6	80	74	4	86	51
Dife+X-77	5+.25%						
/Dife+Thif&Trib+X-77(6d)	/5+.22+.25%	10	91	70	0	94	55
Tralkoxyidm+Bromoxynil&MCPA+TF+AMS	2.9+8+.5%+24	80	97	94	82	98	90
MON37500+ND72	.37+1%	16	97	59	28	96	50
MON37500+ND72(21f)	.18+1%						
/MON37500+Thif&Trib+ND72(6d)	/.18+.22+1%	28	95	28	38	87	25
HOE-1133+MCPA-ioe	1.6+4	97	98	0	98	99	0
Tiller	9.3	92	93	43	94	73	15
Cheyenne+Thif&Trib	7.3+.22	90	86	76	80	60	56
CGA-184927+Bromoxynil&MCPA+Score	0.4+8+1%	48	97	23	76	96	20
Untreated	0	0	0	0	0	0	0
C.V. %		33	12	56	27	15	58
LSD 5%		19	14	38	17	16	37
# OF REPS		4	4	4	4	4	4

Injury to wheat was not evaluated because of the large variability in stand and growth stage. At the late evaluation, wild oat control was generally increased from split applications of the herbicides for wild oat control, except MON 37500. At the other locations, split applications increased efficacy on MON 37500. The reason for the difference in response to split application at Williston is not known. Further, the split application had the thifensulfuron & tribenuron which should have increased kochia control. Tralkoxydim + bromoxynil & MCPA + adjuvants gave the best control of both wild oat and kochia. Tralkoxydim and fenoxaprop (Tiller) treatment gave 80% or more green foxtail control.

Wild Oat Control in Barley, Ada, MN 1997. (Nalewaja) Treatments were applied to 3-leaf barley, 1- to 3-leaf wild oat, and 1-leaf wild buckwheat on May 30 with 65 F, 40% RH, clear sky, and no wind, on a growers field. Second treatments were applied to 5-leaf barley and 3-leaf wild oat on June 5 with 60 F, 40% RH, clear sky, and 5-mph wind. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6-12-97		7-11-97	
		Barley	Wioa	Barley	Wioa
	oz/A	%		%	
Diclofop+PO	16+.12G	5	68	0	28
Diclofop+PO/Diclofop+PO	8+.25G/8+.12G	11	48	11	53
Imazamethabenz+Act90	4+.25%	1	38	0	40
Imazamethabenz+Act90	8+.25%	3	56	0	54
Immb+Act90/Immb+Act90	4+.25%/4+.25%	5	55	0	58
Difenzoquat	16	19	59	1	99
Imazamethabenz+Dife+Act90	3+8+.25%	11	69	0	98
HOE-1133	1.6	8	50	0	72
HOE-1133/HOE-1133	0.8/0.8	9	54	0	63
HOE-1133+Dife	0.8+8	13	59	1	99
Tral+TF8035+AMS	2.9+.5%+24	16	65	3	59
MON37500+ND72	.25+1%	70	75	59	5
HXB+ND72	.25+1%	56	71	29	94
HOE-1133+MON37500+ND72	0.8+.15+1%	68	79	13	69
Tiller	9.3	18	49	0	51
Untreated	0	0	0	0	0
C.V.%		33	28	55	15
LSD 5%		9	23	6	12
# OF REPS		4	4	4	4

At the June 12 evaluation, treatments had not had time to effect wild oat control. Thus, the discussion of wild oat control will be limited to the July 11 evaluation. Split application of diclofop by 6 days greatly increased wild oat control compared to one application at the same total rate. However, control was only at 53% with the split application. Split application of imazamethabenz also increased wild oat control but to a smaller degree than that for diclofop. Split application of HOE-1133 (Puma) did not increase wild oat control. The poor wild oat control with diclofop, HOE 1133, Tiller, tralkoxydim, and imazamethabenz indicate possible presence of resistant wild oat plants. Difenzoquat (Avenge) alone or in mixture with other herbicides gave more than 90% control of wild oat. MON 37500 and HXB both were injurious to barley, but only HXB gave more than 90% wild oat control. The injury to barley opened the crop canopy allowing the wild oats to grow vigorously. Tests are in progress with wild oat seed from the plots to determine if the poor control with certain herbicides was from resistance.

Antagonism of Wild Oat Control Herbicides, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 2- to 3-leaf wheat, 2- to 4-leaf wild mustard, 2-leaf wild oat and foxtail, and 1-leaf wild buckwheat on June 6 at 80 F, 45% RH, and partly cloudy sky. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6-20				7-31		
Treatment	Rate	Wht	Wioa	Wimu	Wibu	Wht	Wioa	Yeft
	oz/A	%						
Difp+PO	12+.12G	11	73	10	10	0	84	80
Difp+Flur+PO	12+2+.12G	9	80	80	87	0	86	51
Difp+F8426&MCPA+PO	12+6.4+.12G	10	36	98	85	1	31	0
Immb+Act90	5+.25%	9	73	97	70	1	94	13
Immb+Flur+Act90	5+2+.25%	8	83	98	78	2	96	25
Immb+F8426&MCPA+Act90	5+6.4+.25%	8	61	97	90	0	66	30
HOE-1133	1.6	8	86	13	15	0	97	99
HOE-1133+Flur	1.6+2	10	94	80	85	2	97	99
Dife	10	11	71	24	25	4	88	0
Dife+Flur	10+2	13	80	80	85	1	81	26
Dife+Flur	10+2	13	76	83	80	2	88	11
Untreated	0	0	0	0	0	0	0	0
C.V.%		29	16	17	11	188	9	47
LSD 5%		4	16	16	14	NS	10	24
# OF REPS		4	4	4	4	4	4	4

None of the herbicides caused important injury to wheat. Wild oat control with diclofop was highly antagonized by F8426 & MCPA, but not by fluroxypyr. F8426 & MCPA caused severe burn to wheat within one day after treatment when with diclofop + petroleum oil adjuvant. Wheat recovered, but probably were less competitive with wild oats or the rapid burn may have reduced diclofop translocation accounting for the antagonism, F8426 also antagonized wild oat control from imazamethabenz, but to less extent than to diclofop. The oil adjuvant applied with diclofop increased the phytotoxicity from F8426, probably giving the strong antagonism, Fluroxypyr was not antognistic to wild oat control by any of the herbicides.

Wild oat control herbicides with sulfonylureas, Fargo 1997. (Nalewaja) An experiment was conducted in Fargo to determine wild oat control from wild oat control herbicides plus sulfonylurea herbicides and split applications in 1997. '2375' hard red spring wheat was seeded May 10. First treatments were applied to 1- to 3- leaf wheat and wild oat and 2- leaf wild mustard on June 6 with 80 F, 50% RH, partly cloudy sky, and 5 mph wind. Second treatments (6d) were applied to 1- to 4- leaf wheat and wild oat, and 2- to 6- leaf wild mustard on June 12 with 65 F, 50% RH, clear sky and 8 mph wind. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was 18 plants/ft^2 and wild mustard was 6 plants/ft^2.

Treatment[a]	Rate	6-26			7-31	
		Wht	Wioa	Wimu	Wht	Wioa
	oz/A			%		
Diclofop+PO	16+0.12G	5	61	30	0	81
Diclofop+Thif+PO	16+0.37+0.12G	11	58	99	0	83
Difp+PO/Difp+Thifensulfuron+PO(6d)	8+0.12G/8+0.38+0.12G	7	75	99	0	88
Diclofop+PO/Diclofop+PO(6d)	8+0.12G/8+0.12G	7	84	64	0	90
Imazamethabenz+X-77	5+0.25%	7	75	97	0	92
Immb+Thif&Tribenuron+Mets+X-77	5+0.11+0.03+0.25%	12	82	99	2	89
Imazamethabenz+Thifensulfuron+X-77	5+0.37+0.12G	14	67	99	1	88
HOE-1133	12	8	89	38	1	91
HOE-1133+Thif&Trib+Metsulfuron	1.9+0.11+0.03	13	66	99	1	84
HOE-1133+Thifensulfuron	1.9+0.37	12	83	97	1	88
HOE-1133/Thif&Trib+Mets+X-77(6d)	1.9/0.11+0.03+0.25%	11	89	99	3	94
Tralkoxydim+TF8035+AMS	2.9+0.5%+24	8	87	47	1	81
Tral+Thif&Trib+Mets+TF8035+AMS	1.9+.11+0.03+0.5%+24	6	10	98	0	42
Tralkoxydim+Thif+TF8035+AMS	2.9+0.37+0.5%+24	11	84	99	2	89
Tralkoxydim+TF8035+AMS/ Thif&Trib+Metsulfuron+X-77(6d)	2.9+.5%+24/ 0.11+0.03+0.25%	12	88	99	1	90
Fenoxaprop&2,4-D&MCPA+Thif	1&3&6.3+0.37	11	60	99	0	80
LSD 5%		NS	14	11	NS	11
# OF REPS		4	4	4	4	4

[a]&=formulated mixture; thifensulfuron&tribenuron (Harmony Extra) 2:1; TF8035= surfactant from Zeneca, Wilmington, DE; X-77=nonionic surfactant from Loveland Industries, Greeley CO; PO= Clean Crop from Platte Chemical Co., Fremont NE.

None of the treatments caused important injury to wheat. Thifensulfuron did not antagonize diclofop or imazamethabenz phytotoxicity to wild oat and when applied with diclofop provided wild mustard control. Diclofop applied as two treatments separated by 6 days increased wild oat control about 25% units at the early evaluation. Late evaluations were difficult because of lodging of surviving wild oat plants. Thifensulfuron&tribenuron+metsulfuron were antagonistic to wild oat control by HOE-1133 or tralkoxydim, but not when applied 6 days after HOE-1133 or tralkoxydim. These results indicate that thifensulfuron in tank mixture with diclofop, imazamethabenz, HOE-1133, or tralkoxydim would provide control of certain broadleaf weeds without reducing wild oat control.

Imazamethabenz Plus Adjuvants and Split Applications for Wild Oat Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1- to 3-leaf wheat and wild oat and 2-leaf wild mustard and wild buckwheat on June 5 with 65 F, 40% RH, partly cloudy sky, and 10 to 20 mph wind. Second treatments were applied to 4-leaf wheat, 2- to 4-leaf wild oat, 2- to 4-leaf green and yellow foxtail and 6-leaf wild mustard and wild buckwheat on June 11 with 65 F, 50% RH, cloudy sky, and 5-mph wind. All treatments were applied with a bicycle wheel type shielded plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 18. Wild oat density about 150 plant/yd^2.

Treatment	Rate	6-26			7-29			8-18
		Wht	Wioa	Wimu	Wht	Wioa	Fota	Yield
	oz/A				%			bu/A
Imazamethabenz+X-77	5+0.25%	6	90	97	0	87	65	33
Imazamethabenz+SunitII	5+0.18G	5	91	96	0	88	60	34
Imazamethabenz+Scoil	5+0.18G	6	88	93	0	89	75	35
Immb+X-77/Immb+X-77	2.5+0.25%/2.5+0.25%	3	90	99	0	95	70	36
Immb+SunitII/Immb+SunitII	1.5+0.18G/1.5+0.18G	2	91	99	0	99	65	38
Immb+SunitII/Immb+SunitII	2.5+0.18G/2.5+0.18G	3	95	99	0	99	65	38
Immb+Scoil/Immb+Scoil	2.5+0.18G/2.5+0.18G	5	94	99	0	99	70	39
Untreated	0	0	0	0	0	0	0	14
C.V. %		45	5	4	0	2	15	9
LSD 5%		2	5	5	NS	2	21	4
# OF REPS		4	4	4	4	4	2	4

Wild oat control was high with all imazamethabenz treatments. Yield of wheat was increased 19 or more bushels/acre from wild oat and wild mustard control. Split application of imazamethabenz separated by 6 days generally increased wild oat control compared to one application at the same total rate. Further, a split application of imazamethabenz at one half the total rate applied with Suni-it II equalled or exceeded the single full rate application. These data indicate that split applications of imazamethabenz have potential to increase wild oat control or reduce rates. Other experiments with split applied imazamethabenz did not always show more effectiveness than a single application at the same total rate. However, when control levels were low from single application (Minot and Williston) the split applications greatly increased efficacy.

Imazamethabenz Spray Volume Droplet Size in Wheat, 1997. (Nalewaja) '2375' wheat was seeded May 10. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced 20 inches apart. The offset boom eliminated wheel tracks from within the plot and cone shields mounted at each nozzle reduced drift. Treatments were applied to 2- to 3-leaf wheat, 1- to 3-leaf wild oat, 1- to 4-leaf wild mustard, 1 leaf wild buckwheat, and 2 leaf foxtail on June 6 with 70 F, 5- to 8-mph wind, 40% RH, and a clear sky. Travel was at 5 or 10 mph depending on the volume desired for a nozzle size. Plot size was 11.5 by 30 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken on June 25 and July 29. Wild oat density at more than 100 plants/yd^2.

Treatment	Nozzle	Spray volume	Rate	6-25					7-29	
				Wht	Wioa	Wimu	Wibu	Fota	Wht	Wioa
		gpa	oz/A	%						
Immb+Act90	8001	2.5	4+.25%	11	63	98	73	50	0	84
Immb+Act90	8001	5	4+.25%	12	75	98	79	63	0	83
Immb+Act90	8002	5	4+.25%	9	76	98	84	58	0	81
Immb+Act90	8002	10	4+.25%	8	78	99	89	61	0	81
Immb+Act90	8004	20	4+.25%	8	78	99	90	70	0	80
Immb+SunitII	8001	2.5	4+.18G	8	91	98	93	67	0	96
Immb+SunitII	8001	5	4+.18G	8	81	97	85	59	0	94
Immb+SunitII	8001	5	4+1%=(0.4pt)	7	78	99	89	79	0	86
Immb+SunitII	8002	5	4+.18G	9	73	99	91	66	0	90
Immb+SunitII	8002	10	4+.18G	10	79	99	93	53	0	91
Immb+SunitII	8004	20	4+.18G	10	69	99	93	61	0	81
Immb+SunitII	8004	20	4+1%=(1.6pt)	9	73	99	90	68	0	88
Untreated			0	0	0	0	0	0	0	0
C.V. %				42	16	1	9	19	0	6
LSD 5%				5	16	2	10	16	NS	7
# OF REPS				4	4	4	4	4	4	4

Wheat injury from imazamethabenz was of no concern regardless of spray volume or adjuvant. Spray volume did not influence imazamethabenz control of wild oats when applied with surfactant Activator 90 at 0.25% at the late evaluation. Differences among treatments were small at the late evaluation, possibly from post treatment emerged wild oats. At the early evaluation wild oat control was reduced for the 2.5 gpa treatment with surfactant at 0.25%. The amount of surfactant at this low volume may not have been adequate to support herbicide absorption. The results with Sun-it II indicated that a high concentration of the oil in the spray was positive to imazamethabenz efficacy. The greatest control was from application in 2.5 gpa followed by 5 gpa and the other volumes resulted in similar but less wild oat control. Sun-it II was at 1.5 pt/A so at 2.5 gpa the concentration was at 7.5%. These results indicate that when using Sun-it II at 1.5 pt/A with imazamethabenz low spray volumes will optimze efficacy.

Tralkoxydim for Wild Oats Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1- to 3-leaf wheat and wild oat, 2-leaf foxtail and wild buckwheat, and 4- leaf wild mustard on June 4 with 70 F, 55% RH, clear sky and no wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 18. Wild oat density was more than 100 plants/yd^2 and wild mustard about 3 plants/yd^2.

Treatment	Rate	6-25				7-30			8-18
		Wht	Wioa	Wimu	Wibu	Wht	Wioa	Yeft	Yield
	oz/A	%							
Tralkoxydim+TF8035	2.9+.5%	9	95	0	3	0	86	85	25
Tralkoxydim+TF805+AMS	2.9+.5%+1.8%	14	90	0	4	0	86	85	23
Tralkoxydim+TF8035+MCPA-ioe	2.9+.5%+8	12	88	93	13	3	92	85	29
Tral+TF8035+MCPA-ioe+AMS	2.9+.5%+8+1.8%	9	94	93	14	2	91	75	31
Tral+TF8035+24-Dioe+AMS	2.9+.5%+8+1.8%	7	14	98	83	1	43	0	11
Tral+TF8035+Brox&MCPA	2.9+.5%+8	10	83	93	74	1	86	0	31
Tral+TF8035+Brox&MCPA+AMS	2.9+.5%+8+1.8%	14	85	96	83	1	87	40	31
Tral+TF8035+Clpy&MCPA	2.9+.5%+9.5	10	88	97	91	1	89	60	29
Tral+Flox+TF8035+AMS	2.9+2+.5%+1.8%	10	91	70	88	0	90	75	31
Tral+F8426&MCPA+TF8035+AMS	2.9+6.4+.5%+1.8	10	70	92	80	1	60	20	19
Tral+TF8035+Clpy&MCPA+AMS	2.9+.5%+9.5+1.8	10	95	95	90	1	96	80	32
Flox+24-Dioe+AMS	2+6+1.8%	5	6	98	90	0	0	0	10
Untreated	0	0	0	0	0	0	0	0	13
C.V. %		48	10	6	19	487	8		15
LSD 5%		6	10	6	15	NS	8		5
# OF REPS		4	4	4	4	4	4	1	4

None of the herbicide treatments caused important injury to wheat. Wheat yield related closely to wild oat control. Effective wild oat control more than doubled wheat grain yield. Ammonium sulfate adjuvant did not influence wild oat control by tralkoxydim alone or when with broadleaf control herbicides. 2,4-D and F8426 & MCPA were antagonistic to wild oat control by tralkoxydim. F8426 caused rapid injury to wheat when applied with tralkoxydim and TF8035. However, the injury was not evident at evaluation. These data indicate that tralkoxydim control of wild oat can occur when applied with selected herbicides for broadleaf weed control. Tralkoxydim was most effective for both wild oat and foxtail when with MCPA ioe or clopyralid & MCPA.

Tralkoxydim Plus Scoil for Wild Oat Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 4-leaf wheat, 2- to 4-leaf wild oat and green and yellow foxtail, and 6-leaf wild mustard and wild buckwheat on June 11 with 78F, 35% RH, hazy sky and 5- to 8-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density was 315 plants/yd^2.

Treatment	Rate	6-26	
		Wheat	Wioa
	oz/A	%	
Tralkoxydim+TF8036+AMS	3+.5%+24	5	80
Tralkoxydim+Scoil+AMS	2+1%+24	6	84
Tralkoxydim+Scoil+AMS	2+2%+24	5	93
Tralkoxydim+Scoil+AMS	2+3%+24	9	96
Untreated	0	0	0
C.V.%		41	6
LSD 5%		3	7
# OF REPS		4	4

The objective was to determine percentage of Scoil needed to maximize wild oat control from tralkoxydim. In a previous experiment scum was observed in the spray which was determined to be from including the Scoil before tralkoxydim in the spray mixture. This experiment tralkoxydim was placed into the water first, Scoil second, and AMS last which prevented the scum. Tralkoxydim efficacy increased as percentage Scoil in the mixture increased from 1 to 3%. Tralkoxydim was equally as effective when with TF8036 at 0.5% or Scoil at 1%. Oil adjuvants often are applied on an area basis at 1.5 to 2 pt/A. Scoil at 1%=0.68 pt/A.

Tralkoxydim with Adjuvants, Fargo. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1- to 3-leaf wheat and wild oat, 2- to 4-leaf wild mustard, and 1-leaf wild buckwheat on June 5 with 65 F, 40% RH, clear sky, and 5- to 10-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

		6-20			7-30		
Treatment	Rate	Wht	Wioa	Wibu	Wht	Wioa	Wibu
	oz/A			%			
Tralkoxydim+TF8036+AMS	3+.5%+1.8%	6	86	0	0	94	75
Tralkoxydim+TF8036+AMS	2+.5%+1.8%	25	76	18	0	91	88
Tralkoxydim+Scoil	2+.18G	8	63	0	0	78	75
Tralkoxydim+Scoil+AMS	2+.18G+1.8%	11	86	0	0	98	88
Tralkoxydim+Phase	2+.25%	6	40	0	0	45	50
Tralkoxydim+Li-105	2+.5%	7	76	0	0	90	83
Tralkoxydim+ND-191C5	2+1%	8	83	0	1	90	90
Tralkoxydim+ND-191C10	2+1%	12	78	0	0	88	80
Tralkoxydim+ND192C5	2+1%	7	78	0	0	94	88
Tralkoxydim+ND192C10	2+1%	9	79	0	0	92	90
Tralkoxydim+Scoil+ND-72	2+.18G+.5%	10	80	0	0	95	83
Untreated	0	0	0	0	0	0	0
C.V. %		109	11	693	693	5	
LSD 5%		NS	11	NS	NS	6	
# OF REPS		4	4	4	4	4	1

None of the tralkoxydim treatments were injurious to wheat, regardless of adjuvant. The inclusion of AMS to the Scoil spray mixture reduced the scum which was evident in the Scoil alone treatment mixtures. ND-72 did not reduce the scum when with Scoil. The mixture were prepared by first including the adjuvants and then the tralkoxydim. Subsequently it was determined that dispersion of tralkoxydim first prevent the scum with Scoil. It is believed that the non-uniform suspensions reduced tralkoxydim efficacy. Differences among adjuvants in enhancement of tralkoxydim efficacy was small except for Phase which was not effective.

Achieve for weed control in wheat, Carrington 1997. (Endres, Jessen, and Zwinger) The experiment was conducted to evaluate weed control and wheat response with Achieve herbicide. '2375' HRS wheat was planted in 6-inch rows at the rate of 1.25 million PLS/A on May 19. Treatments were applied June 16 with 56 F, 83% RH, clear sky, and 6-mph wind to 4- to 5-leaf wheat and 2- to 5-leaf green and yellow foxtail. Treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer delivering 10.3 gal/A at 30 psi through 8001 flat fan nozzles. Wheat was machine harvested on August 20. The experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	July 21		August 22	Wheat	
		Wht	Foxtail	Foxtail	Grain yield	Test weight
	lb/A	% inj	--- % control ---		bu/A	lb/bu
Achieve + TF8035	0.18	0	86	70	33.6	56
Achieve + TF8035 + AS	0.18	0	67	60	36.2	56
Achieve + TF8035 + MCPAe	0.18 + 0.5	0	89	77	35.1	56
Achieve + TF8035 + MCPAe + AS	0.18 + 0.5	3	94	74	31.0	56
Achieve + TF8035 + 2,4-De + AS	0.18 + 0.5	0	95	79	34.1	57
Achieve + TF8035 + Bronate	0.18 + 0.5	0	89	72	37.6	56
Achieve + TF8035 + Bronate + AS	0.18 + 0.5	0	71	61	37.4	56
Achieve + TF8035 + Curtail M	0.18 + 0.58	0	96	81	37.5	57
Achieve + TF8035 + Curtail M + AS	0.18 + 0.58	0	96	81	33.6	57
Achieve + TF8035 + Starane + 2,4-De + AS	0.18 + 0.17 + 0.5	0	97	83	35.7	56
Untreated		0	0	0	35.0	56
LSD (0.05)		NS	26	25	NS	1
C.V. %			23	26	10	1

[a]TF8035 applied at 0.5% v/v. AS=Ammonium sulfate applied at 15 lb ai/100 gal.

Wheat essentially was not injured by herbicide treatments. Foxtail control was 86 to 97% with nearly all treatments when visually evaluated on July 21. Foxtail control was fair with all treatments at wheat harvest, ranging from 60 to 83%. Addition of broadleaf herbicides to Achieve did not antagonize the foxtail control. No differences in grain yield were detected among treatments.

Tralkoxydim grassy weed control in Wheat, 1997, Cando, ND. (Terry Gregoire) Verde wheat was seeded May 25. Treatments were applied to 4-5 leaf wheat, 4-5 leaf wild oats, 6-8 leaf green foxtail, 3-4 leaf barnyardgrass and 4-8 leaf redroot pigweed June 16 from 10:00-12 30 noon. The wind was calm, sky clear, temperature 70°F at 70% relative humidity. Treatments were applied by a backpack sprayer delivering 10.0 gpa at 40 psi through 8001 nozzles. The experiment was a randomized complete block with 3 replications. Wild oat density was 3-5 per square yard. Green foxtail density was greater than 15 per square ft. Barnyardgrass was lightly scattered throughout the treatment area. NIS when used was at 0.5% v/v.

			7/24/97		
	Rate oz/A	Wheat* discoloration	Grftl	Wioa	Bygr
Tralkoxydim + NIS	0.18 lb	0.0	100	100	100
Tral + NIS + NH^4SO^4	0.18 lb + 15 lb	0.0	98	100	100
Tral + NIS + MCPA Ester	0.18 lb + 8	0.7	100	100	100
Tral + NIS + MCPA +NH^4SO^4	0.18 lb + 8 + 15 lb	0.0	100	100	100
Tral + NIS	0.18 lb	0.0	98	100	100
Tral + Bromoxynil + MCPA + NIS	0.18 lb + 4 + 4	0.0	99	100	100
Tral + Bromoxynil + NIS+ NH^4SO^4	0.18 lb + 4 + 4 + 15 lb	1.0	98	100	100
Tral + Clopyralid + 2,4-D + NIS	0.18 lb + 1.5 + 8	0.0	97	100	100
Tral + Clop + 2,4-D + NIS + NH^4SO^4	0.18 lb + 32 + 1.5 + 15 lb	1.3	100	100	100
Tral + Fluoxypyr + MCPA + NIS + NH^4SO^4	0.18 lb + 10.8 + 8 + 15 lb	0	100	100	100
Check		0.0	0	0	0
Diclofop	40 oz	2.0	100	100	100
CV		163	2.3	0	0
LSD		1.15	3.6	0	0

*0 = no discoloration, 3 = yellow green, 6 = yellow, 9 = brown.

HOE-1133 for Wild Oat and Broadleaf Weed control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 2- to 3-leaf wheat, 1- to 3-leaf wild oat, 2- to 4-leaf wild mustard, 1-leaf wild buckwheat, and 2-leaf green and yellow foxtail on June 6 with 70 F, 40% RH, clear sky and 5- to 8-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 18. Wild oat density about 100 plants/yd^2, green and yellow foxtial (fota) 200 plants/yd^2, and wild mustard 5 plants/yd^2.

Treatment	Rate	6-26					8-18
		Wht	Wioa	Wimu	Wibu	Fota	Yield
	oz/A			%			bu/A
HOE-1133	1.7	2	95	18	3	88	25
HOE-1133+Thif&Trib	1.7+.22	7	94	99	96	80	30
HOE-1133+Thif&Trib	1.9+.22	4	97	99	98	81	35
HOE-1133+Brox&MCPA	1.7+8	5	94	99	95	54	30
HOE-1133+Brox&MCPA	1.9+8	5	91	99	96	66	32
HOE-1133+Bromoxynil	1.7+4	4	95	86	86	69	30
HOE-1133+MCPA-ioe	1.9+6	8	93	99	40	89	32
HOE-1133+F8426&MCPA	1.7+6.4	6	96	99	91	80	31
Tiller+Bromoxynil	9.3+4	10	87	99	91	66	26
Immb+Brox&MCPA+sCOIL	6+8+.18G	9	88	99	94	31	27
Tral+TF8036+Brox&MCPA+AMS	2.9+.5%+8+24	7	95	99	87	84	33
Untreated	0	0	0	0	0	0	12
C.V. %		50	6	11	13	14	13
LSD 5%		4	8	13	14	14	5
# OF REPS		4	4	4	4	4	4

None of the herbicides caused important injury to wheat. Wheat yield was increased more than two fold from wild oat, foxtail, and wild mustard control. Wild oats control by HOE 1133 was not antagonized by any of the herbicides for broadleaf weed control. However, foxtail control was antagonized by bromoxynil & MCPA or bromoxynil alone and increasing HOE 1133 rate from 1.7 to 1.9 oz/A did not overcome the antagonism. These data indicate that antagonism of foxtail control by HOE 1133 tended to occur from all the broadleaf control herbicides except MCPA ioe. The greater antagonism of foxtail than wild oat control may reflect the lower level of foxtail control.

MON 37500 for Wild Oat Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1-to 3-leaf wheat and wild oat, 2-to 4-leaf wild mustard, and 1-leaf wild buckwheat on June 5 with 65 F, 35% RH, clear sky, and 5 to 10 mph wind. The treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Wild oat density exceeded 200 plants/yd^2, yellow foxtail and wild mustard densities were less than 20 pl/yd^2.

Treatment[a]	Rate	6-25				8-01		
		Wheat	Wioa	Wimu	Wibu	Wheat	Wioa	Yeft
	oz/A	%						
MON 37500+R-11	0.2+0.25%	8	83	96	53	1	89	0
MON 37500+ND72	0.2+1%	12	94	99	54	1	92	30
MON 37500+Thifensulfuron+R-11	0.2+0.2+0.25%	14	44	99	92	3	88	20
MON 37500+Thifensulfuron+ND72	0.2+0.2+1%	14	83	99	79	4	89	20
MON 37500+F8426&MCPA+R-11	0.2+0.37&6+0.25%	11	20	99	63	1	72	0
MON 37500+F8426&MCPA+ND72	0.2+0.37&6+1%	14	34	99	91	1	78	20
MON 37500+MCPA-ioe+R-11	0.2+6+0.25%	12	26	99	76	2	83	0
MON 37500+MCPA-dma+R-11	0.2+6+0.25%	11	39	99	74	0	76	70
MON 37500+MCPA-dma+ND72	0.2+6+1%	6	29	99	76	0	87	25
MON 37500+Bromoxynil+ND72	0.2+4+1%	12	34	97	90	1	81	0
MON 37500+F8426&MCPA+ND72	0.2+0.37&6+1%	12	33	99	92	0	81	0
Untreated	0	0	0	0	0	0	0	0
C.V.%		39	33	2	24	171	5	
LSD 5%		6	21	2	25	NS	6	
# OF REPS		4	4	4	4	4	4	1

[a]&=formulated mixture; R-11=surfactant from Wilfarm L.L.C., Gladstone, MO, and ND72=adjuvant from North Dakota State University.

MON 37500 did not cause important injury to wheat regardless of adjuvant or broadleaf control herbicide in tank mixture. Observation shortly after treatment indicated leaf burn from treatment with F8426&MCPA applied with ND72. Wild oat control ratings were much higher at preharvest than 3 weeks after treatment and differences among treatments were less at preharvest. The greater late season control indicates possible plant uptake of MON 37500 from the soil. Many rains occurred that would have leached the herbicide to the plant roots for absorption. The early ratings represent the potential antagonism from various broadleaf control herbicide that would occur when rainfall was limited. All broadleaf control herbicides antagonized wild oat control from MON 37500, except for thifensulfuron applied with ND72 adjuvant. Wild mustard was controlled by all herbicide treatments. Wild buckwheat control was greatest when treatments contained thifensulfuron, F8426&MCPA+ND72, or bromoxynil. These results indicate that adjuvants and broadleaf control herbicides influence wild oat control from MON 37500.

Herbicide Split Applications with Adjuvants, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seed May 16. Treatments were applied as follows:

Treatment		3D	6D	9D
date	June 6	June 9	June 12	June 16
temperature(F)	80	65	67	60
humidity (%)	40	45	50	60
sky	cloudy	clear	clear	clear
wind (mph)	--	10	8	12
Crop growth stage (lf)	2 to 3	3 to 4	3 to 4	4 to 5
Weed/growth stage (lf)				
wild oat	2 to 3	2 to 4	2 to 4	3 to 5
wild mustard	2 to 4	4 to 6	4 to 6	6 to 8
wild buckwheat	2 to 3	2 to 4	3 to 4	4 to 6
foxtail, green and yellow	2	2 to 3	2 to 4	3 to 5

All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized compete block design with four replicates. Harvest for yield was on August 18. Wild oat density was 270 plants/yd^2, wild mustard 54 plants/yd^2, and wild buckwheat 27 plants/yd^2.

Treatment	Rate	6-26					7-29			8-18
		Wht	Wioa	Wimu	Wibu	Fota	Wht	Wioa	Fota	Yield
	oz/A	%								
MON37500+ND72	0.25+1%	12	93	99	60	76	0	90	71	25
MON37500+ND72 /MON37500+ND72(3D)	0.12+1% /.12+1%	9	97	99	80	77	1	97	75	28
MON37500+ND72 /MON37500+ND72(6D)	0.12+1% /.12+1%	9	97	99	87	78	1	97	66	28
MON37500+ND72 /MON37500+ND72(9D)	0.12+1% /.12+1%	9	99	99	92	83	1	99	71	29
MON37500+R11 /MON37500+R11(6D)	0.12+.25% /.12+.25%	6	91	99	82	71	0	91	61	26
Diclofop+PO	16+.12G	4	79	29	8	72	0	83	57	24
Diclofop+PO /Diclofop+PO(6D)	16+.12G /16+.12G	7	96	46	23	96	0	98	95	25
Diclofop+PO /Diclofop+PO(6D)	8+.12G /8+.12G	4	87	21	10	81	0	90	81	22
HXB+X-77	0.15+.25%	11	93	99	76	68	1	96	61	26
HXB+ND4	0.15+1%	7	97	99	89	88	0	97	62	30
HXB+ND72/HXB+72(6D)	.06+1%/.06+1%	11	99	99	94	95	1	99	83	27
Untreated	0	0	0	0	0	0	0	0	0	13
C.V.%		39	6	10	23	16	269	4	17	11
LSD 5%		4	7	11	20	18	NS	5	16	4
# OF REPS		4	4	4	4	4	4	4	4	4

None of the herbicide treatments caused important injury to wheat. Herbicide treatment that controlled wild oats, wild mustard, and foxtail doubled wheat yield. MON37500 and HXB were highly effective in controlling wild oat so increase from split applications was small, but consistant. The 9 day split in MON37500 treatments tended to be more effective than the shorter time between split application. Split appliication of diclofop at the same total rate greatly increased wild oat and foxtail control. Diclofop as a split application each at 16 oz/A gave more than 95% control of wild oat and green foxtail.

CGA-184927 Control of Wild Oat in Wheat, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 1- to 3-leaf wheat and wild oat, 1- to 2-leaf green and yellow foxtail, 2- to 4-leaf wild mustard, cotyledon- to 1-leaf wild buckwheat, and cotyledon- to 2-leaf common lambsquarters on June 4 with 75 F, 50% RH, partly cloudy sky, and 5 mph wind. Treatments were appplied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design. Wild oat density was at about 200 and wild mustard 30 (variable) plants/yd^2.

Treatment	Rate	6-20				7-31		
		Wht	Wioa	Wimu	Wibu	Wht	Wioa	Yeft
	oz/A	%						
CGA-184927+Score	0.8+1%	5	92	46	38	0	97	84
CGA-184927+Dica-Na+Score	0.8+1.5+1%	8	75	89	83	3	91	50
CGA-184927+24-Ddma+Score	0.8+8+1%	8	78	89	81	5	73	45
CGA-184927+MCPA-dma+Score	0.8+8+1%	8	84	91	78	3	85	70
CGA-184927+Brox&MCPA+Score	0.8+8+1%	6	89	88	86	0	88	70
CGA-184927+Dica-Na+MCPA-dma+Score	0.8+1.5+6+1%	8	63	90	88	3	63	58
CGA-184927+Triasulfuron+MCPA+Score	0.8+.2+6+1%	7	65	99	87	0	55	80
CGA-184927+Thifensulfuron+Score	0.8+.20+1%	6	90	97	90	0	91	33
CGA-184927+Tribenuron+Score	0.8+.2+1%	8	85	91	83	1	88	83
CGA-184927+Fluroxypyr+Sword+Score	0.8+2+6+1%	8	90	97	91	0	88	50
CGA-184927+F8426&MCPA+Score[a]	0.8+6.4+1%	7	86	89	83	0	88	73
Tral+Brox&MCPA+TF8035+AMS	2.9+8+0.5%+24	13	89	88	87	4	88	83
HOE-1133+MCPA-ioe	1.9+4	9	91	85	55	0	92	70
Untreated	0	0	0	0	0	0	0	0
C.V.%		117	9	8	10	224	6	33
LSD 5%		NS	10	10	10	NS	7	42
# OF REPS		4	4	4	4	4	4	2

[a]Score=a petroleum oil adjuvant.

CGA-184927 did not cause important injury to wheat. The late evaluation for wild oat control were difficult because of lodging. Most broadleaf control herbicides tended or reduced wild oat control by CGA-184927, except bromoxynil & MCPA, thifensulfuron, and fluroxypyr (at the early evaluation). The most antagonistic broadleaf weed control herbicides were 2,4-D, triasulfruon, and dicamba sodium & MCPA dma. Some of the antagonism from broadleaf control herbicides for yellow foxtail control may be slightly confounded by wild mustard competition in the CGA-184927 only treatment and the variable stand of foxtail. The apparent antagonism of CGA 184927 by many broadleaf control herbicides may reflect the rate which was one half that recommended.

Clodinafop for grassy weed control in Wheat. 1997, Cando, ND. (Terry Gregoire) Verde wheat was seeded May 25. Treatments were applied to 4-5 leaf wheat, 4-5 leaf wild oats, 6-8 leaf green foxtail, 3-4 leaf barnyardgrass and 4-8 leaf redroot pigweed June 16 from 10:00-12:30 noon. The wind was calm, sky clear, temperature 70°F at 70% relative humidity. Treatments were applied by a backpack sprayer delivering 8.5 gpa at 35 psi through 8001 nozzles. The experiment was a randomized complete block with four replications. Wild oat density was 3-5 per square yard. Green foxtail density was greater than 15 per square ft. NIS when used was at 0.5% v/v.

	Rate/ oz/Acre	Wheat discoloration*	Green & Yellow Foxtail	Wild Oat	Barnyard Grass
Untreated		0	0	0	0
Clodinafop + NIS	1	2.8	100	100	100
Clop + NIS plus Dicamba SGF	1 + 1.5	0.8	100	100	100
Clop + NIS plus 2,4-D Amine	1 + 8	3.0	100	100	100
Clop + NIS plus MCPA Amine	1 + 8	4.0	100	100	100
Clop + NIS plus Bromoxynil + MCPA	1 + 4 + 4	0	100	100	100
Clop +NIS + Dica SGF + 2,4-D Amine	1 + 4 + 4	4.5	95	100	100
Clop + NIS + Triasulfuron	1 + .21	3.8	100	100	100
Clop + NIS + Prosulfuron	1 + .17	0	100	100	100
Tralkoxydim + NIS	0.18 lb	0	100	100	100
Tral + NIS + Bromoxynil + MCPA	0.18 lb + 4	0	98.8	100	97.5
Tiller	9.3	4.3	95.0	92.5	100
Tiller + Bromoxynil	9.3 + 6	3.5	100	93.8	100
Puma	10.5 + 1	4.5	100	100	100
Puma + Triasulfuron	1 + 0.21	0.8	97.5	100	100
LSD			1.9	7	51.8
CV		64	5.4	3.8	1.4

* 0 = none, 3 = yellow green, 6 = yellow, 9 = brown.

Dicamba, prosulfuron and bromoxynil plus MCPA reduced wheat discoloration when used with clodinafop. Triasulfuron reduced wheat discoloration when used with Puma. Discoloration disappeared within 10 days of treatment for all treatments, and no height reduction was noticed.

Weed populations were light but uniform and percent grass control was excellent with all treatments.

Hard red spring wheat cultivar response to Avenge, Casselton and Prosper, 1997. (Peel and Zollinger) Avenge is an important herbicide for wild oat control in wheat and barley. Avenge injures some HRS wheat varieties and the Avenge label designates which varieties Avenge can be applied. New varieties are in development and some are released each year. Avenge has not been labeled on several hard red spring wheat (HRSW) varieties because tolerance has been inadequate or has not been determined. This experiment was conducted to determine HRSW cultivar response to Avenge in North Dakota.

Wheat varieties were seeded at Casselton on May 21 and Prosper on May 27 at 28 plants/sq ft. At Casselton, treatments were applied to 4-4.5 leaf wheat on June 12 at 8:00 am with 73 F air, 90 F soil surface, 55% RH, and a 3-5 mph wind. At Prosper, treatments were applied to 4-5 leaf wheat on June 18 at 9:00 am with 65 F air, 60 F soil surface, 48% RH, 100% clouds, and 0-3 mph wind.

As an overview, HRS wheat varieties at Casselton showed excellent tolerance to Avenge and the Avenge + Assert tankmix. The following is a summary of HRS wheat response to Avenge and Avenge + Assert at Casselton:
Wheat injury: Marshall
Height reduction: 2375, GluPro, Hamer, and Russ
Delay in heading: Hamer
Yield reduction: Avenge + Assert treatment on ND690
With the exception of Marshall, varieties that showed significant injury did not yield less than the respective untreated plots.

As an over view, slightly more injury and less HRS wheat tolerance was observed at Prosper. The following is a summary of HRS wheat response to Avenge and Avenge + Assert at Prosper:
Wheat injury: Gunner, Hamer, Lars, Marshall, MN93-043, and Russ
Height reduction: Gunner and Hamer
Delay in heading: Gunner
Yield reduction: Sharpshooter, and Verde.
With the exception of Verde, varieties that showed significant injury did not yield less than the respective untreated plots.

Response of twenty hard red spring wheat varieties to Avenge and Avenge plus Assert combination at Casselton and Prosper 1997.

			Casselton				Prosper			
Variety	Treatment	Rate	Injury	Height	Heading date	Yield	Injury	Height	Heading date	Yield
		(pt/A)	%	cm	7/1	bu/A	%	cm	7/1	bu/A
2375	Untreated		0	92	11	45.4	0	87	13	35.4
	Avenge	4	0	92	10	51.5	0	85	14	41.9
	Avenge	6	0	87	11	45.6	0	88	14	41.9
	Avenge + Assert	2 + 0.75	0	91	10	41.1	0	85	14	43.6
Forge	Untreated		0	91	9	48.1	0	88	11	37.6
	Avenge	4	0	89	8	45.8	0	84	11	38.3
	Avenge	6	0	90	9	50.6	0	90	11	46.9
	Avenge + Assert	2 + 0.75	0	90	8	56.0	7	88	11	33.6
Glupro	Untreated		0	116	15	38.0	0	107	17	29.3
	Avenge	4	0	114	14	32.6	7	109	18	33.4
	Avenge	6	0	116	15	31.8	0	109	18	38.4
	Avenge + Assert	2 + 0.75	0	106	14	29.7	0	109	17	31.9
Gunner	Untreated		0	94	14	39.7	0	85	16	32.0
	Avenge	4	0	94	14	46.8	20	81	18	32.0
	Avenge	6	0	92	15	42.8	0	86	17	34.6
	Avenge + Assert	2 + 0.75	0	94	13	40.4	20	77	19	31.5
Hamer	Untreated		0	89	12	46.6	0	75	16	34.9
	Avenge	4	0	85	10	48.8	0	77	15	35.3
	Avenge	6	0	83	12	51.3	13	74	15	33.0
	Avenge + Assert	2 + 0.75	0	84	11	49.5	10	69	15	37.1
Keene	Untreated		0	104	12	39.7	0	99	16	40.5
	Avenge	4	0	107	11	46.0	0	97	18	34.6
	Avenge	6	0	101	12	45.8	0	97	17	48.8
	Avenge + Assert	2 + 0.75	0	109	12	40.6	0	95	17	41.5
Kulm	Untreated		0	97	10	49.2	0	92	12	42.6
	Avenge	4	0	94	9	41.6	0	88	12	42.4
	Avenge	6	0	98	10	43.6	3	92	12	44.0
	Avenge + Assert	2 + 0.75	0	100	10	44.2	3	89	12	38.3
Lars	Untreated		0	77	14	43.2	0	70	17	36.8
	Avenge	4	3	73	14	41.4	3	64	18	29.4
	Avenge	6	2	78	14	40.4	0	70	16	30.9
	Avenge + Assert	2 + 0.75	0	75	13	43.1	10	67	16	39.4
Marshall	Untreated		0	82	15	44.6	0	75	18	28.8
	Avenge	4	8	81	14	43.6	10	73	18	30.5
	Avenge	6	12	84	15	38.8	3	75	18	34.0
	Avenge + Assert	2 + 0.75	3	84	14	48.8	13	70	19	32.5
MN93-043	Untreated		0	83	14	42.4	0	74	18	36.5
	Avenge	4	7	83	14	45.2	13	75	18	34.7
	Avenge	6	3	81	14	47.0	0	77	17	35.7
	Avenge + Assert	2 + 0.75	0	83	15	43.7	10	72	19	38.8
LSD (0.05)	Line mean basis		4	5	1.3	10.2	9	5	2	9

Response of twenty hard red spring wheat varieties to Avenge and Avenge plus Assert combination at Casselton and Prosper 1997 (continued).

			Casselton					Prosper		
					Heading		Visual		Heading	
Variety	Treatment	Rate	Injury	Height	date	Yield	Injury	Height	date	Yield
		(pt/A)	%	cm	July 1	bu/A	%	cm	July 1	bu/A
MN93413	Untreated		0	93	16	39.9	0	78	21	30.4
	Avenge	4	3	93	15	50.7	7	80	21	32.4
	Avenge	6	0	93	16	44.6	0	82	20	39.2
	Avenge + Assert	2 + 0.75	0	93	15	51.4	3	80	19	27.0
ND690	Untreated		0	90	10	46.8	0	85	15	33.6
	Avenge	4	0	93	10	43.9	3	83	14	33.6
	Avenge	6	0	94	11	43.9	0	85	14	36.8
	Avenge + Assert	2 + 0.75	0	93	11	37.7	5	82	14	31.5
ND694	Untreated		0	95	10	53.3	0	94	15	42.0
	Avenge	4	0	100	10	46.2	0	91	15	40.5
	Avenge	6	0	98	10	48.0	0	95	16	43.8
	Avenge + Assert	2 + 0.75	0	97	10	41.7	0	90	15	40.6
ND695	Untreated		0	94	11	47.2	0	85	17	32.4
	Avenge	4	0	91	11	46.4	0	84	16	37.5
	Avenge	6	0	94	12	44.4	0	84	15	39.4
	Avenge + Assert	2 + 0.75	0	95	11	39.4	7	81	16	36.6
Oxen	Untreated		0	85	10	46.8	0	81	14	33.6
	Avenge	4	0	88	11	51.2	0	78	14	36.2
	Avenge	6	0	87	12	53.4	3	83	14	39.7
	Avenge + Assert	2 + 0.75	0	86	11	44.1	3	81	14	40.8
Russ	Untreated		0	97	10	45.2	0	89	13	31.3
	Avenge	4	0	94	10	45.7	0	86	14	35.0
	Avenge	6	0	92	10	49.1	0	85	14	39.0
	Avenge + Assert	2 + 0.75	0	92	10	51.1	10	84	14	37.1
SD3249	Untreated		0	94	8	44.7	0	90	11	38.2
	Avenge	4	0	96	8	48.6	0	89	11	38.8
	Avenge	6	0	97	9	40.9	3	94	11	43.1
	Avenge + Assert	2 + 0.75	0	97	8	42.0	0	87	12	35.4
Sharp-	Untreated		0	90	11	41.4	0	88	13	45.8
shooter	Avenge	4	0	91	10	52.8	7	86	14	42.8
	Avenge	6	0	89	10	46.8	0	90	14	43.5
	Avenge + Assert	2 + 0.75	0	93	10	35.5	0	84	13	35.3
Trenton	Untreated		0	101	10	44.6	0	98	15	40.8
	Avenge	4	0	105	11	42.7	0	94	15	46.0
	Avenge	6	0	104	11	53.4	0	99	15	45.8
	Avenge + Assert	2 + 0.75	0	104	10	42.2	7	96	15	42.0
Verde	Untreated		0	82	14	42.3	0	76	18	42.0
	Avenge	4	0	84	14	45.4	10	74	18	34.9
	Avenge	6	0	81	14	45.0	6	76	17	39.2
	Avenge + Assert	2 + 0.75	0	82	13	39.9	18	72	19	30.3
LSD (0.05) Line mean basis			3	5	1.3	10	9	5	2	9

Tralkoxydim for Foxtail Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 16. Treatments were applied to 2-to 4-leaf wheat and wild mustard, 2- to 3-leaf green and yellow foxtail, and 2-leaf redroot pigweed on June 10 with 68 F, 40% RH, clear sky and 10-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was taken August 23. Foxtail density exceeded 300 plants/yd^2.

Treatment	Rate	6-27				8-6		8-23
		Wht	Fota	Wimu	Rrpw	Wht	Yeft	Yield
	oz/A	%				%		bu/A
Tralkoxydim+TF8035	2.9+.5%	1	79	13	13	0	63	36
Tralkoxydim+TF805+AMS	2.9+.5%+1.8%	3	73	14	20	0	60	34
Tralkoxydim+TF8035+AMS	2.9+.5%+8	4	82	99	80	1	64	38
Tral+TF8035+MCPA-ioe+AMS	2.9+.5%+8+1.8%	6	89	99	83	1	80	38
Tral+TF8035+24-Dioe+AMS	2.9+.5%+8+1.8%	13	69	99	99	10	34	31
Tral+TF8035+Brox&MCPA	2.9+.5%+8	8	78	99	86	1	65	37
Tral+TF8035+Brox&MCPA+AMS	2.9+.5%+8+1.8%	7	77	99	66	2	65	38
Tral+TF8035+Clpy&MCPA	2.9+.5%+9.5	6	77	99	93	1	51	38
Tral+Flox+TF8035+AMS	2.9+2+.5%+1.8%	5	82	85	49	0	76	40
Tral+F8426&MCPA+TF8035+AMS	2.9+6.4+.5%+1.8%	12	23	99	99	5	8	28
Tral+TF8035+Clpy&MCPA+AMS	2.9+.5%+0.5+1.8%	8	83	99	85	0	67	39
Flox+24-Dioe+AMS	2+6+1.8%	12	19	99	99	2	0	27
Untreated	0	0	0	0	0	0	0	27
C.V.%		47	9	8	13	121	26	9
LSD 5%		4	9	9	13	3	18	4
# OF REPS		4	4	4	4	4	4	4

None of the herbicide treatments caused important injury to wheat. Considering both evaluations, 2, 4-D ioe, clopyralid & MCPA, and F8426 & MCPA were antagonistic to foxtail control from tralkoxydim. 2,4-D ioe and F8426 & MCPA were consistantly the most antagonistic. Foxtail control was not complete with any herbicide treatment, possibly because late rains stimulated foxtail emergence after treatment. However, wheat yield was increased about 10 bu/A when foxtail control exceeded 50%.

MON 37500 Split Applied for Foxtail Control, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seed May 16. Treatments were applied to 3-leaf wheat, 2- to 4-leaf green and yellow foxtail and wild mustard, and 4-leaf redroot pigweed on June 10 with 64 F, 40% RH, clear sky, and 10 mph wind. Second treatments were applied to 4.5-leaf wheat and wild mustard, 3- to 5-leaf green and yellow foxtail, and 9-to 6-leaf redroot pigweed on June 16 at 65 F, 60% RH clear sky and 10-mph wind. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Foxtail density about 300 plants/yd^2.

Treatment	Rate	6-27			8-06		
		Wht	Fota	Rrpw	Wht	Fota	Rrpw
	oz/A				%		
MON37500+R-11	0.12+.25%	8	34	76	1	54	18
MON37500+R-11	0.25+.25%	17	53	69	4	73	46
MON37500+ND-72	0.12+1%	6	49	85	0	63	25
MON37500+ND72	0.25+1%	18	66	89	5	77	40
MON37500+R-11/MON37500+R-11	0.06+.25%/.06+.25%	6	60	85	5	61	23
MON37500+R-11/MON37500+R-11	0.12+.25%/.12+.25%	13	69	98	7	71	40
MON37500+ND72/MON37500+ND72	0.06+.25%/.06+.25%	8	66	93	2	78	41
MON37500+ND72/MON37500+ND72	0.12+1%/.12+1%	9	78	91	10	90	66
Propanil+MCPA-ioe+PO	16+4+.12G	14	64	99	4	24	24
Propanil+MCPA-ioe+PO /Propanil+MCPA-ioe+PO	8+2+.12G /8+2+.12G	12	83	99	5	54	54
Untreated	0	0	0	0	0	0	0
C.V. %		41	17	13	73	20	32
LSD 5%		6	14	15	4	17	16
# OF REPS		4	4	4	4	4	4

MON 37500 and propanil gave greater foxtail control when applied as a split treatment seperated by 6 days than one treatment at the same total rate. Split applications at one half the total MON37500 rate ofter gave equal foxtail control to twice the total as one application. The most effective MON37500 treatment was two applications at 0.12 oz/A + ND-72 adjuvart. Late season green foxtail control was poor, possibly from late season emerged plants. Difference among treatment were difficult to determine at the low level of green foxtail control.

HOE-1133 Antagonism for Foxtail Control in Durum, Fargo 1997. (Nalewaja)'Munich' durum wheat was seeded May 17. Treatments were applied to 3- to 4-leaf wheat, 3-leaf yellow foxtail, 2- to 3-leaf green foxtail, 5-leaf wild mustard, and 1-leaf wild buckwheat on June 10 with 74 F, 35% RH, 90% clear sky and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 25. Foxtail density was more than 250 plants and wild mustard more than 30 plants /yd^2.

Treatment	Rate	7-04				8-06			8-25
		Wht	Fota	Wimu	Wibu	Wht	Yeft	Grft	Yield
	oz/A				%				bu/A
HOE-1133	0.8	0	97	0	0	0	99	99	16
HOE-1133	1.0	1	98	10	0	0	98	99	15
HOE-1133+Clpy&MCPA	0.8+9.4	7	85	99	99	0	49	76	30
HOE-1133+Clpy&MCPA	1.0+9.4	8	89	99	99	0	54	71	32
HOE-1133+Trib+MCPA-ioe	0.8+0.12+4	6	78	99	92	0	46	71	29
HOE-1133+Trib+MCPA-ioe	1.0+.12+4	9	78	99	79	3	54	71	30
HOE-1133+Dica-Na+MCPA-ioe	0.8+1+4	9	83	99	87	0	48	72	28
HOE-1133+Dica-Na+MCPA	1.0+1+4	8	92	99	85	0	64	84	32
HOE-1133+MCPA-ioe	0.8+4	9	92	97	15	1	66	82	32
HOE-1133+MCPA-ioe	1.0+4	8	95	97	8	1	78	92	32
HOE-1133+Trib+Dica-Na+MCPA-ioe	0.8+0.12+1+4	7	63	99	93	0	21	53	28
HOE-1133+Trib+Dica-Na+MCPA-ioe	1.0+0.12+1+4	8	53	99	99	0	41	62	30
Tral+TF8036+Brox+AMS	2.9+0.5%+4+24	39	95	92	99	19	70	74	28
Untreated	0	0	0	0	0	0	0	0	13
C.V. %		42	7	8	27	103	28	21	17
LSD 5%		5	8	9	23	3	23	21	7
# OF REPS		4	4	4	4	4	4	4	4

Tralkoxydim injured durum wheat, but yield was not reduced compared to that of HOE 1133-treated wheat. Durum wheat yield was more than doubled when foxtail control was above 50% and wild mustard was controlled. HOE 1133 typically provides only partial foxtail control, so the excellent foxtail rating when wild mustard was not controlled apparently was due to wild mustard suppresion of foxtail germination. Thus, determination of antagonism of HOE 1133 phytotoxicity to foxtail should be limited to treatments with wild mustard controlled, especially at the late evaluation. MCPA ioe appeared to be the least antagonistic to HOE 1133 efficacy. HOE 1133 at the higher rate did not greatly increase efficacy, except when applied with dicamba-sodium + MCPA ioe.

CGA-184927 in Wheat for Green and Yellow Foxtail Control, Fargo 1997. (Nalewaja) 'Munich' durum wheat was seeded May 17. Treatments were applied to 3- to 4-leaf wheat 2- to 3-leaf green and yellow foxtail, 5- leaf wild mustard, and 1-leaf wild buckwheat on June 10 with 74 F, 35% RH, 90% clear sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 24.

		7-04			8-06			8-25
Treatment	Rate	Wht	Fota	Wimu	Wht	Yeft	Grft	Yield
	oz/A				%			bu/A
CGA-184927+Score	0.5+1%	5	97	30	0	97	99	23
CGA-184927+Dica+Score	0.5+1.5+1%	7	90	88	0	54	73	33
CGA-184927+2,4-Ddma+Score	0.5+8+1%	10	68	99	0	21	39	29
CGA-184927+MCPA-dma+Score	0.5+8+1%	10	91	99	0	69	70	35
CGA-184927+MCPA-ioe+Score	0.5+6+1%	9	95	99	1	65	59	33
CGA-184927+Brox&MCPA+Score	0.5+8+1%	7	88	99	1	63	64	34
CGA-184927+Dicamba+MCPA+Score	0.5+1.5+6+1%	9	93	99	0	40	51	34
CGA-184927+Amber+MCPA+Score	0.5+.2+6+1%	8	87	99	0	47	63	30
Tral+Brox&MCPA+TF8035+AMS	2.9+8+.5%+24	28	99	99	9	81	83	31
Tiller	9.3	34	94	99	22	61	51	25
HOE-1133	1.7	7	99	13	0	99	99	22
Untreated	0	0	0	0	0	0	0	16
C.V. %		38	11	10	120	23	21	14
LSD 5%		6	13	11	5	19	19	6
# OF REPS		4	4	4	4	4	4	4

Herbicde treatments that controlled wild mustard and gave moderate foxtail control generally doubled wheat yield. Tralkoxydim and Tiller injured durum wheat early but injury from Tiller also was evident at the late evaluation. Tiller treated durum wheat yielded less than durum treated with other herbicides with similar weed control. CGA-184927 applied alone should not be used as a reference for antagonism from broadleaf herbicide in mixture. The dense wild mustard probably prevented growth of treated plants or late season foxtail emergence in plots treated with CGA-184927 alone which did not control wild mustard. MCPA dma appeared to be the only broadleaf control herbicide not to antagonize foxtail control from CGA-184927

Adjuvants with Foxtail Control Herbicides in Durum, Fargo 1997. (Nalewaja) 'Munich' durum wheat was seeded May 17. Treatments were applied to 4-leaf wheat, wild mustard, common lambsquarters, and redroot pigweed; 2-to 3-leaf green foxtail, and 3- to 4-leaf yellow foxtail on June 10 with 78 F, 35% RH, 90% clear sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Foxtail at more than 250 plants and wild mustard 30 plants/yd^2.

Treatment	Rate	6-27					8-06		
		Wht	Fota	Wimu	Rrpw	Colq	Wht	Yeft	Grft
	oz/A	%							
HXB+X-77	0.2+.25%	7	84	99	84	50	3	71	98
HXB+X-77	0.4+.25%	9	91	99	90	40	7	84	98
HXB+ND4	0.2+1%	16	94	99	94	79	7	75	97
HXB+ND14	0.2+1%	14	94	99	97	78	18	74	97
HXB+ND72	0.2+1%	15	97	99	95	77	16	85	99
HOE-1133	0.4	1	95	15	0	0	0	96	99
HOE-1133	0.8	1	98	30	0	0	0	99	99
HOE-1133+Scoil	0.4+0.18G	2	95	24	0	8	0	97	99
HOE-1133+ND4[a]	0.4+1%	4	80	99	45	44	0	79	97
HOE-1133+Act90	0.4+0.25%	2	96	13	0	0	0	98	99
Untreated	0	0	0	0	0	0	0	0	0
C.V.%		36	6	14	8	21	77	9	2
LSD 5%		3	7	13	5	10	5	10	3
# OF REPS		4	4	4	4	4	4	4	4

[a] Wild mustard control indicates possible contamiation, etc.

Foxtail control at the first evaluation was good with all herbicide treatments. However, yellow foxtail somewhat recovered from HXB for the late evaluation. The excellent late season foxtail control by HOE 1133 may reflect competition from uncontrolled wild mustard. ND-4 should not control broadleaf weeds and indicates possible sprayer contamination. Adjuvants did not influence HOE 1133 efficacy as weed control was high with all treatments preventing differenciation among adjuvant treatments. HXB efficacy was enhanced more by ND-72 than the other adjuvants. Late season yellow foxtail control from HXB was equal at one half the rate when applied with ND-72 compared to twice the rate with X-77.

Propanil DG Split Application, Fargo 1997. (Nalewaja)'Valley' oat, white proso millet, and Siberian foxtial millet were seeded May 21. First treatments were applied to 5- to 6-leaf oat, 6-leaf proso millet, and 4- to 6-leaf foxtail millet on July 212 with 75 F, 65% RH, partly cloudy sky, and 5-mph wind. Second treatments were applied to 5- to 6-leaf oat, 6-leaf proso millet, and 5- to 6-leaf foxtail millet on July 24 with 75 F, 70% RH, partly cloudy sky, and 5-mph wind. Third treatments were applied to 4- to 7-leaf oat, 6- to 7- proso millet, and 6- to 7-leaf foxtail millet on July 28 with 78 F, 60% RH, clear sky, and 3-mph wind. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 or 17 gpa at 35 psi through 8001 or 8002 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Nozzle	Spray volume	Rate	Oat	Fota
		gpa	oz/A	— % —	
Prop-DG+PO	8001	8.5	16+.18G	5	40
Prop-DG+PO/Prop-DG+PO(4d)	8001	8.5	8+.18G/8+.18G	13	58
Prop-DG+PO/Prop-DG+PO/Prop-DG+PO(8d)	8001	8.5	5+.18G/5+.18G/5+.18G	5	34
Prop-DG+PO	8002	17	16+.18G	5	34
Prop-DG+PO/Prop-DG+PO(4d)	8002	17	8+.18G/8+.18G	7	55
Prop-DG+PO/Prop-DG+PO/Prop-DG+PO(8d)	8002	17	5+.18G/5+.18G/5+.18G	10	56
C.V. %				70	21
LSD 5%				NS	14
# OF REPS				4	4

A single split (2 applications) of propanil increased phytotoxicity to foxtail (Fota) at both 8.5 and 17 gpa applications. The higher volume did not increase propanil effectiveness compared to the lower volume, except when application was split three times. The plants were large at treatment so it was believed that the higher volumes would penetrate through the canopy better than the low volume. However, apparently the 8.5 gpa penetrated equally to the 17 gpa spray volume. The control level and the benefit from split application may have been greater had the foxtail plants been small as recommended for control with propanil.

Small grain cultivar response to trifluralin, Carrington 1997. (Endres, Geselius, and Zwinger) The trial was conducted to evaluate response of recently-released hard red spring (HRS) wheat, durum, and barley cultivars to spring-applied, PPI trifluralin granules. The trial was established on a conventionally-tilled Heimdal-Emrick loam soil with 4.4% organic matter and pH of 6.8. Plot size was 5.25 by 16 ft. Treflan granules were applied at 0.4 and 0.8 lb/A on May 14 with a Gandy air-flow applicator with 44 F, 45% RH, partly-sunny sky, and moderate wind. Granules were incorporated on May 14 and May 21 with a Melroe culti-harrow set to till at 3.5-inch depth at a speed of 5 mph. The small grain was planted in 7-inch rows at the rate of 1.25 million PLS/A and a depth of 1.5 inches on May 21. Very low densities of grassy weeds including foxtail existed in the trial. Bronate at 1 pt/A was applied across the trial on June 13 for broadleaf weed control. Visual evaluation of plant injury and plant counts (no./m row) were taken on June 4 with the crop in the 1.5- to 2-leaf stage. Head density (no. heads/m row) was determined on July 30-31. Plant height was measured on August 12. The trial was machine harvested on August 19. The experiment was a randomized complete block design with a split-plot arrangement and four replicates per treatment.

Across trifluralin rates, Butte 86 and Verde HRS wheat had the highest plant injury ratings, ranging from 7 to 9%. Also, Butte 86, Keene, Kulm, and Verde HRS; all durum varieties; and Stander barley had the lowest plant densities. Russ had the highest yield among HRS varieties, Ben and Renville were the highest yielding durum varieties, and Robust and Stander were the highest yielding barley varieties when averaged across trifluralin rates. Across varieties, plant injury increased with trifluralin at 0.8 lb/A and plant density declined at both trifluralin rates but grain yield increased.

Butte 86 had the highest injury (6%) among varieties with trifluralin at 0.4 lb/A. Butte 86 and Verde had 19% injury with trifluralin at 0.8 lb/A. Other varieties with 10% or more injury with trifluralin applied at the high rate include 2375, Hamer, Keene, Kulm, and Lars HRS and Stander barley. However, varieties did not differ in their response to the trifluralin treatments as measured by plant and head density, plant height, grain yield, and test weight. A combination of dry topsoil at trifluralin granule application time and delay of substantial rainfall (0.86 inches) until eight days after trifluralin application may have slowed herbicide release and likely reduced injury during crop germination and emergence.

Small grain cultivar	Trif rate	Plant Injury	Plant Density	Head density	Plant height	Grain yield	Test weight
	lb/A	%	plt/A (x1000)	head/A (x1000)	inches	bu/A	lb/bu
HRS wheat							
2375	0	0	1081.4	1980.7	31.8	53.7	59.5
	0.4	0	996.0	1872.5	32.1	58.7	59.0
	0.8	10	705.8	1662.0	31.2	60.1	59.3
	mean	3	927.7	1838.4	31.7	57.5	59.3
AC Barrie	0	0	1058.6	2288.0	34.5	43.7	58.5
	0.4	2	1013.1	2259.6	34.3	53.5	58.5
	0.8	7	785.4	2088.8	34.7	52.2	58.3
	mean	3	952.4	2212.1	34.5	49.8	58.4
AC Cora	0	0	1064.3	2117.3	37.0	38.2	57.0
	0.4	1	1001.7	2191.3	36.8	53.2	58.3
	0.8	5	779.8	2202.7	38.0	48.3	56.5
	mean	2	948.6	2170.4	37.3	47.3	57.3
Butte 86	0	0	1081.4	2253.9	32.3	50.0	60.0
	0.4	6	757.0	2009.1	32.1	56.9	58.8
	0.8	19	643.2	2037.6	31.6	54.1	59.3
	mean	9	827.2	2100.2	32.0	53.7	59.3
Gunner	0	0	1235.1	2151.4	33.1	42.8	60.0
	0.4	2	973.3	2373.4	32.7	54.8	59.8
	0.8	8	961.9	2447.4	33.6	53.5	58.8
	mean	3	1056.7	2324.1	33.1	50.4	59.5
Hamer	0	0	996.0	2123.0	30.6	47.7	58.8
	0.4	0	933.4	1707.5	29.8	54.5	58.8
	0.8	13	683.0	1827.0	30.2	58.3	58.0
	mean	4	870.8	1885.8	30.2	53.5	58.5
Keene	0	0	887.9	2066.1	37.2	49.2	58.5
	0.4	4	734.2	2111.6	36.0	56.9	57.8
	0.8	12	671.6	2060.4	36.5	60.2	58.5
	mean	5	764.6	2079.3	36.6	55.5	58.3
Kulm	0	0	1030.2	1895.3	31.2	44.3	59.0
	0.4	2	836.7	1775.8	31.9	65.7	58.3
	0.8	13	614.7	1679.0	32.4	57.6	59.3
	mean	5	827.2	1783.4	31.8	55.8	58.8
Lars	0	0	876.5	1975.0	25.7	43.6	55.0
	0.4	3	916.4	2123.0	26.7	57.8	56.0
	0.8	12	779.8	1656.3	26.1	49.8	56.0
	mean	5	857.5	1918.1	26.1	50.4	55.7
Oxen	0	0	916.4	2271.0	28.7	48.3	58.0
	0.4	1	996.0	2401.9	29.6	59.0	57.5
	0.8	6	711.5	2071.8	27.6	58.8	58.8
	mean	2	874.6	2248.2	28.6	55.3	58.1
Russ	0	0	1024.5	1952.2	32.5	58.8	59.5
	0.4	1	1024.5	2111.6	30.7	69.3	59.5
	0.8	4	859.4	1992.1	32.6	68.2	59.5
	mean	2	969.5	2018.6	31.9	65.4	59.5
Trenton	0	0	1183.9	1952.2	35.5	51.9	59.3
	0.4	1	916.4	1952.2	34.9	60.0	58.8
	0.8	4	927.7	1997.8	35.1	60.8	58.8
	mean	1	1009.3	1967.4	35.2	57.6	58.9

Small grain cultivar	Trif rate	Plant Injury	Plant Density	Head density	Plant height	Grain yield	Test weight
	lb/A	%	plt/A (x1000)	head/A (x1000)	inches	bu/A	lb/bu
Verde	0	0	899.3	2242.5	30.9	43.5	58.0
	0.4	2	717.1	2060.4	28.7	46.8	57.5
	0.8	19	677.3	2083.1	28.6	49.8	58.7
	mean	7	764.6	2128.7	29.4	46.7	58.0
Durum							
Belzer	0	0	813.9	1309.1	34.4	32.1	55.8
	0.4	1	791.1	1354.6	35.1	45.2	56.0
	0.8	3	694.4	1343.2	33.4	45.4	55.8
	mean	1	766.5	1335.6	34.3	40.9	55.8
Ben	0	0	779.8	1536.7	32.9	39.7	59.0
	0.4	0	757.0	1673.3	33.7	53.3	59.0
	0.8	2	683.0	1218.0	34.0	49.9	59.3
	mean	1	739.9	1476.0	33.5	47.6	59.1
Munich	0	0	779.8	1582.3	28.9	36.6	57.3
	0.4	2	774.1	1428.6	29.6	48.8	57.5
	0.8	7	591.9	1428.6	28.4	46.5	56.3
	mean	3	715.2	1479.8	29.0	44.0	57.0
Renville	0	0	956.2	1644.9	36.4	45.2	57.0
	0.4	1	791.1	1724.6	35.5	52.9	57.4
	0.8	3	739.9	1502.6	34.7	53.0	57.8
	mean	1	829.1	1624.0	35.6	50.2	57.4
Barley							
Foster	0	0	1126.9	1576.6	27.2	83.4	44.8
	0.4	0	825.3	1570.9	28.7	84.0	45.8
	0.8	1	956.2	1895.3	28.7	84.2	44.8
	mean	0	969.5	1680.9	28.2	83.9	45.1
Robust	0	0	1200.9	1514.0	28.6	83.1	46.3
	0.4	0	910.7	1815.6	29.4	89.5	46.3
	0.8	1	996.0	1599.3	31.0	92.4	46.3
	mean	0	1035.9	1643.0	29.7	88.3	46.3
Stander	0	0	967.6	1519.7	26.7	92.5	45.7
	0.4	1	717.1	1371.7	27.3	84.4	45.3
	0.8	10	791.1	1371.7	27.5	91.5	46.0
	mean	4	825.3	1421.0	27.1	89.7	45.7
variety mean							
	0	0	998.0	1897.6	31.8	51.1	56.5
	0.4	1	869.1	1894.5	31.8	60.0	56.4
	0.8	8	762.7	1808.2	31.8	59.7	56.2
LSD (0.05)	trif	1	114.4	NS	NS	4.7	NS
LSD (0.05)	variety	3	117.0	NS	NS	5.3	NS
LSD (0.05)	trif*var	5	NS	NS	NS	NS	NS

Broadleaf Weed Control in Wheat, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 4- to 5-leaf wheat, 4-leaf redroot pigweed and common lambsquarters, and 1-inch kochia on June 10 with 75 F, 35% RH, clear sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7-07				8-10			
		Wht	Rrpw	Wimu	Wibu	Wht	Yeft	Rrpw	Wibu
	oz/A	%							
2,4-Dioe	6	0	91	99	0	0	0	99	0
Bromoxynil&MCPA	8	4	84	97	99	0	0	92	99
Dicamba-dma	1	1	90	63	83	1	10	99	30
Thif&Trib+Metsulfuron+X-77	.22+.06+.25%	7	99	99	99	4	50	99	99
Thifensulfuron&Trib+Mets+X-77	.17+.04+.25%	5	99	99	98	6	45	99	99
Thif&Tribenuron+Mets+X-77	.11+.03+.25%	3	99	99	99	3	43	99	99
Thif&Trib+Mets+Dica+X-77	.22+.06+1+.25%	3	99	99	99	3	36	99	99
Thif&Trib+Mets+Dica+X-77	.11+.03+1+.25%	4	99	99	99	1	9	99	99
Thif&Trib+Mets+2,4-Dioe+X-77	.22+.06+6+.25%	5	99	99	99	2	31	99	99
Thif&Trib+Mets+2,4-Dioe+X-77	.11+.03+6+.25%	5	99	99	98	3	15	99	90
Thif&Trib+Mets+Dica+2,4-Dioe+X-77	.11+.03+1+6+.25%	8	99	99	99	0	0	99	95
Pros+2,4-Dioe+X-77	.22+6+.25%	4	99	99	98	1	0	99	90
F8426&MCPA+28N	6.4+2%	2	98	99	89	0	0	99	90
Fluroxypyr+2,4-Dioe	1.5+6	3	97	97	97	1	0	99	99
Untreated	0	0	0	0	0	0	0	0	0
C.V.%		64	6	5	4	154	94	4	
LSD 5%		3	8	7	5	NS	21	5	
# OF REPS		4	4	4	4	4	4	4	1

None of the herbicide treatments caused any important injury to wheat. Late season growth of foxtail was intense and prevented growth of the redroot pigweed which was dense early, at treatment. Yellow foxtail control was evident from thifensulfuron & tribenuron + metsulfuron treatments and control was reduced when applied with dicamba, 2,4-D, or dicamba + 2,4-D. Redroot pigweed was completely controlled by all treatments except dicamba, 2,4-D, and bromoxynil & MCPA. 2,4-D at 6 oz/A was ineffective and dicamba at 1 oz/A partly effective for wild buckwheat control. Wheat yield was not taken because of the severe foxtail infestation.

Broadleaf Weed Control in Wheat, Carrington 1997. (Zwinger) 'Russ' hard red spring wheat was seeded May 29. Treatments were applied to 3- to 4-leaf wheat, 2- to 3-leaf redroot pigweed and wild buckwheat, and 2-leaf common lambsquarters and wild mustard on June 18 with 55 F, 73% RH, clear sky, and 7 mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 28 ft plots. The experiment was a randomized complete block design. Harvest for yield

Treatment	Rate	7-15-97						
		Wht	Fota	Rrpw	Wimu	Colq	Prpw	Wibu
	oz/A	%						
2,4-Dioe	6	1	25	97	99	99	94	75
Brox&MCPA	8	0	18	99	99	99	99	99
Dica-dma	1	0	0	65	96	80	78	72
Thif&Trib+Mets+X-77	.22+.06+.25%	9	50	99	99	99	99	99
Thif&Trib+Mets+X-77	.17+.04+.25%	21	30	99	99	99	99	99
Thif&Trib+Mets+X-77	.11+.03+.25%	13	28	94	99	97	97	97
Thif&Trib+Mets+Dica+X-77	.22+.06+1+.25%	3	30	99	99	99	99	99
Thif&Trib+Mets+Dica+X-77	.11+.03+1+.25%	0	35	99	99	99	99	99
Thif&Trib+Mets+2,4-Dioe+X-77	.22+.06+6+.25%	0	48	99	99	99	99	99
Thif&Trib+Mets+2,4-Dioe+X-77	.11+.03+6+.25%	1	45	99	99	99	99	99
Thif&Trib+Mets+Dica+2,4-D+X-77	.11+.03+1+6+.25%	8	33	99	99	99	99	99
Prosulfuron+2,4-Dioe+X-77	.22+6+.25%	1	35	99	99	99	99	99
F8426&MCPA+28N	6.4+2%	1	38	99	99	99	99	99
Fluroxypyr+2,4-Dioe	1.5+6	1	30	99	99	99	99	99
Untreated	0	0	0	0	0	0	0	0
C.V.%		184	80	3	13	3	4	10
LSD 5%		10	NS	4	16	5	5	13
# OF REPS		4	4	4	4	4	4	4

None of the herbicides caused important injury to wheat. However, the injury to wheat that was evident from the sulfonylurea herbicides generally was reduced when in mixture with auxin herbicide. Broadleaf weeds were effectively controlled by all herbicdes except 2,4-D at 6 oz/A and dicamba at 1 oz/A each when applied alone.

Broadleaf Weed Control in Wheat, Hettinger 1997. (Ericksmcen) 'Kulm' hard red spring wheat was seeded April 29. The experimental area was treated with diclofop at 1 lb/A +Sunit II at 0.5 pt/A for wild oat and foxtail control on June 3. Treatments were applied to 3-leaf wheat and 1- to 4-inch wild buckwheat on June 3 with 60 F, 53% RH, hazy sky, and 8-mph wind. Treatments were applied with a tractor mounted plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 5 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 18.

Treatment	Rate	7-08 Wht	7-08 Wibu	8-18 Yield
	oz/A	—	% —	bu/A
2,4-Dioe	6	0	69	10
Bromoxynil&MCPA	8	0	98	14
Dicamba-dma	1	0	90	14
Thif&Trib+Metsulfuron+X-77	0.22+.06+.25%	0	96	12
Thifensulfuron&Trib+Mets+X-77	0.17+.04+.25%	1	94	14
Thif&Tribenuron+Mets+X-77	0.11+.03+.25%	0	91	12
Thif&Trib+Mets+Dicamba+X-77	0.22+.06+1+.25%	0	94	16
Thif&Trib+Mets+Dicamba+X-77	0.11+.03+1+.25%	0	93	12
Thif&Trib+Mets+2,4-Dioe+X-77	0.22+.06+6+.25%	0	93	12
Thif&Trib+Mets+2,4-Dioe+X-77	0.11+.03+6+.25%	0	93	14
Thif&Trib+Mets+Dica+2,4-Dioe+X-77	0.11+.03+1+6+.25%	3	93	11
Prosulfuron+2,4-Dioe+X-77	0.22+6+.25%	0	92	12
F8426&MCPA+28N	6.4+2%	0	73	14
Fluroxypyr+2,4-Dioe	1.5+6	0	96	12
Untreated	0	0	0	14
C.V.%		83	8	26
LSD 5%		NS	10	NS
# OF REPS		4	4	4

None of the herbicides injured wheat. Wheat yield was not increased from wild buckwheat control. Wild buckwheat normally is not competitive with wheat, but causes harvest problems when green at harvest and vines wind about moving parts onthe combine. All herbicide treatments, except 2,4-D and F8426 & MCPA, gave 90% or more wild buckwheat control.

Broadleaf Weed Control in Wheat, Minot 1997. (Zarnstorff) 'Renville' durum wheat was seeded May 29. Treatments were applied to 3- to 5-leaf durum, 1- to 4-leaf wild oat, 3-leaf canola, and 1- to 2-inch tall kochia on June 23 with 64 F, 92% RH, 30% cloudy sky, and 6-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 25 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on September 17.

Treatment	Rate	7-10				9-17
		Durum	KOCZ	Canola	Grft	Yield
	oz/A	%				bu/A
2,4-Dioe	6	0	75	98	6	19
Bromoxynil&MCPA	8	0	96	99	18	20
Dicamba-dma	1	0	93	56	0	19
Thifensulfuron&Trib+Mets+X-77	0.22+0.06+0.25%	0	96	99	41	23
Thif&Tribenuron+Mets+X-77	0.17+0.04+0.25%	0	94	99	40	21
Thif&Trib+Metsulfuron+X-77	0.11+0.03+0.25%	0	70	87	48	20
Thif&Trib+Mets+Dicamba+X-77	0.22+0.06+1+0.25%	1	99	99	34	21
Thif&Trib+Mets+Dica+X-77	0.11+0.03+1+0.25%	0	99	99	0	19
Thif&Trib+Mets+2,4-Dioe+X-77	0.22+0.06+6+0.25%	0	99	99	38	22
Thif&Trib+Mets+2,4-Dioe+X-77	0.11+0.03+6+0.25%	0	99	99	20	19
Thif&Trib+Mets+Dica+24-Dioe+X-77	0.11+0.03+1+6+0.25%	0	99	99	24	19
Prosulfuron+2,4-Dioe+X-77	0.22+6+.25%	0	99	99	36	25
F8426&MCPA+28N	6.4+2%	0	99	99	8	25
Fluroxypyr+2,4-Dioe	1.5+6	0	99	99	21	24
Untreated	0	0	0	0	0	17
C.V. %		775	10	8	90	26
LSD 5%		NS	13	10	29	NS
# OF REPS		4	4	4	4	4

Herbicide treatments did not injure durum wheat. Wheat yield was not significantly increased from weed control, but most wheat from plots treated with herbicides yield 2 to 7 bu/A more than non-treated wheat. Yields were variable because of variation in wheat stand. All herbicide treatments except 2,4-D and thifensufluron & tribenuron at 0.11 + metsulfuron at 0.03 oz/A gave more than 90% control of kochia. The inclusion of 2,4-D or dicamba to sulfonylurea herbicides tended to reduce or reduced sulfonylurea suppression of green foxtail control. Canola was volunteer plants from the 1996 crop seed.

Bromoxynil and F8426 for Broadleaf Weed Control in Wheat, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments were applied to 4-leaf wheat and redroot pigweed, 2- to 5-0leaf wild mustard, and 2- to 4-leaf green and yellow foxtail on June 11 with 78 F, 35% RH, clear sky, and 5- to 8-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. At treatment, weed density was redroot pigweed about 200 plants, wild mustard 1 plant, and wild buckwheat 2 plants/yd^2.

		7-07-97			
Treatment	Rate	Wht	Rrpw	Wimu	Wibu
	oz/A		%		
Bromoxynil&MCPA	6	0	83	99	99
Bromoxynil&MCPA	8	1	89	99	99
Bromoxynil&MCPA+Peak+Act90	6+.2+.25%	1	99	99	99
Bromoxynil&MCPA+Thif&Trib+Act90	6+.16+.25%	2	99	99	99
Bromoxynil	4	0	87	99	99
Bromoxynil-WP	4	0	88	99	99
Bromoxynil-WP	5	1	81	99	99
F8426&MCPA+28N	6.4+2%	2	96	99	99
F8426&MCPA+ND4	6.4+1%	13	99	99	95
F8426&MCPA+28N	8.6+2%	4	98	99	99
F8426&MCPA+Dicamba-SGF+28N	6.4+1.5+2%	5	99	99	99
F8426&MCPA+Dicamba-dma+28N	6.4+1.5+1%	7	99	99	99
F8426&MCPA+Dicamba-SGF+ND4	6.4+1.5+1%	16	99	99	99
F8426&MCPA+Dicamba-dma+ND4	6.4+1.5+1%	21	99	99	99
F8426&MCPA+Dicamba-SGF+ND72	6.4+1.5+1%	9	99	99	99
Untreated	0	0	0	0	0
C.V.%		47	8	0	
LSD 5%		3	10	NS	
# OF REPS		4	4	4	1

Late season weed control rating or grain yield were not taken because of a dense infestation of foxtail which occurred in all plots regardless of herbicide treatment. Harvest would have been difficult and any broadleaf weed control early would have been masked by the foxtail competition. The dense redroot pigweed stand at treatment did not survive the foxtail competition, in the untreated plots, late in the season. Bromoxynil formulations did not differ in effectiveness for redroot pigweed control. Bromoxynil & MCPA applied in combination with sulfonylureas enhanced redroot pigweed control. All F8426 & MCPA treatments gave nearly complete broadleaf weed control. F8426 & MCPA was most injurious to wheat when applied with ND-4.

Bromoxynil Formulation for Weed Control in Wheat, Fargo 1997. (Nalewaja) '2375' hard red spring wheat was seeded on May 10. Treatments were applied to 4- to 5-leaf wheat, 4- to 6-leaf redroot pigweed, 5-leaf wild mustard, 2-leaf wild buckwheat, and 1.5-inch kochia on June 11 with 78F, 35% RH, clear sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Weed densities were redroot pigweed about 100 plants and wild mustard about 1 plant /yd^2.

Treatment	Rate	7-07-97		
		Wht	Rrpw	Wimu
			%	
Bromoxynil&MCPA	8	3	91	99
CA-1797+MCPA-dma	4+4	0	87	99
CA-1797+MCPA-ioe	4+4	0	87	97
CA-1797+MCPA-dma+X-77	4+4+.25%	3	90	99
CA-1797+MCPA-dma+PO	4+4+1%	4	85	99
CA-1797+MCPA-dma+Scoil	4+4+1%	6	90	99
CA-1797+MCPA-dma	6.4+6.4	0	89	99
CA-1797+Mets+X-77	4+0.06+.25%	5	99	99
CA-1797+Thif&Trib+X-77	4+0.22+.25%	5	99	99
CA-1797+MCPA-dma+Thif&Trib+X-77	4+4+.22+.25%	4	99	99
Untreated	0	0	0	0
		110	5	2
C.V. %		4	6	2
LSD 5%		4	4	4
# OF REPS				

None of the herbicide treatments caused any important injury to wheat. Redroot pigweed control was the greatest when treatments contained sulfonylurea herbicides. All other herbicide treatments were similarly effective for redroot pigweed control. Late weed control or wheat yield was not taken because a dense foxtail infestation which prevented redroot pigweed growth regardless of herbicide treatment. Wheat yield probably would not have differed with treatments and would have been difficult with the presence of green foxtail plants.

Fluroxypyr for Weed Kochia Control in Wheat, Fargo, 1997. (Nalewaja) '2375' hard red spring wheat was seeded May 10. Treatments (S1) were applied to 4-to 5-leaf wheat, 4- to 6-leaf wild mustard and redroot pigweed,4- to 7-leaf wild buckwheat, and 3- to 4-leaf green and yellow foxtail on June 16 with 65F, 55% RH, clear sky and 5-mph wind. Treatments (S2) were applied to 6- to 7-leaf wheat and wild mustard, 4- to 8-leaf redroot pigweed, 6- to 6-leaf green and yellow foxtail, and blooming wild buckwheat on June 25 with 70F, 60% RH, partly cloudy sky, and 10-mph wind. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 3.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates. Harvest for yield was on August 22. Weed dersity was redroot pigweed about 200 plant and wild mustard 2 plants /yd^2.

Treatment	Rate	7-07			8-22
		Wht	Rrpw	Wimu	Yield
	oz/A		%		bu/A
Fluroxypyr(S1)	6	0	94	99	38
Fluroxypyr+Dicamba-dma(S1)	1+0.5	2	74	86	38
Fluroxypyr+Dicamba-dma(S1)	1+1.0	5	89	86	34
Dicamba-dma(S1)	2	8	91	69	31
Fluroxypyr+2,4-D-Salvo(S1)	2+5	1	95	99	33
Fluroxypyr+2,4-D-Salvo(S1)	1.5+3.75	1	89	99	31
Fluroxypyr+Thif&Trib(S1)	1.5+.22	1	96	97	36
Fluroxypyr+MCPA-Sword(S1)	2+20	1	98	99	31
Fluroxypyr(S1)	6	0	83	96	35
Fluroxypyr+Dicamba-dma(S2)	1+0.5	12	59	89	28
Fluroxypyr+Dicamba-dma(S2)	1+1.0	19	85	96	25
Dicamba-dma(S2)	2	16	95	91	26
Fluroxypyr+2,4-D-Salvo(S2)	2+5	1	86	99	33
Fluroxypyr+2,4-D-Salvo(S2)	1.5+3.75	5	83	99	31
Fluroxypyr+Thif&Trib	1.5+.22	7	91	99	34
Fluroxypyr+MCPA-Sword(S2)	2+20	5	71	74	31
Untreated	0	0	0	0	29
C.V. %		75	19	16	14
LSD 5%		5	21	20	6
# OF REPS		4	4	4	4

Wheat was injured when treatments contained dicamba applied at the second wheat growth stage. The injury from these dicamba treatments reduced yield significantly. The dense foxtail infestation probably prevented the wheat from recovering from dicamba injury causing the large yield reduction. Wheat was highly tolerant to fluroxypyr even at 6 oz/A applied early or late. Wheat yield was increased by nearly all herbicide treatments that were not injuious to wheat.

Oat cultivar response to fluroxypyr, Fargo, 1997. (Zollinger) An experiment was conducted to evaluate oat cultivar response to Starane herbicides applied POST. Thirty-six oat cultivars were seeded on May 3. POST treatments were applied June 11 at 8:30 am with 75 F air, 78 F soil surface, 38% RH, 10% clouds, and 0-3 mph wind to 4-4.5 leaf oat. Treatments were applied to ends of an oat variety strip trial with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The treatments were not applied to more than one replicate.

Treatment	Rate
	pt/A
Starane + MCPA-Amine	0.33 + 1
Starane + MCPA-Amine	0.67 + 1

No evidence of injury was detected to any of the oat cultivars throughout the season.

Oat cultivars tested were ND940118, ND940638, ND940944, ND940969, ND940977, ND941119, ND941127, ND941172, ND941505, ND950864, ND891757, ND900697, ND900779, ND910117, ND910529, ND910569, ND910592, ND910779, ND910916, ND910932, ND911048, ND930122, ND930376, ND930738, ND931318, ND931475, RD95031, Assiniboia, Belle, CDC Boyer, Dumont, Troy, Jerry, Jud, AC Medallion, Paul.

Perennial grass control in CRP - grazed and no-till, Steele Co., 1996-1997 (Zollinger, Fitterer and Vachal) An experiment was conducted to evaluate grass control in CRP. CRP was planted in the fall of 1988 and grazed July 1 to July 31, 1996. Area consisted of approximately 80% bromegrass, 15% alfalfa, and a few other species with 50% of the area covered with gopher mounds. Fall treatments were applied September 24, 1996 at 4:30 pm with 63 F air, 56 F soil surface, 35% RH, 50% clouds, and 6-12 mph wind to 7-12" bromegrass and 18-24" flowering alfalfa. Spring treatments were applied May 30, 1997 at 11:30 am with 78 F air, 21% RH, 50% clouds, and 1-3 mph wind to 6-8" bromegrass and 8" alfalfa. Treatments were applied to a 20 ft wide area the length of the 20 X 50 ft plots with a tractor mounted CO_2 sprayer in the fall and a bicycle-wheel-type plot sprayer in the spring delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	October 9, 1996		May 30, 1997		June 20, 1997		July 15, 1997	
		Brome	Alfa	Brome	Alfa	Brome	Alfa	Brome	Alfa
	Product/A	% control							
FALL									
Roundup Ultra + AMS	1 qt + 17 oz/100 gal	52	47	98	98	83	65	63	30
Roundup Ultra + AMS	2 qt + 17 oz/100 gal	55	45	98	99	86	70	67	33
FALL fb SPRING									
Select + PO / Select + PO	8 oz + 1 qt / 10 oz + 1 qt	7	0	0	0	27	0	20	0
Select + PO / Select + PO	12 oz + 1 qt / 10 oz + 1 qt	12	0	7	0	43	0	17	0
Select + PO / Select + PO	15 oz + 1 qt / 10 oz + 1 qt	6	0	7	0	30	0	23	0
Roundup Ultra + AMS / Select + PO	1.5 qt + 17 oz/ 100 gal / 10 qt + 1 oz	57	44	99	98	95	87	88	50
Roundup Ultra + AMS / Roundup Ultra + AMS	1 qt + 17 oz/ 100 gal / 1 qt + 17 oz/100 gal	52	47	98	98	96	79	93	43
Assure II + PO / Assure II + PO	16 oz + 1 qt / 10 oz + 1 qt	6	0	47	0	63	0	23	0
SPRING									
Roundup Ultra + AMS	1 qt + 17 oz/ 100 gal	-	-	-	-	77	60	53	43
Roundup Ultra + AMS	2 qt + 17 oz/ 100 gal	-	-	-	-	91	92	93	89
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		8	10	9	1	13	17	20	19

Roundup Ultra was a required treatment component for smooth bromegrass and alfalfa control. At the May 30 evaluation, all treatments with Roundup Ultra gave near complete smooth bromegrass and alfalfa control. At the June 20 evaluation, only treatments with sequential herbicide applications and spring applied Roundup Ultra at 2 qt/A gave 91% or greater smooth bromegrass control and gave the greatest alfalfa control. The same trend occurred at the July 15 evaluation but only spring applied Roundup Ultra gave acceptable alfalfa control. At the July 15 evaluation, there were no differences in smooth bromegrass and alfalfa control between spring and fall applications of Roundup Ultra at 1 qt/A and control of both species were inadequate. However, smooth bromegrass and alfalfa were only controlled with Roundup Ultra at 2 qt/A when spring applied. Roundup Ultra at 2 qt/A applied fall or spring or 1 qt/A in fall and spring all gave 88% or more smooth bromegrass control. Assure II or Select as one or split fall and spring application did not give adequate smooth bromegrass control. Excellent smooth bromegrass control was observed from Roundup Ultra applied in the fall followed by spring applications of Select or Roundup Ultra, but alfalfa was not controlled.

Vegetation control in CRP - grazed plus tilled, Steele Co., 1996-1997 (Zollinger, Fitterer and Vachal) An experiment was conducted to evaluate grass control in CRP. CRP was planted in the fall of 1988 and grazed July 1 to July 31, 1996. Area consisted of approximately 80% bromegrass, 15% alfalfa, 5% quackgrass with 50% of the area affected with gopher mounds. Fall treatments were applied September 24, 1996 at 4:30 pm with 63 F air, 55 F soil surface, 35% RH, 50% clouds, and 6-12 mph wind to 7-12" bromegrass and 18-24" flowering alfalfa. Spring treatments were applied May 30, 1997 at 11:30 am with 78 F air, 21% RH, 50% clouds, and 1-3 mph wind to 6-8" bromegrass and 8" alfalfa. Two tillage passes were performed June 5 with a heavy disk. Treatments were applied to a 20 ft wide area the length of the 20 X 50 ft plots with a tractor mounted CO_2 sprayer in the fall and a bicycle-wheel-type plot sprayer in the spring delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	October 9, 1996		May 30, 1997		June 20, 1997		July 15, 1997	
		Brome	Alfa	Brome	Alfa	Brome	Alfa	Brome	Alfa
	Product/A	% control							
FALL									
Roundup Ultra + AMS	1 qt + 17 oz/100 gal	48	43	98	98	78	67	88	50
Roundup Ultra + AMS	2 qt + 17 oz/100 gal	57	50	98	98	95	86	92	53
FALL fb SPRING									
Select + PO / Select + PO	8 oz + 1 qt / 10 oz + 1 qt	4	0	0	0	50	0	33	0
Select + PO / Select + PO	12 oz + 1 qt / 10 oz + 1 qt	4	0	20	0	72	0	43	0
Select + PO / Select + PO	15 oz + 1 qt / 10 oz + 1 qt	5	0	23	0	73	0	38	0
Roundup Ultra + AMS / Select + PO	1.5 qt + 17 oz/100 gal / 10 oz + 1 qt	60	52	99	99	78	90	88	57
Roundup Ultra + AMS / Roundup Ultra + AMS	1 qt + 17 oz/100 gal / 1 qt + 17 oz/100 gal	48	43	99	99	90	83	85	57
Assure II + PO / Assure II + PO	16 oz + 1 qt / 10 oz + 1 qt	3	0	33	0	67	0	33	0
SPRING									
Roundup Ultra + AMS	1 qt + 17 oz/100 gal	-	-	-	-	67	37	58	48
Roundup Ultra + AMS	2 qt + 17 oz/100 gal	-	-	-	-	90	80	91	88
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		6	5	17	1	16	18	18	12

Similar results occurred at the May 30 and June 20 evaluations as with the grazed and no-tilled experiment. However, at the July 15 evaluation, spring applied Roundup Ultra at 1 qt/A gave good and greater smooth bromegrass but equal and poor alfalfa control compared to fall applied Roundup Ultra. Fall or spring applied Roundup Ultra at 2 qt/A gave equal and excellent smooth bromegrass control and poor alfalfa control.

Perennial grass control in CRP, (Exp. 1) 1997, Steele Co. 1997 (Zollinger, Fitterer and Vachal) An experiment was conducted to evaluate grass control in CRP. POST treatments were sprayed May 30 at 3:30 pm with 84 F air, 52 F soil surface, 26% RH, 40% clouds, and 0-2 mph wind to 8-12" bromegrass. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	June 20		July 15
		Brome	Alfa	Brome
	Product/A	% control		
Assure II + PO	10 oz + 1 pt	50	0	72
Roundup Ultra + AMS	2 pt + 2.5 lb	73	42	78
Assure II + Roundup Ultra + AMS	4 oz + 1 pt + 2.5 lb	60	32	79
Assure II + Roundup Ultra + AMS	6 oz + 1 pt + 2.5 lb	65	23	73
Assure II + Roundup Ultra + AMS	8 oz + 1 pt + 2.5 lb	50	18	68
Assure II + Roundup Ultra + AMS	10 oz + 1 pt + 2.5 lb	65	40	70
Assure II + Roundup Ultra + AMS	4 oz + 1.5 pt + 2.5 lb	67	30	72
Assure II + Roundup Ultra + AMS	6 oz + 1.5 pt + 2.5 lb	68	35	73
Assure II + Roundup Ultra + AMS	8 oz + 1.5 pt + 2.5 lb	68	32	87
Assure II + Roundup Ultra + AMS	10 oz + 1.5 pt + 2.5 lb	65	30	80
Assure II + Banvel + PO	8 oz + 0.25 pt + 2 pt	75	32	43
Assure II + Express + PO	8 oz + 0.167 oz + 2 pt	75	32	70
Assure II + Ally + PO	8 oz + 0.083 oz + 2 pt	72	20	75
Untreated		0	0	0
LSD (0.05)		15	15	15

Except for treatments without Roundup Ultra, smooth bromegrass control generally improved at the July 15 evaluation. No treatment gave greater bromegrass control than Roundup Ultra applied at 2 pt/A. Addition of Assure II to Roundup Ultra did not increase smooth bromegrass control over Roundup Ultra applied alone at 2 pt/A. Assure II plus Roundup Ultra resulted in greater smooth bromegrass control than Assure II alone. Generally, smooth bromegrass control did not increase as rates of Assure II and Roundup Ultra increased in tank-mix combinations. Alfalfa control did not exceed 40% with any herbicide treatment tested.

Perennial grass control in CRP, (Exp. 2) 1997, Steele Co. 1997 (Zollinger, Fitterer and Vachal) An experiment was conducted to evaluate grass control in CRP. POST treatments were sprayed May 30 at 3:30 pm with 84 F air, 52 F soil surface, 26% RH, 40% clouds, and 0-2 mph wind to 8-12" bromegrass. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	June 20		July 15
		Brome	Alfa	Brome
	Product/A	% control		
Assure II + PO	10 oz + 1 qt	45	0	58
Roundup Ultra + AMS	2 pt + 2.5 lb	76	40	85
Assure II + Roundup Ultra + AMS	4 oz + 1 pt + 2.5 lb	53	27	75
Assure II + Roundup Ultra + AMS	6 oz + 1 pt + 2.5 lb	63	23	70
Assure II + Roundup Ultra + AMS	8 oz + 1 pt + 2.5 lb	52	23	75
Assure II + Roundup Ultra + AMS	10 oz + 1 pt + 2.5 lb	63	33	68
Assure II + Roundup Ultra + AMS	4 oz + 1.5 pt + 2.5 lb	65	25	70
Assure II + Roundup Ultra + AMS	6 oz + 1.5 pt + 2.5 lb	70	37	85
Assure II + Roundup Ultra + AMS	8 oz + 1.5 pt + 2.5 lb	70	37	83
Assure II + Roundup Ultra + AMS	10 oz + 1.5 pt + 2.5 lb	63	27	75
Assure II + Banvel + PO	8 oz + 0.25 pt + 2 pt	70	30	77
Assure II + Express + PO	8 oz + 0.167 oz + 2 pt	73	30	68
Assure II + Ally + PO	8 oz + 0.083 oz + 2 pt	71	23	60
Untreated		0	0	0
LSD (0.05)		13	12	22

Except for treatments without Roundup Ultra, smooth bromegrass control generally improved at the July 15 evaluation. No treatment gave greater bromegrass control than Roundup Ultra applied at 2 pt/A. Addition of Assure II to Roundup Ultra did not increase smooth bromegrass control over Roundup Ultra applied alone at 2 pt/A. Assure II plus Roundup Ultra resulted in greater smooth bromegrass control than Assure II alone. Generally, smooth bromegrass control did not increase as rates of Assure II and Roundup Ultra increased in tank-mix combinations. Alfalfa control did not exceed 40% with any herbicide treatment tested.

Perennial grass control in CRP (Exp. 3), 1997, Steele Co. 1997 (Zollinger, Fitterer and Vachal) An experiment was conducted to evaluate grass control in CRP. POST treatments were sprayed May 30 at 3:30 pm with 84 F air, 52 F soil surface, 26% RH, 40% clouds, and 0-2 mph wind to 8-12" bromegrass. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	June 20		July 15
		Brome	Alfa	Brome
	Product/A	% control		
Assure II + PO	10 oz + 1 qt	53	0	69
Roundup Ultra + AMS	2 pt + 2.5 lb	78	33	72
Assure II + Roundup Ultra + AMS	4 oz + 1 pt + 2.5 lb	52	27	58
Assure II + Roundup Ultra + AMS	6 oz + 1 pt + 2.5 lb	68	22	60
Assure II + Roundup Ultra + AMS	8 oz + 1 pt + 2.5 lb	50	22	68
Assure II + Roundup Ultra + AMS	10 oz + 1 pt + 2.5 lb	70	30	80
Assure II + Roundup Ultra + AMS	4 oz + 1.5 pt + 2.5 lb	67	32	75
Assure II + Roundup Ultra + AMS	6 oz + 1.5 pt + 2.5 lb	72	37	77
Assure II + Roundup Ultra + AMS	8 oz + 1.5 pt + 2.5 lb	73	43	85
Assure II + Roundup Ultra + AMS	10 oz + 1.5 pt + 2.5 lb	68	33	85
Assure II + Banvel + PO	8 oz + 0.25 pt + 2 pt	73	35	70
Assure II + Express + PO	8 oz + 0.167 oz + 2 pt	72	28	70
Assure II + Ally + PO	8 oz + 0.083 oz + 2 pt	73	20	76
Untreated		0	0	0
LSD (0.05)		13	12	22

Except for treatments without Roundup Ultra, smooth bromegrass control generally improved at the July 15 evaluation. No treatment gave greater bromegrass control than Roundup Ultra applied at 2 pt/A. Addition of Assure II to Roundup Ultra did not increase smooth bromegrass control over Roundup Ultra applied alone at 2 pt/A. Assure II plus Roundup Ultra resulted in greater smooth bromegrass control than Assure II alone. Generally, smooth bromegrass control did not increase as rates of Assure II and Roundup Ultra increased in tank-mix combinations. Alfalfa control did not exceed 40% with any herbicide treatment tested.

Clopyralid and Picloram injury in Canola, 1997, Devils Lake, ND. (Terry Gregoire) Treatments were applied July 4 to bud stage 'Oscar' canola between 9:30 and 11:00 a.m. The sky was clear, temperature 62°F, wind was calm and the soil wet following 2.8" of rainfall July 3. Treatments were applied using a backpack sprayer delivering 8.5 gpa at 35 psi through 8001 nozzles.

Treatment	Rate oz a.i./A	Crop Injury Percent
Clopyralid	1.5	2
Picloram	1.0	5
Clopyralid	3.0	3
Picloram	2.0	13
Picloram	3.0	18
Picloram	4.0	21
Check		0
Picloram	0.5	8
Imazamethabenz	6.0	66
LSD (P = 0.05)		6.3
Standard Deviation		4.3
CV		28.47

Canola biomass was reduced by the 3.0 and 4.0 oz picloram treatments. Some clubbing of the raceme was noted at these rates. While no yields were taken it appeared yield would be reduced at the 3.0 and 4.0 oz rates of picloram. Imazamethabenz at 6.0 oz caused severe biomass reduction with bud death common. No yield was likely from imazamethabenz treated plots.

Preplant, preemergence, and postemergence herbicide treatments for weed management in canola in North Dakota. Zarnstorff, Mark E., and Michael Miller. The objective of this study was to evaluate canola injury and weed control with preplant incorporated, preemergence, postemergence, and sequential herbicide applications for weed management in canola. This study was conducted near Minot, ND on the North Central Research Extension Center on a Williams loam with 1.0% organic matter, pH 6.6, and soil test N, P, K, and S levels of 34, 30, 800 and 369 lb/A, respectively. The site was fertilized with 131 lb N/A prior to planting. Wheat was the previous crop and the site was chisel plowed after wheat harvest. The study was designed as a randomized complete block experiment with four replications and a plot size of 10 by 30 ft. Data were collected only on the center 5 feet of each plot. Before application of the PPI herbicides the site was leveled with a field cultivator. After applying the PPI treatments the entire plot area was field cultivated twice to a depth of 3 to 4 inches with the implement operated at a very slight angle to the length of the plot. 'Hyola 401' hybrid canola was treated with granular carbofuran and benomyl and planted at a seeding rate of 15 viable seeds/ft^2 on May 16. Treatment information, environmental conditions and crop and weed sizes are listed below:

Date	May 12	May 19	June 13	June 20
Treatment	PPI	PRE	POST I	POST II
Temperature (F)				
air	50	37	74	65
soil (4 inch)	56	46	74	68
Relative humidity (%)	30	90	31	64
Wind (mph:direction)	5:N	8:NW	6:NE	7:NE
Sky	clear	cloudy	clear	p. cloudy
Soil moisture	moist	moist	dry	wet
Canola				
height (in)	--	--	2-3	5-6
Common Lambsquarters (CHEAL)				
height (in)	--	--	2-3	4-6
Green foxtail (SETVI)				
height (in)	-	-	1-2	3-4
Russian Thistle (SASKR)				
height (in)	-	-	2-3	5-6
Kochia (KCHSC)				
height (in)	-	-	2-3	4-5
Rainfall after application (in)				
1st week	0.12	0.21	1.32	1.44
2nd week	0.0	0.0	1.44	1.38
3rd week	0.0	0.0	1.38	0.18

Canola injury was minimal with all PPI treatments (<10%). The major weed species in this trial were green foxtail, common lambsquarters, russian thistle, and kochia. The PPI treatments (ethalfluralin, trifluralin, and pendimethalin) provided the best control of these weeds. Preemerge treatments did not provide adequate weed control due to dry conditions following application. Foxtail control was very good to excellent with all preplant incorporated treatments and for postemergence sethoxydim and quizalofop-P used alone. Application of dicamba at 0.063 lb/A, following trifluralin 0.75 lb/A PPI, caused some epinasty when observed 14 days after application, however the canola was able to out grow this condition and not affect yield. Clopyralid, endothall, and ethametsulfuron applied by themselves, did not provide adequate control of russian thistle or kochia. The application of PPI or sequential application of postemerge treatments, following trifluralin 0.75 lb/A PPI, provided the greatest yields.

Table 1. Preplant, preemergence and postemergence herbicides for weed management in canola at Minot ND in 1997 (Zarnstorff, Miller, and Lueschen).

Treatments	Rate	SETVI		CHEAL		SASKR		KCHSC		Yield
		6/11	6/30	6/11	6/30	6/11	6/30	6/11	6/30	
	(lb/A or %)	----------								lb/A
PPI										
Ethalfluralin	0.95	95	98	65	93	58	88	58	88	1242
Pendimethalin	1.24	94	95	68	92	56	77	49	53	1150
Trifluralin	0.75	94	98	65	90	53	78	48	77	1162
Trifluralin	1.0	95	97	70	93	59	83	58	83	1240
PPI trifluralin 0.75/ fb POST I										
Clopyralid	0.125	95	97	66	87	53	73	50	73	789
Dicamba	0.063	94	98	70	90	58	80	58	80	1268
Endothall	0.375	95	97	63	90	53	78	53	78	1263
Endothall	0.56	91	98	66	90	50	77	46	50	1152
Endothall	0.75	95	97	63	87	55	78	45	65	1301
Endothall	1.125	95	97	65	87	58	70	45	60	1160
Sethoxydim+COC	0.2+1.25%	95	98	60	82	53	65	53	65	1191
Quizalofop+COC	0.055+1.0%	94	98	68	92	58	70	58	77	1277
Ethametsulfuron+NIS	0.019+0.25%	94	98	63	90	50	87	50	87	730
Preemergence										
Metolachlor	2.44	43	77	13	7	15	7	23	7	916
Dimethenamid	1.41	58	77	19	13	19	13	33	13	964
Acetochlor+dichlormid	2.4	46	65	25	13	25	13	23	13	493
POST I (weeds 2-3 inches tall)										
Clopyralid	0.125	--	0	--	23	--	13	--	17	536
Endothall	0.56	--	0	--	37	--	23	--	23	953
Sethoxydim+COC	0.2+1.25%	--	100	--	0	--	0	--	0	1098
Quizalofop+COC	0.055+1%	--	100	--	0	--	0	--	0	1110
Sethoxydim+endothall+NIS	0.2+0.375+0.25%	--	100	--	23	--	13	--	13	987
Quizalofop+endothall+NIS	0.055+0.375+0.25%	--	100	--	17	--	17	--	17	1085
Sethoxydim+clopyralid+NIS	0.2+0.125.0.25%	--	97	--	58	--	45	--	33	1096
Quizalofop+clopyralid+NIS	0.055+0.125+0.25%	--	98	--	65	--	7	--	7	1045
Quizalofop+ethametsulfuron+NIS	0.055+0.019+0.25%	--	95	--	10	--	10	--	10	1165
POST I (weeds 2-3 inches tall)/POST II (weeds 5-6 inches tall)										
Sethoxydim+NIS/endothall	0.2+0.25%/0.375	--	100	--	23	--	20	--	20	1042
Sethoxydim+COC/endothall	0.2+1.25%/0.375	--	98	--	30	--	43	--	23	1111
Quizalofop+COC/endothall	0.055+1%/0.375	--	97	--	13	--	13	--	13	871
Quizalofop+NIS/endothall	0.055+0.25%/0.375	--	100	--	23	--	23	--	23	927
Quizalofop+COC/ethametsulfuron	0.055+1%/0.019+0.25	--	98	--	48	--	27	--	62	939
Hand weeded Check		100	100	100	100	100	100	100	100	1304
Check		0	0	0	0	0	0	0	0	723
LSD (P=.05)		11	4	8	15	9	14	12	15	199

[a]Treatments: acetochlor + dichloramid=Surpass 6.4E; clopyralid=Stinger 3L; Dicamba=Banvel 4l; dimethanamid=Frontier 7.5E; endothall=Herbicide 273 3\L; ethametsulfuron=Muster 75DF, metolachlor=DUAL II 7.8E; pendimethalin=Prowl 3.3 E; quizalofop=Assure II 0.88E; sethoxydim = Poast 1.53E; trifluralin=Treflan 4E and NIS=nonionic surfactant Spray Boosters from Cenex Land O'Lakes.

Borage and camelina herbicide screening trial, Carrington 1997. (Endres, Schatz, and Zwinger) The trial was conducted to evaluate the tolerance of borage and camelina to common small grain herbicides, as no herbicides currently are labeled for these specialty oilseed crops. Treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer. PPI treatments were applied on May 28 with 52 F, 63% RH, clear sky, and 11-mph wind with the sprayer delivering 17.5 gal/A at 40 psi through 8002 flat fan nozzles and immediately incorporated with a rototiller at a 4-inch depth. Borage and 'Robinson' camelina were planted in 7-inch rows at 22 lb PLS/A on June 4. POST treatments were applied June 30 with 79 F, 56% RH, 10% clouds, and 10-mph wind with the sprayer delivering 20.7 gal/A (Basagran) or 10.3 gal/A at 40 psi through 8001 flat fan nozzles to 2- to 4-leaf borage and 2- to 10-leaf camelina. Ultima 160 at 0.2 lb/A + Dash at 20 fl oz/A were applied on June 25 across the trial for grassy weed control. Generally, low levels of broadleaf weeds existed in the trial. Injury was estimated by visually evaluating biomass and stand reduction. Borage was swathed on August 22 with a sickle mower. Borage was harvested with a stationary thresher and camelina with a plot combine on September 3. The experiment was a randomized complete block design with four replications.

Herbicide		Borage			Camelina		
		Injury		Seed	Injury		Seed
Treatment	Rate	7/12	7/30	yield	7/12	7/30	yield
	lb/A	--- % ---		lb/A	--- % ---		lb/A
PPI							
Sonalan	0.75	81	67	107	0	0	860
trifluralin (Treflan)	0.5	31	17	157	0	0	401
POST							
Basagran	0.5	95	94	17	99	99	0
MCPA amine (Rhomene)	0.25	24	26	63	48	58	151
bromoxynil (Buctril)	0.25	92	80	87	32	66	370
Express + 2,4-D ester	0.125 + 0.25	87	88	15	95	99	38
Tordon	0.0156	23	48	53	39	49	202
Untreated check	--	0	0	122	0	0	592
C. V. %		17	26	59	10	18	38
LSD (0.05)		14	20	65	5	12	177

All treatments injured borage with 67 to 95% injury occurring by Sonalan, Basagran, bromoxynil, and Express + 2,4-De. Seed yield was statistically similar to the untreated check with Sonalan, trifluralin, MCPA amine, and bromoxynil. This preliminary data indicates that borage has the potential to tolerate moderate to high levels of herbicide injury. Camelina was not injured with Sonalan and trifluralin while injury ranged from 32 to 99% with the POST treatments. Lack of injury generally resulted in higher camelina yield. Basagran and Express + 2,4-D ester appear to be effective in controlling volunteer borage or camelina.

Weed control in field pea, Carrington 1996. (Endres, Schatz, and Zwinger) The experiment was conducted to evaluate weed control and field pea tolerance to selected soil- and POST-applied herbicides. Plot size was 10 by 25 ft. Herbicide treatments were applied to a 6.67 by 25 ft area with a hooded bicycle-wheel-type plot sprayer. PPI treatments were applied at 17.5 gal/A at 40 psi through 8002 flat fan nozzles on May 17 with 57 F, 49% RH, sunny sky, and 17 mph wind. PPI treatments were immediately incorporated twice using a field cultivator with a rolling basket set at a 3.5-inch depth. On May 19, 'Profi' field pea was planted in 7-inch rows at pure live seed rates of 300,000 seeds/A. POST treatments were applied at 10.4 gal/A or 20.8 gal/A (treatments containing Basagran, Chiptox, or Rhomene) at 40 psi through 8002 flat fan nozzles. On June 7, POST treatments were applied, except Chiptox, Rhomene, and the second application of the Pursuit, Basagran, and Basagran + Pursuit sequential treatments, with 76 F, 44% RH, sunny sky, and 12 mph wind to 3-4 inches tall field pea, 1 inch tall common lambsquarters, 1 inch tall redroot and prostrate pigweed, and 3-4 leaf yellow and green foxtail. On June 13, the remaining POST treatments were applied with 74 F, 32% RH, sunny sky, and 8 mph wind to 6-8 inch tall field pea, 1-3 inch tall common lambsquarters, 1 inch tall redroot and prostrate pigweed, and 3-5 leaf yellow and green foxtail. Sparse densities of weeds including kochia, Canada thistle, and perennial sowthistle existed in the trial. Field pea were harvested with a plot combine on August 11. The experiment was a randomized complete block design with four replicates.

Yellow and green foxtail control was good to excellent (85-97%) with the PPI treatments, Basagran + Assure II + PO, and Raptor at 0.024 lb/A + MVO (Table 1). Raptor at 0.024 lb/A + MVO improved foxtail control compared to Raptor at 0.031 lb/A + NIS and POST treatments containing Pursuit. Sequential Pursuit or Basagran treatments did not improve control of foxtail, common lambsquarters, and pigweed compared to Pursuit at 0.031 lb/A or Basagran at 1 lb/A. Common lambsquarters control was excellent (91-96%) with the PPI, Basagran + Assure II, sequential Basagran + Pursuit, and Raptor + MVO treatments. Raptor at 0.024 lb/A + MVO improved common lambsquarters control compared to Raptor at 0.031 lb/A + NIS and POST Pursuit + NIS. Redroot and prostrate pigweed control was 89-99% with the PPI, sequential Pursuit and Basagran + Pursuit, and Raptor + MVO treatments.

Field pea generally was very tolerant to the herbicide treatments (Table 2). Field pea seed yield was greatest with the PPI, bentazon + quizalofop, and metribuzin treatments and treatments that included imazethapyr and imazamox. The higher yield relates to treatments that generally provided good to excellent control of at least one of the weed species present. Treatments associated with the highest yield generally had improved test weight.

Table 1. Weed control in field pea (Endres, Schatz, and Zwinger).

Treatment[a]	Rate	June 28			July 11		
		Foxtail[b]	Colq	Pigweed[c]	Foxtail[b]	Colq	Pigweed[c]
	lb/A	% control					
PPI							
Sonalan + Sencor	0.75 + 0.25	92	92	97	91	92	97
Sonalan/ Pursuit + + NIS (POST)	0.75/ 0.031	97	95	99	97	96	98
Prowl/ Pursuit + NIS (POST)	0.94/ 0.031	90	91	94	93	91	94
POST							
Pursuit + NIS	0.031	60	58	83	73	58	84
Pursuit + NIS/ Pursuit + NIS	0.016/ 0.016	54	64	92	71	62	90
Basagran	1	0	14	28	0	15	16
Basagran/ Basagran	0.5/ 0.5	0	10	34	0	14	15
Basagran + Assure II + PO	1 + 0.7	86	92	73	85	95	75
Basagran + Pursuit + NIS/ Basagran + Pursuit + NIS/	0.5 + 0.016/ 0.5 + 0.016	51	93	92	60	94	89
Raptor + MVO	0.024	87	93	91	90	92	94
Raptor + NIS	0.031	63	48	83	65	49	65
Sencor	0.19	15	80	78	25	73	71
Chiptox	0.38	0	45	52	0	48	35
Rhomene	0.38	0	49	51	0	40	28
Sencor + Chiptox	0.13 + 0.13	20	68	63	40	67	71
Untreated		0	0	0	0	0	0
LSD (0.05)		22	24	26	17	25	24

[a]NIS=Activator 90 applied at 0.25% v/v; MVO=Scoil applied at 1.5 pt/A; PO=Peptoil applied at 1% v/v.
[b]Foxtail=Yellow and green.
[c]Pigweed=Redroot and prostrate.

Mechanical and/or chemical weed control in field pea, Carrington 1997.
(Endres, Schatz, and Zwinger) The experiment was conducted to determine if a harrow or rotary hoe may be effectively used to reduce the dependence on herbicides for weed control in field pea. The experiment was established on a loam soil with 7.9 pH and 3.2% organic matter. Tillage for final seedbed preparation was on May 16 using a Melroe culti-harrow. Plot size was 10 by 25 ft. Herbicide treatments were applied to a 6.67 by 25 ft area with a hooded bicycle-wheel-type plot sprayer. PPI Sonalan was applied as a herbicide check at 0.75 lb/A with the sprayer delivering 17.5 gal/A at 35 psi through 8002 flat fan nozzles. Sonalan was applied on May 17 with 62 F, 42% RH, clear sky, and 20 mph wind. Sonalan was immediately incorporated using a field cultivator with a rolling basket set to till at 3.5-inch depth. 'Profi' field pea was planted on May 19 in 7-inch rows at the rate of 315,000 PLS/A and a depth of 2- to 2.5-inches. POST-plant tillage treatments were applied perpendicular to the crop. The 3-point hitch mounted harrow and rotary hoe were set to till at 1- to 1.5-inch depth. The harrow was operated at 4 mph and the rotary hoe at 8 to 10 mph. The initial POST-tillage treatments were made on May 23 with 56 to 60 F, partly-sunny sky, 9 to 12 mph wind, and dry soil surface with very few emerged weeds present. The second tillage passes were performed on May 31 with 80 F, partly-sunny sky, 14 mph wind, and dry soil surface to emerging to 2-inch height field pea and few newly-emerged weeds. Pursuit was POST applied with the sprayer delivering 17.5 gal/A at 40 psi through 8002 flat fan nozzles. Pursuit was applied to herbicide check at 0.031 lb/A and tillage/herbicide plots at 0.023 lb/A on June 7 with 77 F, 42% RH, sunny sky, and 12 mph wind to 1-to 3-inch height field pea, 2- to 4-leaf green and yellow foxtail, 2- to 4-leaf redroot and prostrate pigweed, and 2-leaf wild mustard. Sparse densities of other annual weeds existed in the trial including common lambsquarters, wild buckwheat, annual smartweed, and wild oat. Weed control and field pea injury were visually evaluated. Also, pea injury was evaluated by plant counts (three, one-meter lengths of row/plot). Gramoxone Extra at 1.5 pt/A + NIS at 0.19% v/v was applied on August 11 across the trial to dry plant material for harvest. The crop was harvested with a plot combine on August 19 to determine seed yield. The experiment was a randomized complete block design with four replications.

Foxtail and pigweed control (85 to 93%) with the Sonalan/Pursuit treatment generally was superior to other treatments (Table 1). Wild mustard control with one tillage pass/Pursuit treatments was 89 to 91%. Weed control generally did not differ when comparing similar harrow and rotary hoe treatments. Two tillage passes tended to provide improved weed control compared to one tillage pass. Field pea density was reduced with all weed control treatments and was reduced 20 to 22% with two tillage passes (Table 2). Visible injury also was greatest with two tillage passes. The combination of one tillage pass (harrow or rotary hoe) and the reduced rate of Pursuit resulted in seed yield similar to the herbicide check. Unsatisfactory weed control and/or crop injury associated with other treatments resulted in yield similar to the weedy check.

Table 1. Common lambsquarters and yellow foxtail control with mechanical and/or chemical methods in field pea.

Treatment	Herbicide Rate	Weed control Foxtail 6/23	Foxtail 7/9	Wild mustard 7/9	Pigweed 6/23	Pigweed 7/9
	lb/A	%				
Weedy check		0	0	0	0	0
Sonalan/Pursuit + NIS	0.75/0.031	93	90	61	92	85
Harrow x 1		24	8	23	14	0
Harrow x 2		58	41	35	18	8
Harrow x 1/Pursuit + NIS	0.023	68	71	89	69	76
Rotary hoe x 1		44	31	16	0	0
Rotary hoe x 2		54	33	29	25	18
Rotary hoe x 1/Pursuit + NIS	0.023	68	63	91	71	72
C.V. %		26	38	56	37	27
LSD (0.05)		19	23	35	19	13

Table 2. Field pea performance with mechanical and/or chemical weed control.

Treatment	Herbicide rate	'Profi' field pea Density 6/19	Injury 6/20	Injury 7/9	Seed yield	Test weight
	lb/A	plants/A	--- % ---		bu/A	lb/bu
Weedy check		284510	0	0	40.5	59.6
Sonalan/Pursuit + NIS	0.75 + 0.031	278820	6	1	60.5	59.4
Harrow x 1		273130	0	1	36.6	59.4
Harrow x 2		221915	15	9	41.8	59.9
Harrow x 1/Pursuit + NIS	0.023	250370	3	4	53.7	59.3
Rotary hoe x 1		244680	3	9	38.5	59.6
Rotary hoe x 2		227610	10	9	38.8	60.0
Rotary hoe x 1/Pursuit + NIS	0.023	278820	1	0	60.6	59.4
C.V. %		16	92	108	11	1
LSD (0.05)		5905	6	1	7.3	0.5

Imazamox (Raptor) with Adjuvants on Flax, Soybeans, and Millet, Grand Forks 1997. (Nalewaja) 'Neche' flax, 'McCall' soybean, 'Siberian' foxtail millet, and white proso millet were seeded in adjacent strips as bioassay species on June 4. Treatments were applied across the strips to 8-leaf flax, 4-leaf soybean, 3- to 5-leaf foxtail and proso millet. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design.

Treatment	Rate	6-30-97			
		Sobe	Flax	Fomi	Prmi
	oz/A	%			
Imazamox+SunitII	0.25+0.18G	0	69	99	94
Imazamox+Scoil	0.25+0.18G	0	80	98	91
Imazamox+ND4	0.25+0.5%	0	73	99	94
Imazamox+ND4	0.25+1%	0	69	99	96
Imazamox+ND72	0.25+0.5%	0	65	97	91
Imazamox+ND72	0.25+1%	0	75	99	93
Imazamox+ND148	0.5+1%	0	74	99	93
Imazamox+ND140	0.25+1%	0	75	98	94
Imazamox+ND153a	0.5+1%	0	81	99	94
Imazamox+AR516	0.25+1%	0	63	96	88
Untreated	0	0	0	0	0
C.V. %		0	12	1	2
LSD 5%		NS	12	1	3
# OF REPS		4	4	4	4

Imazamox was highly phytotoxic to foxtail millet and proso millet but did not injure soybean regardless of adjuvant. The wet conditions probably caused the high phytotoxicity from imazemox. ND-4 at 1% tended to be the most effective in enhancement of imazemox phytotoxicity to proso millet. However, Scoil and ND153a appeared most effective for phytotoxicity to flax.

Imazethapyr Rate, Adjuvants and Droplet Size on Species, Fargo 1997.

(Nalewaja) 'Valley' oats, red Siberian foxtail millet, and white proso millet were seeded in adjacent drill strips May 21. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches apart. This arrangement eliminated wheel tracks from within the plot and a cone shield mounted on each nozzle reduced drift. Treatments were applied to oats 12 inches tall, 8- to 9-leaf with 2- to 3-tillers; proso millet 10- to 12- inches tall and 4- to 5 leaf; and foxtail millet 7- to 9-inches tall and 5- to 6-leaf on June 30 with 80 F, 5- to 10-mph wind, 63% RH, and a cloudy sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken on July 22.

Treatment	Nozzle	Spray volume	Rate	7-22 Oat	7-22 Prmi	7-22 Fomi
		gpa	oz/A		%	
Imazethapyr+Act90	8001	5	0.25+.25%	4	9	30
Imazethapyr+SunitII	8001	5	0.25+.2G	16	34	43
Imazethapyr+Act90	8001	5	0.5+0.25%	13	41	66
Imazethapyr+SunitII	8001	5	0.5+.2G	56	64	67
Imazethapyr+Act90	8001	5	0.75+.25%	29	51	69
Imazethapyr+SunitII	8001	5	0.75+.2G	73	81	83
Imazethapyr+Act90	8004	20	0.25+.25%	5	9	35
Imazethapyr+SunitII	8004	20	0.25+.2G	8	21	40
Imazethapyr+Act90	8004	20	0.5+.25%	11	30	61
Imazethapyr+SunitII	8004	20	0.5+.2G	20	47	61
Imazethapyr+Act90	8004	20	0.75+.25%	28	46	69
Imazethapyr+SunitII	8004	20	0.75+.2G	40	47	64
C.V. %				23	23	12
LSD 5%				8	13	10
# OF REPS				4	4	4

Discussion will be limited to oat and proso millet. Foxtail millet was more susceptible than the other spiecies to imazethapyr and less responsive to adjuvants. Spray volume did not statistically influence imazethapyr phytotoxicity when applied with Activator 90 at 0.25%. But imazethapyr often tended to be more phytotoxic at the low spray volume when with Activator 90. Imazethapyr applied with Sun-it II at 1 qt/A always was more phytotoxic when in 5 than 20 gpa. In fact imazethapyr at 0.5 oz/A in 5 gpa was more phytotoxic than 0.75 oz/A in 20 gpa, when with Sun-it II. These data further demonstrate that low spray volumes are positive to imazethapyr phytotoxicity when applied with Sun-it II on a per acre basis. The higher oil concentration apparently is important ot imazethapyr phytotoxicity.

Imazethapyr Spray Volume on Wheat, Flax, and Sunflower, Fargo 1997. (Nalewaja) '2375' wheat, Omega flax, and volunteer sunflower were seeded in adjacent drill strips May 21. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches. This arrangement eliminated wheel tracks within the plot and a cone shield mounted on each nozzle reduced drift. Treatments were applied to wheat 10- to 12-inches tall, 8- to 10-leaf with 3- to 4-tillers; flax 8- to 10-inches tall; and sunflower 10- to 15-inches tall and 9- to 12-leaf on June 27 with 91 F, 10- to 15-mph wind, 60% RH, and a clear sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken July 22.

Treatment	Nozzle	Spray volume	Rate	7-22				
				Wht	Flax	Sufl	Rrpw	Fota
		gpa	oz/A	%				
Imazethapyr+Act90	8001	5	0.38+.25%	46	4	43	87	83
Imazethapyr+Act90+28N	8001	5	0.38+.25%+.25G	70	11	76	92	89
Imazethapyr+SunitII	8001	5	0.38+.18G	76	9	83	95	90
Imazethapyr+ND4	8001	5	0.38+1%	71	13	70	91	89
Imazethapyr+ND72	8001	5	0.38+1%	45	12	68	90	90
Imazethapyr+Act90	8004	20	0.38+.25%	42	11	60	84	88
Imazethapyr+Act90+28N	8004	20	0.38+.25%+.25G	68	15	72	85	87
Imazethapyr+SunitII	8004	20	0.38+.18G	68	8	58	90	92
Imazethapyr+ND4	8004	20	0.38+1%	74	5	70	95	95
Imazethapyr+ND72	8004	20	0.38+1%	64	8	65	93	90
Untreated			0	0	0	0	0	0
C.V. %				13	77	14	5	6
LSD 5%				11	NS	12	6	8
# OF REPS				4	4	4	4	4

Imazethapyr was equally as effective when applied in 5 gpa or 20 gpa when adjuvants were on a percentage of value basis. Imazethapyr generally was more effective in 5 gpa than 20 gpa for sunflower and redroot pigweed when applied with Sun-it II at 0.18 g/A. ND-4 and Activator 90+ 28% N generally were equally as effective as Sun-it II in enhancement of imazethapyr efficacy. The generally greater imazethapyr phytotoxicity at the low volume when with Sun-it II may be in response to the higher concentration of Sun-it II which was applied on an area basis. These results further indicate that low spray volume is equally or more efficacious than high spray volume for imazethapyr, especially when applied with Sun-it II.

Imazethapyr with Adjuvants, Grand Forks 1997. (Nalewaja) White proso millet, 'Neche' flax, 'McCall' soybean and Siberian foxtail millet were seeded in adjacent strips as bioassay species on June 4. Treatments were applied across the strips to 3- to 4-leaf proso millet, 8-leaf flax, 3- to 5-leaf foxtail millet, and 4-leaf soybean on June 18 with 70 F, 60% RH, cloudy sky, and 5-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	6-30			
		Prmi	Flax	Fomi	Sobe
	oz/A		%		
Imazethapyr+SunitII	0.5+0.18G	89	68	98	0
Imazethapyr+Scoil	0.5+0.18G	91	71	98	0
Imazethapyr+ND4	0.5+0.5%	90	66	95	0
Imazethapyr+ND4	0.5+1%	93	65	98	0
Imazethapyr+ND72	0.5+0.5%	85	53	94	0
Imazethapyr+ND72	0.5+1%	86	59	97	0
Imazethapyr+ND148	0.5+1%	89	41	94	0
Imazethapyr+ND140	0.5+1%	85	51	94	0
Imazethapyr+ND163a	0.5+1%	87	39	96	0
Imazethapyr+AR516	0.5+1%	85	55	92	0
Untreated	0	0	0	0	0
C.V. %		5	22	3	0
LSD 5%		6	17	4	NS
# OF REPS		4	4	4	4

Contitions were wet so imazethapyr efficacy was high. Imazethapyr was most phytotoxic to proso millet and flax when applied with Sun-it II, Scoil, and ND-4. Soybean was not injured regardless of adjuvant and foxtail millet control nearly complete regardless of adjuvant with imazethapyr.

Imazamethabenz with Adjuvants and Spray Volume, Fargo 1997. (Nalewaja) 'Valley' oats, white proso millet, and red Siberian foxtail millet were seeded in adjacent drill strips July 25. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced 20 inches apart. The offset boom eliminated wheel tracks from within the plot and a cone shield mounted at each nozzle reduced drift. Treatments were applied to 9 inch and 5 leaf oats with 3 tillers; 11 inch and 6 leaf foxtail and proso millets both with 2 tillers on August 20 with 67 F, 5- to 10-mph wind, 54% RH, and a partly cloudy sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Percent control was visual estimates based on comparison to non-treated plants.

Treatment	Adjuvant	Spray volume	Nozzle	Rate	8-29		9-10	
					Oat	Fomi	Oat	Fomi
	pt/A	gpa		oz/A	%			
Imazamethabenz+SunitII	1.5	2.5	8001	3+6%	80	44	95	67
Imazamethabenz+SunitII	0.75	2.5	8001	3+3%	63	30	89	61
Imazamethabenz+SunitII	0.37	2.5	8001	3+1.5%	67	26	77	34
Imazamethabenz+SunitII	1.5	5	8001	3+3%	69	35	92	63
Imazamethabenz+SunitII	0.75	5	8001	3+1.5%	54	19	65	28
Imazamethabenz+SunitII	0.37	5	8001	3+0.75%	43	14	45	20
Imazamethabenz+SunitII	1.5	20	8003	3+1.5%	88	64	98	83
Imazamethabenz+Act90	0.25	2.5	8001	3+1%	71	40	88	50
Imazamethabenz+Act90	0.12	2.5	8001	3+.5%	69	40	86	61
Imazamethabenz+Act90	0.06	2.5	8001	3+.25%	46	16	49	19
Imazamethabenz+Act90	0.25	5	8001	3+.5%	66	30	85	51
Imazamethabenz+Act90	0.12	5	8001	3+.25%	51	16	65	25
Imazamethabenz+Act90	0.25	20	8003	3+.25%	72	35	91	65
C.V. %					12	32	6	17
LSD 5%					11	14	7	12
# OF REPS					4	4	4	4

Data interpretation will consider only the late evaluation for oats which should represent wild oat control for which imazamethabenz is used commercially. Other experiments indicated that low spray volume (5 gpa) was more efficacious than the high volume (30 gpa) when imazamethabenz was applied with Sun-it II at 1.5 pt/A. These data indicate that the high percentage oil in the spray carrier with low volume accounted for the greater efficacy. In this experiment 2.5 and 5 gpa were equally as effective as 20 gpa when Sun-it II was kept at 1.5 pt/A. Increasing the percentage of surfactant, Activator 90, from 0.25 to 1% in 2.5 gpa and 0.25 to 0.5% in 5 gpa (both at 0.25 pt/A) greatly increased efficacy of imazamethabenz. Thus, low spray volumes are equally as effective as high spray volumes so long as adjuvant ammounts are kept constant.

Sethoxydim Spray Volume and Droplet Size, Fargo 1997. (Nalewaja) 'Valley' oats, white proso millet, and red Siberian foxtail millet were seeded in adjacent drill strips June 4. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced 20 inches apart. A cone shield mounted at each nozzle reduced drift and the offset boom eliminated wheel tracks from within the plot. Treatments were applied to boot stage oats 16 inches tall and 7 leaf with 2 tillers; proso millet 14 inches tall and 4- to 6-leaf; and foxtail millet 14 inches tall and 7 leaf with 2 tillers on July 22 with 86 F, 3 mph wind, 52% RH, and partly cloudy sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken on August 4.

Treatment	Nozzle	Spray volume	Rate	8-04		
				Oat	Prmi	Fota
		gpa	oz/A		%	
Sethoxydim+PO	8001	5	1.5+.25G	61	74	72
Sethoxydim+Scoil	8001	5	1.5+.25G	83	88	79
Sethoxydim+PO	8001	5	1.5+1%	48	62	61
Sethoxydim+Scoil	8001	5	1.5+1%	67	74	72
Sethoxydim+PO	8002	5	1.5+.25G	54	71	60
Sethoxydim+Scoil	8002	5	1.5+.25G	84	83	78
Sethoxydim+PO	8002	5	1.5+1%	45	58	63
Sethoxydim+Scoil	8002	5	1.5+1%	69	68	69
Sethoxydim+PO	8004	20	1.5+.25G	38	54	51
Sethoxydim+Scoil	8004	20	1.5+.25G	70	70	69
Sethoxydim+PO	8004	20	1.5+1%	49	63	62
Sethoxydim+Scoil	8004	20	1.5+1%	60	63	64
Untreated			0	0	0	0
C.V. %				22	21	21
LSD 5%				18	19	18
# OF REPS				4	4	4

Sethoxydim was more efficacious when applied at 5 gpa than 20 gpa, when the oil adjuvants were applied on an area basis of 1 qt/A (0.25G). However, when the oils were on a spray percentage basis, spray volume was not important to efficacy. The amount of oil per area increased with spray volume when on a percentage basis which probably compensated for any advantage from the smaller droplets at the lower volumes. Sethoxydim often tended to be more effective when applied as the smaller droplets from the 8001 than larger droplets from the 8002 nozzle, at 5 gpa, Sethoxydim was more effective when applied with Scoil, a methylyated vegetable oil, than the petroleum oil at all spray volumes. These results indicate that low spray volume and possibly small spray droplets are positive to sethoxydim efficacy. The low volume is especially important when oil adjuvants are applied on an area basis. The greater oil adjuvant concentration with low volume probably is important to sethoxydim efficacy.

Adjuvants with CGA-184927, Fargo 1997. '2375' hard red spring wheat, 'Valley' oat, white proso millet, and Siberian foxtail millet was seeded May 21. Treatments were applied to 4.5-leaf wheat, 4-leaf oat, and 5-leaf proso and foxtail millet on June 26 with 75 F, 40% RH, clear sky and 8-mph wind. Treatments (5d) were applied to 5-to 6-leaf wheat and proso millet and 4- to 5-leaf oat and foxtail millet on July 1 with 83 F, 60% RH, mostly cloudy sky, 5- to 10-mph wind. A rainfall of .16 inch occurred 6 hours after applications. All treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7-15-97			
		Wht	Oat	Prmi	Fomi
	oz/A			%	
CGA-184927+Score	0.25+0.08G	2	99	90	85
CGA-184927+Scoil	0.25+0.08G	2	99	94	90
CGA-184927+Scoil	0.25+0.18G	2	99	94	93
CGA-184927+SunitII	0.25+0.18G	1	98	93	87
CGA-184927+ND4	0.25+1%	3	99	92	84
CGA-184927+Herbimax	0.25+0.08G	0	99	94	86
CGA-184927+Tergitol 15-S-7	0.25+0.25%	0	99	90	86
CGA-184927+Tergitol 15-S-30	0.25+0.25%	0	99	83	81
CGA-184927+LAE 810-60	0.25+0.25%	0	99	92	82
CGA-184927+S240	0.25+0.25%	2	99	91	90
CGA-184927+S278	0.25+0.25%	1	99	91	88
CGA-184927+SilwetL77	0.25+0.25%	2	99	95	90
CGA-184927+Score/CGA-184927+Score(5d)	0.2+0.08G/0.2+0.08G	3	98	81	78
Untreated	0	0	0	0	0
C.V. %		171	1	4	6
LSD 5%		NS	1	5	7
# OF REPS		4	4	4	4

Conditions were extremely wet and adjuvants did not greatly influence CGA-184927 efficacy eventhough applied at less than one half the recommended rate. Oat was completely controlled by CGA-184927 regardless of adjuvant. proso millet and foxtail millet control generally were greatest when CGA-184927 was applied with Scoil or Silwett L77. The lower HLB less viscous more spreading Tergitol 15-S-7 tended to be more efficacious than Tergtitol 15-S-30. These data indicate that the spreading of spray droplets by surfactants may be important to efficacy of CGA-184927.

Glyphosate Spray Volume and Droplet Size on Species, Fargo 1997. (Nalewaja) 'Valley' oats, white proso millet, and red Siberian foxtail millet were seeded in adjacent drill strips May 21. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4- wheeled all-terrain vehicle equipped with a side mounted boom with four nozzles spaced 20 inches apart. A cone shield mounted on each nozzle reduced drift and the offset boom eliminated wheel tracks from within the plot. Treatments were applied to oats 12 inches tall and 8- to 9-leaf with 2- to 3-tillers; proso millet 10- to 12-inches tall and 4- to 5-leaf; and foxtail millet 7- to 9-inches tall and 5- to 6-leaf on July 1 with 83 F, 10 mph wind, 65% RH, and a cloudy sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. A visual estimate of percentage control was taken on July 15.

Treatment	Nozzle	Spray volume	Rate	7-15		
				Oat	Prmi	Fota
		gpa	oz/A		%	
Glyt-Ultra	8001	5	1	90	81	98
Glyt-Ultra+12-14-60	8001	5	1+.25%	99	83	97
Glyt-Ultra+12-14-80	8001	5	1+.25%	94	90	99
Glyt-Ultra+12-14-60	8001	4x20	1+.25%	98	69	97
Glyt-Ultra+12-14-80	8001	4x20	1+.25%	97	80	98
Glyt-Ultra+12-14-60	8002	10	1+.25%	98	81	95
Glyt-Ultra+12-14-80	8002	10	1+.25%	96	88	99
Glyt-Ultra+12-14-60	8004	20	1+.25%	97	63	88
Glyt-Ultra+12-14-80	8004	20	1+.25%	95	75	97
Glyt-Ultra	8006	30	1	66	48	77
Glyt-Ultra+12-14-60	8006	30	1+.25%	97	60	88
Glyt-Ultra+12-14-80	8006	30	1+.25%	95	71	97
Untreated			0	0	0	0
C.V. %				6	12	9
LSD 5%				7	12	11
# OF REPS				4	4	4

Glyphosate (Ultra formulation) when applied with surfactants too phytotoxic for good differenciation of differences between surfactants or spray volume, except for proso millet control. However, glyphosate without surfactant was much less phytotoxic to all species when applied at 30 than 5 gpa. Glyphosate phytotoxicity to proso millet increased as spray volume decreased regardless of droplet size and was more phytotoxic when with 12-14-80 than 12-14-60 surfactant. The spray carrier was the "new" Fargo water low in salts so the increased effectiveness of low spray volume probably was from increased glyphosate concentration in the spray carrier.

Quizalofop with Adjuvants on Oats, Proso Millet, and Foxtail Millet, Fargo 1997. (Nalewaja) 'Valley' oat, white proso millet, and 'siberian' foxtail millet were seeded May 21. Treatments were applied to 5- to 6-leaf oat, 6-leaf proso millet, and 4- to 6-leaf foxtail millet on July 21 with 75 F, 68% RH, partly cloudy sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7-31		
		Oat	Prmi	Fomi
	oz/A		%	
Quizalofop+Herbimax	0.25+0.25G	86	84	74
Quizalofop+PO(Mor-Act)	0.25+0.25G	91	87	83
Quizalofop+PO(Prime oil)	0.25+0.25G	91	89	82
Quizalofop+PO(Clean Crop)	0.25+0.25G	94	83	80
Quizalofop+Scoil	0.25+0.25G	88	85	81
Quizalofop+SunitII	0.25+0.25G	87	82	72
Quizalofop+Act90	0.25+0.25%	94	87	82
Quizalofop+Silwet L77	0.25+0.25%	91	82	71
Quizalofop+S240	0.25+0.25%	94	92	85
Quizalofop+S278	0.25+0.25%	96	93	87
Untreated	0	0	0	0
C.V. %		4	8	10
LSD 5%		5	9	10
# OF REPS		4	4	4

Quizalofop phytotoxicity to grasses was greatest when applied with S278 silicone surfactant. Various commercial petroleum oil adjuvants (PO) were similarly effective with quizalofop. Quizalofop at only 0.25 oz/A was highly effective probably because of the excessively wet conditions.

Nicosulfuron Spray Volume and AMS, Fargo 1997. (Nalewaja) 'Valley' oats, white proso millet, and red Siberian foxtail millet were seeded in adjacent drill strips July 25. Treatments were applied perpendicular to the drill strips so that each plot contained all three species. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced at 20 inches apart. The offset boom eliminated wheel tracks from within the plot. Treatments were applied August 13 to oats 6 inches tall and 4 leaf with 1 tiller; proso millet 8 inches tall and 4- to 5-leaf with 1 tiller; and foxtail millet 8 inches tall and 5 leaf with 2 tillers with 70 F, calm wind, 45% RH, and a clear sky. Plot size was 11.5 by 23 feet and the experiment was a randomized complete block design with four replicates. Visual estimates of percentage control were taken on August 26 and September 10.

Treatment	Nozzle	Spray volume	Rate	8-26			9-10
				Oat	Fomi	Prmi	Oat
		gpa	oz/A			%	
Nico+X-77+AMS	8001	5	0.37+.25%+32	41	73	73	61
Nico+Scoil	8001	5	0.37+.18G	84	97	93	96
Nico+Scoil	8001	5	0.37+1%	54	92	86	73
Nico+ND4	8001	5	0.37+1%	82	92	91	95
Nico+X-77+AMS	8004	10	0.37+.25%+32	43	79	78	67
Nico+Scoil	8004	10	0.37+.18G	80	97	94	93
Nico+Scoil	8004	10	0.37+1%	54	92	69	73
Nico+ND4	8004	10	0.37+1%	84	94	94	97
Nico+X-77+AMS	8004	20	0.37+.25%+32	56	86	86	73
Nico+Scoil	8004	20	0.37+.18G	58	94	90	78
Nico+Scoil	8004	20	0.37+1%	74	96	94	82
Nico+ND4	8004	20	0.37+1%	86	95	91	98
Untreated			0	0	0	0	0
C.V. %				10	5	16	7
LSD 5%				8	7	19	8
# OF REPS				4	4	4	4

Discussion will be limited to the late rating of oat control which appeared to best express response to adjuvants. Oat control from nicosulfuron increased with spray volume when applied with X-77 at 0.25% and ammonium sulfate at 32 oz/A. Oat control increased as spray volume decreased when nicosulfuron was applied with Scoil at 1.5 pt/A (0.18G), but not when at 1%. The high concentration of Scoil that occurred in low spray volume apparently was important to nicosulfuron efficacy. ND-4 at 1% of spray volume was efficacious with nicosulfruon at all spray volumes.

Spray Volume with Bromoxynil, Fargo, 1997. (Nalewaja) Plots were established in a mowed field with a good stand of regrowth redroot pigweed. Treatments were applied at 28 psi with a 4-wheeled all-terrain sprayer equipped with a side mounted boom with four nozzles spaced 20 inches apart. The offset boom eliminated wheel tracks from within the plot and a cone shield mounted at each nozzle reduced drift. Treatments were applied to 5- to 9-inch flowering pigweed on August 11 with 65 F, 7 mph wind, 59% RH, and a clear sky. Plot size was 11.5 by 30 feet and the experiment was a randomized complete block design with four replicates. A visual estimate of percentage control was taken on August 27.

Treatment	Rate	Nozzle	Spray volume	Mph	# of pass	8-27 Rrpw
	lb/A		gpa			%
Bromoxynil	0.188	8001	5	5	1	41
Bromoxynil	0.188	8001	20	5	4	36
Bromoxynil	0.188	8002	5	10	1	40
Bromoxynil	0.188	8002	10	5	1	43
Bromoxynil	0.188	8004	10	10	1	34
Bromoxynil	0.188	8004	20	5	1	44
Bromoxynil	0.188	8006	30	5	1	48
C.V. %						33
LSD 5%						NS
# OF REPS						4

Spray volume and spray droplet size did not influence bromoxynil efficacy for redroot pigweed control. Control level was low because of the large pigweed at treatment and the low bromoxynil rate used in the experiment.

EXP311301A in Corn PE, Casselton 1997. (Nalewaja) Treatments were applied on May 28 with 70 F, 35% RH, clear sky, and 5- to 8-mph wind. Treatments were applied with a bicycle wheel type plot sprayer delivering 17 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. 'Interstate Payco 4x-85' corn was seeded following treatments. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7-14-97			
		Corn	Yeft	Wimu	Cocb
	oz/A		%		
EXP31130A	1.13	0	40	28	14
EXP31130A	1.50	0	64	54	28
EXP31130A	1.88	0	64	36	15
EXP31130A+Acet	1.5+16	0	88	66	35
EXP31130A+MetoII	1.5+20	4	80	35	25
EXP31130A+Atra-L	1.5+ 12	0	50	30	30
EXP31430A	1.08	0	59	61	15
EXP31430A	0.81	0	40	55	20
EXP31498A	0.83	0	46	51	8
EXP31498A	1.10	3	60	60	24
Cyan-DF+Atra-DF+MetoII	20+8+32	0	95	91	48
Cyan-DF+Atra-DF+Acet	20+8+24	0	92	93	46
Untreated	0	0	0	0	0
C.V. %		500	24	34	77
LSD 5%		NS	21	25	26
# of Reps		4	4	4	4

Herbicides were applied to a lumpy soil surface. A 0.6 inch rain occurred 3 days after treatment with no further rain for about 3 weeks. The 0.6 inch rain may have helped weed germination from inbetween the lumps. The herbicide proabably was retained mainly on the lumps that were not disrupted by the 0.6 inch rain. Corn was not injured by herbicides. Weed control was inadequate, except for the standard reference treatments. The lumpy conditions may have accounted for the generally poor weed control from EXP31130A applied alone and the mistaken low use rate of EXP31498A.

PPI vs. PP Incorporated EXP31130A with Corn, Casselton 1997. (Nalewaja) All treatments were applied on May 28 with 70 F, 35% RH, clear sky, and 5- to 8-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 17 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. Treatments (PPI) were incorporated twice with field cultivator plus harrow. PP treatments were applied after incorporation tillage, but before corn was seeded. 'Interstate Payco 4x-85' corn was seeded on May 28 following treatment. The experiment was a randomized complete block design with four replicates.

		7-14-97			
Treatment	Rate	Corn	Yeft	Cocb	Wimu
	oz/A		%		
EXP31130A(PPI)	1.5	0	61	0	57
EXP31130A+Acet(PPI)	1.5+16	0	94	64	98
Cyan-DF+Atra-DF+Acet(PPI)	20+8+24	0	97	90	99
EXP31130A(PP)	1.5	0	23	8	0
EXP31130A+Acet(PP)	1.5+16	3	91	61	91
Cyan-DF+Atra-DF+Acet(PP)	20+8+24	0	95	76	91
Untreated	0	0	0	0	0
C.V. %		529	21	36	27
LSD 5%		NS	21	23	25
# OF REPS		4	4	4	4

EXP31130A was more effective when preplant soil incorporated than as a preplant surface treatment. However, EXP 31130A alone did not give acceptable weed control with either method of application. The application of acetochlor with EXP 31130A enhanced control of yellow foxtail which exceed 90%. All herbicide treatments tended to be more effective when soil incorporated. The soil was very wet when cultivated for herbicide incorporation creating a very lumpy surface. The lumpy soil and dryness after herbicide application may have accounted for the poor weed control. A rain of about 0.5 inches occurred 3 days after treatment. This rain probably stimulated weed germination but did not mallow the soil lumps, which were covered with the surface applied herbicides.

Adjuvants with Nicosulfuron in Corn, Casselton 1997. (Nalewaja) 'Interstate Payco 4x-85' corn was seeded May 28. Treatments were applied to 4- to 7-leaf corn, 4- to 7-leaf green and yellow foxtail, and 6-leaf common cocklebur on June 26 with 68 F, 50% RH, clear sky, and 5-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat fan nozzles to a 7 ft wide area the length of 10 by 30 ft plots. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	7-14				8-01			
		Corn	Yeft	Wimu	Cocb	Corn	Yeft	Cocb	Wimu
	oz/A	%							
Nicosulfuron&Rims&Atra+PO	1.11+1%	1	39	34	98	6	59	99	46
Nicosulfuron&Rims&Atra+Scoil	1.11+1%	0	64	23	99	1	70	99	30
Nicosulfuron&Rims&Atra+PO	0.56+2%	0	21	14	87	1	65	99	25
Nicosulfuron&Rims&Atra+Scoil	0.56+1%	1	47	28	91	1	81	99	40
Nicosulfuron&Rims&Atra+Scoil	0.56+2%	0	62	23	97	0	85	99	23
Nicosulfuron+ND72	0.25+1%	1	97	48	99	1	95	99	53
Nicosulfuron+ND4	0.25+1%	0	75	50	99	1	96	99	53
Nicosulfuron+Scoil	0.25+2%	0	75	41	99	0	95	99	36
Nicosulfuron+Dica+Scoil	0.25+2+2%	0	98	99	99	0	98	99	99
Nicosulfuron+Flum&Clop&24-D+Act90	0.5+3.37+.25%	0	94	99	99	1	92	99	97
Nicosulfuron+Flum&Clop&24-D+ND4	0.5+3.37+1%	0	97	99	99	0	97	99	99
Nicosulfuron+Flum&Clop&24-D+ND4	0.25+1.7+1%	0	74	73	74	3	95	99	92
Untreated	0	0	0	0	0	0	0	0	0
C.V. %		428	36	33	16	188	10	0	23
LSD 5%		NS	33	23	21	3	12	0	18
# OF REPS		4	4	4	4	4	4	4	4

Conditions after treatment were severly wet probably accentuating weed control, especially at the second evaluation, at the first evaluation, control was not yet completely expressed. The most effective treatment were Nicosulfuron at 0.25 oz + dicamba at 2 oz/A + Scoil at 2%; and nicosulfuron at 0.5 oz/A + flumetsulam & clopyralid & 2,4-D at 3.37 + activator 90 or Scooil. At the second evaluation all nicosulfuron treatments were highly effective. Dicamba at 2 oz/A with nicosulfuron at 0.25 oz/A + Scoil at 2% continued to give effective control of grass and broadleaf weeds without injury to corn.

Weed control in corn, 1997, Galchutt (Zollinger, Seibert, and Fitterer) A study was conducted to evaluate weed control in corn. Pioneer '9730' corn was seeded May 9 and PRE treatments were applied May 12 at 4:00 pm with 58 F air, 58 F soil at 4", 90% RH, 90% clouds, and 12 mph wind. EPOST treatments were applied June 4 at 3:45 pm with 88 F air, 92 F soil surface, 28% RH, 10% clouds, and 3-8 mph wind to V1-V2 corn, 1-2" foxtail (10-100/ft^2), 0.25-4" diameter rosette wild mustard (1/ft^2), 1-2" redroot pigweed (2-3/ft^2), 1-2" common lambsquarters (2-12/ft^2), and 0.5-1" wild sunflower (1/ft^2). POST treatments were applied June 12 at 11:30 am with 83 F air, 45% RH, 15% clouds, and 2-5 mph wind to V3-V4 corn, 2-6" foxtail, 2-6" diameter rosette wild mustard, 2-8" redroot pigweed, 2-8" common lambsquarters, and 3-6" wild sunflower. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

The purpose of the study was to evaluate weed control from conventional herbicides and herbicides that are used on tolerant crops. A conventional corn variety was planted which resulted in complete death from Liberty and Lightning.

Herbicides at 14 DAT gave poor to excellent weed control, but by 28 DAT most treatments gave greater than 90% broadleaf weed control but variable foxtail and wild proso millet control.

Crop Injury: When corn was 4 to 8 inches and after significant rain events, corn chlorosis and whitening was observed from all Balance treatments. Herbicide symptoms disappeared after 5 to 7 days, but no reduction in height or permanent negative effect from exposure was observed at any of evaluation. Some tightening of corn leaves were observed with some Banvel treatments. No other treatments caused corn injury.

14 DAT: Most of the foxtail escaping control from Balance or Accent applied alone was yellow foxtail. Combinations or sequential application of these herbicides with atrazine or Shotgun (contains atrazine) increased grass control. Most treatments gave good to excellent pigweed and lambsquarters control, but BAS 662 and Hornet gave low control which shows a weakness of Hornet POST. BAS 662 also gave low sunflower control. Liberty, Lightning, or Basis Gold generally gave excellent broadleaf weed control but variable grass control.

28DAT: Most treatments, except BAS 662, gave greater than 90% broadleaf weed control. Accent followed by Hornet gave 60% lambsquarters control showing a weakness of both herbicides. Treatments containing Accent gave greater than 85% grass control.

Liberty and Lightning: Lightning controlled grass and broadleaf weeds. Liberty gave 60% to 80% grass control showing Liberty may not control some grass species.

Basis Gold: Basis Gold is a premix of Accent, Matrix, and atrazine. The amount of atrazine in the labeled rate of 14 oz product/A is 0.75 lb ai/A and small grains and other sensitive crops planted the next year after Basis Gold may be injured from atrazine residue. Research has shown that most crops including wheat and sugarbeet can be planted the year following atrazine if applied at no more than 0.38 lb ai/A which amount would be in the half rate of Basis Gold. In an attempt to utilize this product in ND, weed control was evaluated at reduced rates to prevent crop rotation restrictions from atrazine.
The following chart shows amount of product at each rate used.

Basis Gold Rate	Accent oz product/A	Matrix oz product/A	Total SU	Atrazine lb ai/A	$/A
14 oz product/A	0.188 (3/16)	0.188 (3/16)	0.376	0.76	$16.00
10.7 oz product/A	0.14	0.14	0.28	0.58	$12.00
7 oz product/A	0.094	0.094	0.188	0.38	$ 8.00

Applying Basis Gold at 7 oz product/A reduces the atrazine rate to 0.38 lb ai/A but also may reduce Accent and Matrix rates below adequate levels for weed control with the low rate of atrazine. Adding Accent at 0.2 oz product/A ($5.60) to Basis Gold at 7 oz product/A equals a total sulfonylurea (SU) rate of 0.29 oz product/A or the equivalent to the total SU rate as in Basis Gold at 10.7 oz product/A and costs $13.50/A. Excellent weed control was observed with all Basis Gold treatments.

ND-4: ND-4 is an adjuvant developed at NDSU for use with certain herbicides including Accent, Pursuit, and Raptor. ND-4 is to be applied at 1% v/v. ND-4 is an surfactant/adjuvant blend and should cost less than using Scoil or a methylated seed oil (MSO type) adjuvant with equal weed control. Accent at a half label rate of 0.33 oz product/A + ND-4 gave equal or greater weed control than Accent at full label rates alone or with tankmix combinations.

Treatment	Rate	14 DAT					28 DAT					
		Fxtl	Wipm	Rrpw	Colq	Snfl	Grft	Yeft	Wipm	Rrpw	Colq	Snfl
	Product/A	% control										
PRE												
Surpass + Hornet	2.5 pt + 0.3 lb	93	79	99	99	96	93	90	77	99	99	99
Balance	2 oz	90	95	99	99	90	98	90	96	99	99	99
Balance	1.5 oz	68	87	99	99	80	96	83	90	93	94	99
Balance + Atrazine	1.5 oz + 0.42 lb	73	91	99	99	70	98	92	93	99	99	99
PRE fb POST												
Axiom / Banvel	1.44 lb / 1 pt	85	45	90	85	70	90	92	30	99	99	66
Frontier / Buctril	20 oz / 1.5 pt	70	35	80	90	80	77	57	20	99	99	99
Frontier / CA 1216	20 oz / 2.25 lb	73	37	80	93	85	83	55	27	99	99	99
Frontier / Shotgun	20 oz / 2 pt	75	25	83	95	83	83	57	58	99	99	99
Frontier / Shotgun	20 oz / 3 pt	87	30	90	99	90	87	87	67	99	99	99
Balance / Accent + Scoil	1.5 oz / 0.33 oz + 1.5 pt	60	97	99	99	70	99	97	87	99	99	99
Balance / Banvel	1.5 oz / 1 pt	63	87	99	99	70	98	78	78	99	99	99
Balance / Scorpion III + NIS + UAN	1.5 oz / 0.25 lb+0.25+2	70	85	99	99	70	96	82	82	99	99	99
Balance / Accent + Atrazine + Scoil	1.5 oz / 0.33oz+0.42lb+1.5	83	90	96	99	72	99	96	96	99	99	99
Frontier / BAS 662	20 oz / 0.25 lb	90	20	69	27	10	85	80	57	89	66	83
Frontier / BAS 662	20 oz / 0.375 lb	92	20	98	30	40	90	83	73	86	69	86
Balance / Liberty + AMS	1.5 oz / 16 oz + 3 lb	80	87	99	99	70	99	99	99	99	99	99
EPOST												
Accent + Prowl + Atrazine + Scoil	0.67 oz + 3 pt+0.42lb+1.5	97	90	99	99	90	99	96	95	99	99	99
POST												
Accent + Atrazine + Scoil	0.67 oz + 0.42lb + 1.5 pt	74	80	96	98	95	98	96	90	96	99	99
Accent + Atrazine + CA 1216 + Scoil	0.67 oz + 0.42lb+1.5lb+1.5	61	80	99	99	96	91	85	85	99	99	99
Accent + Scorpion III + NIS + UAN	0.67 oz + 0.25 lb+0.25+2.5	65	70	95	77	95	95	85	85	99	99	99
Accent + Hornet + NIS + UAN	0.67 oz + 2.4 oz+0.25+2.5	77	80	78	63	60	98	95	95	93	60	98
Accent + Banvel + NIS + UAN	0.67 oz + 1pt + 0.25+2.5	68	75	92	90	80	98	88	87	99	99	99
Liberty + AMS	28 oz + 3 lb	62	70	90	95	95	60	60	60	90	99	99
Liberty + Atrazine + AMS	28 oz + 0.42 lb + 3 lb	83	80	90	96	95	80	77	77	93	99	99
Lightning + Scoil + UAN	1.28 oz + 1.5 pt + 2 qt	67	95	75	73	63	99	99	99	99	99	99
Lightning + Banvel + Scoil +UAN	1.28 oz + 6 oz + 1.5 + 2	81	95	90	90	93	99	99	99	99	99	99
Lightning + Atrazine + Scoil +UAN	1.28 oz + 0.42 lb + 1.5+2	81	99	96	98	95	98	96	96	99	99	99
Basis Gold + Scoil	14 oz + 1.5 pt	63	99	95	96	95	98	96	96	99	99	99
Basis Gold + Scoil	10.5 oz + 1.5 pt	58	99	98	96	93	96	90	90	99	99	99
Basis Gold + Accent + Scoil	7 oz + 0.2 oz + 1.5 pt	65	99	95	95	93	96	94	94	99	99	99
Accent + ND-4	0.33 oz + 1% v/v	-	-	-	-	-	95	93	90	99	60	96
LSD (0.05)		8	4	9	11	9	8	9	9	8	7	8

NIS = Preference at 0.25% v/v, Scoil = 1.5 pt/A, UAN = qt/A, AMS = 3 lb/A.
DAT = days after each PRE, PRE fb POST, EPOST and POST application.
CA 1216 = a dry formulation of bromoxynil, BAS 662 = dicamba + diflufenzopyr (auxin transport inhibitor).
ND-4 = surfactant blend adjuvant

Glufosinate tolerant corn, 1997, Casselton (Zollinger) A study was conducted to evaluate weed control in glufosinate tolerant corn. Northrup King 'N2555BT' corn was seeded and PRE treatments were applied May 28 at 5:15 pm with 73 F air, 55 F soil at 4", 21% RH, 60% clouds, and 3-7 mph wind. EPOST treatments were applied June 18 at 12:00 pm with 73 F air, 70 F soil surface, 56% RH, 97% clouds, and 0-5 mph wind to 3 collar corn, 1-2" foxtail (1-10/ft^2), 1-3" diameter rosette wild mustard (1-8/ft^2), 0-1" redroot pigweed (1/ft^2), 0-1" common lambsquarters (1/ft^2), and 1-3" common cocklebur (1-8/ft^2). POST treatments were applied June 21 at 2:00 pm with 80 F air, 23% RH, 30% clouds, and 0-8 mph wind to 4 collar corn, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). LPOST treatments were applied June 27 at 3:30 pm with 92 F air, 76% RH, 10% clouds, and 3-7 mph wind to 4-5 collar corn, 1-3" foxtail, 1-3" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-3" common cocklebur. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

This study was designed to test Liberty applied at labeled or reduced rates alone, with residual, tank-mix combinations, and sequential application against other standard herbicide treatments used in corn. Few weeds emerged after treatments where one application was made. PRE or PRE followed by POST application generally gave good weed control except wild mustard and Canada thistle. POST applications of Liberty alone or with residual herbicides gave good annual broadleaf weed control but variable foxtail control. Sequential applications of Liberty at rates as low 12 oz/A gave excellent and equal control as Liberty treatments at higher rates alone or in sequential applications. Sequential Liberty applications also increased Canada thistle control.

Treatment	Rate	July 2						July17					
	Product/A	Fxtl	Wimu	Rrpw	Colq	Cath	Cocb	Fxtl	Wimu	Rrpw	Colq	Cath	Cocb
		% control											
PRE													
Bicep II	2.4 qt	50	70	77	85	0	20	63	80	99	99	50	43
PRE fb POST													
Dual II / Liberty	3 pt / 28 oz	96	93	99	99	93	99	96	70	99	96	60	93
Atrazine / Liberty + AMS	0.55 lb / 28 oz + 3 lb	93	85	99	99	99	99	80	53	99	99	53	90
Balance / Liberty + AMS	1.5 oz / 16 oz + 3 lb	96	99	99	99	99	99	89	83	83	99	50	93
POST													
Liberty + AMS	28 oz + 3 lb	93	86	93	98	94	93	95	90	99	90	50	96
Liberty + Atrazine + AMS	28 oz + 0.5 lb + 3 lb	99	99	99	99	99	99	93	99	99	98	53	99
Accent + Buctril+Atrazine + NIS + UAN	0.67 oz + 2 pt + 0.25 % v/v + 2 qt	93	99	99	99	98	99	86	76	83	98	95	96
Liberty + AMS	20 oz + 3 lb	83	77	86	96	99	96	67	70	99	96	40	96
Liberty + Atrazine + AMS	20 oz + 0.42 lb + 3 lb	89	99	93	99	99	99	86	96	89	99	50	93
Liberty + Banvel + AMS	20 oz + 0.5 pt + 3 lb	75	89	99	99	99	99	53	77	89	99	80	86
Liberty + Prowl + AMS	20 oz + 3 pt + 3 lb	83	83	83	89	94	96	98	88	99	93	50	99
Liberty + Hornet + NIS + AMS	12 oz + 2.4 oz + 0.25 % v/v + 3 lb	93	99	99	99	99	96	78	99	99	93	99	96
Liberty + Scorpion III + NIS + UAN	12 oz + 0.25 lb + 0.25 % v/v + 3 lb	78	99	99	99	99	96	86	99	99	94	99	99
EPOST fb LPOST													
Liberty + AMS / Liberty + AMS	20 oz + 3 lb / 20 oz + 3 lb	99	99	99	99	99	99	99	98	99	99	96	99
Liberty + AMS / Liberty + AMS	16 oz + 3 lb / 16 oz + 3 lb	99	99	99	99	99	99	95	99	99	99	93	99
Liberty + AMS / Liberty + AMS	12 oz + 3 lb / 12 oz + 3 lb	93	99	99	99	99	99	93	96	99	99	99	96
LSD (0.05)		18	15	16	7	6	6	32	30	18	7	14	26

NIS = Preference

IMI tolerant corn, 1997, Casselton (Zollinger) A study was conducted to evaluate weed control in IMI tolerant corn. Garst '8773 It' was seeded and PRE treatments were applied May 28 at 5:30 pm with 73 F air, 55 F soil at 4", 21% RH, 60% clouds, and 3-7 mph wind. EPOST treatments were applied June 18 at 12:00 pm with 73 F air, 70 F soil surface, 56% RH, 97% clouds, and 0-5 mph wind to 2 collar corn, 1-2" foxtail (1-10/ft^2), 1-3" diameter rosette wild mustard (1-8/ft^2), 0-1" redroot pigweed (1/ft^2), 0-1" common lambsquarters (1/ft^2), and 1-3" common cocklebur (1-8/ft^2). POST treatments were applied June 21 at 2:00 pm with 80 F air, 90 F soil surface, 23% RH, 30% clouds, and 0-8 mph wind to 3 collar corn, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). LPOST treatments were applied June 27 at 3:30 pm with 92 F air, 76% RH, 10% clouds, and 3-7 mph wind to 4 collar corn, 1-3" foxtail, 1-3" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-3" common cocklebur. Treatments were applied to an 8 ft wide area the length of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

This study was designed to investigate weed control from a premix formulation of Lightning applied alone at various rates, with other herbicides, or in sequential application. All treatments gave near complete control of foxtail, wild mustard, and redroot pigweed. Redroot pigweed and common lambsquarters were completely controlled at the first evaluation. Common cocklebur control was variable but was 90% or greater when Lightning was applied at the highest rate, with Scoil, Banvel, or in sequential at the 0.5 oz/A rate schedule.

Treatment	Rate	July 2			July 17				
		Fxtl	Wimu	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% control							
PRE fb POST									
Balance / Lightning + Scoil	1.5 oz / 1 oz + 1.5 pt	99	93	63	99	99	99	99	83
POST									
Lightning + NIS + UAN	1.28 oz + 0.25 % v/v + 2 qt	99	93	78	99	99	99	99	97
Lightning + NIS + UAN	1 oz + 0.25 % v/v + 2 qt	99	93	68	99	99	99	99	79
Lightning + NIS + UAN	0.75 oz + 0.25 % v/v + 2 qt	99	89	40	96	96	96	98	73
Lightning + Scoil	1.28 oz + 1.5 pt	99	93	83	99	99	99	99	96
Lightning + Scoil	1 oz + 1.5 pt	99	93	73	99	99	99	99	94
Lightning + Prowl + NIS + UAN	1.28 oz + 3 pt + 0.25 % v/v + 2 qt	99	93	66	99	99	99	99	80
Lightning + Atrazine + PO + UAN	1.28 oz + 0.42 lb + 2 pt + 2 qt	99	99	57	99	99	99	99	93
Lightning + Atrazine + PO + UAN	1 oz + 0.42 lb + 2 pt + 2 qt	99	99	40	99	99	99	99	77
Lightning + Atrazine + Scoil	0.75 oz + 0.42 lb + 1.5 pt	99	99	40	99	99	99	99	80
Lightning + Banvel + NIS + UAN	1.28 oz + 6 oz + 0.25 % v/v + 2 qt	99	99	84	99	99	99	99	98
Lightning + Banvel + NIS + UAN	1 oz + 6 oz + 0.25 % v/v + 2 qt	99	99	78	99	99	99	99	98
Lightning + Shotgun + NIS + UAN	0.75 oz + 1.5 oz + 0.25 % v/v + 2 qt	96	99	94	96	99	99	99	95
EPOST fb LPOST									
Lightning + NIS + UAN / Lightning + NIS + UAN	0.5 oz + 0.25 % v/v + 2 qt / 0.5 oz + 0.25 % v/v + 2 qt	99	99	73	99	99	99	99	96
Lightning + NIS + UAN / Lightning + NIS + UAN	0.375 oz + 0.25 % v/v + 2 qt / 0.375 oz + 0.25 % v/v + 2 qt	99	99	60	99	99	99	99	70
LSD (0.05)		2	12	30	3	2	2	1	20

Rrpw and colq were 99% control on the first rating date.
NIS = Preference, PO = Herbimax

PRE weed control in corn, 1997, Casselton (Zollinger) A study was conducted to evaluate weed control in corn soil applied. Interstate Payco '4X85' corn was seeded and PRE treatments were applied May 28 at 1:00 pm with 73 F air, 21% RH, 40% clouds, and 3-7 mph wind. POST treatments were applied June 28 at 9:30 am with 82 F air, 90 F soil surface, 88% RH, 100% clouds, and 0-3 mph wind to 3-4 collar corn, 2-8" green and yellow foxtail (5-50/ft^2), 2-8" diameter rosette wild mustard (2-10/ft^2), 1-3" redroot pigweed (1-2/ft^2), 1-3" common lambsquarters (1-3/ft^2), and 2-8" common cocklebur (2-8/ft^2). Treatments were applied to the center 8 ft of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for PPI treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

		July 2						July 17		
Treatment	Rate	Corn	Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Cocb
	Product/A	% injury	% control							
PRE										
Surpass	2.5 pt	0	74	60	95	96	56	83	50	23
Surpass + Hornet	2.5 pt + 0.3 lb	3	90	99	99	99	99	98	99	99
Balance	2 oz	0	99	99	99	99	99	99	99	99
Balance + Surpass	1.5 oz + 1.25 pt	0	98	99	99	99	79	99	99	83
Balance + Surpass	2 oz + 1 pt	0	81	99	99	99	80	89	99	86
Balance + Atrazine	2 oz + 0.42 lb	23	96	99	99	99	94	99	99	89
PRE fb POST										
Frontier / Buctril	20 oz / 1 pt	0	72	96	99	99	99	77	99	99
Frontier / CA 1216	20 oz / 1.5 lb	0	68	96	99	99	99	77	99	99
Frontier / CA 1797	20 oz / 0.5 lb	0	60	96	99	99	93	77	99	99
Frontier / Buctril	20 oz / 1.5 pt	0	77	96	99	99	99	73	99	99
Frontier / CA 1216	20 oz / 2.25 lb	0	73	99	99	99	96	73	99	99
Frontier / CA 1797	20 oz / 0.75 lb	0	76	99	99	99	99	80	99	99
Frontier / BAS 662	20 oz / 0.25 lb	3	67	77	96	99	81	73	99	96
Frontier / BAS 662	20 oz / 0.375 lb	27	83	96	99	98	83	93	99	96
Frontier / Shotgun	20 oz / 2 pt	0	67	89	99	99	53	75	99	73
Frontier / Shotgun	20 oz / 3 pt	0	83	99	99	99	99	92	99	99
Frntr/Shtgn+Broclean	20/1.5pt+0.75 pt	0	53	83	99	99	83	83	99	99
Frntr/Shotgun+Banvel	20 / 1.5 pt + 2 oz	0	66	99	99	99	93	80	99	99
Frntr/Shotgun+Sencor	20 / 1.5 pt + 2 oz	7	75	99	99	99	99	86	99	99
Frntr/Shotgun+Sencor	20 / 1.5 pt + 2 oz	8	75	99	99	99	96	77	99	99
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		12	12	11	3	2	9	14	7	12

Frontier was applied at 20 fl oz/A, CA 1216, CA 1797 = dry formulations of bromoxynil, BAS 662 = dicamba + diflufenzapyr (an auxin transport inhibitor under development).

Most PRE treatments controlled foxtail, wild mustard, redroot pigweed, and common lambsquarters. Reduced foxtail control from Balance + Surpass PRE was due to yellow foxtail escapes. Surpass + Hornet completely controlled cocklebur.

The purpose of Frontier PRE only at 20 fl oz/A in the PRE followed by POST treatments was to reduce foxtail pressure so broadleaf weed control could be evaluated without being confounded by grass competition. BAS 662 gave increased foxtail control (herbistatic effect). Increased grass control was observed from Shotgun due to atrazine component. Redroot pigweed and common lambsquarters control was 99% at July 17. Most PRE treatments controlled foxtail, wild mustard, redroot pigweed, common lambsquarters and common cocklebur control (except low rate of Shotgun).

Soil applied corn herbicides, 1997, Casselton (Zollinger) A study was conducted to evaluate weed control in corn soil applied. Interstate Payco '4X85' corn was seeded and PPI treatments were applied May 28 and incorporated to a 1-2" depth at 10:00 am with 73 F air, 21% RH, 60% clouds, and 3-7 mph wind. POST treatments were applied June 27 at 3:30 pm with 92 F air, 115 F soil surface, 76% RH, 10% clouds, and 3-7 mph wind to 3-4 collar corn, 0.5-3" green and yellow foxtail, 1-3" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-3" common cocklebur. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for PPI treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	July 2		July 17		
		Fxtl	Cocb	Fxtl	Wimu	Cocb
	Product/A	% control				
PPI						
DoublePlay	5 pt	99	20	95	70	47
Surpass	2.5 pt	99	20	88	58	33
Axiom	1.2 lb	77	20	85	70	23
Axiom	1.32 lb	80	20	92	63	27
Axiom	1.44 lb	85	20	92	67	30
Lasso	3 qt	83	20	92	63	27
Axiom + Bladex	1.32 lb + 2.22 lb	90	93	97	89	70
Surpass + Bladex	2.5 pt + 2.22 lb	95	92	93	63	70
Surpass + Atrazine	2.5 pt + 0.55 lb	90	70	95	77	63
Surpass + Hornet	2.5 pt + 0.3 lb	95	96	97	92	90
PPI fb POST						
Axiom / Banvel	1.32 lb / 1 pt	80	98	96	99	99
Axiom / Banvel	1.44 lb / 1 pt	91	99	98	99	99
Untreated		0	0	0	0	0
LSD (0.05)		5	11	5	11	9

Wild mustard was 99% control on July 2 and redroot pigweed and common lambsquarters control was 99% on July 17. Most treatments controlled foxtail but not wild mustard which is a weakness of acetanilide herbicides. Bladex, Atrazine, Hornet, or Banvel was required to control wild mustard. Only treatments containing Hornet or Banvel controlled cocklebur.

Weed control in corn, 1997, Casselton (Zollinger) A study was conducted to evaluate POST weed control in corn. Interstate Payco '4X85' corn was seeded May 28. EPOST treatments were applied June 18 at 12:00 pm with 73 F air, 70 F soil surface, 56% RH, 97% clouds, and 0-5 mph wind to 3 collar corn, 1-2" green and yellow foxtail (1-10/ft^2), 1-3" diameter rosette wild mustard (1-8/ft^2), 1" redroot pigweed (1/ft^2), 1" common lambsquarters (1/ft^2), and 1-3" common cocklebur (1-8/ft^2). POST treatments were applied June 21 at 3:00 pm with 82 F air, 90 F soil surface, 23% RH, 40% clouds, and 0-8 mph wind to 4 collar corn, 1-4" green and yellow foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 1" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). LPOST treatments were applied June 27 at 3:30 pm with 92 F air, 115 F soil surface, 76% RH, 10% clouds, and 3-7 mph wind to 5 collar corn, 0.5-3" green and yellow foxtail, 1-3" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-5" common cocklebur. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		14 DAT		28 DAT		
Treatment	Rate	Cath	Cocb	Fxtl	Cath	Cocb
	Product/A			% control		
EPOST						
Accent + Surpass + Clarity+NIS	0.33oz+1.5pt+ 0.5 pt+0.25	47	63	93	70	99
Prowl + Accent + NIS + UAN	3 pt + 0.5 oz + 0.25 + 2	13	30	99	20	33
Prwl + Acnt+Clarity+NIS+UAN	3 pt + 0.5 oz + 6 oz + 0.25+2	47	60	99	77	86
Prwl + Acnt + Bctrl +NIS+UAN	3 pt + 0.5oz + 0.75pt+0.25+2	27	98	99	50	99
Prwl + Acnt + Atra + NIS+UAN	3 pt + 0.5oz+0.42lb+0.25+2	10	53	99	0	20
POST						
Accent + Atrazine + Scoil	0.5 oz + 0.42 lb + 1.5 pt	20	50	99	40	50
Acnt + Bctrl + Atra+ NIS+UAN	0.67 oz + 1pt+0.42lb+0.25+2	50	99	99	37	99
Acnt+CA1216+Atra+NIS+UAN	0.67oz+1.5lb+0.42lb+0.25+2	70	99	99	20	99
Acnt+CA1216+Atra+NIS+UAN	0.67 oz+1.5+0.42lb+0.25+2	53	99	99	23	93
Acnt + Scorpion III + NIS+UAN	0.67 oz + 0.25 lb + 0.25 + 2	60	96	99	80	99
Accent + Hornet + NIS + UAN	0.67 oz + 2.4 oz + 0.25 + 2	57	70	98	87	99
POST fb LPOST						
Accent + NIS + UAN / Hornet+NIS+UAN	0.67 oz + 0.25 + 2 / 2.4oz + 0.25 + 2	40	57	96	80	99
Untreated		0	0	0	0	0
LSD (0.05)		14	11	4	12	7

DAT refers to number of days after each EPOST, POST, and LPOST application
NIS = Preference at 0.25% v/v, UAN at 2 qt/A.
CA 1216 = a dry formulation of bromoxynil.

No corn injury was observed at either evaluation date. Foxtail, wild mustard, redroot pigweed, and common lambsquarters control was 99% at 14 DAT. Wild mustard, redroot pigweed, and common lambsquarters control was 99% at 28 DAT. By 28 DAT, near complete foxtail control resulted from all treatments containing bromoxynil, Clarity, Scorpion III, or Hornet gave complete cocklebur control, and treatments containing Scorpion III or Hornet gave greater than 80% Canada thistle control.

Weed control in corn, 1997, Carrington (Zollinger and Endres) A study was conducted to evaluate weed control in corn. Interstate Payco '4X85' corn was seeded May 28. PPI treatments were applied May 12 at 7:00 pm with 42 F air, 30% clouds, and 6-13 mph wind. PRE treatments were applied May 16 at 6:30 pm with 68 F air, 0% clouds, and 6-13 mph wind. POST treatments were applied June 17 at 5:30 pm with 60 F air, 64 F soil surface, 20% clouds, and 8-13 mph wind to 4 collar corn, 4-5 leaf foxtail, 3" common lambsquarters, 3-5" Russian thistle, 3-4" wild buckwheat, 2" redroot pigweed, 1" prostrate pigweed, 2nd trifoliolate volunteer soybean, and 3-4" volunteer canola. Treatments were applied to the center 8 ft of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 10 gpa at 40 psi through 8001 flat fan nozzles for POST applied treatments. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	July 15						
		Fxtl	Wimu	Rrpw	Colq	Ruth	Wibw	Kocz
	Product/A	% control						
PPI								
DoublePlay	5 pt	98	99	99	99	83	96	99
PPI fb POST								
Axiom / Banvel	1.44 lb + 1 pt	90	99	99	99	76	78	99
PRE								
Surpass + Hornet	2.5 pt + 0.3 lb	80	99	96	93	66	80	80
Balance	2 oz	60	99	27	60	57	7	96
Balance + Atrazine	1.5 oz + 0.42 lb	75	90	83	89	83	50	83
PRE fb POST								
Frontier / Buctril	20 oz / 1.5 pt	92	99	93	96	86	95	99
Frontier / CA 1216	20 oz / 2.25 lb	90	86	93	93	73	93	99
Frontier / Shotgun	20 oz / 3 pt	93	99	96	99	94	66	93
Balance / Banvel	1.5 oz / 1 pt	63	93	99	99	96	99	99
Blnc / ScrpnIII+NIS+UAN	1.5 oz / 0.25 lb + 0.25+2	80	99	95	99	99	93	99
Blnc / Acnt + Atra + Scoil	1.5 oz / 0.33oz+0.42lb+1.5	88	99	99	99	93	82	99
Frtr / BAS 662	20 oz / 0.25 lb	68	99	63	77	62	99	99
Frtr / BAS 662	20 oz / 0.375 lb	82	99	66	95	78	93	99
POST								
Acnt + Atrazine + Scoil	0.67 oz + 0.42 lb + 1.5pt	87	99	93	96	87	73	99
Acnt + Prwl + Atra+Scoil	0.67 oz + 3 pt+0.42 lb+1.5	97	99	93	99	93	96	99
Acnt +Atra+CA1216+Scoil	0.67oz+0.42 lb+1.5 lb+1.5	48	99	96	99	96	98	99
Acnt +ScrpnIII+NIS+UAN	0.67 oz + 0.25lb+0.25+2.5	75	99	96	99	83	72	89
Acnt + Banvel+NIS+UAN	0.67 oz + 1 pt + 0.25+2.5	91	96	99	96	90	92	99
Untreated		0	0	0	0	0	0	0
LSD (0.05)		17	8	11	16	16	17	15

CA 1216 = a dry formulation of bromoxynil, BAS 662 = dicamba + diflufenfopyr (auxin transport inhibitor).
NIS = Preference at 0.25% v/v, UAN = qt/A.

PPI treatments gave good to excellent weed control. PRE treatments gave erratic weed control probably due to almost no rainfall until July. This shows greater weed control from PPI herbicides under dry conditions compared to PRE. Despite dry conditions following PRE treatments Surpass + Hornet controlled most weeds except Russian thistle. Adding Atrazine to Balance increased weed control compared Balance applied alone. PPI or PRE followed by POST treatments controlled most weeds (except BAS 662). BAS 662 at 0.375 lb/A increased grass control compared to the 0.25 lb/A rate (herbistatic affect). Most POST treatments controlled grass and broadleaf weeds.

Accent with Placement drift control agent in corn, 1997, Casselton (Zollinger) A study was conducted to evaluate Placement drift control agent in corn. Interstate Payco '4X85' corn was seeded May 29. POST treatments were applied June 21 at 4:00 pm with 84 F air, 90 F soil surface, 23% RH, 40% clouds, and 0-8 mph wind to 4 collar corn, 1-4" green and yellow foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1/ft^2), 0.5-2" redroot pigweed (2/ft^2), 0.5-3" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft wide of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		July 2				July 17		
Treatment	Rate	Fxtl	Rrpw	Colq	Cocb	Fxtl	Colq	Cocb
	Product/A	% control						
Accent + Exceed	0.17 oz + 0.5 oz	43	73	50	47	37	70	70
Accent + Exceed + Hasten + UAN	0.17 oz + 0.5 oz + 1.5 pt + 2 qt	77	99	77	77	99	99	99
Accent + Exceed + W4971 + UAN	0.17 oz + 0.5 oz + 1.5 pt + 2 qt	68	99	70	73	99	99	99
Accent + Exceed + Placement + Hasten + UAN	0.17 oz + 0.5 oz + 2 oz + 1.5 pt + 2 qt	77	99	73	80	99	99	99
Accent + Exceed	0.33 oz + 1 oz	55	70	53	57	73	90	83
Accent + Exceed + Hasten + UAN	0.33 oz + 1 oz + 1.5 pt + 2 qt	82	99	80	80	99	99	99
Accent + Exceed + W4971+ UAN	0.33 oz + 1oz + 1.5 pt + 2 qt	70	99	80	77	99	99	99
Accent + Exceed + Placement + Hasten + UAN	0.33 oz + 1 oz + 2 oz + 1.5 pt + 2 qt	78	99	83	82	99	99	99
LSD (0.05)		19	14	11	14	14	8	12

Hasten is an ethylated seed oil from Wilfarm. W4971 is an adjuvant from Wilfarm.

Wild mustard was completely controlled at both evaluations and redroot pigweed was completely controlled at the last evaluation (data not shown). Ingredients were added in a specific order and agitated to encapsulate after mixing and prior to application to encapsulate herbicides. There were no differences in weed control from any treatment containing Hasten, W4971, or Placement. Control from Accent + Exceed without any adjuvant may have been due to root uptake from herbicide movement into the soil following abundant precipitation after application.

Adjuvants with Accent, 1997, Casselton (Zollinger) A study was conducted to evaluate several adjuvants with Accent for weed control in corn. Interstate Payco '4X85' corn was seeded May 29. POST treatments were applied June 21 at 3:00 pm with 80 F air, 90 F soil surface, 23% RH, 40% clouds, and 0-8 mph wind to 4 collar corn, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (0.25-1/ft^2), 0.5-3" common lambsquarters (0.5-1/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	July 2			July 17		
		Fxtl	Colq	Cocb	Fxtl	Colq	Cocb
	Product/A	% control					
Accent at 0.33 oz DF/A							
NIS + UAN							
+ Preference + UAN	+ 0.25% + 1 qt	57	27	35	60	30	23
+ IMBD2	+ 3 lb	59	23	20	57	35	10
+ Dispatch 2N	+ 2.5 qt	65	30	20	70	30	17
+ Class APM-28	+ 2 qt	60	37	17	70	35	17
Petroleum oil + UAN							
+ Herbimax + UAN	+ 2 qt + 1qt	71	53	20	70	50	10
+ CL 9715	+ 20 lb/100 gal	75	60	25	37	53	10
+ IMBD2 + CORTC	+ 2.5 lb + 2 pt	72	75	20	93	53	30
MSO/ESO + UAN							
+ Sun-It II + UAN	+ 1.5 pt + 1 qt	93	80	30	90	75	40
+ MSO + UAN	+ 2 qt + 1 qt	92	77	35	93	70	40
+ Hasten + UAN	+ 1.5 pt + 1 qt	92	70	35	63	70	40
+ Eth-N-Ate	+ 2 qt	90	77	33	91	75	40
+ Sundance II + UAN	+ 1.5 pt + 1 qt	75	52	30	89	60	43
+ CHSU1 + SMAI1	+ 1 pt + 2.5 lb	87	68	32	91	63	30
+ Destiny + UAN	+ 1.5 pt + 1 qt	90	75	25	92	70	33
+ CL 9706	+ 3 pt	85	73	25	93	75	27
+ CL 9711	+ 5 pt	88	73	30	92	70	37
MSO + NIS + UAN							
+ Destiny + Preference + UAN	+ 0.25%+0.25%+1qt	75	53	25	93	63	30
MSO/ESO + Org. silicon surf.							
+ Dyne-Amic	+ 4 pt/100 gal	67	47	20	68	40	10
+ Phase	+ 2 pt/100 gal	63	32	20	70	35	10
MSO + Drift retardant							
+ CHSU1 + TPA12	+ 1 pt + 1 lb	87	78	30	90	73	30
Adjuvant blend							
+ ND-4	+ 1%	87	73	35	84	70	30
LSD (0.05)		7	10	NS	12	11	13

Wild mustard and redroot pigweed was 99% at both ratings. No treatment gave greater than 40% common cocklebur control. Adjuvant enhancement of Accent followed the following order: MSO type > PO > NIS. Few differences in Accent enhancement occurred within NIS or PO classes of adjuvants but differences did occur within MSO type adjuvants. MSO type adjuvants + NIS + UAN enhanced herbicides equal to or greater than NIS + UAN or PO + UAN or equal to MSO type + UAN adjuvants. Substituting organosilicone surfactant for 28% UAN reduced weed control from Accent. Adding drift retardants to Accent had no affect on weed control. ND-4 enhanced Accent equal to or greater than any other adjuvant or adjuvant combination. Adjuvants are herbicide and weed specific.

Potato response to Matrix, Prosper, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate potato response and weed control from Matrix applied POST in potato. 'Red Norland' potato was seeded May 22 and one cultivation was performed on June 18. POST treatments were applied June 27 at 2:30 pm with 92 F air, 99 F soil surface, 54% RH, 0% clouds, and 10-16 mph wind to 6-8" potato, 1-3" foxtail (1-10/ft^2), 1-6" diameter rosette wild mustard (1/ft^2), and 1-4" common cocklebur (1/ft^2). Treatments were applied to the center 8 ft of the 12 X 25 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		July 22			August 8				September 9
Treatment	Rate	Fxtl	Wimu	Kocz	Fxtl	Wimu	Colq	Kocz	Yield
	Product/A	% control							cwt/A
Matrix + Activator 90	1 oz + 0.25 % v/v	99	99	99	99	99	98	99	378
Matrix + Activator 90	1.5 oz + 0.25 % v/v	99	99	96	99	99	99	98	439
Matrix + Lexone + Activator 90	1 oz + 1.33 oz + 0.25 % v/v	99	99	99	99	99	99	99	371
Matrix + Lexone + Activator 90	1 oz + 2.66 oz + 0.25 % v/v	99	99	99	99	99	99	99	384
Matrix + Lexone + Activator 90	1 oz + 4 oz + 0.25 % v/v	99	99	99	98	99	99	99	407
Matrix + Lexone + Activator 90	1 oz + 5.33 oz + 0.25 % v/v	96	96	99	98	99	99	99	383
Matrix + Lexone + Activator 90	1.5 oz + 1.33 oz + 0.25 % v/v	99	99	99	99	99	99	99	383
Matrix + Lexone + Activator 90	1.5 oz + 2.66 oz + 0.25 % v/v	99	99	99	99	99	99	99	392
Matrix + Lexone + Activator 90	1.5 oz + 4 oz + 0.25 % v/v	99	99	99	99	98	99	99	418
Matrix + Lexone + Activator 90	1.5 oz + 5.33 oz + 0.25 % v/v	99	99	99	99	99	99	96	380
Lexone + Activator 90	5.33 oz + 0.25 % v/v	99	99	99	99	98	99	99	386
Lexone	0.67 oz	93	99	86	96	98	99	96	401
Cultivated	-	99	80	99	99	98	99	99	375
Untreated		0	0	0	0	0	0	0	244
LSD (0.05)		6	12	11	3	2	1	3	78

This study was conducted to evaluate potato response of a metribuzin sensitive variety to Matrix and metribuzin (Lexone/Sencor) at different rates applied alone or in combination. No injury was found at any evaluation. Common lambsquarters was 99% at July 22. Redroot pigweed was completely controlled. Initial weed pressure prior to cultivation was heavy but cultivation and vigorous potato growth prevented emergence and competition of subsequent weed flushes. All treatments yielded better than the untreated check. The cultivated treatment yield was equal to any chemical treatment. This data supports current potato production practices of chemical control used in less than half of potato acreage because of high weed control from hilling and cultivation. The data also show that potato has excellent tolerance to Matrix at rates as high as 1 oz DF/A applied with metribuzin at rates as high as 5.33 oz DF/A with a NIS.

Matrix vs cultivation on potato yield, Prosper, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate potato yield response to Matrix versus cultivation. 'Red Norland' potato was seeded May 22 and one cultivation was performed on June 18 when potato plants were 6" tall and weeds had emerged. Treatments were applied POST to potato and PRE to weeds on June 27 at 3:00 pm with 92 F air, 99 F soil surface, 54% RH, 0% clouds, and 10-16 mph wind to 6-8" potato, 1-2" foxtail (1/ft^2), 2-6" diameter rosette wild mustard (1/ft^2), and 1-4" common cocklebur (1/ft^2). Treatments were applied to the center 8 ft of the 12 X 25 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		July 22		August 8			September 17
Treatment	Rate	Wimu	Kocz	Wimu	Colq	Kocz	Tuber Yield
	Product/A	% control					cwt/A
Cultivation / Matrix + NIS	- / 1 oz + 0.25 % v/v	96	99	99	98	99	378
Cultivation / Matrix + NIS	- / 1.5 oz + 0.25 % v/v	99	96	99	99	94	439
Cultivation	-	99	99	98	99	99	383
Matrix + Lexone + NIS	1 oz + 0.25 lb + 0.25 % v/v	96	99	99	99	99	378
Untreated		0	0	0	0	0	244
LSD (0.05)		7	4	7	2	7	81

NIS = Preference.

All weed control methods used gave excellent weed control. No injury was observed at any evaluation. Control was 99% for foxtail and common cocklebur, at the 21 DAT (July 22) rating, and for foxtail and redroot pigweed, at the 42 DAT (August 8) rating. Weed flushes did not emerge after cultivation or herbicide application. All treatments gave greater potato yield than no treatment. There were no differences between weed control treatments. Results validate grower practice of heavy reliance on cultivation for weed control.

Weed control in potato, Drayton, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate tolerance and weed control in irrigated potato from experimental herbicides applied PRE and POST. 'Russet Burbank' potato was seeded May 26 and a blind cultivation was done June 6. PRE treatments were applied June 11 at 2:30 pm with 90 F air, 83 F soil at 4", 17% RH, 80% clouds, and 3-9 mph wind. POST treatments were applied June 26 at 11:30 am with 80 F air, 88 F soil surface, 41% RH, 30% clouds, and 7-13 mph wind to 2-6" potato, 1" foxtail (15/ft^2), 0-2" redroot pigweed (10/ft^2), and 2" common lambsquarters (1/ft^2). Treatments were applied to the center 8 ft of the 9 X 25 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment. No soil disturbance was done after herbicide application.

		July 7				July 30			
Treatment	Rate	Potato	Fxtl	Rrpw	Colq	Potato	Fxtl	Wimu	Rrpw
	Product/A	% injury	% control			% injury	% control		
PRE									
Authority	0.187 lb	0	85	86	96	2	83	83	96
Authority	0.25 lb	0	92	92	96	2	96	89	96
Authority	0.31 lb	0	92	93	96	3	98	89	98
Authority	0.375 lb	0	96	98	98	0	96	93	98
Authority + Sencor	0.25 lb + 0.375 lb	0	90	92	96	3	89	99	89
Authority + Matrix	0.25 lb + 1 oz	0	92	90	96	5	89	99	99
Balance	0.75 oz	0	88	88	95	3	99	99	88
Balance	1.13 oz	0	92	88	96	22	99	99	99
Balance	1.5 oz	2	92	84	96	20	99	99	99
Balance	1.88 oz	2	94	92	96	25	98	98	99
Balance + Sencor	1.13 oz + 0.375 lb	1	93	93	96	5	99	99	99
POST									
Balance	0.75 oz	2	68	53	95	12	99	99	99
Balance	1.13 oz	3	92	60	92	15	99	99	98
Balance + Sencor + NIS	1.13 oz + 0.25 lb+ 0.25 % v/v	7	67	62	95	18	89	89	89
Balance + Matrix + NIS	1.13 oz + 1 oz + 0.25 % v/v	8	72	75	93	13	99	99	99
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		4	13	3	4	16	16	11	17

Authority, registered for small seeded broadleaf weed control in soybean and Balance, registered for grass and broadleaf weed control in corn were evaluated for weed control and potato response. Both herbicides showed excellent potato safety at the first evaluation. However, at the July 30 evaluation, Balance PRE resulted in at least 20% potato injury and Balance POST had 12 to 15% injury. Balance caused a whitening and yellowing followed by burning of leaf tips.

At July 7, PRE treatments controlled foxtail, pigweed, and lambsquarters. Authority at the lowest rate gave at least 85% weed control. Balance POST or tankmixes containing Balance controlled lambsquarters but did not control foxtail or pigweed. At July 30, all treatments, excluding the lowest rate of Authority, controlled all weeds. Vigorous potato growth and competition was probably responsible for increased weed control between the July 7 and 30 evaluation.

Weed control in potato, Oakes, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate tolerance and weed control in irrigated potato from experimental herbicides applied PRE and POST. 'Russet Burbank' potato was seeded April 29 and one cultivation was perform on May 30. PRE treatments were applied June 5 at 11:30 am with 80 F air, 66 F soil at 4", 40% RH, 20% clouds, and 5-8 mph wind. POST treatments were applied June 24 at 4:30 pm with 85 F air, 95 F soil surface, 71% RH, 10% clouds, and 0-5 mph wind to 16-18" potato. Treatments were applied to the center 8 ft of the 9 X 25 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment. Soil was not disturbed after herbicide application.

Treatment	Rate	June 24 Potato injury	July 9 Potato injury
	Product/A	%	%
PRE			
Authority	0.187 lb	0	0
Authority	0.25 lb	0	0
Authority	0.31 lb	0	0
Authority	0.375 lb	0	0
Authority + Sencor	0.25 lb + 0.375 lb	0	0
Authority + Matrix	0.25 lb + 1 oz	0	0
Balance	0.75 oz	0	0
Balance	1.13 oz	0	0
Balance	1.5 oz	0	0
Balance	1.88 oz	0	0
Balance + Sencor	1.13 oz + 0.375 lb	0	0
POST			
Balance	0.75 oz	0	0
Balance	1.13 oz	0	0
Balance + Sencor + NIS	1.13 oz + 0.25 lb + 0.25 % v/v	0	0
Balance + Matrix + NIS	1.13 oz + 1 oz + 0.25 % v/v	0	0
Untreated		0	0
LSD (0.05)		0	0

NIS = Preference

No potato injury was observed from any herbicide treatments. Few weeds emerged after field was hilled so no weed control data was obtained. The results from this study show excellent potato tolerance to Authority and Balance applied in irrigated conditions.

Matrix with adjuvants, NW-22, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate Matrix weed control comparing different adjuvants. POST treatments were applied July 17 at 9:00 am with 78 F air, 85 F soil surface, 50% RH, 0% clouds, and 2-3 mph wind to 1-5" foxtail (20/ft^2), 1-6" diameter rosette wild mustard (1/ft^2), 1-4" redroot pigweed (10-15/ft^2), and 2-4" common cocklebur (1/ft^2). Treatments were applied to the center 8 ft area of the 10 X 30 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment. The experiment was established in a non-crop environment. The experiment was initially established in a potato field. Poor weed emergence caused the trial to be established at Fargo to evaluate weed control. The soil was not disturbed after herbicide application.

		July 7						August 13			
Treatment	Rate	Fxtl	Rrpw	Colq	Pesw	Vema	Cocb	Fxtl	Rrpw	Pesw	Cocb
	Product/A	% control									
Matrix + Activator 90	1 oz + 0.25 % v/v	53	96	50	43	60	70	53	83	53	70
Matrix + Herbimax	1 oz + 1 qt	62	99	50	43	60	70	72	88	63	63
Matrix + Scoil	1 oz + 1.5 pt	85	99	57	43	60	70	90	83	60	73
Matrix + Silwet L-77	1 oz + 0.125 % v/v	48	99	50	33	60	70	38	83	53	33
Matrix + Activator 90	1.5 oz + 0.25 % v/v	53	99	50	40	60	70	37	86	43	60
Matrix + Herbimax	1.5 oz + 1 qt	82	99	50	43	60	70	83	83	50	70
Matrix + Scoil	1.5 oz + 1.5 pt	92	99	50	43	60	70	90	90	70	70
Matrix + Silwet L-77	1.5 oz + 0.125 % v/v	43	99	50	17	60	70	50	77	47	43
Matrix + Activator 90	2 oz + 0.25 % v/v	67	99	50	43	60	70	73	86	60	77
Matrix + Herbimax	2 oz + 1 qt	73	99	50	50	60	70	87	83	63	77
Matrix + Scoil	2 oz + 1.5 pt	98	99	60	63	67	73	95	91	73	80
Matrix + Silwet L-77	2 oz + 0.125 % v/v	53	89	43	33	60	70	62	77	60	63
Matrix + Lexone + Activator 90	1.5 oz + 0.25 lb + 0.25 % v/v	53	99	98	96	60	80	47	85	63	50
LSD (0.05)		14	8	9	11	3	3	12	15	18	18

All treatments gave complete wild mustard control. Venice mallow and common lambsquarters population was low at the Aug 13 rating due to severe curled dock infestation and was not rated. Currently, the 1.5 oz/A rate of Matrix is the maximum allowed in potato. Foxtail control increased with increasing Matrix rates. Adjuvant enhancement for foxtail control with Matrix increased in the following order: Scoil > Herbimax > Activator 90 = Silwet L-77. Silwet L-77 with Matrix gave less control of lambsquarters and smartweed than Matrix with other adjuvants. However, broadleaf weed control did not usually differ with Matrix rate or adjuvant use. This data may indicate that Matrix can give season long control of grass and susceptible broadleaf weeds. Using high rates or oil additives may not increase control of more tolerant broadleaf weeds. However, Matrix can aid in weed control if used with normal hilling and cultivation practices and weed control from potato competition.

Potato response to Prism, Prosper and Oakes, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate potato response to Prism applied POST. At Prosper, ND, 'Gold Rush' potato was seeded May 22 and one cultivation was perform on June 18. POST treatments were applied June 27 at 4:30 pm with 92 F, 99 F soil surface, 54% RH, 0% clouds, and 10-16 mph wind to 6-8" potato. At Oakes, ND, 'Russet Burbank' potato was seeded April 29 and one cultivation was perform on May 30. POST treatments were applied June 24 at 4:30 pm with 85 F, 95 F soil surface, 71% RH, 10% clouds, and 0-5 mph wind to 16-18" potato. Treatments were applied to the center 8 ft of the 9 X 25 ft plots with a back-pack sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		Prosper		Oakes	
Treatment	Rate	July 9 Potato inj.	July 22 Potato inj.	July 10 Potato inj.	July 31 Potato inj.
	Product/A	%	%	%	%
Prism + PO	13 oz + 1 % v/v	0	0	0	0
Prism + PO	17 oz + 1 % v/v	0	0	0	0
Prism + PO	25.6 oz + 1 % v/v	0	0	0	0
Poast	1 pt	0	0	0	0
LSD (0.05)		0	0	0	0

PO= Herbimax

The purpose of this trial was to obtain crop tolerance data to warrant federal labeling of Select/Prism on potato. No injury was found 14 or 28 DAT. No weeds emerged after cultivation so weed control data was not taken.

Potato vine kill, Oakes, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate irrigated potato vine desiccation from labeled and experimental herbicides. 'Russet Burbank' potato was seeded April 29 and one cultivation was perform on May 30. Vine kill chemicals were applied September 3 at 11:30 am with 75 F, 40% RH, 10% clouds, and 10-12 mph wind to vines which were still vigorous and green. Treatments were applied to the center 8 ft of the 9 X 25 ft plots with a back-pack sprayer delivering 43 gpa at 40 psi through 8005 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	September 6	September 10	September 13
		Potato vine	Potato vine	Potato vine
	Product/A	% desiccation		
V-53482 + PO	2 oz + 1 qt	25	42	55
V-53482 + PO	3 oz + 1qt	29	45	63
V-53482 + PO	4 oz + 1 qt	20	42	62
Diquat + NIS	1 pt + 0.25 % v/v	25	50	63
Diquat + NIS	2 pt + 0.25 % v/v	50	83	89
Untreated		0	0	0
LSD (0.05)		11	12	19

NIS = Preference, PO = Herbimax

At time of application vines were very thick, green and vigorous which may prevented spray penetration through the canopy. V-53482 was as fast and produced the same degree of vine kill as 1 pt Diquat, but not as fast or to the same degree as 2 pt of Diquat. Increased rates of V-53482 did not increase vine desiccation.

Potato vine kill, Prosper, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate dryland potato vine desiccation from labeled and experimental herbicides. 'NorValley' potato was seeded May 5 and one cultivation was perform on June 18. Vine kill chemicals were applied September 9 at 2:00 am with 74 F, 31% RH, 40% clouds, and 7-10 mph wind. Treatments were applied to the center 8 ft of the 12 X 25 ft plots with a back-pack sprayer delivering 43 gpa at 40 psi through 8005 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Experiment 1 (Prosper).

Treatment	Rate	September 12	September 16	September 19
		Potato vine	Potato vine	Potato vine
	Product/A		% desiccation	
V-53482 + PO	2 oz + 1 qt	48	67	80
V-53482 + PO	3 oz + 1 qt	53	73	85
V-53482 + PO	4 oz + 1 qt	48	67	83
Diquat + NIS	1 pt + 0.25 % v/v	58	78	93
Diquat + NIS	2 pt + 0.25 % v/v	73	87	99
Untreated		0	0	0
LSD (0.05)		15	14	16

Experiment 2 (Prosper).

Treatment	Rate	September 12	September 16	September 19
		Potato vine	Potato vine	Potato vine
	Product/A		% desiccation	
V-53482 + PO	2 oz + 1 qt	33	53	67
V-53482 + PO	3 oz + 1qt	33	60	82
V-53482 + PO	4 oz + 1qt	50	72	88
Diquat + NIS	1 pt + 0.25 % v/v	58	78	93
Diquat + NIS	2 pt + 0.25 % v/v	73	87	99
Untreated		0	0	0
LSD (0.05)		16	11	8

NIS = Preference, PO = Herbimax

This experiment was conducted to evaluate V-53482, a cell membrane disrupter (PPO inhibitor) herbicide under development from Valent as a potato vine desiccant. V-53482 at the highest rate gave less vine desiccation than Diquat at the lowest rate. Potato vines were effected approximately 40% by late blight at the time of herbicide application.

POST Weed Control in Soybean, Casselton 1997. (Nalewaja) 'Lambert' soybean was seeded May 29. Treatments were applied to 4-leaf soybean, 4- to 6-leaf common cocklebur, and 2- to 4-leaf wild mustard, and 2- to 3-leaf green and yellow foxtail on June 19 with 70 F, 60% RH, partly cloudy sky, and 10- to 12-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 or 17gpa at 35 psi through 8001 or 8002 flat fan nozzles, respectively to a 7 ft wide area the length of 10 by 30 ft plots. A rainfall totalling 0.28-inches occurred 3.5 hours after application. The experiment was a randomized complete block design with four replicates.

Treatment	Spray volume	Rate	7-14-97			
			Sobe	Fota	Wimu	Cocb
		oz/A		%		
Imazethapyr+Act90	8.5	0.5+0.25%	9	71	99	97
Imazethapyr+Act90+28N	8.5	0.5+0.25%+0.25G	12	83	99	99
Imazethapyr+SunitII	8.5	0.5+0.18G	4	97	99	98
Imazethapyr+SunitII+28N	8.5	0.5+0.18G+0.25G	11	95	99	99
Imazethapyr+ND4	8.5	0.5+1%	7	85	99	98
Imazethapyr+ND72	8.5	0.5+1%	5	80	99	98
Imazethapyr+Act90	17	0.5+0.25%	5	75	99	95
Imazethapyr+Act90+28N	17	0.5+0.25%+0.25G	16	76	99	98
Imazethapyr+SunitII	17	0.5+0.18G	19	85	99	98
Imazethapyr+SunitII+28N	17	0.5+0.28G+0.25G	9	87	99	98
Imazethapyr+ND4	17	0.5+1%	11	84	99	98
Imazethapyr+ND72	17	0.5+1%	9	82	99	98
Untreated		0	0	0	0	0
C.V. %			50	7	0	2
LSD 5%			6	8	0	3
# OF REPS			4	4	4	4

Low spray volume was important to the enhanced imazethapyr efficacy by Sun-it II at 1.5 pt/A (0.18G). Inclusion of 28% nitrogen fertilizer enhanced imazethapyr efficacy when with activator 90 but not with Sun-it II. At 17 gpa, Sun-it II and ND- adjuvants were similarly effective, but at low spray volume Sun-it II was more effective than the other adjuvants.

AC-299263 Weed Control in Soybean, Casselton 1997. (Nalewaja) 'Lambert' soybean was seeded May 29. Treatments were applied to 3- to 4-leaf soybean, 4- to 6-leaf common cocklebur, 2- to 4-leaf wild mustard, and 2- to 3-leaf green and yellow foxtail on June 19 with 70 F, 60% RH, partly cloudy sky, and 10- to 12-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 or 17gpa at 35 psi through 8001 or 8002 flat fan nozzles, respectively to a 7 ft wide area the length of 10 by 30 ft plots. A rainfall totalling 0.28 inches occured 3 hours after application. The experiment was a randomized complete block design with four replicates.

Treatment	Spray volume	Rate	7-14-97			
			Sobe	Fota	Wimu	Cocb
		oz/A	%			
AC-299263+Act90	8.5	0.25+0.25%	3	80	99	84
AC-299263+Act90+28N	8.5	0.25+0.25%+0.25G	5	93	99	91
AC-299263+SunitII	8.5	0.25+.18G	3	85	99	79
AC-299263+SunitII+28N	8.5	0.25+.18G+0.25G	4	91	99	89
AC-299263+ND4	8.5	0.25+1%	8	96	99	94
AC-299263+ND72	8.5	0.25+1%	5	95	99	90
AC-299263+Act90	17	0.25+0.25%	4	80	99	87
AC-299263+Act90+28N	17	0.25+0.25%+0.25G	8	93	99	90
AC-299263+SunitII	17	0.25+.18G	0	79	99	75
AC-299263+SunitII+28N	17	0.25+.18G+0.25G	8	89	99	86
AC-299263+ND4	17	0.25+1%	6	96	99	91
AC-299263+ND72	17	0.25+1%	4	90	99	89
Untreated		0	0	0	0	0
C.V. %			95	5	0	6
LSD 5%			NS	6	NS	7
# OF REPS			4	4	4	4

AC-299263 gave the greatest weed control when applied with ND-4 at 1% of the spray volume and was equally as effective in 8.5 or 17 gpa spray volumes. Sun-it II enhances AC-299263 more when applied in 8.5 than 17 gpa.

Bentazon with Adjuvants in Soybean, Casselton 1997. (Nalewaja) 'Lambert' soybean was seeded May 29. Treatments were applied to 4-leaf soybean, 4- to 6-leaf common cocklebur, 2- to 4-leaf wild mustard, and 2- to 3-leaf green and yellow foxtail on June 19 with 70 F, 60% RH, partly cloudy sky, and 10- to 12-mph wind. Treatments were applied with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 35 psi through 8001 flat nozzles to a 7 ft wide area the length of 10 by 30 ft plots. A rainfall totalling .28 inches occurred two hours after treatment. The experiment was a randomized complete block design with four replicates.

		7-14-97			
Treatment	Rate	Sobe	Fota	Wimu	Cocb
	oz/A		%		
Bentazon+X-77	12+.25%	0	0	83	75
Bentazon+15-S-30	12+.25%	0	3	81	71
Bentazon+Silwet L77	12+.25%	0	3	97	92
Bentazon+S240	12+.25%	0	0	99	91
Bentazon+S278	12+.25%	0	4	97	93
Bentazon+ND4	12+1%	1	3	93	87
Bentazon+ND72	12+1%	0	0	76	69
Bentazon&Acifluorfen+X-77	9.8+.25%	1	10	99	70
Bentazon&Acifluorfen+Scoil	9.8+.18G	2	14	99	96
Bentazon&Acifluorfen+Silwet L77	9.8+.25%	1	20	99	91
Bentazon&Acifluorfen+S240	9.8+.25%	0	15	99	64
Bentazon&Acifluorfen+S278	9.8+.25%	1	16	99	93
Bentazon&Acifluorfen+ND4	9.8+1%	0	19	98	73
Untreated	0	0	0	0	0
C.V. %		334	112	8	12
LSD 5%		NS	12	10	13
# OF REPS		4	4	4	4

Silicone surfactants were all more effective than X-77 or Tergitol 15-S-30 as adjuvants to bentazon for wild mustard and common cockelbur control. ND-4 was similar to silicone surfactants, but ND-72 was significantly less effective than the silicone surfactants or ND-4. Scoil (methylated vegetable oil) and silicone surfactants, Silwet-L77 and S278, were the most effectivve adjuvants with bentazon & acifluorfen. None of the herbicide adjuvant treatments caused injury to soybean. Silicone surfactants have been shown to give spray penetration of stomates. This may have been important to their efficacy with the rain that occurred 2 h after application.

Soil and POST treatments in soybeans, Barney, 1997. (Zollinger and Seibert) An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied PPI, PRE, and POST. PPI treatments were applied May 5 at 11:30 am with 63 F air, 56 F soil at 4", 45% RH, 50% clouds, and 15-20 mph wind and incorporated to a depth of 1 to 2" with a rototiller. A Roundup Ready soybean variety was seeded and PRE treatments were applied May 13 at 4:30 pm with 58 F air, 56 F soil at 4", 90% RH, 95% clouds, and 3-5 mph wind. POST treatments were applied June 10 at 4:30 am with 86 F, 92 F soil surface, 29% RH, 20% clouds, and 3-7 mph wind to unifoliolate to 1st trifoliolate soybeans, 1-4" green and yellow foxtail (1-30/ft^2), 1-6" diameter rosette wild mustard (5-20/ft^2), 1-4" redroot pigweed (1-20/ft^2), 1-4" common lambsquarters (1-10/ft^2), 1-6" Pennsylvania smartweed (1-50/ft^2), and 1-3" eastern black nightshade (1-25/ft^2). LPOST treatments were applied June 25 at 10:30 am with 74 F, 88 F soil surface, 46% RH, 0% clouds, and 3-10 mph wind to 5-6 trifoliolate soybeans, 1-4" green and yellow foxtail (5/ft^2), 1-6" diameter rosette wild mustard (1/ft^2), 4" redroot pigweed (2/ft^2), and 1-4" common lambsquarters (3-5/ft^2). Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Most PPI, PPI followed by POST, or PRE followed by POST treatments gave excellent weed control. Authority plus trifluralin did not control wild mustard, eastern black nightshade, or Pennsylvania smartweed. PRE treatments generally gave good pigweed, lambsquarters, nightshade, and smartweed control but gave variable foxtail and wild mustard control. POST applications of Pursuit or Raptor alone or in tank-mix combination gave excellent weed control except Pursuit gave poor control of common lambsquarters. Reduced rates of Pursuit plus Raptor or Raptor alone gave excellent weed control. Roundup Ultra at reduced rates with residual herbicides Prowl, Authority, FirstRate, and Prowl gave excellent control of foxtail, pigweed, and nightshade, good control of smartweed but erratic wild mustard and lambsquarters control. Raptor applied twice in sequential application, each at low rates, gave excellent control of most weeds except lambsquarters control was poor at the lowest rate. Roundup Ultra applied twice in sequential application, each at low rates, gave excellent weed control.

Treatment	Rate	28 DAT						
		Soybean	Fxtl	Wimu	Rrpw	Colq	Ebns	Smwd
	Product/A	% injury	% control					
PPI								
Authority + Treflan	0.5 lb + 1.5 pt	0	98	10	99	98	45	67
Authority + FirstRate	0.33 lb + 0.61 oz	0	94	99	99	99	99	99
Authority + FirstRate	0.41 lb + 0.76 oz	0	85	99	99	99	99	99
Treflan + FirstRate	1.5 pt + 0.61 oz	1	98	99	99	99	99	99
Brdstrk+Trfln	2.25 pt	5	99	99	99	99	99	99
PRE								
Authority + Frontier	0.5 lb + 20 oz	1	85	68	99	99	99	82
Authority + FirstRate	0.33 lb + 0.61 oz	0	63	72	91	96	89	98
Authority + FirstRate	0.41 lb + 0.76 oz	0	75	78	97	87	87	91
Frontier + FirstRate	20 oz + 0.61 oz	1	70	91	92	72	99	99
PPI fb POST								
Treflan / FirstRate	1.5 pt / 0.19 oz	0	97	90	92	89	79	99
Prowl / Pursuit + Sun-It II	3 pt / 1.08 oz + 1.5 pt	11	99	99	98	93	99	97
PRE fb POST								
Prowl / Pursuit + PO + UAN	3 pt / 1.08 oz + 2 pt + 4 pt	7	99	99	99	99	99	99
Prowl / Raptor + PO + UAN	3 pt / 4 oz + 2 pt + 4 pt	4	89	87	92	94	99	99
POST								
Pursuit + PO + UAN	1.08 oz + 2 pt + 4 pt	1	97	98	99	65	99	97
Pursuit + Pinnacle + PO + UAN	1.08 oz + 0.188 oz + 2 pt + 2.5 pt	9	98	99	99	90	99	95
Pursuit + Cobra + PO + UAN	1.08 oz + 4 oz + 1 pt + 4 pt	2	99	99	99	65	99	87
Pursuit + Raptor + PO + UAN	0.72 oz + 2 oz + 2 pt + 4 pt	4	99	99	99	84	99	87
Raptor + Cobra + PO + UAN	4 oz + 4 oz + 1 pt + 4 pt	6	91	99	99	97	99	92
Raptor + Cobra + Sun-It II	4 oz + 4 oz + 1.5 pt	7	88	99	99	92	99	87
Raptor + Sun-It II	4 oz + 1.5 pt	6	98	99	99	93	99	88
Raptor + Sun-It II	3 oz + 1.5 pt	9	99	99	99	92	99	99
Roundup Ultra + AMS	2 pt + 2.5 lb	1	99	99	94	99	99	98
Roundup Ultra + AMS	1 pt + 2.5 lb	3	99	87	97	92	99	87
Roundup Ultra + Prowl + AMS	0.5 pt + 2.5 pt + 2.5 lb	9	85	65	82	70	97	84
Roundup Ultra + Authority + AMS	0.5 pt + 0.33 lb + 2.5 lb	0	96	50	99	99	99	82
Roundup Ultra + FirstRate + AMS	0.5 pt + 0.19 oz + 2.5 lb	3	97	82	92	77	97	97
Roundup Ultra + Pursuit + AMS	0.5 pt + 0.72 oz + 2.5 lb	0	99	95	99	87	99	99
POST fb LPOST								
Raptor + Sun-It II / Raptor + Sun-It II	2 oz + 1.5 pt / 2 oz + 1.5 pt	0	90	97	96	91	99	90
Raptor + Sun-It II / Raptor + Sun-It II	1 oz + 1.5 pt / 1oz + 1.5 pt	3	84	99	97	75	99	87
Roundup Ultra + AMS / Roundup Ultra + AMS	0.5 pt + 2.5 lb / 0.5 pt + 2.5 lb	0	99	97	99	99	99	98
LSD (0.05)		5	14	12	7	11	13	12

Soil and POST weed control in soybeans, Casselton, 1997. (Zollinger) An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied PPI, PRE, and POST. PPI treatments were applied May 28 at 4:30 pm with 73 F air, 55 F soil at 4", 21% RH, 60% clouds, and 3-7 mph wind and incorporated to a depth of 1 to 2" with a rototiller. 'Lambert' soybean was seeded and PRE treatments were applied May 30 at 7:00 pm with 80 F air, 62 F soil at 4", 22% RH, 20% clouds, and 2-4 mph wind. POST treatments were applied June 28 at 9:30 am with 82 F, 69 F soil surface, 88% RH, 100% clouds, light rain, and 0-3 mph wind to V2 beans, 2-8" foxtail (1-10/ft^2), 1-3" diameter rosette wild mustard (1-8/ft^2), 1-3" redroot pigweed (1/ft^2), 1-3" common lambsquarters (2/ft^2), and 1-3" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

June 26 Evaluation: POST treatments were applied 2 days after visable evaluations so weed control was entirely due to PPI and PRE herbicides - NOT POST. Any treatment containing an ALS inhibiting herbicide controlled wild mustard. Most treatments gave near complete lambsquarters control. However, low rate of FirstRate in the treatment with Authority resulted in reduced lambsquarters control. PPI treatments containing FirstRate gave greater than 90% cocklebur control but the only the 0.76 oz rate PRE gave 90% control. Broadstrike + Dual PRE gave unusually good cocklebur control, in fact most PRE treatments gave good weed control probably due to ample rain events occurring after application activating herbicides.

July 17 Evaluation: Redroot pigweed and common lambsquarters control was 99%. PPI treatments gave variable foxtail control, but PRE treatments gave excellent foxtail control due to good rains. POST treatments gave similar foxtail control as observed at June 26. Wild mustard was generally completely controlled due to an ALS herbicide in most treatments. Authority + FirstRate PPI gave complete cocklebur control. However, replacing Authority with Treflan greatly reduced cocklebur control. Authority or FirstRate PRE, even with good moisture, gave 55% to 76% cocklebur control considering Frontier contributed little to cocklebur control. However, combining Authority + FirstRate gave 88% to 96% control. Most POST treatments containing Pursuit or Expert gave good to excellent cocklebur control. FirstRate POST at 0.19 oz/A gave 60% control but adjuvant was unintentionally omitted which probably would greatly increased control. Adding AMS to Roundup Ultra + Expert + NIS gave less weed control than without AMS which was a surprise, is probably a fluke, and is unexplainable since research has shown multiple benefits from adding AMS to Roundup Ultra to reduce or eliminate antagonism from salts in water, and overcome tankmix antagonism from several herbicides, including Roundup.

Treatment	Rate	June 26					July 17		
		Soybean	Fxtl	Wimu	Colq	Cocb	Fxtl	Wimu	Cocb
	Product/A	% injury	% control						
PPI									
Authority + Treflan	0.5 lb + 1.5 lb	0	88	70	99	17	70	60	7
Authority + FirstRate	0.33 lb + 0.61 oz	3	84	99	99	90	83	99	99
Authority + FirstRate	0.41 lb + 0.76 oz	0	93	99	99	97	93	99	99
Treflan + FirstRate	1.5 lb + 0.61 oz	0	91	53	98	32	78	93	46
Brdstrk+Trfln	2.25 pt	0	94	99	99	30	70	73	30
PRE									
Authority + Frontier	0.5 lb + 20 oz	3	99	99	99	85	98	99	55
Authority + FirstRate	0.33 lb + 0.61 oz	0	75	99	86	78	90	99	88
Authority + FirstRate	0.41 lb + 0.76 oz	0	78	99	99	90	96	99	96
Frontier + FirstRate	20 oz + 0.61 oz	3	79	99	99	78	93	99	76
PPI fb POST									
Treflan / FirstRate	1.5 lb + 0.19 oz	0	92	37	99	32	90	76	60
Prowl / Pursuit + Sun-It II	3 pt / 1.08 oz + 1.5 pt	0	99	35	99	30	99	99	93
PRE fb POST									
Prowl / Pursuit + PO + UAN	3 pt / 1.08 oz + 2+4	0	63	35	73	25	86	99	85
Prowl / Prst + Pinn + PO+UAN	3pt/1.08oz+0.188oz+2+2.5	0	60	35	99	25	82	99	96
Prowl / Prst + Cobr + PO+UAN	3 pt/1.08oz+4oz+1+4	32	80	35	99	25	77	99	98
Bstk+Dl/Expt+Actn+PO+UAN	2.25 pt / 1.5oz+1.2oz+1+4	25	88	99	99	83	82	99	82
Bstk+Dl/Expt+Cobr+PO+UAN	2.25 pt / 1.5oz+6oz+1+1	28	88	99	99	85	82	99	99
Bstk+Dl/Expt+Blzr+PO+UAN	2.25 pt /1.5oz+0.5pt+1+1	20	90	99	99	82	95	99	87
POST									
Roundup Ultra	1.5 pt	0	-	-	-	-	99	99	98
Roundup Ultra+Expert+NIS	1.5 pt + 1.5 oz + 0.25	0	-	-	-	-	99	99	99
RdupUltra+Expert+NIS+AMS	1.5 pt+1.5 oz+0.25+2.5 lb	0	-	-	-	-	80	99	72
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		4	8	9	12	9	16	11	15

NIS = Preference at 0.25% v/v, PO = Herbimax at pt/A, UAN at pt/A.

Broadleaf weed control in soybean, 1997, Casselton (Zollinger) A study was conducted to evaluate POST weed control in soybean. 'Lambert' soybean was seeded May 29. POST treatments were applied June 20 at 5:00 pm with 77 F air, 96 F soil surface, 51% RH, 40% clouds, and 0-5 mph wind to 1st trifoliolate soybeans, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft wide of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	July 7				July 17				
		Soybean	Fxtl	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% injury	% control			% control				
Raptor + PO + UAN	4 oz + 1 + 2	0	96	99	87	99	99	99	99	83
FirstRate + PO + UAN	0.3 oz + 1 + 2	0	67	70	76	77	99	89	89	98
Pinnacle + PO + UAN	0.1 oz + 0.5 + 2	0	0	99	30	20	96	99	99	27
Pinnacle + PO + UAN	0.125 oz + 0.5 + 2	2	0	99	50	50	88	99	99	47
Pinn + NIS + UAN	0.125 oz + 0.25 + 2	0	0	99	33	37	86	96	93	43
Expert + NIS + UAN	1.25 oz + 0.25+2	0	90	99	82	95	99	99	99	87
Rptr + Rsrc+PO+UAN	4 oz + 4 oz + 1 + 2	2	99	99	88	99	99	99	99	87
FirstRate + Rsrc+PO	0.3 oz + 4 oz +1	5	50	85	99	83	99	99	99	99
Expt + Rsrc+NIS+UAN	1.25 oz+4 oz+0.25+ 2	4	92	99	68	98	99	99	99	72
Pinn+Rsrc + PO + UAN	0.1 oz+4 oz+0.5% +2	3	0	99	40	23	96	99	99	40
Pinn + Rsrc +PO+UAN	0.125oz+4oz+0.5%+2	5	0	99	50	40	96	99	99	47
Pinn + Rsrc + PO+UAN	0.25 oz+4oz+0.5%+2	5	0	99	57	53	96	99	99	53
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		4	5	10	10	15	10	8	9	11

NIS = Preference at 0.25% v/v, PO = Herbimax in pt/A, and UAN = 2 qt/A.

Wild mustard and redroot pigweed were completely controlled at July 7. Expert and Raptor gave excellent foxtail control alone or in tankmix combination. All treatments except FirstRate gave complete common lambsquarters control. Addition of Resource to Raptor did not increase cocklebur control and added to Expert reduced cocklebur control. FirstRate gave excellent broadleaf weed control including cocklebur. Increased grass control at the July 17 rating may be due to competition from vigorous soybean growth.

Weed control in soybean, 1997, Casselton (Zollinger) A study was conducted to evaluate weed control in soybean. 'Lambert' soybean was seeded May 29. POST treatments were applied June 27 at 4:30 pm with 92 F air, 113 f soil surface, 76% RH, 10% clouds, and 3-7 mph wind to V2 soybeans, 2-6" foxtail (5-100/ft^2), 2-10" diameter rosette wild mustard (2-5/ft^2), 1-3" redroot pigweed (1-4/ft^2), 1-3" common lambsquarters (1-2/ft^2), and 1-3" common cocklebur (2-10/ft^2). LPOST treatments were applied June 28 at 3:30 pm with 92 F air, 115 F soil surface, 76% RH, 10% clouds, and 3-7 mph wind to V2 soybeans, 2-6" foxtail, 2-10" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-3" common cocklebur. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		14 DAT						28 DAT				
Treatment	Rate	Soybean	Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% injury	% control									
POST												
Select + PO + UAN	4 oz + 1 + 1	0	99	0	0	0	0	99	0	0	0	0
Select + PO + UAN	6 oz + 1 + 1	0	99	0	0	0	0	99	0	0	0	0
Slct+Bsgn+PO+UAN	6 oz + 1.5 pt+1 + 1	0	63	99	43	60	93	93	53	50	47	95
Slct+Prst+PO+UAN	6 oz + 1.08 oz+1+1	0	77	99	99	60	60	99	96	89	89	78
Slct+Cobr+PO+UAN	6 oz + 8 oz +0.5+2t	13	92	99	99	63	99	99	99	99	86	93
Slct+Cobr+PO+UAN	6 oz +12.8oz+0.5+1t	17	95	99	99	57	99	99	99	99	83	96
Slct + Prst + Cobra + PO +UAN	6 oz+1.08 oz+8 oz + 0.5+2t	17	90	99	99	70	99	99	99	99	96	99
Slct + Bsgrn + Cobra + PO + UAN	6 oz + 1 pt + 8 oz + 0.5 + 2 qt	9	90	99	99	63	99	98	99	99	83	98
Slct + Pinn + Cobra + PO + UAN	6 oz+0.25oz+ 8 oz + 0.5+1	18	93	99	99	83	99	99	99	99	99	95
Slct+Pinn+Resource+ PO + UAN	6 oz + 0.1 oz + 4 oz + 0.5 + 1	7	83	60	93	83	47	99	90	80	73	37
Slct + Pinn +Rsrc + PO + UAN	6 oz + 0.125oz+4oz+ 0.5 + 1	6	95	60	95	90	57	99	96	86	83	40
POST fb LPOST												
Slct+Stlr+PO+UAN/ Slct+Stlr+PO+UAN	6 oz + 5 oz + 0.5 + 1/ 6 oz + 7 oz + 0.5 + 1	10	93	99	99	70	99	98	99	99	94	93
Untreated		0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		6	8	0	3	8	4	6	5	12	11	10

PO = Herbimax in % v/v, and UAN = in qt/A

14 DAT Evaluation: Treatments containing Cobra gave 13% to 18% soybean injury at the 14 DAT evaluation, but no injury was observed at the 28 DAT rating. Select alone gave complete foxtail control. Foxtail control was not reduced when Cobra was added to Select or with the Select + Pinnacle + Cobra or the Select + Pinnacle + Resource tankmix. Foxtail control was reduced when Select was applied with Basagran, Pursuit, Pinnacle, or Resource. Sequential applications of Select + Stellar + PO controlled foxtail Wild mustard and redroot pigweed was controlled by most treatments. Common lambsquarters was controlled by treatments containing Pinnacle. Common cocklebur was only controlled by treatments containing Basagran or Cobra or the sequential treatment.

28 DAT Evaluation: All treatments gave greater than 90% foxtail control. Most broadleaf herbicides controlled wild mustard and redroot pigweed. Pursuit + Cobra or Pinnacle + Cobra, or the sequential treatment were the only treatments that controlled lambsquarters. Cocklebur control followed pattern in the 14 DAT evaluation. Vigorous soybean growth may have increased weed control from the 14 DAT evaluation.

Broadleaf weed control in soybeans, 1997, Casselton (Zollinger) A study was conducted to evaluate broadleaf weed control in soybean. 'Lambert' soybean was seeded May 28. POST treatments were applied June 20 at 4:00 pm with 77 F air, 96 F soil surface, 51% RH, 40% clouds, and 0-5 mph wind to 1st trifoliolate soybeans, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (2/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	July 5					July 17	
		Soybean	Fxtl	Rrpw	Colq	Cocb	Fxtl	Cocb
	Product/A	% injury	% control				% control	
Basagran + PO	1.5 pt + 0.5 % v/v	0	0	47	63	99	0	80
Pursuit + PO	1.08 oz + 0.5 % v/v	2	95	99	73	70	99	94
Cobra 25WP + PO	6.4 oz + 1 pt	7	0	80	70	70	43	57
Cobra 25WP+ PO	12.8 oz + 1 pt	15	0	93	77	78	50	82
Cobra 2EC+ Prst + PO	4 oz + 1.08 oz + 1	6	94	99	99	99	99	96
Cobra 2EC+ Prst + PO	6.4 oz +1.08oz +1	13	88	99	89	99	99	96
Cobra 25WP+ Prst + PO	6.4 oz +1.08oz +1	9	93	99	96	99	98	96
Cobra 2EC+ Prst + PO	8 oz + 1.08 oz +1	7	99	99	99	99	98	93
Cobra 2EC+ Bsgn + PO	4 oz + 1 pt + 1	8	0	98	93	99	33	92
Cobra 2EC+ Bsgn + PO	6.4 oz + 1 pt + 1	12	0	99	99	99	47	87
Cobra 25WP+ Bsgn + PO	6.4 oz + 1 pt + 1	7	0	93	88	96	43	87
Cobra 2EC+ Bsgrn + PO	8 oz + 1 pt + 1	17	0	96	90	99	60	93
V-10057 + PO	24 oz + 1 pt	15	0	93	83	99	43	92
V-10057 + PO	32 oz + 1 pt	17	0	92	77	99	50	92
V-10059 + PO	26 oz + 1 pt	20	0	93	92	99	40	92
V-10059 + PO	34 oz + 1 pt	15	0	88	85	99	57	92
Cobra 25WP+ Pinn + PO	6.4oz+0.125oz+1	15	0	95	90	80	57	73
Untreated		0	0	0	0	0	0	0
LSD (0.05)		7	3	6	15	7	12	12

PO = Herbimax at 1 pt/A

The objectives of this study was to evaluate 2EC and 25WP formulations of Cobra alone or with Pursuit or Basagran and to evaluate V-10057 and V-10059, two different ratios of Cobra and Basagran in premix formulation. Soybean injury was 20% or less from any treatment. Wild mustard was completely controlled at both evaluations. Redroot pigweed and common lambsquarters was completely controlled at July 17. Treatments containing combinations or Cobra with Pursuit or Basagran greater than 90% broadleaf weed control.

Roundup Ready soybean, Fargo, 1997. (Zollinger) An experiment was conducted to evaluate weed control in Roundup Ready soybeans. Asgrow 'AGA-08701' a Roundup Ready soybean variety was seeded June 10 and PRE treatments were applied June 12 at 3:00 pm with 88 F air, 69 F soil at 4", 26% RH, 90% clouds, and 5-12 mph wind. EPOST treatments were applied July 7 at 8:30 am with 52 F, 60 F soil surface, 26% RH, 90% clouds, and 5-15 mph wind to unifoliolate soybeans, 0-4" foxtail (5-10/ft^2), 1-3" diameter rosette wild mustard (1-2/ft^2), 0-3" redroot pigweed (10-20/ft^2), and 1-2" Venice mallow (1-2/ft^2). MPOST treatments were applied July 17 at 9:00 am with 78 F air, 85 F soil surface, 50% RH, 0% clouds, and 2-3 mph wind to 2nd trifoliolate soybeans, 1-5" foxtail (20/ft^2), 1-6" diameter rosette wild mustard (2/ft^2), 1-4" redroot pigweed (10-12/ft^2), 2-4" common cocklebur (2/ft^2), and 1-2" Venice mallow (1-3/ft^2). LPOST treatments were applied July 21 at 9:30 am with 80 F air, 90 F soil surface, 70% RH, 10% clouds, and 0 mph wind to 5th trifoliolate soybeans, 2-6" foxtail, 2-10" diameter rosette wild mustard, 2-6" redroot pigweed, and 2-4" Venice mallow. LLPOST treatments were applied July 29 at 9:30 am with 82 F air, 87 F soil surface, 30% RH, 0% clouds, and 0 mph wind to early flowering soybeans, 10-12" foxtail, flowering (18") wild mustard, 6-10" redroot pigweed, 6-14" barnyardgrass and 4-8" Venice mallow. Treatments were applied to an 8 ft wide area the length of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

This study was established late due to an extended wet period. Replicates 3 was injury from standing water after soybeans emerged. The fourth replicate was not harvested due to excessive injury from water. Other flushes of weeds emerged after EPOST application and weed control evaluations were lower at earlier evaluations (data not shown). However, fast crop growth and canopy were effective in reducing competitive effects from weeds as shown by nonsignificant crop yields among chemical treatments. In this study, excellent mid season weed control was observed and no yield differences resulted from different combinations of Roundup Ultra applied early, mid, late, and late-late applied as one application or sequential applications.

Treatment	Rate	August 14						Yield
		Fxtl[a]	Wimu	Rrpw	Vema	Pesw	Cocb	
	product/A	% control						bu/A
PRE								
Pursuit Plus+ Prowl	2.5 pt + 1 pt	99	99	99	99	99	99	20
PRE fb EPOST								
Prowl / Pursuit + Sun-It II + AMS	3 pt / 1.08 oz + 1.5 pt + 2.5 lb	97	99	99	96	98	98	25
PRE fb E, M, L, & LLPOST								
Pursuit Plus/ Roundup Ultra / Roundup Ultra / Roundup Ultra / Roundup Ultra	2.5 pt / 1 qt / 1 qt / 1 qt / 1 qt	98	99	99	99	99	99	22
EPOST								
Roundup Ultra + AMS	1 qt + 2.5 lb	93	98	96	98	94	99	24
Roundup Ultra + Pursuit + AMS	1 qt + 1.08 oz + 2.5 lb	95	99	98	97	97	99	26
Pursuit + Sun-It II + AMS	1.08 oz + 1.5 pt + 2.5 lb	90	99	94	87	89	99	24
MPOST								
Roundup Ultra + AMS	1 qt + 2.5 lb	98	99	94	99	99	96	22
Roundup Ultra + Pursuit + AMS	1 qt + 1.08 oz + 2.5 lb	99	99	99	99	98	99	26
LPOST								
Roundup Ultra + AMS	1 qt + 2.5 lb	99	99	99	98	99	99	28
Roundup Ultra + Pursuit + AMS	1 qt + 1.08 oz + 2.5 lb	77	97	87	94	94	97	23
EPOST fb M, L & LLPOST								
Roundup Ultra / Roundup Ultra / Roundup Ultra / Roundup Ultra	1 qt / 1 qt / 1 qt / 1 qt	98	99	99	99	99	99	23
EPOST fb LPOST								
Roundup Ultra + AMS / Roundup Ultra + AMS	0.25 pt + 2.5 lb/0.25 pt + 2.5 lb	97	98	98	98	96	99	22
Roundup Ultra + AMS / Roundup Ultra + AMS	0.5 pt + 2.5 lb/0.5 pt + 2.5 lb	99	99	99	99	97	99	20
Roundup Ultra + AMS / Roundup Ultra + AMS	0.75 pt + 2.5 lb / 0.75 pt + 2.5 lb	99	99	99	98	96	99	24
Roundup Ultra + AMS / Roundup Ultra + AMS	1 pt + 2.5 lb / 1 pt + 2.5 lb	99	99	99	99	98	99	25
MPOST fb LPOST fb LLPOST								
Roundup Ultra / Roundup Ultra / Roundup Ultra	1 qt / 1 qt / 1 qt	99	99	99	99	99	99	23
LPOST fb LLPOST								
Roundup Ultra / Roundup Ultra	1 qt / 1 qt	99	99	99	99	99	99	25
LLPOST								
Roundup Ultra	1 qt	99	99	99	98	97	99	23
Handweeded		99	99	99	99	99	99	24
Untreated (plus weeds)		0	0	0	0	0	0	17
LSD (0.05)		8	4	8	9	10	4	6

[a]Fxtl = Grft and Yeft.

Adjuvants with Pursuit, 1997, Casselton (Zollinger) A study was conducted to evaluate several adjuvants with Pursuit for weed control in soybean. Lambert soybean was seeded May 29. POST treatments were applied June 20 at 6:00 pm with 77 F air, 51% RH, 40% clouds, and 0-5 mph wind to 1st trifoliolate soybeans, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (0.25-1/ft^2), 0.5-3" common lambsquarters (0.5-1/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to an 8 ft wide area the length of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Adjuvant enhancement of Pursuit followed the following order: MSO type > PO > NIS. Few differences in Pursuit enhancement occurred within NIS or PO classes of adjuvants but differences did occur within MSO type adjuvants. Zn EDTA + NIS or Fe EDDHA did not reduce weed control. MSO type adjuvants + NIS + UAN enhanced herbicides equal to or greater than NIS + UAN or PO + UAN or equal to MSO type + UAN adjuvants. Substituting organosilicone surfactant for 28% UAN reduced weed control from Pursuit. Adding drift retardants to Pursuit reduced weed control. ND-4 enhanced Pursuit equal to or greater than any other adjuvant or adjuvant combination. Adjuvants are herbicide and weed specific.

Treatment	Rate	July 5					July 17				
		Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	Product/A	% control									
Pursuit at 0.72 oz DG/A											
NIS+UAN											
+ Preference + UAN	+ 0.25 % v/v + 1 qt	65	99	99	57	43	60	99	89	56	60
+ IMBD2	+ 3 lb	63	99	99	52	38	58	83	63	53	63
NIS + Micronutrient											
+ Preference + Zn EDTA	+ 0.25 % v/v + 1 qt	57	83	86	43	33	48	86	67	57	50
+ Preference + Fe EDDHA	+ 0.25 % v/v + 2.5 lb	50	89	93	56	40	45	70	60	53	50
Petroleum oil + UAN											
+ Herbimax + UAN	+ 2 qt + 1 qt	72	96	96	70	53	85	96	89	69	83
+ CL-9715	+ 20 lb/100 gal	70	93	93	57	48	70	90	67	50	72
+ IMBD2 + CORTC	+ 2.5 lb + 2 pt	73	89	83	67	49	84	96	93	69	88
MSO/ESO + UAN											
+ Sun-It II + UAN	+ 1.5 pt + 1 qt	78	98	76	73	68	96	99	99	80	95
+ MSO + UAN	+ 1.5 pt + 1 qt	70	99	99	60	52	98	99	99	75	96
+ Hasten + UAN	+ 1.5 pt + 1 qt	83	99	99	75	65	96	98	99	81	94
+ Eth-N-Ate	+ 2 qt	88	99	99	85	66	99	99	98	83	95
+ Sundance II + UAN	+ 1.5 pt + 1 qt	70	99	99	60	60	98	99	99	73	93
+ CHSU1 + SMAI1	+ 1 pt + 2.5 lb	78	99	99	68	55	93	93	76	75	79
+ Destiny + UAN	+ 1.5 pt + 1 qt	78	79	99	70	60	96	99	89	78	95
+ CL 9706	+ 3 pt	85	98	86	73	62	93	99	99	80	90
+ CL 9711	+ 5 pt	87	99	99	73	63	97	99	89	83	90
MSO + NIS + UAN											
+ Destiny + Preference + UAN	+ 0.25 % + 0.25 % + 1 qt	83	99	99	70	65	95	99	93	93	92
MSO/ESO + Org. Silicon Surf.											
+ Dyne-Amic	+ 4 pt/100 gal	70	93	93	67	55	95	99	99	78	88
+ Phase	+ 2 pt/100 gal	67	99	96	57	55	94	96	89	73	83
MSO + Drift Retardant											
+ CHSU1 + TPA12	+ 1 pt + 1 lb	58	89	93	53	43	98	99	99	65	92
Adjuvant Blend											
+ ND-4	+ 1 % v/v	87	99	99	82	72	99	99	99	90	95
LSD (0.05)		11	8	8	7	11	10	7	7	9	10

Adjuvants with Raptor, 1997, Casselton (Zollinger) A study was conducted to evaluate several adjuvants with Raptor for weed control in soybean. Lambert soybean was seeded May 29. POST treatments were applied June 21 at 1:00 pm with 78 F air, 23% RH, 20% clouds, and 0-8 mph wind to 1st trifoliolate soybeans, 1-4" foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (0.25-1/ft^2), 0.5-3" common lambsquarter (0.5-1/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to an 8 ft wide area the length of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Adjuvant enhancement of Accent followed the following order: MSO type > PO > NIS. Few differences in Raptor enhancement occurred within NIS or PO classes of adjuvants but differences did occur within MSO type adjuvants. Zn EDTA + NIS or Fe EDDHA reduced weed control from Raptor. MSO type adjuvants + NIS + UAN enhanced herbicides equal to or greater than NIS + UAN or PO + UAN or equal to MSO type + UAN adjuvants. Substituting organosilicone surfactant for 28% UAN did not affect weed control from Raptor. Adding drift retardants had no affect on weed control from Raptor. ND-4 enhanced Raptor equal to or greater than any other adjuvant or adjuvant combination. Adjuvants are herbicide and weed specific.

Treatment	Rate	July 7					July 17			
		Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Rrpw	Colq	Cocb
	Product/A	% control								
Raptor at 3 fl oz/A										
NIS + UAN										
+ Preference + UAN	+ 0.25% + 1 qt	57	96	63	63	77	65	89	59	70
+ IMBD2	+ 3 lb	83	99	89	80	80	70	99	49	87
NIS + Micronutrients										
+ Preference + 9% Zn EDTA	+ 0.25% + 1 qt	70	93	83	73	80	81	83	53	77
+ Preference + Fe EDDHA	+ 0.25% + 2.5 lb	57	83	70	50	67	57	89	56	60
Petroleum oil + UAN										
+ Herbimax + UAN	+ 2 qt + 1qt	90	99	93	93	90	92	99	78	88
+ CL 9715	+ 20 lb/100 gal	67	96	86	66	63	70	89	54	63
+ IMBD2 + CORTC	+ 2.5 lb + 2 pt	77	99	73	57	77	87	99	60	82
MSO/ESO + UAN										
+ Sun-It II + UAN	+ 1.5 pt + 1 qt	87	99	99	93	87	96	89	78	92
+ MSO + UAN	+ 1.5 pt + 1 qt	70	99	60	67	83	99	99	53	90
+ Hasten + UAN	+ 1.5 pt + 1 qt	82	99	93	93	90	96	99	75	92
+ Eth-N-Ate	+ 2 qt	83	96	86	63	87	98	99	78	92
+ Sundance II + UAN	+ 1.5 pt + 1 qt	83	99	89	63	90	98	99	77	93
+ CHSU1 + SMAI1	+ 1 pt + 2.5 lb	70	93	76	63	77	98	99	68	96
+ Destiny + UAN	+ 1.5 pt + 1 qt	77	99	70	70	80	80	89	72	90
+ CL 9706	+ 3 pt	63	99	70	63	73	91	99	65	88
+ CL 9711	+ 5 pt	83	99	93	87	87	96	99	78	91
MSO + NIS + UAN										
+ Destiny + Preference + UAN	+ 0.25% + 0.25% + 1 qt	87	99	99	90	90	98	99	80	91
MSO/ESO + Org. silicon surf.										
+ Dyne-Amic	+ 4 pt/100 gal	87	99	93	83	90	89	99	70	77
+ Phase	+ 2 pt/100 gal	80	99	89	86	87	94	99	72	78
MSO + Drift retardant										
+ CHSU1 + TPA12	+ 1 pt + 1 lb	83	99	89	80	87	81	89	70	80
Adjuvant blend										
+ ND-4	+ 1%	92	99	99	90	88	95	99	80	95
LSD (0.05)		9	8	10	8	10	7	8	11	10

Wimu was 99% at the second rating date.

Soil applied weed control in dry beans, Casselton, 1997. (Zollinger) An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied PPI, PRE, and POST. PPI treatments were applied May 28 at 4:00 pm with 73 F air, 55 F soil at 4", 21% RH, 60% clouds, and 3-7 mph wind and incorporated to a depth of 1 to 2" with a rototiller. 'Othello' pinto and 'Norstar' navy beans were seeded and PRE treatments were applied May 28 at 4:30 pm with 73 F air, 55 F soil at 4", 21% RH, 60% clouds, and 3-7 mph wind. POST treatments were applied June 20 at 3:00 pm with 77 F, 97 F soil surface, 51% RH, 40% clouds, and 0-5 mph wind to 1st trifoliolate beans, 1-4" green and yellow foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-1" redroot pigweed (1/ft^2), 0.5-3" common lambsquarters (2/ft^2), and 1-5" common cocklebur (1-8/ft^2). Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

		July 2				July 17		
Treatment	Rate	Drbe	Fxtl	Wimu	Cocb	Fxtl	Wimu	Cocb
	Product/A	% inj			% control			
PPI								
Broadstrike+Treflan	2 pt	0	89	99	20	82	98	20
Brdstrk+Trfln	4 pt	8	99	99	25	98	99	40
Brdstrk+Dual	2.25 pt	0	88	96	18	76	99	7
Brdstrk+Dual	4.5 pt	2	93	99	28	93	99	27
Sonalan + Frontier	1.5 pt + 20 oz	0	99	60	7	91	63	10
Prowl + Frontier	3 pt + 20 oz	0	96	81	8	95	66	0
PRE								
Brdstrk+Dual	2.25 pt	0	20	99	17	47	99	3
Brdstrk+Dual	4.5 pt	2	48	99	23	70	99	37
Prowl + Frontier	3 pt + 20 oz	0	67	53	0	90	53	7
PPI fb POST								
Treflan / Basagran + PO	1 pt / 1.5 pt + 1	0	96	99	95	86	99	72
Treflan / Pursuit + NIS	1 pt / 0.72 oz + 0.25	0	91	90	53	93	99	80
Brdstrk+Trfln / Pursuit + NIS	1.75 pt / 0.72 oz + 0.25	0	99	99	80	99	99	83
Prowl / Pursuit + NIS	3 pt/ 0.72 oz + 0.25	0	98	99	60	96	89	73
PRE fb POST								
Frontier / Pursuit + NIS	20 oz / 0.72 oz + 0.25	0	82	99	80	86	99	80
Frontier / Basagran + PO	20 oz / 1.5 pt + 1	0	33	99	91	40	99	93
Frontier / Pursuit + Basagran + NIS	20 oz / 0.72 oz + 1.5 pt + 0.25	0	77	99	90	98	99	95
POST								
Frontier + Pursuit + NIS	20 oz + 0.72 oz + 0.25	0	77	99	80	96	99	82
Frontier + Basagran + PO	20 oz + 1.5 pt + 1	0	37	99	92	48	99	93
Frontier + Pursuit + Basagran + NIS	20 oz + 0.72 oz + 1.5 pt + 0.25	0	67	99	93	91	99	96
Untreated		0	0	0	0	0	0	0
LSD (0.05)		3	18	17	15	18	15	19

NIS = Preference at 0.25% v/v, PO = Herbimax at 1 qt/A.

This study was conducted to determine dry bean response to 1X and 2X rates of Broadstrike premixes, and evaluate herbicide treatments recently labeled in dry bean. Data indicates excellent tolerance of dry bean to Broadstrike. All treatments gave complete redroot pigweed and common lambsquarters control. Pinto and navy cultivars used in this study show excellent tolerance to Broadstrike premixes applied PPI or PRE. Broadstrike + Dual PRE controlled less foxtail than PPI. Frontier PRE or POST did not control foxtail due to lack of rainfall for the critical weed germination period after application. Most treatments gave excellent wild mustard control. Only treatments containing Basagran and/or Pursuit controlled cocklebur.

POST weed control in dry beans, Casselton, 1997. (Zollinger) An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied POST. 'Othello' pinto and 'Norstar' navy beans were seeded on May 28. POST treatments were applied June 20 at 2:00 pm with 77 F air, 96 F soil surface, 51% RH, 40% clouds, and 0-5 mph wind to 1st trifoliolate beans, 1-4" green and yellow foxtail (1-10/ft^2), 1-5" diameter rosette wild mustard (1-8/ft^2), 0.5-2" redroot pigweed (1/ft^2), 0.5-2" common lambsquarters (1/ft^2), and 1-5" common cocklebur (1-8/ft^2). LPOST treatments were applied June 27 at 3:30 with 92 F, 76 RH, 10% clouds, and 3-7 mph wind to V2-V4 beans, 0.5-3" green and yellow foxtail, 1-3" diameter rosette wild mustard, 1-3" redroot pigweed, 1-3" common lambsquarters, and 1-3" common cocklebur. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

This experiment was conducted to determine weed control and dry bean safety from Pursuit and Raptor applied at different rates, alone or in tankmix combination, with different adjuvants, or in sequential applications. Previous research has shown variable dry bean tolerance affected mostly by environment. Objectives were to increase dry bean safety while maintaining adequate weed control. To our surprise no injury was observed with any treatment at any evaluation. Temperature and humidity prior to and after application were more moderate compared to conditions in 1995 and 1996 when dry bean stunting from Raptor was observed.

Pursuit at 0.72 oz WDG/A was enhanced more by Sun-It II than NIS. Adding Basagran to Pursuit + NIS increased general weed control over Pursuit + NIS at the last evaluation. However, addition of Basagran to Pursuit + Sun-It II did not increase weed control compared to Pursuit + Sun-It II alone. Other research has shown safening of dry bean to Pursuit by adding Basagran but no injury was recorded with either treatments. Increasing the Basagran rate from 0.5 to 1 pt increased weed control with Pursuit + NIS but did not further increase weed control with Pursuit + Sun-It II. Pursuit + Select at 8 fl oz/A gave excellent grass and broadleaf weed control.

Raptor label in soybean allows use alone at 5 fl oz/A or 4 fl oz/A only if a soil herbicide is applied prior to Raptor. Raptor gave greater lambsquarters control than Pursuit with similar adjuvants. Raptor at 3 fl oz/A + Sun-It II gave greater general weed control than Raptor at 3 fl oz/A and equal or greater weed control than Raptor at 4 fl oz/A + NIS. Evaluations of Raptor of weed control at an even lower rate of 2 fl oz/A + Sun-It II initially was lower but was equal to Raptor at 3 fl oz/A + Sun-It II at July 17. Addition of Basagran to Raptor antagonized grass and broadleaf weed control. Adding Sun-It II in the place of NIS did not overcome Basagran antagonism of Raptor. However, reducing the rate of Sun-It II from 1.5 to 0.5 pt/A resulting in less weed control. With the exception of cocklebur control at low rates, Raptor applied in sequential applications at rates from 1 fl oz/A to 2 fl oz/A resulted in almost complete weed control. Previous research has shown that sequential applications of Raptor at reduced rates increases dry bean safety. Present research shows that adequate weed control can be obtained using this same method of application.

Treatment	Rate	July 2					July 17				
		Fxtl	Wimu	Rrpw	Colq	Cocb	Fxtl	Wimu	Rrpw	Colq	Cocb
	oz prod/A	% control									
POST											
Basagran + PO	1 + 1.5	0	83	23	40	93	0	63	30	30	95
Pursuit + NIS	0.72 + 0.25	80	60	79	66	81	70	63	63	63	70
Pursuit + Sun-It II	0.72 + 1.5	81	81	83	76	90	88	88	83	80	83
Pursuit + Basagran + Sun-It II	0.72 + 0.5 + 1.5	78	86	93	88	96	88	93	92	79	79
Pursuit + Basagran + Sun-It II	0.72 + 1 + 1.5	73	96	85	86	97	81	96	94	85	83
Pursuit + Basagran + NIS	0.72 + 0.5 + 0.25	73	84	71	75	94	86	80	70	71	73
Pursuit + Basagran + NIS	0.72 + 1 + 0.25	77	97	73	76	89	88	83	91	73	70
Pursuit + Select + NIS	0.72 + 6 + 0.25	85	96	83	88	79	86	85	93	80	83
Pursuit + Select + NIS	0.72 + 8 + 0.25	80	90	90	90	83	97	99	99	90	90
Raptor + NIS	4 + 0.25	63	80	86	78	60	84	97	97	78	63
Raptor + Sun-It II	3 +1.5	81	92	90	87	70	86	99	96	88	63
Raptor + Sun-It II	2 + 1.5	66	94	76	73	53	73	99	96	83	56
Raptor + Basagran + NIS	4 + 0.5 + 0.25	86	96	82	71	88	88	97	79	78	76
Raptor + NIS	3 + 0.25	61	83	80	68	63	81	89	76	73	53
Raptor + Basagran + NIS	3 + 0.5 + 0.25	75	94	80	80	84	86	97	88	73	80
Raptor + Basagran + Sun-It II	2 + 0.5 + 1.5	76	91	86	80	96	69	86	76	60	70
Raptor + Basagran + Sun-It II	2 + 0.5 + 0.5	66	92	83	74	84	56	74	70	56	46
POST fb LPOST											
Raptor + Sun-It II / Raptor + Sun-It II	1 + 1.5 / 1 + 1.5	90	95	93	94	78	93	99	99	93	73
Raptor + Sun-It II / Raptor + Sun-It II	1.5 + 1.5 / 1.5 + 1.5	87	94	90	91	88	97	99	99	93	76
Raptor + Sun-It II / Raptor + Sun-It II	2 + 1.5 / 1 + 1.5	93	99	99	99	90	97	98	97	95	86
Raptor + Sun-It II / Raptor + Sun-It II	2 + 1.5 / 2 + 1.5	96	99	99	97	90	97	99	99	96	91
LSD (0.05)		14	7	15	9	9	13	12	10	10	12

NIS = Preference, PO = Herbimax

NIS was applied at 0.25% v/v, PO and Sun-It II were applied in pt/A.

Weed control in dry beans, Minto, 1997. (Zollinger, Brummond and Fitterer) An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied PPI, PRE, and POST. PPI treatments were applied May 28 at 12:00 pm with 73 F air, 62 F soil at 4", 18% RH, 5% clouds, and 3 mph wind and incorporated to a depth of 1 to 2" with a rototiller. 'Othello' pinto, 'Norstar' navy, and 'Montcalm' kidney beans were seeded and PRE treatments were applied May 28 at 1:00 pm with 73 F air, 62 F soil at 4", 18% RH, 5% clouds, and 3 mph wind. POST treatments were applied June 20 at 11:00 am with 75 F air, 75 F soil surface, 41% RH, 90% clouds, and 0-3 mph wind to 1-3" green and foxtail (20-40/ft^2), 0-3" redroot pigweed (10-20/ft^2), and 1-3" common lambsquarters (1-4/ft^2). Treatments were applied to the center 8 ft of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with four replicates per treatment.

This study was conducted to determine dry bean response to 1X and 2X rates of Broadstrike herbicide premixes, and evaluate herbicide treatments recently labeled in dry bean. Data indicates excellent dry bean tolerance and weed control from 1X rates of Broadstrike + Treflan PPI and 1X or 2X rates of Broadstrike + Dual PPI. Weed control from PRE or PRE followed by POST treatments was inadequate due to dry weather following application. No rainfall occurred after application until July 1. PPI followed by POST treatments gave excellent weed control. Weed control from POST treatment containing Pursuit and/or Basagran was inadequate probably due to drought stressed condition of weeds. Dry bean injury from Pursuit may be due to drought stressed condition of dry beans also. Dry bean response to Raptor was good which verifies other research indicating that dry bean injury from Raptor can occur under wet, humid, and hot conditions but safe under drier, warm conditions. Basagran antagonized weed control from Raptor. Antagonism increased as Raptor rates decreased. Raptor at 2 fl oz/A + Sun-It II did not control weeds. However, Sun-It II overcame Basagran antagonism of Raptor even though weed control was poor.

Treatment	Rate	14 DAT			28 DAT			July 8			
		Grft	Rrpw	Colq	Grft	Rrpw	Colq	Dry Bean	Grft	Rrpw	Colq
	Product/A	% control			% control			% injury	% control		
PPI											
Brdstrk+Trfln	2 pt	91	98	98	89	95	98	0	90	98	98
Brdstrk+Trfln	4 pt	98	99	99	96	99	99	13	98	99	99
Brdstrk+Dual	2.25 pt	87	95	99	78	90	96	3	87	95	99
Brdstrk+Dual	4.5 pt	94	98	98	93	98	99	0	96	98	99
Sonalan + Frontier	1.5 pt + 20 oz	97	99	99	98	99	99	0	96	99	99
Prowl + Frontier	3 pt + 20 oz	81	71	91	78	70	91	3	77	71	91
PRE											
Brdstrk+Dual	2.25 pt	42	47	65	27	27	67	3	33	40	67
Brdstrk+Dual	4.5 pt	62	62	83	50	50	73	0	57	57	75
Prowl + Frontier	3 pt + 20 oz	57	57	53	47	58	60	0	47	50	70
PPI fb POST											
Treflan / Basagran + PO	1 pt / 1.5 pt + 1	94	98	99	91	96	98	0	91	96	98
Treflan / Pursuit + NIS	1 pt / 0.72 oz + 0.25	92	98	98	91	98	98	0	91	98	98
Brdstrk+Trfln / Pursuit + NIS	1.75 pt / 0.72 oz + 0.25	94	99	99	95	99	99	3	95	99	99
Prowl / Pursuit + NIS	3 pt / 0.72 oz + 0.25	94	96	98	95	85	98	22	95	98	98
PRE fb POST											
Frontier / Pursuit + NIS	20 oz / 0.72 oz + 0.25	48	72	80	67	70	70	0	67	70	70
Frontier / Basagran + PO	20 oz / 1.5 pt + 1	32	70	86	32	75	80	3	32	75	80
Frontier / Pursuit + Basagran + NIS	20 oz / 0.72 + 1.5 pt + 0.25	63	70	83	62	69	77	20	62	69	77
POST											
Frontier + Pursuit + NIS	20 oz + 0.72 oz + 0.25	53	57	67	53	57	67	0	53	57	67
Frontier + Basagran + PO	20 oz + 1.5 pt + 1	38	70	77	38	70	77	5	38	70	77
Frontier + Pursuit + Basagran + NIS	20 oz + 0.72 + 1.5 pt + 0.25	33	73	83	50	73	83	27	50	73	83
Basagran + PO	1 pt + 1.5	0	67	83	0	82	83	0	0	67	83
Pursuit + Basagran + NIS	0.72 oz + 1 pt + 0.25	57	70	57	57	70	77	7	57	70	77
Pursuit + Basagran + NIS	0.72 oz + 0.5 pt + 0.25	77	80	90	77	70	90	10	77	80	90
Raptor + NIS	4 oz + 0.25	92	93	95	92	85	95	3	92	93	95
Raptor + Basagran + NIS	4 oz + 0.5 pt + 0.25	58	80	80	75	80	80	7	75	80	80
Raptor + NIS	3 oz + 0.25	87	90	85	87	90	85	0	87	90	85
Raptor + Basagran + NIS	3 oz + 0.5 pt + 0.25	82	85	70	82	85	70	3	82	85	70
Raptor + Sun-It II	2 oz + 1.5	64	63	65	64	63	48	5	64	63	65
Raptor + Basagran + Sun-It II	2 oz + 1 pt + 1.5	73	65	70	73	62	70	3	73	65	70
Raptor + Basagran + Sun-It II	2 oz + 0.5 pt + 0.5	68	60	75	68	70	75	5	68	60	75
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		15	13	14	10	9	11	11	10	13	9

NIS = Preference at 0.25 % v/v, PO = Herbimax in qt/A, Pursuit was applied at 0.72 oz WDG/A.

Dry bean herbicide trial, Carrington 1997. (Endres, Frie, and Zwinger) The experiment was conducted to evaluate weed control and pinto bean response with Pursuit and Raptor. 'Othello' pinto bean was planted in 30-inch rows at the rate of 70,000 PLS/A on May 30. Treatments were applied June 23 with 74 F, 80% RH, 75% clouds, and 13-mph wind to 2-trifoliolate leaf pinto bean, 2- to 6-leaf green foxtail, 1-to 2-inch tall common lambsquarters, 1- to 2-inch tall redroot and prostrate pigweed, and cotyledon- to 4-leaf wild mustard. Treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer delivering 10.3 gal/A at 40 psi through 8001 flat fan nozzles. Visual estimates of percentage crop injury and weed control were taken July 8 and 22, and August 18. The experiment was a randomized complete block design with four replications.

Treatment[a]	Rate	July 8					July 22				
		Drbe	Grft	Wimu	Colq	Piqw	Drbe	Grft	Wimu	Colq	Piqw
	lb/A	% inj	----	% control	----		% inj	----	% control	----	
Assure II + Pursuit + NIS	0.7 + 0.032	0	79	98	69	83	0	72	98	71	81
Pursuit + NIS	0.032	0	80	98	69	77	0	75	99	72	86
Basagran + MVO	0.5	0	0	99	95	64	0	0	95	97	71
Pursuit + Basagran + NIS	0.032 + 0.5	3	84	91	95	82	4	79	88	96	84
Pursuit + Basagran + NIS	0.032 + 0.25	13	72	89	68	76	7	75	85	74	75
Raptor + NIS	0.047	16	94	98	72	86	13	89	99	73	89
Raptor + Basagran + NIS	0.047 + 0.25	0	93	97	81	93	0	89	96	78	91
Raptor + NIS	0.032	0	91	99	75	89	0	83	99	73	87
Raptor + Basagran + NIS	0.032 + 0.25	0	91	98	81	89	0	84	96	79	89
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		NS	6	12	17	14	NS	11	13	22	16
C.V. %			5	8	14	11		10	9	18	12

[a]NIS=Preference applied at 0.25% v/v. MVO=Scoil applied at 1.5 pt/A.

Treatment[a]	Rate	August 18				
		Drbe	Grft	Wimu	Colq	Pigw
	lb/A	% inj	----	% control		----
Assure II + Pursuit + NIS	0.7 + 0.032	0	79	99	68	81
Pursuit + NIS	0.032	0	80	99	68	78
Basagran + MVO	0.5	0	0	99	94	60
Pursuit + Basagran + NIS	0.032 + 0.5	0	82	92	93	84
Pursuit + Basagran + NIS	0.032 + 0.25	0	75	85	72	70
Raptor + NIS	0.047	0	93	99	53	84
Raptor + Basagran + NIS	0.047 + 0.25	0	95	98	73	87
Raptor + NIS	0.032	0	92	99	66	84
Raptor + Basagran + NIS	0.032 + 0.25	0	92	99	66	83
Untreated		0	0	0	0	0
LSD (0.05)			9	11	31	18
C.V. %			8	8	28	15

[a]NIS=Preference applied at 0.25% v/v. MVO=Scoil applied at 1.5 pt/A.

Pinto bean injury (reduction in biomass) was present with several treatments but was not detected late in the season. Green foxtail control likely was antagonized with the addition of Pursuit with Assure II. Raptor treatments generally provided greater green foxtail control compared to Pursuit treatments. Wild mustard control generally was excellent with all treatments. The Raptor treatments did not improve common lambsquarters control compared to Pursuit treatments. The addition of Basagran to Pursuit or Raptor generally did not affect weed control. However, Pursuit at 0.032 lb/A + Basagran at 0.5 lb/A provided 93-97% lambsquarters control. Raptor treatments consistently provided good control (83-93%) of pigweed.

Quizalofop and Imazamethabenz combination for weed control in Sunflower, 1997, Devils Lake ND. (Terry Gregoire) Treatments were applied to oil sunflower 8" tall, July 4. Green and yellow foxtail were in the 4-8 leaf stage. The wind was calm, sky clear and the temperature was 70°F. The soil was wet following a 1.8" rainfall July 3. Treatments were applied by a backpack sprayer delivering 8.5 gpa at 35 psi through 8001 nozzles. Scoil at 0.25% v/v was added to all treatments.

7/4/97	Rate oz a.i./A	Yeft % control
Quizalofop	0.4	24
Quizalofop + Imazamethabenz	0.4 + 6	14
Quizalofop	0.6	51
Quizalofop + Imazamethabenz	0.6 + 6	24
Quizalofop	0.8	54
Quizalofop + Imazamethabenz	0.8 + 6	38
Check		0
Quizalofop	1.0	60
Quizalofop + Imazamethabenz	1.0 + 6	44
Imazamethabenz	6	3
LSD (P=.05)		18.1
Standard Deviation		12.4
CV	39.5	

Imazamethabenz tended to reduce yellow foxtail control at all rates of quizalofop. Green foxtail was scattered but it appeared control of green foxtail was much less affected by combinations.

No sunflower injury was noted.

Fall treatments in sunflower, NW-22, 1996-1997. (Zollinger and Fitterer) An experiment was conducted to evaluate weed control in sunflower from labeled and experimental herbicides soil applied in the fall. Soil had 3% sand, 49% silt, and 48% clay - 6.0% OM and 7.5 pH. Fall applications were applied November 8, 1996 at 10:30 am with 30 F air, 30% clouds, and 5 mph wind. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a back-pack sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles. Interstate '6111' sunflower was seeded on June 12, 1997. The experiment had a randomized complete block design with three replicates per treatment.

		October 14, 1996		
Treatment	Rate	Snfl	Fxtl	Rrpw
	lb ai/A	% injury	% control	
Prowl	1.5	0	38	20
Sonalan	1.3	0	15	10
TopNotch	1.5	0	38	8
TopNotch	3	0	10	3
Authority	0.187	0	33	55
Authority	0.38	0	30	49
Goal	0.25	0	8	5
Goal	0.5	0	20	3
Balance	0.07	0	34	18
Balance	0.14	0	8	0
Balance	0.21	0	30	15
Untreated		0	13	10
LSD (0.05)		0	30	30

Wet weather delayed seeding and weeds had emerged so the area was worked in the direction of the plots before planting. Sunflower exhibited excellent tolerance to all treatments, no injury was detecting. Weed control for all treatments was poor.

Fall treatments in sunflower, Cogswell, 1996-1997. (Zollinger and Fitterer) An experiment was conducted to evaluate weed control in sunflower from labeled and experimental herbicides soil applied in the fall. Soil had 21% sand, 55% silt, 24% clay, 5.2% OM, and 7.3 soil pH. Fall applications were applied November 14, 1996 at 12:30 pm with 25 F air, 20% clouds, and 15-20 mph wind. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a back-pack sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles. Pioneer '6451' sunflower was seeded no-till on May 27, 1997. The experiment had a randomized complete block design with three replicates per treatment.

		June 24				
Treatment	Rate	Snfl	Wioa	Kocz	Corw	Cocb
	lb ai/A	% injury	% control			
Prowl	1.5	0	43	48	35	35
Sonalan	1.3	0	50	51	48	45
TopNotch	1.5	0	38	43	58	50
TopNotch	3	0	55	45	65	58
Authority	0.187	13	43	73	63	40
Authority	0.38	9	60	83	70	55
Goal	0.25	12	45	46	73	73
Goal	0.5	12	46	63	79	78
Balance	0.07	12	70	70	69	70
Balance	0.14	12	73	84	88	83
Balance	0.21	16	91	91	89	89
Untreated		0	0	0	0	0
LSD (0.05)		12	11	17	19	19

Sunflower exhibited excellent tolerance to Prowl, Sonalan, and TopNotch. Injury did not exceed 16% with any treatments. Only Balance gave adequate wild oat control. Balance and Authority gave greater than 70% kochia control. Goal and Balance gave 70% or more common ragweed and common cocklebur control. Winter precipitation activated soil applied herbicides to suppress/control weeds present.

Spring treatments in sunflower, NW-22, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate weed control in sunflower from labeled and experimental herbicides soil applied in the spring. Soil had 3% sand, 49% silt, 48% clay, 6% OM, and 7.5 soil pH. Spring applications were applied June 13 at 8:15 am with 58 F air, 58 F soil at 4", 44% RH, 0% clouds, and 2-6 mph wind. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. Interstate '6111' sunflower was seeded on June 12, 1997. The experiment had a randomized complete block design with three replicates per treatment.

		July 10		
Treatment	Rate	Sunflower	Fxtl	Rrpw
	lb ai/A	% injury	% control	
PRE				
Prowl	1.5	0	68	64
Sonalan	1.3	0	65	61
TopNotch	1.5	0	89	98
TopNotch	3	0	92	99
Authority	0.187	0	79	99
Authority	0.38	0	89	99
Goal	0.25	0	66	70
Goal	0.5	0	88	90
Balance	0.07	78	99	98
Balance	0.14	88	99	99
Balance	0.21	93	99	99
Untreated		0	0	0
LSD (0.05)		12	9	5

PRE applications were made to dry soil surface and subsoil. Balance treatments caused the sunflower to become white and stunted. All other treatments gave no sunflower response. The higher rates of Balance completely killed sunflowers. TopNotch gave greater foxtail and pigweed control than Prowl and Sonalan. The higher rates of TopNotch, Authority, and all rates of Balance nearly gave complete control.

Spring treatments in sunflower, Cogswell, 1997. (Zollinger) An experiment was conducted to evaluate weed control in sunflower from labeled and experimental herbicides soil applied in the spring. Soil had 21% sand, 55% silt, 24% clay, 5.2% OM, and 7.3 soil pH. Spring applications were applied May 29 at 3:30 pm with 64 F air, 55 F soil at 4", 30% RH, 10% clouds, and 1-2 mph wind. Treatments were applied to the center 8 ft of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. Pioneer '6451' sunflower was seeded no-till on May 27. The experiment had a randomized complete block design with three replicates per treatment.

		June 6			July 9				
Treatment	Rate	Sunflower	Fxtl	Kocz	Sunflower	Fxtl	Wioa	Kocz	Corw
	lb ai/A	% injury	% control		% injury	% control			
PRE									
Prowl	1.5	13	20	90	1	44	65	89	46
Sonalan	1.3	6	49	89	0	58	68	91	58
TopNotch	1.5	6	72	92	0	66	75	96	97
TopNotch	3	13	85	93	3	69	74	98	98
Authority	0.187	0	38	91	0	59	71	92	91
Authority	0.38	0	51	94	3	69	84	91	94
Goal	0.25	31	3	90	0	10	30	95	89
Goal	0.5	31	13	90	3	30	50	96	97
Balance	0.07	19	63	91	3	73	76	92	95
Balance	0.14	63	63	91	8	73	78	96	96
Balance	0.21	65	73	94	18	83	80	98	98
Untreated		0	0	0	0	0	0	0	0
LSD (0.05)		14	17	3	8	13	11	8	7

PRE: soil surface and subsoil were dry. Wild oat and common ragweed was not evaluated at the June 6 rating. Sunflower were significantly injured by Goal and the higher rates Balance rates. Balance injury on sunflower were exhibited as total white and severally stunted. Except for Balance at 0.21 lb/A, sunflower plants had recovered by the July 9 evaluation. No treatments gave sufficient grass control. However, the high rates of Authority and Balance gave above 80% grass control. Most treatments gave above 90% kochia and common ragweed control.

Weed control in sunflower, Prosper, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate weed control and sunflower response from labeled and experimental herbicides applied PRE and POST. DeKalb '8790' sunflower was seeded and PRE treatments were applied June 6, at 5:00 pm with 82 F air, 71 F soil at 4", 25% RH, 50% clouds, and 2-3 mph wind. POST treatments were applied June 27 at 5:00 pm with 92 F, 99 F soil surface, 54% RH, 0% clouds, and 10-16 mph wind to V2-V4 sunflower, 1-2" green and yellow foxtail (4/ft^2), 0-1" redroot pigweed (2/ft^2), and 2-4" common cocklebur (1/ft^2). Treatments were applied to the center 8 ft area of the 10 X 40 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

		June 27					July 22				
Treatment	Rate	Snfl	Fxtl	Wimu	Rrpw	Cocb	Snfl	Fxtl	Wimu	Rrpw	Cocb
	lb ai/A	% injury	% control				% injury	% control			
PRE											
TopNotch	1.5	0	70	91	98	43	0	96	99	96	93
TopNotch	3	0	95	92	98	62	0	87	99	99	96
Authority	0.187	11	96	90	92	10	0	96	99	99	70
Authority	0.25	17	99	96	90	13	0	96	96	99	83
Authority	0.31	15	98	96	92	13	0	93	99	96	86
Authority	0.375	25	98	98	96	12	0	98	96	99	86
Authority + Prowl	0.25 + 1.5	25	98	89	98	27	0	99	99	99	66
Authority + TopNotch	0.25 + 1.5	10	92	96	99	73	0	99	96	99	66
Lorox	1.5	25	96	87	96	82	0	89	96	96	86
Lorox + Prowl	1 + 1.5	13	95	89	98	91	0	99	86	99	60
Balance	0.05	0	99	96	98	87	0	96	96	99	77
Balance	0.094	0	99	99	98	98	0	99	99	99	96
POST											
Balance	0.02	22	89	87	99	75	48	99	94	99	86
Balance	0.04	37	90	90	99	88	53	96	93	99	96
Balance + PO	0.02 + 1 qt	53	95	96	99	58	77	99	94	99	79
Balance + PO	0.04 + 1 qt	88	99	99	99	91	75	86	99	99	89
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		15	8	13	3	17	17	11	10	4	15

PO = Herbimax.

Roundup Ultra was applied as a burndown June 10. Balance injury was observed as a yellowing and whitening of the leaves and some puckering and stunting. Excellent crop competition provided for greater weed control of some species than would normally be expected. Authority gave up to 25% sunflower injury on June 27 but sunflower had recovered by July 22. Balance without PO applied POST caused less sunflower injury and gave equal weed control compared to applications with PO. Injury was excessive with PO and sunflower did not recover. Most treatments gave adequate wild mustard and redroot pigweed control at the June 27 evaluation. Soil applied Lorox and Balance gave at least 80% common cocklebur control at the early evaluation. Nearly complete wild mustard and redroot pigweed control was observed with most treatments at the July 22 evaluation. Common cocklebur control was erratic on July 22 but TopNotch and Balance gave greater than 90% control.

Weed control in sunflower, Carrington, 1997. (Endres, Zollinger, and Schatz) An experiment was conducted to evaluate weed control and sunflower response from experimental PRE herbicides applied in the spring. Mycogen '658' oilseed sunflower was seeded in 30-inch rows at the rate of 60,000 seeds/A on May 30. Herbicide treatments were applied to the center 8 ft of the 10 X 25 ft plots with a hooded bicycle-wheel-type plot sprayer through 8002 flat-fan nozzles delivering 17 gpa at 40 psi. Treatments were applied June 3 with 74 F, 61 F soil surface, 63% RH, partly-sunny sky, and 10 mph wind. Rainfall after herbicide application was delayed until June 14-17 when a total of 0.44 inches was received. Visual estimates of sunflower injury and weed control were taken June 19 and July 3. The experiment was a randomized complete block design with four replicates.

Treatment	Rate	Snfl	Fxtl			Rrpw		Wimu	Colq	
		7/15	6/19	7/3	7/15	7/3	7/15	7/15	7/3	7/15
	lb ai/A	% inj	% control							
PRE										
TopNotch	1.5	0	0	40	74	84	99	92	0	82
Authority	0.187	0	14	51	66	20	92	87	0	94
Authority	0.25	0	9	15	52	0	66	85	0	82
Authority	0.31	3	33	31	76	66	92	95	47	90
Authority	0.375	0	0	0	66	45	95	87	40	87
Auth + Prowl	0.25 + 1.5	4	14	46	79	41	90	89	22	86
Auth+TopNotch	0.25 + 1.5	4	0	26	49	90	58	55	22	50
Balance	0.05	0	0	7	73	35	88	70	0	70
Balance	0.094	8	12	17	70	28	97	75	43	76
Untreated		0	0	0	0	0	0	0	0	0
LSD (0.05)		7	13	13	17	19	19	18	16	15

June 19 and July 3 evaluations: Sunflower was not injured by herbicides. Delay in rainfall after PRE application reduced herbicide effectiveness. Redroot pigweed was 84% to 90% with treatment including TopNotch. Other herbicide treatments generally provided poor to no weed control.

July 15 evaluation: Sunflower response was less than 8% from all herbicide treatments. No treatment gave greater than 79% foxtail control. Most treatments gave greater than 70% wild mustard, redroot pigweed, and common lambsquarters control. Reduced weed control occurred from the Authority + TopNotch tank mix which has been observed in other sunflower weed control experiments.

Weed control in sunflower, Minot, 1997. (Zarnstorff and Zollinger) An experiment was conducted to evaluate weed control and sunflower response to experimental herbicides soil applied in the spring. Sunflower was planted May, 28 and herbicides were applied the morning of May 29. Max/min temperature on May 29 was 72/47 with 62 F ave soil temp, 8 mph ave wind speed, 556 total solar radiation, and 33.4 ave dew point. Treatments were applied to the center 8 ft of the 10 X 30 ft plots with a bicycle wheel type sprayer delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

		July 15			
Treatment	Rate	Fxtl	Wimu	Rrpw	Kocz
	lb ai/A	% control			
PRE					
TopNotch	1.5	91	99	99	99
Authority	0.187	68	90	99	91
Authority	0.25	80	97	98	90
Authority	0.31	82	96	99	97
Authority	0.375	85	99	99	98
Authority + Prowl	0.25 + 1.5	89	99	99	99
Authority + TopNotch	0.25 + 1.5	94	99	99	99
Balance	0.05	71	92	97	85
Balance	0.094	86	91	98	99
Prowl	1.5	65	91	71	85
Untreated		0	0	0	0
LSD (0.05)		12	15	7	8

No injury was observed with any treatment which was unusual since Balance has exhibited slight to severe sunflower injury at other locations. Most treatments gave adequate foxtail and nearly complete wild mustard, redroot pigweed, and kochia control. Environmental data show approximately 0.5 inch of rainfall in the 3 weeks prior to application but good rain events following application. This could activate herbicides without leaching a significant amount into the root zone for stunting and possible injury.

Sunflower response to herbicides, Prosper, 1997. (Zollinger and Fitterer) An experiment was conducted to evaluate hybrid line tolerance to labeled and experimental herbicides applied at 1X and 2X rates PPI, PRE, and POST. PPI treatments were applied May 27 at 4:00 pm with 75 F air, 61 F soil at 4", 23% RH, 90% clouds, and 3-7 mph wind and incorporated to a depth of 1 to 2" with a rototiller. Sixteen Cargill hybrid sunflower lines were seeded and PRE treatments were applied June 6 at 3:00 pm with 80 F air, 70 F soil at 4", 31% RH, 75% clouds, and 3-5 mph wind. POST treatments were applied June 30 at 10 am with 76 F air, 82 F soil surface, 69% RH, 90% clouds, and 3-7 mph wind. Treatments were applied to the center 8 ft of the 10 X 104 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles for soil applied treatments and 8.5 gpa at 40 psi through 8001 flat fan nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

Treatment	Rate	Hybrid line															
		1	8	9	6	15	5	7	11	2	3	4	10	12	13	14	16
	ai/A	plants/16 ft															
PPI																	
Dual II Magnum	1.58 lb	13	16	27	20	17	12	16	14	24	17	20	11	13	11	11	15
Dual II Magnum	2.85 lb	15	13	24	19	15	15	21	21	20	17	18	12	15	11	14	9
Frontier	1.5 lb	16	12	18	14	19	14	15	14	25	17	20	17	19	17	16	17
Frontier	3 lb	15	14	14	21	20	11	12	11	18	12	13	15	15	13	13	14
Harness	2 lb	18	15	22	23	22	12	15	18	21	20	17	13	15	14	16	14
Harness	4 lb	12	13	14	17	9	12	13	15	12	14	14	10	14	13	12	13
Prowl	1.5 lb	16	19	27	24	15	16	15	18	28	21	20	15	14	12	15	11
Prowl	3 lb	15	16	20	19	22	11	12	13	20	18	22	13	15	13	15	12
Sonalan	1.3 lb	21	18	20	18	19	14	19	22	26	20	18	15	15	16	15	11
Sonalan	2.6 lb	15	15	17	22	22	18	17	19	22	18	15	17	15	16	19	16
Authority	0.25 lb	15	20	22	20	22	19	18	24	21	17	15	15	17	23	17	16
PRE																	
Dual II Magnum	1.58 lb	16	18	30	24	20	14	19	18	32	23	20	17	15	17	16	10
Dual II Magnum	2.85 lb	16	17	18	15	21	16	14	13	20	17	17	12	15	16	21	14
Frontier	1.5 lb	17	19	19	17	17	15	17	23	22	15	16	14	14	18	13	20
Frontier	3 lb	17	13	27	18	12	15	16	13	21	24	15	13	16	14	18	12
Harness	2 lb	15	22	22	18	22	18	15	22	20	20	11	20	20	21	14	16
Harness	4 lb	15	14	23	20	16	13	14	14	19	17	17	16	14	13	21	15
Prowl	1.5 lb	14	14	16	19	15	15	19	23	19	17	16	14	17	18	17	12
Prowl	3 lb	23	17	22	21	25	17	21	18	28	21	17	13	15	20	23	15
Goal	0.25 lb	17	16	25	16	18	13	12	19	25	22	17	13	15	17	14	12
Goal	0.5 lb	17	16	18	16	16	22	12	18	23	17	17	16	15	19	18	17
Authority	0.25 lb	18	19	22	21	19	13	17	18	24	18	16	17	14	15	18	17
Authority	0.375 lb	17	17	28	20	17	13	18	13	25	20	24	18	17	18	21	16
POST																	
Assert	0.375 lb	14	16	22	19	19	16	15	15	15	15	19	19	14	16	18	13
Untreated		16	20	19	21	20	18	17	19	25	19	20	19	14	17	20	14
LSD (0.05)		8	6	13	9	11	6	6	9	9	7	7	7	6	7	7	7

Stand counts were taken July 1. Sunflower seed was categorized according to size: small = 6, 9, and 15, medium = 1 and 8, and large = 2, 3, 4, 5, 7, 10, 11, 12, 13, 14, and 16. PPI & PRE - soil surface was dry and subsoil was moist. In general, sunflower cultivars showed little response to herbicides even at 2X field use rates according to soil type. Populations generally were lower at the 2X rate but usually not significant. Sunflower populations generally were greater with PRE than PPI application but not significant. Harness showed the greatest effect in lowering sunflower stands. Cultivars 1, 9, 6, 2, 3, 4, and 14 showed a large reduction in population from Harness at 4 lb/A than 2 lb/A

Treatment Name	Rate ai/A	Hybrid line 1	8	9	6	15	5	7	11	2	3	4	10	12	13	14	16
		% stunting															
PPI																	
Dual II Magnum	1.58 lb	0	0	3	0	0	3	0	0	0	0	0	0	0	0	5	0
Dual II Magnum	2.85 lb	7	18	3	0	0	2	2	2	2	7	7	2	0	0	10	2
Frontier	1.5 lb	2	20	10	5	0	3	5	3	3	2	10	7	0	3	5	2
Frontier	3 lb	5	30	30	12	12	18	13	13	17	17	30	20	13	18	50	20
Harness	2 lb	0	7	7	0	2	5	0	2	3	5	13	10	2	3	12	2
Harness	4 lb	15	18	42	5	10	13	17	20	25	22	17	17	13	12	20	12
Prowl	1.5 lb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Prowl	3 lb	0	2	12	0	0	2	0	0	0	0	7	2	0	2	5	3
Sonalan	1.3 lb	0	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonalan	2.6 lb	12	17	18	10	2	7	7	0	0	0	0	3	3	5	13	0
Authority	0.25 lb	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	2
PRE																	
Dual II Magnum	1.58 lb	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Dual II Magnum	2.85 lb	3	0	2	0	0	0	0	0	0	0	0	0	0	3	0	0
Frontier	1.5 lb	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frontier	3 lb	0	10	3	0	0	0	3	0	0	0	0	0	0	0	0	0
Harness	2 lb	0	7	5	0	0	3	0	3	2	2	3	3	0	0	7	0
Harness	4 lb	3	8	7	2	5	13	5	5	3	5	13	3	3	0	7	3
Prowl	1.5 lb	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0
Prowl	3 lb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goal	0.25 lb	0	10	3	0	2	7	0	0	2	0	3	0	0	2	10	2
Goal	0.5 lb	5	12	8	8	10	10	7	5	8	8	17	10	13	12	37	8
Authority	0.25 lb	0	0	0	0	0	0	3	3	0	0	10	0	2	0	0	2
Authority	0.375 lb	0	2	0	0	3	0	0	0	0	0	5	2	0	3	5	8
POST																	
Assert	0.375 lb	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD (0.05)		8	13	13	5	5	8	6	6	4	4	12	9	6	9	11	6

Stunting evaluations were taken July 10. Sunflower seed was categorized according to size: small = 6, 9, and 15, medium = 1 and 8, and large = 2, 3, 4, 5, 7, 10, 11, 12, 13, 14, and 16. In general, sunflower cultivars showed little response to most herbicides even at 2X field use rates according to soil type. Except for Frontier, Harness, and Goal, the 2X rate did not produce greater stunting than the 1X rate. Significant stunting occurred to most varieties from the PPI application of Frontier and Harness at the 2X rate and from the PRE application of Goal at the 2X rate. However, the 2X rate of Sonalan stunted sunflower lines 1, 8, 9, 6, and 14, and Harness applied PRE at the 2X rate stunted lines 4 and 5. Seed size did not seem to affect cultivar response. Sunflower that were the most affected by 2X herbicide rates were: PPI - Frontier, Harness, Sonalan, and PRE - Harness and Goal. Overall sunflower safety was good regardless of rate from PPI - Dual Magnum, Prowl, Authority, and PRE - all except 2X rates of Goal and Harness.

Treatment Name	Rate	Hybrid line															
		1	8	9	6	15	5	7	11	2	3	4	10	12	13	14	16
	ai/A	flowering height (inches)															
PPI																	
Dual II Magnum	1.58 lb	47	47	39	62	45	43	58	51	64	47	43	45	48	29	58	61
Dual II Magnum	2.85 lb	55	44	41	60	47	44	55	52	61	47	42	43	43	22	55	54
Frontier	1.5 lb	57	40	56	58	44	43	56	50	62	45	48	46	52	27	65	58
Frontier	3 lb	51	47	47	60	43	42	54	47	63	40	40	37	48	29	59	59
Harness	2 lb	51	41	43	56	45	37	48	50	57	41	43	33	43	31	62	61
Harness	4 lb	54	48	38	55	39	35	52	42	51	40	42	37	44	30	61	62
Prowl	1.5 lb	53	56	52	65	49	49	60	55	69	51	49	47	53	30	65	67
Prowl	3 lb	60	53	46	57	53	47	52	56	68	47	47	46	59	29	65	65
Sonalan	1.3 lb	60	50	49	61	43	41	63	59	69	48	48	48	53	36	67	62
Sonalan	2.6 lb	59	54	46	62	48	39	62	50	70	46	55	52	51	30	63	64
Authority	0.25 lb	63	61	51	62	51	49	61	56	71	53	53	52	55	35	63	65
PRE																	
Dual II Magnum	1.58 lb	59	47	49	52	47	40	54	48	54	48	47	48	51	31	63	51
Dual II Magnum	2.85 lb	54	49	46	60	48	44	58	56	62	51	49	47	51	28	64	59
Frontier	1.5 lb	58	60	50	56	41	40	51	49	67	49	50	50	54	35	66	60
Frontier	3 lb	61	45	48	62	43	43	55	47	63	50	44	46	53	33	67	65
Harness	2 lb	55	50	49	60	41	43	53	49	65	49	37	39	50	30	62	66
Harness	4 lb	52	43	52	48	42	39	48	43	65	44	43	34	46	28	64	61
Prowl	1.5 lb	59	52	54	64	53	43	61	47	65	50	48	45	46	28	53	62
Prowl	3 lb	63	46	53	57	53	48	59	47	62	47	45	45	52	29	53	61
Goal	0.25 lb	62	54	55	63	50	47	50	52	65	51	52	52	54	34	66	62
Goal	0.5 lb	60	46	52	59	51	42	57	48	67	49	50	48	54	32	63	60
Authority	0.25 lb	63	55	55	62	49	44	56	54	70	55	56	55	57	36	67	66
Authority	0.375 lb	65	54	57	61	59	45	48	52	70	55	55	52	57	35	65	63
POST																	
Assert	0.375 lb	64	59	57	63	55	52	60	59	71	54	52	52	56	33	65	62
Untreated		58	50	46	60	49	50	63	60	63	52	50	50	50	32	67	64
LSD (0.05)		4	2	2	2	6	3	4	3	2	2	2	2	2	3	2	4

Less height reduction was observed from PRE applications than PPI applications. In general, height reductions occurred from PPI applications of 2X rates of Dual II Magnum and Frontier and 1X and 2X applications of Harness. Sunflower cultivars affected the most by all herbicides applied PPI and PRE were 5, 7, 11, and 4. Cultivars 3, 10, and 12 were shorter from Dual II Magnum, Frontier, and Harness but little difference were exhibited from PRE applications (except Harness). Lines that generally exhibited good tolerance to herbicides were 1, 8, 9, 6, 15, 2, 13, 14, and 16. Most varieties (except 5, 7, and 11) showed excellent tolerance to Prowl, Sonalan, Goal (PRE), Authority, and Assert.

Yields were not taken. From previous research, crops yield may or may not be affected by herbicide response.

Matrix carryover on sunflower, 1996-1997, Fargo. (Zollinger) A study was conducted to evaluate Matrix carryover on sunflower. Treatments were sprayed July 3, 1996. Interstate '6111' sunflower was seeded June 12, 1997. Treatments were applied to the center 8 ft of the 10 X 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 17 gpa at 40 psi through 8002 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Treatment	Rate	Sunflower	Yield
	oz DF/A	% injury	lb/A
Matrix + NIS	1 + 0.25% v/v	0	237
Matrix + NIS	1.5 + 0.25% v/v	0	254
Matrix + NIS	3 + 0.25% v/v	0	221
Matrix + NIS	4 + 0.25% v/v	0	183
Untreated		0	175
LSD (0.05)		0	141

Matrix is labeled in potato at 1 to 1.5 oz DF/A 3 and 4 oz/A rates are equivalent to 3X and 4X rates of Matrix. No indication was observed from weed pressure, weed species, or sunflower response that Matrix residue was present in 1997. No injury was found at any evaluation. Some plots were affected by excessive water from rainfall. Grass and broadleaf weeds pressure was very high. Treatment yields were erratic. The planting of sunflowers exceeded a 10 month rotational plant back interval.

Mechanical weed control in sunflower, Carrington 1997. (Endres, Schatz, and Zwinger) The experiment was conducted to determine if a harrow or rotary hoe may be effectively substituted for herbicides for weed control in sunflower. The experiment was established on a loam soil with pH and % organic matter. Plot size was 10 by 25 ft. Tillage for final seedbed preparation was made May 30 using a Melroe culti-harrow set to till at a 3.5-inch depth. The PPI herbicide treatment was applied to a 6.67 by 25 ft area with a hooded bicycle-wheel-type plot sprayer. Sonalan was applied as a herbicide-check treatment at 1.15 lb/A with the sprayer delivering 17.5 gal/A at 40 psi through 8002 flat fan nozzles. Sonalan was applied on May 30 with 77 F, 19% RH, 25% cloudy sky, and 6 mph wind. Sonalan was immediately incorporated using a tractor mounted roto-tiller set to till at a 4-inch depth. Interstate/Payco 6111 sunflower was planted on June 2 in 30-inch rows at the rate of 30,000 pure live seeds/A. POST-plant tillage treatments were applied perpendicular to the sunflower rows to a 8.3- by 25-ft area with a harrow and a 7- by 25-ft area with a rotary hoe. The tillage implements were set to till at a depth of 0.5-1 inch. The harrow tilled at a 1- to 2-inch depth and was operated at 4 mph. The rotary hoe tilled at a 1.5- to 2-inch depth and was operated at 8 to 9 mph. The initial tillage treatments were made on June 6 with 75 F, sunny sky, 9 mph wind, and dry soil surface with few emerged weeds present. The second tillage passes were performed on June 13 with 75 F, sunny sky, 8 mph wind, and dry soil surface to VC stage sunflower, 0.5- to 3-leaf yellow and green foxtail and emerging to 2-leaf redroot and prostrate pigweed. Between-row cultivation was performed on June 27. Sparse densities of other annual weeds existed in the trial including common lambsquarters, common purslane, shepardspurse, and wild mustard. Sunfower injury was evaluated by plant counts (three, one-meter lengths of row/plot) on June 20 and June 27. Sunflower were hand thinned to a population of 20,000 plants/A on July 8 and 9. Visual estimates of percentage foxtail and pigweed control were taken June 26 and July 10. In addition, weed density was measured in a 0.25 m^2 area/plot on June 27. The crop was hand harvested and machine threshed on October 1 to determine seed yield. The experiment was a randomized complete block design with four replications.

Excellent control (98-99%) of yellow and green foxtail and redroot and prostrate pigweed was achieved with Sonalan (Table 1). Two tillage passes with the harrow or rotary hoe provided 78-85% weed control. Early-season control of foxtail and pigweed with two tillage passes with the harrow was similar to the herbicide check. Also, use of the rotary hoe provided early-season control of pigweed similar to the herbicide check. However, evaluation of weed control on July 10 indicated that tillage with a harrow or rotary hoe followed by between-row cultivation provided less weed control compared to use of Sonalan and between-row cultivation. Weed control tended to improve with two versus one tillage pass. Two passes with the harrow provided greater foxtail control compared to one pass. Weed control generally did not differ when comparing similar harrow and rotary hoe treatments. During the period between sunflower planting and the second tillage with the harrow and rotary hoe, 0.03 inch of rain was recorded. Lack of rain until after tillage with the harrow and rotary hoe was completed generally delayed weed emergence. Thus the effectiveness of the tillage treatments for weed control was reduced.

Sunflower plant density was reduced by 20% with two tillage passes one week after these treatments were applied (Table 2). Crop density was similar among all treatments later in the season. Sunflower seed yield associated with the two-pass harrow and rotary hoe treatments were similar to yield with the herbicide check. The sunflower apparently was competitive with the generally higher weed densities associated with the harrow and rotary hoe treatments.

Table 1. Foxtail and pigweed control with a harrow or rotary hoe in sunflower (Endres, Schatz, and Zwinger).

Treatment	Foxtail[a] Control 6/26	Foxtail[a] Control 7/10	Foxtail[a] Density 6/27	Pigweed[b] Control 6/22	Pigweed[b] Control 7/10	Pigweed[b] Density 6/27
	--- % ---		plt/0.25 m^2	--- % ---		plt/0.25 m^2
Weedy check	0	71	49	0	69	95
Sonalan	98	98	1	99	99	6
Harrow x 1	56	70	71	52	66	77
Harrow x 2	85	78	20	80	78	79
Rotary hoe x 1	69	76	73	75	77	71
Rotary hoe x 2	79	81	35	78	79	62
LSD (0.05)	16	7	52	41	15	NS
C.V. %	16	6	83	25	7	67

[a]Foxtail=yellow and green.
[b]Pigweed=redroot and prostrate.

Table 2. Field pea performance with mechanical weed control (Endres, Schatz, and Zwinger).

Treatment	Sunflower Density 6/20	Sunflower Density 6/27	Sunflower Seed yield	Sunflower Test weight
	plants/m		lb/A	lb/bu
Weedy check	10	9	1962	30
Sonalan	10	10	2424	29
Harrow x 1	7	7	2029	30
Harrow x 2	8	8	2214	30
Rotary hoe x 1	9	8	2544	30
Rotary hoe x 2	8	9	2166	29
LSD (0.05)	2	NS	352	1
C.V. %	15	18	10	1

Preemergence weed control in sunflower, Carrington 1997. (Endres, Zollinger, and Schatz) The experiment was conducted to evaluate sunflower injury and weed control with experimental PRE herbicides. Mycogen 658 oilseed sunflower was seeded in 30-inch rows at the rate of 60,000 seeds/A on May 30, 1997. Herbicide treatments were applied to a 6.67 ft wide area the length of 10 by 25 ft plots with a hooded bicycle-wheel-type plot sprayer through 8002 flat-fan nozzles delivering 17 gal/A at 40 psi. Treatments were applied June 3 with 74 F, 63% RH, partly-sunny sky, and 10 mph wind. Rainfall after herbicide application was delayed until June 14-17 when a total of 0.44 inches was received. Visual estimates of percentage sunflower injury and weed control were taken June 19 and July 3. The experiment was a randomized complete block design with four replications.

Herbicide		Sunflower injury		Weed control: Green foxtail		Weed control: Redroot pigweed	Weed control: Common lambsquarters
Treatment	Rate	6/19	7/3	6/19	7/3	7/3	7/3
	lb/A	%					
Topnotch 3.2 ME	1.8	0	0	0	40	84	0
Authority 75 DF	0.187	0	0	14	51	20	0
Authority 75 DF	0.25	0	0	9	15	0	0
Authority 75 DF	0.31	0	0	33	31	66	47
Authority 75 DF	0.375	0	0	0	0	45	40
Authority 75 DF + Prowl 3.3 EC	0.25 + 1.5	0	0	14	46	41	22
Authority 75 DF + Topnotch 3.2 ME	0.25 + 1.5	0	0	0	26	90	22
Balance 75 DF	0.05	0	0	0	7	35	0
Balance 75 DF	0.094	0	0	12	17	28	43
Untreated		0	0	0	0	0	0
LSD (0.05)		-	-	23	33	33	36
C.V. %		-	-	196	97	57	148

Sunflower was not injured by the herbicide treatments. Delay in rainfall after PRE herbicide application apparently reduced the effectiveness of herbicides. Redroot pigweed control was 84 to 90 percent with treatments that included Topnotch. Other herbicide treatments generally provided poor or no weed control.

Leafy spurge control with glyphosate plus 2,4-D alternated with picloram or dicamba. Rodney G. Lym. Several long-term management alternatives provide a choice of herbicides and duration of leafy spurge control. When leafy spurge infests an area that can be treated annually, then dicamba at 2 lb/A or picloram plus 2,4-D at 0.25 + 1 lb/A spring-applied will provide 85% or better leafy spurge control after 3 to 5 years. However, when these herbicides are fall applied, the picloram rate must be increased to 0.5 lb/A with 2,4-D to provide similar leafy spurge control to the spring treatment and is no longer cost-effective. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A applied in the fall provides 70 to 90% control but can cause severe grass injury. The purpose of this research was to evaluate glyphosate plus 2,4-D applied in late-June annually or rotated with various auxin herbicides for leafy spurge control.

The initial experiments were established on June 21 and June 28, 1993, near Jamestown and Valley City, North Dakota, respectively. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Leafy spurge was in the late-flower to early seed-set growth stage at both locations. Retreatments for the second experiment were applied in June 1994 and 1995 at both locations when leafy spurge was in the vegetative to flowering growth stage. The soil at both locations was a loam with a 6.8 pH. The grass species present were generally bluegrass and smooth brome with occasional wheatgrass. Visual evaluations were based on percent stand reduction as compared to the control.

Glyphosate plus 2,4-D generally provided similar initial leafy spurge control to picloram plus 2,4-D and dicamba in the first months after application (data not shown), but provided better long-term control 12 months after treatment (MAT) in the first year of a rotational program (Table 1). Grass injury 3 MAT averaged 15% with glyphosate plus 2,4-D at 0.4 + 0.6 lb/A (data not shown) but declined to near zero the second year even when glyphosate plus 2,4-D was applied for 2 consecutive years. In general, leafy spurge control was similar with glyphosate plus 2,4-D applied alone or with picloram until 39 months after the first treatment (MAFT) at Jamestown where the addition of picloram improved control over glyphosate plus 2,4-D alone.

Control was better at Valley City than Jamestown 24 MAFT and averaged 76% and 47%, respectively, over all treatments (Table 1). However, within a location, control was similar regardless of treatment following the 1994 applications. The original 1993 treatments were reapplied in 1995 to the same plots. Control averaged 91% over all treatments at Valley City 36 MAFT but was much lower at Jamestown which only averaged 71%. The original 1994 treatments were reapplied in June 1996. The best long-term control at Jamestown was the combination treatments of glyphosate plus picloram plus 2,4-D which averaged 77% 51 MAFT. However, all treatments at Valley City that included picloram plus 2,4-D or dicamba in the rotation averaged 87% control 51 MAFT with minimal or no grass injury.

A second series of experiments was established to further evaluate glyphosate plus 2,4-D alone at reduced rates or in rotation with auxin herbicides for leafy spurge control. The experiments were established at the Ekre experiment station, and near Fort Ransom and Jamestown in 1995. The herbicides were applied as previously described except the picloram plus 2,4-D and dicamba treatments were applied in mid-June during the leafy spurge true-flower growth stage and the

glyphosate plus 2,4-D treatments in late June during seed-set. Thus, in the second set of experiments both the auxin herbicides and the glyphosate plus 2,4-D treatments were applied at the optimum growth stage for each herbicide treatment.

In general, control in 1996 was less than in previous years regardless of treatment (Tables 1 and 2). The reason for the reduced control may be due to high air temperature at application in 1995, which ranged from 72 to 83 F during application and quickly warmed to the upper 80s to 90s F a few hours after treatment. The warm conditions may have caused too rapid absorption of the herbicide and/or rapid death to the phloem and xylem resulting in poor herbicide movement to the roots. This was evidenced by many plants that had dead leaves and stems in the upper portions, but had green stems near the soil surface. New growth emerged from the green stems approximately 6 weeks after treatment. In the previous experiments the stem tissue had been killed to the soil surface.

Control 12 MAT with glyphosate plus 2,4-D averaged 65%, which was better than the picloram plus 2,4-D or dicamba treatments which only averaged 37% (Table 2). Glyphosate alone did not control leafy spurge as well as glyphosate plus 2,4-D. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A and 0.3 + 0.46 lb/A provided similar leafy spurge control, but control declined with further rate reduction. Approximately 30% grass injury was observed with the glyphosate plus 2,4-D treatments at Ekre, but injury was minimal to none at the other two locations. Brome grass was frequently injured but bluegrass was not injured or only slightly injured at any location.

Control 15 MAFT was similar for most treatments (3 months after the 1996 retreatments) (Table 2). In general, control was similar when glyphosate plus 2,4-D was applied 2 years in a row or rotated with picloram plus 2,4-D or dicamba and averaged 77%. Glyphosate plus 2,4-D applied 2 years in a row was the least costly treatment at $18/A but there was an average of 15% grass injury. The cost rose to $22/A when picloram plus 2,4-D at 0.25 + 1 lb/A was applied following glyphosate plus 2,4-D but the treatment provided consistent control with little grass injury. Picloram plus 2,4-D applied 2 years in a row tended to provide the best control regardless of application rate but cost $26 to $46/A depending on the picloram rate. Dicamba treatments were too costly for the leafy spurge control provided.

Control declined to less than 80% regardless of treatment 24 MAFT (Table 2). Rotations that included picloram plus 2,4-D at 0.25 plus 1 lb/A tended to provide the best control. The 1995 treatments were reapplied to the same plots in 1997. Control averaged better then 90% for all treatments when evaluated 2 months later (27 MAFT) except when glyphosate was applied alone. Grass injury also increased when glyphosate plus 2,4-D at 0.4 plus 0.6 lb/A was reapplied and averaged 27%.

Glyphosate plus 2,4-D should be used in a long-term leafy spurge management program. The treatment costs approximately $4 to $5/A less than picloram plus 2,4-D at 0.25 + 1 lb/A, provides better control 12 MAT, and can be used in areas with a high water table. The 15 to 20% grass injury is of minor concern especially if glyphosate plus 2,4-D is used as an initial treatment in a dense stand where grass production is already severely reduced.

Table 1. Leafy spurge with glyphosate plus 2,4-D, either applied alone or with picloram and/or alternated with auxin herbicides over 4 years, applied in late June at two locations in North Dakota.

1993 and 1995		1994 and 1996		12 MAFT[a]		24 MAFT[a]	36 MAFT[a]		48 MAFT[a]		51 MAFT[a]	
Treatment	Rate	Treatment	Rate	Control	Grass injury	Control	Control	Grass injury	Control	Grass injury	Control	Grass inj.[b]
	— lb/A —		— lb/A —					%				
Jamestown												
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	47	0	48	71	8	68	32	39	
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	59	0	54	64	0	52	0	30	
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	68	0	53	67	0	73	0	50	
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	23	0	27	53	0	80	0	64	
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	22	0	32	71	0	82	0	66	
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	65	0	61	79	0	64	25	41	
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	69	0	44	76	0	84	0	76	
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	65	0	53	86	0	81	0	78	
LSD (0.05)				18	...	NS	NS	NS	21	17	29	
Valley City												
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	88	0	67	76	11	87	96	30	97
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	94	5	81	97	10	96	0	94	0
Gly+2,4-D[c]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	93	0	89	97	8	95	4	93	0
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	43	0	70	93	1	98	0	89	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	30	0	71	89	3	92	6	82	0
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	91	0	81	97	14	89	68	56	40
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	80	0	68	96	6	94	0	89	0
Gly+2,4-D[c]+pic[d]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	86	0	84	84	8	93	24	76	24
LSD (0.05)				17	3	NS	16	NS	7	37	25	33

[a]MAFT = months after first treatment.
[b]Grass injury could not be evaluated at Jamestown in Sept 1997 because a severe hail storm occurred at the research location
[c]Commercial formulation - Landmaster BW.
[d]Picloram.

Table 2. Leafy spurge control with glyphosate plus 2,4-D alternated with auxin herbicides averaged over three locations in North Dakota.

1995 and 1997		1996		Control				Grass injury	Total
Treatment	Rate	Treatment	Rate	12 MAFT[a]	15 MAFT[a]	24 MAFT[a]	27 MAFT[a]	27 MAFT[a]	cost
	—lb/A—		—lb/A—			%			$/A
Glyphosate + 2,4-D[b]	0.4 + 0.6	Glyphosate + 2,4-D[b]	0.4 + 0.6	61	75	58	91	36	27
Glyphosate + 2,4-D[b]	0.4 + 0.6	Picloram + 2,4-D	0.25 + 1	69	77	51	98	21	31
Glyphosate + 2,4-D[b]	0.4 + 0.6	Dicamba	2	64	71	51	91	25	59
Picloram + 2,4-D	0.25 + 1	Picloram	0.25 + 1	36	83	79	98	4	39
Dicamba	2	Dicamba	2	37	77	64	97	5	123
Picloram + 2,4-D	0.5 + 1	Picloram + 2,4-D	0.5 + 1	39	83	71	87	3	69
Glyphosate	0.4	Picloram + 2,4-D	0.25 + 1	44	84	73	51	8	26
Glyphosate	0.4	Dicamba	2	43	61	58	57	6	53
Glyphosate + 2,4-D[b]	0.3 + 0.46	Glyphosate + 2,4-D[b]	0.3 + 0.46	59	65	41	91	17	20
Glyphosate + 2,4-D[b]	0.2 + 0.3	Glyphosate + 2,4-D[b]	0.2 + 0.3	39	56	45	97	8	16
LSD (0.05)				18	12	19	15	9	

[a]MAFT=months after first treatment.
[b]Commercial formulation - Campaign.

Evaluation of AC 263,222 for leafy spurge control. Rodney G. Lym. AC 263,222 (Plateau) has been registered for leafy spurge control in non-cropland. The label states AC 263,222 should be applied with a methylated seed oil (MSO) type adjuvant plus 28% urea nitrogen. Also, the manufacturer recommends AC 263,222 be applied in the fall prior to a killing frost or as a split application in the fall and the following spring. The purpose of these experiments was to evaluate AC 263,222 for leafy spurge control applied alone or with a MSO adjuvant and/or 28% N, applied in the spring or fall, in a variety of soil types.

The first experiment compared AC 263,222 applied alone, with a MSO, 28% N, or MSO plus 28% N and was established at the Ekre Research Station, near Walcott, ND on September 4, 1996. The leafy spurge was in the fall regrowth stage and was 12 to 18 inches tall. The soil was a sandy loam (Table 1). The herbicide treatments were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 feet and replicated four times with the herbicide treatments in a randomzied complete block design. The air temperature was 83 F, and the soil temperature at the 4 inch depth was 77 F. A light frost occurred on September 15 when the temperature was 30 F and a killing frost on October 2 when the low temperature was 23 F. Leafy spurge control and grass injury was visually evaluated with control or injury based on percent stand reduction compared to the control.

AC 263,222 applied at 2 oz/A provided 98% or better leafy control in June 1997 [9 months after treatment (MAT)] whether applied alone or with an adjuvant and was similar to the standard treatment of picloram plus 2,4-D (Table 2). However, control was increased when AC 263,222 at 1 oz/A was applied with MSO or MSO plus 28% N compared to the herbicide applied alone and averaged 95 and 68% control, respectively. Grass injury averaged 7 and 16 % when AC 263,222 was applied at 1 and 2 oz/A, respectively, and was similar whether the herbicide was applied alone or with an adjuvant.

Leafy spurge control declined dramatically by August 1997 for all treatments except AC 263,222 plus MSO and 28% N which averaged 76% (Table 2). Leafy spurge control was better when AC 263,222 was applied with MSO plus 28% N compared to the herbicide applied alone and tended to provide better leafy spurge control when applied with MSO alone than with 28% N alone. Grass injury was minimal regardless of treatment.

The second experiment evaluated leafy spurge control with AC 263,222 applied in mid-summer or fall at two locations in North Dakota. Herbicides were applied near Valley City or Jamestown on July 3 or July 4, 1996, respectively, when the leafy spurge was in the flowering to seed-set growth stage. The air temperature was approximately 80 F and the soil temperature at the 4 inch depth was 57 F at Valley City and 69 F at Jamestown. The fall treatments were applied at both locations on September 9 when the leafy spurge was in the fall regrowth stage and the air temperature was in the mid 80s. The summer treatments were reapplied in July 1997 to two treatments at Valley City (Table 3) and all treatments at Jamestown (Table 4). The soil at both locations was a fine-loam (Table 1). A killing frost occurred on October 3 when the minimum temperature was 28 and 22 F at Valley City and Jamestown, respectively.

AC 263,222 applied in mid-summer did not control leafy spurge when visually evaluated in September (Table 3). However, control averaged 94 and 99% in May of the following year when AC 263,222 was applied at 2 and 4 oz/A, respectively. AC 263,222 at 4 oz/A provided 93% leafy spurge control in September 1997 with minimal grass injury, but 4 oz/A is twice the labeled

use rate. AC 263,222 fall-applied at 2 or 4 oz/A provided excellent leafy spurge control the following spring but grass injury was very noticeable and averaged 43%. AC 263,222 provided 92% leafy spurge control when applied at 1 or 2 oz/A with MSO 12 MAT which was higher than the standard picloram plus 2,4-D treatment which averaged 47%.

Leafy spurge control with AC 263,222 applied in mid-summer tended to be less at Jamestown than Valley City (Tables 3 and 4). Only AC 263,222 at 4 oz/A provided greater than 90% control in May 1997 and all treatments were reapplied in July 1997. Control averaged 99% in September following a second application of picloram plus 2,4-D, but was 71% or less with a second application of AC 263,222. Grass injury could not be evaluated in September because a severe hail storm occurred at the research location.

AC 263,222 applied in the fall at Jamestown provided excellent leafy spurge control and averaged 99% regardless of application rate (Table 4). In contrast to the high grass injury at Valley City (Table 3), AC 263,222 at 4 oz/A fall-applied averaged 18% grass injury and was the only treatment to injure grass at Jamestown. Leafy spurge control averaged 97% 12 MAT with both AC 263,222 applied alone at 4 oz/A or at 2 oz/A with MSO compared to 26% with picloram plus 2,4-D.

The third experiment evaluated leafy spurge control with AC 263,222 on a sandy soil at Camp Grafton South, near McHenry, North Dakota (Table 1). The experiment was established on August 29, 1996 when leafy spurge was in the fall regrowth stage, the air temperature was 79 F and the soil temperature was 72 F at the 4 inch soil depth.

Leafy spurge control averaged 100% with AC 222,263 compared to 89% with picloram plus 2,4-D in June 1997 (Table 5). There was 23% grass injury with AC 263,222 applied at 3 oz/A. Control remained high 12 MAT with both AC 263,222 treatments and averaged 95% control compared to 48% with picloram plus 2,4-D and the grass had recovered.

In general, AC 263,222 applied in the fall provided better leafy spurge control than mid-summer treatment and control was improved when the herbicide was applied with a MSO or MSO plus 28% N compared to AC 263,222 applied alone. Control varied by location and tended to be higher in sandier soils. Leafy spurge control was better 12 MAT with AC 263,222 at 2 oz/A plus MSO compared to picloram plus 2,4-D at 8 plus 16 oz/A and averaged 85 and 39% over all locations, repectively. Grass injury to cool season species tended to be higher when AC 263,222 was spring- compared to fall-applied, but the grasses recovered by 12 MAT.

Table 1. Soil type at the various experiment locations in North Dakota.

Location	N-P-K	pH	Organic matter	Sand:Silt:Clay
	— lb/A—		— % —	
Camp Grafton South	2-2-275	7.4	3.9	85:9:6
Jamestown	6-4-340	6.8	6.8	46:44:10
Valley City	5-5-1415	7.1	6.8	32:51:17
Walcott	3-3-70	6.8	2.9	85:10:5

Table 2. AC 263,222 applied alone and with a MSO or MSO plus nitrogen for leafy spurge control near Walcott, ND.

Treatment	Rate	Evaluation			
		June 1997		August 1997	
		Control	Grass injury	Control	Grass injury
	oz/A	%			
AC 263,222	1	68	1	1	0
AC 263,222	2	99	12	17	2
AC 263,222 + MSO[b]	1 + 1 qt	96	6	11	0
AC 263,222 + MSO[b]	2 + 1 qt	99	18	55	5
AC 263,222 + 28% N	1 + 1 qt	74	11	7	1
AC 263,222 + 28% N	2 + 1 qt	98	21	25	3
AC 263,222 + MSO[b] + 28% N	1 + 1 qt + 1 qt	94	8	28	0
AC 263,222 + MSO[b] + 28% N	2 + 1 qt + 1 qt	99	14	76	6
Picloram + 2,4-D	8 + 16	98	5	36	0
LSD (0.05)		17	12	26	4

[a]Treatments applied September 4, 1996.
[b]Methylated seed oil was SunIt by AGSCO.

Table 3. AC 263,222 for leafy spurge control applied in mid-summer or fall at Valley City, ND.

Treatment[a]	Rate	Evaluation					
		Sept. 1996		May 1997		Sept. 1997	
		Control	Grass injury	Control	Grass injury	Control	Grass injury
	oz/A	%					
AC 263,222 (summer)	2	0	0	94	10	74	5
AC 263,222 (summer)	4	0	0	99	28	93	5
AC 263,222 + MSO[b] (summer)	1 + 1 qt	0	0	0	8	87	3
AC 263,222 + MSO[b] (summer)[c]	2 + 1 qt	0	0	99	28	73	16
Picloram + 2,4-D (summer)	4 + 16	74	4	75	0	38	0
AC 263,222 (fall)	2			100	36	71	0
AC 263,222 (fall)	4			100	53	99	0
AC 263,222 + MSO[b] (fall)	1 + 1 qt			100	20	92	0
AC 263,222 + MSO[b] (fall)	2 + 1 qt			100	40	92	0
Picloram + 2,4-D (fall)	8 + 16			99	13	47	0
LSD (0.05)		34	NS	20	25	25	NS

[a]Treatments applied July 2, (summer) and September 9, 1996 (fall).
[b]Methylated seed oil was SunIt by AGSCO.
[c]Treatments reapplied in July 1997.

Table 4. AC 263,222 for leafy spurge control applied in mid-summer or fall at Jamestown, ND.

		Evaluation				
		Sept. 1996		May 1997		Sept. 1997
Treatment[a]	Rate	Control	Grass injury	Control	Grass injury	Control
	oz/A	%				
AC 263,222 (summer)[c]	2	0	0	0	0	0
AC 263,222 (summer)[c]	4	13	14	92	1	71
AC 263,222 + MSO[b] (summer)[c]	1 + 1 qt	28	0	33	0	13
AC 263,222 + MSO[b] (summer)[c]	2 + 1 qt	17	0	72	0	45
Picloram + 2,4-D (summer)[c]	4 + 16	46	0	15	0	99
AC 263,222 (fall)	2			99	5	28
AC 263,222 (fall)	4			100	18	97
AC 263,222 + MSO[b] (fall)	1 + 1 qt			99	6	70
AC 263,222 + MSO[b] (fall)	2 + 1 qt			100	6	96
Picloram + 2,4-D (fall)	8 + 16			95	0	26
LSD (0.05)		14	10	19	6	18

[a]Treatments applied July 2, (summer) and September 9, 1996 (fall).
[b]Methylated seed oil was SunIt by AGSCO.
[c]Treatments reapplied in July 1997.

Table 5. AC 263,222 for leafy spurge control near trees established on Camp Grafton South near McHenry, ND.

		Evaluation			
		June 1997		Sept. 1997	
Treatment[a]	Rate	Control	Grass inj.	Control	Grass inj.
	oz/A	%			
AC 263,222 + MSO[b] + 28% N	2 + 1 qt + 1 qt	100	11	93	0
AC 263,222 + MSO[b] + 28% N	3 + 1 qt +1 qt	100	23	96	3
Picloram + 2,4-D	8 + 16	89	0	48	0
LSD (0.05)		8	9	14	NS

[a]Treatments applied August 29, 1996.
[b]Methylated seed oil was SunIt by AGSCO.

Picloram plus 2,4-D applied annually for 13 years to control leafy spurge. Lym, Rodney G., and Calvin G. Messersmith. Picloram is an effective herbicide for leafy spurge control, especially when applied at rates from 1 to 2 lb/A. However, the high cost of picloram at 1 to 2 lb/A makes it uneconomical to treat large acreages in pasture and rangeland weed control programs. Research by North Dakota State University has suggested that picloram at 0.25 to 0.5 lb/A applied annually will give satisfactory leafy spurge control after 3 to 5 yr. The purposes of this experiment were to establish the number of annual applications of picloram needed to provide 90 to 100% control of leafy spurge and to investigate possible synergism between picloram and 2,4-D.

The experiment was established at three locations in North Dakota and began on 25 August 1981 at Dickinson, 1 September 1982 at Sheldon, and on 11 June 1982 at Valley City. Dickinson had a loamy fine sand soil with pH 6.6 and 3.6% organic matter, Sheldon had a fine sandy loam with pH 7.7 and 2.1% organic matter, and Valley City had a loam with pH 6.7 and 9.4% organic matter. Dickinson, located in western North Dakota, generally receives much less precipitation than the other two sites located in eastern North Dakota. All treatments were applied annually except 2,4-D alone which was applied biannually (both spring and fall). Picloram and picloram plus 2,4-D were applied in late August 1981 and in June of 1982 through 1986. The Sheldon and Dickinson locations were discontinued following the fall evaluations in 1985 and spring evaluations in 1989, respectively. The Valley City site has received ten picloram and picloram plus 2,4-D treatments and 20 2,4-D treatments prior to the evaluation in June 1992. The plots were 10 by 30 ft and each treatment was replicated four times in a randomized complete block design. Evaluations were a visual estimate of percent stand reduction as compared to the control.

Leafy spurge control averaged 79% across all treatments 48 months after first treatment (MAFT) and declined slightly to 71% following the 1988 drought (60 and 72 months MAFT) before increasing to 87% in 1990 (84 MAFT) (Table). Leafy spurge control 96 MAFT (June 1991) increased by an average of 24, 12, and 9% when 2,4-D at 1 to 2 lb/A was applied with picloram at 0.25, 0.38 or 0.5 lb/A, respectively, as compared to picloram alone. However, by 108 MAFT (June 1992) only control with picloram at 0.25 lb/A was increased by 2,4-D and averaged 68 and 85%, respectively. In general, the 2,4-D rate did not influence control when applied with picloram. Leafy spurge control averaged 80% with 2,4-D alone following 10 yr of biannual treatments.

Picloram at 0.5 lb/A alone and all picloram at 0.38 or 0.5 lb/A plus 2,4-D treatments provided or nearly provided the target of 90% leafy spurge control following four annual applications (Table). Control did not increase or increased only slightly with subsequent retreatments in these small plot experiments which have a constant pressure for reinfestation from plants in the plot borders. Since control had not or only slightly changed since 1987, the retreatments were discontinued after 1995. The only leafy spurge topgrowth observed in 1995 was in the control plots and from encroachment from plot borders.

To evaluate the longevity of control after the annual and biannual treatments had been discontinued, picloram at 2 lb/A was applied to the control plots and all borders in Sept. 1995. Leafy spurge control averaged over 97% in June 1996 12 months after the treatments had been discontinued (data not shown). However, by September control had declined to an average of 51% in the 2,4-D only plots. Thus, even after 13 yr of biannual treatments of 2,4-D, leafy spurge regrew rapidly the year after treatments had been discontinued. Leafy spurge control from the

2,4-D only treatments began to decline rapidly in 1997, 2 yr after treatments were stopped and averaged 73 and 40%, in June and August 1997, respectively (Table). In contrast, the average control for picloram at 0.25, 0.38 or 0.5 lb/A applied with 2,4-D averaged 91, 98, and 99%, respectively, in August 1997. Long-term control has only slightly declined with any treatment that contained picloram 2 yr following the last application.

Table. Leafy spurge control with annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments from 1982 to 1995 in North Dakota.

		1997		Months after first treatment									
Herbicide	Rate	June	Aug	12	24	36	48	60	72	84	96	108	120
		% control[a]											
	— lb/A—												
Picloram	0.25	96	93	39	48	48	58	49	38	64	56	68	96
Picloram	0.38	96	93	65	62	52	77	69	67	96	72	91	99
Picloram	0.5	98	97	65	71	81	86	77	71	92	81	91	99
2,4-D biannually	1	72	43	22	30	38	50	39	55	70	69	74	82
2,4-D biannually	1.5	70	37	22	24	26	45	49	49	62	57	66	74
2,4-D biannually	2	75	40	19	30	26	54	54	62	75	67	78	83
Picloram+2,4-D	0.25+1	93	87	52	66	63	85	73	76	92	80	85	95
Picloram+2,4-D	0.25+1.5	97	94	58	66	70	85	77	62	88	73	82	99
Picloram+2,4-D	0.25+2	96	92	57	62	66	83	76	77	91	88	88	99
Picloram+2,4-D	0.38+1	100	98	69	72	70	90	84	76	96	82	89	97
Picloram+2,4-D	0.38+1.5	97	96	68	74	76	93	84	79	88	83	92	99
Picloram+2,4-D	0.38+2	99	99	68	59	76	91	86	82	96	86	95	99
Picloram+2,4-D	0.5+1	99	98	71	75	84	94	87	82	96	84	97	99
Picloram+2,4-D	0.5+1.5	100	100	64	73	80	97	91	88	99	95	98	99
Picloram+2,4-D	0.5+2	99	98	76	75	81	95	91	88	99	90	96	99
LSD (0.05)		10	20	18	14	19	14	14	15	19	17	14	10
Mean of treatments		93	85	52	55	63	79	72	70	87	78	86	94

[a]Mean values through 48 and 72 months after first treatment include data from the Sheldon and Dickinson locations which were discontinued after 1985 and 1989, respectively.

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides in a sandy soil. Rodney G. Lym and Calvin G. Messersmith. The leafy spurge flea beetle, *Aphthona nigriscutis*, has been successfully established in North Dakota since 1988. Flea beetles have been redistributed to all counties in North Dakota with varying establishment success. The best soil type needed for *Aphthona* spp. establishment is not well defined. However, establishment has been especially poor in very sandy soils such as those found on the Sheyenne National Grasslands in Ransom County. Previous research at North Dakota State University has shown that both leafy spurge control and flea beetle population increased when herbicides are used in conjunction with the *Aphthona* spp. biocontrol insects.

An experiment to evaluate the effect of herbicide application timing on biocontrol insect establishment and leafy spurge control in sandy soil was established at the Ekre Experiment Station near Walcott, North Dakota, on a southwest facing slope. Approximately 3000 *Aphthona nigriscutis* were released June 28, 1993, and initial stand density was evaluated. The soil was a loamy-sand similar to the Sheyenne National Grasslands with a sand:silt:clay content of 85:10:5.

The herbicide treatments included picloram plus 2,4-D at 0.5 plus 1 lb/A fall applied, picloram plus 2,4-D at 0.25 plus 1 lb/A spring applied, and an untreated control (insect only). The initial fall treatment was applied on September 23, 1993, and the spring treatment on June 22, 1994. The spring and fall treatments were reapplied to the same plots in 1994 and 1995. The plots were 15 by 50 feet and all treatments were replicated four times. *A. nigriscutis* population was evaluated by sweep counts with a standard insect collection net and are reported as a mean of three counts/plot with five sweeps per count. Leafy spurge roots were evaluated for root nutrient content by collecting root samples in October 1994 and 1995 for carbohydrate and protein analyses. The nutrient content is a measure of the long-term effect of a treatment on the leafy spurge root system.

A. nigriscutis established at the Ekre Experiment Station, but the population was low and only averaged 1 beetle/m^2 in 1994, 1 yr after release (Table 1). The number of beetles increased slightly to 5 beetles/m^2 in 1995 in the insects only treatment. However, the number of insects declined in 1996 to an average of 3 beetles/m^2 and remained at that low concentration in 1997.

The initial fall-applied herbicide treatment with insects reduced leafy spurge stem density from an average of 136 stems/m^2 to only 16 stems/m^2 9 months after treatment (Table 2). However, by August 1994 leafy spurge stem density had returned to an average of 80 stems/m^2 which was slightly higher than the stem density in the insect alone treatment (data not shown). Stem density averaged only 8 stems/m^2 in June 1996, but the decrease was likely due only to the herbicide treatment because the insect population remained low (Table 1). Stem density tended to be higher in 1997 than 1996 regardless of treatment (Table 2).

Picloram plus 2,4-D spring applied over the insects provided slightly better control than the insects alone in May 1995 after two annual treatments (Table 2). Stem density averaged 68 stems/m^2 following two spring-applied herbicide treatments compared to 112 stems/m^2 with the insect only treatment; the later was the same density as when the experiment was established. Density declined to 24 stems/m^2 by May 1996 but averaged 40 stems/m^2 in 1997.

The spring-applied treatment of picloram plus 2,4-D reduced the sucrose and starch content of leafy spurge roots in the first year of the experiment (Table 3). Both herbicide-insect combination treatments reduced leafy spurge in 1995. No treatment reduced the protein content of the roots. In general, initial

leafy spurge control at the Ekre station was only due to the herbicides picloram plus 2,4-D.

Table 1. Effect of herbicides on *Aphthona nigriscutis* for control of leafy spurge near Walcott, ND.

		A. nigriscutis count[b]			
Treatment[a]	Rate	1994	1995	1996	1997
	- lb/A -	——— No./m^2 ———			
Picloram+2,4-D (spring)	0.25+1	0.7	1	5	6
Picloram+2,4-D (fall)	0.5+1	0.7	1	2	3
Insects only	...	1.6	5	2	3
LSD (0.05)		NS	3.5	NS	NS

[a]Herbicides applied Sept. and June in 1993, 1994. and 1995 for fall or spring application, respectively.
[b]3000 insects released June 28, 1993, and evaluated in mid-June each year thereafter.

Table 2. Herbicide interaction with *Aphthona nigriscutis* for control of leafy spurge near Walcott, ND.

		Leafy spurge stand counts				
Treatment[a]	Rate	1993 July	1994 May	1995 May	1996 June	1997 June
	- lb/A -	——— No./m^2 ———				
Picloram+2,4-D (spring)	0.25+1	140	104	68	24	40
Picloram+2,4-D (fall)	0.5+1	136	16	4	8	48
Insects only	...	120	112	112	96	120
LSD (0.05)		NS	20	16	12	20

[a]Herbicides applied Sept. and June in 1993, 1994, and 1995 for fall or spring application, respectively.

Table 3. The effect of *A. nigriscutis* alone or combined with herbicides on leafy root carbohydrate and protein content near Walcott, ND.

Treatment	Rate	Sucrose[a]		Starch[b]		Protein[c]	
		1994	1995	1994	1995	1994	1995
	– lb/A –	mg/g					
Picloram + 2,4-D (spring)	0.25+1	117	97	146	102	24	16
Picloram + 2,4-D (fall)	0.5 + 1	132	93	207	132	35	17
Insects only	...	149	140	213	152	34	22
LSD (0.05)		22	12	45	NS	NS	NS

[a]Water-soluble carbohydrate fraction.
[b]Water-insoluble carbohydrate fraction, hydrolyzed and analyzed as glucose.
[c]Soluble crude protein.

Leafy spurge control with *Aphthona nigriscutis* alone or combined with herbicides. Rodney G. Lym, Don A. Mundal, and Robert B. Carlson. An experiment to evaluate the effect of herbicide application timing on biocontrol insect population and leafy spurge control was established on a private farm near Cuba, North Dakota. Approximately 500 *Aphthona nigriscutis* were released in July 1989 in a moderately dense patch of leafy spurge. The insects established and began to spread to other patches of leafy spurge within the pasture prior to the beginning of this experiment.

The experiment was established in two patches of leafy spurge approximately 5000 square feet each and about 100 yards apart. The treatments included picloram plus 2,4-D at 0.5 plus 1 lb/A fall applied, picloram plus 2,4-D at 0.25 plus 1 lb/A spring applied, and an untreated control. Herbicides were applied annually beginning with the initial spring treatment on June 5, 1992, and the first fall treatment on September 10, 1992. Herbicides were reapplied at similar dates from 1993 to 1995. The plots were 15 by 50 feet, and treatments were replicated four times (two per patch). *A. nigriscutis* population was evaluated by sweep counts with a standard insect collection net and are reported as a mean of three counts/plot with five sweeps per count. Leafy spurge root samples were harvested annually in October from 1993 to 1995, and carbohydrate and protein content were analyzed as a measure of root vigor.

Leafy spurge stem density declined rapidly when herbicides were fall applied to plants infested with *A. nigriscutis* (Table 1). The leafy spurge stand declined from 164 stems/m^2 in 1992 to 12 stems/m^2 the following year. Leafy spurge gradually declined with the insect alone treatment from 188 stems/m^2 in 1992 to 6 stems/m^2 by May 1995. Both the insect alone and fall-applied herbicide plus insect treatments provided more rapid leafy spurge stem reduction than the spring-applied herbicides plus insects treatment. Herbicides applied in June prevent the adult flea beetles from feeding on those plants, and thus probably reduce egg laying and subsequent larvae feeding.

Leafy spurge stem density recovered more rapidly from the insect alone treatment than from either herbicide plus insect treatment (Tables 1 and 2). For example, leafy spurge control averaged 73% with the insect alone treatment in May 1995, but declined rapidly once the adult flea beetles emerged (i.e., large larvae that had fed on roots pupated and then emerged) and only averaged 47 and 31% control in July and September 1995, respectively (Table 2). Leafy spurge control with the fall-applied herbicide plus insect treatment averaged slightly over 80% in May and July 1995 before declining to 60% in September.

Leafy spurge stem density was lower in 1996 then 1995 regardless of treatment, but the combination treatment of insects plus herbicides provided better control then the insects alone (Table 1). Leafy spurge control remained high in 1996 and declined only slightly from the June to September evaluation dates compared to the same time in 1995. Control averaged 91% in September 1996 with the two combination treatments compared to 79% control with the insects alone (Table 2). Since herbicide application was stopped after 1995, the decline is due to the insects alone. Control was similar regardless of treatment and averaged 11 stems/m^2 1997, 2 yr after the last herbicide application (Table 1).

The *A. nigriscutis* population gradually increased over time and generally reached peak numbers in the first week of July each year (Table 3). Beetle population gradually increased

from 1993 to 1996 and averaged 90 adults/m^2 in 1997 regardless of treatment. Despite the increased leafy spurge control when fall-applied herbicides were combined with the flea beetles, there generally were less than half as many adults found on those plants compared to untreated plants. There was not much regrowth for the adults to feed on until late-summer and fall, when flea beetle populations begin to naturally decline. Thus, even though the initial combination of control methods was synergistic, the fall-applied treatments were discontinued to prevent the flea beetles from completely abandoning the research area.

Root nutrient reserves as measured by sucrose, glucose, and protein content declined from 1993 to 1995 (Table 4). However, the decline was similar regardless of treatment except for the initial sucrose concentration and the glucose concentration in 1995. Previous research at North Dakota State University has shown that root nutrient content, especially root proteins, are a good indicator of root vigor. Thus, these nutrient reserves can estimate a treatment's effect on the root system and thus long-term control that cannot be evaluated from visual evaluations and stand counts.

Table 1. Leafy spurge stem density after treatment with *Aphthona nigriscutis* alone or combined with herbicide treatments near Cuba, ND.

		Stem density/evaluation date								
Treatment[a]	Rate	June 1992	May 1993	May 1994	Sept 1994	May 1995	Sept 1995	June 1996	Sept 1996	June 1997
	– lb/A –	No./m^2								
Picloram+2,4-D (Spring)	0.25+1	220	208	136	76	16	40	24	8	12
Picloram+2,4-D (Fall)	0.5+1	164	12	12	92	0.5	52	0.5	12	12
Insect only	. .	188	152	100	120	6	68	12	36	8
LSD (0.05)		28	28	20	20	8	12	8	8	NS

[a]Herbicides applied in June or September annually from 1992 to 1995.

Table 2. Leafy spurge control after treatment with *Aphthona nigriscutis* alone or combined with herbicides.

Treatment[a]	Rate	Visible control							
		May 1993	May 1994	May 1995	July 1995	Sept 1995	June 1996	Sept 1996	June 1997
	- lb/A-	%							
Picloram+2,4-D (Spring)	0.25+1	6	35	91	60	73	88	93	90
Picloram+2,4-D (Fall)	0.5+1	93	94	81	84	60	99	90	93
Insect only	. .	19	45	73	47	31	90	79	86
LSD (0.05)		11	10	NS	35	23	11[b]	7	NS

[a]Herbicides applied in June or September annually from 1992 to 1995.
[b]LSD = 10%.

Table 3. Effect of herbicide application on *Aphthona nigriscutis* population 3 yr after the biocontrol insect had established.

Treatment[a]	Rate	*A. nigriscutis* counts[b]/year					
		1992	1993	1994	1995	1996	1997
	- lb/A -	No./m^2					
Picloram+2,4-D (Spring)	0.25+1	1	0	19	76	25	12
Picloram+2,4-D (Fall)	0.5+1	21	52	40	30	18	8
Insects only	. . .	12	28	132	70	96	23
LSD (0.05)		5	16	63	26	29	6

[a]Herbicides applied in June or Sept. annually from 1992 through 1995.
[b]Maximum number obtained in weekly or bimonthly sweepings from June through Sept.

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

Treatment and application date	Rate	Sucrose			Glucose			Protein		
		93	94	95	93	94	95	93	94	95
	- lb/A -	mg/g								
Picloram + 2,4-D[a] (Spring)	0.25 + 1	151	116	96	137	143	92	27	17	20
Picloram + 2,4-D[a] (Fall)	0.5 + 1	153	103	92	147	128	90	27	21	19
Insect only	. . .	180	126	127	158	156	150	28	25	18
Untreated[b]	. . .	171	. .	. .	123	. .	. .	39	. .	. .
LSD (0.05)		19	NS	NS	NS	NS	30	NS	NS	NS

[a]*Apthona nigriscutis* were introduced in 1989, and herbicides were applied in June or Sept. from 1992 to 1995 for spring or fall application, respectively.
[b]Samples collected in insect free area near experiment.

Pre- and post-harvest treatments for Canada thistle and perennial sowthistle control in wheat. Rodney G. Lym and Katheryn Christianson. Canada thistle and perennial sowthistle are an increasing problem in wheat in the Northern Great Plains, in part due to very wet fall seasons in the region since 1993. These wet conditions are ideal for thistle germination and rosette formation in cropland. The purpose of this research was to evaluate several in-crop and post-harvest herbicide treatments for Canada thistle and perennial sowthistle control in wheat.

The experiment was established near Fargo, ND in a dense stand of both Canada and perennial sowthistle. Hard red spring wheat, variety '2375', was seeded on May 15, 1996. Herbicide treatments were applied with a tractor-mounted sprayer delivering 8.5 gal/A at 35 psi using Spraying Systems 8001 flat-fan nozzles. Fenoxaprop plus MCPA plus 2,4-D at 0.6 plus 0.11 plus 0.18 lb/A were applied on June 4, 1996, when the wheat had 2 to 3 leaves and Canada thistle and perennial sowthistle were in the rosette to 3- to 4-leaf growth stage. The jointing-stage herbicide treatments to control Canada thistle and perennial sowthistle were applied on June 27 when the wheat was in the 6-leaf to jointing stage and Canada thistle and perennial sowthistle were 4 to 6 inches tall. The preharvest treatments were applied on August 2 when the wheat was in the medium to hard dough stage, Canada thistle was 8 to 12 inches tall and blooming, and perennial sowthistle was 6 to 8 inches tall. The post-harvest treatments were applied on September 13 when the Canada thistle and perennial sowthistle were in the rosette stage or 4 to 5 inches tall following harvest. The experiment was in a randomized complete block design with four replications, and each plot was 10 by 30 feet.

Table. Pre- and post-harvest treatments for Canada thistle and perennial sowthistle control.

			Canada thistle			Pern. sowthistle		
			1996	1997		1996	1997	
Treatment	Crop stage	Rate	Sept	June	July	Sept	June	July
		— oz/A —	——— % control ———					
Tribenuron + 2,4-D[a]	Jointing	0.33 + 6	16	60	25	9	29	18
2,4-D ester/clopyralid + 2,4-D[b]	Jointing/Post-harvest	10/1.5 + 8	10	99	94	23	97	86
Clopyralid + 2,4-D[b]	Jointing	1.5 + 8	45	94	81	39	48	58
Glyphosate	Pre-harvest	12	69	79	76	51	79	63
Glyphosate + 2,4-D[a]	Pre-harvest	12 + 8	50	71	58	48	85	45
Glyphosate	Post-harvest	12	..	92	79	..	58	18
Glyphosate + 2,4-D[a]	Post-harvest	12 + 8	..	94	56	..	54	13
Clopyralid + 2,4-D[b]	Post-harvest	1.5 + 8	..	75	61	..	38	33
Clopyralid + 2,4-D[b]	Post-harvest	3 + 16	..	91	69	..	58	35
Dicamba	Post-harvest	16	..	91	65	..	63	20
LSD (0.05)			39[b]	24	32	NS	NS	43

[a]2,4-D was a mixture of the triisopropanolamine and dimethylamine salts - Formula 40.
[b]Commercial formulation - Curtail.
[b]LSD= (0.10).

In general any treatment that contained clopyralid provided the best long-term Canada thistle control (Table). Clopyralid plus 2,4-D applied at the jointing stage of wheat or post-harvest following a 2,4-D treatment at jointing, tended to provide the best long-term Canada thistle

control and averaged 94 and 81%, respectively, in July 1997 (the following growing season). Glyphosate applied post-harvest alone or with 2,4-D provided better Canada thistle control than the same treatments applied pre-harvest and averaged 93 and 75%, respectively, the following June. Dicamba applied post-harvest at 16 oz/A provided 91% Canada thistle control the following June but control dropped to only 65% by July. Tribenuron plus 2,4-D applied at jointing did not provide adequate Canada thistle control.

Clopyralid plus 2,4-D applied post-harvest following 2,4-D at jointing tended to provide the best long-term perennial sowthistle control (Table). Glyphosate applied alone or with 2,4-D pre- or post-harvest averaged 82 and 55% control, respectively, the following June. No other treatment provided satisfactory perennial sowthistle control. In general, treatments that contained glyphosate applied pre- or post-harvest provided similar Canada thistle control, but the post-harvest glyphosate treatments provided better perennial sowthistle control than the pre-harvest treatments that contained glyphosate.

Canada thistle control for industrial areas. Katheryn M. Christianson and Rodney G. Lym. Total vegetation control often is a goal for weed control in industrial and non-crop areas such as railroad rights-of-way. Canada thistle is an invasive perennial weed and often is the first plant to regrow in industrial and utility areas. There are many broadleaf herbicides available to control Canada thistle. The objective of this experiment was to evaluate several herbicides alone and in combination for Canada thistle control in industrial areas.

The experiment was established on a dense stand of Canada thistle on September 12, 1995, at the North Dakota State University Experiment Station at Fargo. The soil was Fargo silty clay with 3.5% organic matter and a 8.0 pH. The plants were in the rosette to early bolt growth stage, 6 to 8 inches tall. The treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 feet arranged in a randomized complete block design with four replications. Treatments were visually evaluated for percent Canada thistle control and bareground compared to the untreated control.

All treatments provided greater than 90% Canada thistle control 9 months after treatment (MAT) except clopyralid plus 2,4-D at 4 plus 24 oz/A and both dicamba plus 2,4-D treatments (Table 1). All treatments containing metsulfuron or chlorsulfuron provided total vegetation control and averaged 94% bareground. Treatments containing picloram, dicamba, or clopyralid did not give complete vegetation control.

Canada thistle control declined slightly 12 MAT for all treatments but still exceeded 90% except for both metsulfuron plus 2,4-D treatments and dicamba plus 2,4-D at 4 plus 11.5 oz/A which averaged 71% control (Table 1). Treatments containing chlorsulfuron at rates higher than 0.75 oz/A maintained 87% or higher bareground 12 MAT. Chlorsulfuron plus 2,4-D at 0.75 plus 16 oz/A and metsulfuron plus 2,4-D at 0.6 plus 16 oz/A averaged 45% bareground. No other treatment provided even short-term total vegetation control.

Chlorsulfuron at 1.5 and 2.25 oz/A applied with 2,4-D maintained 76% bareground 21 MAT (Table 2) but declined to less than 50% 24 MAT. Picloram at 4 oz/A and clopyralid at 4 oz/A tended to provide the best long-term Canada thistle control and averaged 70% 24 MAT. In general, kochia and annual grasses were the first plants besides Canada thistle to begin regrowth in this study. Metsulfuron or chlorsulfuron with 2,4-D provided the best total vegetation control of the herbicides evaluated, with chlorsulfuron plus 2,4-D maintaining bareground the longest.

Table 1. Canada thistle control and total vegetation management with various herbicides 1 yr after treatment.

Treatment	Rate	Canada thistle control		Bareground	
		9 MAT[a]	12 MAT[a]	9 MAT[a]	12 MAT[a]
	– oz/A –	—— % ——		—— % ——	
Metsulfuron + 2,4-D	0.3 + 16	97	79	85	29
Metsulfuron + 2,4-D	0.6 + 16	93	68	94	50
Chlorsulfuron + 2,4-D	0.75 + 16	95	82	92	41
Chlorsulfuron + 2,4-D	1.5 + 16	99	91	98	87
Chlorsulfuron + 2,4-D	2.25 + 16	100	90	98	92
Chlorsulfuron	1.125	97	91	94	77
Picloram	4	94	92	20	10
Picloram	8	98	96	24	10
Clopyralid	4	91	98	21	9
Clopyralid	8	96	93	26	13
Clopyralid + 2,4-D[b]	2 + 12	94	94	21	11
Clopyralid + 2,4-D[b]	4 + 24	82	86	20	10
Dicamba + 2,4-D[c]	4 + 11.5	72	67	16	13
Dicamba + 2,4-D[c]	8 + 23	87	96	27	13
LSD (0.05)		16	18	12	14

[a]Months after treatment.
[b]Commercial formulation - Curtail.
[c]Commercial formulation - Weedmaster.

Table 2. Canada thistle control and total vegetation management with various herbicides 2 yr after treatment.

Treatment	Rate	Canada thistle control		Bareground	
		21 MAT[a]	24 MAT[a]	21 MAT[a]	24 MAT[a]
	— oz/A —		%		
Metsulfuron + 2,4-D	0.3 + 16	43	26	28	3
Metsulfuron + 2,4-D	0.6 + 16	18	27	33	3
Chlorsulfuron + 2,4-D	0.75 + 16	43	27	31	1
Chlorsulfuron + 2,4-D	1.5 + 16	70	39	76	25
Chlorsulfuron + 2,4-D	2.25 + 16	80	52	76	43
Chlorsulfuron	1.125	54	38	49	26
Picloram	4	74	35	23	1
Picloram	8	85	68	19	1
Clopyralid	4	87	70	23	0
Clopyralid	8	53	43	18	0
Clopyralid + 2,4-D[b]	2 + 12	66	45	18	1
Clopyralid + 2,4-D[b]	4 + 24	74	50	18	0
Dicamba + 2,4-D[c]	4 + 11.5	43	42	16	0
Dicamba + 2,4-D[c]	8 + 23	65	54	16	7
LSD (0.05)		34	23[d]	11	13

[a]Months after treatment.
[b]Commercial formulation - Curtail.
[c]Commercial formulation - Weedmaster.
[d]LSD = 0.15.

Evaluation of AC 263,222 for Canada thistle control. Rodney G. Lym. AC 263,222 (formerly known as imazameth) has been labeled for weed control for several species including leafy spurge in non-cropland. AC 263,222 is classified as an imidazolinone herbicide which inhibits acetohydroxyacid synthase. The addition of urea ammonium nitrate (28% N) and/or methylated seed oil (MSO) has increased the effectiveness of imidazolinone herbicides. The purpose of this research was to evaluate AC 263,222 for Canada thistle control alone and applied with nitrogen or a MSO.

The experiment was established on September 13, 1996, in a dense stand of Canada thistle near the North Dakota State University campus at Fargo. Canada thistle was 6 to 8 inches tall and in the rosette growth stage. The air temperature was 69 F, and the soil temperature at the 4 inch depth was 64 F. Frost did not occur in the area until October 3 when the low temperature was 27 F. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. Canada thistle control was visually evaluated on June 6 and August 21, 1997, with control based on percent stand reduction as compared to the control.

Treatment	Rate	Control	
		9 MAT[a]	12 MAT[a]
	oz/A	%	
AC 263,222	1	83	28
AC 263,222	2	81	28
AC 263,222	3	76	26
AC 263,222 + MSO[b]	1 + 1 qt	70	3
AC 263,222 + MSO[b]	2 + 1 qt	71	21
AC 263,222 + MSO[b]	3 + 1 qt	91	5
AC 263,222 + MSO[b] + 28% N	1 + 1 qt + 1 qt	68	10
AC 263,222 + MSO[b] + 28% N	2 + 1 qt + 1 qt	85	11
AC 263,222 + MSO[b] + 28% N	3 + 1 qt + 1 qt	87	6
Clopyralid	4	99	91
Picloram	4	100	92
LSD (0.05)		19	27

[a]Months after treatment.
[b]Methylated seed oil was SunIt by AGSCO.

AC 263,222 provided an average of 80% Canada thistle control 9 months after treatment (MAT) when applied alone at 1, 2, or 3 oz/A (Table). Control declined rapidly 12 MAT and was 28% or less regardless of AC 263,222 rate. The addition of a MSO or MSO plus nitrogen did not consistently improve control compared to AC 263,222 applied alone. AC 263,222 did not provide satisfactory long-term Canada thistle control compared to the standard treatments of clopyralid or picloram, which averaged better than 90% control 12 MAT.

Evaluation of AC 263,222 and quinclorac for spotted knapweed control. Rodney G. Lym. AC 263,222 (formerly known as imazameth) has been labeled for control of several perennial weeds in non-cropland. AC 263,222 may be a more cost-effective treatment than the widely used herbicide combination of picloram plus 2,4-D for spotted knapweed control. Quinclorac is a systemic herbicide registered to control annual grass and broadleaf weeds in rice. Quinclorac also controls leafy spurge in pasture and rangeland with minimal or no impact on desirable forbs. The purpose of this research was to evaluate AC 263,222 and quinclorac for spotted knapweed control.

The experiment was established on September 19, 1996, on a sandy/gravely site near the Hawley Airport, Hawley, MN. Spotted knapweed was in the rosette growth stage and had been mowed in mid-summer. The air temperature was 61 F, and the soil temperature at the 4 inch depth was 61 F. Frost did not occur in the area until October 3 when the low temperature was 27 F. Herbicides were applied using a hand-held sprayer delivering 8.5 gpa at 35 psi. The grass species present were generally bluegrass and smooth bromegrass. Control of bolted spotted knapweed plants and grass injury was evaluated on June 12 and August 22, 1997, and control of spotted knapweed rosettes on August 22. Visual evaluations were based on percent stand reduction as compared to the control.

		Evaluation				
		9 MAT[a]		12 MAT[a]		
Treatment	Rate	Bolted	Grass Inj.	Bolted	Rosette	Grass Inj.
	— oz/A —			%		
AC 263,222	2	21	0	4	0	22
AC 263,222 + MSO[b] + 28% N	1 + 1 qt + 1 qt	18	0	25	0	12
AC 263,222 + MSO[b] + 28% N	2 + 1 qt + 1 qt	8	0	0	0	71
AC 263,222 + MSO[b] + 28% N	4 + 1 qt + 1 qt	33	5	7	0	48
Quinclorac	8	55	0	51	8	6
Quinclorac + MSO[b]	4 + 1 qt	60	0	65	46	3
Quinclorac + MSO[b]	8 + 1 qt	61	0	58	36	0
Quinclorac + MSO[b]	16 + 1 qt	93	0	91	86	0
Picloram + 2,4-D	4 + 16	100	0	100	100	0
Clopyralid + 2,4-D[c]	3 + 16	98	0	99	71	0
LSD (0.05)		28	3	30	33	30

[a]Months after treatment.
[b]Methylated seed oil was SunIt by AGSCO.
[c]Commercial formulation - Curtail.

AC 263,222 did not provide adequate spotted knapweed control regardless of application rate. However, the growth of cool season grass species was reduced. Grass injury averaged 22 and 71% 12 MAT (months after treatment) when AC 263,222 was applied at 2 oz/A alone or with a MSO plus 28% N, respectively.

Quinclorac at 16 oz/A plus a MSO provided 91 and 86% bolted and rosette spotted knapweed control, respectively, 12 MAT with no visible grass injury. Quinclorac at 8 or 4 oz/A did not control spotted knapweed. Picloram plus 2,4-D averaged 100% control of both bolted and rosette spotted knapweed 12 MAT with no grass injury. Clopyralid plus 2,4-D also provided excellent bolted spotted knapweed control, but only 71% rosette control 12 MAT. Thus, picloram plus 2,4-D would be the treatment of choice for long-term spotted knapweed control in many situations, but quinclorac (if

labeled in the future) would be useful in areas where picloram cannot be used, or where removal of all broadleaf species would be undesirable.

General broadleaf weed control in pasture. Rodney G. Lym and Katheryn M. Christianson. Perennial and biennial pasture weeds compete with pasture and rangeland grasses for nutrients and moisture. Effective weed control will result in higher forage production and quality. However, to be cost-effective, a treatment must provide both broad-spectrum and long-term weed control with minimal cost. The purpose of this research was to evaluate several herbicides alone and in combination for long-term cost-effective broadleaf weed control in pasture.

The experiment was established in a pasture that contained a variety of broadleaf weeds on the NDSU Ekre Experiment Station near Walcott, ND (Table 1). Herbicides were applied on June 4 or June 24, 1996, when most of the weeds were in the vegetative growth stage. Treatments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 15 by 50 feet and replicated four times with the herbicide treatments in a randomized complete block design. Whole plots were split so the June 4 treatments were applied to the left side of the plots (7.5 feet) and the June 24 treatments were applied to the right side (7.5 feet). Weed control was visually evaluated.

All treatments applied on June 4 provided 75% or more goldenrod and joepyeweed control (7 weeks after treatment), except triasulfuron or dicamba applied alone (Table 2). However, no treatment provided satisfactory control when applied 3 weeks later on June 24. The later application date (June 24) was best for wild licorice control as most treatments averaged 100% except triasulfuron alone and glyphosate plus 2,4-D. Only 2,4-D provided 100% wild licorice control when treatments were applied on June 4. Metsulfuron plus 2,4-D applied on June 4 provided about 70% mint control but early evaluations were quite variable from plot to plot, and no treatment provided satisfactory mint control when applied on June 24. Glyphosate plus 2,4-D slightly injured cool season grasses on the June 4 application date. The experiment could not be re-evaluated in 1996 because of very dry conditions which led to poor regrowth and severe grasshopper damage in many plots.

In general, goldenrod and joepyeweed control was better in 1997, the year following treatment compared to 1996 especially for treatments applied on June 24 (Table 3). Triasulfuron at 0.56 oz/A applied in combination with other herbicides, metsulfuron plus 2,4-D, and picloram plus 2,4-D all provided 90% or better control regardless of treatment date. Mint control was much higher in 1996 than 1997 and nine treatments provided 90% or better control when applied on June 24. However, wild licorice control tended to decline the year following treatment. Regrowth varied dramatically among treatments but 2,4-D provided 100 and 99% wild licorice control 1 year after treatment when applied on June 4 and June 24, respectively.

Metsulfuron plus 2,4-D provided good to excellent control of most broadleaf plants in the pasture but at $20 to $40/A is an expensive treatment. Picloram plus 2,4-D provided 93% or higher control on all weeds evaluated regardless of treatment date except the early wild licorice treatment but costs $12/A. In general, 2,4-D at 16 oz/A ($3) provided the most cost-effective broadleaf weed control but would need to be combined with triasulfuron ($6 to $7.50 total cost), to control goldenrod/Joe-pyeweed. Glyphosate plus 2,4-D, clopyralid plus 2,4-D, and dicamba did not provide broad spectrum broadleaf weed control.

Table 1. Broadleaf plants found in the experiment and height when treated.

Scientific name	Common name	1996 treatment date	
		4 June	24 June
		inches[a]	
Aster novae-angliae L.	New England aster	2 - 4	4 - 8
Asclepias syriaca L.	Common milkweed	4 - 6	6 - 8
Cirsium flodmanii (Rydb.) Arthur	Flodman thistle	Rosette	6 - 10
Eupatorium maculatum L. var. *bruneri* (A. Gray) Breitung	Joepyeweed	2 - 4	6 - 8
Glycyrrhiza lepidota (Nutt.) Pursh	Wild licorice	2 - 4	24 - 36
Onosmodium molle Michx. var. *occidentale* (Mack.)	False gromwell	2 - 4	4 - 6
Solidago missouriensis Nutt.	Missouri goldenrod	2 - 4	4 - 8
Solidago rigida L.	Rigid goldenrod	8 - 12	12 - 24
Verbena stricta Vent.	Hoary vervain	4 - 8	8 - 16
Vicia spp.	Vetch (various)	6 - 10	12 - 24

[a]All plants were in the vegetative growth stage except the *Vicia* spp. which were at the early flower growth stage on June 24, 1996.

Table 2. Multi-species broadleaf weed control in pasture, with herbicides applied on June 4 or 24, 1996, and evaluated on July 16, 1996 near Walcott, ND.

Treatment	Cost	Rate	Goldenrod/joepyeweed		Mint		Wild licorice		Grass injury	
			4 June	24 June	4 June	24 June	4 June	24 June	4 June	24 June
	$/A	– oz/A –	% control						%	
Triasulfuron+X-77	2.25	0.28+0.25%	44	13	0	3	25	38	0	0
Triasulfuron+X-77	4.50	0.56+0.25%	54	15	3	11	35	8	0	0
Triasulfuron+dicamba+X-77	15.50	0.56+8+0.25%	81	31	3	8	7	100	0	0
Triasulfuron+picloram+X-77	14.50	0.56+4+0.25%	83	19	33	16	33	100	0	0
Triasulfuron+2,4-D+X-77	6.00	0.56+8+0.25%	78	38	44	22	30	100	0	0
Triasulfuron+2,4-D+X-77	7.50	0.56+16+0.25%	86	25	50	18	21	100	0	0
Metsulfuron+2,4-D+X-77	20.00	1+8+0.25%	99	23	71	25	55	100	0	0
Metsulfuron+2,4-D+X-77	40.00	2+16+0.25%	94	36	67	33	8	100	4	0
2,4-D	3.00	16	80	19	25	20	100	100	0	0
Glyphosate+2,4-D[a]	8.00	16	80	18	3	12	40	68	14	1
Dicamba	11.00	8	63	15	7	13	13	100	0	0
Clopyralid+2,4-D[b]	9.00	9.5	88	23	33	23	7	100	0	0
Dicamba+2,4-D[c]	7.50	16	75	23	3	29	9	100	0	0
Picloram+2,4-D	12.00	4+16	91	34	38	23	15	100	0	0
LSD (0.05)			23	NS	NS	16	NS	45	5	NS

[a]Commercial formulation-Landmaster BW.

[b]Commercial formulation-Curtail.

[c]Commercial formulation-Weedmaster.

Table 3. Multi-species broadleaf weed control in pasture, with herbicides applied on June 4 or 24, 1996, and evaluated on June 24, 1997 near Walcott, ND.

Treatment	Cost	Rate	Goldenrod/joepyeweed		Mint		Wild licorice	
			4 June	24 June	4 June	24 June	4 June	24 June
	-$/A-	- oz/A -	% control					
Triasulfuron+X-77	2.25	0.28+0.25%	72	60	79	86	50	68
Triasulfuron+X-77	4.50	0.56+0.25%	99	84	54	65	69	69
Triasulfuron+dicamba+X-77	15.50	0.56+8+0.25%	93	94	79	73	75	93
Triasulfuron+picloram+X-77	14.50	0.56+4+0.25%	95	95	99	99	91	98
Triasulfuron+2,4-D+X-77	6.00	0.56+8+0.25%	99	91	98	100	43	80
Triasulfuron+2,4-D+X-77	7.50	0.56+16+0.25%	100	91	99	100	50	79
Metsulfuron+2,4-D+X-77	20.00	1+8+0.25%	99	100	97	100	74	88
Metsulfuron+2,4-D+X-77	40.00	2+16+0.25%	99	100	100	100	62	83
2,4-D	3.00	16	82	74	92	99	100	99
Glyphosate+2,4-D[a]	8.00	16	68	68	24	61	75	93
Dicamba	11.00	8	59	59	67	78	55	83
Clopyralid+2,4-D[b]	9.00	9.5	70	64	83	91	70	80
Dicamba+2,4-D[c]	7.50	16	80	48	99	100	13	67
Picloram+2,4-D	12.00	4+16	93	98	99	100	66	94
LSD (0.05)			25[d]	23	27	20	NS	NS

[a]Commercial formulation-Landmaster BW.

[b]Commercial formulation-Curtail.

[c]Commercial formulation-Weedmaster.

[d]LSD = (0.10).

Aphthona spp. flea beetle movement along railroad right-of-ways. K. M. Christianson, R. G. Lym, and C. G. Messersmith. Leafy spurge is often found in long narrow corridors such as railroad right-of-ways and is difficult to treat. Two experiments were conducted to determine the establishment, population increase, and movement of Aphthona species flea beetles in confined areas of leafy spurge.

A. nigriscutis was released in a dense stand of leafy spurge along a railroad corridor on June 28, 1993. There were five treatments consisting of 100, 200, 300, 400, and 500 adult insects released per treatment, plots were 260 feet apart, and replicated three times along a 2.5 mile stretch of the Burlington Northern railroad right-of-way near Buffalo, ND. Stem density and adult flea beetle population were monitored in the spring and summer, respectively, at the release point and at distances 10, 25, and 40 feet in a semi-circle pattern from the release point.

A. nigriscutis flea beetles were found in all treatment each year after release and leafy spurge stem density began to decline in 1995. The stem density decreased from an average of 18 stems/0.25m2 in 1993 to 5 stems/0.25m2 in 1997 (Table 1). The greatest stem density decrease was 72% when 500 beetles/plot were released. The maximum stem density decrease and highest beetle population occurred within 10 feet of the release point regardless of treatment. *A nigriscutis* populations in the 100 and 400 insects/release treatments averaged 7 beetles/m^2 compared to 2 beetles/m^2 for the 500 insects/release treatment.

A similar experiment was established on July 10, 1995 with a mixed population of *A. czwalinae/lacertosa* along the Red River Valley and Western railroad right-of-way near Lisbon, ND. The number of insects released was increased to 500, 1000, 15000, and 2000 adults per treatment. Release points were 150 feet apart with four replications along a 3.5 mile stretch of the right-of-way. Stem density and adult flea beetle population were monitored in the spring and summer, respectively, at the release point and at distances of 10, 30, 50, and 70 feet in a circular pattern around the release point.

A. czwalinae/lacertosa were found at all release sites in both 1996 and 1997. The average stem density in the 2000 insects/release treatment declined by 71% 2 years after release from 21 stems/m^2 to 6 stems/m^2 within 10 feet of the release point (Table 2). The average stem density declined 48, 60, and 23% within 10 feet of the release point for the 1500, 1000, and 500 insect treatments, respectively. *A czwalinae/lacertosa* were found up to 70 feet from the release point. Flea beetles will establish on industrial sites such as railroad right-of-ways. The larger the release number the more rapid the site stem density declines.

Table 1. *A. nigriscutis* establishment along the Burlington Northern Railroad near Buffalo, ND.

No. *A. nig.* released[a]	Stand count			Sweep count		
	1993	1996	1997	1995	1996	1997
	— No./0.25m^2 —			—— No./m^2 ——		
100	17	5	9	2	1	6
200	16	11	13	4	2	6
300	19	9	12	8	8	7
400	19	6	11	9	8	8
500	18	5	7	4	3	2
LSD (0.05)	NS	2	3	3	5	3

[a]Insects released June 1993, stand counts May each year.

Table 2. *A. czwalinae/lacertosa* establishment along the Red River Valley and Western Railroad near Lisbon, ND.

No. A. nig. released[a]	Stand count			Sweep count	
	1995	1996	1997	1996	1997
	— No./0.25m^2 —			—— No./m^2 ——	
500	26	26	21	2	19
1000	28	31	33	2	86
1500	27	23	20	3	14
2000	21	15	36	3	81
LSD (0.05)	NS	8	9	NS	NS

[a]Insects released June 1995, stand counts May each year.

NDSU perennial weed demo experiment 193.

Leafy spurge demonstration plots, Ekre station.

Annual application date and treatment	Cost[a]	Rate	Control					
			1994		1995		1997	
			June	Sept.	June	Sept.	June	Sept.
	$/A	— lb/A —	—	—	%	—	—	—
September 1993								
Picloram + 2,4-D amine	28	0.5+1	90	80	98	95	100	99
Picloram	25	0.5	95	70	100	98	100	97
Picloram + 2,4-D amine	14	0.25+1	98	48	100	65	100	95
2,4-D amine	6	2	10	5	75	40	90	55
Dicamba	36	2	85	20	90	50	97	73
Glyphosate + 2,4-D[b]	8	0.4+0.6	80[c]	25[c]	35[e]	45	60[f]	0
AC 263,222 +Scoil + N[g]	20	0.125+1 qt+1 qt					99	95
June 1994								
Picloram	13	0.25		20[d]	30	68	80	78
Fosamine	80	8		78[d]	77	87	7	98
Picloram + 2,4-D amine	28	0.5+1		63[d]	65	98	100	100
Picloram	25	0.5		33[d]	45	97	97	98
Picloram + 2,4-D amine	14	0.25+1		0[d]	•	25	68	90
2,4-D amine	6	2		0[d]	•	0	12	87
Dicamba	36	2		0[d]	•	23	50	100
Glyphosate + 2,4-D[b]	8	0.4+0.6		0[d]	•	25	35	0

[a]Annual treatment cost, but does not include application cost.

[b]Commercial formulation (Landmaster BW).

[c]Grass injury was 60% in June 94 and 10% in Sept, treatment was discontinued after 1995 application because grass injury averaged 87%.

[d]Rain fell within 2 hours of treatment, resulting in much below average control.

[e]Grass injury was 60%.

[f]Grass injury was 30%.

[g]AC 263,222 was first applied in Sept 1996.

Herbicides for Common Milkweed Control, Cando, ND, 1997. (Terry Gregoire) An experiment near Cando was established June 16 in Verde wheat planted May 25. Milkweed was 12" to 15" tall in the bud stage. Canada thistle was 8" tall. Clopryralid plus 2,4-D was applied with a backpack sprayer delivering 8.5 gpa at 35 psi through 8001 nozzles. The sky was clear, 70°F with calm wind. Three replications were sprayed.

Treatments	Rate lb/A	% growth reduction Common Milkweed	Canada Thistle
Clopyralid plus 2,4-D	0.14 + 0.75	25	100
check		0	0

Common milkweed was twisted but additional growth was evident in the treated area. Canada thistle top growth control was evident by completely brown top growth at evaluation time. No wheat injury was noted.

A non- replicated demonstration nearby using prosulfuron, triasulfuron and clopyralid plus 2,4-D was also sprayed June 16.

Treatments	Rate a.i. per acre	Estimated % growth reduction
Clopyralid + 2,4-D	0.14 lb plus 0.75 lb	15
Triasulfuron	0.21 oz	50
Tribenuron	0.25 oz	80
Tribenuron	0.5 oz	60

Dicamba plus MCPA (1 oz plus 8 oz) was applied over triasulfuron and tribenuron by the farmer approximately June 24.

Clopyralid plus 2,4-D twisted milkweed growth but new growth was evident. Triasulfuron at 0.25 oz reduced new growth and terminal bud activity and browned leaves. The 0.5 oz triasulfuron treatment provided nearly complete control with crisp brown leaves and dead terminal buds evident. Common milkweed growth reduction by triasulfuron at 0.21 oz was similiar to tribenron at 0.25 oz.