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FORWARD

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1998

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PROJECT I

WEEDS OF RANGE AND FOREST

ROGER SHELEY, CHAIR

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	1996 treatment date: 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).

Forage cultivar performance on rangeland twelve years after seeding. Timothy W. Miller, F. Eddie Northam, and Robert H. Callihan. A field trial was initiated in fall of 1985 to investigate the adaptation of 21 grass and forb species potentially useful for revegetation of yellow starthistle-infested canyon rangelands. Two cultivars were included for four of the species, and two hybrids were also planted giving a total of 27 distinct taxa. The site is on National Park Service land approximately 2.25 miles northeast of Whitebird, ID on the floor of the canyon. The soil is a Banner silt loam. At the time of seeding, medusahead, ventenata, and field bindweed dominated the plant community. Subsequently, yellow starthistle (CENSO) has naturally invaded and become the dominant forb. Sheep had periodically grazed the site prior to seeding operations; no grazing has occurred since the forages were seeded.

Two experiments were included in the initial trial and were seeded on October 29, 1985 and March 27, 1986. Cultivars were considered to be successfully established if they achieved densities greater than 3 plants/ft^2 by the end of the first growing season (July and August, 1986). Plant materials used are listed in Table 1. The site was revisited on August 1, 1997 and visual observations were made to subjectively grade the seeded forages for (1) stand longevity after twelve growing seasons and (2) ability of the cultivar to withstand invasion by CENSO. Results of this grading are in Table 2.

Three grass cultivars, 'Rosana' western wheatgrass, 'Durar' hard fescue, and 'Covar' sheep fescue, performed the best whether seeded in the fall or spring. The stands of these cultivars were exceptionally dense and had spread beyond the original plot borders, although drill rows in the fescue plots were still evident. No CENSO plants were present in the stands of these three cultivars. Interestingly, no 'Covar' plants were evident in the initial evaluations conducted after one growing season, and it was thought this cultivar had failed to establish. The spring seedings of 'Luna' pubescent wheatgrass and PI478831 basin wildrye were also maintaining good stand density and effectively resisting CENSO invasion. The fall-seeded 'Luna,' while still fairly dense, was lightly infested by CENSO. Both fall- and spring-seeded 'Alkar' tall wheatgrass and 'Magnar' basin wildrye were maintaining moderately dense stands, but a few CENSO plants were noted in these plots. Grass cultivars rated "good" when fall-seeded and "fair" when spring-seeded were 'Tualitin' tall oatgrass, 'Reubens' Canada bluegrass, and 'Pierre' sideoats grama. Of these, 'Reubens' and 'Pierre' were notable in that their stands, although variably dense, were effectively excluding CENSO. The 'Tualitin' plots, while fairly dense, ranged from lightly to heavily infested with CENSO. The spring-seeded 'Rush' intermediate wheatgrass and both fall- and spring-seeded 'Oahe' intermediate wheatgrass exhibited fair stand density and plots were moderately infested with CENSO. The only forb species maintaining at least a fair population was 'Appar' Lewis flax, although it was not effectively resisting CENSO invasion. All other cultivars were either present at less than 50% cover or absent altogether, and severely infested with CENSO. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83844-2339.)

Table 1. Forage cultivars seeded at Whitebird, Idaho on October 29, 1985 and March 27, 1986.

Common Name	Scientific Name	Cultivar	Seeding rate (lbs/A)	Successfully Established[1]
Basin Wildrye	*Elymus cinereus*	'Magnar'	13.9	--
Basin Wildrye	*Elymus cinereus*	PI478831	13.9	--
Big Bluegrass	*Poa secunda*	'Sherman'	5.9	3.3, f
Bluebunch Wheatgrass	*Agropyron spicatum*	'Secar'	12.5	--
Bluebunch Wheatgrass	*Agropyron spicatum*	T2950	12.4	4.3, f
Buffalograss	*Buchloe dactyloides*	---	15.6	--
Canada Bluegrass	*Poa compressa*	'Reubens'	5.1	--
Cicer Milkvetch	*Astragalus cicer*	'Lutana'	12.6	3.1, s
Crested Wheatgrass	*Agropyron cristatum*	'Ephraim'	15.7	--
Crested Wheatgrass	*Agropyron cristatum*	'Nordan'	11.4	--
Crested Wheatgrass hybrid	*Agropyron cristatum*	'Hycrest'	11.5	5.3, f
Hard Fescue	*Festuca ovina* var. *duriuscula*	'Durar'	6.2	5.8, f
Indian Ricegrass	*Oryzopsis hymenoides*	'Nezpar'	13.6	--
Intermediate Wheatgrass	*Thinopyrum intermedium* ssp. *intermedium*	'Oahe'	19.4	8.8, f; 6.5, s
Intermediate Wheatgrass	*Thinopyrum intermedium* ssp. *intermedium*	'Rush'	21.8	8.1, f
Lewis Flax	*Linum perenne* var. *lewisii*	'Appar'	12.5	10.8, f
Orchardgrass	*Dactylis glomerata*	'Paiute'	9.3	--
Pubescent Wheatgrass	*Thinopyrum intermedium* ssp. *barbulatum*	'Luna'	19.1	4.1, f; 4.8, s
Quackgrass x Bluebunch Wheatgrass hybrid	*Elytrigia repens* x *Agropyron spicatum*	T27395	12.5	--
Siberian Wheatgrass	*Agropyron fragile*	P-27	10.7	--
Sicklekeel Lupine	*Lupinus albicaulis*	'Hederma'	36.3	--
Sideoats Grama	*Bouteloua curtipendula*	'Pierre'	18.2	--
Sheep Fescue	*Festuca ovina*	'Covar'	6.2	--
Small Burnet	*Sanguisorba minor*	'Delar'	32.8	6.8, s; 9.7, s
Tall Oatgrass	*Arrhenatherum eliatus*	'Tualitin'	11.6	4.9, f
Tall Wheatgrass	*Thinopyrum ponticum*	'Alkar'	22.1	4.1, f; 3.3, s
Western Wheatgrass	*Agropyron smithii*	'Rosana'	15.8	3.1, f

[1]If blank, the species did not successfully establish; number = plants/ft^2, f = fall seeded, and s = spring seeded.

Table 2. Cultivar performance[1] on August 1, 1997.

Excellent	Good	Fair
Fall 1985 Seeding		
'Rosana' western wheatgrass	'Tualitin' tall oatgrass	'Appar' Lewis flax[3]
'Durar' hard fescue	'Luna' pubescent wheatgrass	'Oahe' intermediate wheatgra
'Covar' sheep fescue	'Reubens' Canada bluegrass[2]	
	'Pierre' sideoats grama	
	'Alkar' tall wheatgrass	
	'Magnar' basin wildrye	
Spring 1986 Seeding		
'Durar' hard fescue	'Magnar' basin wildrye	'Oahe' intermediate wheatgra
'Covar' sheep fescue	'Rush' intermediate wheatgrass	'Tualitin' tall oatgrass[3]
'Rosana' western wheatgrass	'Alkar' tall wheatgrass	'Pierre' sideoats grama[2]
'Luna' pubescent wheatgrass		'Appar' Lewis flax[3]
PI478831 basin wildrye		'Reubens' Canada bluegrass[2]

[1]Excellent = 95 to 100% cover, no CENSO; Good = 75 to 94% cover, some CENSO; Fair = 51 to 74% cover, mode
CENSO; cultivars not listed = plants scattered or no longer present, CENSO dominant.
[2]CENSO not present.
[3]CENSO dominant.

The competitive effects of five cool-season grasses on downy brome and musk thistle. Kristi K. Rose, Tom D. Whitson, and David W. Koch. Downy brome (*Bromus tectorum* L.) is diffucult to control because it has a five-year seed life in soils on arid rangeland. The use of herbicides requires sequential applications to provide long-term control of downy brome. Musk thistle (*Carduus nutans* L.) forms dense stands crowding out desirable forage. Chemical control is an effective control for musk thistle. However, reapplication is required until a depletion of the seed bank is achieved. A study was conducted to determine the competitive ability of five cool-season grasses on downy brome and musk thistle. Before drilling, the five cool-season grasses on May 3, 1994, the study site was sprayed June 10, 1993 with picloram at 0.5 lb ai/A to eliminate musk thistle. All areas were seeded with 10 lbs PLS/acre except Russian wildrye which was seeded at 6 lbs. PLS/acre. Soils are sandy loam with 73% sand, 12% silt, 15% clay, 1.7% organic matter, and a pH of 6.9. Dry matter yields were determined by harvesting by species four (¼) meter^2 quadrats. Samples were oven-dried before weighing on August 27, 1996 and July 19, 1997. Areas seeded to Luna pubescent wheatgrass, Hycrest crested wheatgrass, and Sodar streambank wheatgrass provided 100%, 100%, and 99% downy brome control in 1997, respectively. That same year musk thistle was reduced 97% in the crested wheatgrass stand and 100% in the area seeded to pubescent wheatgrass. Perennial grasses became better established and some were considerably more competitive in 1997 compared to 1996.

Table 1. The competitive effects of five cool-season grasses on downy brome.

	Grass production		Downy brome			
	lbs.(DM)/A		lbs.(DM)/A		% reduction	
Perennial grass	1996	1997	1996	1997	1996	1997
(Critana) thickspike wheatgrass[1]	720	1305	830	34	32	80
(Bozoisky) Russian wildrye	818	1261	670	47	45	73
(Sodar) streambank wheatgrass	1032	1484	188	1	85	99
(Luna) pubescent wheatgrass	1558	2252	0	0	100	100
(Hycrest) crested wheatgrass	1451	2369	113	0	91	100
Unseeded control	0	0	1215	172	0	0

[1]See Table 2 for scientific names.

Table 2. The competitive effects of five cool-season grasses on musk thistle in 1997.

	Grass production	Musk thistle	
Perennial grass	lbs.(DM)/A	lbs.(DM)/A	% reduction
(Critana) thickspike wheatgrass (*Elymus lanceolatus*)	1305	761	66
(Bozoisky) Russian wildrye (*Psathyrostachys juncea*)	1261	959	57
(Sodar) streambank wheatgrass (*Elymus lanceolatus*)	1484	347	84
(Luna) pubescent wheatgrass (*Elytrigia intermedia*)	2252	0	100
(Hycrest) crested wheatgrass (*Agropyron cristatum*)	2369	68	97
Unseeded control	0	2221	0

Bur buttercup control in rangeland. Gary A. Lee and Brenda M. Waters. A study was conducted in Canyon County near Marsing, Idaho to evaluate postemergence herbicide treatments for the control of bur buttercup (CCFTE) in rangeland. Herbicide treatments were applied March 10, 1997 when bur buttercup plants were in pre-bud stage of growth, and range grasses were starting to break dormancy (Table 1). The plots were arranged in a randomized complete block design with four replications. Each plot was 7 by 40 ft. The soil at the location is a Very Stony Land Loam (48% sand, 44% silt, 8% clay, 2.8% organic matter and 7.8 pH). Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 20 gpa at 30 psi. Weed control evaluations were made on April 1 (22 DAT) and May 2 (53 DAT).

Table 1. Application information.

	March 10, 1997
Crop stage	native grasses dormant
Weed stage	CCFTE 1-2 in.
Air temp. (F)	66
Relative humidity (%)	36
Wind (mph)	3
Sky (% cloud cover)	40
Soil temp. (F at 4 in.)	54
Soil moisture	dry surface, good moisture at 1.5 in.

First significant rain fall after herbicide application was 0.37 in. on March 31, 1997.

Metsulfuron at 0.004 lb/A, thifensulfuron/tribenuron at 0.021 and 0.028 lb/A (with either organosilicone surfactant or NIS) and tribenuron at 0.016 lb/A reduced flowering and corresponding seed production of bur buttercup by 95% or better 22 DAT (Table 2). 2,4-DB and 2,4-D caused severe swelling of the pedicel, but resulted in only moderate reduction in flower and seed production at 22 DAT. At the first evaluation 22 DAT, all herbicide treatments had resulted in significant reduction of bur buttercup plant vigor, and treatments had provided acceptable control. By 53 DAT, metsulfuron at 0.003 and 0.004 lb/A, thifensulfuron/tribenuron at 0.021 and 0.028 lb/A (with organosilicone surfactant or NIS), 2,4-DB at 0.75 and 1.0 lb/A (with organosilicone surfactant or NIS) and tribenuron at 0.016 lb/A eliminated 98% or better of the bur buttercup population. 2,4-D, 2,4-D + MCPP + dicamba and dimethenamid were significantly less effective than 2,4-DB in eliminating bur buttercup when applied as an early spring treatment in a rangeland ecosystem. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of herbicide treatments on bur buttercup flowering, seed production, and control.

Treatment	Rate	Floral Reduction 22 DAT	Seed Reduction 22 DAT	Seed Reduction 53 DAT	Vigor Reduction 22 DAT	Population Reduction 53 DAT
	lb/A		----------	%	----------	
Metsulfuron[1]	0.003	90.0	90.0	100.0	81.3	100.0
Metsulfuron[1]	0.004	95.0	95.0	100.0	83.3	100.0
Dimethenamid[1]	1.13	22.5	20.0	70.0	26.3	62.5
Dimethenamid[1]	1.5	50.0	45.0	68.8	37.5	71.3
Thifensulfuron/tribenuron[1]	0.021	98.8	98.8	100.0	87.5	100.0
Thifensulfuron/tribenuron[1]	0.028	100.0	100.0	100.0	87.5	100.0
Thifensulfuron/tribenuron[2]	0.021	100.0	100.0	100.0	82.5	100.0
2,4-DB[2]	0.75	80.0	78.8	100.0	71.3	100.0
2,4-DB[1]	0.75	80.0	73.8	98.5	76.3	98.0
2,4-DB[1]	1.0	83.8	82.5	100.0	82.5	100.0
2,4-D + MCPP + dicamba[1]	0.825 + 0.439 + 0.085	73.8	68.8	76.3	66.3	76.3
2,4-D + MCPP + dicamba[1]	1.015 + 0.504 + 0.105	77.5	71.3	80.0	77.5	81.3
2,4-D[1]	0.713	58.8	56.3	65.0	56.3	72.5
2,4-D[1]	0.95	55.0	60.0	65.0	55.0	76.3
Tribenuron[1]	0.012	76.3	97.5	95.0	75.0	94.3
Tribenuron[1]	0.016	97.3	97.3	98.5	81.3	98.5
Weedy Check	----	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		23.5	14.1	9.2	13.4	9.6

[1]Sylgard organosilicone surfactant added at 0.125% v/v.
[2]Latron Ag-98 nonionic surfactant added at 0.25% v/v.

Response of yellow hawkweed to several herbicides. Timothy W. Miller, Sandra L. Shinn, and Donald C. Thill. A field trial was initiated to investigate the efficacy of nine herbicides on yellow hawkweed (HIECA). The site was formerly a log-holding yard for a cedar mill near Santa, ID that had been seeded to smooth brome, orchardgrass, and Kentucky bluegrass. Although the grasses had established, the site was heavily infested with HIECA. The experimental design was a randomized complete block with four replications and individual plots were 10 by 25 ft. Herbicides were applied postemergence on May 30, 1997 using a CO_2-pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Air temperature was 62 F, relative humidity was 75%, winds were calm, and skies were overcast. HIECA plants were beginning to bolt at the time of application, with flower stems to three inches tall. Foliage was dry, although a very light, intermittent rain occurred the first hour following herbicide application. Herbicide efficacy was evaluated on June 27 and July 30, 1997. Initial HIECA injury rating was on a scale from 1 (no foliar symptoms) to 5 (dry, brown leaves); the second was a visual estimation of HIECA control.

Early HIECA injury was greatest with picloram and carfentrazone + dicamba (injury ratings of 5 and 4.5, respectively), although many plants had recovered from the carfentrazone + dicamba treatment by the July 30 evaluation. Clopyralid and fluroxypyr + dicamba also caused substantial early injury to HIECA (4.0 and 3.8, respectively). Acceptable HIECA control was achieved by picloram, clopyralid, quinclorac + 2,4-D, fluroxypyr + 2,4-D, and fluroxypyr + dicamba. Imazapic treatments did not control HIECA but prevented flowering. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83844-2339.)

Table. Injury to and control of yellow hawkweed near Santa, ID.

Treatment[1]	Rate	HIECA injury[2] June 27, 1997	HIECA control July 30, 1997
	(lb/A)	(1 to 5)	(%)
Picloram	0.25	5.0	98
Clopyralid	0.375	4.0	89
2,4-D ester	2.0	3.3	73
Dicamba	1.0	3.3	63
Quinclorac	0.125	1.0	13
Quinclorac	0.25	1.0	5
Quinclorac	0.375	1.0	6
BAS 662 01H	0.3	2.0	15
Fluroxypyr	0.125	1.8	0
Fluroxypyr	0.25	2.8	0
Fluroxypyr	0.375	2.8	0
Carfentrazone	0.031	1.3	3
Imazapic	0.094	2.0	0
Imazapic	0.125	2.0	6
Imazapic	0.188	2.3	3
Quinclorac + 2,4-D ester	0.25 + 2.0	3.3	78
Quinclorac + dicamba	0.25 + 1.0	3.0	31
Carfentrazone + 2,4-D ester	0.031 + 2.0	3.0	70
Carfentrazone + dicamba	0.031 + 1.0	4.5	59
Fluroxypyr + 2,4-D ester	0.25 + 2.0	3.3	95
Fluroxypyr + dicamba	0.25 + 1.0	3.8	80
$LSD_{0.05}$		0.6	20
CV		17	40

[1]All treatments except imazapic were applied with a non-ionic surfactant (R-11) at 0.5% v/v; imazapic treatments were applied with a methylated seed oil plus surfactant (Sunit II) at 1.25% v/v.
[2]Injury scale, from 1 (no foliar symptoms) to 5 (dry, brown leaves).

Control of houndstongue with postemergence herbicides. Steven Dewey and William Mace. An experimen was established near Smithfield, Utah to evaluate postemergence control of houndstonge (CYWOF) using metsulfuron, dicamba and 2,4-D alone and in combinations. The soil type was a Kidman fine sandy loam, with 7.5 pH and OM content of 1%. On May 20, 1996, treatments were applied in a randomized block pattern with three replications. Each treatment was broadcast on a 10 by 30 foot plot with a CO^2 backpack sprayer equipped with flatfan 8002 nozzles and calibrated to spray 24.7 gallons per acre at 35 psi. At the time of herbicide application, houndstongue ranged from four to twelve inches tall. The most advanced plants were in bud to very early blossom stage with one to two open flowers. Visual evaluations were taken on June 4, 1996, and June 12, 1997.

All metsulfuron treatments, alone or in combination with 2,4-D and dicamba, provided complete control of houndstongue one year after application. Dicamba and 2,4-D were not as effective as metsulfuron but did control approximately 85 percent of the houndstongue plants. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. A comparison of selected postmergence herbicides to control houndstongue.

Treatment[1]	Rate	CYWOF 6/4/96	CYWOF 6/12/97
	oz ai/A	— % Control —	
Metsulfuron	0.6	82	100
Metsulfuron	1.2	78	100
2,4-D	16.0	73	88
Dicamba	4.0	72	83
Metsulfuron+ 2,4-D+ Dicamba	0.6 16.0 4.0	82	100
Metsulfuron+ 2,4-D+ Dicamba	1.2 16.0 4.0	83	100
Check		0	0
LSD(0.05)		7	14

[1]Silicone surfactant applied at 0.065% v/v.

The effects of various herbicides on houndstongue. Tom D. Whitson, Kristi K. Rose, and Mike Willi. Houndstongue is an introduced, biennial. The first year of growth a rosette is formed and the second it flowers and produces seed. Houndstongue in fresh forage or hay is an accumulative toxin to grazing animals causing liver cells to stop reproduction. This experiment was conducted to determine which herbicides most effectively control houndstongue. The herbicides were applied at the early vegetative stage on June 5, 1997. The air temperature was 79F, relative humidity 70%, soil temperature at 1 inch 75F, 4 inches 64F, and it was a clear, calm day. Soils were sandy clay loam with 47% sand, 25% silt, 28% clay with a pH of 6.3 and 4.8% organic matter. The experiment was arranged as a randomized complete block design with three replications. 2,4-D(LVE) at 2.0 lb ai/A and the combination of 2,4-D(LVE) + metsulfuron at 2.0 lb ai/A and 8.5 g (0.5 oz. product) ai/A controlled 100% of the houndstongue. Imazameth at 0.19 lb (12 oz.product) ai/A, picloram + metsulfuron at 0.25 + 8.5 g/A, metsulfuron at 8.5 g/A and picloram at 0.5 lb/A provided 99, 97, 96, 95 and 92% control of houndstongue, respectively. (Department of Plant Science, University of Wyoming, Laramie, WY 82071).

Table. Control of houndstongue with various herbicides.

Treatment	Rate ai/A	% Control (Ave.)
2,4-D LVE	2.0 lb.	100
2,4-D LVE + metsulfuron	2.0 lb. + 8.5 g	100
Metsulfuron	8.5 g	95
Metsulfuron	17 g	72
Picloram	0.25 lb.	75
Picloram	0.5 lb.	92
Picloram + metsulfuron	0.25 lb. + 8.5 g	97
Picloram + metsulfuron	0.5 lb. + 8.5 g	96
Imazameth	0.19 lb	99
Untreated	----	0

A comparison of selected postmergence herbicides to control poison hemlock. Steven Dewey and R. William Mace. Two locations near Newton, UT were used to evaluate postemergence application of metsulfuron, dicamba and 2,4-D alone and in combination for poison hemlock (COIMA) control. The soil of the area is a Mendon silt loam, with 7.3 pH, and O.M. content of 2%. On May 20, 1996, treatments were applied at Location 1 in a randomized block design with three replications. Each treatment was applied broadcast on a 10 by 30 foot plot with a CO^2 backpack sprayer equipped with flatfan 8002 nozzles calibrated to spray 24.7 gpa at 35 psi. At the time of herbicide application, poison hemlock plants averaged four feet tall and formed a thick canopy. Visual evaluations were taken June 6, 1996, and twelve months after treatment.

A second location was established April 16, 1997 using the same treatments as in 1996 plus a reduced rate of metsulfuron. Herbicide application methods and soils were nearly identical for the two sites. The majority of poison hemlock plants were in the 6-inch rosette stage when treated at the second location. Visual evaluations were completed on April 30, May 13 and June 13, 1997.

Metsulfuron consistently provided the highest level of poison hemlock control at both locations. Even the lowest rate of metsulfuron (0.3 oz ai/A) averaged 96 percent control at the last evaluation two months after application. Poison hemlock plants treated with dicamba alone (4 oz ai/A) were almost indistinguishable from the non-treated checks at both locations. Tank mixing 2,4-D and dicamba with metsulfuron did not significantly improve the level of hemlock control compared to corresponding rates of metsulfuron alone. Excellent control of poison hemlock with metsulfuron into the second growing season was evident in the 1996 trial and was partially attributed to competition from a dense quackgrass stand that reestablished in metsulfuron treated plots after hemlock control. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. A comparison of selected postmergence herbicides to control poison hemlock.

1996 - Location 1		COIMA	
Treatment[1]	Rate	6/6/96	6/13/97
	oz ai/A	— % Control —	
Metsulfuron	0.6	68	88
Metsulfuron	1.2	60	91
2,4-D	16.0	62	48
Dicamba	4.0	0	10
Metsulfuron+	0.6	80	65
Metsulfuron+	1.2	80	97
Check		0	0
LSD(0.05)		7	19

[1]Silicone surfactant applied at 0.065% v/v in all treatments.

1997 - Location 2			COIMA	
Treatment[1]	Rate	4/30/97	5/13/97	6/13/97
	oz ai/A		% Control	
Metsulfuron	0.3	67	80	96
Metsulfuron	0.6	62	73	100
Metsulfuron	1.2	65	73	100
2,4-D	16.0	17	50	30
Dicamba	4.0	2	0	10
Metsulfuron+	0.3	78	87	97
Metsulfuron+	0.6	85	87	99
Metsulfuron+	1.2	82	92	100
Check		0	0	0
LSD(0.05)		13	5	9

[1] Silicone surfactant applied at 0.05% v/v in all treatments.

Diffuse knapweed control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba. James R. Sebastian and K.G. Beck. An experiment was established near Boulder, CO to evaluate diffuse knapweed (CENDE) control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba. The experiment was designed as a randomized complete block with four replications.

Herbicides were applied when diffuse knapweed was in rosette to early bolt on June 12, 1995. All treatments were applied with a CO_2-pressurized backpack sprayer using 11004LP flat fan nozzles at 50 gal/a, 20 psi. Other application information is presented in Table 1. Plot size was 10 by 30 feet.

Visual evaluations compared to non-treated control plots were taken in September 1995, 1996, and 1997. Metsulfuron alone controlled 26 to 51% of CENDE, while metsulfuron tank mixed with dicamba and 2,4-D controlled approximately 90% of CENDE 90 days after treatment (DAT), 73% of CENDE 455 to 820 DAT, (Table 2). Dicamba (0.25 lb/ai) and quinclorac (1.0 lb/ai) controlled about 74% of CENDE 90 DAT and 70% and 89% CENDE, respectively, 455 to 820 DAT. Picloram (0.25 lb/ai) controlled 97% to 100% of CENDE from 90 to 820 DAT.

Baseline CENDE density and canopy cover and grass canopy cover were taken before the initial application and these data will be collected each successive fall for the duration of the study. Cover and density values are means from five 0.1 m² quadrats per plot (20 total quadrats per treatment) taken approximately 90 and 455 DAT. CENDE density and cover dramatically decreased, while grass cover significantly increased as CENDE control increased. This reflects the release of grass from CENDE competition. (Weed Research Laboratory, Colorado State University, Fort Collins, CO 80523).

Table 1. Application data for diffuse knapweed control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba.

Environmental data	
Application date	June 12, 1995
Application time	10:00 AM
Air temperature, F	65
Cloud cover, %	15
Relative humidity, %	40
Wind speed, mph	0

Application date	species	growth stage	height (in.)
June 12, 1995	CENDE	1st year rosette	0 to 1
		2nd year early bolt	2 to 4
	POAPR	late boot	7 to 12
	BROIN	boot	7 to 15
	FESSP	vegetative	10 to 15
	KOECR	vegetative	3 to 6

Table 2. Diffuse knapweed control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba.

Herbicide[a]	Rate	Diffuse knapweed Control 95	96	97	Cover 95	96	97	Density 95	96	97	Grass Cover 95	96	97
	(oz ai/a)	%						#			%		
metsulfuron	0.6	26	16	14	42	48	29	5	6	3	34	36	56
metsulfuron	1.2	51	33	29	16	30	24	2	3	2	37	43	58
metsulfuron + 2,4-D + dicamba	0.6 16.0 4.0	91	78	78	2	5	3	0	1	0	56	63	71
metsulfuron + 2,4-D + dicamba	1.2 16.0 4.0	89	73	71	4	7	9	1	1	1	55	64	73
2,4-D	16.0	68	66	53	14	14	18	1	1	1	42	53	55
dicamba	4.0	73	74	63	7	8	12	1	1	1	55	58	70
picloram	4.0	97	100	100	1	0	0	0	0	0	60	66	75
quinclorac	16.0	75	91	89	11	1	1	2	1	0	37	40	47
check		0	0	0	35	36	34	4	5	3	25	28	36
LSD (0.05)		12	10	21	14	13	11	2	2	1	19	17	13

[a] Silicone surfactant (Sylgard) was added to all treatments at 0.5% v/v except for quinclorac where methylated seed oil (Scoil) was added at 1 quart per acre.

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.

The effects of late summer applications of various herbicides on Russian knapweed. Tom D. Whitson, Wayne R. Tatman, Steve D. AAgard, and Kristi K. Rose. Russian knapweed is a highly competitive perennial commonly found on sub-irrigated areas and riparian zones. It is common throughout the West. This experiment was conducted to evaluate late summer applications of various herbicides for Russian knapweed control. Plots were 10 by 27 ft. arranged in a randomized complete block design with four replications.
Application information was taken on August 21, 1995 when Russian knapweed stage was 65% bloom and 35% bud, temperature: air 81F, soil surface 70F, 1 inch 72F, 2 inches 71F, 4 inches 70F with 81% relative humidity, clear skies, and no wind. Soils were a loamy sand with 70% sand, 13% silt, 17% clay with 3.4% organic matter and a pH of 7.9. Evaluations were made August 7, 1997. Applications of picloram at 0.5,0.75, and1.0 ai/A controlled 95, 98 and 100 % of the Russian knapweed respectively. (Department of Plant Science, University of Wyoming, Laramie, WY 82071.)

Table. Control of Russian knapweed with various herbicides.

Herbicide	Rate (lb ai/A)	% Control (Ave.)
Picloram + X-77[1]	0.125	29
Picloram + X-77[1]	0.25	66
Picloram + X-77[1]	0.375	84
Picloram + X-77[1]	0.5	95
Picloram + X-77[1]	0.75	98
Picloram + X-77[1]	1.0	100
Picloram, 2,4-D, + X-77[1]	0.25 + 1.0	66
Picloram	0.25	60
Clopyralid + X-77[1]	0.125	08
Clopyralid + X-77[1]	0.25	28
Clopyralid + X-77[1]	0.375	51
Clopyralid + X-77[1]	0.5	53
Picloram + triclopyr	0.25 + 0.5	73
Dicamba + X-77[1]	2.0	13
Untreated	-----	0

[1]X-77 added to treatment @ 0.25% v/v.

Range improvement through mulesear control. Steven Dewey, R. William Mace and Holli Murdock. Mulesear (*Wyethia amplexicaulis*) is a robust invader of many mountain ranges in the West. Herbicides were applied to a uniform stand of mulesear with a grass understory in the Caribou National Forest in southeastern Idaho to evaluate three rates of picloram+2,4-D and 2,4-D alone in controlling mulesear and allowing grasses to compete and reestablish dominance in the plant community. Treatments were applied June 18, 1996 in a randomized block design with three replications. Each treatment was broadcast on 20 by 30 foot plots with a CO^2 backpack sprayer equipped with flatfan 8001 nozzles calibrated to spray 12.5 gpa at 40 psi. At the time of herbicide application, mulesear was in early bloom. The soil was a gravelly loam with 6.3 pH. Plots were evaluated using a 10 - point frame to count plants at positions every six feet along two permanent transects established diagonally across each plot. Plants were counted prior to treatment, and again 1 year later July 8, 1997. Percentage change in plant density and ground cover were recorded.

Mulesear density in check plots increased 25 percent the year following treatment. The highest level of mulesear control (98 percent) resulted from the application of 2,4-D ester alone. Medium and high rates of picloram+2,4-D also provided good mulesear control. Only picloram+2,4-D treatments resulted in increased perennial grass density (16 to 18 percent). The density of other forb species decreased and percent bare ground increased in all treatments. The smallest increase in bare ground occurred with the highest rate of picloram+2,4-D, which also stimulated the greatest increase in grass cover. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Plant community effects after the application of selected herbicides to mulesear.

Treatment	Rate	Mulesear	Forbs	Grass	Bare ground
	lb ai/A	—— % Control ——		% Increase	%Change
Picloram+2,4-D amine	0.635	50	64	74	209
Picloram+2,4-D amine	0.953	76	71	116	93
Picloram+2,4-D amine	1.27	84	89	118	35
2,4-D Ester	2.0	98	53	87	158
Untreated		-25	17	18	-24
Dicamba+ 2,4-D Amine	0.25 0.75	41	41	49	75
LSD(0.05)		65	36	57	NS

The effects of various herbicides on plains picklypear. Tamra R. Jensen, Tom D. Whitson, and Kristi K. Rose. Pricklypear is native and usually grows on dry, sandy soil. This plant reduces the utilization of desirable forage species because livestock avoid feeding on or in close proximity to it. This experiment was conducted near Lusk, WY to determine which herbicides most effectively control pricklypear. The herbicides were applied July 2, 1996 to plants in bloom. The air temperature was 105F, relative humidity 20 %, soil temperature at the surface 105F, 1 inch 105F, 2 inches 100F, 4 inches 95F, and a 5 mph wind. Evaluations were made on August 11, 1997. 2,4-D (A) + picloram 1.0 + 0.25 lb/A reduced pricklypear by 86% one year after treatment. Past experiments indicate that three years are required to obtain maximum pricklypear control. (Department of Plant Science, University of Wyoming, Laramie, WY 82071).

Table. Control of plains pricklypear with various herbicides.

Treatment	Rate (lb ai/A)	% Reduction (Ave.)
2,4-D (A) + picloram	0.5 + 0.125	78
2,4-D (A) + picloram	0.75 + 0.188	81
2,4-D (A) + picloram	1.0 + 0.25	86
2,4-D Ester	2.0	66
Picloram, 2,4-D ester	0.125 + 0.5	84
Picloram, 2,2-D ester	0.5 + 1.0	83
Untreated	----	0

The effects of various herbicides on fringed sagebrush. Doug L. Reynolds, Tom D. Whitson, Les N. Burrough, and Kristi K. Rose. Fringed sagebrush is an important source of feed for wildlife and sheep, but is very competitive with grasses and increases with overgrazing. This experiment was conducted to determine which herbicides most effectively reduce the production of fringed sagebrush. The herbicides were applied June 6, 1996. The air temperature was 80F, relative humidity 40%, soil temperature at the surface 80F, 1 inch 82, 2 inches 84, 4 inches 86, and the wind was clam. Evaluations were made on June 16, 1997. The application of picloram and 2,4-D ester at 0.25 and 1.0 ai/A controlled 98% of the fringed sagebrush. The application of 2,4-D (A) + picloram at .125 + 0.5 controlled 93% of the fringed sagebrush. (Department of Plant Science, University of Wyoming, Laramie, WY 82071).

Table. Control of fringed sagebrush with various herbicides.

Treatment	Rate (lb ai/A)	% Control (Ave.)
2,4-D Ester	2.0	55
2,4-D (A) + picloram	0.5 + 0.125	93
2,4-D (A) + picloram	0.75 + 0.188	68
2,4-D (A) + picloram	1.0 + 0.25	35
Picloram, 2,4-D ester	0.125, 0.5	80
Picloram, 2,4-D ester	0.25, 1.0	98
Untreated	----	73

The control of fringed sagebrush, hairy goldenaster, and connom sagewort with various herbicides. Phillip A. Rosenlund, Tom D. Whitson and M.A. Ferrell. Rangeland is often decimated by perennial, undesirable species that are directly competitive with perennial, desirable grasses. Fringed sagebrush (*Artemisia frigida* Willd.), hairy goldenaster (*Heterotheca villosa* Pursh.) and common sagewort (*Artemisia campestris* L.) are often found on sandy loam soils growing in close association to each other. This study was initiated to determine the efficacy of various herbicides on this competitive forb community growing in association with rangeland grasses. The experiment was established July 16, 1996, when the three weed species were fully seeded. Plots were 10 x 27 ft. with four replications arranged in a randomized complete block. Herbicides were applied broadcast with a CO_2 pressurized knapsack sprayer delivering 30 gpa at 41 psi. Application information: humidity 30%, wind SW 1-2 mph, sky clear, temperature: 85F, soil; 1 inch = 83F, 2 inch = 83F and 4 inches = 80F. The soil was sandy (88% sand, 5% silt and 7% clay) with 1.7% organic matter and a pH of 6.8. Fringed sagebrush and hair goldenaster was controlled greater than 90% with 2,4-D (A) + picloram at 1.0 + 0.25 lb/A, picloram + 2,4-D (LVE) at 0.13 + 0.5 lb/A and 0.25 + 1.0 lb/A while common sagewort control of 58% was attained with picloram + 2,4-D (LVE) at 0.25 + 1.0 lb ai/A. The highest overall control was with picloram at 0.25 lb/A combined with either 1.0 lb of 2,4-D amine or low volatile ester.

Table. Control of fringed sagebrush, hairy goldenaster and common sagewort with various herbicides.

Herbicide	Rate lb ai/A	% Control ARTFR	HETVI	ARTCA
2,4-D (A) + picloram	1.0 + 0.14	55	88	08
2,4-D (A) + picloram	0.75 + 0.19	63	90	38
2,4-D (A) + picloram	1.0 + 0.25	95	98	45
2,4-D (LVE)	2.0	74	75	31
picloram + 2,4-D (LVE)	0.13 + 0.5	98	98	38
picloram + 2,4-D (LVE)	0.25 + 1.0	100	100	58
Untreated	-	0	0	0

Saltcedar control with a basal spray of triclopyr in diesel oil. Kirk C. McDaniel, Kevin Gardner, and John P. Taylor. Regrowth from portions of roots remaining in the soil is common after mechanical clearing of saltcedar thickets on the Bosque del Apache National Wildlife refuge near Socorro, NM. This experiment was conducted on an old portion of the Rio Grande floodplain occupied by a near monocultural stand of saltcedar (3 to 5 m ht). Mechanical clearing was conducted within five 5 ha blocks in winter/summer 1995 using the following sequence: bulldozers laid down the standing material; front-end loaders equipped with rakes pushed the debris into piles for burning; bulldozers equipped with root plows severed the roots at a 45 cm depth; bulldozers with root rakes gathered the root debris into piles for burning. The next year (summer 1996), saltcedar resprouts were common across all blocks so plans were made to treat them by individual plant method.

Within a portion of each mechanically cleared block low-volume basal sprays to winter dormant saltcedar resprouts were made the first week of March 1997. Triclopyr was mixed in diesel oil as a 5, 10, 15, 20 or 25% low volume basal treatment. Applications were made with backpack sprayers fitted with a Spray System Co. 5500 X-1 adjustable cone jet nozzle that allowed delivery of a fine spray mist in band around the outer bark surface at about 10 cm above ground level. Typically 2 to 10 stems (0.5 to 2 cm diam; 0.5 to 2 m length) grew from buds on root crowns remaining after the clearing operation. We considered a group of stems originating from what appeared to be a common root source a plant unit. In this study, each replication was placed in a portion of the five larger mechanically cleared blocks. Pretreatment plant unit counts in each treatment plot (30 by 30 m) indicated difference between blocks (reps) with numbers ranging from an average of 0.75 to 2.2 plant units/m^2. Every plant unit within a plot was treated with the basal application of triclopyr.

Three months after spraying all treatments appeared visually successful when compared to actively growing saltcedar in untreated plots because little green material could be found on treated resprouts. However, regrowth was evident on more half the plant units treated with 20% or less triclopyr-diesel mixture 8 month post-treatment. Saltcedar reduction with the 25% basal triclopyr treatments averaged 79% at 8 month. We noted stems treated but partially buried by soil were more likely to have regrowth than fully exposed stems. (Dep. of Animal and Range Sci. and Dept. of Ent. Plt. Path. and Weed Sci., NMSU, Las Cruces, 88003).

Table. Herbicide control of resprouted saltcedar.

Treatment[1]	Rate	Saltcedar control by evaluation date[2] 5/13/97	10/9/97
	% + %	------- %	-------
Triclopyr + diesel oil	5 + 95	86	28
Triclopyr + diesel oil	10 + 90	87	47
Triclopyr + diesel oil	15 + 85	87	43
Triclopyr + diesel oil	20 + 80	95	52
Triclopyr + diesel oil	25 + 75	95	79

[1]Treatments applied March 3-6, 1997.
[2]All plants within the 30 by 30 m plots were counted as having live growth or no apparent growth to compute control.

The effects of various herbicides on broom snakeweed. Tamra R. Jensen, Tom D. Whitson, and Kristi K. Rose. Broom snakeweed is a native perennial and is highly toxic at leaf formation. If cattle or sheep eat this plant it may cause weak calves and lambs or abortions. Broom snakeweed intermixed with grasses reduces utilization of pastures and rangeland. This experiment was conducted to determine which herbicides most effectively control broom snakeweed. The herbicides were applied July 2, 1996 when plants were in the pre-bloom stage. The air temperature was 96F, relative humidity 20%, soil temperature at the surface 100F, 1 inch 95F, 2 inches 85F, 4 inches 85F, and a 1-3 mph wind. Soils were a clay loam with 38% sand, 32% silt, 30% clay and the organic matter was about 2 % with a pH of 7.2. Evaluations were done August 11, 1997. Applications of 2,4-D (A) + picloram at 0.75 + 0.188 and 1.0 + 0.25 ai/A controlled 92 and 94% of the broom snakeweed. (Department of Plant Science, University of Wyoming, Laramie, WY 82071).

Table. Control of broom snakeweed with various herbicides.

Treatment	Rate (ai/A)	% Reduction (Ave.)
2,4-D (A) + picloram	0.5 + 0.125	70
2,4-D (A) + picloram	0.75 + 0.188	92
2,4-D (A) + picloram	1.0 + 0.25	94
2,4-D Ester	2.0	46
Picloram, 2,4-D ester	0.125, 0.5	72
Picloram, 2,4-D ester	0.25, 1.0	89
Untreated	-----	18 % increase

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.

		Evaluation			
		June 1997		August 1997	
Treatment	Rate	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 Sunlt by AGSCO.

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

		Evaluation					
		Sept. 1996		May 1997		Sept. 1997	
Treatment[a]	Rate	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.

Response of yellow starthistle to several herbicides. Timothy W. Miller, Sandra L. Shinn, and Donald C. Thill. A field trial was initiated to investigate the efficacy of nine herbicides on yellow starthistle (CENSO). The site was steep, east-facing canyonland near Whitebird, ID, heavily infested with CENSO. The grasses were dominated by the annual species ventenata, downy brome, Japanese brome, sixweeks fescue and medusahead. Perennial grass species present at a low level were intermediate wheatgrass, bluebunch wheatgrass, and Canada bluegrass. The experimental design was a randomized complete block with four replications and individual plots were 10 by 30 ft. Herbicides were applied postemergence on May 24, 1997 using a CO_2-pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Air temperature was 63 F, relative humidity was 75%, winds 4 to 7 mph from the NE, and skies were overcast. Most CENSO leaves were 4-inches long, and plants were in the late rosette stage of growth with a few beginning to bolt. Foliage was dry at the time of application, although a light rain occurred the first hour following herbicide application. Herbicide efficacy was evaluated on July 23, 1997.

Acceptable CENSO control was achieved by picloram, clopyralid, dicamba, BAS 662 01H at the two higher rates, and fluroxypyr + dicamba, although the latter treatment did not provide significantly better control than dicamba alone. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83844-2339)

Table. Control of yellow starthistle near Whitebird, ID.

Treatment[1]	Rate	CENSO control July 23, 1997
	(lb/A)	(%)
Picloram	0.375	100
Clopyralid	0.188	98
2,4-D ester	1.0	35
Dicamba	0.5	81
Quinclorac	0.125	38
Quinclorac	0.25	41
Quinclorac	0.375	56
BAS 662 01H	0.125	61
BAS 662 01H	0.25	89
BAS 662 01H	0.375	94
Fluroxypyr	0.25	5
Carfentrazone	0.031	0
Imazapic	0.094	14
Imazapic	0.125	14
Imazapic	0.188	49
Quinclorac + 2,4-D ester	0.25 + 1.0	58
Quinclorac + dicamba	0.25 + 0.5	56
Carfentrazone + 2,4-D ester	0.031 + 1.0	41
Carfentrazone + dicamba	0.031 + 0.5	49
Fluroxypyr + 2,4-D ester	0.25 + 1.0	61
Fluroxypyr + dicamba	0.25 + 0.5	83
$LSD_{0.05}$		22
CV		31

[1]All treatments except imazapic were applied with a non-ionic surfactant (R-11) at 0.5% v/v; imazapic treatments were applied with a methylated seed oil plus surfactant (Sunit II) at 1.25% v/v.

Yellow starthistle control with imazapic. Sandra L. Shinn, Timothy W. Miller, and Donald C. Thill. A study was established near Dayton, Washington and Whitebird, Idaho to evaluate yellow starthistle control with imazapic. The yellow starthistle population treated at Dayton contained auxin-resistant plants. The experimental design was a randomized complete block with four replications and individual plots were 10 by 30 ft. Herbicide treatments were applied postemergence on May 9, at Dayton and on June 5, 1997 at Whitebird with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table1). Yellow starthistle was evaluated visually on June 30, and September 4, 1997 at Dayton and on July 23, 1997 at Whitebird. Yellow starthistle and grass species were cut from 2.7 ft^2 area, dried for 48 hours and weighed at the Whitebird site.

Table 1. Application data.

	Dayton	Whitbird
Yellow starthistle stage	4 to 6 inch rosettes	4 to 6 inch rosettes
Air temperature (F)	75	73
Relative humidity (%)	40	50
Wind (mph)	calm	0 to 2 southeast
Cloud cover (%)	0	30

At Whitebird, imazapic controlled yellow starthistle 85 to 95% and reduced yellow starthistle biomass to 229 to 335 oz/ft^2 compared to the untreated check, which had 1257 oz/ft^2 (Table 2). Picloram controlled the yellow starthistle 100% and reduced yellow starthistle biomass to 3.2 oz/ft^2. Grass species biomass was 307, 139, and 41.4 oz/ft^2 for picloram, imazapic and the untreated control treatments, respectively. The population with auxin-resistant yellow starthistle at Dayton was suppressed 56 to 76% with imazapic. Biomass was not taken at the Dayton site. (Plant Science Division, University of Idaho, Moscow, ID 838344-2339)

Table 2. Yellow starthistle control and dry weight.

		Yellow starthistle control			Biomass	
		Dayton		Whitebird	Whitebird	
	Rate	June 30	September 4	July 23	Yellow starthistle	Grass spp
Treatment	lb/A	(%)			oz/ft^2	
Imazapic [1]	0.094	56	64	85	335.2	132.8
Imazapic	0.125	68	65	86	266.6	138.3
Imazapic	0.188	76	75	95	229.0	144.5
Picloram [2]	0.375	--	--	100	3.2	307.0
Untreated check	--	--	--	--	1256.7	41.4
$LSD_{(0.05)}$		17	20	5	276.8	28.5

[1] All imazapic treatments were applied with a methylated seed oil plus surfactant at 1.25% v/v.
[2] A non-ionic surfactant (R-11) at 0.5% v/v was applied with picloram.
[3] Grass spp was a mixture of ventenata (*Ventenata dubia*) and annual brome (*Bromus* spp.)

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.

		Canada thistle control		Bareground	
Treatment	Rate	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 21 MAT[a]	Canada thistle control 24 MAT[a]	Bareground 21 MAT[a]	Bareground 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.

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.

Treatment	Rate	Control 9 MAT[a]	Control 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

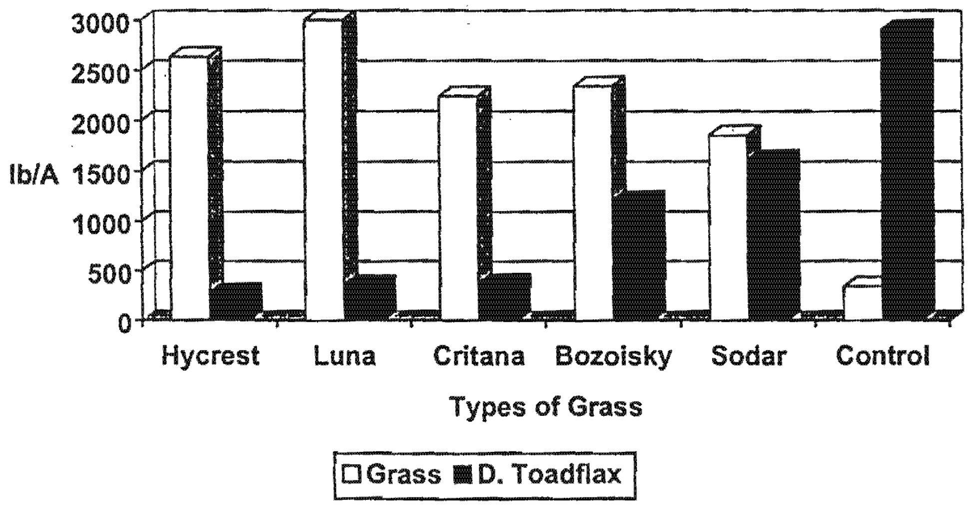
[a]Months after treatment.
[b]Methylated seed oil was SunIt by AGSCO.

The competitive effects of five cool-season grasses on Dalmatian toadflax. Kristi K. Rose and Tom D. Whitson. Dalmatian toadflax is a noxious weed that invades disturbed areas. Once established it can outcompete desirable forage. Dalmatian toadflax has a deep root system and waxy leaves, which make it very difficult to control. A study was conducted to determine the competitive ability of five cool-season grasses on Dalmatian toadflax. The area was sprayed with picloram at 0.5 lb ai/A on September 10, 1994. The study was arranged as randomized complete blocks with three replications. Tillage with a rototiller was followed by seeding on April 6, 1995. Dry matter yields were determined by harvesting three 0.25 m^2 quadrats per plot on July 9, 1997. Samples were oven dryed and weighed July 11, 1997. The areas seeded to Hycrest crested wheatgrass and Critana thickspike wheatgrass reduced Dalmatian toadflax 91% and 87%, respectively. Areas seeded to Luna pubescent wheatgrass produced the greatest biomass and reduced Dalmatian toadflax by 88% (Table 1). The land biomass production capability was similar whether it is Dalmatian toadflax, a desirable grass, or a mixture of the two (Figure 1). (Department of Plant Science, University of Wyoming , Laramie, WY 82071).

Table 1. The competitive effects of five cool-season grasses on Dalmatian toadflax.

	Grass Production	D.toadflax production	
Perennial grass	lbs.(DM)/A	lbs.(DM)/A	% reduction
(Hycrest) crested wheatgrass (*Agropyron cristatum*)	2635	275	91
(Luna) pubescent wheatgrass (*Elytrigia intermedia*)	3000	355	88
(Critana) thickspike wheatgrass (*Elymus lanceolatus*)	2242	372	87
(Bozoisky) Russian wildrye (*Psathyrostachys juncea*)	2341	1209	58
(Sodar) streambank wheatgrass (*Elymus lanceolatus*)	1859	1614	44
Unseeded control	339	2907	0

Figure 1. Graph of the competitive effects of five cool-season grasses on Dalmatian toadflax.



Yellow toadflax control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba. James R. Sebastian and K.G. Beck. An experiment was established near Camp Hale, CO to evaluate yellow toadflax (LINVU) control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba. The experiment was designed as a randomized complete block with four replications.

Herbicides were applied when yellow toadflax was early seedset on September 10, 1996. All treatments were applied with a CO_2-pressurized backpack sprayer using 11004LP flat fan nozzles at 50 gal/a, 20 psi. Silicone surfactant (Sylgard) was added to all treatments at 0.5% v/v except for quinclorac where methylated seed oil (Scoil) was added at 1 quart per acre. Other application information is presented in Table 1. Plot size was 10 by 30 feet.

Visual evaluations compared to non-treated control plots were taken in October 1997 (Table 2). Treatments controlled 5 to 43% of LINVU 380 days after treatment (Weed Research Laboratory, Colorado State University, Fort Collins, CO 80523).

Table 1. Application data for yellow toadflax control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba.

Environmental data	
Application date	September 10, 1996
Application time	4:00 PM
Air temperature, F	61
Relative humidity, %	60
Wind speed, mph	0

Application date	species	growth stage	height (in.)
September 10, 1996	LINVU	seedset	10 to 20
	POAPR	seedset	8 to 14
	PHLSP	seedset	15 to 26
	AGRSM	seedset	15 to 24

Table 2. Visual estimates of yellow toadflax control on Colorado rangeland 12 months after various herbicides were applied.

Herbicide[a]	Rate	Yellow toadflax Control
	(oz ai/a)	------%--------
metsulfuron	0.6	6
metsulfuron	1.2	28
metsulfuron	0.6	5
+ 2,4-D	16.0	
+ dicamba	4.0	
metsulfuron	1.2	10
+ 2,4-D	16.0	
+ dicamba	4.0	
2,4-D	16.0	14
dicamba	4.0	10
picloram	4.0	8
picloram	8.0	43
quinclorac	16.0	24
check		0
LSD (0.05)		20

Yellow toadflax control with picloram or picloram plus 2,4-D applied for 1 to 3 consecutive years. James R. Sebastian and K.G. Beck. An experiment was established near Camp Hale, CO to evaluate yellow toadflax (LINVU) control with picloram or picloram + 2,4-D. The experiment was designed as a split-plot with four replications. Herbicides and rates comprised the main plots (arranged as a randomized complete block) and treatments applied for 1,2, or 3 consecutive years constituted the split.

Herbicides were applied when yellow toadflax was flowering on August 8, 1995 (year 1), August 20, 1996 (year 2), and August 13, 1997 (year 3). All treatments were applied with a CO_2-pressurized backpack sprayer using 11003LP flat fan nozzles at 21 gal/A, 14 psi. Other application information is presented in Table 1. Main plot size was 30 by 30 feet and sub-plots were 10 by 30 feet.

Baseline LINVU density and cover and grass cover were taken before the initial application and these data will be collected each successive fall for the duration of the study. Cover and density values are means from three 0.1 m^2 quadrats per plot (12 total quadrats per treatment).

The 1, 2, and 3 year treatments are classified separately in Table 2 although they are the original first year's application in 1995. The 1996 data represents 1 or 2 year's of application and 1997 data 1,2, or 3 year's of application. Visual evaluations compared to non-treated control plots were taken in October 1995, 1996, and 1997. All initial treatments controlled 25 to 65% of LINVU in October 1995 and 0 to 81% in 1996 and 1997(Table 2). Slight decline in LINVU cover, density, and values were noted with picloram plus 2,4-D treatments versus the same rates of picloram alone, although they were not always statistically different. Several consecutive years of higher picloram or picloram plus 2,4-D treatments also increased grass cover 15 to 30%. (Weed Research Laboratory, Colorado State University, Fort Collins, CO 80523).

Table 1. Application data for yellow toadflax control with picloram or picloram + 2,4-D applied for 1 to 3 consecutive years.

Environmental data			
Application date	August 3, 1995	August 20, 1996	August 13, 1997
Application time	6:00 AM	9:00 AM	7:00 AM
Air temperature, C	16	14	11
Cloud cover, %	15	35	30
Relative humidity, %	64	63	68
Wind speed, mph	0	0 to 5	0

Application date	species	growth stage	height (in.)	density (shoots/ft^2)
August 3, 1995	LINVU	flowering	8 to 19	13 to 20
	POAPR	flowering	3 to 10	
	BROMA	flowering	10 to 19	
	AGRSM	late boot	3 to 10	
August 20, 1996	LINVU	flowering	7 to 19	15 to 21
	POAPR	flowering	2 to 6	
	BROMA	flowering	17 to 24	
	AGRSM	late boot	9 to 16	
August 13 1997	LINVU	flowering	8 to 19	13 to 17
	POAPR	flowering	6 to 12	
	BROMA	flowering	13 to 26	

Table 2. Yellow toadflax control with picloram or picloram + 2,4-D applied for 1 to 3 consecutive years[a] on Colorado rangeland.

Herbicide[b]	Rate	Years of Treatment	Yellow Toadflax Control 95	96	97	Yellow Toadflax Cover 95	96	97	Yellow Toadflax Density 95	96	97	Grass Cover 95	96	97
	(lb ai/A)		%						#			%		
picloram	0.25	1	30	0	0	53	55	55	20	16	11	34	37	53
		2	25	0	10	52	50	51	16	18	15	38	33	57
		3	29	0	15	60	52	69	20	18	19	34	35	48
picloram	0.5	1	53	30	9	46	42	43	19	15	13	40	44	62
		2	53	25	30	62	47	46	30	21	14	26	39	59
		3	56	28	38	41	21	26	15	9	13	39	46	59
picloram	0.8	1	55	41	19	44	27	37	17	8	13	23	40	48
		2	55	35	58	42	21	11	14	5	3	33	44	67
		3	54	43	51	55	41	28	21	14	6	22	39	62
picloram	1.0	1	59	60	34	31	19	26	11	5	7	49	56	65
		2	59	60	81	24	16	4	9	4	1	51	62	73
		3	56	60	75	39	20	11	11	6	3	49	52	69
picloram + 2,4-D	0.25 + 1.0	1	36	18	0	48	38	53	17	13	13	39	44	53
		2	40	21	43	33	34	26	9	10	5	46	46	63
		3	39	18	34	41	36	40	16	14	13	44	49	64
picloram + 2,4-D	0.5 + 1.0	1	65	73	58	19	3	6	7	1	1	44	53	67
		2	65	69	80	19	10	1	9	2	1	45	55	67
		3	64	64	74	29	18	13	11	6	3	47	55	71
control		1	0	0	0	51	60	63	20	21	17	35	26	42
		2	0	0	0	54	57	65	19	19	16	41	32	45
		3	0	0	0	37	41	49	13	15	13	35	27	39
LSD (0.05)			10	20	22	25	24	25	12	10	8	24	18	16

[a] The 1995 data is the original application and 1996 data is from 1 or 2 year's application.
[b] X-77 surfactant added to all treatments at 0.25% v/v.

PROJECT 2

WEEDS OF HORTICULTURAL CROPS

CAROL REGUSCI, CHAIR

Post-emergence weed control in newly planted one-year-old asparagus crowns. Robert J. Mullen. A post-emergence weed control trial in newly planted one-year-old asparagus crowns was established at Foppiano Farms on King Island northwest of Stockton, California on April 4, 1997. Four herbicides were evaluated for weed control and safety to the young asparagus crop. The soil type was an Egbert muck and the asparagus cultivar was UC 157_{F1}. All treatments were applied over the asparagus crop fern and the weeds with a handheld CO_2 backpack sprayer using 8004 nozzles at 30 psi in a spray volume of 50 gal/a water. At the time of treatment, weeds present included 3 to 8 inch tall redroot pigweed (AMARE), 4 to 16 inch rosette wild radish (RAPRA), 1 to 3 inch tall henbit (LAMAM), seedling to 2 inch diameter common purslane (POROL), 3 to 5 inch rosette common chickweed (STEME), 1 to 4 inch tall swamp smartweed (POLCC), and seedling to 3 inch tall Italian ryegrass (LOLMU); the young asparagus fern was 4 to 18 inches tall. There were four replications of each treatment in a randomized complete block design. Individual plots were single 60-inch beds measuring 25 feet in length.

An evaluation of weed control efficacy and crop phytoxicity took place on April 11, 1997. None of the treatments were effective in controlling Italian ryegrass. Best control of the remaining weed species occurred with carfentrazone-ethyl at 0.03 lb/A, followed by linuron at 1.0 lb/A plus crop oil concentrate and then metribuzin at 1.0 lb/A which was weak on swamp smartweed. Carfentrazone-ethyl, though showing excellent control of broadleaf weeds caused severe, but temporary, foliar damage to the asparagus fern while all other treatments were quite safe to the asparagus crop. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205).

Table. Postemergence weed control in newly planted one-year-old asparagus crowns.

		Weed Control[1]							Asparagus[1]
Herbicide[2]	Rate	RAPRA	AMARE	LAMAM	POROL	STEME	POLCC	LOLMU	Injury
	lb/A				%				%
Clopyralid	0.19	40	50	30	58	23	33	20	6
Clopyralid	0.25	48	55	35	65	30	38	25	6
Carfentrazone-ethyl	0.03	91	95	88	95	91	85	38	71
Metribuzin	1.0	90	98	75	100	93	48	20	7
Linuron	1.0	93	100	65	98	91	80	35	8
Untreated Control	---	0	0	0	0	0	0	0	6

[1] 0 = no weed control, no crop injury
100 = complete weed control, crop dead
[2] Carfentrazone-ethyl treatment included crop oil concentrate at 1.0% (V/V) and Linuron treatment included crop oil concentrate at 0.5% (V/V)

Response of 'Dogwood'florist azaleas to a preemergence soil application of pendimethalin herbicide. Edwin E.Sieckert. This research project was initiated to determine the effects on vigor and phytotoxicity to 'Dogwood' florist azaleas from preemergence (PRE) applications of pendimethalin made to the greenhouse floor. Historically, oryzalin,(in the same class of herbicides (dinitroanaline)as pendimethalin), was used for preemergence weed control in greenhouses, however, that use was recently removed. Trifluralin (a dinitroanaline)evaluated for use in greenhouses also caused foliar stunting. This research was conducted in a commercial greenhouse in Sylmar, California.

Pendimethalin WDG was applied at 3.69 lb./a to a commercial greenhouse floor twelve inches below the growing bench) with a commercial sprayer delivering 108 gpa at 40 psi. Preemergence (PRE) treatments were soil applied September 17,1996, one hour prior to azalea placement on the benches. Thirty Azaleas (liners in 5 inch pots) were placed on slated wooden benches (twelve inch tall)at two locations, North (near the cooling cells) and South (near the exhaust fans), one hour after application. Thirty plants were placed in a separate untreated shadehouse for evaluation. Soil texture beneath the benches was a loam with pea gravel in the walkways. Thermostats were set at 85°F and humidistats at 70% RH to produce maximum growth on the azaleas during the growing period. Evaluations were made on October 25,1996 (38 DAT [Days after Treatment])and November 22,1996, (66 DAT)for foliar phtotoxicity and growth reduction.

Effects of pendimethalin herbicide on azalea growth are presented in Table 1. Foliar phytotoxicity of the treated greenhouse plants at 39 DAT included terminal leaf silvering, light chlorosis and downward cupped leaves. Treated plants compared with untreated controls, exhibited overall stunting of 23 and 28 percent (North and South sections respectively). At 66 DAT plants were severely stunted 27 and 36% respectively, as compared with the untreated controls. Terminal leaves were small, intensely silvered, and chlorotic when compared with the 38 day evaluation. Tissue samples taken from similarly exposed plants also exhibiting the above symptoms were found to contain 1.91 to 2.87 ppm pendimethalin. Warm temperatures and high relative humidity,a rapidly growing plant, and a moderately volatile dinitroanalilne herbicide apparently caused reduced plant growth and foliar phytotoxicity. (Rush-Marcroft, & Associates, Lodi, California)

Table Azalea plant height and percent growth reduction in response to a soil applied treatment of pendimethalin in Sylmar, California

Treatment	Rate lb/a	Height (38 DAT)	Growth Reduction (38 DAT)	Height (66 DAT)	Growth Reduction (66 DAT)
		inches	%	inches	%
Untreated Control	0	11.6 /1	0	14.2	0
Pendimethalin (North)	3.96	8.9	23	10.4	27
Pendimethalin (South)	3.96	8.4	28	9.1	36

Treatments applied September 17, 1996

Postemergence weed control in broccoli. Kai Umeda, Gonen Gal, and Joaquin Murrieta. A small plot field study was conducted at the University of Arizona Maricopa Agricultural Center, Maricopa, AZ to evaluate and determine the efficacy and safety of postemergence (POST) applied herbicides in broccoli. Broccoli cv. Captain was direct-seeded in two rows on a conventional 40-inch bed on 11 November 1996 and furrow irrigated. Treatment plots measured two beds by 20 ft and were replicated three times in a randomized complete block design. POST treatments were applied on 09 January 1997 when the broccoli was at the 2- to 4-leaf stage of growth. The herbicides were applied using a hand-held boom equipped with four flat fan 8002 nozzle tips spaced 20 inches apart. The sprays were applied using a backpack CO_2 pressurized sprayer at 45 psi and delivering 22 gpa water. The weeds present at the time of application included *Sisymbrium irio* (London rocket) at the 2- to3-leaf stage, *Melilotus officinalis* (annual yellow sweetclover) at the 2-leaf stage, *Sonchus oleraceus* (annual sowthistle) at the 2-leaf stage, and *Polygonum argyocoleon* (knotweed) at the 2- to 4-leaf stage. At the time of herbicide applications, the sky was clear, the air temperature was 60F, and there was an occasional slight breeze of less than 3 mph.

At 3 weeks after treatment (WAT), carfentrazone at 0.5 lb/A controlled knotweed, London rocket, and sowthistle. Clopyralid and oxyfluorfen treatments controlled sowthistle at 77 to 88%. At 6 WAT, carfentrazone at the high rate continued to adequately control London rocket but not the other weeds. Clopyralid marginally controlled sowthistle and did not provide adequate control of other weeds. Annual yellow sweetclover was not adequately controlled by any of the treatments. Sulfentrazone and pyridate did not provide control of any treated weeds. At 3 WAT, carfentrazone severely injured the broccoli and the degree of injury caused by the high rate increased at 6 WAT. Sulfentrazone and oxyfluorfen exhibited marginally acceptable injury on broccoli at 3 WAT. Pyridate and clopyralid caused minimal crop injury.

Table. Postemergence weed control in broccoli.

Treatment	Rate	Broccoli Crop Injury		WeedControl POLAG		SSYIR		SONOL		MEUOF	
		31 Jan	24 Feb	31 Jan	24 Feb	31 Jan	24 Feb	31 Jan	24 Feb	31 Jan	24 Feb
	(lb AI/A)	%									
Untreated check		0	0	0	0	0	0	0	0	0	0
Oxyfluorfen	0.063	12	0	67	67	77	65	77	65	33	33
Oxyfluorfen	0.094	12	5	75	53	78	68	85	57	50	57
Pyridate	0.5	8	5	47	0	53	40	68	52	25	2
Pyridate	1.0	5	8	33	27	33	27	80	60	42	40
Clopyralid	0.14	5	8	57	62	37	58	88	82	68	57
Clopyralid	0.28	5	2	72	77	50	17	82	87	73	58
Sulfentrazone	0.125	7	7	72	63	67	50	78	57	32	17
Sulfentrazone	0.25	10	8	63	77	50	33	80	58	42	17
Sulfentrazone	0.5	15	7	78	80	75	72	80	77	53	33
Carfentrazone	0.125	22	20	77	68	88	82	85	57	62	20
Carfentrazone	0.5	52	82	93	80	99	96	95	72	65	20
LSD (p=0.05)		19.1	9.5	24.4	30.8	37	41.6	11.8	35.3	30.6	44.7

POST herbicide applications made on 09 January 1997.

Cantaloupe herbicide weed control. Kai Umeda, Gonen Gal, and Brent Strickland. A small plot field study was conducted at the University of Arizona Maricopa Agricultural Center, Maricopa, AZ to evaluate and determine efficacy and safety of preemergence (PREE) and postemergence (POST) herbicide treatments on cantaloupe. Cantaloupe cv. Gold Eagle was planted on 40-inch beds in a single line on every other bed. Furrow irrigation was applied in a single furrow on one side of the bed during the season. Treatment plots measured 3.3 ft by 40 ft and were replicated four times in a randomized complete block design. PREE treatments were applied immediately after planting on 19 March 1997 and watered immediately after to completely wet across the beds. POST treatments were applied on 22 April when the air temperature was 88F and clear skies with an occasional slight breeze. Cantaloupe was at the 4-leaf stage of growth, *Chenopodium album* (lambsquarters) ranged from the 1- to 12-leaf stage, *Amaranthus blitoides* (prostrate pigweed) was at the 4- to 6-leaf stage, *A. albus* (tumble pigweed) was at the 3- to 4-leaf stage, and *Portulaca oleracea* (common purslane) was about 12-leaf stage. All treatments were applied using a hand-held boom equipped with two flat fan 8002 nozzle tips spaced 20 inches apart. A backpack CO_2 sprayer pressurized to 40 psi delivered the herbicides in water at 25 gpa. POST treatments included nonionic surfactant Latron CS-7 at 0.25% v/v. Visual weed control and crop safety evaluations were made at intervals after herbicide applications and cantaloupes were harvested at the end of the season.

Clomazone, bensulide, sulfentrazone, and halosulfuron treatments applied PREE provided very good control of prostrate pigweed, lambsquarters, and common purslane at better than 90% at 5 weeks after treatment (WAT). Halosulfuron was effective in controlling all weeds better than 90% at 7 WAT. Carfentrazone was not effective against most of the weeds present in the test but appeared to be safe on cantaloupe. POST treatments alone did not provide acceptable control of pigweeds but controlled lambsquarters and common purslane at 2 WAT. Halosulfuron and bentazon applied POST following PREE treatments controlled most of the weeds better than 90% through 7 WAT. Cantaloupe yields were highest with good weed control provided by PREE treatments followed by POST herbicide applications. Bentazon at 0.50 lb/A injured cantaloupe after applications but yields were not affected compared to the untreated check. Clomazone, sulfentrazone, and halosulfuron caused cantaloupe injury after PREE applications. Bentazon caused substantial crop injury after POST applications.

Table. Cantaloupe herbicide weed control.

Treatment	Rate	Timing	Cantaloupe				Weed Control							
			Injury		Yield*		AMABL		AMAAL		CHEAL		POROL	
			22 Apr	06 May	27 Jun		22 Apr	06 May	22 Apr	06 May	22 Apr	06 May	22 Apr	06 May
	lb AI/A		%		lb/plot	no./plot	%							
Untreated Check			0	0	41.5	17.8	0	0	0	0	0	0	0	0
Bensulide	6.0	PREE	3	0	69.9	25.0	94	84	89	74	95	86	98	99
Clomazone	0.5	PREE	9	1	47.0	18.8	95	84	84	66	99	96	99	96
Clomazone	0.75	PREE	15	8	64.7	25.8	97	85	90	78	97	98	99	95
Clomazone +	0.5 +	PREE	13	10	68.3	23.3	98	90	91	81	98	97	99	97
Bensulide +	6.0 +	PREE												
Bentazon	0.5	POST												
Sulfentrazone	0.25	PREE	15	10	62.6	23.8	96	85	86	74	97	94	91	91
Sulfentrazone	0.5	PREE	28	15	49.6	20.0	95	90	91	78	96	89	95	94
Carfentrazone	0.008	PREE	6	0	46.1	16.5	82	35	67	34	40	33	72	88
Carfentrazone	0.031	PREE	10	4	45.8	18.8	81	39	75	30	59	69	76	85
Halosulfuron	0.1	PREE	16	23	67.3	27.0	99	95	98	94	98	94	99	93
Bensulide +	6.0	PREE	4	30	70.2	29.0	93	85	88	83	98	98	98	98
Bentazon	0.5	POST												
Bensulide +	6.0 +	PREE	5	10	74.0	28.0	95	91	85	86	96	96	99	98
Halosulfuron	0.1	POST												
Clomazone +	0.5 +	PREE	10	26	64.5	27.3	97	86	88	74	96	97	99	97
Bentazon	0.5	POST												
Clomazone +	0.5 +	PREE	13	6	78.4	30.3	95	91	89	84	96	97	99	97
Halosulfuron	0.1	POST												
Bentazon	0.5	POST	0	20	62.3	25.8	0	84	0	69	0	97	0	95
Bentazon	0.75	POST	0	26	42.9	20.8	0	81	0	69	0	96	0	93
Halosulfuron	0.05	POST	0	5	68.6	26.5	0	83	0	73	0	96	0	95
Halosulfuron	0.1	POST	0	5	73.4	28.5	0	84	0	76	0	93	0	95
LSD (p=0.05)			10	9	13.9	5.8	5	22	8	17	21	14	10	4

PREE treatments applied on 19 March 1997 and POST treatments applied on 22 April 1997.
*Cantaloupe harvested from 10 ft of row per plot, weight and number of fruit per plot measured.

Postemergence herbicide weed control in cantaloupe. Kai Umeda. A small plot field test was established within a commercial cantaloupe field near Scottsdale, AZ to evaluate and determine efficacy and safety of two postemergence herbicides. Cantaloupe was planted on conventional 80-inch beds and germinated with sprinkler irrigation and then furrow irrigated for the remainder of the growing season. The treated plots measured 3.3 ft by 30 ft and treatments were replicated three times in a randomized cmplete block design. The herbicide treatments were applied with hand-held boom equipped with two 8002 flat fan nozzles tips spaced 20 inches apart. The sprays were applied using a CO_2 pressurized backpack sprayer at 40 psi delivering 25 gpa water. All treatments included a nonionic surfactant, Latron CS-7, at 0.25% v/v. At the time of the applications, melons were at the 1-leaf stage of growth and *Ipomoea hederacea* (annual morningglory) was at the 2-leaf stage and few were slightly larger-sized. Weather conditions at the time of application was nearly clear skies with few scattered clouds, air temperature at 94F, and slight breeze at less than 5 mph. Visual weed control and crop safety were evaluated at 1 and 2 weeks after treatment (WAT).

Bentazon was marginally safe at 1 WAT at the lowest rate and at 2 WAT, the melon injury was nearly acceptable at the middle rate of 0.75 lb/A. At 1.0 lb/A, bentazon caused unacceptable injury at 27% but the crop continued to grow and the degree of injury was less severe at 18% at 2 WAT. Morningglory control was 90% with bentazon at 1.0 lb/A and became marginal at the lower rates. At 1 WAT, halosulfuron caused marginally acceptable melon injury that decreased in severity for rates above 0.075 lb/A at 2 WAT. Morningglory growth was significantly reduced at 1 WAT then control improved to 85 to 88% at 2 WAT. Halosulfuron efficacy appeared to be equivalent at 0.05 to 0.10 lb/A to control morningglory.

Table. Postemergence herbicide weed control in cantaloupe.

Treatment	Rate	Crop Injury		Weed Control*	
		05 Aug	12 Aug	05 Aug	12 Aug
	(lb AI/A)	%			
Untreated check		0	0	0	0
Bentazon	0.5	15	10	60	63
Bentazon	0.75	20	17	82	78
Bentazon	1.0	27	18	92	90
Halosulfuron	0.05	10	13	78	85
Halosulfuron	0.075	13	12	83	87
Halosulfuron	0.1	17	13	83	88
LSD (p=0.05)		8.5	5.2	9.0	14.2

Treatments applied on 29 Jul 1997.

Nonionic surfactant Latron CS-7 at 0.25% added to all treatments.

* Morningglory (*Ipomoea hederacea)* was dominant weed present.

Noncrop herbicide weed control. Kai Umeda and Gonen Gal. A small plot field test was established at the University of Arizona Maricopa Agricultural Center, Maricopa, Arizona. In a noncrop area that was basin flood irrigated, treatment plots measured 6.7 ft by 25 ft and replicated three times in a randomized complete block design. The postemergence herbicide treatments were applied on 14 July 1997. All treatments were applied using a hand-held boom equipped with four flat fan 8002 nozzle tips. The sprays were pressurized with a backpack CO_2 system at 40 psi that delivered 22 gpa water. All treatments included a nonionic surfactant, Latron CS-7, at 0.25% v/v. The dominant weeds present were *Portulaca oleracea* (common purslane), *Trianthema portulacastrum* (horse purslane), *Amaranthus blitoides* (prostrate pigweed), *A. albus* (tumble pigweed), *Cyperus rotundus* (purple nutsedge), and summer annual grasses, *Leptochloa sp.* (sprangletop), *Echinochloa crus-galli* (watergrass) and *E. colona* (junglerice). The purslane plants had 6 to 10 inch long stems, prostrate pigweed had 4 to 6 inch long stems, tumble pigweed was 8 to 10 inches tall, and nutsedge and grasses were 6 to 8 inches tall. At the time of application, the weather was clear, there was negligible wind, and 100F. Visual weed control ratings were made at 3, 7, 10, 16, and 22 days after treatment (DAT).

Paraquat and diquat were effective against weeds within 3 DAT. Glyphosate, sulfosate, and glufosinate exhibited activity against the weeds at 7 to 10 DAT. Paraquat provided the most complete weed control of most weeds at 10 to 16 DAT. Most of the diquat treated weed recovered and exhibited regrowth after 22 DAT. Glufosinate did not provide adequate control of most weeds at 22 DAT similar to diquat. Glyphosate and sulfosate were nearly equivalent at 0.50 and 2.0 lb AI/A against most weeds at most of the rating dates.

Table 1. Noncrop herbicide weed control study.

Treatment	Rate	Weed Control																
		---POROL---		--------------TRTPO------------					------------AMABL------------					------------AMAAL------------				
		17 Jul	21 Jul	17 Jul	21 Jul	24 Jul	30 Jul	05 Aug	17 Jul	21 Jul	24 Jul	30 Jul	05 Aug	17 Jul	21 Jul	24 Jul	30 Jul	05 Aug
	(lb AI/A)	%																
Untreated check	0.0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glyphosate	0.125	0	-	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Glyphosate	0.50	18	70	13	25	18	17	0	0	13	17	15	0	0	0	7	0	0
Glyphosate	2.0	70	88	50	67	72	80	77	85	95	93	88	87	37	57	62	72	80
Sulfosate	0.125	0	-	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Sulfosate	0.50	13	-	13	25	33	7	0	0	0	7	0	0	0	0	0	0	0
Sulfosate	2.0	73	90	60	82	80	78	85	87	95	92	87	87	38	40	50	43	68
Glufosinate	0.125	0	-	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0
Glufosinate	0.50	18	78	7	23	23	7	0	0	20	13	7	0	0	0	3	0	0
Glufosinate	2.0	48	92	40	78	80	82	80	30	73	85	85	78	7	67	68	68	63
Paraquat	0.125	65	80	32	32	13	8	0	10	27	18	8	0	7	0	3	0	0
Paraquat	0.50	90	98	88	82	85	83	88	62	93	92	88	77	33	78	80	73	60
Paraquat	2.0	96	99	96	98	98	99	95	96	99	99	99	98	92	95	96	95	92
Diquat	0.13	40	-	22	20	3	0	0	17	7	7	0	0	7	0	0	0	0
Diquat	0.50	70	87	53	50	33	40	0	45	47	40	42	0	13	7	17	0	0
Diquat	2.0	92	98	87	80	77	67	78	87	85	87	77	75	63	67	50	55	60
LSD (p=0.05)		13.3	5.8	14.2	18.7	17.7	21	3.7	18.2	11.7	15.5	21	6	19.7	13.3	18.3	24.6	12.1

POST applications made on 14 July 1997.
Nonionic surfactant Latron CS-7 added to all treatments at 0.25% v/v.

Table 2. Noncrop herbicide weed control study.

Treatment	Rate	Weed Control									
		----------Grasses----------					---------- CYPRO----------				
		17 Jul	21 Jul	24 Jul	30 Jul	05 Aug	17 Jul	21 Jul	24 Jul	30 Jul	05 Aug
	(lb AI/A)	%									
Untreated check	0.0	0	0	0	0	0	0	0	0	0	0
Glyphosate	0.125	0	0	0	0	0	0	0	0	0	0
Glyphosate	0.50	7	7	13	0	0	0	0	0	0	0
Glyphosate	2.0	48	43	83	85	85	0	0	62	40	77
Sulfosate	0.125	0	0	0	0	0	0	0	0	0	0
Sulfosate	0.50	0	0	3	0	0	0	0	0	0	0
Sulfosate	2.0	50	50	77	77	75	0	0	38	42	72
Glufosinate	0.125	0	0	0	0	0	0	0	0	0	0
Glufosinate	0.50	0	13	7	0	0	0	3	7	0	0
Glufosinate	2.0	27	67	80	78	0	0	40	68	57	0
Paraquat	0.125	13	7	18	0	0	0	0	0	0	0
Paraquat	0.50	67	63	73	57	0	43	47	30	25	0
Paraquat	2.0	90	83	90	80	70	82	77	80	57	27
Diquat	0.13	10	0	0	0	0	13	0	0	0	0
Diquat	0.50	17	20	18	0	0	23	0	7	0	0
Diquat	2.0	72	33	57	7	0	43	23	30	0	7
LSD (p=0.05)		18.9	23.2	14	8.1	8.8	15.4	14.5	17.3	17.7	11.5

POST applications made on 14 July 1997.
Nonionic surfactant Latron CS-7 added to all treatments at 0.25% v/v.

Preemergence weed control in dry bulb onions. Gary A. Lee and Brenda M. Waters. The objective of this study was to determine the effect of preemergence herbicide treatments on annual weeds, crop injury and onion quality and yield. The trial was conducted at the Parma Research and Extension Center, Parma, Idaho on a Greenleaf-Owyhee Silt Loam soil (32% sand, 60% silt, 8% clay, 1.32% organic matter and 7.2 pH). Onions (cultivar 'Vega') were planted March 14, 1997 at a rate of 8 lb/A and at a depth of 0.75 in. on 22 in. beds. The soil surface was slightly cloddy (0.5 to 1 in. diameter) and dry with good moisture at the .5 in. depth. Individual plots were 7 by 40 ft. Plots were arranged in a randomized complete block design with four replications. Herbicide treatments were applied on March 3 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). The onion crop emerged on April 8 and weed control and crop injury visual evaluations were taken on May 27 (54 DAT). Plots were furrow irrigated on an approximate 10 day schedule throughout the growing season. Onions were harvested on September 15, 1997 and graded for quality on September 30.

Table 1. Application information.

	April 3
Crop stage	Preemerge
Weed stage	Dormant
Air temp. (F)	58.1
Relative humidity (%)	28
Wind (mph)	3
Sky (% cloud cover)	15
Soil temp. (F at 4 in.)	46
Soil moisture	dry surface, good moisture at 1.5 in.

First significant rain fall after herbicide application was 0.3 inch on April 19, 1997.

Pendimethalin at 1.5 lb/A, pendimethalin + ethofumesate at 1.0 + 0.25 lb/A, pendimethalin + dimethenamid at 1.0 + 1.0 lb/A, and dimethenamid + glyphosate at 1.0 + 0.38 lb/A gave 94% or better control of the annual broadleaf and grass weed population (Table 2). Pendimethalin at 1.0 lb/A did not provide acceptable control of redroot pigweed (AMARE) and common lambsquarters (CHEAL) compared to the 1.5 lb/A rate. There were no differences between pendimethalin rates of application in terms of onion injury. Pendimethalin + ethalfluralin at 1.0 + 1.0 lb/A, dimethenamid + ethalfluralin at 1.0 + 1.0 lb/A and dimethenamid + glyphosate at 1.0 + 0.38 lb/A caused significant crop injury compared to the weedy check. However, no differences in total onion yield occurred between any herbicide treated plots and the handweeded and weedy check plots (Table 3). The percentage colossal grade (premium quality) was significantly lower in the plots treated with dimethenamid + ethofumesate at 1.0 + 0.25 lb/A and the weedy check plot compared to plots treated with pendimethalin at 1.0 lb/A, pendimethalin + ethofumesate at 1.0 + 0.25 lb/A, pendimethalin + dimethenamid at 1.0 + 1.0 lb/A, dimethenamid at 1.0 lb/A, dimethenamid + glyphosate at 1.0 + 0.38 lb/A and the handweeded check. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preemergence herbicide on weed control and onion injury.

Treatment	Rate	Weed Control KCHSC	AMARE	CHEAL	MALNE	ECHCG	Onion Injury
	lb/A	------	------	------	% ------	------	------
Pendimethalin	1.0	96.3	85.0	87.5	99.0	93.8	5.0
Pendimethalin	1.5	99.0	95.8	97.8	98.8	94.0	5.0
Pendimethalin + ethofumesate	1.0 + 0.25	98.8	96.5	99.0	97.3	97.8	3.8
Pendimethalin + ethalfluralin	1.0 + 1.0	100.0	96.0	97.3	98.0	91.3	7.5
Pendimethalin + dimethenamid	1.0 + 1.0	99.0	98.8	97.3	97.0	95.8	5.0
Dimethenamid	1.0	88.8	93.3	86.3	32.5	77.5	0.0
Dimethenamid	1.5	93.8	95.8	81.3	33.8	83.8	0.0
Dimethenamid + ethofumesate	1.0 + 0.25	42.5	30.0	35.0	28.8	21.3	3.8
Dimethenamid + ethalfluralin	1.0 + 1.0	88.8	93.3	93.3	86.3	88.8	15.0
Dimethenamid + glyphosate	1.0 + 0.38	93.8	99.0	95.8	96.3	98.3	10.0
Handweeded check	----	0.0	0.0	0.0	0.0	0.0	0.0
Weedy Check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		22.5	18.9	20.0	20.5	19.8	5.1

Table 3. Effect of preemergence herbicide on onion yield and gross income per acre.

Treatment	Rate	Onion Yield Total	Colossal	Jumbo	Medium	Cull	Income[1]
	lb/A	CWT/A	-----------------	--------%	------------------		Dollars/A
Pendimethalin	1.0	842.9	43.6	46.9	6.7	2.7	3986.00
Pendimethalin	1.5	862.9	34.4	51.2	11.3	3.1	3952.09
Pendimethalin + ethofumesate	1.0 + 0.25	837.3	41.8	46.5	7.3	4.4	3870.41
Pendimethalin + ethalfluralin	1.0 + 1.0	795.0	37.6	50.6	7.6	4.2	3685.79
Pendimethalin + dimethenamid	1.0 + 1.0	773.9	43.7	41.2	8.6	6.4	3535.23
Dimethenamid	1.0	683.5	41.6	41.7	11.7	5.0	3128.49
Dimethenamid	1.5	837.3	24.6	55.3	16.4	3.7	3706.91
Dimethenamid + ethofumesate	1.0 + 0.25	501.2	14.5	64.9	18.2	2.4	2185.48
Dimethenamid + ethalfluralin	1.0 + 1.0	624.5	24.8	52.4	19.5	3.2	2720.56
Dimethenamid + glyphosate	1.0 + 0.38	776.9	53.8	35.3	6.9	4.1	3732.06
Handweeded check	----	707.0	51.1	34.9	5.2	8.9	3216.42
Weedy Check	----	735.8	17.4	60.6	19.4	2.6	3207.79
LSD (0.05)		236.9	22.5	17.0	9.7	4.7	1100.61

[1]Nov. 12, 1997 prices quoted from JC Watson's Parma, ID: Colossal \$5.50/CWT, Jumbo \$4.50/CWT, Medium \$3.50/CWT, Cull \$0.00

Postemergence weed control in dry bulb onions. Gary A. Lee and Brenda M. Waters. A trial was established at the Parma Research and Extension Center, Parma, Idaho to evaluate postemergence herbicides for control of annual weeds, crop injury, yield and quality of onions. Onions (cultivar 'Vega') were planted on March 14, 1997 at a rate of 8.0 lb/A and at a depth of 0.75 in. on a Greenleaf-Owyhee Silt Loam soil (32% sand, 60% silt, 8% clay, 1.32% organic and 7.2 pH). The experiment was arranged in a randomized complete block design with four replications, and individual plots were 7 by 40 ft. Herbicide treatments were applied on April 29, 1997 when all onions were in the 1-leaf stage except pendimethalin which was applied at two additional times on April 11 and May 9 (Table 1). Herbicide treatments were applied with CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Visual weed control and crop injury ratings were taken May 27, 1997 (46 DAT).

Table 1. Application information.

	April 11	April 29	May 9
Crop stage	Cracking	1 leaf	2 leaf
Weed stage	Preemerge	KCHSC 8 lf; CHEAL 4 lf; MALNE 2 lf	KCHSC 1-4 in; CHEAL 2-4 in; MALNE 2-12 lf
Air temp. (F)	55	60	73
Relative humidity (%)	28	45	33
Wind (mph)	2	3	3
Sky (% cloud cover)	20	60	80
Soil temp. (F at 4 in.)	56	60	70
Soil moisture	dry surface, good moisture at 1.5 in.		
First significant rain fall after herbicide application was	0.3 in. April 19, 1997	0.21 in. May 1, 1997	0.2 May 16, 1997

Oxyfluorfen + pendimethalin at 0.05 + 1.5 lb/A, bromoxynil + ethofumesate + sethoxydim + pendimethalin at 0.15 + 0.5 + 0.1 + 1.0 lb/A and pendimethalin + metolachlor + dimethenamid at 1.0 + 0.63 + 1.0 lb/A controlled 95% or better of the annual weed population present (Table 2). Herbicide treatments containing pendimethalin alone or in combination were most effective in controlling common mallow (MALNE). Pendimethalin did not effectively control established weed seedlings, including common mallow indicated by the late application on May 9. Metolachlor + bromoxynil at 0.63 + 0.15 lb/A, pendimethalin at 1.0 lb/A (May 9) and bromoxynil + ethofumesate + sethoxydim + pendimethalin at 0.15 + 0.5 + 0.1 + 1.0 lb/A caused significant injury to young onion plants. The handweeded check plots were hoed by labor at four different times during the growing season to maintain a weed-free condition. The weedy check and herbicide-treated plots were handweeded on June 10 and maintained weed-free for the remainder of the growing season (total of two labor operations). Onion yields from plots treated with oxyfluorfen at 0.05 lb/A were significantly lower than yields from plots sprayed with pendimethalin + metolachlor + dimethenamid at 1.0 + 0.63 + 1.0 lb/A (Table 3). The weedy check had significantly greater percentage of medium grade bulbs than plots treated with pendimethalin at 1.0 lb/A (April 11), bromoxynil + ethofumesate + sethoxydim + pendimethalin at 0.15 + 0.5 + 0.1 + 1.0 lb/A, pendimethalin + metolachlor + dimethenamid at 1.0 + 0.63 + 1.0 lb/A and the handweeded check. No other significant differences in onion yield or quality were detectable. (Department of Plant, Soil and Entomological Sciences, University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicide on weed control and onion injury.

Treatment	Rate	Weed Control KCHSC	AMARE	CHEAL	MALNE	ECHCG	Onion Injury
	lb/A	------------------	------	------ %	------	------	------
Oxyfluorfen	0.05	72.5	90.0	77.5	91.3	45.0	2.5
Oxyfluorfen + pendimethalin	0.05 + 1.5	98.0	97.3	95.8	98.3	95.8	0.0
Pendimethalin[7]	1.0	97.8	95.0	95.0	96.5	81.3	0.0
Pendimethalin[8]	1.0	93.8	90.0	85.0	95.0	82.5	0.0
Pendimethalin[9]	1.0	50.0	55.0	52.5	30.0	30.0	5.0
Brom[1] + ethof[2] + seth[3] + pend[4]	0.15 + 0.5 + 0.1 + 1.0	99.0	99.5	99.5	98.5	96.0	5.0
Pendimethalin + metol[5] + dimeth[6]	1.0 + 0.63 + 1.0	97.3	98.3	97.8	97.0	96.5	2.5
Clethodim + bromoxynil	0.045 + 0.15	95.8	97.0	97.0	83.8	86.3	1.3
Metolachlor + bromoxynil	0.63 + 0.15	100.0	100.0	100.0	88.8	81.3	10.0
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0
Handweeded check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		4.3	6.1	7.8	5.8	7.6	3.6

[1]Brom = bromoxynil
[2]Ethof = ethofumesate
[3]Seth = sethoxydim
[4]Pend = pendimethalin
[5]Metol = metolachlor
[6]Dimeth = dimethenamid
[7]Pendimethalin applied when onions were emerging (cracking stage) on April 11, 1997
[8]Pendimethalin applied when onions were in the 1 leaf stage on April 29, 1997
[9]Pendimethalin applied when onions were in the 2 leaf stage on May 9, 1997.

Table 3. Effect of postemergence herbicide on onion yield and gross income per acre.

Treatment	Rate	Onion Yield Total	Colossal	Jumbo	Medium	Cull	Income[7]
	lb/A	CWT/A	------	------ %	------	------	Dollars/A
Oxyfluorfen	0.05	620.1	17.9	55.3	24.3	2.5	2718.04
Oxyfluorfen + pendimethalin	0.05 + 1.5	787.6	31.0	52.8	12.2	3.9	3584.18
Pendimethalin	1.0	819.7	27.7	57.7	9.8	4.8	3695.16
Pendimethalin	1.0	914.9	27.3	59.2	12.6	0.9	4226.12
Pendimethalin	1.0	759.3	15.8	68.1	14.3	1.8	3370.10
Brom[1] + ethof[2] + seth[3] + pend[4]	0.15 + 0.5 + 0.1 + 1.0	803.7	35.1	51.3	8.3	5.3	3647.85
Pendimethalin + metol[5] + dimeth[6]	1.0 + 0.63 + 1.0	929.8	24.9	61.2	11.1	2.8	4201.58
Clethodim + bromoxynil	0.045 + 0.15	790.0	27.2	57.6	13.4	1.7	3616.02
Metolachlor + bromoxynil	0.63 + 0.15	748.3	17.6	63.1	17.0	2.3	3344.96
Weedy check	----	735.8	17.4	60.6	19.4	2.6	3207.79
Handweeded check	----	698.6	27.4	62.3	8.2	2.1	3224.45
LSD (0.05)		257.8	17.8	13.3	7.8	3.2	1327.68

[1]Brom = bromoxynil
[2]Ethof = ethofumesate
[3]Seth = sethoxydim
[4]Pend = pendimethalin
[5]Metol = metolachlor
[6]Dimeth = dimethenamid
[7]Nov. 12, 1997 prices quoted from JC Watson's Parma, ID: Colossal $5.50/CWT, Jumbo $4.50/CWT, Medium $3.50/CWT, Cull $0.00

Preemergence-postemergence sequential herbicide treatments for weed control in dry bulb onions. Gary A. Lee and Brenda M. Waters. A study was conducted at the Parma Research and Extension Center, Parma, Idaho to determine the effectiveness of sequentially applied preemergence and postemergence herbicides for annual weed control and subsequent effect on onion yield and quality. Onions (cultivar 'Vega') were planted on March 14, 1997 at a seeding rate of 8 lb/A and at a depth of 0.75 in. on 22 in. beds. The preemergence herbicide treatments were applied April 3 when onion seedlings were at the soil surface (Table 1). Onions were considered emerged on April 8. Postemergence herbicide treatments were applied on April 29 when onion plants were in the 1-leaf stage of growth. Plots were arranged in a split block design with preemergence treatments as the whole plots and postemergence treatments as the split plots. Each individual plot receiving preemergence-postemergence sequential treatment was 4 rows by 20 ft and replicated four times. The location is a Greenleaf-Owyhee Silt Loam soil (32% sand, 60% silt, 8% clay, 1.32% organic matter and 7.2 pH), and surface condition at the time of applications was slightly cloddy (0.5 to 1 in. diameter) and dry with good moisture at the 0.5 in. depth. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance was visually evaluated May 27, 1997 (54 DAT). The crop was furrow irrigated on a 10 day schedule throughout the growing season. The crop was harvested on September 19 and graded for size and quality on September 30, 1997.

Table 1. Application information.

	April 3	April 29
Crop stage	Preemerge	1 lf
Weed stage	Preemerge	KCHSC 8 lf; CHEAL 4 lf; MALNE 2 lf; AMARE 4 lf; ECHCG preemerge
Air temp. (F)	46.3	55
Relative humidity (%)	40	55
Wind (mph)	3	4
Sky (% cloud cover)	25	15
Soil temp. (F at 4 in.)	44	52
Soil moisture	dry surface, good moisture at 1.5 in.	
First significant rain fall after herbicide application.	0.06 in April 9, 1997	0.21 in May 1, 1997

Visual weed control ratings for preemergence, postemergence and sequential preemergence-postemergence herbicide treatments were done 54 days after PRE treatments and 28 days after POST treatments were applied (Table 2). Pendimethalin at 1.0 lb/A, dimethenamid at 1.0 lb/A and glyphosate at 0.38 lb/A, as PRE treatments did not provide acceptable control of all annual weed species present. The weed population was emerging at the time PRE treatments were applied, accounting for the low percentage control obtained with glyphosate alone. Oxyfluorfen + metolachlor + ethofumesate at 0.05 + 1.25 + 0.5 lb/A and pendimethalin at 1.0 lb/A applied as POST treatments controlled 92% or better of the broadleaf and grass species present. Clethodim + bromoxynil at 0.125 + 0.15 lb/A, sethoxydim + bromoxynil at 0.1 + 0.15 lb/A and pendimethalin at 1.0 lb/A applied POST over pendimethalin at 1.0 lb/A (PRE) eliminated all weed species except common mallow (MALNE). The common mallow infestation was reduced 93% or better with these sequential herbicide treatments. Significant increase in weed control was achieved with sequential treatments compared to PRE treatments alone except for treatments containing clethodim at 1.0 lb/A. However, barnyardgrass (ECHCG) control was improved in plots treated with clethodim at 1.0 lb/A POST in combination with PRE treatments.

All plots treated with pendimethalin at 1.0 lb/A alone as PRE or POST and in combination with all POST herbicide treatments produced significantly higher onion bulb yields than the nontreated check (Table 3). Plots treated with glyphosate at 0.38 lb/A with oxyfluorfen + metolachlor + ethofumesate at 0.05 + 1.25 + 0.5 lb/A produced significantly higher yields than plots treated with glyphosate at 0.38 lb/A alone.

Significantly greater percentage of colossal grade onions were harvested from plots treated with pendimethalin at 1.0 lb/A PRE and in combination with all POST treatments as well as sequential treatments containing pendimethalin at 1.0 lb/A POST. All herbicide treated plots except those receiving dimethenamid at 1.0 lb/A PRE and sethoxydim + bromoxynil at 0.1 + 0.15 lb/A POST and clethodim at 0.125 lb/A alone POST and clethodim at 0.125 lb/A alone POST produced significantly less medium grade (lowest marketable class) than the nontreated check plots. Only dimethenamid at 1.0 lb/A PRE with clethodim + bromoxynil at 0.125 + 0.15 lb/A POST and glyphosate at 0.38 lb/A PRE with oxyfluorfen + metolachlor + ethofumesate at 0.05 + 1.25 + 0.5 lb/A POST treated plots produced significantly higher percentage of cull grade onion bulbs than the untreated check plots. However, in both cases, the percentage of colossal grade was significantly greater than the untreated check plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2 Effect of Pre/Post sequential herbicide treatments on weed control and onion injury.

Treatment		Rate		Weed Control					Onion
PRE	POST	PRE	POST	KCHSC	AMARE	CHEAL	MALNE	ECHCG	INJURY
		---- lb/A -------		----------------------		%		----------------------	
Pendi[1]	Oxyfluorfen	1.0	0.05	100.0	92.5	91.3	93.8	100.0	0.0
Pendi[1]	Oxyfl[4] + metol[5] + ethof[6]	1.0	0.05 + 1.25 + 0.5	100.0	98.3	98.5	97.3	100.0	7.5
Pendi[1]	Clethodim	1.0	0.125	100.0	95.0	94.5	90.0	100.0	0.0
Pendi[1]	Clethodim + bromoxynil	1.0	0.125 + 0.15	100.0	100.0	100.0	93.8	100.0	0.0
Pendi[1]	Sethoxydim + bromoxynil	1.0	0.1 + 0.15	100.0	100.0	100.0	96.5	100.0	0.0
Pendi[1]	Pendimethalin	1.0	1.0	100.0	100.0	100.0	95.8	100.0	0.0
Pendi[1]	Check	1.0	----	91.3	86.3	82.5	65.0	85.0	0.0
Dimet[2]	Oxyfluorfen	1.0	0.05	86.3	96.3	92.5	95.0	99.5	5.0
Dimet[2]	Oxyfl[4] + metol[5] + ethof[6]	1.0	0.05 + 1.25 + 0.5	96.5	99.5	100.0	99.5	100.0	7.5
Dimet[2]	Clethodim	1.0	0.125	60.0	95.8	70.0	47.5	99.5	0.0
Dimet[2]	Clethodim + bromoxynil	1.0	0.125 + 0.15	100.0	100.0	100.0	93.8	100.0	0.0
Dimet[2]	Sethoxydim + bromoxynil	1.0	0.1 + 0.15	99.5	99.0	99.0	92.0	98.8	3.8
Dimet[2]	Pendimethalin	1.0	1.0	91.3	97.5	93.8	93.8	99.5	3.8
Dimet[2]	Check	1.0	----	60.0	91.3	52.5	40.0	94.5	0.0
Glyph[3]	Oxyfluorfen	0.38	0.05	70.0	97.5	97.8	95.3	97.3	5.0
Glyph[3]	Oxyfl[4] + metol[5] + ethof[6]	0.38	0.05 + 1.25 + 0.5	92.5	98.3	100.0	95.8	95.0	0.0
Glyph[3]	Clethodim	0.38	0.125	0.0	0.0	0.0	0.0	99.5	0.0
Glyph[3]	Clethodim + bromoxynil	0.38	0.125 + 0.15	99.5	100.0	93.8	78.8	98.8	0.0
Glyph[3]	Sethoxydim + bromoxynil	0.38	0.1 + 0.15	100.0	97.3	99.5	92.5	95.0	0.0
Glyph[3]	Pendimethalin	0.38	1.0	98.3	94.5	95.8	90.0	95.8	0.0
Glyph[3]	Check	0.38	----	56.3	42.5	40.0	0.0	0.0	0.0
Check	Oxyfluorfen	----	0.05	75.0	92.5	67.5	94.5	72.5	1.3
Check	Oxyfl[4] + metol[5] + ethof[6]	----	0.05 + 1.25 + 0.5	96.5	99.5	94.5	97.3	97.0	0.0
Check	Clethodim	----	0.125	0.0	0.0	0.0	0.0	65.8	0.0
Check	Clethodim + bromoxynil	----	0.125 + 0.15	93.8	91.3	90.0	66.3	92.5	0.0
Check	Sethoxydim + bromoxynil	----	0.1 + 0.15	90.0	88.8	91.3	78.8	91.3	1.3
Check	Pendimethalin	----	1.0	95.0	95.8	95.0	92.5	97.8	0.0
Check	Check	----	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)				5.1	3.0	3.6	5.7	13.1	2.0

[1]Pendi = Pendimethalin [4]Oxyfl = Oxyfluorfen
[2]Dimet = Dimethenamid [5]Metol = Metolachlor
[3]Glyph = Glyphosate [6]Ethof = Ethofumesate

Table 3. Effect of Pre/Post sequential herbicide treatments in onion yield and gross income per acre.

Treatment		Rate		Onion Yield					Income[7]
PRE	POST	PRE	POST	Total	Colossal	Jumbo	Medium	Cull	
		---- lb/A -------		CWT/A	---------------		%	------------	Dollars/A
Pendi[1]	Oxyfluorfen	1.0	0.05	837.9	21.6	57.2	16.9	4.4	3637.07
Pendi[1]	Oxyfl[4] + metol[5] + ethof[6]	1.0	0.05 + 1.25 + 0.5	858.7	32.0	53.6	11.9	2.5	3941.38
Pendi[1]	Clethodim	1.0	0.125	948.6	24.6	61.2	11.1	3.2	4251.42
Pendi[1]	Clethodim + bromoxynil	1.0	0.125 + 0.15	841.1	27.8	57.6	10.2	4.4	3753.33
Pendi[1]	Sethoxydim + bromoxynil	1.0	0.1 + 0.15	813.2	23.2	58.3	15.4	3.1	3608.28
Pendi[1]	Pendimethalin	1.0	1.0	898.6	30.1	56.2	10.6	3.1	4096.40
Pendi[1]	Check	1.0	----	864.7	23.3	57.7	17.0	2.0	3879.64
Dimet[2]	Oxyfluorfen	1.0	0.05	745.3	30.0	50.4	16.3	3.3	3362.96
Dimet[2]	Oxyfl[4] + metol[5] + ethof[6]	1.0	0.05 + 1.25 + 0.5	730.5	19.3	64.4	15.3	1.0	3280.24
Dimet[2]	Clethodim	1.0	0.125	576.0	16.6	56.2	24.6	2.5	2505.74
Dimet[2]	Clethodim + bromoxynil	1.0	0.125 + 0.15	852.2	29.0	51.8	12.8	6.4	3738.01
Dimet[2]	Sethoxydim + bromoxynil	1.0	0.1 + 0.15	657.0	14.1	56.1	25.8	3.9	2797.78
Dimet[2]	Pendimethalin	1.0	1.0	847.4	36.9	51.4	8.6	3.1	3923.82
Dimet[2]	Check	1.0	----	670.4	10.9	64.5	22.1	2.5	2873.35
Glyph[3]	Oxyfluorfen	0.38	0.05	771.2	31.5	51.3	13.3	3.9	3478.31
Glyph[3]	Oxyfl[4] + metol[5] + ethof[6]	0.38	0.05 + 1.25 + 0.5	841.1	47.9	39.3	5.7	7.1	3877.11
Glyph[3]	Clethodim	0.38	0.125	499.6	24.4	55.8	16.4	3.4	2212.81
Glyph[3]	Clethodim + bromoxynil	0.38	0.125 + 0.15	690.6	38.9	51.7	6.3	3.1	3246.32
Glyph[3]	Sethoxydim + bromoxynil	0.38	0.1 + 0.15	587.6	35.4	48.3	12.7	3.6	2681.89
Glyph[3]	Pendimethalin	0.38	1.0	827.2	43.3	45.1	6.8	4.8	3846.76
Glyph[3]	Check	0.38	----	627.2	17.2	60.5	20.0	2.3	2754.78
Check	Oxyfluorfen	----	0.05	760.5	21.4	62.0	12.5	4.1	3352.69
Check	Oxyfl[4] + metol[5] + ethof[6]	----	0.05 + 1.25 + 0.5	800.7	29.1	55.0	11.8	4.1	3615.57
Check	Clethodim	----	0.125	620.1	14.7	56.6	26.3	2.3	2646.33
Check	Clethodim + bromoxynil	----	0.125 + 0.15	830.1	24.8	57.0	16.8	4.4	3687.73
Check	Sethoxydim + bromoxynil	----	0.1 + 0.15	691.8	15.9	63.4	18.5	2.1	3030.45
Check	Pendimethalin	----	1.0	898.6	16.5	66.2	14.3	3.0	3950.75
Check	Check	----	----	532.0	6.2	60.7	31.4	1.7	2225.75
LSD (0.05)				185.2	14.0	11.8	8.0	3.2	854.06

[1]Pendi = Pendimethalin [2]Dimet = Dimethenamid [3]Glyph = Glyphosate
[4]Oxyfl = Oxyfluorfen [5]Metol = Metolachlor [6]Ethof = Ethofumesate
[7]Nov. 12, 1997 prices quoted from JC Watson's Parma, ID. Colossal $5.50/CWT, Jumbo $4.50/CWT, Medium $3.50/CWT, Cull $0.00.

Yellow nutsedge control in dry bulb onions. Gary A. Lee and Brenda M. Waters. Experiments were initiated at two locations in Malheur County near Nyssa, Oregon and two locations in Canyon County near Parma, Idaho to compare postemergence herbicides for the control of yellow nutsedge (CYPES) and onion tolerance. The Oregon sites are both a Nyssa Silt Loam soil (38% sand, 54% silt, 8% clay, 1.12% organic matter and 7.6 pH); the site northeast of Parma, Idaho is an Owyhee Silt Loam soil (72% sand, 20% silt, 8% clay, 0.78% organic matter and 7.2 pH); and the site southwest of Parma, Idaho is a Baldock Loam soil (48% sand, 42% silt, 10% clay, 1.84% organic matter and 7.8 pH). Postemergence herbicides were applied at two dates at each location when the onions were in the 2-leaf and 4-leaf stage, respectively, and the yellow nutsedge was 1 to 3 in. and 2 to 5 in. tall, respectively (Table 1). Each trial was arranged in a randomized complete block design with four replications, except location No. 4, which had three replications, and individual plots were 7 by 40 ft. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance was visually evaluated 69 or 70 DAT. The crop was harvested at each location and graded for size and quality.

Table 1. Application information.

	May 7,				May 28			
	[1]L-1	L-2	L-3	L-4	L-1	L-2	L-3	L-4
Crop stage	2-5 in.	1-5 in.	1-5 in.	2-6 in.	6 in.	1-6 in.	1-6 in.	2-7 in.
Weed stage	CYPES 1-6 in.	CYPES 2-3 in.	CYPES 1-3 in.	CYPES 2-4 in.	CYPES 4-8 in.	CYPES 2-7 in.	CYPES 1-5 in.	CYPES 2-9 in.
Air temp. (F)	59	70	70	66	76.2	77	78	77
Relative humidity (%)	37	23	24	31	42	41	28	41
Wind (mph)	3	4	3	3	2	0	0	2
Sky (% cloud cover)	0	0	5	0	100	100	100	100
Soil temp. (F at 4 in.)	62	60	60	56	70	62	65	
Soil moisture	normal	normal	normal	normal	normal	normal	normal	normal

First significant rain fall was 0.12 in. and 0.17 in. on May 24 and 29, 1997, respectively.

[1]L = location ; L-1, L-2, L-4 were furrow irrigated, L-3 was drip irrigated.

Location No. 3 had supplemental water delivered through a drip irrigation system while all other locations had furrow irrigation as a delivery system. Yellow nutsedge control at the drip irrigation site was substantially lower with all herbicide treatments compared to the surface irrigated locations (Table 2). Weed control results with each herbicide treatment were relatively consistent among furrow irrigated sites. Halosulfuron at 0.042 and 0.084 lb/A gave 96% or better control of yellow nutsedge at all locations, but effectively eliminated all onion stands. Under furrow irrigation systems, pendimethalin + metolachlor at 1.5 + 0.91 lb/A, pendimethalin + metolachlor + dimethenamid at 1.5 + 0.91 + 1.0 lb/A and dimethenamid + metolachlor at 1.0 + 0.91 lb/A controlled 90% or better control of the target weed species. Pendimethalin + metolachlor + dimethenamid at 1.5 + 0.91 + 1.0 lb/A did cause significant onion damage at location No. 4; however, the total yield of onion bulbs for this treatment was the highest at the location (Table 3). Yellow nutsedge competition with onion plants tended to reduce the quality of the marketable crop as indicated by the high percentage of jumbo and medium grade in the weedy check plots compared to herbicide treated plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicides on nutsedge control and onion injury at 4 different locations.

Treatment	Rate	CYPES Control				Onion Injury			
		L-1[1]	L-2	L-3	L-4	L-1	L-2	L-3	L-4
	lb/A	%							
Metolachlor	0.91	82.5	82.5	60.0	80.0	0	0	0	0.0
Metolachlor	1.22	95.0	88.8	55.0	93.3	0	0	0	0.0
Dimethenamid	1.0	71.3	71.3	40.0	50.0	0	0	0	0.0
Dimethenamid	1.5	80.0	71.3	50.0	65.0	0	0	0	0.0
Pendimethalin + metol[2]	1.5 + 0.91	90.0	90.0	52.5	91.7	0	0	0	0.0
Pendi[3] + metol[2] + dimeth[4]	1.5 + 0.91 + 1.0	93.3	95.8	50.0	96.0	0	0	0	3.7
Dimethenamid + metol[1]	1.0 + 0.91	96.5	91.3	57.5	90.0	0	0	0	0.0
Halosulfuron	0.042	97.3	97.5	97.5	97.3	100	100	100	99.3
Halosulfuron	0.084	100.0	96.5	97.5	97.7	100	100	100	100.0
Weedy check	----	0.0	0.0	0.0	0.0	0	0	0	0.0
LSD (0.05)		2.4	4.9	22.5	6.3	0	0	0	0.9

[1]L = location ; L-1, L-2, L-4 were furrow irrigated, L-3 was drip irrigated.
[2]Metol = metolachlor
[3]Pendi = pendimethalin
[4]Dimeth = dimethenamid

Table 3. Effect of herbicide treatments on dry bulb onion yield at four separate locations.

Treatment	Rate	Onion Yield															
		Total				Colossal/A				Jumbo/A				Medium/A			
		L-1[1]	L-2	L-3	L-4	L-1	L-2	L-3	L-4	L-1	L-2	L-3	L-4	L-1	L-2	L-3	L-4
	lb/A	CWT/A				%											
Metolachlor	0.91	439	706	593	729	11	1	0	6	70	72	64	76	17	26	30	17
Metolachlor	1.22	370	537	512	642	5	3	0	3	64	59	50	74	28	33	47	20
Dimethenamid	1.0	470	612	625	736	14	1	0	5	64	65	64	74	20	32	31	20
Dimethenamid	1.5	304	758	584	688	7	2	2	6	66	72	58	69	23	26	34	23
Pendimethalin + metol[2]	1.5 + 0.91	400	653	680	747	15	2	1	10	59	63	63	72	22	33	30	17
Pendi[3] + metol[2] + dimeth[4]	1.5 + 0.91 + 1.0	353	741	560	848	5	1	0	10	81	72	53	75	12	26	41	14
Dimethenamid + metol[1]	1.0 + 0.91	352	705	540	621	6	0	1	6	54	68	52	58	26	31	41	26
Halosulfuron	0.042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Halosulfuron	0.084	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weedy check	----	228	455	500	604	2	1	0	0	39	40	52	66	47	57	40	32
LSD (0.05)		237	219	178	219	11	2	1	8	26	18	21	18	21	18	18	13

[1]L = location ; L-1, L-2, L-4 were furrow irrigated, L-3 was drip irrigated.
[2]Metol = metolachlor
[3]Pendi = pendimethalin
[4]Dimeth = dimethenamid

Postemergence weed control in peppermint. Gary A. Lee and Brenda M. Waters. A study was conducted in Payette County, near Fruitland, Idaho to evaluate postemergence herbicides for annual weed control in peppermint (cultivar 'Black Mitchum'). The experiment was established on a 1 year old stand of peppermint in a location which is a Harpt Silt Loam soil (36% sand, 54% silt, 10% clay, 1.86% organic matter and 7.6 pH). The plots were arranged in a randomized complete block design with four replications. Each plot was 7 by 40 ft. Herbicide treatments were applied on March 24, April 7 and April 14, 1997 when the peppermint was starting to break dormancy, but the crop plants were not actively growing (Table 1). Blue mustard (COBTE) was starting to produce flowers at the time of herbicide applications. Populations of blue mustard continued to intensify in plots where complete control was not attained and required mowing and removal of the blue mustard biomass on May 17. Other weed species and the peppermint crop were released from the competition of blue mustard and grew normally until the harvest operation. Uncontrolled prickly lettuce (LACSE) in the study area was treated with glyphosate at a 1 to 3 dilution in water carrier applied with a Super Sponge Weed Wiper (Smucker Manufacturing, Inc., Harrisburg, OR) on July 9. Weed control and crop tolerance evaluations were made May 2 and July 25, 1997. The plots were cut with a flail harvester on August 18 and samples allowed to dry for 10 days prior to distillation for oil recovery.

Table 1. Application information.

	March 24	April 7	April 14
Crop stage	dormant	dormant	<1 inch growth
Weed stage	COBTE 8 lf-flwr; LACSE 2-20 lf; DESSO 0.5-8 in.; CONAR dormant; SETVI preemerge; ECHCG preemerge	COBTE flwr; LACSE 2 lf - flwr; DESSO 0.5-10 in.; CONAR 0.5-2 in.; SETVI preemerge; ECHCG preemerge	COBTE flwr; LACSE 2 lf flwr; DESSO 0.5-11 in; CONAR 0.5-3 in.; SETVI preemerge; ECHCG preemerge
Air temp. (F)	66.1	67.5	69
Relative humidity (%)	23	24	31
Wind (mph)	2	3	3
Sky (% cloud cover)	0	5	95
Soil temp. (F at 4 in.)	58	52	55
Soil moisture	dry surface, good moisture at 1.5 in.		
First significant rain fall after herbicide application.	0.6 in. March 28, 1997	0.3 in. April 19, 1997	0.3 in. April 19, 1997

Blue mustard was effectively controlled with terbacil + paraquat at 1.0 + 0.5 lb/A, oxyfluorfen + paraquat at 0.5 + 0.5 lb/A and pyridate at 0.47 + 0.38 lb/A (Table 2.). Bromoxynil at 0.38 and 0.5 lb/A did not provide acceptable control even though the blue mustard leaves were severely burned and seed production reduced. After the remaining blue mustard plants were removed from the plot area, other annual broadleaf and grass species infesting the area were able to grow and develop. Oxyfluorfen + paraquat at 0.5 + 0.5 lb/A was the only herbicide treatment that provided 90% or better control of all annual weed species. The combination of oxyfluorfen + paraquat at 0.5 + 0.5 lb/A gave significantly better weed control than oxyfluorfen at 1.0 lb/A. Slight crop injury was observed with some of the herbicide treatments but no lasting effect was noted. Intensive late flushes of barnyardgrass (ECHCG) and prickly lettuce (LACSE) influenced the growth of the peppermint crop and the subsequent harvested hay. The total biomass harvested included both weeds and mint and in most cases, the majority of the harvest sample was comprised of weeds. Plots treated with terbacil + paraquat at 1.0 + 0.5 lb/A, bromoxynil at 0.38 lb/A and pyridate at 0.94 lb/A produced significantly higher mint oil yields than the weedy check. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Influence of herbicide treatments on weed control, crop injury and mint yield including biomass and oil.

Treatment	Rate	Weed Control						Crop Injury		Yield	
		COBTE 39 DAT	AMARE 123 DAT	CHEAL 123 DAT	LACSE 123 DAT	ECHCG 123 DAT	SETVI 123 DAT	39 DAT	123 DAT	Biomass	Oil
	-- lb/A --	%								-- lb/A --	
Pendimethalin	1.98	0.0	57.5	60.0	60.0	15.0	15.0	0.0	0.0	24775	41.8
Pendimethalin	3.96	0.0	73.8	72.5	75.0	25.0	25.0	0.0	0.0	20745	71.1
Terbacil	1.0	0.0	67.5	73.8	71.3	57.5	57.5	0.0	0.0	34794	31.4
Diuron	0.8	40.0	76.3	73.8	73.8	71.3	71.3	0.0	0.0	26626	63.8
Diuron	1.6	55.0	80.0	80.0	77.5	75.0	75.0	0.0	0.0	26136	47.1
Diuron + terbacil	0.8 + 0.5	33.8	66.3	70.0	65.0	72.5	72.5	0.0	0.0	27116	55.4
Terbacil + paraquat	1.0 + 0.5	95.8	80.0	81.3	78.8	62.5	62.5	0.0	0.0	26136	108.8
Oxyfluorfen	1.0	80.0	77.5	75.0	75.0	70.0	70.0	0.0	2.5	29022	46.0
Oxyfluorfen + paraquat	0.31 + 0.2	81.3	86.3	82.5	81.3	72.5	72.5	0.0	5.0	26027	74.3
Oxyfluorfen + paraquat	0.5 + 0.5	97.0	91.3	91.3	91.3	90.0	90.0	0.0	0.0	24121	59.6
Paraquat	0.5	86.3	10.0	10.0	12.5	0.0	0.0	0.0	0.0	26408	53.4
Sulfentrazone	0.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22216	39.8
Sulfentrazone	0.37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31635	29.3
Bentazon[1]	1.5	82.5	71.3	67.5	67.5	67.5	67.5	0.0	0.0	23686	57.5
Bromoxynil[2]	0.38	84.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26027	78.5
Clopyralid[2]	0.125	0.0	15.0	15.0	15.0	2.5	2.5	0.0	1.3	32833	24.1
Clopyralid[2]	0.19	31.3	21.3	25.0	27.5	0.0	0.0	0.0	3.8	28750	61.5
Clopyralid + bromoxynil[2]	0.125 + 0.38	85.5	27.5	30.0	25.0	0.0	0.0	0.0	5.0	25537	65.9
Bromoxynil[2]	0.5	62.5	0.0	0.0	2.5	0.0	0.0	0.0	0.0	26789	33.5
Lactofen[2]	0.1	51.3	23.8	22.5	25.0	0.0	0.0	0.0	1.3	23522	47.1
Pyridate[2]	0.47	76.3	32.5	32.5	32.5	0.0	0.0	0.0	0.0	23250	47.1
Pyridate[2]	0.94	81.3	42.5	40.0	25.0	0.0	0.0	0.0	0.0	22760	81.6
Pyridate + bromoxynil[2]	0.47 + 0.38	96.3	50.0	50.0	47.5	0.0	0.0	0.0	0.0	23958	70.1
Lactofen[2]	0.2	86.3	45.0	45.0	55.0	0.0	0.0	0.0	5.0	31363	49.2
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22597	35.6
LSD (0.05)		11.8	6.1	6.9	6.5	4.9	4.9	NS	1.4	8483	41.6

[1]Crop Oil Concentrate added at 1% v/v.
[2]Latron Ag-98 nonionic surfactant added at 0.25% v/v.

Quackgrass control in peppermint. Gary A. Lee and Brenda M. Waters. The objective of this investigation was to determine the efficacy of selected "lipid biosynthesis inhibitor" herbicides for quackgrass (AGRRE) control and subsequent peppermint tolerance. The study was established in Payette County near Fruitland, Idaho. The peppermint (cultivar 'Black Mitchum') was a second year stand planted on a Harpt Loam soil (36% sand, 50% silt, 14% clay, 1.74% organic matter and 7.8 pH). Herbicide treatments were applied on March 25, April 14 and May 23, 1997 when the mint plants were dormant, 1 to 2 in. growth and 4 to 9 in. growth, respectively (Table 1). The plots were arranged in a randomized complete block design with four replications, and individual plots were 7 by 40 ft. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance was visually evaluated on May 2 (38 DAT) and June 7 (74 DAT). The peppermint stand was sparse, and meaningful yields could not be obtained.

Table 1. Application information.

	March 25	April 14	May 23
Crop stage	dormant	1-2 in.	4-9 in.
Weed stage	AGRRE 4-10 in.	AGRRE 10-18 in.	AGRRE 12-36 in.
Air temp. (F)	63	65	64
Relative humidity (%)	28	31	42
Wind (mph)	1	3	1
Sky (% cloud cover)	80	95	100
Soil temp. (F at 4 in.)	50	58	60
Soil moisture	normal	normal	normal
First significant rain fall.	0.37 in. March 31	0.3 April 19	0.12 May 24

Quizalofop + COC at 0.006 lb/A + 1% v/v applied March 25, April 24 and May 23 gave 91% or better control of quackgrass on both dates of evaluation (Table 2). The double application of quizalofop + COC at 0.007 lb/A + 1% v/v resulted in 94% control 38 DAT, but some quackgrass plants were recovering even though most plants were stunted and red in color. Clethodim + COC at 0.125 lb/A + 1% v/v applied March 25 and again 20 days later gave 95% control at the 38 DAT evaluation; however, the target species was recovering 74 DAT. Sequential applications of sethoxydim and fluazifop did not achieve 90% control at either evaluation date. No mint injury was evident in plots treated with multiple applications of herbicides. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of herbicide treatments on quackgrass control and peppermint injury.

Treatment	Rate	AGRRE control		Mint injury	
		38 DAT	74 DAT	38 DAT	74 DAT
	lb/A	%			
Quizalofop[1,4] + quizalofop[2,4]	0.006 + 0.006	96.3	55.0	0.0	0.0
Quizalofop[1,4] + quizalofop[2,4]	0.007 + 0.007	94.5	80.0	0.0	0.0
Quizalofop[1,4] + quizalofop[2,4] + quizalofop[3,4]	0.006 + 0.006 + 0.006	91.3	92.5	0.0	0.0
Sethoxydim[1,4] + sethoxydim[2,4]	0.23	66.3	30.0	0.0	0.0
Sethoxydim[1,4] + sethoxydim[2,4]	0.47	87.5	17.5	0.0	0.0
Clethodim[1,4] + clethodim[2,4]	0.094	81.3	17.5	0.0	0.0
Clethodim[1,4] + clethodim[2,4]	0.125	95.0	72.5	0.0	0.0
Fluazifop[1,4] + fluazifop[2,4]	0.125 + 0.063	76.3	47.5	0.0	0.0
Fluazifop[1,4] + fluazifop[2,4]	0.188 + 0.094	87.5	58.8	0.0	0.0
Weedy check	----	0.0	5.0	0.0	0.0
LSD (0.05)		7.3	10.7	0.0	0.0

[1]Treatment applied on March 25, 1997.
[2]Treatment applied on April 14, 1997.
[3]Treatment applied on May 23, 1997.
[4]Crop oil concentrate added at 1.0% v/v.

Field bindweed control in peppermint. Gary A. Lee and Brenda M. Waters. A trial was conducted to compare the suppressive influence of 2,4-DB and MCPB on field bindweed (CONAR) growth and subsequent effect on peppermint growth and oil yield. The study was established in Payette County, near Fruitland, Idaho at a location that has a Harpt Loam soil (36% sand, 50% silt, 14% clay, 1.74% organic matter and 78.8 pH). The peppermint (cultivar 'Black Mitchum') was established in 1996, and the field was irrigated with a wheel-line sprinkler system. The experimental design was a randomized complete block with four replications, and each plot was 7 by 40 ft. Herbicide treatments were applied postemergence to both the field bindweed and peppermint at three different dates (Table 1). Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Herbicide rates were reduced by 0.5 for applications made on May 12 and May 23 compared to the April 28 dates. Visual evaluation of weed control (suppression) and crop injury were made on June 6 (40 DAT) and July 18 (81 DAT). Mint was harvested on August 18, 1997 (112 DAT), samples dried and oil extracted by distillation.

Table 1. Application information.

	April 28	May 12	May 23
Crop stage	3 in.	3-8 in.	4-10 in.
Weed stage	CONAR 6-7 in.	CONAR 9-24 in.	CONAR flowering
Air temp. (F)	57.1	68.2	63.7
Relative humidity (%)	39	38	42
Wind (mph)	2	0	1
Sky (% cloud cover)	100	5	100
Soil temp. (F at 4 in.)	50	60	60
Soil moisture	normal	normal	normal
First significant rain fall.	0.21 in. May 1	0.12 May 24	0.12 May 24

Field bindweed growth was significantly suppressed with MCPB compared to 2,4-DB when herbicides were applied to the target species in the 6 to 7 in. growth stage (Table 2). The effect was visually detectable at both 40 DAT and 81 DAT. When MCPB at 0.5 and 0.75 lb/A and 2,4-DB at 0.25 and 0.375 lb/A were applied to field bindweed with 9 to 24 in. growth and at flowering, no differences were apparent at the 40 DAT evaluation, but only the high rates of application were nonsignificant at the last evaluation date. 2,4-DB at the highest rate of application caused significant crop injury at both 40 and 81 DAT evaluations. By the last evaluation, peppermint plants in all MCPB treated plots appeared normal and healthy. Mint hay yields included both crop and weed biomass, and no differences were detected statistically. However, plots treated with MCPB at 0.25 lb/A on May 12 and MCPB at 0.5 lb/A applied on May 23 produced significantly more mint oil than the untreated check plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of herbicide treatments on bindweed control and peppermint injury.

		CONAR control		Mint			
				Injury		Yield	
Treatment	Rate	40 DAT	81 DAT	40 DAT	81 DAT	Hay	Oil
	lb/A	%				lb/A	
2,4-DB[1,4]	0.25	35.0	30.0	0.0	3.8	23141.3	56.5
2,4-DB[1,4]	0.5	50.0	45.0	4.3	5.0	24339.2	59.6
2,4-DB[1,4]	0.75	52.5	78.8	5.5	5.0	22270.1	48.1
MCPB[1,4]	0.5	65.0	28.8	0.0	0.0	22106.7	60.7
MCPB[1,4]	1.0	75.0	80.0	1.3	0.0	20854.4	68.0
MCPB[1,4]	1.5	86.3	86.3	2.5	0.0	20636.6	59.6
2,4-DB[2,4]	0.125	50.0	55.0	6.3	5.0	21072.2	70.1
2,4-DB[2,4]	0.25	85.0	82.5	5.0	5.0	24448.1	64.9
2,4-DB[2,4]	0.375	88.8	88.8	5.0	5.0	19983.2	78.5
MCPB[2,4]	0.25	75.0	86.3	0.0	0.0	21780.0	104.6
MCPB[2,4]	0.5	83.8	88.8	0.0	0.0	21134.1	67.0
MCPB[2,4]	0.75	92.5	92.5	6.8	0.0	21017.7	61.7
2,4-DB[3,4]	0.125	72.5	71.3	0.0	5.0	21126.6	77.4
2,4-DB[3,4]	0.25	86.3	78.8	2.5	5.0	22487.9	84.7
2,4-DB[3,4]	0.375	91.3	87.5	5.0	5.0	21017.7	65.9
MCPB[3,4]	0.25	91.3	90.0	0.0	0.0	21780.0	83.7
MCPB[3,4]	0.5	87.5	90.0	0.0	0.0	21997.8	93.1
MCPB[3,4]	0.75	92.5	91.3	6.0	0.0	22324.5	61.7
Weedy Check	----	0.0	0.0	0.0	0.0	21126.6	47.1
LSD		9.7	4.0	3.0	0.8	3857.0	41.8

[1]R-11 nonionic surfactant added at 0.25% v/v.
[2]Treatment applied on April 28, 1997.
[3]Treatment applied on May 12, 1997.
[4]Treatment applied on May 23, 1997.

Control of annual grasses and broadleaf weeds in sweet corn. Bill D. Brewster, Carol A. Mallory-Smith, and Paul E. Hendrickson. A trial was conducted at the Hyslop research farm near Corvallis, OR to evaluate herbicide treatments for the control of grasses and broadleaf weeds in sweet corn. 'Jubilee' sweet corn was seeded in 30-in-wide rows on May 13, 1997. The experimental design was a randomized complete block with four replications and 10-ft by 35-ft plots. Herbicides were applied with a single-wheel, compressed-air plot sprayer that delivered 20 gpa at 19 psi. Soil incorporation of the preplant treatments was accomplished with a Roterra field cultivator set at a depth of 2 in. The soil was a Woodburn silt loam with a pH of 5.6 and an organic matter content of 2.1%. Corn ears were harvested from 12 ft of each of the middle two rows in each plot on August 27, 1997. Some of the treatments and data are presented in the table.

Powell amaranth (AMAPO), hairy nightshade (SOLSA), common lambsquarters (CHEAL), and barnyardgrass (ECHCG) were adequately controlled by each of the treatments, but proso millet (PANMX) was more difficult to control. EPTC-diclormid followed by dimethenamid plus atrazine was the only treatment that provided complete control of proso millet. This treatment and metolachlor-benoxacor followed by dimethenamid plus atrazine produced the two highest corn yields in the trial. Dimethenamid followed by dicamba plus SAN 835H provided excellent weed control but injured the corn. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Corn injury, weed control, and corn ear yield following herbicide applications.

Treatment[1]	Rate	Timing[2]	Corn injury[3]	Weed control[3] AMAPO	SOLSA	CHEAL	ECHCG	PANMX	Corn yield
	lb/A		%						T/A
Dimethenamid + atrazine	1.17 + 1.34	PPI	0	96	93	86	99	10	6.4
Metolachlor-benoxacor + atrazine	1.95 + 1.59	PPI	3	100	100	100	100	53	7.4
EPTC-diclormid + dimethenamid + atrazine	4.0 + 1.17 + 1.34	PPI PES	10	100	100	100	100	100	10.8
Metolachlor-benoxacor + dimethenamid + atrazine	1.95 + 1.17 + 1.34	PES PPI	11	100	100	100	100	95	11.2
Dimethenamid + bentazon + atrazine	1.17 + 0.52 + 0.52	PPI EPOE	16	100	100	100	100	89	7.9
Metolachlor-benoxacor + bentazon + atrazine	1.95 + 0.52 + 0.52	PPI EPOE	8	100	100	100	100	35	7.6
Dimethenamid + dicamba + SAN 835H	1.17 + 0.125 + 0.05	PPI EPOE	24	100	100	100	100	96	7.3
Check	0		0	0	0	0	0	0	0.3
$LSD_{(0.05)}$				13	3	6	1	22	2.1

[1] Crop oil Crossfire added to EPOE treatments at 1 qt/A.
[2] PPI applied May 13, 1997; PES applied May 14, 1997; EPOE applied June 10, 1997 to 8- to 12-in-tall corn with 4 to 5 leaves, up to 2-in-tall broadleaf weeds, and up to 4-in-tall proso millet with 2 to 5 leaves.
[3] Visual evaluations July 14, 1997.

Postemergence weed control in sweet corn. Gary A. Lee and Brenda M. Waters. The objective of this experiment was to evaluate the effect of postemergence herbicides on weed species and sweet corn plants. Sweet corn (cultivar 'Casino') was planted on April 30, 1997 at a seeding rate of 43,500 plants/A and a depth of 2 in. on in 30-in. rows. The study was established at the Parma Research and Extension Center, Parma, Idaho on a Greenleaf-Owyhee Silt Loam soil (34% sand, 58% silt, 8% clay, 1.17% organic matter and 7.3 pH). The plots were arranged in a randomized complete block design with four replications, and each plot was 7 by 40 ft. The herbicide treatments were applied at three different stages of crop growth per application recommendations (Table 1). Herbicide applications were made May 12 when corn was in the 'spike' stage or 1 in. tall, May 23 when corn was 4 to 6 leaf-stage or 8 in. tall and May 28 when corn was 5 to 6 leaf-stage or 10 in. tall. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance were visually evaluated on June 5, 1997. The trial was terminated on July 9, 1997.

Table 1. Application information.

	May 12	May 23	May 28
Crop stage	Spike	4-6 lf	5-6 lf
Weed stage	Preemerge	SOLSA 6-8 lf; KCHSC 1-6 in.; ECHCG 1-3 in.; SONOL 5 lf; AMARE 1-2 in.	SOLSA 4-8 in.; KCHSC 6-1 in.; ECHCG 3-6 in.; SONOL 12 lf; AMARE 2-4 in.
Air temp. (F)	84.2	61.8	60.7
Relative humidity (%)	18	59	72
Wind (mph)	2	2	3
Sky (% cloud cover)	0	100	90
Soil temp. (F at 4 in.)	79	60	58
Soil moisture	Normal	Excessive	Normal
First significant rain fall after herbicide application.	0.12inch May 24	0.12 inch May 24	0.17 inch May 29

Pendimethalin + atrazine at 1.0 + 1.5 lb/A, pendimethalin + metolachlor + atrazine at 1.0 + 1.22 + 1.2 lb/A and pendimethalin + metolachlor at 1.0 + 0.91 lb/A controlled 96% or better of all annual broadleaf and grass weeds (Table 2). Metolachlor + prosulfuron at 1.22 + 0.018 lb/A and metolachlor + prosulfuron + CGA -248757 at 1.22 + 0.018 + 0.004 lb/A provided 90% or better control of the weed spectrum present. Halosulfuron at 0.042 and 0.084 did not control either broadleaf or grass species as a postemergence treatment. All herbicide treatments exhibited excellent crop safety. (Department of Plant, Soil and Entomological Sci., University of ID 83660-6699)

Table 2. Effect of postemergence herbicide on weed control and sweet corn injury.

Treatment	Rate	Weed Control SOLSA	AMARE	CHEAL	KCHSC	ECHCG	Corn Injury
	lb/A	----	----	%	----	----	----
Pendimethalin + atrazine	1.0 + 1.5	100.0	98.5	98.3	100.0	96.5	0.0
Pendimethalin + metolachlor + atrazine	1.0 + 1.22 + 1.2	100.0	100.0	100.0	100.0	97.3	0.0
Pendimethalin + metolachlor	1.0 + 0.913	100.0	100.0	100.0	99.5	97.3	0.0
Pendimethalin + alachlor	1.0 + 2.0	82.5	82.5	81.3	88.8	92.5	0.0
Metolachlor + prosulfuron[1]	1.22 + 0.018	85.0	98.8	96.5	100.0	92.5	0.0
Metolachlor + prosulfuron[1]	1.22 + 0.018	90.0	99.5	96.5	100.0	95.8	0.0
Metolachlor + prosulfuron + CGA-248757[1]	1.22 + 0.018 + 0.004	90.0	91.3	92.5	95.8	90.0	0.0
Halosulfuron[2]	0.042	0.0	0.0	0.0	0.0	0.0	0.0
Halosulfuron[2]	0.084	0.0	0.0	0.0	0.0	0.0	0.0
Weedy check		0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		2.4	2.4	2.3	1.4	2.4	NS

[1]Crop Oil Concentrate added at 1.0% v/v.
[2]Latron Ag-98 nonionic surfactant added at 0.25% v/v.

Preemergence weed control in sweet corn. Gary A. Lee and Brenda M. Waters. A study was conducted at the Parma Research and Extension Center, Parma, Idaho to determine the effectiveness of preemergence herbicides for annual weed control and crop tolerance. The sweet corn (cultivar 'Casino') was planted on 30 in. rows at a seeding rate of 43500 plants/A at a depth of 2 in. on April 30, 1997. The preemergence herbicide treatments were applied on May 9, and the corn emerged on May 12. The plots were arranged in a randomized complete block design with four replications. Each plot was 2 rows by 40 ft. in length. The soil at the location is a Greenleaf-Owyhee Silt Loam (34% sand, 8% wilt, 58% clay, 1.17% organic matter and 7.3 pH), and the surface condition at the time of herbicide applications was dry, smooth (clods >1 in.) with no visible organic debris present. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance was visually evaluated July 5 (57 DAT). The study was terminated on July 9, 1997.

Table 1. Application information.

	May 9
Crop stage	Preemerge
Weed stage	SOLSA 2 lf; KCHSC 8-10 lf ros.; CYPES 2-4 in.; MALNE 2 lf; CHEAL 2-4 in.; ECHCG 1 in.
Air temp. (F)	66.2
Relative humidity (%)	35
Wind (mph)	4
Sky (% cloud cover)	0
Soil temp. (F at 4 in.)	69
Soil moisture	dry surface, good moisture at 1.5 in.

First significant rain fall after herbicide application was 0.12 inch on May 24, 1997.

Pendimethalin + atrazine at 1.0 + 1.5 lb/A, pendimethalin + alachlor at 1.0 + 2.0 lb/A and pendimethalin + metolachlor + atrazine at 1.0 + 1.22 + 2.4 lb/A controlled 95% or better of all annual broadleaf and grass weeds (Table 2). Pendimethalin at 1.5 lb/A was the only single herbicide treatments that controlled more than 90% of the yellow nutsedge (CYPES); however, the treatment did not provide acceptable control of kochia (KCHSC) or barnyardgrass (ECHCG). Metolachlor at 0.91 and 1.22 lb/A and dimethenamid at 1.5 lb/A provided similar control of yellow nutsedge and barnyardgrass, but metolachlor was more effective for control of redroot pigweed (AMARE), common lambsquarters (CHEAL) and kochia (KCHSH). Although this trial was not taken to yield, no visual herbicide injury was detectable on the corn plants from emergence until tasseling. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699).

Table 2. Effect of preemergence herbicide on weed control and sweet corn injury.

Treatment	Rate	Weed Control CYPES	AMARE	CHEAL	KCHSC	ECHCG	Corn Injury
	lb/A	---	---	---	%	---	---
Metolachlor	0.913	71.3	88.8	92.5	100.0	96.5	0.0
Metolachlor	1.22	71.3	90.0	95.8	100.0	95.8	0.0
Metolachlor + atrazine	0.913 + 1.2	85.0	87.5	95.8	95.8	97.3	0.0
Pendimethalin	1.5	92.5	91.3	63.8	90.0	78.8	0.0
Pendimethalin + atrazine	1.0 + 1.5	97.0	99.5	99.5	100.0	95.0	0.0
Pendimethalin + metolachlor	1.0 + 0.913	90.0	93.8	95.8	95.0	96.5	0.0
Pendimethalin + alachlor	1.0 + 2.0	95.8	96.5	98.5	100.0	95.0	0.0
Pendimethalin + metolachlor + atrazine	1.0 + 1.22 + 2.4	100.0	100.0	100.0	100.0	97.3	0.0
Dimethenamid	1.0	57.5	61.3	61.3	81.3	91.3	0.0
Dimethenamid	1.5	70.0	72.5	72.5	87.5	95.8	0.0
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		3.9	3.9	3.0	3.1	3.0	NS

Proso millet control in sweet corn. Gary A. Lee and Brenda M. Waters. A study was conducted in Canyon County, near Caldwell, Idaho to evaluate postemergence herbicide treatments for control of proso millet (PANMI) in sweet corn grown for seed stocks. A proprietary variety of sweet corn was planted May 10, 1997 at a population of 45,000 plants/A at a depth of 2 in. on 36 in. row spacing. The crop emerged approximately May 16 and was in the 3 to 7 leaf stage (4 to 12 in. tall) at the time of herbicide applications on June 9, 1997 (Table 1). The soil at the site is a Purdom Silt Loam (36% sand, 56% silt, 8% clay, 1.3% organic matter and 7.9 pH). The experiment was arranged in a randomized complete block design with four replications and individual plots were 10 by 40 ft. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi.

Table 1. Application information

Crop stage	3-7 lf; 4-12 in.
Weed stage	3-8 tiller; 3-10 in.
Air temp. (F)	84
Relative humidity (%)	28
Wind (mph)	4
Sky (% cloud cover)	75
Soil temp. (F at 4 in.)	78
Soil moisture	dry surface, adequate moisture at 1 in.

First significant rainfall after herbicide application was 0.35 in. on June 12, 1997.

Visual evaluations of weed control and crop injury were made on July 24, 1997 (Table 2). Rimsulfuron/thifensulfuron + SOL32 + COC at 0.022 lb/A + 11% v/v + 3% v/v, rimsulfuron/thifensulfuron + dicamba/atrazine + SOL32 + COC at 0.022 + 0.56 lb/A + 11% v/v + 3% v/v, rimsulfuron/thifensulfuron + atrazine + SOL32 + COC at 0.022 + 1.06 lb/A + 11% v/v + 3% v/v, halosulfuron + NIS at 0.118 lb/A + 0.7% v/v and dimethenamid + halosulfuron + NIS at 1.4 + 0.059 lb/A + 0.7% v/v gave 100% control of the proso millet population without visible damage to the sweet corn crop. Dimethenamid + NIS at 2.1 lb/A + 0.7% v/v did not control the target weed species. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicides on control of proso millet and sweet corn injury.

Treatment	Rate	PANMI Control	ZEAMS Injury
	lb/A	%	%
Rimsulfuron/thifensulfuron[1,2]	0.022	100.0	0.0
Rimsulfuron/thifensulfuron + dicamba/atrazine[1,2]	0.022 + 0.56	100.0	0.0
Rimsulfuron/thifensulfuron + atrazine[1,2]	0.022 + 1.06	100.0	0.0
Halosulfuron[1,2]	0.059	96.5	0.0
Halosulfuron[3]	0.118	100.0	0.0
Dimethenamid + halosulfuron[3]	1.4 + 0.059	100.0	0.0
Dimethenamid[3]	2.1	0.0	0.0
Rimsulfuron/thifensulfuron + halosulfuron[1,2]	0.022 + 0.059	97.0	0.0
Handweeded check	----	100.0	0.0
Weedy check	----	0.0	0.0
LSD (0.05)		1.4	NS

[1]Crop Oil Concentrate added at 3% v/v.
[2]SOL 32 (32% Nitrogen Solution) added at 11% v/v.
[3]Latron AG-98 nonionic surfactant added at 0.7% v/v.

Yellow nutsedge control in sweet corn. Gary A. Lee and Brenda M. Waters. A trial was established at the Parma Research and Extension Center, Parma, Idaho to determine the effectiveness of postemergence herbicide treatments for the control of yellow nutsedge (CYPES) in sweet corn. The sweet corn (cultivar 'Casino') was direct drilled April 30, 1997 at a population of 43,500 plants/A and at a depth of 2 in. on a row spacing of 30 in. The crop emerged approximately on May 17 and was in the 4 to 5 leaf (5 to 8 in. tall) and 10 leaf (20 in. tall) on May 28 and June 15, respectively, when herbicide treatments were applied (Table 1). The location is a Greenleaf-Owyhee Silt Loam soil (36.4% sand, 55.6% silt, 8.0% clay, 1.3% organic matter and 7.9 pH). The experiment was arranged in a randomized complete block design with four replications, and individual plots were 10 by 30 ft. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi.

Table 1. Application information

	May 28	June 15
Crop stage	4-5 lf; 5-8 in. tall	10 lf; 20 in. tall
Weed stage	10-12 lf; 5-6 in. tall	14 lf; 8 in. tall
Air temp. (F)	60	80
Relative humidity (%)	78	45
Wind (mph)	3	3
Sky (% cloud cover)	70	10
Soil temp. (F at 4 in.)	58	73
Soil moisture	dry surface, good moisture at 1.0 in.	

First significant rainfall after herbicide application was 0.17 in. on May 29 and 0.15 in. on June 18, 1997.

Applications of bentazon + NIS at 1.4 lb/A + 0.7% v/v followed by same rate 18 days later resulted in significantly better yellow nutsedge control (Table 2). Halosulfuron + NIS at 0.118 lb/A + 0.7% v/v provided the same level of yellow nutsedge control as a split application of the same total active ingredient. Bentazon + halosulfuron + NIS at 1.05 + 0.059 lb/A + 0.7% v/v controlled 94% of the target weed species. The split application of halosulfuron + NIS at 0.059 lb/A + 0.7% v/v caused significant injury to the sweet corn plants compared to a single application. The competitive influence of yellow nutsedge reduced the size and vigor of the sweet corn plants over 50% at the time of evaluation. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicides on yellow nutsedge and crop injury.

Treatment		Rate		CYPES	ZEAMS
May 28	June 15	May 28	June 15	Control	Injury
		lb/A		-------- % --------	
Bentazon[1]	Bentazon[1]	1.4		70.0	0.0
Bentazon[1]		1.4 + 1.4		95.8	0.0
Bentazon[1] + halosulfuron[1]		1.05 + 0.059		93.8	0.0
Halosulfuron[1]		0.118		96.5	0.0
Halosulfuron[1]	Halosulfuron[1]	0.059	0.059	95.8	32.5
Weedy check		----		0.0	52.5
LSD (0.05)				5.6	23.8

[1]Latron AG-98 added at 0.7% v/v.

Sweet corn herbicide weed control. Kai Umeda, Gonen Gal, and Brent Strickland. A small plot field test was conducted at the University of Arizona Maricopa Agricultural Center, Maricopa, AZ. Sweet corn cv. Sugar Ace was planted in a single row on conventional 40-inch beds on 04 March 1997. Plots measured two beds by 40 ft and treatments were replicated three times. Treatments were applied using a hand-held boom with four flat fan 8002 nozzle tips spaced 20 inches apart. The treatments were sprayed with a backpack CO_2 sprayer pressurized to 40 psi and delivering 25 gpa water. Preemergence (PREE) treatments were applied on 05 March when the air temperature was 75F, the sky was clear, and the soil was dry. Irrigation water was applied immediately after herbicide application in the furrows and the wetting front completely wetted across the beds. Postemergence (POST) treatments were applied on 07 April when the sweet corn was at the 6-leaf stage of growth. Weeds present were *Amaranthus* sp. (pigweeds) at the 4- to 8-leaf stage, *Chenopodium album* (lambsquarters) at the 4- to 6-leaf stage, and *Portulaca oleracea* (common purslane) at the 10-leaf stage. The air temperature was 74F, the sky was clear, and there was no wind at the time of POST herbicide applications. Visual weed control and crop injury was evaluated at intervals after applications and sweet corn yields were evaluated at the end of the season.

Combinations of PREE herbicide applications followed by POST applications provided very good weed control of pigweeds, lambsquarters, and common purslane at most of the rating dates. Metolachlor, thiafluamide/metribuzin mixture, and prosulfuron/primisulfuron mixture treatments were marginally effective against lambsquarters. Treatments applied alone that gave good weed control were pendimethalin applied PREE and bentazon applied POST. Pendimethalin followed by POST treatments, and bentazon following metolachlor or thiafluamide/metribuzin gave season-long near complete weed control. Prosulfuron/primisulfuron treatments caused nearly unacceptable corn injury at the early rating date after application. Sweet corn yields were numerically higher for weights and numbers of marketable ears in plots where weed control was improved by herbicide treatments.

Table 1. Sweet corn herbicide weed control.

Treatment	Rate	Timing	Weed Control AMARA 31 Mar	AMARA 16 Apr	AMAAL 29 Apr	AMABL 29 Apr	CHEAL 31 Mar	CHEAL 16 Apr	CHEAL 29 Apr	POROL 31 Mar	POROL 16 Apr	POROL 29 Apr
	(lb AI/A)		--------	--------	--------	--------	--------	%	--------	--------	--------	--------
Untreated			0	0	0	0	0	0	0	0	0	0
Pendimethalin	1.0	PREE	90	82	87	98	90	98	88	95	92	92
Metolachlor	1.5	PREE	83	80	85	88	80	88	68	88	83	83
Thiafluamide/metribuzin	0.55	PREE	82	82	88	88	90	88	80	90	96	96
Bentazon	1.0	POST		92	83	93		93	98		99	99
Dicamba	0.5	POST		83	88	85		85	83		83	83
Prosulfuron/primisulfuron	0.06	POST		77	83	83		83	50		82	82
Pendimethalin +	1.0 +	PREE		99	99	99		99	99		99	99
Bentazon	1.0	POST										
Pendimethalin +	1.0 +	PREE		95	99	99		99	98		99	99
Dicamba	0.5	POST										
Pendimethalin +	1.0 +	PREE		92	98	96		96	93		98	98
Prosulfuron/primisulfuron	0.06	POST										
Metolachlor +	1.5 +	PREE		96	93	99		99	99		99	99
Bentazon	1.0	POST										
Metolachlor +	1.5 +	PREE		87	93	91		91	85		94	94
Dicamba	0.5	POST										
Metolachlor +	1.5 +	PREE		87	92	93		93	85		91	91
Prosulfuron/primisulfuron	0.06	POST										
Thiafluamide/metribuzin +	0.55	PREE		95	95	99		99	99		99	99
Bentazon	1.0	POST										
Thiafluamide/metribuzin +	0.55	PREE		90	93	90		90	93		94	94
Dicamba	0.5	POST										
Thiafluamide/metribuzin +	0.55	PREE		88	88	95		95	83		94	94
Prosulfuron/primisulfuron	0.06	POST										
LSD (p=0.05)			6.9	5.7	6.3	4.3	0	8.1	9.8	4.6	8.8	2.5

PREE herbicide treatments applied on 05 March 1997 and POST herbicide treatments applied on 07 April 1997.

Table 2. Sweet corn herbicide weed control.

Treatment	Rate	Timing	Sweet Corn Crop injury 31 Mar	16 Apr	29 Apr	Wt./plot	Yield Mktble	Immature
	(lb AI/A)		----------%	----------		lb.	No./plot	
Untreated			0	0	0	7.0	5	14
Pendimethalin	1.0	PREE	0	0	0	8.4	8	12
Metolachlor	1.5	PREE	0	0	0	7.0	8	9
Thiafluamide/metribuzin	0.55	PREE	0	0	0	7.0	2	17
Bentazon	1.0	POST		0	0	9.2	10	11
Dicamba	0.5	POST		0	0	8.2	13	10
Prosulfuron/primisulfuron	0.06	POST		15	7	7.2	10	10
Pendimethalin +	1.0 +	PREE		0	0	8.8	10	13
Bentazon	1.0	POST						
Pendimethalin +	1.0 +	PREE		0	0	9.4	9	16
Dicamba	0.5	POST						
Pendimethalin +	1.0 +	PREE		15	5	8.1	10	9
Prosulfuron/primisulfuron	0.06	POST						
Metolachlor +	1.5 +	PREE		0	0	8.2	11	9
Bentazon	1.0	POST						
Metolachlor +	1.5 +	PREE		0	0	8.3	12	10
Dicamba	0.5	POST						
Metolachlor +	1.5 +	PREE		8	8	6.9	9	8
Prosulfuron/primisulfuron	0.06	POST						
Thiafluamide/metribuzin +	0.55	PREE		0	0	7.7	9	11
Bentazon	1.0	POST						
Thiafluamide/metribuzin +	0.55	PREE		0	0	8.8	6	15
Dicamba	0.5	POST						
Thiafluamide/metribuzin +	0.55	PREE		15	13	7.7	6	13
Prosulfuron/primisulfuron	0.06	POST						
LSD (p=0.05)			0	0	3.3	1.8	4.7	6.8

PREE herbicide treatments applied on 05 March 1997 and POST herbicide treatments applied on 07 April 1997.

Carfentrazone-ethyl herbicide for caneburning in red raspberry and Marion blackberry. Diane Kaufman and Ray D.William. The removal of early primocane growth and lower foliage from fruiting canes enhances production of machine-harvested red raspberries and Marion blackberries. The loss of dinoseb in the early 1990's necessitated the search for alternative practices. Oxyfluorfen has provided inadequate suppression of primocanes in Marion blackberry, and there is concern among growers that repeated use has reduced plant vigor in red raspberry. Unlike oxyfluorfen, which can remain active in the soil for several weeks, carfentrazone-ethyl is a contact herbicide with no soil activity. This research was conducted in two commercial fields in the Portland area and at the North Willamette Research and Extension Center to evaluate the effectiveness of carfentrazone-ethyl for caneburning in two varieties of red raspberry ('Meeker' and 'Willamette') and Marion blackberry.

Each experiment was randomized in a complete block design with four replications. Treatments were applied with a CO_2-pressured backpack sprayer, mounted with a single 8004 nozzle set at 40 psi. Rates were applied at the equivalent of 50 gals of water per acre and included the addition of 0.25% surfactant on a volume basis. Red raspberries were treated one time in late April, 1997. Marion blackberries were treated two or three times between May and early June.

Marion blackberry: Carfentrazone-ethyl applied two or three times at rates of 0.05, 0.1, or 0.2 lb active ingredient/A was compared to Goal applied twice at a rate of 2 pt material/A. At all rates and timings, carfentrazone provided more uniform and thorough suppression of primocanes than Goal, with no apparent damage to fruiting canes or plant vigor. There was no difference in yield among treatments or in the number of primocanes produced in 1997. There were significantly fewer broken primocanes at the end of the season in any carfentrazone treatment than in Goal or control plots.

Red raspberry: 'Meeker': Carfentrazone applied at rates of 0.05, 0.1 and 0.2 lb active ingredient/A was compared to Goal applied at 0.5 pt material/A, hand removal, brushing of primocanes twice a week, and an untreated control. At all rates, carfentrazone provided more uniform and thorough suppression of primocanes than Goal, with no apparent damage to fruiting canes or plant vigor. Yield was similar across treatments. There was no difference in the number of primocanes produced in 1997.

Red raspberry: 'Willamette': Because this variety has proven more susceptible to damage from Goal than 'Meeker', carfentrazone treatments were expanded to include lower rates. Carfentrazone applied at the following rates: 0.01, 0.02, 0.04, 0.05, 0.1, and 0.2 lb active ingredient/A was compared to Goal applied at 0.33 pt material/A, hand removal, and an untreated control. At all rates, carfentrazone provided better suppression of both primocanes and lower buds on fruiting canes than Goal, with no apparent damage to fruiting canes or plant vigor. There was no difference in yield across treatments.

Based on these preliminary results, in 1998 we will apply carfentrazone-ethyl to 'Meeker' red raspberry at rates of 0.025, 0.05, 0.1, and 0.2 lb active ingredient/A and to 'Willamette' red raspberry at rates of 0.025, 0.05, and 0.1 lb active ingredient/A. We hope to continue this research for at least two more years to evaluate the effect of repeated use of carfentrazone-ethyl on plant vigor over time.

A pre-transplant incorporated weed control trial in processing tomatoes. Robert J. Mullen, Ted Viss, and Scott Whitely. A pre-transplant trial, soil incorporating six herbicide treatments, was established in processing tomatoes at K & H Farms south of Tracy, California on May 12, 1997. All treatments were applied to the soil surface of the beds using a handheld CO_2 backpack sprayer with 8002 nozzles at 40 psi in a spray volume of 30 gal/a water The treatments were then incorporated into the soil 2.5 inches deep using a tractor-pulled Performer rotary tiller. The soil type of the trial field was a Sorrento clay and the tomato variety transplanted the day following herbicide treatment was Heinz 9553. A furrow irrigation was applied within 24 hours of transplanting. There were four replications of each treatment in a randomized complete block design. Individual plots were single 60-inch beds measuring 40 feet in length.

An evaluation of weed control efficacy and crop injury was made on June 5, 1997 and again on June 12, 1997. Best overall weed control of black nightshade (SOLNI) and hairy nightshade (SOLSA), common fiddleneck (AMSIN), and shepherd's purse (CAPBP) was achieved by rimsulfuron at 0.5 oz/A. The remaining treatments of metolachlor, dimethenamid, FOE-5043 and a combination of pebulate plus trifluralin also gave good to excellent control of the weed species present. All treatments proved very safe to the tomato crop. The trial was harvested on August 28, 1997 and all treatments, most of them significantly, outyielded the untreated control. The rimsulfuron treatment gave the highest yield at 52.4 tons/A. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205).

Table. Pre-transplant incorporated weed control in processing tomatoes.

Herbicide	Rate lb or oz/A	Weed Control[1] SOLNI/SOLSA 6/5	6/12	AMSIN 6/5	6/12	CAPBP 6/5	6/12	Tomato Injury[1] 6/5	6/12	Tomato Yield
		%						%		T/A
Pebulate + trifluralin	6.0 lbs + 0.5 lb	85	80	100	93	100	84	5	11	47.6
Metolachlor	2.5 lbs	90	83	88	80	100	93	5	10	45.8
FOE-5043	0.9 lb	78	79	100	89	100	90	5	10	46.5
Rimsulfuron	0.5 oz	88	89	100	100	100	95	5	10	52.4
Dimethenamid	0.75 lb	81	80	100	79	100	80	5	14	47.8
Untreated Control	----	30	23	33	28	40	25	5	12	40.0
									LSD @ 5%:	6.6
									CV =	9.4%

[1] 0 = no weed control, no crop injury
100 = complete weed control, crop dead

A processing tomato layby incorporated weed control trial. Robert J. Mullen, Ted Viss, and Scott Whitely. A layby incorporated weed control trial in processing tomatoes was established at Marca Bella Farms northwest of Tracy, California on May 27, 1997. All treatments were applied as directed sprays to the surface of the beds using a handheld CO_2 backpack sprayer with 8002 nozzles at 40 psi in a spray volume of 30 gal/a water. The treatments were then soil incorporated 3 inches deep with the grower's power driven rotary tiller. Growth stage of the crop at the time of treatment had a stand that averaged 5 to 8 inches tall on a double row bed. The soil type at the trial site was a Burns clay loam and the tomato variety was Heinz 8892. The field was furrow irrigated 5 days after herbicide treatment. There were four replications of each treatment in a randomized complete block design. Individual plots were single 66-inch beds measuring 40 feet in length.

An evaluation of weed control efficacy and crop injury was made on June 18, 1997. All treatments gave good to excellent control of hairy nightshade (SOLSA), barnyardgrass (ECHCG), and smooth crabgrass (DIGIS), led by dimethenamid at 0.75 lb/A and followed by metolachlor at 2.5 lbs/A, and the combination treatment of pebulate plus trifluralin at 6.0 lbs/A plus 0.5 lb/A. Rimsulfuron at 0.5 oz/A gave the best nightshade control. All treatments exhibited excellent crop safety. The trial was harvested on August 14, 1995 and all treatments outyielded the untreated control, with the rimsulfuron and dimethanamid treatments giving significantly greater yields. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205).

Table. Layby incorporated preemergence weed control in processing tomatoes.

Herbicide	Rate lb or oz/A	Weed Control[1] SOLSA	ECHCG	DIGIS	Tomato[1] Injury	Tomato Yield
		----	%	----	---- % ----	T/A
Pebulate + trifluralin	6.0 lbs + 0.5 lb	88	84	93	5	35.7
Metolachlor	2.5 lbs	90	86	90	5	37.0
FOE-5043	0.9 lb	81	86	93	5	35.3
Rimsulfuron	0.5 oz	94	80	88	5	44.2
Dimethenamid	0.75 lb	90	88	90	5	42.4
Untreated Control	-----	0	0	0	5	31.8
					LSD @ 5%:	6.5
					CV =	11.4%

[1] 0 = no weed control, no crop injury
100 = complete weed control, crop dead

A processing tomato postemergence weed control trial. Robert J. Mullen, Ted Viss and Scott Whitely. A postemergence weed control trial in processing tomatoes, seeking to control black nightshade (SOLNI), was established at OPC Farms east of Tracy, California on June 16, 1997. Four different adjuvants (X-77, crop oil concentrate, SCOIL and SILWET) added to three different rates of rimsulfuron were compared. Metribuzin, alone and in combination with rimsulfuron plus crop oil concentrate was also evaluated. All treatments were applied over the tomato crop and black nightshade using a handheld CO_2 backpack sprayer with 8002 nozzles at 40 psi in a spray volume of 30 gal/a water. At the time of treatment the black nightshade and tomatoes were at colyledon to first true leaf stage of growth. The soil type at the trial location was a Sorrento clay and the tomato variety was Heinz 8892. There were four replications of each treatment in a randomized complete block design. Individual plots were single 60-inch beds measuring 40 feet in length.

Weed control efficacy and crop injury evaluations were made on June 24, 1997. Control of black nightshade with rimsulfuron was good to excellent regardless of what adjuvant was used. Metribuzin alone was only partially effective on black nightshade, while the combination of metribuzin plus rimsulfuron plus crop oil concentrate gave very good control. In terms of crop safety, minor growth suppression increased with all adjuvants as the rate of rimsulfuron increased from 0.25 oz/A to 0.5 oz/A. However, SILWET appeared to show a higher rate of crop injury as the rate of rimsulfuron increased. Metribuzin was very safe to the crop. The trial was harvested on September 25, 1995 and there was no significant difference in yield with any of the treatments, including the untreated control. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205).

Table. A postemergence black nightshade (SOLNI) weed control trial in processing tomatoes.

Herbicide[2]	Rate oz or lb/A	Weed Control[1] SOLNI	Tomato[1] Injury	Tomato Yield
		----- % ----	--- % --	T/A
Rimsulfuron + X77	0.25 oz	87	18	26.8
Rimsulfuron + COC	0.25 oz	79	13	27.7
Rimsulfuron + SCOIL	0.25 oz	80	13	27.6
Rimsulfuron + SILWET	0.25 oz	84	20	26.4
Rimsulfuron + X77	0.375 oz	87	19	25.6
Rimsulfuron + COC	0.375 oz	84	18	29.0
Rimsulfuron + SCOIL	0.375 oz	81	18	28.6
Rimsulfuron + SILWET	0.375 oz	89	24	28.1
Rimsulfuron + X77	0.5 oz	86	20	27.3
Rimsulfuron + COC	0.5 oz	84	19	25.6
Rimsulfuron + SCOIL	0.5 oz	90	24	25.1
Rimsulfuron + SILWET	0.5 oz	89	30	27.5
Metribuzin	0.25 lb	63	8	31.5
Rimsulfuron + Metribuzin + COC	0.5 oz + 0.125	85	17	30.4
Untreated Control	---------	10	9	27.9
			LSD @ 5%:	n.s.
			CV =	12.2%

[1] 0 = no weed control, no crop injury
10 = complete weed control, crop dead
[2] Rimsulfuron treatments had X-77, COC (crop oil concentrate), SCOIL and SILWET applied at 0.2 % (V/V)

Pre/Post-emergence weed control in direct seeded processing tomatoes. Robert J. Mullen, Ted Viss, and Scott Whitely. A pre/post-emergence weed control trial in direct seeded processing tomatoes was established at Vaquero-Farms near Byron, California. On March 20, 1997, the grower applied metam-sodium, as a subsurface layered treatment, to one-half of the trial area. Emerged field bindweed (CONAR) was treated with glyphosate at 1.0 lb/A plus X-77 prior to field seeding on March 29, 1997 and proved to be ineffective. The trial was seeded to the variety CXD 181 on April 1, 1997 and the soil type of the field was a Brentwood clay. The remaining pre-emergence treatments were made postplant on April 4, 1997, using a handheld CO_2 backpack sprayer with 8002 nozzles at 40 psi in a spray volume of 30 gal/a water. These treatments were then soil incorporated into the bed using sprinklers three days later. Post-emergence applications of rimsulfuron plus crop oil concentrate and one treatment of metribuzin were made on April 28, 1997. There were four replications of each treatment in the trial using a randomized complete block design. Individual plots were single 60-inch beds measuring 40 feet in length.

An evaluation of weed control efficacy and crop injury for the pre-emergence treatments took place on April 28, 1997. Weeds present included cotyledon to early second true leaf black nightshade (SOLNI) and hairy nightshade (SOLSA), first to late second true leaf volunteer tomatoes, first to second true leaf redroot pigweed (AMARE), and cotyledon to first true leaf field bindweed. Some larger field bindweed (5 to 6 inch rosette) was present due to the lack of success of the glyphosate treatment made earlier. Tomato crop growth stage was at late first to late second true leaf. None of the pre-emergence treatments gave control of field bindweed. Where metam-sodium was used there was partial to moderate control of volunteer tomatoes. Only slight activity was observed with the other treatments on volunteer tomatoes. Best control of the remaining weed species was attained by the combination treatments of rimsulfuron plus dimethenamid, metam-sodium plus rimsulfuron, rimsulfuron plus napropamide, and rimsulfuron alone. Crop safety was good with all treatments, except for the combination treatments of rimsulfuron plus dimethenamid where some crop vigor and stand reduction occurred–in particular with the high rate treatment.

Weed control and crop injury ratings were again taken on May 5, 1997. Post-emergence treatments involving rimsulfuron or metribuzin did not provide control of seedling field bindweed or volunteer tomatoes. Control of black nightshade, hairy nightshade, and redroot pigweed was good to excellent with rimsulfuron plus crop oil concentrate, while metribuzin also showed good activity on these weed species. Most of the pre-emergence treatments were still providing good control of the nightshades and redroot pigweed. Crop injury was minimal for all treatments on May 5, 1997.

Yields were taken on August 18, 1997 and all of the treatments, five of them significantly, outproduced the untreated control. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205).

Table. Pre/Postemergence weed control in direct seeded processing tomatoes.

Herbicide	Rate lb or oz/A	Application Timing	Weed Control[1] SOLNI/SOLSA 4/28	SOLNI/SOLSA 5/5	AMARE 4/28	AMARE 5/5	CONAR 4/28	CONAR 5/5	Volunteer Tomatoes 4/8	Volunteer Tomatoes 5/5	Tomato[1] Injury 4/8	Tomato Injury 5/5	Tomato Yield
			%								%		T/A
Metam-Sodium + rimsulfuron	48 lbs + 0.375 oz	Pre	85	80	91	89	18	16	60	39	15	11	59.4
Metam-Sodium + rimsulfuron	48 lbs + 0.5 oz	Pre	91	86	93	90	23	23	68	50	10	10	58.9
Metam-Sodium + rimsulfuron*	48 lbs + 0.25 oz	Pre + Post	55	81	80	91	15	15	61	43	11	11	56.6
Metam-Sodium + rimsulfuron*	48 lbs + 0.375 oz	Pre + Post	57	87	81	92	13	19	65	48	9	12	60.8
Metam-Sodium + rimsulfuron*	48 lbs + 0.5 oz	Pre + Post	60	91	81	94	15	19	61	49	10	14	56.4
Metam-Sodium + metribuzin*	48 lbs + 0.25 lb	Pre + Post	57	79	79	88	18	13	61	43	10	11	62.9
Rimsulfuron	0.375 oz	Pre	83	79	91	89	19	14	13	11	12	10	63.9
Rimsulfuron	0.5 oz	Pre	90	86	95	93	26	25	14	13	10	10	55.9
Rimsulfuron + dimethenamid	0.375 oz + 0.375 lb	Pre	91	89	98	96	31	29	26	21	25	16	61.3
Rimsulfuron + dimethenamid	0.5 oz + 0.5 lb	Pre	95	94	100	99	41	33	34	30	34	22	61.8
Rimsulfuron + napropamide	0.5 oz + 2.0 lb	Pre	89	86	94	93	18	18	12	11	11	10	54.8
Untreated Control	-----	-----	0	0	0	0	0	0	0	0	16	14	48.6
											LSD @ 5%:		11.8
											CV =		14%

[1] 0 = no weed control, no crop injury
100 = complete weed control, crop dead
[2] Rimsulfuron applied postemergence had crop oil concentrate added a 0.25% (V,V)
* Rimsulfuron and metribuzin were applied as postemergence treatments on April 28 and evaluated on May 5

Screening vegetables for tolerance to preemergence and postemergence herbicides. Robert B. McReynolds, Gideon Abraham, Daniel L. Kunkel and Edith L. Lurvey. This project was designed as a preliminary screen of vegetable tolerance to herbicides for which there is currently little data. Fourteen herbicides were applied as either preemergence or postemergence treatments to twenty different vegetables seeded on June 10, 1997 in a field trial located at the North Willamette Research and Extension Center in western Oregon. Plot design was randomized complete block with four replications. Treatments were applied across vegetable lines to plots 7 by 35 ft with a CO_2 backpack sprayer delivering 38 to 40 gpa at 38 psi. Preemergence treatments were applied broadcast on June 11, (air temp. 55F, relative humidity 89%, wind SW 2 to 4 mph, sky 100% cloudy, soil temp. – 2 inch 57F) to a Woodburn Silt Loam soil. Rainfall recorded following the applications by the NOAA Station #356151-2 located at Aurora was 0.25 inches. Postemergence treatments were applied over the top on July 2, except for flumiclorac and imazamox which were applied the following day (July 2, air temp. 72F, relative humidity 60%, wind still, sky clear, soil temp. – 2 inch 81F and July 3, air temp. 69F, relative humidity 61%, wind still, sky clear, soil temp. – 2 inch 68F). The trial was sprinkler irrigated with 0.5 inches of water in the evening of July 3. The herbicide rates and application times are listed in Table 1. Crop tolerance to the preemergence treatments was evaluated on June 19 by counting emerged seedling in a 2-ft section of row for each vegetable line (Table 2.). On July 23, plant biomass weights for the above ground portion from 2-ft sections of each vegetable line for each treatment were recorded to determine the effects of the herbicides on plant growth in comparison to the untreated control after 44 days of growth. Those results are listed in Table 3. The untreated is listed as lb/2 ft of row and the other treatments are expressed as the percentage yield of the untreated.

The herbicide rates used in the trial were based upon those tested in other commodities. Some herbicides were non-selective for these vegetables. Many other treatments resulted in reduced plant biomass and may indicate that the rates were too high. It is also possible that some vegetable lines might have recovered if they had been left to harvest maturity. Vegetables within the same crop groups (Brassica, Chenopodiceae, Cucurbitaceae, and Umbelliferae) expressed different degrees of tolerance to the same herbicides. The cucurbit group exhibited the broadest range of tolerance to all herbicides. In general, most vegetable lines were more tolerant of dimethenamid applied postemergence than preemergence. Seedling emergence in the isoxaflutole, halosulfuron, and rimsulfuron preemergence treatments was nearly as good as in the untreated nine days after seeding. But later the seedlings died, which is reflected by the absence of biomass for many vegetables in those treatments (Table 3.). Azefenadin was the most selective preemergence treatment and flumiclorac, a grass herbicide, exhibited the greatest selectivity postemergence. (Seedling emergence and biomass results were not statistically analyzed, but represent the treatment means for the 4 replications.) (North Willamette Research and Extension Center, Oregon State University, Aurora, OR 97002 and IR-4 Project, Rutgers University, New Brunswick, NJ 08903)

Table 1. Treatment rates of preemergence and postemergence herbicides, NWREC, 1997.

Preemergence Treatments	Rate	Postemergence Treatments	Rate
	lb/a		lb/a
Untreated		Thiazopyr	0.25
Handweeded		Triflusulfuron	0.016
Azefenidin	0.025	Imazamox	0.04
Isoxaflutole	0.063	Prosulfuron	0.013
Rimsulfuron	0.016	Rimsulfuron	0.016
Sulfentrazone	0.19	CGA-24857	0.0045
Fluamide	0.25	Oxasulfuron	0.7
Halosulfuron	0.05	Flumiclorac	0.036
Dimethenamid	1	Dimethenamid	0.5

Table 2. Herbicide/Vegetable Phytotoxicity Screen, Seedling Emergence 10 Days After Planting, Preemergence Treatments, NWREC 1997[a]

Vegetable Variety	Untreated	Handweeded	Azafenadin	Rimsulfuron	Isoxaflutole	Fluamide	Sulfentrazone	Halosulfuron	Dimethenamid
Winter Squash Golden Delicious	4.5	51	84	73	89	56	62	56	56
Zucchini Elite	6.3	95	85	56	44	88	83	60	84
Cucumber Panther	14.3	138	98	108	125	129	105	115	101
Cabbage Heads Up	10.5	103	95	70	105	94	95	79	81
Cauliflower Snowball Y	33.5	102	110	81	106	73	55	30	70
Kale Darkisor	22.5	86	78	29	89	88	84	44	64
Rutabaga Laurentian	18.3	137	101	97	131	85	78	101	108
Turnip Purple Top	37.3	114	101	83	89	105	70	66	104
Mustard Green India Mustard	81.8	93	74	83	88	104	79	71	68
Napa Cabbage Chorus	42.3	110	113	76	108	98	102	62	80
Bok Choy Joi Choy	25.5	87	104	68	105	94	64	45	97
Radish Fuego	60.5	69	98	89	84	63	76	75	89
Swiss Chard Aceola Blanca	36.8	88	18	26	77	69	0	0.05	69
Spinach Baker	22.8	98	53	77	105	101	21	48	101
Cilantro Slobolt	2.0	200	50	100	350	190	0	0	50
Parsley Forest Green	0	0	0	0	0	0	0	0	0
Parsnip Harris Model	0	0	0	0	0	0	0	0	0
Leaf Lettuce Parris Island	38.8	104	41	89	128	72	57	61	35
Basil Italian	5.0	206	46	156	156	226	226	250	10
Green Onion Ishikura	41.0	121	67	44	83	87	73	4	45

[a] Count of emerged seelings per 2 feet of row. Untreated is listed as the mean of 4 replications and the treatments are expressed as a percentage of the untreated.

Table 3. Herbicide/Vegetable Phytotoxicity Screen, Plant Biomass Expressed as a Percentage of the Untreated 44 Days After Seeding, NWREC, 1997

Vegetable Variety	Untret[1] lb/2ft^2	Hand	Azefe PREE	Sulfen PREE	Isoxafl PREE	Halos PREE	Fluami PREE	Rimsul PREE	Rimsul POST	Dimeth PREE	Dimeth POST	Thiaz POST	Prosu POST	Oxasu POST	248757 POST	Triflus POST	Flumic POST	Imaza POST
Winter Squash G. Delicious	1.35	98	119	134	0	54	109	87	13	94	133	99	55	41	68	89	94	56
Zucchini Elite	1.74	124	116	26	0	35	127	52	37	137	82	105	39	41	113	62	121	78
Cucumber Panther	0.59	145	96	21	0	140	25	92	102	29	82	59	15	76	71	114	38	29
Cabbage Heads Up	0.84	95	123	73	0	0	38	0	6	22	50	35	1	13	39	93	66	2
Cauliflower Snowball Y	0.32	112	86	0	0	0	15	0	0	40	42	62	0	0	32	64	104	0
Kale Darkisor	0.47	105	85	65	0	0	41	0	6	68	58	65	0	0	20	93	119	0
Rutabaga Laurentian	0.78	116	87	83	0	0	11	0	0	60	79	71	0	0	21	63	145	44
Turnip Purple Top	1.63	107	134	101	1	0	105	13	0	90	75	76	0	0	54	88	125	37
Mustard Green India Mustard	1.44	88	85	76	0	0	35	0	0	35	71	71	0	0	87	47	132	2
Napa Cabbage Chorus	1.27	112	106	118	14	0	81	0	0	78	80	82	0	0	76	65	124	11
Bok Choy Joi Choy	2.32	117	107	0	2	0	49	0	0	40	44	72	0	0	16	53	122	24
Radish Fuego	2.00	104	111	84	24	0	121	23	0	105	77	78	0	0	103	48	116	6
Swiss Chard Aceola Blanca	0.63	100	19	0	0	0	9	7	33	62	55	59	0	0	19	135	35	0
Spinach Baker	0.24	136	26	0	0	0	59	12	0	98	90	95	0	0	83	129	23	0
Cilantro Slobolt	0.23	76	48	0	46	0	65	45	0	42	86	83	0	0	20	38	47	27
Parsley Forest Green	0.03	88	59	0	0	0	32	0	0	0	51	74	0	0	44	25	96	0
Parsnip Harris Model	4.50	72	44	0	0	0	39	0	0	0	22	50	0	0	17	0	61	0
Leaf Lettuce Parris Island	0.93	85	19	0	0	0	1	2	0	0	67	115	2	28	52	73	31	101
Basil Italian	0.14	106	19	22	0	9	0	5	0	0	44	4	0	2	22	79	52	0
Green Onion Ishikura	0.14	136	61	0	0	0	45	0	0	43	48	75	0	0	89	93	93	2

1 Untret=Untreated, Hand=Handweeded, Azefe=Azefenadin, Sulfen=Sulfentrazone, Isoxafl=Isoxaflutole, Halos=Halosulfuron, Fluami=Fluamide, Rimsul=Rimsulfuron, Dimeth=Dimethenamid, Thiaz=Thiazopyr, Pros=Prosulfuron, Oxasu=Oxasulfuron, 248757=CGA248757, Triflus=Triflusulfuron, Flumic=Flumiclorac, Imaza=Imazamox

Watermelon herbicide weed control. Kai Umeda, Gonen Gal, Brent Strickland. A small plot field study was conducted at the University of Arizona Maricopa Agricultural Center, Maricopa, AZ to evaluate and determine efficacy and safety of preemergence (PREE) and postemergence (POST) herbicide treatments on watermelon. Watermelon cv. Sangria was planted on 40-inch beds in a single line on every other bed on 19 March 1997. Furrow irrigation was applied in a single furrow on one side of the bed throughout the season. Treatment plots measured 3.3 ft by 40 ft and were replicated four times in a randomized complete block design. PREE treatments were applied immediately after planting and watered to completely wet across the beds immediately after herbicide applications. POST treatments were applied on 22 April when the air temperature was 88F, the sky was clear with an occasional slight breeze. Watermelon was at the 4-leaf stage of growth, *Chenopodium album* (lambsquarters) ranged from the 1- to 12-leaf stage, *Amaranthus blitoides* (prostrate pigweed) was at the 4- to 6-leaf stage, *A. albus* (tumble pigweed) was at the 3- to 4-leaf stage, and *Portulaca oleracea* (common purslane) was about 12-leaf stage of growth at the time of application. All treatments were applied using a hand-held boom equipped with two flat fan 8002 nozzle tips spaced 20 inches apart. A backpack CO_2 sprayer pressurized to 40 psi delivered the herbicides in water at 25 gpa. POST treatments included 0.25% v/v nonionic surfactant Latron CS-7. Visual weed control and crop safety evaluations were made at intervals after herbicide applications and watermelons were harvested at the end of the season in June 1997.

Bensulide, clomazone, sulfentrazone, and halosulfuron treatments applied PREE gave very good weed control of prostrate pigweed, lambsquarters, and common purslane at 5 weeks after treatment (WAT). Bentazon and halosulfuron applied POST alone were marginally effective at less than 85% against the pigweed species at 2 WAT and controlled lambsquarters and common purslane. POST treatments following PREE treatments were highly effective to control most weeds. Watermelon injury was acceptable for clomazone and halosulfuron treatments. Bentazon caused slight injury when applied POST on the watermelons. Carfentrazone was not effective against the weeds present in this test site and was safe on the crop. The greatest number of marketable watermelons were harvested from plots having treatments that provided effective weed control. Clomazone plus bensulide PREE followed by bentazon POST and bensulide PREE followed by halosulfuron POST treated watermelons yielded high numbers of marketable fruit.

Table. Watermelon herbicide weed control.

Treatment	Rate	Timing	Watermelon Crop Injury 22 Apr	Watermelon Crop Injury 06 May	Yield* Mktble.	Yield* Nonmkt.	Weed Control AMABL 22 Apr	AMABL 06 May	AMAAL 22 Apr	AMAAL 06 May	CHEAL 22 Apr	CHEAL 06 May	POROL 22 Apr	POROL 06 May
	(lb AI/A)		--------%	--------	No./10 ft		----------	----------	----------	--%	----------	----------	----------	----------
Untreated Check			0	0	2	8	0	0	0	0	0	0	0	0
Bensulide	6.0	PREE	0	0	3	7	88	80	86	69	95	86	98	96
Clomazone	0.5	PREE	11	5	2	6	90	81	89	70	99	96	99	95
Clomazone	0.75	PREE	11	0	2	8	91	90	90	70	97	98	99	97
Clomazone +	0.5 +	PREE	9	4	5	6	96	91	94	90	98	97	99	99
Bensulide +	6.0 +	PREE												
Bentazon	0.5	POST												
Sulfentrazone	0.25	PREE	3	4	2	8	96	89	91	81	97	94	89	94
Sulfentrazone	0.5	PREE	9	4	4	7	95	86	90	74	96	89	83	91
Carfentrazone	0.008	PREE	0	0	2	6	46	35	40	18	40	33	38	41
Carfentrazone	0.031	PREE	0	6	1	7	69	60	58	30	59	69	63	84
Halosulfuron	0.1	PREE	13	13	4	5	98	95	98	92	98	94	95	97
Bensulide +	6.0 +	PREE	0	14	4	5	94	94	92	88	98	98	99	98
Bentazon	0.5	POST												
Bensulide +	6.0 +	PREE	4	14	5	5	91	92	89	83	96	96	99	99
Halosulfuron	0.1	POST												
Clomazone +	0.5 +	PREE	9	16	3	6	89	91	88	86	96	97	99	99
Bentazon	0.5	POST												
Clomazone +	0.5 +	PREE	14	9	3	6	90	84	86	74	96	97	99	97
Halosulfuron	0.1	POST												
Bentazon	0.5	POST	0	9	2	6	0	83	0	68	0	97	0	95
Bentazon	0.75	POST	0	11	3	7	0	86	0	73	0	96	0	96
Halosulfuron	0.05	POST	0	3	2	8	0	81	0	63	0	96	0	89
Halosulfuron	0.1	POST	0	5	2	8	0	85	0	73	0	93	0	89
LSD (p=0.05)			5	7	2	3	24	21	20	20	21	14	20	17

PREE treatments applied on 19 March 1997 and POST treatments applied on 22 April 1997.

*Number of marketable and nonmarketable fruit per 10 ft of each plot counted at harvest time in June 1997.

PROJECT 3

WEEDS OF AGRONOMIC CROPS

CAROL MALLORY-SMITH, CHAIR

Preplant incorporated weed control for establishing alfalfa crop. Gary A. Lee and Brenda M. Waters. A trial was established at the Parma Research and Extension Center, Parma, Idaho to evaluate PPI herbicide treatments for control of annual weeds, crop tolerance and influence on first-year alfalfa hay production and quality. Herbicide treatments were applied on April 18 and immediately incorporated with a Triple K harrow to a depth of 2 in. (Table 1). On May 7, 1997, alfalfa (cultivar 'WD-503') was broadcast planted at 12 lb/A with a hand-held cyclone spreader and incorporated to a depth of 0.25 to 0.5 in. with a spring-tine harrow. Plots were arranged in a randomized complete block design with four replications and individual treatments were 7 by 30ft. The location is a Greenleaf-Owyhee Silt Loam soil (34% sand, 60% silt, 6% clay 1.25% organic matter and 7.7 pH). Surface condition at the time of herbicide application and seeding was dry, smooth (no clods) with no visible organic debris present. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance was visually evaluated on June 1 (44 DAT) and July 15 (88 DAT), 1997. Alfalfa forage and weeds were hand harvested on August 6 and October 15, 1997. Forage and weeds were separated, dried, and yields calculated on a per acre basis.

Table 1. Application information.

Crop stage	Preplant
Weed stage	Preemerge
Air temp. (F)	65
Relative humidity (%)	56
Wind (mph)	3
Sky (% cloud cover)	100
Soil temp. (F at 4 in.)	58
Soil moisture	dry surface, good moisture at 1.5 in.
First significant rain fall after herbicide application was 0.3 in. on April 19.	

All PPI herbicide treatments provided 92% or better control of redroot pigweed (AMARE) and common lambsquarters (CHEAL) at 44 and 88 days after treatment (DAT) (Table 2). EPTC + benefin at 2.0 + 1.2 lb/A and EPTC + ethalfluralin at 2.0 + 1.0 lb/A resulted in significantly better control of all weed species at both evaluation dates compared to the other herbicide treatments. All PPI treatments except EPTC at 2.0 lb/A gave 93% or better control of barnyardgrass (ECHCG). However, EPTC at 2.0 lb/A was the only PPI herbicide that did not cause significant crop stunting and/or leaf malformation 44 DAT. The alfalfa plants recovered in all herbicide treated plots and no visual phytotoxic symptoms were observed 88 DAT.

Weeds did germinate and grow in plots as the residual herbicide dissipated in the soil. At the time of the first cutting (110 DAT), the weedy check plots averaged 1.02 T/A weed biomass which was significantly greater than any herbicide treated plots (Table 3). EPTC + trifluralin at 2.0 + 1.0 lb/A, EPTC + benefin at 2.0 + 1.2 lb/A, EPTC + ethalfluralin 2.0 + 1.0 lb/A and ethalfluralin + dimethenamid at 1.0 + 1.0 lb/A had significantly less weed biomass than EPTC at 2.0 lb/A at the first cutting (110 DAT). Removal of annual weed biomass at the first cutting, coupled with crop competition during the remainder of the growing season, resulted in complete elimination of weeds in the alfalfa forage of all the treated plots at the second cutting except in the EPTC at 2.0 lb/A. No differences in first cutting alfalfa production occurred as a result of PPI herbicide treatments. However, substantial improvement in hay quality was achieved with all herbicide treatments at the first cutting date (110 DAT) and all treatments except EPTC at 2.0 lb/A at the second cutting date (180 DAT). (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preplant incorporated herbicide treatments on weed control in forage alfalfa establishment

		Weed Control					
		AMARE		CHEAL		ECHCG	
Treatment	Rate	44 DAT	88 DAT	44 DAT	88 DAT	44 DAT	88 DAT
	-- lb/A --	%					
EPTC	2.0	93.8	93.3	92.0	94.5	90.8	87.5
EPTC + trifluralin	2.0 + 1.0	98.5	99.5	99.5	96.5	97.8	93.8
EPTC + benefin	2.0 + 1.2	100.0	100.0	100.0	100.0	95.3	99.8
EPTC + ethalfluralin	2.0 + 1.0	99.0	100.0	98.8	100.0	99.0	97.3
EPTC + dimethenamid	2.0 + 1.0	100.0	95.3	100.0	97.5	97.8	95.8
Ethalfluralin + dimethenamid	1.0 + 1.0	98.8	92.5	100.0	96.5	97.0	97.5
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		3.6	4.1	3.4	4.0	5.4	4.3

Table 3. Effect of preplant incorporated herbicide treatments on crop injury, alfalfa yield and weed biomass in forage alfalfa establishment.

		Weeds		Alfalfa			
		Biomass		Yield		Injury	
Treatment	Rate	110 DAT	180 DAT	110 DAT	180 DAT	44 DAT	88 DAT
	-- lb/A --	tons/A				%	
EPTC	2.0	0.70	0.04	2.43	1.90	0.0	0.0
EPTC + trifluralin	2.0 + 1.0	0.46	0.00	2.57	1.40	57.5	0.0
EPTC + benefin	2.0 + 1.2	0.33	0.00	2.65	1.70	13.8	0.0
EPTC + ethalfluralin	2.0 + 1.0	0.31	0.00	2.68	1.50	37.5	0.0
EPTC + dimethenamid	2.0 + 1.0	0.50	0.00	2.54	1.60	80.0	0.0
Ethalfluralin + dimethenamid	1.0 + 1.0	0.42	0.00	2.16	1.30	85.0	0.0
Weedy check	----	1.43	0.04	2.32	2.00	0.0	0.0
LSD (0.05)		0.25	NS	NS	0.59	7.8	NS

Postemergence weed control for establishing alfalfa crop. Gary A. Lee and Brenda M. Waters. A study was conducted at the Parma Research and Extension Center, Parma, Idaho to determine the effectiveness of postemergence herbicides for control of annual weeds, crop tolerance and influence on first-year alfalfa forage production. Alfalfa (cultivar 'WD503') was planted on May 7, 1997 as a broadcast seeding at 12 lb/A and incorporated with a springtime harrow to a depth of 0.25 to 0.5 in. Furrows were made on 30 in. intervals for subsequent irrigation. Plots were arranged in a randomized complete block design with four replications, and individual plot were 7 by 30 ft. The soil at the location is a Greenleaf-Owyhee Silt Loam (34% sand, 60% silt, 6% clay, 1.25% organic matter and 7.7 pH) and the surface condition at the time of herbicide applications was dry, smooth (no clods),and no visible organic debris present. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). Weed control and crop tolerance was visually evaluated on June 1 (2 DAT) and July 15 (46 DAT), 1997. The crop was harvested on August 6 and October 15, 1997. Alfalfa forage and weed biomass were hand-harvested, separated, dried and yields calculated.

Table 1. Application information.

	May 30, 1997	June 2, 1997
Crop stage	2 trifoliate	2-3 trifoliate
Weed stage	AMARE 5-7 lf; ECHCG 2-10 in.; CHEAL 1-3 in	AMARE 5-8 lf; ECHCG 2-12 in.; CHEAL 1-4 in
Air temp. (F)	65.3	81.2
Relative humidity (%)	75	51
Wind (mph)	2	4
Sky (% cloud cover)	5	0
Soil temp. (F at 4 in.)	60	80
Soil moisture	Excessive	Normal

First significant rain fall after herbicide application 0.11 in. on June 4, 1997.

Redroot pigweed (AMARE) and common lambsquarters (CHEAL) were rapidly affected by several herbicide treatments (Table 2). Bromoxynil at 0.38 lb/A, imazethapyr + bromoxynil at 0.063 + 0.38 lb/A applied with both SOL32 at 2% v/v and nonionic adjuvant at 0.43% v/v, bromoxynil + fluazifop at 0.38 + 0.188 lb/A, bromoxynil + clethodim at 0.38 + 0.094 lb/A and 0.38 + 0.125 lb/A, bromoxynil + quizalofop at 0.38 + 1.0 lb/A, AC 299,263 + bromoxynil at 0.047 + 0.38 lb/A and bentazon at 1.0 lb/A controlled 95% or better of the broadleaf weeds within 2 days after treatment (DAT). No treatment provided rapid control of barnyardgrass (ECHCG) at 2 DAT, but all treatments except bromoxynil at 0.38 lb/A, 2,4-DB at 1.0 lb/A and bentazon at 1.0 lb/A gave 91% or better annual grass control 46 DAT. Imazethapyr alone and in combination with other herbicides showed improved control of all weed species at the later date of evaluation. Imazethapyr + bromoxynil + SOL 32 at 0.063 + 0.38 lb/A + 2% v/v, imazethapyr + sethoxydim + COC at 0.063 + 0.044 + 1% v/v, imazethapyr + clethodim + COC at 0.063 + 0.125 + 1% v/v and AC 299,263 + bromoxynil + SOL 32 at 0.047 + 0.38 + 2% v/v eliminated all annual weeds 46 DAT.

Imazethapyr at 0.063 and 0.094 lb/A and 2.4-DB at 1.0 lb/A were the only herbicide treatments that did not cause significant phytotoxicity to alfalfa seedlings 2 DAT (Table 3). Air temperatures exceeded 80 F the day after herbicide applications which accounts for the excessive initial alfalfa leaf burn and stunting observed in plots receiving bromoxynil alone and in combination with other herbicides. Significant stunting was visible in plots treated with bromoxynil in combination with fluazifop, clethodim, quizalofop and AC 299,263 and AC 299,263 + clethodim + COC at 0.047 + 0.125 + 1% v/v 46 DAT, but no leaf burn or chlorosis was observed.

Imazethapyr + 2,4-DB + SOL32 at 0.063 + 1.0 lb/A + 2% v/v and imazethapyr + sethoxydim + COC at 0.063 + 0.044 lb/A + 1% v/v treated plots produced significantly higher alfalfa yields than the weedy check at the first cutting 110 DAT (Table 3). The weedy check plot produced significantly higher alfalfa yields than imazethapyr + bromoxynil + nonionic adjuvant at 0.063 + 0.38 lb/A + 0.4% v/v and bromoxynil + clethodim + COC at 0.38 + 0.094 lb/A + 1% v/v treated plots at the second cutting. Reduced alfalfa yields cannot, however, be attributed to herbicide phytotoxicity.

Barnyardgrass was the predominant weed species infesting the study area at the second harvest date. All plots treated with herbicides except bromoxynil at 0.38 lb/A, bromoxynil + clethodim + COC at 0.38 + 0.094 lb/A + 1% v/v, AC 299,263 + clethodim + COC at 0.047 + 0.125 lb/A + 1% v/v and bentazon at 1.0 lb/A produced significantly less weed biomass than the weedy check plots at the second cutting. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Efficacy of postemergence herbicide treatments during establishment of forage alfalfa.

Treatment	Rate	Weed Control					
		AMARE		CHEAL		ECHCG	
		2 DAT	46 DAT	2 DAT	46 DAT	2 DAT	46 DAT
	---- lb/A ----	----------	----------	----------	%	----------	----------
Imazethapyr[1,4]	0.063	28.8	95.8	28.8	96.5	0.0	91.3
Imazethapyr[1,4]	0.094	45.0	100.0	45.0	100.0	0.0	95.8
Bromoxynil[4]	0.38	95.0	92.5	95.8	95.8	12.5	0.0
2,4-DB[4]	1.0	20.0	88.8	20.0	88.8	0.0	0.0
Imazethapyr[1,4] + bromoxynil[1,4]	0.063 + 0.38	98.0	100.0	98.3	100.0	45.0	100.0
Imazethapyr[1,4] + 2,4-DB[1,4]	0.063 + 1.0	30.0	100.0	28.8	100.0	0.0	96.5
Imazethapyr[1,2,4] + sethoxydim[1,2,4]	0.063 + 0.044	40.0	100.0	40.0	100.0	10.0	100.0
Imazethapyr[1,3,4] + bromoxynil[1,3,4]	0.063 + 0.38	98.0	100.0	98.3	100.0	28.8	96.5
Imazethapyr[1,3,4]	0.063	50.0	100.0	47.5	100.0	7.5	96.5
Bromoxynil[4] + fluazifop[2,5]	0.38 + 0.188	96.5	95.8	95.8	99.5	42.5	95.8
Bromoxynil[4] + clethodim[2,5]	0.38 + 0.094	97.3	95.0	98.0	100.0	37.5	99.5
Bromoxynil[4] + clethodim[2,5]	0.38 + 0.125	95.0	95.8	96.3	99.5	65.0	97.3
Bromoxynil[4] + quizalofop[2,5]	0.38 + 1.0	97.3	95.8	95.8	95.8	30.0	98.8
Imazethapyr[4] + clethodim[1,2,5]	0.063 + 0.125	38.8	100.0	41.3	100.0	12.5	100.0
AC299,263[1,4] + bromoxynil[1,4]	0.047 + 0.38	98.0	100.0	98.5	100.0	37.5	100.0
AC299,263[1,2,4] + clethodim[1,2,4]	0.047 + 0.125	52.5	99.5	47.5	99.5	7.5	100.0
Bentazon[4]	1.0	98.0	91.3	99.5	95.8	0.0	0.0
Weedy check		0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		3.8	1.7	4.2	1.3	4.6	1.9

[1]SOL 32 (32% nitrogen solution) added at 2.0% v/v.
[2]Crop oil concentrate added at 1.0% v/v.
[3]Nu-film-P nonionic adjuvant added at 0.4% v/v.
[4]Applied on May 30, 1997.
[5]Applied on June 2, 1997.

Table 3. Effect of postemergence herbicide treatments on crop injury, alfalfa yield, and weed biomass in forage alfalfa establishment.

Treatment	Rate	Weeds		Alfalfa			
		Yield				Injury	
		110 DAT	180 DAT	110 DAT	180 DAT	2 DAT	46 DAT
	-- lb/A --	----------	tons/A	----------		---- %	---
Imazethapyr[1,4]	0.063	0.60	0.00	2.48	1.69	0.0	0.0
Imazethapyr[1,4]	0.094	0.61	0.01	2.60	1.72	0.0	0.0
Bromoxynil[4]	0.38	1.07	0.02	2.26	1.73	30.0	0.0
2,4-DB[4]	1.0	1.00	0.01	2.09	1.70	0.0	0.0
Imazethapyr[1,4] + bromoxynil[1,4]	0.063 + 0.38	0.47	0.00	2.74	1.46	30.0	0.0
Imazethapyr[1,4] + 2,4-DB[1,4]	0.063 + 1.0	0.57	0.00	2.95	1.57	3.8	0.0
Imazethapyr[1,2,4] + sethoxydim[1,2,4]	0.063 + 0.044	0.32	0.00	2.98	1.44	3.8	0.0
Imazethapyr[1,3,4] + bromoxynil[1,3,4]	0.063 + 0.38	0.36	0.00	2.23	1.14	31.3	0.0
Imazethapyr[1,3,4]	0.063	0.61	0.01	2.51	1.84	3.8	0.0
Bromoxynil[4] + fluazifop[2,5]	0.38 + 0.188	0.37	0.01	2.70	1.62	30.0	5.0
Bromoxynil[4] + clethodim[2,5]	0.38 + 0.094	0.43	0.03	2.29	1.16	30.0	5.0
Bromoxynil[4] + clethodim[2,5]	0.38 + 0.125	0.33	0.00	2.66	1.74	30.0	5.5
Bromoxynil[4] + quizalofop[2,5]	0.38 + 1.0	0.37	0.00	2.56	1.38	30.0	9.3
Imazethapyr[4] + clethodim[1,2,5]	0.063 + 0.125	0.33	0.00	2.62	1.88	2.5	10.0
AC299,263[1,4] + bromoxynil[1,4]	0.047 + 0.38	0.99	0.00	2.85	1.50	30.0	9.3
AC299,263[1,2,4] + clethodim[1,2,4]	0.047 + 0.125	1.12	0.02	2.50	1.55	10.0	10.5
Bentazon[4]	1.0	1.28	0.02	2.07	1.60	17.5	0.0
Weedy check	----	1.43	0.04	2.32	2.00	0.0	0.0
LSD (0.05)		0.60	0.03	0.60	0.54	2.5	1.3

[1]SOL 32 (32% nitrogen solution) added at 2.0% v/v.
[2]Crop oil concentrate added at 1.0% v/v.
[3]Nu-film-P nonionic adjuvant added at 0.4% v/v.
[4]Applied on May 30, 1997.
[5]Applied on June 2, 1997.

Weed control in established alfalfa grown for seed. Gary A. Lee and Brenda M. Waters. A study was conducted in Canyon County near Caldwell, Idaho to evaluate herbicide treatments for annual weed control, crop tolerance and subsequent benefit in alfalfa seed production. The site is a Minidoka-Scism Silt Loam soil (42% sand, 52% silt, 6% clay, 1.53% organic matter and 8.0 pH). The trial was initiated on an established proprietary cultivar of alfalfa (planted 1996) growing on 30 in. rows. Plots were arranged in a randomized complete block design with four replications and each plot was 7 by 40 ft. At the time of herbicide applications, the soil was rough with moderate organic debris on the surface (Table 1). Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Weed control and crop tolerance were visually evaluated on May 2 and July 8, 1997. The alfalfa seed was harvested prematurely on July 31, 1997 because the site changed ownership. Seed samples were dried, threshed, and yields were determined.

Table 1. Application information.

	March 21	April 16	May 21
Crop stage	dormant	10 in.	24-36 in.
Weed stage	KCHSC 2-6 lf; CHEAL premerge; SSYAL 10 lf	KCHSC 6-12 lf; CHEAL 2 lf; SSYAL bolt	KCHSC 10-20 lf; CHEAL 10-14 lf; SSYAL flower
Air temp. (F)	58	77	66
Relative humidity (%)	37	24	32
Wind (mph)	3	1	3
Sky (% cloud cover)	5	98	3
Soil temp. (F at 4 in.)	60	60	60
Soil moisture	normal	below normal	below normal
First significant rain fall; after herbicide application	0.37 in. March 31	0.91 May 2	0.12 May 22

Intensive weed populations were present at the site in 1996, but only light weed infestations developed in 1997. Imazethapyr + clethodim at 0.063 +0.125 lb/A, imazethapyr at 0.06 lb/A, oxyfluorfen at 0.25 and 0.5 lb/A, oxyfluorfen + paraquat at 0.25 + 0.25 lb/A and 0.5 + 0.5 lb/A, metribuzin at 0.5 lb/A, metribuzin + paraquat at 0.5 +0.5 lb/A, diuron at 1.5 lb/A, diuron + terbacil at 1.5 + 0.5 lb/A, and terbacil at 0.75 lb/A controlled 90% of better of kochia (KCHSC), tumble mustard (SSYAL) and common lambsquarters (CHEAL) early in the growing season (Table 2). Late germinating kochia and common lambsquarters did reinfest a number of herbicide treated plots resulting in oxyfluorfen + paraquat at 0.5 + 0.5 lb/A, diuron at 1.5 lb/A and diuron + terbacil at 1.5 + 0.5 lb/A treated plots maintaining 90% or better residual control on the July 8, 1997 evaluation. Pendimethalin at 1.98 and 3.96 lb/A was broadcast applied on March 21, April 16 and May 21 when the alfalfa was dormant, 10 in. and 24 to 36 in. tall, respectively, and as a directed spray on May 21. Applications of pendimethalin made to actively growing alfalfa on April 16 and May 21 controlled 90% or better of kochia and common lambsquarters, but did not effectively control the established tumble mustard. Some injury in the form of leaf spotting was observed on alfalfa leaves receiving the broadcast applications of pendimethalin, but the symptoms were minor and transitory. Applications of pendimethalin to the dormant crop (March 21) tended to provide less control of the weed species present and may be attributed to the dry conditions following application. No herbicide treatment, with the exception of the minor pendimethalin injury, caused visible phytotoxicity to the alfalfa crop. Because of light weed competition pressure, lack of phytotoxicity from the herbicide treatments and premature harvesting of the seed crop, there were no significant differences in alfalfa seed yields from plots treated with herbicides. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Influence of postemergence herbicide treatments on weed control, alfalfa injury and seed production.

		Weed Control						Alfalfa		
		KCHSC		SSYAL		CHEAL		Injury		Yield
Treatment	Rate	42 DAT	109 DAT	42 DAT	109 DAT	42 DAT	109 DAT	42 DAT	109 DAT	
	- - lb/A - -	- - -	- - -	- - -	- - -	%	- - -	- - -	- - -	lb/A
Imazethapyr + clethodim[1,4]	0.063 + 0.125	97.0	87.5	90.0	85.0	93.8	90.0	0	0	288
Pendimethalin[2,3]	1.98	85.0	76.3	40.0	30.0	91.3	80.0	0	0	266
Pendimethalin[2,3]	3.96	87.5	81.3	47.5	50.0	86.3	80.0	0	0	281
Pendimethalin[2,4]	1.98	90.0	85.0	72.5	71.3	95.0	87.5	0	0	234
Pendimethalin[2,4]	3.96	93.8	88.8	76.3	71.3	92.5	82.5	0	0	294
Pendimethalin[2,5]	1.98	93.0	87.5	84.9	57.5	95.3	82.5	0	0	187
Pendimethalin[2,5]	3.96	96.3	90.0	73.3	52.5	98.6	85.0	0	0	200
Pendimethalin[2,6]	1.98	---	88.8	---	0.0	---	65.0	---	0	372
Pendimethalin[2,6]	3.96	---	88.8	---	0.0	---	67.5	---	0	246
AC 299,263[1,3]	0.05	87.5	81.3	47.5	42.5	95.0	86.3	0	0	179
AC 299,263[1,3]	0.06	92.5	86.3	51.3	55.0	96.3	90.0	0	0	290
Imazethapyr[1,3]	0.06	96.3	87.5	92.5	87.5	95.0	86.3	0	0	299
Oxyfluorfen[2,3]	0.25	96.3	88.8	96.3	90.0	98.8	88.8	0	0	335
Oxyfluorfen[2,3]	0.5	94.5	86.3	91.3	88.8	96.3	85.0	0	0	200
Oxyfluorfen + paraquat[2,3]	0.25 + 0.25	100.0	90.0	97.5	90.0	97.5	85.0	0	0	237
Oxyfluorfen + paraquat[2,3]	0.5 + 0.5	96.3	85.0	95.0	90.0	96.3	90.0	0	0	209
Paraquat[2,3]	0.5	92.5	82.5	93.8	85.0	60.0	52.5	0	0	321
Metribuzin[2,3]	0.5	96.3	86.3	95.0	86.3	98.8	92.5	0	0	197
Metribuzin + paraquat[2,3]	0.5 + 0.5	96.3	86.3	93.8	87.5	95.0	91.3	0	0	271
Diuron[2,3]	1.5	95.0	90.0	96.3	93.8	97.0	91.3	0	0	203
Diuron + terbacil[2,3]	1.5 + 0.5	98.8	90.0	95.0	90.0	98.8	92.5	0	0	291
Terbacil[2,3]	0.75	93.8	83.8	93.8	87.5	98.8	88.8	0	0	117
Norflurazon[2,3]	2.0	70.0	65.0	60.0	52.5	55.0	47.5	0	0	193
Norflurazon[2,3]	3.0	76.3	65.0	60.0	65.0	70.0	65.0	0	0	266
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0	0	0	364
LSD (0.05)		8.7	9.1	13.3	19.5	8.2	12.4	NS	NS	NS

[1]SOL 32 (32% nitrogen solution) added at 2.0% v/v.
[2]Latron AG-98 nonionic surfactant added at 0.25% v/v.
[3]Applied on March 21,1997; [4]applied on April 16, 1997; [5]applied on May 21,1997; [6]applied post directed on May 21, 1997.

Postemergence control of perennial goosegrass and yellow foxtail in alfalfa with clethodim. Mick Canevari and Tom DeWitt. A study was established near Lodi, California to evaluate perennial goosegrass (*Eleusine tristachya*) control comparing various rates and timing of application with clethodim and two types of crop oil concentrates. The plot size was 10 feet by 15 feet and three replications in a randomized complete bock design. The applications were made on June 20, a sequential application on July 14, 1997. Treatments were applied with a CO_2 backpack sprayer at a volume of 30 gpa at 35 psi. Crop injury and weed control was visually evaluated on June 30, July 14, August 8, and September 9, 1997. Additional information is listed in Table 1. Other weeds evaluated were yellow foxtail (SETLU).

Table 1. Application crops and weed species size information.

Application Date		6/20	7/14
Application Timing		8" – 12" height	6" – 10" height
Air Temperature		82°	85°
Soil Moisture		High	High
Wind (MPH)		3 – 5	5 – 8
		Weed Size	
Goosegrass	(N/A)	8" height, 6" diameter	8" height, 8" diameter
Yellow Foxtail	(SETLU)	6" height, 4 Tillers	10" height, 5 Tillers

Crop injury was 0% for both application timings. Goosegrass control was highest with the two applications of clethodim plus Hasten at 0.25 Lb/A reaching 84% at season end. Yellow foxtail control was best with the two application and timings with no difference between adjuvants reaching 90% control. Single application of the 0.25 Lb/A rate provided 40% suppression of goosegrass and 80% of yellow foxtail for approximately 45 days following treatment. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Perennial and annual grass control in established alfalfa.

			Weed Control							
		Application	Yellow Foxtail				Perennial Goosegrass			
Treatment[1]	Rate	Timing	6/30	7/14	8/8	9/11	6/30	7/14	8/8	9/11
	Lb/A		%							
Check	----	----	0	0	0	0	0	0	0	0
Clethodim + EVO	0.125	6/20	60	82	43	33	33	40	20	0
Clethodim + EVO	0.25	6/20	70	89	79	75	37	62	53	45
Clethodim + EVO	0.125	6/20	60	77	87	78	37	33	63	58
Clethodim + EVO	0.125	7/14								
Clethodim + EVO	0.25	6/20	70	86	92	90	40	65	84	77
Clethodim + EVO	0.25	7/14								
Clethodim + COC	0.25	6/20	56	74	65	67	33	42	30	27
Clethodim + COC	0.25	6/20	63	76	89	90	37	65	77	73
Clethodim + COC	0.25	7/14								

[1] EVO = Esterfied Vegetable Oil (Hasten) 1 pt/A
COC = Crop oil concentrate (Herbicide Activator) 2 qt/100 gal

Broadleaf weed and grass control in alfalfa with post and preemergence herbicides. Mick Canevari and Ted Viss. A study was conducted near Stockton, California to evaluate post emergence control of winter broadleaf weeds and preemergence control of summer grasses. The trial was established December 20, 1996 to a 3 year stand of alfalfa immediately following sheep grazing. The plots were 10 feet by 15 feet and three replications in a randomized complete block design. Soil type was a sandy loam with < 1% om, and a pH of 7.4. Herbicides were applied with a CO_2 backpack sprayer using 8003 flat fan nozzles delivering 30 gpa at 35 psi. Granular formulation herbicides were applied following broad cast spray treatments. Rainfall occurred on December 22. Application data and weed sizes are provided in Table 1. Crop injury was taken on February 4, and winter weed control evaluations were made on February 4, and March 10, 1997. Yellow foxtail and goosegrass ratings were made on June 17, July 14, and August 8, 1997.

Table 1. Application information and weed size.

Air Temperature	40°	Application	December 20, 1996
Wind (MPH)	0-2	Alfalfa	2" – 4" tall
Weather	Foggy	Swinecress (COPDI)	1" – 6" tall
Humidity	100%	Cheeseweed (MALPA)	2" – 4" tall
Soil Moisture	High	Perennial goosegrass (Eleusine tristachya)	2" – 4" tall, 4" – 6" clumps

Crop height reduction (Table 2) on February 4, ranged between 40–50% for the paraquat treatments and 0–10% for the hexazinone and imazethapyr treatments. By the March 10 evaluation, crop injury was reduced to 3 to 17% and no visual height reduction by April 2, 1997. The summer harvest evaluations did not show any further crop reduction. Common mallow control was 93-100% except with the imazamox treatment at 77%. Swinecress control was best with paraquat plus the higher rates of thiazopyr between 90-100%. All other treatments provided good control ranging between 82-90%. Yellow foxtail was evaluated cuttings and the best control on August 8, was 88% with thiazopyr 2.5% granular at the 0.5 Lb/A rate. This rate also provided the best control of goosegrass at 67%. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Crop injury and weed control near Stockton, California.

					Weed Control									
			Crop Injury		Little Mallow		Swinecress		Yellow Foxtail			Goosegrass		
Treatment[1,2]	Rate	Formulation	2/4	3/10	2/4	3/10	2/4	3/10	6/17	7/14	8/8	6/17	7/14	8/8
	Lb/A		%											
Thiazopyr + paraquat	0.25 + 0.6	2.5 G	45	17	100	93	100	73	93	68	66	72	39	35
Thiazopyr + paraquat	0.375 + 0.6	2.5 G	48	20	100	98	100	90	100	89	83	80	60	56
Thiazopyr + paraquat	0.5 + 0.6	2.5 G	45	17	100	100	100	100	100	89	88	63	70	67
Thiazopyr + paraquat	0.25 + 0.6	2 E	50	20	100	100	100	95	95	60	58	37	30	30
Thiazopyr + paraquat	0.5 + 0.6	2 E	47	13	100	100	100	99	100	90	83	82	75	55
Trifluralin + paraquat	2.0 + 0.6	10 G	47	17	100	100	100	53	91	69	63	33	28	26
Pendimethalin + paraquat	3.0 + 0.6	5 G	40	30	100	100	100	82	85	74	63	38	35	32
Norflurazon + paraquat	2.5 + 0.6	80 DF	47	17	100	95	100	95	60	35	30	35	23	20
Imazethapyr	0.093	70 DF	0	3	100	100	100	70	38	22	0	0	0	0
Imazamox	0.09	70 DF	10	3	100	100	100	83	25	25	0	0	0	0
Hexazinone	0.5	2 E	0	3	100	77	100	88	42	27	20	10	7	0
Hexazinone+ thiazopyr	0.5 + 0.25	2 E	10	3	100	100	100	93	73	65	60	20	13	10
Imazethapyr+thiazopyr	0.09 + 0.25	2 E	0	3	100	100	100	90	90	63	60	43	13	0
Check	----	---	0	3	0	17	0	10	0	0	0	0	0	0

[1] Paraquat 2 E Formulation
[2] All treatments received NIS @ .25% vv

Postemergence weed control in seedling alfalfa comparing two application timings of imazamox. Mick Canevari and Don Colbert. The study was conducted near Stockton, California to fall seeded alfalfa (Var. Sutter) on application dates of January 8, and February 5, 1997. Herbicide comparisons were made between imazethapyr and imazamox at various rates and in combination with bromoxynil. The treatments were applied with a CO_2 backpack sprayer at a volume of 23 gpa and 30 psi. Plot size was 10 feet by 15 feet and replicated three times in a randomized complete block design. Weed species evaluated were wild oats, black mustard, shepherds purse, henbit and common mallow. Application information and weed size is shown in Table 1. Crop injury and weed evaluations were made on March 14, and April 16, 1997 and illustrated in Table 2. Plots were harvested on April 17, 1997 with a Carter self-propelled harvester.

Table 1. Application information and weed size.

	First Application (1/8/97)	Second
Alfalfa size	2 to 3 trifoliate	5 to 6 tr.
Air temperature	55° F	54° F
Soil temperature	54° F	60° F
Relative humidity (%)	51	67
	Weed Size	
Common mallow	4 to 6 leaf	6 to 9 le
Black mustard	6 to 8 leaf	6 to 10 l
Henbit	2" to 3" tall	3" to 5"
Shepherds purse	6 to 8 leaf	10 to 12
Wild oats	6" to 8" tall, 3 tillers	8" to 18

Crop injury with imazamox on March 14, ranged from 0 to 5% on the early application timing and 11 to 15% at the later application. The pre-harvest evaluation injury was 0 to 5% and 12 to 20% comparing early to late application of imazamox. The tank mix treatment with bromoxynil did not show an increase of injury to crop by the later evaluations. Imazethapyr plus bromoxynil early application timing injury ranged from 0 to 20% as the rate of imazethapyr increased prior to harvest evaluation.

The early timing of imazamox at all rates provided 100% control of wild oats, black mustard, shepherds purse and 80 to 90% control of henbit and common mallow. Imazethapyr treatments were excellent on black mustard and shepherds purse, moderate control of henbit and common mallow and poor control of wild oats at 13 to 47%. Clethodim treatments showed no injury to alfalfa and provided 100% control of wild oats at both application timings. The yields reflect the degree of weed control were as the best treatments of weed control had significantly lower yields but produced higher quality hay. Hay quality was measured by crude protein, total digestible nutrients and acid detergent fiber analysis, which is shown in Table 3. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Crop injury and weed control at Stockton, California.

Treatment[1]	Rate	Application[2] Timing	Crop Injury 3/14	Crop Injury 4/16	Weed Control AVENA 4/16	BRSNI 4/16	CAPBP 4/6	MALNE 4/16	LAMAM 4/16
	Lb/A		%						
Imazamox + EVO + UN32	0.024	P1	0	3	100	99	100	82	82
Imazamox + EVO + UN32	0.032	P1	9	0	100	100	100	87	91
Imazamox + EVO + UN32	0.04	P1	15	5	100	100	100	92	93
Imazamox + bromoxynil + EVO + UN32	0.024 + 0.25	P1	12	2	100	100	100	92	91
Imazamox + bromoxynil + EVO + UN32	0.032 + 0.25	P1	13	2	100	100	100	91	91
Imazamox + bromoxynil + EVO + UN32	0.04 + 0.25	P1	18	5	100	100	100	90	90
Imazethapyr + bromoxynil + EVO + UN32	0.047 + 0.25	P1	3	0	13	100	100	72	62
Imazethapyr + bromoxynil + EVO + UN32	0.063 + 0.25	P1	15	15	32	100	100	85	73
Imazethapyr + bromoxynil + EVO + UN32	0.094 + 0.25	P1	27	20	47	100	100	91	87
Imazamox + EVO + UN32	0.024	P2	13	17	98	99	100	86	87
Imazamox + EVO + UN32	0.032	P2	11	12	100	100	100	89	93
Imazamox + EVO + UN32	0.04	P2	15	20	99	99	100	94	93
clethodim + EVO	0.1	P2	0	0	100	0	0	0	0
clethodim + EVO	0.1	P1	0	0	100	0	0	0	0
bromoxynil + EVO	0.25	P1	5	3	0	100	100	27	28
Imazethapyr + EVO	0.094	P1	13	3	86	100	100	83	76
Check			0	0	0	0	0	0	0

[1] EVO = Esterfied vegetable oil (Hasten) 1 pt/A
UN32= Liquid fertilizer 32% nitrogen at 1 qt/A
[2] P1 = Post timing at 1/8/97
P2 = Post timing at 2/5/97

Table 3. The effects of herbicide treatments on yield and quality of alfalfa.

Treatment[1]	Rate	Application Timing	Yield Alfalfa	Biomass Composition Alfalfa	Weeds	Quality[1] Crude Protein	ADF	TDN
	Lb/A		LB/A	%				
Imazamox + EVO + UN32	0.024	P1	3021 BC	100	0	35	26	54
Imazamox + EVO + UN32	0.032	P1	2947 BC	100	0	36	27	54
Imazamox + EVO + UN32	0.04	P1	2706 C	98	2	35	24	56
Imazamox + bromoxynil + EVO + UN32	0.024 + 0.25	P1	2678 C	99	1	35	24	56
Imazamox + bromoxynil + EVO + UN32	0.032 + 0.25	P1	2601 C	100	0	37	26	55
Imazamox + bromoxynil + EVO + UN32	0.04 + 0.25	P1	2626 C	100	0	35	24	56
Imazethapyr + bromoxynil + EVO + UN32	0.047 + 0.25	P1	4100 A	40	60	19	37	47
Imazethapyr + bromoxynil + EVO + UN32	0.063 + 0.25	P1	3915 A	55	45	18	35	48
Imazethapyr + bromoxynil + EVO + UN32	0.094 + 0.25	P1	4122 A	78	22	12	33	49
Imazamox + EVO + UN32	0.024	P2	2839 C	95	5	29	23	57
Imazamox + EVO + UN32	0.032	P2	2620 C	100	0	29	24	56
Imazamox + EVO + UN32	0.04	P2	2377 C	100	0	29	23	57
clethodim + EVO	0.1	P2	3799 A	50	50	15	31	51
clethodim + EVO	0.1	P1	3597 AB	54	46	23	37	46
bromoxynil + EVO	0.25	P1	4201 A	48	52	19	36	47
Imazethapyr + EVO	0.094	P1	2727 C	100	0	25	20	60
Check			3930 A	56	44	16	39	45
LSD 0.05			708					

[1] ADF = Acid Detergent Fiber
TDN = Total Digestible Nutrients

Puna grass control in established alfalfa. Mick Canevari, Ted Viss. This study was conducted to evaluate control measures for Puna grass (*Stipa brachychaeta* Godr.) in a two year stand of alfalfa located in Tracy, California. Post and preemergence herbicides were applied at two timing intervals. The fall treatment was made on October 31, 1996 and a spring treatment on March 8, 1997. The plot size was 10 feet by 15 feet with three replications in a randomized complete block design. Herbicides were applied with a CO_2 backpack sprayer using 8002 flat fan nozzles calibrated for 20 gpa at 40 psi. Environmental conditions and weed size is listed in Table 1. Alfalfa injury evaluation was made on February 3, 1997 and puna grass control rated on February 3, March 20, May 13, June 18, and July 11, of 1997.

Table 1. Application information and weed size.

Application Date	10/31/96	3/8/97
Soil Moisture	High	Medium
Air Temperature	55°	62°
Wind	3 – 5 mph	5 – 10 mph
Weed Size	6" –12" height, 3" – 8" diameter	6" – 8" height, 4" – 8" diameter
Alfalfa	8" – 12" height	4" – 8" height

Crop injury was 0% for treatments except glyphosate which killed 100% of the alfalfa used as a spot treatment. The fall application treatments provided 88% control with clethodim and 73% with sethoxydim at the March, 20 evaluation. Glyphosate spot treatments provided 100% control. The spring application control was 70% with both sethoxydim and clethodim at rates of 0.45 and 0.25 Lb/A respectively. Clethodim and sethoxydim applied two times, in the fall and again in the spring timing achieved 97% and 96% control respectively. Pronamide and imazamox gave 0% and 20 % control only. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Effects of herbicide application to control puna grass at Tracy, California.

Treatment[1]	Rate	Application Timing	Crop Injury 2/3/97	Puna Grass Control 2/3	3/20	5/13	6/18	7/11
	Lb/A		%					
Sethoxydim	0.45	10/31	0	82	70	75	77	52
Sethoxydim	0.45	4/8	---	---	---	30	87	70
Sethoxydim +	0.45	10/31	0	87	73	90	98	96
Sethoxydim	0.45	4/8	---					
Clethodim	0.25	10/31	0	92	88	98	98	91
Clethodim + Sethoxydim	0.25 + 0.45	4/8	---	---	---	30	94	80
Clethodim +	0.25	10/31	0	96	96	97	100	97
Clethodim	0.25	4/8						
Pronamide	2.0	10/31	0	0	0	0	0	0
Pronamide	2.0	4/8	---	---	---	0	0	0
Pronamide +	2.0	10/31	0	0	0	0	0	0
Pronamide	2.0	4/8						
Sethoxydim + Pronamide	0.45 + 2.0	10/31	0	88	87	82	94	73
Sethoxydim + Pronamide +	0.45 + 2.0	10/31	0	95	89	99	99	97
Sethoxydim + Pronamide	0.45 + 2.0	4/8						
Glyphosate	2%vv	10/31	100	100	100	100	100	100
Imazamox +	0.04	10/31	0	82	67	57	65	50
Imazamox + sethoxydim	0.45 + 0.45	4/8						
Sethoxydim + thiazopyr	0.45 + 0.50	10/31	0	89	88	88	99	95
Imazamox	0.04	4/8	---	---	---	30	30	20
Clethodim	0.25	4/8	---	---	---			
Check	---	---	---	---	---			

[1] All treatments received a crop oil concentrate (Dynamic) at 1 qt/A
Glyphosate treatment received a non ionic surfactant (Unifilm 707) at 25% vv

Spray solution volume effect on wild oat control with imazamethabenz and difenzoquat. Joan M. Campbell and Donald C. Thill. A study was established at the University of Idaho, Plant Science Farm near Moscow, Idaho to evaluate wild oat control and spring barley yield as affected by spray solution volume with imazamethabenz and difenzoquat. The experimental design was a split-block with four replications and 8 by 24 ft experimental units. Main plots were two densities of wild oat and sub-plots were a factorial arrangement of herbicide treatment and spray solution volume. An untreated control was included for comparison. Wild oat and spring barley were seeded perpendicular to each other on May 1 and May 2, 1997, respectively, with an 8 ft wide double-disk drill. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 5, 10, 15, and 20 gpa at 40 psi (Table 1). Wild oat control was evaluated visually on July 21, 1997. Barley grain was harvested at maturity on August 29, 1997 with a small plot combine from a 4.1 by 21 ft area of each plot.

Table 1. Application data and soil analysis.

Application date	June 2, 1997
Growth stage	
spring barley	3 to 4 leaf
wild oat	2 to 4 leaf
Air temperature (F)	79
Relative humidity (%)	42
Wind velocity (mph)	0 to 3 East
Cloud cover (%)	0
Soil temperature at 2 inch (F)	72
pH	5.4
OM (%)	2.6
Texture	loam

All herbicide treatments at all spray solution volumes controlled wild oat 71 to 95% regardless of wild oat density (Table 2). Wild oat control averaged over herbicide treatments tended to be higher with 15 and 20 gpa compared to 5 and 10 gpa. Wild oat control averaged over spray solution volume was 83, 89, and 93% with imazamethabenz at 0.37 lb/A, imazamethabenz at 0.47 lb/A, and imazamethabenz + difenzoquat, respectively. Barley grain yield was 4751 lb/A for 9 wild oat plants/ft^2 and 4178 lb/A for 28 wild oat plants/ft^2 (Table 3). This corresponded to 85 and 91% control for 9 and 28 wild oat plants/ft^2, respectively, however, wild oat control was not statistically different. Herbicide treatment and spray solution volume did not affect barley grain yield. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. The effect of herbicide and spray solution volume on wild oat control averaged over wild oat densities.

Herbicide[1]	Rate	Spray solution volume: 5 gpa	10 gpa	15 gpa	20 gpa	*Mean*
	lb/A	% wild oat control[2]				
Imazamethabenz	0.37	71	74	95	91	*83*
Imazamethabenz	0.47	88	92	84	89	*89*
Imazamethabenz + difenzoquat	0.235 + 0.5	93	90	94	94	*93*
Mean		*84*	*86*	*91*	*91*	

[1]A nonionic surfactant was mixed with all treatments at 0.5% v/v.
[2]P>F not significant at the 0.05% level

Table 3. The effect of herbicide and spray solution volume on barley grain yield.

		Barley grain yield[2,3] — Spray solution volume and wild oat plants/ft^2								
		5 gpa		10 gpa		15 gpa		20 gpa		
Herbicide[1]	Rate	9	28	9	28	9	28	9	28	*Mean*
	lb/A	lb/A								
Imazamethabenz	0.37	4645	4144	4406	3824	4796	4245	4553	4122	*4342*
Imazamethabenz	0.47	4805	3787	4968	4623	4601	3738	4521	3819	*4358*
Imazamethabenz + difenzoquat	0.235 + 0.5	4772	42711	4758	4877	5210	4780	4972	3905	*4693*
Mean		*4404*		*4576*		*4562*		*4315*		

[1]A nonionic surfactant was mixed with all treatments at 0.5% v/v.
[2]P>F not significant at the 0.05% level. Grain weight includes wild oat contamination.
[3]Wheat yield in the untreated check plots was 4578 and 3140 lb/A for 9 and 28 plants/ft^2, respectively.

Wild oat density and tralkoxydim dose effects on wild oat and spring barley. David Belles and Donald C. Thill. A study was established on the University of Idaho Plant Science Farm near Moscow, ID to evaluate the effect of wild oat density and tralkoxydim dose on wild oat seed production in spring barley. The experimental design was a five by five split-plot with four replications. Tralkoxydim was applied at 0.056, 0.113, 0.169, and 0.225 lb/A to five wild oat densities (0, 4 , 7, 11,and 15 plants per ft^2). An untreated control also was included in the experiment. These doses correspond to 0, 25, 50, 75, and 100% of the recommended rate for tralkoxydim. Wild oat seed was sown 1 inch deep on May 8 with a cone seeder in rows spaced 3.5 inches apart rows. 'Baroness' spring barley was seeded at 90 lb/A on May 9, 1997 with a commercial grain drill in rows spaced 7 inches apart. Barley and wild oat plants were counted in a randomly selected 5.4 ft^2 area in each plot before herbicide application. Wild oat densities were 0.6, 3.2, 4.7, 8.5, and 11.8 plants/ft^2. Herbicide treatments were applied on May 30, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi and 3 mph (Table 1). Wild oat control was evaluated visually 10 days after treatment and at wild oat heading. Biomass samples of barley and wild oat were harvested from a 5.4 ft^2 area in each plot on July 14, 1997. Plant material was oven-dried at approximately 60 C for 7 days and weighed. Wild oat seeds were harvested and counted from a 5.4 ft^2 area of each plot when the upper-most florets began to shed their seed. Panicles also were counted when seeds were stripped from the plants. Plots were harvested on August 18, 1997 with a small plot combine. Harvested plot size was 4.1 by 15 ft.

Table 1. Application data

Application date	May 30, 1997
Growth stage	
spring barley	2 to 3 leaf
wild oat	1 to 4 leaf
Air temperature (F)	77
Relative humidity (%)	64
Wind speed (mph, direction)	1, W
Cloud cover (%)	50
Soil temperature at 2 in. (F)	67

Herbicide treatments did not injure the barley (data not shown). Visual wild oat control at heading was 93% or better with all rates of tralkoxydim at all wild oat densities. The number of wild oat panicles/ft^2 ranged from 0 with the high rates of herbicide and low densities of wild oat, to 6.7/m^2 for the untreated control at the highest wild oat density (Table 2). The number of wild oat seeds, averaged over wild oat density, was 115/ft^2 in the control and 7, 2, 1.5, 0 seeds/ft^2 for the 25, 50, 75, and 100% tralkoxydim doses, respectively. The number of wild oat seed averaged 25, 104, 119, 151, and 176 seeds/ft^2 in the untreated control plots with 0.6, 3.2, 4.7, 8.5 and 11.8 wild oat plants/ft^2, respectively. Wild oat densities of 0.6 to 3.2 plants/ft^2 did not affect barley yield. In general, untreated wild oat densities equal to or greater than 4.7 plants/ft^2 reduced barley yield. At these wild oat densities, barley yield was equal for all doses of tralkoxydim. (Plant Science Division, University of Idaho, Moscow ID 83844-2399)

Table 2. The effect of tralkoxydim dose and wild oat density on wild oat control and barley grain yield.

			Wild oat			
Actual wild oat density	Tralkoxydim rate[1]	Barley yield	Control[2]	Biomass	Panicle	Seed
Plants/ft^2	lb/A	lb/A	---%---	---oz/ft^2---	---no./ft^2---	---no./ft^2---
0.6	0.0	6235	-[3]	0.02	0.9	24.7
0.6	0.056	6465	-	0	0.2	2.8
0.6	0.113	6338	-	0	0	0
0.6	0.169	6262	-	0	0	0.21
0.6	0.225	6212	-	00	0	0
3.2	0,0	6409	0	0.06	3.0	103.7
3.2	0.056	6353	99	0	0.2	5.4
3.2	0.113	6302	100	0	0.4	2.8
3.2	0.169	6403	100	0	0	0
3.2	0.225	6562	100	0	0	0
4.7	0.0	5510	0	0.06	4.1	119.3
4.7	0.056	6008	98	0	0.7	8.4
4.7	0.113	6411	99	0	0.2	0.6
4.7	0.169	6447	100	0	0.6	4.1
4.7	0.225	6101	100	0	0	0
8.5	0.0	5888	0	0.08	5.0	150.7
8.5	0.056	6039	93	0.01	0.9	10.1
8.5	0.113	6038	100	0	0.2	1.1
8.5	0.169	6187	100	0	0.4	3.0
8.5	0.225	6321	100	0	0.2	0.02
11.8	0.0	5781	0	0.12	6.7	175.7
11.8	0.056	6216	93	0.01	0.7	7.8
11.8	0.113	6414	100	0	0.4	4.1
11.8	0.169	6365	100	0	0.2	0.6
11.8	0.225	6278	100	0	0	0
$LSD_{(0.05)}$		366	2	0	2	48

[1] Tralkoxydim applied with a commercially formulated nonionic surfactant crop oil blend (TF8035, Supercharge) added at 0.5% v/v.
[2] June 15, 1997 evaluation.
[3] Dash occurs where the zero sown wild oat plus resident population was too sparse to visually evaluate.

Wild oat control in barley. John O. Evans and R.William Mace. Tralkoxydim was applied to 'Walker' barley at two rates as postemergence and tiller growth stage treatments to evaluate wild oat (AVEFA) control. These were compared with postemergence treatments of imazamethabenz, difenzoquat and diclofop. Plots were established on the Jenkins farm in Newton, UT. The crop was planted May 28, 1997 in a Crookston loam with 7.7 pH and OM content less than 2%. Treatments were applied in a randomized block design, with three replications on June 13, and June 27, for the postemergence and tiller stages, respectively. Individual treatments were applied to 10 by 30 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 10 foot spray width calibrated to deliver 25 gpa at 39 psi. Wild oat populations were about 70 plants/ft^2. Visual evaluations of wild oat control and crop injury were completed June 27, July 7 and August 7. Plots were harvested August 7.

Tralkoxydim controlled 95 to 100 percent of the wild oats in the barley when employed as a tiller stage spray. There was some injury to the barley at this growth stage. At the three leaf stage it did not perform as well, controlling only about 60% of the wild oats, but there was no barley injury. Imazamethabenz gave excellent control of wild oats without injury to barley. Difenzoquat and diclofop did not injure barley but were poor in controlling wild oats. The imazamethabenz treated barley had the highest yield but was not significantly better than other treatments in this experiment. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Wild oat control with selected herbicides in barley. Newton, UT. 1997.

			AVEFA			Barley		
		Growth	Control			Injury		Yield
Treatment	Rate	Stage	5/27	7/7	8/7	7/7	8/7	8/7
	lb ai/A			%		%		bu/A
Tralkoxydim[1]	0.18	Post	65	52	67	0	0	41.4
Tralkoxydim[1]	0.27	Post	77	85	85	0	0	51.9
Tralkoxydim[1]	0.18	Tiller	0	99	100	13	30	28.3
Tralkoxydim[1]	0.27	Tiller	0	95	97	15	32	41.4
Imazamethabenz[2]	0.5	Post	80	94	96	0	0	56.9
Difenzoquat	0.75	Post	63	37	57	0	0	24.1
Diclofop	1	Post	53	30	68	0	0	36
Check			0	0	0	0	0	37.2
LSD(0.05)			7	11	7	4	6	NS

[1] 'Supercharge' surfactant added at 0.5% v/v.
[2] Non-ionic surfactant added at 0.25% v/v.

EXP31130A comparisons in spring barley for weed control and crop injury. John O. Evans and R.William Mace. Three dosages of EXP311301A were applied to 'Rollo' barley as preemergence treatments for Russian thistle (SALIB) control and compared with 3 dosages of this compound applied four weeks later to the same crop as postemergence treatments. These two groups of treatments were further measured against postemergence treatments of bromoxynil/MCPA and thifensulfuron/tribenuron. The trial was established on the Jenkins farm in Newton, UT on a Crookston loam soil with 7.7 pH and OM content less than 2%. Barley was planted May 20. 1997 and treatments were applied in a randomized block design, with three replications May 7 and June 5, for preemergence and postemergence treatments, respectively. Individual treatments were applied to 10 by 30 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 10 foot spray width calibrated to deliver 25 gpa at 39 psi. Russian thistle populations were 2 plants/ft^2. Visual evaluations for Russian thistle control and crop injury were completed June 19, and July 21. Plots were harvested August 7.

Preemergence treatments of EXP31130A provided excellent control of Russian thistle without barley injury. Postemergence treatments of EXP31130A did not contol Russian thistle and displayed injury effects on barley height and color. Wet spring conditions prevented application of postemergence treatments until the barley was tillering and Russian thistle was two inches high. The addition of thifensulfuron/tribenuron to EXP31130A improved postemergence treatments substantially. Bromoxynil/MCPA controlled Russian thistle well alone and in combination with thifensulfuron/tribenuron. Yields were not significantly different among treatments. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. A comparison of EXP31130A applied premergence, postemergence, and in combination with other herbicides for Russian thistle control. Newton, UT. 1997.

				SALIB		Barley		
				Control		Injury		Yield
Treatment	Rate	Unit	Stage	6/19	7/21	6/19	7/21	8/7
				— % —		—%—		bu/A
EXP31130A	0.75	oz ai/A	PRE	92	92	0	0	58.7
EXP31130A	1.13	oz ai/A	PRE	97	98	0	0	56.6
EXP31130A	1.5	oz ai/A	PRE	98	100	3	0	63.2
EXP31130A	0.5	oz ai/A	POST	23	30	13	3	53.1
EXP31130A	0.75	oz ai/A	POST	28	30	0	3	55.7
EXP31130A	1.13	oz ai/A	POST	43	47	25	15	41.4
EXP31130A+ Thifen/Triben[1]	0.5 0.25	oz ai/A oz ai/A	POST	80	88	20	0	58.5
Bromox/MCPA	0.75	lb ai/A	POST	97	98	0	0	58.5
Bromox/MCPA+ Thifen/Triben[1]	0.5 0.016	lb ai/A lb ai/A	POST	93	100	0	3	62.5
Check				0	0	0	0	52.0
LSD(0.05)				8.5	15.5	6.1	5.5	NS

[1] Nonionic surfactant applied at 0.25% v/v.

Broadleaf weed control In barley. John O. Evans and R.William Mace. EXP31130A was applied to 'Walker' barley at three rates as preemergence and early postemergence treatments. These were compared to postemergence treatments of F8426 applied alone and in combination with thifensulfuron/tribenuron. Barley was planted May 16 into a Millville silt loam soil with 7.5 pH and OM content less than 2% at the Greenville farm in North Logan, UT. The experimental site was broadcast with 2 lb/A redroot pigweed (AMARE) seed in an effort to establish a uniform weed population; however; the redroot pigweed never grew taller than four inches and was not competitive with the barley. Treatments were applied in a randomized block design, with three replications on May 17, June 5, and June 11, 1997 for the preemergence, early postemergence and postemergence treatments respectively. Individual treatments were applied to 10 by 30 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 10 foot spray width calibrated to deliver 25 gpa at 39 psi. Visual evaluations for redroot pigweed control and crop injury were completed June 19, and July 21. Plots were harvested August 26.

EXP31130A provided excellent control of redroot pigweed at all three preemergence rates but there was evidence of injury to barley especially at the highest rate. Early postemergence treatments of EXP31130A were also excellent in controlling pigweed and did not injur barley. F8426 controlled almost 100% of the redroot pigweed population but slightly injured the barley early in the season. F8426 slightly depressed seed production but no significant yield differences existed among treatments at harvest. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. EXP31130A and F8426 comparisons in spring barley for weed control and crop injury. North Logan, UT. 1997.

				AMARE		Barley		
				Control		Injury		Yield
Treatment	Rate	Unit	Stage[2]	6/19	7/21	6/19	7/21	8/26
				— % —		—%—		bu/A
EXP31130A	0.75	oz ai/A	PRE	85	88	0	7	36
EXP31130A	1.13	oz ai/A	PRE	82	90	5	7	56
EXP31130A	1.5	oz ai/A	PRE	92	87	17	27	58
EXP31130A	0.5	oz ai/A	EPOST	85	90	0	0	38
EXP31130A	0.75	oz ai/A	EPOST	90	93	0	0	55
EXP31130A	1.13	oz ai/A	EPOST	92	95	0	3	52
EXP31130A+ Thifen/Triben[1]	0.5 0.25	oz ai/A oz ai/A	EPOST	85	95	2	3	33
F8426[1]	0.023	lb ai/A	POST	99	97	17	0	40
F8426[1]+ Thifen/Triben[1]	0.031 0.028	lb ai/A lb ai/A	POST	99	97	8	0	39
Check				0	0	0	0	52
LSD(0.05)				11	9	9	16	NS

[1] Nonionic surfactant applied at 0.25% v/v.

[2] Preemergence, early postemergence and postemergence treatments applied May 17,June 5 and June 11, respectively.

Imazamox carry-over to barley, canola, and spring wheat. Daniel A. Ball and Darrin L. Walenta. A study was established near Pendleton, OR to evaluate imazamox residual herbicide carry-over to spring seeded barley, canola, and wheat after previous season application to an imidazalinone resistant winter wheat. Annual precipitation at this site averages 17 inches per year. An imidazalinone resistant selection of "Fidel" winter wheat was seeded on October 5, 1995 at 65 lb/A with a double disk drill. Fall postemergence (EPOST) herbicide applications were made on November 2, 1995 (air temp. 39 °F, relative humidity 68%, wind N at 1 mph, sky clear, soil temp. at 2 in. 36 °F) to wheat in the 2.0-2.5 leaf stage. Spring postemergence (LPOST) herbicide applications were made on March 19, 1996 (air temp. 56 °F, relative humidity 76%, wind N at 3 mph, sky clear, soil temp. at 2 in. 50 °F) to winter wheat in the 7.0-8.0 leaf stage. Original applications were made with a tractor mounted, CO_2 pressurized sprayer delivering 12 gpa at 30 psi. Plots were 30 ft by 15 ft in size with 4 replications arranged in a randomized complete block design. All treatments received R-11 surfactant at 0.25% v/v and 32% liquid nitrogen solution at 1 qt/A. Soil type was a Walla Walla silt loam (23.2% sand, 60.8% silt, 16.0% clay) with 2.2% organic matter, 6.3 soil pH, and a CEC of 15.9 meq/100g. In the year of initial treatments, visible injury of herbicide resistant wheat was observed from the highest rate of imazamox (data not shown). Winter wheat was harvested on July 23, 1996. Few weeds were present in the plot area. Winter wheat stubble was distributed by rotary mowing, followed by a skew treading twice, and chiseling twice to a depth of 12 inches. Spring crops of canola var. 'Legend', barley var. 'Baronesse' and spring wheat var. '936R' were seeded on March 31, 1997. Plant-back plots were 10 ft by 15 ft in size with 4 replications. Crop stand counts were obtained on May 1 by counting two 1-meter sections of row and averaging. Visual evaluations of spring crop injury were made on June 20, 1997. Canola was swathed on July 16 and seed harvested with a small plot combine on July 24, 1997. Spring barley and wheat were direct harvested with a small plot combine on July 28 and August 6, respectively, and all grain samples cleaned. Barley and canola yields were converted to lb/A, and wheat yields converted to bu/A. Early crop stand counts were unaffected by imazamox treatment. Visual injury of barley and canola was evident at the July 20 evaluation. Canola and barley yields were negatively impacted by the high rate of imazamox applied 12 and 16 months before spring crop seeding. Spring wheat did not show significant levels of injury from imazamox treatment applied the previous season to imidazolinone resistant winter wheat. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table. Imazamox herbicide carry-over to barley, canola, and wheat.

			Crop stand count			Visual crop injury			Seed yield		
Treatment	Rate	Timing	Barley	Canola	Wheat	Barley	Canola	Wheat	Barley	Canola	Wheat
	lb/A		------no./m of row------			--------- % ---------			-----lb/A-----		bu/A
imazamox + Solution 32 + R-11	0.04 2.08% .25%	EPOST	35	28	42	5	4	0	4130	690	39
imazamox + Solution 32 + R-11	0.08 2.08% .25%	EPOST	35	22	43	16	23	5	3600	290	33
imazamox + Solution 32 + R-11	0.04 2.08% .25%	LPOST	38	23	40	6	5	0	4050	480	38
imazamox + Solution 32 + R-11	0.08 2.08% .25%	LPOST	33	24	42	15	21	3	3800	260	38
Control			35	19	41	0	0	0	4040	880	39
LSD (0.05)			ns	ns	ns	13	10	ns	210	150	ns

Preplant weed control in dry beans. Gary A. Lee and Brenda M. Waters. An experiment was established at the Parma Research and Extension Center to evaluate preplant incorporated herbicides for annual weed control in dry beans. Pinto beans (cultivar 'Bill Z') were planted May 14, 1997 at a rate of 73 lb/A and at a depth of 1.5 in. on 22 in. rows. Herbicide treatments were applied and immediately incorporated with a Triple K cultivator on May 5 (Table 1). The soil at the location is a Greenleaf-Owyhee Silt Loam (32% sand, 58% silt, 10% clay, 1.25% organic matter and 7.7 pH) and the surface conditions at the time of herbicide applications were moderately coarse (clods 0.5 to 1 in.), no visible organic debris and dry. The plots were arranged in a randomized complete block design with four replications and individual plots were 7 by 30 ft. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Plots were visually evaluated on June 1, 1997 (27 DAT) for weed control and crop injury. The crop was hand harvested on August 28 (115 DAT).

Table 1. Application information.

	May 5
Crop stage	Preemerge
Weed stage	Preemerge
Air temp. (F)	72.5
Relative humidity (%)	38
Wind (mph)	2
Sky (% cloud cover)	50
Soil temp. (F at 4 in.)	79
Soil moisture	dry surface, good moisture at 1.5 in.

First significant rain fall after herbicide application was 0.12 inch on May 24, 1997.

Dimethenamid at 1.0 and 1.5 lb/A, metolachlor at 1.0 lb/A, imazethapyr at 0.05 lb/A and sulfentrazone at 0.38 lb/A were the only PPI treatments that did not provide 91% or better of all annual weed species present (Table 2). Pendimethalin + EPTC at 1.88 + 3.0 and 3.96 + 3.0 lb/A were the only treatments that gave 100% of all weeds. However, the highest rate did cause significant crop injury. Ethalfluralin at 0.75 and 1.12 lb/A was as effective as ethalfluralin + EPTC at 1.0 + 3.0 lb/A with the exception of common lambsquarters (CHEAL) control with the low rate of ethalfluralin alone. Imazethapyr at 0.05 lb/A and sulfentrazone at 0.38 lb/A did not effectively control barnyardgrass (ECHCG). Pendimethalin at 3.96 lb/A, pendimethalin + EPTC at 3.96 + 3.0 lb/A, dimethenamid at 1.5 lb/A and metolachlor at 1.0 lb/A caused significant bean injury compared to plants in the nontreated plots. However, only pendimethalin + EPTC at 3.96 + 3.0 lb/A induced a moderate level of injury. All plots were hand weeded on June 23 and maintained relatively weed-free for the remainder of the growing season. Significant differences in dry bean yields from plots treated with herbicides did occur with ethalfluralin + EPTC at 1.0 + 3.0 lb/A treated plots having the lowest yields. The reason for lower yields is not readily apparent since the treatment provided excellent weed control and no visual crop injury. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preplant herbicide treatments on annual weeds, crop injury and dry bean yield.

		Weed Control					Beans	
Treatment	Rate	AMARE	SOLSA	CHEAL	KCHSC	ECHCG	Injury	Yield
	lb/A	%						CWT/A
Pendimethalin	1.98	97.8	92.5	95.0	97.5	99.5	0.0	24.9
Pendimethalin	3.96	100.0	99.5	98.3	98.8	100.0	7.5	25.6
Ethalfluralin	0.75	98.8	95.0	92.5	95.0	99.0	0.0	28.8
Ethalfluralin	1.12	98.8	95.0	97.0	97.5	100.0	0.0	29.4
Pendimethalin + EPTC	1.98 + 3.0	100.0	100.0	100.0	100.0	100.0	0.0	29.6
Pendimethalin + EPTC	3.96 + 3.0	100.0	100.0	100.0	100.0	100.0	17.5	21.3
Dimethenamid	1.0	83.8	81.3	87.5	92.5	98.0	0.0	28.5
Dimethenamid	1.5	88.8	91.3	90.0	90.0	99.0	3.8	28.3
Dimethenamid + EPTC	1.0 + 3.0	100.0	97.3	100.0	100.0	100.0	1.8	30.2
Ethalfluralin + EPTC	1.0 + 3.0	99.5	94.5	98.3	97.5	100.0	0.0	18.6
Alachlor	3.0	92.5	92.5	91.3	92.5	94.5	0.0	29.3
Metolachlor	1.0	80.0	85.0	87.5	97.5	97.3	5.0	28.5
Imazethapyr	0.05	93.8	95.0	95.0	83.8	66.3	0.0	30.4
Trifluralin + EPTC	0.5 + 3.0	100.0	98.3	100.0	100.0	100.0	0.0	27.0
Sulfentrazone	0.38	97.8	95.0	97.0	100.0	50.0	0.0	23.5
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0	23.8
LSD 90.05)		3.0	3.4	3.5	4.1	3.8	3.5	7.6

Tolerance of dry bean market classes to preplant incorporated herbicides. Gary A. Lee and Brenda M. Waters. A trial was conducted at the Parma Research and Extension Center, Parma, Idaho to evaluate the tolerance of seven market classes of dry beans to standard PPI herbicide treatments. The PPI herbicide treatments were applied on May 5 and incorporated immediately with a Triple K cultivator to a depth of 1 to 1.5 in. (Table 1). On May 14, 1997, pinto (cultivar 'Bill Z'), great northern (cultivar 'UI425'), pink (cultivar 'UI537'), small white (cultivar 'UI137'), black (cultivar 'UI911'), light red kidney (cultivar 'Cal Early Light') and snap ('Hi-Style') market class of beans were planted at 73, 73, 63, 38, 40, 106 and 73 lb/A, respectively, at a depth of 1.5 to 2 in. on 22 in. rows. The soil at the location is a Greenleaf-Owyhee Silt Loam (32% sand, 58% silt, 10% clay, 1.25% organic matter and 7.7 pH). The experiment was arranged in a split block design with herbicide treatments as the whole plot and bean cultivars as the split plot. Each herbicide treatment was replicated four times and individual plots were 7 by 15 ft. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Visual evaluation of weed control and crop injury were made on May 31 (24 DAT). Plots were harvested on August 28 (115 DAT).

Table 1. Application information.

	May 5
Crop stage	Preemerge
Weed stage	Dormant
Air temp. (F)	74.4
Relative humidity (%)	30
Wind (mph)	3
Sky (% cloud cover)	100
Soil temp. (F at 4 in.)	80
Soil moisture	dry surface, good moisture at 1.5 in.

First significant rain fall after herbicide application was 0.12 inch on May 23, 1997.

All PPI herbicide treatments except alachlor at 3.0 lb/A controlled 90% or better of the annual weed species present. EPTC + trifluralin at 3.0 + 0.5 lb/A and EPTC + dimethenamid at 3.0 + 1.0 lb/A provided significantly better control of hairy nightshade (SOLSA), kochia (KCHSC), barnyardgrass (ECHCG) and common mallow (MALNE) compared to the other PPI herbicide treatments (Table 2). No herbicide treatment caused visual injury to either pinto or great northern market class (Table 3). EPTC + ethalfluralin at 3.0 + 1.0 lb/A, EPTC + dimethenamid at 3.0 + 1.0 lb/A and alachlor at 3.0 lb/A treated plots produced significantly higher pinto bean yields than the weedy check plots. EPTC + trifluralin at 3.0 + 0.5 lb/A and alachlor at 3.0 lb/A treated pink beans exhibited significant injury, but no significant reduction in yield was detected. Navy, black and light red kidney bean market classes that were treated with PPI herbicides had significant visual injury symptoms 24 DAT; however, no significant yield reductions were measured. EPTC + dimethenamid at 3.0 + 1.0 lb/A and alachlor at 3.0 lb/A treated snap beans had significant herbicide injury, but yields from herbicide treated plots and the nontreated check plots were not significantly different. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of PPI herbicides on weed control.

Treatment	Rate	Weed control AMARE	SOLSA	ECHCG	KCHSC	MALNE
	lb/A	%				
EPTC + ethalfluralin	3.0 + 1.0	90.0	92.0	91.3	90.1	93.0
EPTC + trifluralin	3.0 + 0.5	98.6	98.6	98.9	99.5	98.2
EPTC + dimethenamid	3.0 + 1.0	99.6	95.1	96.3	99.5	95.9
Alachlor	3.0	91.2	90.0	86.7	90.3	89.8
Weedy check	---	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		0.6	1.7	0.8	0.4	2.4

Table 3. Effect of PPI herbicide on seven market classes of dry bean injury and yield.

Treatment	Rate	Pinto Injury	Pinto Yield	Gr. Northern Injury	Gr. Northern Yield	Pink Injury	Pink Yield	Navy Injury	Navy Yield	Black Injury	Black Yield	Lt. Red Kidney Injury	Lt. Red Kidney Yield	Snap Injury	Snap Yield
	lb/A	-%-	CWT/A	-%-	CWT/A	-%-	CWT/A	-%-	CWT/A	-%-	CWT/A	-%-	CWT/A	-%-	CWT/A
EPTC + ethal[1]	3.0 + 1.0	0.0	33.5	0.0	39.6	0.0	42.2	5.0	36.6	13.8	36.8	10.0	19.7	0.0	14.3
EPTC + trifl[2]	3.0 + 0.5	0.0	31.5	0.0	31.1	8.8	36.7	15.0	36.8	8.8	31.6	5.0	18.2	0.0	20.2
EPTC + dimeth[3]	3.0 + 1.0	0.0	35.8	0.0	36.7	1.3	37.8	5.0	37.5	5.0	34.5	10.0	23.6	5.0	21.7
Alachlor	3.0	0.0	36.8	0.0	35.6	5.0	37.5	10.0	43.8	6.3	33.3	10.0	21.1	5.0	17.9
Weedy check	---	0.0	23.8	0.0	31.7	0.0	31.7	0.0	37.9	0.0	33.7	0.0	16.7	0.0	15.6
LSD (0.05)		NS	8.6	NS	NS	1.5	8.6	1.5	NS	1.5	NS	1.5	NS	1.5	NS

[1]Ethal = ethalfluralin
[2]Trifl = trifluralin
[3]Dimeth = dimethenamid

Annual grass and broadleaf weed control in pinto beans with dimethenamid alone or in combination. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 20, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of pinto beans (var. Bill Z), annual grass and broadleaf weeds to dimethenamid applied alone or in combination. Soil type was a Wall sandy loam with pH of 7.8 and an organic matter content less than 1%. The experimental design was a randomized complete block with three replications. Individual treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preplant incorporated treatments were applied May 19 and immediately incorporated to a depth of two to four in using a tractor driven rototiller. Preemergence treatments were applied May 20 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied June 23 when bean plants were in the third trifoliolate leaf stage and weeds were two to three inch in height. Black nightshade infestations were heavy and redroot and prostrate pigweed, barnyardgrass and green foxtail infestations were moderate throughout the experimental area. Preplant incorporated and preemergence treatments were evaluated visually on June 19. Postemergence treatments were evaluated on July 23. The two center rows of each plot were thrashed on September 4. Results obtained were subjected to analysis of variance at P=0.05.

No crop injury was observed in any of the treatments. Annual grass control was excellent with all treatments except the postemergence treatment of imazethapyr plus bentazon at 0.032 plus 0.5 lb/A and the check. Sethoxydim plus dimethenamid plus bentazon applied postemergence at 0.19 plus 1.0 plus 1.0 gave poor control of broadleaf weeds. A trend was noticed that all postemergence treatments did not control broadleaf weeds as well as the other treatment timings. Yields were 708 to 3229 lb/A higher in the herbicide treated plots as compared to the check. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Control of annual grass and broadleaf weeds in pinto beans with dimethenamid alone or in combination on June 19 and July 23.

		Weed Control					
Treatment	Rate	ECHCG	SETVI	SOLNI	AMARE	AMABL	Yield
	lb/A	--------	--------	%	--------	--------	lb/A
Dimethenamid + pendimethalin[1]	1.0+1.0	100	100	97	100	100	3843
Dimethenamid + pendimethalin[2]	1.0+1.0	100	100	99	100	100	2967
Pendimethalin/dimethenamid[3]	1.0/1.0	100	100	100	100	100	3843
Dimethenamid[2]	1.0	100	100	100	100	100	3485
Dimethenamid/imazethapyr + bentazon[4]	1.0/0.032+0.5	100	100	100	100	99	3843
Dimethenamid + imazethapyr[2]	1.0+0.032	100	100	100	100	100	3536
Dimethenamid + imazethapyr + bentazon + sethoxydim[5]	0.5+0.047+0.5+0.19	100	100	88	91	88	1845
Sethoxydim + imazethapyr + bentazon[5]	0.19+0.032+0.5	100	99	82	80	85	1476
Sethoxydim + dimethenamid + bentazon[5]	0.19+1.0+1.0	100	100	22	20	20	1322
Dimethenamid/dimethenamid + bentazon[4]	0.5/0.5+1.0	100	97	99	100	100	3229
Dimethenamid/dimethenamid + sethoxydim[4]	0.5/0.5+0.19	100	100	88	91	100	2921
Imazethapyr + bentazon[5]	0.032+0.5	68	72	83	81	83	1584
Check		0	0	0	0	0	614
LSD 0.05		2	2	3	2	2	523

1. Treatments applied preplant incorporated.
2. Treatments applied preemergence.
3. First treatment PPI followed by a PRE treatment.
4. First treatment PRE followed by a POST with COC and 32% N solution and rated on July 23.
5. Treatments applied POST with COC and 32% N solution and rated on July 23.

Broadleaf weed control in pinto beans with preplant incorporated, preemergence and preplant incorporated/preemergence herbicides. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 20, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of pinto beans (var. Bill Z) to preplant incorporated, preemergence and preplant incorporated/preemergence herbicides. Soil type was a Wall sandy loam with pH of 7.8 and an organic matter content less than 1%. The experimental design was a randomized complete block with three replications. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preplant incorporated treatments were applied May 19 and immediately incorporated to a depth of two to four in using a tractor driven rototiller. Preemergence treatments were applied May 20 and immediately incorporated with 0.75 in of sprinkler applied water. Black nightshade infestations were heavy and redroot and prostrate pigweed infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control was June 19. The two center rows of each plot were thrashed on September 4. Results obtained were subjected to analysis of variance at P=0.05.

No crop injury was observed in any of the treatments. Black nightshade control was good to excellent with all treatments except ethalfluralin applied preplant incorporated at 0.56 lb/A and the check. All treatments gave good to excellent control of redroot and prostrate pigweed. Yields were 677 to 2922 lb/A higher in the herbicide treated plots as compared to the check. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Broadleaf weed control in pinto beans with preplant incorporated, preemergence and preplant incorporated/preemergence herbicides.

Treatment[1]	Rate	Crop Injury	Weed control AMARE	Weed control SOLNI	Weed control AMABL	Yield
	lb/A	%	%	%	%	lb/A
Metolachlor[1]	2.0	0	100	90	100	2967
Metolachlor II Mag[1]	1.23	0	100	89	100	2967
Dimethenamid[3]	1.21	0	100	90	100	3013
Metolachlor + ethalfluralin[2]	1.75+0.56	0	100	95	100	2767
Dimethenamid + ethalfluralin[2]	0.98+0.56	0	100	95	100	3167
Metolachlor II Mag + ethalfluralin[2]	1.21+0.56	0	100	98	100	3074
S-dimethenamid[1]	0.66	0	100	93	100	3013
S-dimethenamid[2]	0.54+0.56	0	100	95	100	3229
Ethalfluralin[2]	0.56	0	100	81	94	2352
Ethalfluralin/metolachlor[3]	0.56/1.75	0	100	95	100	3229
Ethalfluralin/ metolachlor II Mag[3]	0.56/1.12	0	100	95	100	3321
Ethalfluralin/dimethenamid[3]	0.56/1.0	0	100	97	100	3475
Ethalfluralin/s-dimethenamid[3]	0.56/0.54	0	100	97	100	3382
Handweeded check		0	100	100	100	3475
Check		0	0	0	0	553
LSD 0.05			2	1	3	776

1. Treatments applied preemergence.
2. Treatments applied preplant incorporated.
3. First treatment applied preplant incorporated followed by a preemergence treatment.

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

Table. Soil applied weed control in dry beans.

			July 2			July 17		
Treatment	Rate	Dry bean	SETVI[1]	SINAR	XANST	SETVI	SINAR	XANST
	lb/A	% injury	% control					
PPI								
Flumetsulam&trifluralin	0.91	0	89	99	20	82	98	20
Flumetsulam&trifluralin	1.83	8	99	99	25	98	99	40
Flumetsulam&metolachlor	2.15	0	88	96	18	76	99	7
Flumetsulam&metolachlor	2.39	2	93	99	28	93	99	27
Ethalfluralin + dimethenamid	0.55+1.2	0	99	60	7	91	63	10
Pendimethalin + dimethenamid	1.25+1.2	0	96	81	8	95	66	0
PRE								
Flumetsulam&metolachlor	2.15	0	20	99	17	47	99	3
Flumetsulam&metolachlor	4.31	2	48	99	23	70	99	37
Pendimethalin + dimethenamid	1.25+1.2	0	67	53	0	90	53	7
PPI fb POST								
Trifluralin / bentazon + PO[2]	0.5/0.75	0	96	99	95	86	99	72
Trifluralin / imazethapyr + NIS[3]	0.5/0.031	0	91	90	53	93	99	80
Flumetsulam&trifluralin / imazethapyr + NIS[3]	0.8/ 0.031	0	99	99	80	99	99	83
Pendimethalin / imazethapyr + NIS[3]	1.25/0.031	0	98	99	60	96	89	73
PRE fb POST								
Dimethenamid / imazethapyr + NIS[3]	1.2/0.031	0	82	99	80	86	99	80
Dimethenamid / bentazon + PO[2]	1.2/0.75	0	33	99	91	40	99	93
Dimethenamid / imazethapyr + bentazon + NIS[3]	1.2/0.031+ 0.75	0	77	99	90	98	99	95
POST								
Dimethenamid + imazethapyr + NIS[3]	1.2+0.031	0	77	99	80	96	99	82
Dimethenamid + bentazon + PO[2]	1.2+0.75	0	37	99	92	48	99	93
Dimethenamid + imazethapyr + bentazon + NIS[3]	1.2+0.031+ 0.75	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

[1]SETVI = mostly green foxtail, but yellow foxtail (SETLU) was also present, [2]PO = Herbimax at 1 qt/A, [3]NIS = Preference at 0.25% v/v.

This research was conducted to determine dry bean response to 1X and 2X rates of flumetsulam premixes, and evaluate herbicide treatments recently labeled in dry bean. Data indicate excellent tolerance of dry bean to flumetsulam. All treatments gave complete redroot pigweed and common lambsquarters control. Pinto and navy cultivars used in this study had excellent tolerance to flumetsulam premixes applied PPI or PRE. Flumetsulam&metolachlor controlled less foxtail PRE than PPI. Dimethenamid 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 bentazon and/or imazethapyr, controlled common cocklebur. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Weed control in dry beans. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted to evaluate weed control from labeled and experimental herbicides applied PPI, PRE, and POST, at Minto , ND. PPI treatments were applied May 28, 1997 at 12:00 pm with 73 F air, 62 F soil at 4 in, 18% RH, 5% clouds, and 3 mph wind and incorporated to a depth of 1 to 2 in 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 in, 18% RH, 5% clouds, and 3 mph wind. POST treatments were applied June 20 at 11:00 am with 75 F air, 41% RH, 90% clouds, and 0 to 3 mph wind to 1 to 3 in green foxtail, 0 to 3 in redroot pigweed, and 1 to 3 in common lambsquarters. Treatments were applied to the center 8 feet of the 10 by 30 feet 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 research was conducted to determine dry bean response to 1X and 2X rates of flumetsulam herbicide premixes, and evaluate weed control from herbicide treatments recently labeled in dry bean. Data indicates excellent dry bean tolerance and weed control occurred from 1X rates of flumetsulam&trifluralin PPI and 1X or 2X rates of flumetsulam&metolachlor PPI. Weed control from PRE or PRE followed by POST treatments was inadequate due to dry weather following PRE application. No rainfall occurred after planting until July 1. PPI and PPI followed by POST treatments gave excellent weed control. Weed control from POST treatment containing imazethapyr and/or bentazon was inadequate probably due to drought stressed condition of weeds at application. Dry bean injury from imazethapyr may be due to drought stressed condition of dry beans also. Dry bean injury from imazamox was slight which verifies other research indicating that dry bean injury does not occur under drier, warm conditions. Bentazon antagonized weed control from imazamox. Antagonism increased as imazamox rates decreased. Imazamox at 0.016 lb/A + Sun-It II did not control weeds. However, Sun-It II overcame bentazon antagonism of imazamox even though weed control was poor. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Table. Weed control in dry beans.

		14 DAT			28 DAT			July 8			
Treatment[1]	Rate	SETVI	AMARE	CHEAL	SETVI	AMARE	CHEAL	Dry Bean	SETVI	AMARE	CHEAL
	lb/A	% control						% injury	% control		
PPI											
Flumetsulam&trifluralin	0.91	91	98	98	89	95	98	0	90	98	98
Flumetsulam&trifluralin	1.83	98	99	99	96	99	99	13	98	99	99
Flumetsulam&metolachlor	2.15	87	95	99	78	90	96	3	87	95	99
Flumetsulam&metolachlor	2.39	94	98	98	93	98	99	0	96	98	99
Ethalfluralin + dimethenamid	0.55+1.2	97	99	99	98	99	99	0	96	99	99
Pendimethalin + dimethenamid	1.25+1.2	81	71	91	78	70	91	3	77	71	91
PRE											
Flumetsulam&metolachlor	2.15	42	47	65	27	27	67	3	33	40	67
Flumetsulam&metolachlor	4.31	62	62	83	50	50	73	0	57	57	75
Pendimethalin + dimethenamid	1.25+1.2	57	57	53	47	58	60	0	47	50	70
PPI fb POST											
Trifluralin / bentazon + PO	0.5/0.75+1	94	98	99	91	96	98	0	91	96	98
Trifluralin / imazethapyr + NIS	0.5/0.031	92	98	98	91	98	98	0	91	98	98
Flumetsulam&trifluralin / imazethapyr + NIS	0.8/ 0.031	94	99	99	95	99	99	3	95	99	99
Pendimethalin / imazethapyr + NIS	1.25/0.031	94	96	98	95	85	98	22	95	98	98
PRE fb POST											
Dimethenamid / imazethapyr + NIS	1.2/0.031	48	72	80	67	70	70	0	67	70	70
Dimethenamid / bentazon + PO	1.2/0.75+1	32	70	86	32	75	80	3	32	75	80
Dimethenamid / imazethapyr + bentazon + NIS	1.2/0.031+ 0.75	63	70	83	62	69	77	20	62	69	77
POST											
Dimethenamid + imazethapyr + NIS	1.2+0.031	53	57	67	53	57	67	0	53	57	67
Dimethenamid + bentazon + PO	1.2+0.75+1	38	70	77	38	70	77	5	38	70	77
Dimethenamid + imazethapyr + bentazon + NIS	1.2 +0.031+ 0.75	33	73	83	50	73	83	27	50	73	83
Bentazon + PO	0.5+1.5	0	67	83	0	82	83	0	0	67	83
Imazethapyr + bentazon + NIS	0.031+0.25	57	70	57	57	70	77	7	57	70	77
Imazethapyr + bentazon + NIS	0.031+0.125	77	80	90	77	70	90	10	77	80	90
Imazamox + NIS	0.031	92	93	95	92	85	95	3	92	93	95
Imazamox + bentazon + NIS	0.031+ 0.125	58	80	80	75	80	80	7	75	80	80
Imazamox + NIS	0.023	87	90	85	87	90	85	0	87	90	85
Imazamox + bentazon + NIS	0.023 + 0.125	82	85	70	82	85	70	3	82	85	70
Imazamox + Sun-It II	0.016 + 1.5	64	63	65	64	63	48	5	64	63	65
Imazamox + bentazon + Sun-It II	0.016 + 0.25 + 1.5	73	65	70	73	62	70	3	73	65	70
Imazamox + bentazon + Sun-It II	0.016 + 0.125 + 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

[1]NIS = Preference at 0.25 % v/v, PO = Herbimax rates in qt/A, Sun-It II rates in pt/A.

POST weed control in dry beans. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted, in Casselton, ND, to evaluate weed control from labeled and experimental herbicides applied POST. 'Othello' pinto and 'Norstar' navy beans were seeded on May 28, 1997. POST treatments were applied June 20 at 2:00 pm with 77 F, 51% RH, 40% clouds, and 0 to 5 mph wind to 1st trifoliolate beans, 1 to 4 in green and yellow foxtail, 1 to 5 in diameter rosette wild mustard, 0.5 to 2 in redroot pigweed, 0.5 to 2 in common lambsquarters, and 1 to 5 in common cocklebur. LPOST treatments were applied June 27 at 3:30 with 92 F, 76 RH, 10% clouds, and 3 to 7 mph wind to V2 to V4 beans, 0.5 to 3 in green and yellow foxtail, 1 to 3 in diameter rosette wild mustard, 1 to 3 in redroot pigweed, 1 to 3 in common lambsquarters, and 1 to 3 in common cocklebur. Treatments were applied to the center 8 feet of the 10 by 40 foot 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 injury to dry bean from imazethapyr and imazamox 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 safety to dry bean and maintain adequate weed control. To our surprise, injury did not occur to dry bean for 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 imazamox was observed.

Imazethapyr at 0.031 lb/A was enhanced more by Sun-It II than NIS. Adding bentazon to imazethapyr + NIS increased general weed control over imazethapyr + NIS at the last evaluation. However, addition of bentazon to imazethapyr + Sun-It II did not increase weed control compared to imazethapyr + Sun-It II alone. Other research has shown safening of dry bean to imazethapyr from bentazon but in this research no injury occurred with either treatment. Increasing the bentazon rate from 0.125 to 0.25 lb/A increased weed control with imazethapyr + NIS but did not further increase weed control with imazethapyr + Sun-It II. Imazethapyr + clethodim at 1.5 lb/A gave excellent grass and broadleaf weed control.

Imazamox label in soybean allows use alone at 0.04 lb/A or 0.031 lb/A POST only if a soil herbicide is applied prior to imazamox. Imazamox gave greater common lambsquarters control than imazethapyr with similar adjuvants. Imazamox at 0.023 lb/A + Sun-It II gave greater general weed control than imazamox at 0.023 lb/A + NIS and equal or greater weed control than imazamox at 0.031 lb/A + NIS. Evaluations of imazamox of weed control at an even lower rate of 0.016 lb/A + Sun-It II initially was lower but was equal to imazamox at 0.023 lb/A + Sun-It II at July 17. Addition of bentazon antagonized imazamox control of grass and broadleaf weeds. Adding Sun-It II in the place of NIS did not overcome bentazon antagonism of imazamox. However, reducing the rate of Sun-It II from 1.5 to 0.5 pt/A reduced weed control from imazamox. With the exception of common cocklebur, imazamox applied in sequential applications at rates from 0.008 lb/A to 0.016 lb/A resulted in almost complete weed control. Previous research has shown that sequential applications of imazamox at reduced rates increases dry bean safety. Present research indicates that sequential imazamox at low rates produces adequate weed control. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Table. POST weed control in dry beans.

Treatment[1]	Rate	July 2					July 17				
		SETVI[2]	SINAR	AMARE	CHEAL	XANST	SETVI[2]	SINAR	AMARE	CHEAL	XANST
	lb/A	% control									
POST											
Bentazon + PO	0.5 + 1.5	0	83	23	40	93	0	63	30	30	95
Imazethapyr + NIS	0.031 + 0.25	80	60	79	66	81	70	63	63	63	70
Imazethapyr + Sun-It II	0.031 + 1.5	81	81	83	76	90	88	88	83	80	83
Imazethapyr + bentazon + Sun-It II	0.031 + 0.25 + 1.5	78	86	93	88	96	88	93	92	79	79
Imazethapyr + bentazon + Sun-It II	0.031 + 0.5 + 1.5	73	96	85	86	97	81	96	94	85	83
Imazethapyr + bentazon + NIS	0.031 + 0.25 + 0.25	73	84	71	75	94	86	80	70	71	73
Imazethapyr + bentazon + NIS	0.031 + 0.5 + 0.25	77	97	73	76	89	88	83	91	73	70
Imazethapyr + clethodim + NIS	0.031 + 1.13 + 0.25	85	96	83	88	79	86	85	93	80	83
Imazethapyr + clethodim + NIS	0.031 + 1.5 + 0.25	80	90	90	90	83	97	99	99	90	90
Imazamox + NIS	0.031 + 0.25	63	80	86	78	60	84	97	97	78	63
Imazamox + Sun-It II	0.023 +1.5	81	92	90	87	70	86	99	96	88	63
Imazamox + Sun-It II	0.016 + 1.5	66	94	76	73	53	73	99	96	83	56
Imazamox + bentazon + NIS	0.031 + 0.5 + 0.25	86	96	82	71	88	88	97	79	78	76
Imazamox + NIS	0.023 + 0.25	61	83	80	68	63	81	89	76	73	53
Imazamox + bentazon + NIS	0.023 + 0.5 + 0.25	75	94	80	80	84	86	97	88	73	80
Imazamox + bentazon + Sun-It II	0.016 + 0.5 + 1.5	76	91	86	80	96	69	86	76	60	70
Imazamox + bentazon + Sun-It II	0.016 + 0.5 + 0.5	66	92	83	74	84	56	74	70	56	46
POST fb LPOST											
Imazamox + Sun-It II/ Imazamox + Sun-It II	0.008 + 1.5 / 0.008 + 1.5	90	95	93	94	78	93	99	99	93	73
Imazamox + Sun-It II/ Imazamox + Sun-It II	0.012 + 1.5/ 0.012 +1.5	87	94	90	91	88	97	99	99	93	76
Imazamox + Sun-It II/ Imazamox + Sun-It II	0.016 + 1.5 / 0.008 + 1.5	93	99	99	99	90	97	98	97	95	86
Imazamox + Sun-It II/ Imazamox + Sun-It II	0.016 + 1.5 / 0.016 + 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

[1]NIS = Preference at 0.25%, PO = Herbimax, Sun-It II in pt/A.
[2]SETVI = mostly green foxtail but yellow foxtail (SETLU) was also included.

No effect level of soil-applied chlorsulfuron and metsulfuron on sugar beets. Don W. Morishita, Robert W. Downard, and Debbie Korsmo. Studies were conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho and Agvise Research Center, near Northwood, ND to determine soil-applied herbicide levels that caused visual injury symptoms and reduced sugar beet root yield. Treatments were arranged in a randomized complete block design and replicated six times. Sugar beets ('WS PM-9') at Idaho were planted on 22-inch rows April 15, 1997, at a seeding rate of 47,520 seed/A and sprinkler irrigated. At North Dakota sugar beets ('ACH 192') were planted on 30-inch rows May 15, at a seeding rate of 52,272 seed/A. Individual plots were 6 rows by 30 feet at Idaho and 4 rows by 30 feet at North Dakota. Soil type at Idaho was a silty clay loam with a pH of 8.3, CEC of 20.3 meq/100 g of soil, and 1.7% organic matter. Soil type at North Dakota was a loam with a pH of 7.6, CEC of 31.5 meq/100 g of soil, and 5% organic matter. At Idaho, herbicides were applied broadcast with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa at 36 psi using 11002 even fan nozzles. At North Dakota, herbicides were applied with a tractor-mounted sprayer using compressed air as the propellant and calibrated to deliver 30 gpa at 23 psi using 8002 flat fan nozzles. Additional application information is shown in Table 1. Crop injury was evaluated visually at North Dakota and Idaho on June 30 and July 3, respectively. The two center rows of sugar beets were harvested October 1 and 8 at Idaho and North Dakota, respectively.

Table 1. Application information

Location	Idaho	North Dakota
Application date	4/15	5/15
Air temperature (F)	64	42
Soil temperature (F)	52	35
Relative humidity (%)	44	84
Wind speed (mph)	3 to 9	4

None of the first four rates of metsulfuron, chlorsulfuron, or pendimethalin injured the sugar beets more than 10%, except the fourth highest chlorsulfuron rate (0.000356 oz/A) at North Dakota (Table 2). The highest rates of metsulfuron and chlorsulfuron injured the sugar beets the most at both locations. The second highest rates of metsulfuron and chlorsulfuron injured the sugar beets at Idaho about as much as the highest rates at North Dakota. The higher injury ratings at Idaho can probably be attributed to differences in soil type between the two locations. Sugar content was not affected by any of the herbicide treatments at either location. Sugar beet root yields closely followed injury level at both locations. However, yield reductions were more severe at Idaho than North Dakota. Yield reduction between the highest and lowest rate of metsulfuron, chlorsulfuron, and pendimethalin averaged 91, 97, and 19%, respectively at Idaho. Yield reduction between the highest and lowest rate of the same three herbicides averaged 33, 32, and 0% at North Dakota. Yields from the first four and first five metsulfuron and chlorsulfuron rates at Idaho and North Dakota, respectively were equal to the untreated checks. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Sugar beet injury and root yield from preemergence applications of soil-applied herbicides.

		Sugar beet						
		injury		yield		sugar content		ID recoverable
Treatment	Rate	ID	ND	ID	ND	ID	ND	sugar
	oz/A	---------%---------		-------ton/A------		---------%--------		lb/A
Metsulfuron	0.000014	1	3	35	24	14.7	15.5	8790
Metsulfuron	0.000071	0	5	36	25	14.7	15.7	8970
Metsulfuron	0.000356	0	4	32	25	14.7	16.3	7815
Metsulfuron	0.00143	4	5	37	26	14.4	15.6	9000
Metsulfuron	0.00714	77	13	18	23	14.6	16.1	4275
Metsulfuron	0.0357	100	68	3	16	14.0	15.9	555
Chlorsulfuron	0.000014	0	3	36	25	14.3	15.9	8545
Chlorsulfuron	0.000071	0	3	36	23	14.7	16.1	9030
Chlorsulfuron	0.000356	0	15	38	26	14.8	16.2	9575
Chlorsulfuron	0.00143	9	5	34	25	14.5	16.3	8470
Chlorsulfuron	0.00714	68	9	22	25	14.7	16.5	5420
Chlorsulfuron	0.0357	100	55	1	17	-	16.0	-
Pendimethalin	0.048	0	8	36	24	14.6	16.3	8865
Pendimethalin	0.0964	0	9	37	23	14.8	15.6	9235
Pendimethalin	0.178	4	10	38	22	14.7	15.8	9400
Pendimethalin	0.357	4	8	37	25	14.7	15.8	9160
Pendimethalin	0.714	5	5	32	24	14.6	16.0	7920
Pendimethalin	1.428	18	8	29	24	14.6	16.1	7200
Check		-	-	33	23	14.7	15.8	8235
Check		-	-	35	24	14.8	15.6	8765
Check		-	-	33	26	14.6	15.9	8170
LSD (0.05)		11	9	6	4	ns	ns	1480

Effect of desmedipham, phenmedipham, and ethofumesate tank mixed with clethodim, quizalofop, and sethoxydim for weed control in sugar beets. Robert W. Downard and Don W. Morishita. The objective of this experiment was to evaluate broadleaf and grass weed control with rates of desmedipham, phenmedipham, and ethofumesate (dmp&pmp&efs) tanked mixed with clethodim, quizalofop, or sethoxydim. The trial was conducted under sprinkler irrigation at the University of Idaho Research and Extension Center near Kimberly, Idaho. Sugar beets ('WS-PM9') were planted at 47,520 seeds/A on 22-inch rows April 15, 1997, and emerged May 2. Individual plots were 4 rows by 30 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g of soil, and 1.7% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa at 38 psi using 8001 even fan nozzles. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken June 18 and July 2. Sugar beet roots from the two center rows of each plot were harvested October 3.

Table 1. Application information.

Application timing	cotyledon (cotyl)	7 days later	14 days later	16 days later	35 days later
Application date	5/7	5/15	5/21	5/23	6/3
Air temperature (F)	62	70	76	62	85
Soil temperature (F)	52	62	64	57	64
Relative humidity (%)	55	64	41	58	40
Wind speed (mph)	5 to 12	3 to 6	0	0	10 to 13
Weed growth stage					
Green foxtail	-	2 leaf	2 to 4 leaf	2 to 4 leaf	4 to 6 leaf
Barnyardgrass	-	2 leaf	2 leaf	3 to 4 leaf	5 leaf
Kochia	cotyl to 6 leaf	0.5 to 2 inches	1.5 to 2 inches	1.5 to 2 inches	7 to 8 inches
Common lambsquarters	cotyledon	cotyl to 4 leaf	0.5 to 1.5 inches	1 to 1.5 inches	3 to 5 inches
Redroot pigweed	-	cotyl to 2 leaf	2 to 4 leaf	2 to 6 leaf	4 to 10 leaf
Weed density/ft^2					
Green foxtail	0	8	11	11	6
Barnyardgrass	0	2	4	4	3
Kochia	15	18	18	18	12
Common lambsquarters	8	6	8	8	7
Redroot pigweed	-	5	9	9	5
Total	23	39	50	50	33

All treatments showed little or no injury symptoms (data not shown). Barnyardgrass control was equal among all herbicide treatments ranging from 93 to 100% (Table 2). High control ratings may be partially due to low barnyardgrass densities. Green foxtail control varied and ranged from 75 to 100%. Quizalofop + dmp&pmp&efs at 0.048 + 0.75 lb/A reduced green foxtail control. Tank mixing dmp&pmp&efs with clethodim or sethoxydim did not reduce grass control. Common lambsquarters control was excellent (93 to 99%) on June 18 and July 2, except for dmp&pmp&efs at 0.25 lb/A, followed 14 days later with quizalofop + dmp&pmp&efs at 0.048 + 0.33 lb/A and 21 days later with dmp&pmp&efs at 0.33 lb/A. Most herbicide treatments had fair to poor kochia control due mainly to early germination, rapid growth, and high densities which made it difficult to control kochia. Rain showers that occurred intermittently for two days after emergence prohibited earlier application. Sugar beet root yields correlated closely to kochia control on July 2. Treatments that had 70% or better kochia control had the highest yields. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Grass weed control and yield in sugar beets with desmedipham, phenmedipham, and ethofumesate tank mixed with clethodim, sethoxydim, and quizalofop.

			Weed control[1]								Sugar beet	
			SETVI		ECHCG		KCHSC		CHEAL		root	recoverable
Treatment[2]	Rate	Timing	6/18	7/2	6/18	7/2	6/18	7/2	6/18	7/2	yield	sugar
	lb/A		%								ton/A	lb/A
Untreated			-	-	-	-	-	-	-	-	1	127
Dmp & pmp & efs	0.25	cotyledon	95	91	93	93	70	63	99	95	11	2729
dmp & pmp & efs	0.33	7 days later										
clethodim[3]	0.094	14 days later										
dmp & pmp & efs	0.33	16 days later										
Dmp & pmp & efs	0.25	cotyledon	100	99	100	100	66	60	95	93	11	2793
dmp & pmp & efs	0.33	7 days later										
clethodim[3]	0.125	14 days later										
dmp & pmp & efs	0.33	16 days later										
Dmp & pmp & efs	0.25	cotyledon	99	96	99	100	66	54	93	93	10	2475
dmp & pmp & efs	0.33	7 days later										
clethodim +	0.094 +	14 days later										
dmp & pmp & efs	0.33											
Dmp & pmp & efs	0.25	cotyledon	100	100	100	100	83	76	99	95	20	5141
dmp & pmp & efs	0.33	7 days later										
clethodim +	0.125 +	14 days later										
dmp & pmp & efs	0.33											
Dmp & pmp & efs	0.25	cotyledon	96	91	99	100	74	60	98	93	15	3808
clethodim +	0.094 +	14 days later										
dmp & pmp & efs	0.75											
dmp & pmp & efs	0.33	35 days later										
Dmp & pmp & efs	0.25	cotyledon	99	95	100	100	75	73	98	95	21	5331
clethodim +	0.125 +	14 days later										
dmp & pmp & efs	0.75											
dmp & pmp & efs	0.33	35 days later										
Dmp & pmp & efs +	0.25 +	cotyledon	98	95	98	100	68	59	95	94	15	3808
triflusulfuron	0.0156											
dmp & pmp & efs +	0.33 +	7 days later										
triflusulfuron	0.0156											
clethodim +	0.094 +	14 days later										
dmp & pmp & efs +	.33 +											
triflusulfuron	0.0156											
Dmp & pmp & efs	0.25	Cotyledon	94	81	100	95	60	58	79	73	10	2539
quizalofop +	0.048 +	14 days later										
dmp & pmp & efs	0.33											
dmp & pmp & efs	0.33	35 days later										
Dmp & pmp & efs	0.25	Cotyledon	86	75	98	96	71	71	98	93	22	5585
quizalofop +	0.048 +	14 days later										
dmp & pmp & efs	0.75											
dmp & pmp & efs	0.33	35 days later										
Dmp & pmp & efs	0.25	Cotyledon	96	97	100	98	71	61	97	95	13	3237
quizalofop +	1.32 +	14 days later										
dmp & pmp & efs	0.75											
dmp & pmp & efs	0.33	35 days later										
Dmp & pmp & efs	0.25	Cotyledon	99	96	100	100	68	60	95	96	13	3237
dmp & pmp & efs	0.33	7 days later										
sethoxydim +	0.3 +	14 days later										
dmp & pmp & efs	0.33											
Dmp & pmp & efs	0.25	Cotyledon	99	95	99	100	70	66	96	94	17	4189
sethoxydim +	0.47 +	14 days later										
dmp & pmp & efs	0.75											
dmp & pmp & efs	0.33	35 days later										
LSD (0.05)			7	10	ns	ns	ns	ns	6	8	9	2216

[1]Weeds evaluated were green foxtail (SETVI), barnyardgrass (ECHCG), kochia (KCHSC) and common lambsquarters (CHEAL).
[2]Dmp & pmp & efs is a 1:1:1 commercial premix formulation of desmedipham, phenmedipham, and ethofumesate.
[3]Crop oil concentrate added at 1.0% v/v.

Evaluation of CGA-77102 for weed control in sugar beets. Don W. Morishita and Robert W. Downard. A field experiment was initiated to compare CGA-77102 applied preplant incorporated (PPI), preemergence (PRE), and postemergence (POST) to registered herbicides for weed control in sugar beets. The study was conducted under sprinkler irrigation at the University of Idaho Research and Extension Center near Kimberly, Idaho. Plots were 4 rows by 30 ft and the treatments were arranged in a randomized complete block design with four replications. Soil type at this location was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g of soil, and 1.7% organic matter. Sugar beets ('WS PM-9') were planted April 15, 1997, on 22-inch rows at a rate of 47,520 seeds/A. All herbicide treatments were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer equipped with 8001 even fan nozzles. Additional application information is shown in Table 1. Herbicides applied preplant were incorporated with an Alloway band incorporator to a 2-inch depth. All treatments received 0.5 inches of water immediately after PRE treatments were applied. Visual evaluations for weed control and crop injury were made June 11 and 30. Sugar beet yield was determined by harvesting the center 2 rows of each plot with a mechanical harvester on October 1.

Table 1. Application information.

Application date	4/15	4/22	5/7	5/15	5/23
Application timing	PPI	PRE	cotyledon	2 leaf	3 to 4 leaf
Air temperature (F)	64	49	62	70	62
Soil temperature (F)	52	42	52	62	57
Relative humidity (%)	44	86	55	64	58
Wind speed (mph)	3 to 9	7 to 12	5 to 12	3 to 6	0
Weed species	kochia	c. lambsquarters	hairy nightshade	redroot pigweed	vol. wheat
plants/ft^2	19	9	12	5	3

Crop injury was variable among treatments and ranged from 0 to 16% (Table 2). Kochia was the predominant weed species and the most difficult to control in this experiment. Only ethofumesate applied PRE followed by two dmp&pmp&efs POST applications satisfactorily controlled kochia. Common lambsquarters, redroot pigweed, and hairy nightshade control was best with CGA-77102 followed by two POST applications of dmp&pmp&efs. Volunteer wheat control was better when CGA-77102 was applied PPI or PRE compared to POST. Due primarily to high kochia population sugar beet root yields were better where kochia control was 76% or higher. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Weed control, crop injury, and sugar beet yield with CGA-77102, near Kimberly, Idaho.

			Weed control[1]									Sugar beet	
	Rate	Timing	CHEAL		KCHSC		TRZAX		AMARE		SOLSA	injury	yield
			6/11	6/30	6/11	6/30	6/11	6/30	6/11	6/30	6/30	6/11	
	lb/A		%										ton/A
Check			-	-	-	-	-	-	-	-	-	-	1
CGA-77102	1.27	PPI	95	90	76	76	78	75	100	98	100	0	23
dmp&pmp&efs[2]	0.25	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.59	PPI	95	89	61	60	81	74	100	99	100	0	13
dmp&pmp&efs	0.25	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.27	PRE	94	95	58	64	51	45	100	100	100	13	12
dmp&pmp&efs	0.25	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.59	PRE	94	93	56	58	81	76	100	95	99	3	9
dmp&pmp&efs	0.25	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.17	PPI	95	90	60	55	90	78	100	100	100	16	11
CGA-77102	2.48	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.17	PRE	78	90	45	41	74	70	100	100	100	3	7
CGA-77102	2.48	Cotyledon											
dmp&pmp&efs	0.33	2 leaf											
CGA-77102	1.91	Cotyledon	46	55	11	28	6	0	95	100	100	9	5
dmp&pmp&efs	0.25												
dmp&pmp&efs	0.33	2 leaf											
Dmp&pmp&efs	0.25	Cotyledon	46	68	33	29	8	5	81	85	83	10	3
CGA-77102	1.91	2 leaf											
dmp&pmp&efs	0.33												
Ethofumesate	1.12	PRE	95	95	91	93	94	93	100	98	96	4	23
dmp&pmp&efs	0.25	2-leaf											
dmp&pmp&efs	0.33	3-4 leaf											
Cycloate	0.5	PPI	97	90	29	46	64	66	99	96	100	5	6
dmp&pmp&efs	0.25	2 leaf											
dmp&pmp&efs	0.33	3-4 leaf											
LSD (0.05)			13	9	28	25	22	35	5	9	8	ns	9

[1]Weeds evaluated for control were common lambsquarters (CHEAL), kochia (KCHSC), volunteer wheat (TRZAX), redroot pigweed (AMARE), and hairy nightshade (SOLSA).

[2]dmp&pmp&efs is a 1:1:1 commercial formulation of desmedipham, phenmedipham, and ethofumesate.

Herbicide combinations for broadleaf weed control in sugar beets. Robert W. Downard and Don W. Morishita. The objective of this study was to compare broadleaf herbicide combinations for weed control in sugar beets. The trial was conducted under sprinkler irrigation at the University of Idaho Research and Extension Center near Kimberly, Idaho. Sugar beets ('WS-PM 9') were planted at 47,520 seeds/A on 22-inch rows April 15, 1997, and emerged May 2. Individual plots were 4 rows by 30 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g of soil, and 1.7% organic matter. Herbicides were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa at 38 psi using 8001 even fan nozzles. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken June 11 and July 1. Sugar beet yields were determined by harvesting roots from the two center rows of each plot on October 6.

Table 1. Application information.

Application timing	cotyledon	7 days later	14 days later
Application date	5/7	5/15	5/21
Air temperature (F)	62	70	77
Soil temperature (F)	52	62	76
Relative humidity (%)	55	64	45
Wind speed (mph)	5 to 12	3 to 6	0 to 2
Weed growth stage			
Kochia	cotyledon to 6 leaf	0.5 to 2 inches	0.5 to 2 inches
Common lambsquarters	cotyledon	4 leaf	6 to 8 leaf
Hairy nightshade	cotyledon	2 leaf	4 leaf
Redroot pigweed	-	cotyledon to 2 leaf	2 to 4 leaf
Weed density/ft^2			
Kochia	16	18	22
Common lambsquarters	4	6	10
Hairy nightshade	2	3	3
Redroot pigweed	0	2	2
Total	22	29	37

Sugar beet injury was similar among herbicide treatments and ranged from 5 to 13% (Table 2). Common lambsquarters, hairy nightshade, and redroot pigweed control averaged 92 to 100%. Kochia control however, was unacceptable and ranged from 71 to 78% on June 11 and dropped to 55 to 64% by July 1. Kochia was at the cotyledon to 6-leaf stage at the first application, which means some kochia were past the optimum application timing (Table 1). An earlier application would have provided more consistent control. Rain showers that occurred intermittently for two days after emergence prohibited earlier application. All herbicide combinations for broadleaf weed control provided good control of common lambsquarters, hairy nightshade, and redroot pigweed. All treatments had yields significantly higher than the untreated check, but there were no significant differences in yields among herbicide treatments. Heavy weed pressure reduced sugar beet root yields in the check to <1 ton/A and reduced yields with the herbicide treatments to 50 to 60% of normal. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and root yield in sugar beets with broadleaf herbicide combinations.

			Crop injury		Weed control[1]								Sugar beet	
					KCHSC		CHEAL		SOLSA		AMARE		root	recoverable
Treatment[2]	Rate	Timing	6/11	6/30	6/11	6/30	6/11	6/30	6/11	6/30	6/11	6/30	yield	sugar
	lb/A		-----	-----	-----	-----	%	-----	-----	-----	-----	-----	tons/A	lbs/A
Check			--	--	--	--	--	--	--	--	--	--	0	0
Dmp & pmp + triflusulfuron	0.25 + 0.0156	cotyledon & 7 days later & 14 days later	5	0	74	58	96	96	100	100	100	98	13	3094
Dmp & pmp & efs + triflusulfuron	0.25 + 0.0156	cotyledon & 7 days later & 14 days later	10	0	76	55	93	93	100	100	100	100	11	2599
Dmp & pmp + triflusulfuron	0.25 + 0.0156	cotyledon	6	0	78	58	98	93	100	98	100	96	11	2723
dmp & pmp + triflusulfuron + clopyralid	0.25 + 0.0156 0.07	7 days later & 14 days later												
Dmp & pmp & efs + triflusulfuron	0.25 + 0.0156 +	cotyledon	13	0	75	64	99	98	100	100	100	100	12	2970
dmp & pmp & efs + triflusulfuron + clopyralid	0.25 + 0.0156 + 0.07	7 days later & 14 days later												
Dmp & pmp	0.25	cotyledon	9	0	74	58	96	95	100	100	98	98	10	2537
dmp & pmp + clopyralid	0.25 + 0.094	7 days later & 14 days later												
Dmp & pmp & efs	0.25	cotyledon	13	0	71	60	98	99	100	100	95	92	12	2847
dmp & pmp & efs + clopyralid	0.25 + 0.094	7 days later & 14 days later												
LSD (0.05)			ns	ns	ns	ns	ns	ns	ns	ns	2	ns	8	2008

[1]Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL), hairy nightshade (SOLSA), redroot pigweed (AMARE).

[2]Dmp & pmp is a commercially formulated 1:1 premix of desmedipham and phenmedipham. Dmp & pmp & efs is a commercially formulate 1:1:1 premix of desmedipham, phenmedipham, and ethofumesate.

Weed control in glyphosate resistant sugar beets. Don W. Morishita and Robert W. Downard. An experiment was conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho to evaluate weed control in glyphosate resistant sugar beets. The experiment was established under sprinkler irrigation with treatments arranged in a randomized complete block with four replications. Plots were 4 rows by 30 ft. Sugar beets were planted April 28, 1997, on 22-inch rows and a seed spacing of approximately 2-inches. Soil type at this location was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g soil, and 1.7% organic matter. Fertilizer was applied preplant in the spring at a rate of 22 lb/A N, 104 lb/A P_2O_5, and 6 lb/A S. This was followed with two in-season N applications totaling 75 lb/A. Herbicides were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa at 38 psi. Additional application information is shown in Table 1. The handweeded check was hoed June 3 and July 8. All treatments were evaluated visually for crop injury and weed control July 9 and 22. Sugar beet yields were determined by harvesting the center two rows of each plot October 1 with a mechanical harvester.

Table 1. Application information.

Application date	5/21	5/28	6/6	6/10	6/17	6/25
Application timing	2 leaf	4 leaf	6 leaf	6-8 leaf	8-10 leaf	10 le
Air temperature (F)	77	63	61	72	70	61
Soil temperature (F)	76	64	58	58	60	52
Relative humidity (%)	45	72	70	51	68	60
Wind speed (mph)	0 to 4	0 to 1	5 to 12	0 to 1	0 to 1	1 to
Weed size						
Kochia	3-4 leaf	3-4 inch	5-6 inch	7-8 inch	9-10 in	11-12 i
Common lambsquarters	2-6 leaf	2-3 inch	3-4 inch	4-5 inch	5-6 inch	6-7 in
Volunteer wheat	2 leaf	6 leaf	6-8 leaf	8-10 leaf	10-12 leaf	12-14 l
Green foxtail	2-6 leaf	4-6 leaf	6-8 leaf	8-10 leaf	10-12 leaf	12-14 l
Weed density/ft²						
Kochia	8	7	7	7	7	7
Common lambsquarters	7	5	5	5	5	5
Volunteer wheat	4	4	4	4	4	4
Green foxtail	39	25	25	25	25	25

Sugar beets were not injured significantly by any glyphosate application (Table 2). Kochia and common lambsquarters control ranged from 93 to 100% with all sequential glyphosate applications. A single glyphosate application at the 4-leaf stage was not enough to control the broadleaf weeds or green foxtail into late July. Weed control with the standard desmedipham & phenmedipham + triflusulfuron + sethoxydim treatment was generally not as good as the sequential glyphosate treatments. Similar to weed control all sequential glyphosate treatments had yields equal to the handweeded check. Only glyphosate applied one time and the standard weed control treatment did not yield as high as the handweeded check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and yield following glyphosate applications.

			Crop injury		Weed control[1]								
					KCHSC		CHEAL		SETVI		TRZAX		
Treatment	Rate	Timing[2]	7/9	7/22	7/9	7/22	7/9	7/22	7/9	7/22	7/9	7/22	Yield
	lb/A		%										% of chec
Handweeded check			0	0	100	100	100	100	98	95	100	100	100
Glyphosate	0.75	2 leaf	1	0	98	98	95	93	94	85	100	100	105
glyphosate	0.75	14 d ltr											
Glyphosate	0.75	2 leaf	0	0	99	98	99	99	100	98	100	100	105
glyphosate	0.75	14 d ltr											
glyphosate	0.75	28 d ltr											
Glyphosate	0.75	4 leaf	4	0	81	63	76	72	94	72	96	100	41
Glyphosate	0.75	4 leaf	3	1	96	94	94	93	98	96	98	100	105
glyphosate	0.75	14 d ltr											
Glyphosate	0.75	4 leaf	4	1	95	98	96	98	98	98	100	100	91
glyphosate	0.75	14 d ltr											
glyphosate	0.75	28 d ltr											
Glyphosate	0.75	2 leaf	0	0	95	95	97	99	97	97	100	100	95
glyphosate + trifluralin	0.75 + 0.75	6 leaf											
Dmp & pmp[3] + triflusulfuron	0.25 + 0.0156	cotyl	0	0	65	46	86	89	13	10	18	38	41
dmp & pmp + triflusulfuron	0.33 + 0.0156	7 d ltr											
dmp & pmp + triflusulfuron + sethoxydim	0.33 + 0.0156 + 0.19	14 d ltr											
LSD (0.05)			NS	NS	7	5	8	5	6	10	4	5	27

[1]Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL), green foxtail (SETVI) and volunteer wheat (TRZAX).
[2]Application timing was 2, 4, or 6 leaf stage of sugar beet with sequential applications made 7, 14, or 28 days later.
[3]Dmp & pmp is a 1:1 commercial formulation of desmedipham and phenmedipham.

Glufosinate rate and application timing for weed control in glufosinate tolerant sugar beets. Robert W. Downard and Don W. Morishita. The objective of this study was to determine the best application timing and rate for weed control with glufosinate. The trial was conducted under sprinkler irrigation at the University of Idaho Research and Extension, Center near Kimberly, Idaho. Glufosinate tolerant sugar beet seed ('Beta 8757 LL') was planted on 22-inch rows and a seed spacing of approximately 2 inches April 18, 1997. Individual plots were 4 rows by 30 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g of soil, and 1.7% organic matter. Herbicide treatments were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa at 38 psi using 8001 even fan nozzles. Additional application information is shown in Table 1. Sugar beets were thinned to a 6-inch spacing after all herbicide treatments were applied. On June 3 and July 8 all weeds were removed from the handweeded checks. Weed control evaluations were taken July 2 and July 18. Sugar beet yields were determined by harvesting roots from the two center rows of each plot on October 3.

Table 1. Application information.

Application timing	cotyledon	2 leaf	4 leaf & 7 days after cotyledon	14 days after cotyledon and 2 leaf	14 days after 4 leaf	28 days after 2 leaf	28 day: after 4
Application date	5/9	5/14	5/21	5/28	6/6	6/10	6/1
Air temperature (F)	60	85	77	63	61	72	70
Soil temperature (F)	50	72	76	64	58	58	60
Relative humidity (%)	48	32	45	72	70	51	68
Wind speed (mph)	7	3 to 6	0 to 4	0 to 1	5 to 12	0 to 1	0 to
Weed growth stage							
Kochia	3 to 6 leaf	0.5 tol inch	1.5 to 2.5 inch	3 to 4 inch	6 to 8 inch	9 to 11 inch	12 to inc
Common lambsquarters	cotyledon	2 leaf	2 leaf	2 to 4 leaf	4 to 6 leaf	6 to 8 leaf	8 to 10
Redroot pigweed	-	-	cotyledon to 2 leaf	2 to 4	-	-	-
Volunteer wheat	1 to 3 leaf	4 to 5 leaf	5 to 6 leaf	6 to 7 leaf			
Green foxtail	1 leaf	2 leaf	3 to 4 leaf	5 to 6 leaf	6 to7 leaf	7 to 8 leaf	8 to 9
Weed density/ft^2							
Kochia	11	7	10	10	10	10	10
Common lambsquarters	10	8	16	15	15	15	15
Redroot pigweed	0	0	2	2	-	-	-
Volunteer wheat	10	3	6	6	6	6	6
Green foxtail	9	8	14	13	13	13	13
Total	40	26	48	46	44	44	44

Redroot pigweed and green foxtail were the only weeds that were adequately controlled by all treatments (Table 2). Kochia control was less than 75% with all herbicide treatments. However, addition of ammonium sulfate to glufosinate significantly improved kochia and common lambsquarters control. Volunteer wheat was not satisfactorily controlled with any herbicide treatment. Sugar beet root yields corresponded to glufosinate applied with ammonium sulfate. The timing of application was not as important as increasing glufosinate rate or adding ammonium sulfate for better weed control. Due to the lack of glufosinate translocation, poor weed control may partially be due the application method. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2 Weed control and sugar beet root yield in sugar beets with glufosinate.

			Weed control[1]									
			KCHSC		CHEAL		AMARE		TRZAX		SETVI	Root
Treatment	Rate	Timing	7/2	7/18	7/2	7/18	7/2	7/18	7/2	7/18	7/18	yield
	lb/A		%									ton/A
Handweeded check			95	100	89	100	93	100	98	98	98	20
Glufosinate/ glufosinate/ glufosinate	0.268/ 0.268/ 0.268	2 leaf/ 14 days later/ 28 days later	40	25	55	46	99	81	25	30	100	5
Glufosinate/ glufosinate/ glufosinate	0.357/ 0.357/ 0.357	2 leaf/ 14 days later/ 28 day later	58	45	75	70	100	91	60	43	98	8
Glufosinate[3]/ glufosinate/ glufosinate	0.268/ 0.268/ 0.268	2 leaf/ 14 days later/ 28 days later	69	63	73	73	98	98	40	55	94	11
Glufosinate/ glufosinate/ glufosinate	0.268/ 0.268/ 0.268	4 leaf/ 14 days later/ 28 days later	47	43	60	50	93	95	23	27	83	3
Glufosinate/ glufosinate/ glufosinate	0.357/ 0.357/ 0.357	4 leaf/ 14 days later/ 28 days later	69	50	83	75	93	81	55	50	98	8
Glufosinate[3]/ glufosinate/ glufosinate	0.268/ 0.268/ 0.268	4 leaf/ 14 days later/ 28 days later	74	69	81	74	93	83	46	49	81	12
Dmp & pmp + triflusulfuron Dmp & pmp triflusulfuron Dmp & pmp + triflusulfuron + sethoxydim	0.25 + 0.0156 0.33 + 0.0156 0.33 + 0.0156 + 0.19	cotyledon 7 days later 14 days later	41	41	93	85	100	99	43	33	81	9
LSD (0.05)			20	19	18	17	6	15	23	26	13	7

[1]Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), volunteer wheat (TRZAX) and green foxtail (SETVI).

[2]Dmp & pmp is a 1:1 commercially formulated premix of desmedipham and phenmedipham.

[3]Ammonium sulfate was added to these glufosinate applications at 2.0 lb/A.

Weed emergence patterns and control in sugar beets. Steve L. Young, Don W. Morishita, and Robert W. Downard. A field study was conducted at the University of Idaho Research and Extension Station near Kimberly, Idaho to determine how weeds emerging during the growing season affect sugar beet ('WS-PM9') yield and quality. Sugar beets were planted April 15, 1997, at a rate of 47,520 seeds/A on 22-inch rows, 0.75-inches deep, and grown under sprinkler irrigation. Individual plots were 4 rows by 30 feet and treatments were arranged in a randomized complete block design with four replications. All herbicides were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer. The sprayer was calibrated to deliver 20 gpa at 38 psi using 8001E nozzles. Additional application information is shown in Table 1. Soil type at this site was a silt loam with a pH of 8.3, CEC of 20.3 meq/100 g soil, and 1.7% organic matter. Fertilizer was applied preplant in the spring at a rate of 22, 104, and 6 lb/A N, P_2O_5, and S, respectively. This was followed with two in-season N applications totaling 75 lb/A. Visual evaluations for crop injury and weed control were taken June 13, July 11, and September 11. Weed species evaluated were kochia, common lambsquarters, hairy nightshade, and green foxtail. The two center rows in each plot were harvested October 6 with a mechanical harvester.

Table 1. Application information and weed densities.

Application date	4/22	5/7	5/15	6/2
Application timing	PRE	1 to 2 leaf	7 d later	lay-by
Air temperature (F)	49	60	70	68
Soil temperature (F)	42	50	62	62
Relative humidity (%)	86	57	64	54
Wind velocity (mph)	7 to 12	5 to 12	3 to 6	4 to 7
Weed growth stage				
Kochia	-	cotyledon to 4 leaf	0.5 to 2 inches	4 to 6 inches
Common lambsquarters	-	cotyledon to 1 leaf	2 to 4 leaf	6 to 8 leaf
Hairy nightshade	-	cotyledon	cotyledon to 2 leaf	4 to 6 leaf
Redroot pigweed	-		cotyledon to 2 leaf	4 to 6 leaf
Weed density/ft^2				
Kochia	-	2	2	2
Common lambsquarters	-	10	17	16
Hairy nightshade	-	3	9	2
Redroot pigweed	-	-	20	13

Kochia, common lambsquarters, and hairy nightshade were the first weeds to emerge (Table 2). Kochia density did not exceed 4 plants/m^2. Common lambsquarters and redroot pigweed densities reached 30 and 20 plants/m^2, respectively by June 24. Green foxtail density was highest among the weeds and increased to a maximum of 54 plants/m^2. There was no difference in level of injury among herbicide treatments (Table 3). Addition of cycloate applied at lay-by did not improve weed control or yield. Kochia was controlled 91 to 95% at mid-season with ethofumesate applied PRE followed by at least two POST applications of dmp&pmp&efs + triflusulfuron. The same was true for common lambsquarters, and green foxtail. Late season weed control was similar to mid-season weed control for all treatments. Control of common lambsquarters was maintained at 84% throughout the season with ethofumesate followed by a single POST application of dmp&pmp&efs + triflusulfuron. Sugar beet root yield was not significantly different between the handweeded check and those treatments receiving a POST application of dmp&pmp&efs + triflusulfuron. The check and ethofumesate alone had yields of 7 and 12 tons/acre, respectively, which were lower than the other four treatments. (Department of Plant, Soil and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303)

Table 2. Weed population densities over time[1].

Treatment	Rate	Applic. timing	KCHSC 5/7	KCHSC 6/11	KCHSC 6/24	CHEAL 5/7	CHEAL 6/11	CHEAL 6/24	AMARE 5/7	AMARE 6/11	AMARE 6/24	SOLSA 5/7	SOLSA 6/11	SOLSA 6/24	SETVI 6/11	SETVI 6/24
	lb/A		plants/m^2													
Check			4	4	4	20	32	30	0	22	20	6	2	2	46	54
Handweeded			18	4	4	24	6	6	2	10	8	8	2	0	16	22
Ethofumesate	1.12	PRE	2	6	4	18	26	28	0	2	2	2	2	2	4	4
Ethofumesate	1.12 /	PRE	6	4	4	18	6	4	0	0	0	2	2	0	12	14
dmp&pmp&efs[2] +	0.25 +	2 leaf														
triflusulfuron	0.0156															
Ethofumesate	1.12 /	PRE	4	2	2	16	4	4	0	2	0	8	0	0	8	10
dmp&pmp&efs +	0.25 +	2 leaf														
triflusulfuron	0.0156															
dmp&pmp&efs +	0.33 +	7 d later														
triflusulfuron	0.0156															
Ethofumesate	1.12 /	PRE	6	2	2	14	0	0	0	0	0	8	2	0	6	4
dmp&pmp&efs +	0.25 +	2 leaf														
triflusulfuron	0.0156															
dmp&pmp&efs +	0.33	7 d later														
triflusulfuron +	0.0156 +															
clopyralid	0.094															
cycloate	3.0	lay-by														
LSD (0.05)			ns	ns	ns	ns	18	16	ns	20	18	ns	ns	ns	20[3]	38[3]

[1]Weeds counted were kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), hairy nightshade (SOLSA), green foxtail (SETVI), and barnyardgrass (ECHCG).

[2]Dmp&pmp&efs is a 1:1:1 commercial formulation of desmedipham, phenmedipham, and ethofumesate.

[3]LSD value is significant at P>0.1.

Table 3. Effect of herbicide applications on crop injury, weed control, and sugar beet root yields.

			Crop injury		Weed control[1]						Sugar beet	
					KCHSC		CHEAL		SETVI			
Treatment	Rate	Timing	7/11	9/11	7/11	9/11	7/11	9/11	7/11	9/11	yield	sucros
	lb/A		--------------------				%			--------------------	ton/A	lb/A
Check			-	-	-	-	-	-	-	-	7	1910
Handweeded			10	0	100	97	99	92	94	75	17	4625
Ethofumesate	1.12	PRE	4	0	64	58	68	59	90	90	12	3110
Ethofumesate	1.12	PRE	8	0	80	72	82	84	80	80	17	4785
dmp&pmp&efs[2]+	0.25 +	2 leaf										
triflusulfuron	0.0156											
Ethofumesate	1.12	PRE	6	0	91	91	96	99	91	81	19	5135
dmp&pmp&efs +	0.25 +	2 leaf										
triflusulfuron	0.0156											
dmp&pmp&efs +	0.33 +	7 d later										
triflusulfuron	0.0156											
Ethofumesate	1.12	PRE	4	0	95	84	100	99	96	94	21	5835
dmp&pmp&efs +	0.25 +	2 leaf										
triflusulfuron	0.0156											
dmp&pmp&efs +	0.33	7 d later										
triflusulfuron +	0.0156 +											
clopyralid	0.094											
cycolate	3.0	lay-by										
LSD (0.05)			ns	ns	13	29	18	ns	ns	ns	5	1425

[1]Weeds evaluated for control were kochia (KCHSC), common lambsquarters (CHEAL), and green foxtail (SETVI).
[2]Dmp&pmp&efs is a 1:1:1 commercial formulation of desmedipham, phenmedipham, and ethofumesate.

Postemergence herbicide application timing for broadleaf weed control in sugar beet. Steve L. Young, Don W. Morishita, and Robert W. Downard. The objective of this study was to determine the effect of desmedipham & phenmedipham & ethofumesate (dmp&pmp&efs) rate and application timing for the control of weeds at different growth stages. Triflusulfuron was applied with all dmp&pmp&efs rates. Sugar beets ('WS-PM9') were planted April 15, 1997, at a rate of 47,520 seeds/A on 22-inch rows, 0.75-inches deep, and grown under sprinkler irrigation. Individual plots were 4 rows by 30 feet and treatments were arranged in a randomized complete block design with four replications. All herbicides were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel sprayer. The sprayer was calibrated to deliver 20 gpa at 38 psi using 8001even fan nozzles. Addition application information is shown in Table 1. Soil type at this site was a silt loam with a pH of 8.3, CEC of 20 meq/100 g of soil, and 1.7% organic matter. Visual evaluations for crop injury and weed control were taken June 11, July 11, and September 11. Weed species evaluated were common lambsquarters, hairy nightshade, kochia, redroot pigweed, and green foxtail. The two center rows were harvested October 3 with a mechanical harvester.

Table 1. Application information and weed densities.

Application date	5/7	5/12	5/15	5/21	5/28
Application timing[1]	cotyl	1 to 2 lf	7 d ltr & 3 to 4 lf	14 d after cotyl	14 d after 1 to 2 lf
Air temperature (F)	62	72	66	77	63
Soil temperature (F)	52	62	58	76	64
Relative humidity (%)	55	40		45	72
Wind speed (mph)	5 to 12	2	6 to 10	0 to 4	0 to 1
Weed growth stage					
Kochia	cotyl to 6 lf	cotyl to 8 lf	cotyl to 8 lf	0.5 to 2 in	4 to 8 in
C. lambsquarters	cotyl	cotyl to 2 lf	2 to 4 lf	2 to 10 lf	2 to 4 in
Hairy nightshade	cotyl	cotyl to 2 lf	2 lf	2 to 4 lf	6 to 8 lf
Redroot pigweed			cotyl to 2 lf	cotyl to 4 lf	4 to 8 lf

[1]Initial herbicide applications were cotyledon (cotyl), 1 to 2 leaf, and 3 to 4 leaf, followed by sequential applications and 14 days after the initial applications.

There was no visible crop injury from these herbicide applications (data not shown). Maximum density of common lambsquarters, kochia, hairy nightshade, and redroot pigweed was 42, 30, 32, and 28 plants/m^2 (Table 2). All herbicide treatments controlled hairy nightshade and redroot pigweed 98 to 100%, although hairy nightshade control was partly attributed to a high population of Colorado potato beetle. Common lambsquarters control was lower with dmp&pmp&efs + triflusulfuron at 0.25 + 0.015 lb/A starting at the cotyledon leaf stage as well as dmp&pmp&efs + triflusulfuron at 0.33 + 0.015 lb/A starting at the 1 to 2 leaf stage. All other treatments controlled common lambsquarters 91 to 100%. Green foxtail control averaged 90 to 95% at the higher rates for each of the application timings and 80 to 86% at the lower rates, however there was no significant difference. There was no difference in sugar beet yield and recoverable sucrose among herbicide treatments. The check was significantly lower in yield than all other treatments. These data suggest that late herbicide application timing may be compensated for by increasing herbicide rate. (Department of Plant, Soil and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303)

Table 2. Effect of application timing on weed control and sugar beet yield

Treatment[2]	Rate	Timing[3]	Weed density[1] CHEAL 5/7	CHEAL 5/27	KCHSC 5/7	KCHSC 5/27	SOLSA 5/7	SOLSA 5/27	AMARE 5/7	AMARE 5/21	Weed control[1] CHEAL 6/11	CHEAL 7/11	KCHSC 6/11	KCHSC 7/11	SOLSA 6/11	SOLSA 7/11	AMARE 6/11	AMARE 7/11	SETVI 6/11	SETVI 7/11	Root yiel
	lb/A		-------------								%									-------------	ton/
Check			13	21	9	15	2	16	3	14			0	0	0	0	0	0	0	0	10
Dmp&pmp&efs	0.25	cotyledon	18	4	6	7	4	3	1	0	96	94	90	84	100	100	100	100	95	89	19
triflusulfuron	0.0156																				
dmp&pmp&efs	0.25	7 d later &																			
triflusulfuron	0.0156	14 d later																			
Dmp&pmp&efs	0.33	cotyledon	9	1	4	3	2	2	2	1	100	100	89	84	100	100	100	100	99	97	17
triflusulfuron	0.0156																				
dmp&pmp&efs	0.33	7 d later &																			
triflusulfuron	0.0156	14 d later																			
Dmp&pmp&efs	0.33	1-2 leaf	18	5	5	4	1	1	2	0	91	90	88	81	100	100	99	98	91	83	20
triflusulfuron	0.0156																				
dmp&pmp&efs	0.33	7 d later &																			
triflusulfuron	0.0156	14 d later																			
Dmp&pmp&efs	0.42	1-2 leaf	19	3	7	4	2	0	3	0	95	96	86	84	100	100	100	100	95	91	20
triflusulfuron	0.0156																				
dmp&pmp&efs	0.42	7 d later &																			
triflusulfuron	0.0156	14 d later																			
Dmp&pmp&efs	0.42	3-4 leaf	17	1	8	4	4	0	12	0	95	99	89	81	100	100	100	100	97	90	21
triflusulfuron	0.0156																				
dmp&pmp&efs	0.42	7 d later &																			
triflusulfuron	0.0156	14 d later																			
Dmp&pmp&efs	0.5	3-4 leaf	9	4	4	4	1	0	4	0	96	96	91	86	100	100	99	99	98	95	19
triflusulfuron	0.0156																				
dmp&pmp&efs	0.5	7 d later &																			
triflusulfuron	0.0156	14 d later																			
LSD (0.05)			ns	9	ns	10	ns	7	5	6	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	6

[1]Weeds counted and evaluated for control were common lambsquarters (CHEAL), kochia (KCHSC), hairy nightshade (SOLSA), redroot pigweed (AMARE), and green foxtail (SETVI).

[2]Dmp&pmp&efs is a 1:1:1 commercial formulation of desmedipham, phenmedipham, and ethofumesate.

[3]All treatments received two sequential herbicide applications 7 and 14 days after the first application.

Comparison of fall and spring applied preplant herbicide treatments for weed control in sugar beets. Gary A. Lee and Brenda M. Waters. A study was initiated at the Parma Research and Extension Center to evaluate fall and spring applied preplant herbicide treatments for annual weed control, crop tolerance and subsequent sugar beet yields. The location is a nonuniform Greenleaf-Owyhee Silt Loam soil (32% sand, 58% silt, 10% clay, 1.25% organic matter and 7.7 pH) with sections of exposed calcareous subsoil. The trial was arranged in a randomized complete block design with four replications and each plot was 11 by 40 ft. Metham was injected with a plot applicator with shanks set on 22 in. centers and was applied at 40 gpa (Table 1). Preplant and postemergence treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. A spiketooth harrow with a roller-packer attachment was used to incorporate PPI treatments to a depth of 1.5 to 2 in. immediately after application and bedded on 22 in. rows. Sugar beets (cultivar 'MP-9') were drilled on March 19, 1997 at a planting rate of 78,400 plants/A and at a depth of 1 in. The seed bed was moderately rough (clods 0.5 to 1.0 in.) at the time of planting. Sugar beets emerged on April 3, and postemergence herbicides were applied when the crop was in the 2 to 4 leaf and 4 to 6 leaf stage on April 25 and May 14, respectively. Weed control and crop tolerance evaluations were made on May 13 and June 12. Sugar beets were harvested October 8, and sugar content was determined by Amalgamated Sugar Co., Nyssa, OR on October 9.

Table 1. Application information.

	Nov. 4, 1996	March 14, 1997	April 25, 1997	May 14, 1997
Crop stage	Preplant	Preplant	2-4 leaf	4-6 leaf
Weed stage	Preemerge	Preemerge	KCHSC 12-20 lf; SOLSA 2-4 lf; MALNE 3-5 lf; CHEAL 2-12 lf	KCHSC 12-50 lf; SOLSA 6-8 lf; MALNE 10-20 lf; CHEAL 4-20 lf
Air temp. (F)	47	49	63	69
Relative humidity (%)	44	40	33	44
Wind (mph)	0	0	2	0
Sky (% cloud cover)	40	100	20	75
Soil temp. (F at 4 in.)	45	45	65	64
Soil moisture	Excessive	Normal	Normal	Normal
First significant rain fall after herbicide application	0.04 inch 11-14-96	0.08 inch 3-16-97	0.05 inch 4-29-97	0.2 inch 5-16-97

No appreciable differences in herbicide performance were detected between the two evaluation dates (Table 2). Metham + cycloate at 40 + 0.67 gal/A injected to a depth of 4 in. and phenmedipham/desmedipham + ethofumesate at 0.26 + 0.112 gal/A provided 90% or better control of all annual weeds present. Metham + cycloate at 40 + 0.67 gal/A as an injected treatment provided significantly better weed control compared to metham (injected) + cycloate (surface + incorporation) at the same rates of application. Ethofumesate at 0.94 gal/A (fall applied PPI) caused significantly greater sugar beet injury than all other herbicide treatments. The calcareous exposed subsoil which occurred in replications three and four did not produce typical sugar beet growth and subsequent yields. Phenmedipham/desmedipham + ethofumesate at 0.26 + 0.112 gal/A treated plots produced significantly higher sugar beet yields than phenmedipham/desmedipham + clopyralid at 0.38 + 0.063 gal/A treated plots. Crop yield from herbicide treated plots were not significantly different than yields form the weedy check plots. No significant differences occurred in percent sugar content of the sugar beet roots or recoverable sugar per acre. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of herbicide treatments on weed control, crop injury, and sugar beet yield.

Treatment	Rate	Weed Control KCHSC	SOLSA	CHEAL	SONOL	ECHCG	Injury	Sugar beets Yield beets	sugar	
	gal/A	%						tons/A	%	lb/A
Metham[1]	40	88.8	90.0	88.8	86.3	40.0	0	15.3	15.24	4049.1
Metham[1] + cycloate[1]	40 + 0.67	90.0	92.0	91.3	91.3	95.8	0	17.7	11.74	4737.7
Cycloate[2]	0.67	85.0	85.0	88.8	80.0	77.5	5.0	14.9	15.37	3908.0
Metham[1] + cycloate[2]	40 + 0.67	61.3	47.5	28.8	52.5	61.3	0	13.0	15.24	3376.1
Ethofumesate[2]	0.94	88.8	98.3	95.8	95.8	96.8	28.8	14.7	14.83	3655.2
Cycloate[3]	0.67	71.3	72.5	86.3	86.3	85.0	0	18.7	11.55	4978.4
Phenmedipham/desmedipham[4,5]	0.38	83.8	92.5	91.3	90.0	85.0	15.0	21.4	14.89	5749.6
Phenmed/desmed[4,5,6] + ethofum[4,5,6]	0.26 + 0.112	96.5	95.0	94.5	93.8	90.0	13.8	23.3	15.37	6127.8
Phenmed/desmed[4,5] + clopyr[4,8]	0.38 + 0.063	92.5	93.8	92.5	88.8	77.5	13.8	12.5	15.98	4165.1
Handweeded check	----	0	0	0	0	0	0	19.7	15.68	5707.2
Weedy check	----	0	0	0	0	0	0	15.8	15.81	4061.8
LSD (0.05)		7.2	4.5	4.7	5.7	10.9	6.9	10.4	NS	NS

[1]Applied 11-4-96 as row injected treatment.
[2]Applied 11-4-96 as surface treatment and immediately incorporated.
[3]Applied 3-14-97 as surface treatment and immediately incorporated.
[4]Applied 4-25-97-97 as POST treatment when sugar beets were 2 to 4 leaf stage.
[5]Applied 5-14-97 as POST treatment when sugar beets were 4 to 6 leaf stage.
[6]Phenmed/desmed = Phenmedipham/desmedipham
[7]Ethofum = Ethofumesate
[8]Clopyr = Clopyralid

Postemergence weed control in sugar beets. Mick Canevari and Dawn Cutter. A field study was conducted at Linden California to evaluate post emergence herbicides at various rates and combinations at two different times of application. The experiment was conducted in a commercial field of sugar beets planted May 15, 1997 and furrow irrigated up o May 18, 1997. The plot size was two rows by 30 feet with three replications using a randomized complete block design. Two timing applications were made to emerged weeds on May 28 and June 19, 1997. Treatments were applied with a CO_2 backpack sprayer using 8003 flat fan nozzles, 30 gpa volume at 30 psi. Crop injury and weed control ratings were made on June 3, and June 10, 1997 following the first application timing. Weed evaluation following the second application was made on June 30, 1997. Additional application data and weed size is listed in Table 1.

Table 1. Application information and weed size.

Crop or Weed	Code	First Timing A[1] May 28, 1997	Second Timing B June 19, 1997
Sugar beet		Coty – 2 leaf	6 – 8 leaf
Black mustard	BRSNI	Coty – 2 leaf	6 leaf
Hairy nightshade	SOLSA	Coty – 1 leaf	12 leaf
Jimsonweed	DATST	Coty – 1 leaf	6 leaf
Barnyardgrass	ECHCG	2 leaf	8 leaf – 4 tillers

[1] Coty = Cotyledon leaf

Crop injury ranged from 3% with phen+desm+ethfmst alone to 37% when combined with clopyralid. This combination also resulted in a 20% plant stand reduction. The three way tank mix combination of phen+desm+ethfmst and clopyralid with triflusulfuron reach 33% injury. Crop injury was less than 5% to beets in all treatments seven days following second application. The best control of black mustard, jimsonweed and hairy nightshade was Timing A with phen+desm+ethfmst combined with triflusulfuron. Timing B application on June 29, 1997 was targeted at barnyardgrass that had not been controlled by the earlier treatments. The later application of clethodim provided 78% of barnyardgrass at the June 30 evaluation. Tank mix combinations with clethodim and triflusulfuron reduced the barnyardgrass control by 33%. The broadleaf weeds at Timing B were too large for effective control resulting in 10–30% leaf burn and growth suppression only. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Crop injury, weed control near Stockton, California.

Treatment[2]	Rate	Application Timing	Crop Injury 6/3	Crop Injury 6/10	Weed Control[1] BRSNI 6/3	BRSNI 6/10	SOLSA 6/3	SOLSA 6/10	DATST 6/3	ECHCG 6/3	ECHCG 6/30
	Lb/A		%								
Phen&desm&ethfmst +	0.33	A	5	3	95	92	85	78	100	13	---
clethodim	0.094	B									78
Phen&desm&ethfmst+triflusulfuron	0.33 + 0.016	A	13	12	95	95	97	95	100	43	---
Phen&desm&ethfmst + clopyralid	0.33 + 0.094	A	32	37	98	89	99	93	97	7	
Phen&desm&ethfmst + clethodim	0.33 + 0.094	B									73
Phen&desm&ethfmst +	0.33	A	30	33	100	97	100	97	100	40	
triflusulfuron + clopyralid	0.016 + 0.094	A									
Phen&desm&ethfmst +	0.33	B									70
triflusulfuron + clethodim	0.016 + 0.094	B									
Triflusulfuron + clopyralid	0.016 + 0.094	A	18	18	60	80	70	92	50	17	
triflusulfuron + clethodim	0.016 + 0.094	B									45
Phen&desm&ethfmst + triflusulfuron	0.33 + 0.016	A	17	13	98	95	95	88	100	37	
Check			---	---	---	---	---	---	---	---	---

[1] Weeds evaluated were black mustard, hairy nightshade, jimsonweed, and barnyardgrass.
[2] Phen&desm&ethfmst is a commercial premix formulation of phemedipham, desmedipham and ethofumesate. Triflusuron and clethodim treatments received a COC @ 1 pt/acre.

Preplant incorporated and preemergence timing of CGA 77102 for weed control in sugar beets. Mick Canevari and Randall Wittle. A field experiment was set up to compare preplant incorporated and preemergence applications using the furrow method of irrigation for preemergence incorporation. The trial was conducted in a commercial sugar beet field near Stockton, California on a Wyman Clay Loam soil. The preplant incorporated treatments were applied May 1, 1997 to preformed beds and power incorporated to a depth of 3 inches. The beets were planted on May 1, with the preemergence treatment application made immediately. Furrow irrigation to germinate beet seed and incorporation of herbicide was made on May 16, 1997. Plot size was two rows by 30 feet and three replications using a randomized complete block design. A CO_2 backpack sprayer was used at a volume of 30 gpa and 35 psi. Evaluations for crop injury and weed control were made on May 28, and June 4, 1997.

Crop injury on May 28, was 2 to 8% at the 1.6 and 1.9 Lb/A use rate on the preplant incorporated method and 2 to 4% with the preemergence method. By the second evaluation on June 4, only 2% injury was noticed on the preplant incorporated application and no injury on the preemergence method.

Control of hairy nightshade was excellent at both rates of CGA 77102 with the preplant incorporated method reaching 87 to 94% control. The same rates used in the preemergence method provided only 67 to 78% control of hairy nightshade. The standard herbicide comparison for preplant incorporated treatment was cycolate plus pebulate achieving 85% hairy nightshade control. Pyrazon was the standard comparison used in the preemergence application method and provided 37% of hairy nightshade. Other weeds present included barnyardgrass and redroot pigweed at 100% control with CGA 77102 using the preplant incorporated method. Jimsonweed control reached 65% with the preplant incorporated method and 23% with the preemergence method. This study concludes that the use of furrow irrigation for herbicide incorporation does not provide adequate means of herbicide activation and should not replace the use of mechanical equipment for this purpose. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 1. Crop injury and weed control made on sugar beets near Stockton, California.

Treatment	Rate	Application Timing	Crop Injury 5/28	Crop Injury 6/4	Weed Control[1] AMARE 5/28	BRSNI 5/28	BRSNI 6/4	SOLSA 6/4	ECHCG 6/4	DATST 6/4	Volunteer Tomatoes 6/4
	Lb/A		%								
CGA 77102	1.6	PPI	2	0	100	47	58	87	99	65	3
CGA 77102	1.9	PPI	8	2	100	65	73	94	100	65	12
Cycolate + pebulate	3 + 3	PPI	2	2	80	61	55	85	97	38	25
CGA 77102	1.6	PPI	2	0	93	35	33	67	77	24	0
CGA 77102	1.9	PRE	4	0	99	38	43	78	100	18	7
Pyrazon	3.75	PRE	0	0	42	37	33	37	55	20	57
Untreated	---		0	0	0	0	0	0	0	0	0

[1] Weeds evaluated were redroot pigweed (AMARE), black mustard (BRSNI), hairy nightshade (SOLSA), barnyardgrass (ECHCG) and jimsonweed (DATST).

Evaluation of postemergence herbicides in sugarbeets. Carl E. Bell and Brent Boutwell. This project was a field evaluation of triflusulfuron and a co-formulated commercial herbicide consisting of desmedipham plus phenmedipham plus ethofumasate and combinations of the two herbicides for postemergence weed control and phytotoxicity in sugarbeets. The co-formulation is the current commercial formulation (Betamix Progress). Two field trials were conducted in cooperative grower's fields near Holtville (Experiment 1) and Imperial (Experiment 2), CA.

Experimental design was a randomized complete block with four replications in both experiments. Plot size was 2 beds, each 76 cm wide, by 6 m. Herbicide treatments were made sequentially, beginning when the crop was in the cotyledon stage of growth on October 1, 1996 in Experiment 1 and on October 30, 1996 in Experiment 2. The second treatment was made 14 days later in Experiment 1 and 12 days later in Experiment 2, when the crop was in the 2 to 4 leaf stage. Applications were made with a CO_2 pressured sprayer at 207 kPa, using 8003 nozzles for a spray volume of 230 l/ha. Triflusulfuron treatments, when applied alone, included a silicone-based surfactant at 0.25% v/v. Soil type was a clay loam in both fields. Applications were made in the morning on sunny days, air temperature on October 1 was 32 C and 24 C on October 30.

Data collected were: visual estimates of crop phytotoxicity in Experiment 1 on October 11 and October 25; and visual estimates of nettleleaf goosefoot control in Experiment 2 on November 11 and crop phytotoxicity on November 11, November 26, and December 17, 1996. Results are shown in the Tables below.

According to the visual evaluation, nettleleaf goosefoot control was about the same for all treatments. Crop injury was apparent from most treatments, but tended to increase with increasing herbicide rates and with the combination treatments. This crop injury was still evident at an evaluation of Experiment 2 on December 17, 1996, but was diminishing with time. (Cooperative Extension, University of California, Holtville, CA 92250.)

Table 1. Field evaluation of triflusulfuron and a co-formulation of desmedipham plus phenmedipham plus ethofumasate for sugarbeet injury, Experiment 1 near Holtville, CA in 1996.

Treatment[1]	Applications		Phytotoxicity evaluations	
	Oct. 1	Oct. 14	October 11	October 13
	---- g ai/ ha -----		------- % --------	
Des/phen/etho	280	370	11	10
Des/phen/etho	370	448	5	12
Des/phen/etho	280	280	7	12
Des/phen/etho	280	448	10	15
Triflusulfuron	17.2	17.2	10	10
Triflusulfuron	25.8	25.8	15	12
Triflusulfuron	34.4	34.4	21	15
Triflusulfuron + Des/phen/etho	17.2+190	17.2+380	5	2
Triflusulfuron + Des/phen/etho	17.2+280	17.2+380	17	21
Triflusulfuron + Des/phen/etho	25.8+280	25.8+380	24	21
Triflusulfuron + Des/phen/etho	34.4+280	34.4+380	7	12
Untreated control			0	0

[1] Treatment: Des/phen/etho - commercial co-formulation (Betamix Progress) of desmedipham plus phenmedipham and ethofumasate.

Table 2. Field evaluation of triflusulfuron and a co-formulation of desmedipham plus phenmedipham plus ethofumasate for nettleleaf goosefoot control and sugarbeet injury, Experiment 2 near Brawley, CA in 1996.

Treatment[1]	Applications		Visual evaluations[2]			
			CHEMU	------Phytotoxicity -------		
	Oct. 30	Nov. 11	Nov. 11	Nov. 11	Nov. 26	Dec. 17
	---- g ai/ ha -----		----------------- % --------------------			
Des/phen/etho	280	370	99	2	13	1
Des/phen/etho	370	448	96	2	12	2
Des/phen/etho	280	280	98	6	7	2
Des/phen/etho	280	448	99	2	10	4
Triflusulfuron	17.2	17.2	98	1	4	2
Triflusulfuron	25.8	25.8	98	1	7	2
Triflusulfuron	34.4	34.4	99	4	4	4
Triflusulfuron + Des/phen/etho	17.2+190	17.2+380	99	1	4	1
Triflusulfuron + Des/phen/etho	17.2+280	17.2+380	99	1	4	1
Triflusulfuron + Des/phen/etho	25.8+280	25.8+380	100	2	2	7
Triflusulfuron + Des/phen/etho	34.4+280	34.4+380	99	5	5	1
Untreated control			0	0	0	0

[1] Treatment: Des/phen/etho - commercial co-formulation (Betamix Progress) of desmedipham plus phenmedipham plus ethofumasate.
[2] CHEMU - nettleleaf goosefoot control.

Soil persistance in spring canola, lentil, and pea with metsulfuron. Traci A. Rauch and Donald C. Thill. A study was initiated at the University of Idaho Plant Science Farm near Moscow, Idaho in a field planted to 'Russell' spring barley to evaluate soil persistence of metsulfuron. Plots were 30 by 48 ft arranged in a randomized complete block with four replications. All herbicide treatments were applied on June 1, 1996 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 40 psi and 3 mph (Table 1). After harvest, stubble was chisel plowed in October 1996 and cultivated twice in April 1997. Fertilizer was applied to the canola plots (200 lb/A of 40-0-0-6). 'Westar' canola, 'Redchief' lentil, and 'Columbia' pea were seeded on May 3, 1997 at 8, 55, and 155 lb/A, respectively. Plots were 16 by 30 ft. The pea was treated with 1.5 lb/A of carbaryl and 0.25 pt/A of adjuvant on May 16, 1997 to control pea leaf weevil. The canola was sprayed with 1 lb/A of carbaryl and 0.25 pt/A of adjuvant on May 22, 1997 to control flea beetle. Crop injury was evaluated visually on June 25, 1997. Pea seed was harvested on August 7 and canola and lentil seed on August 26, 1997 with a small plot combine from a 4 by 27 ft area in each plot.

Table 1. Application data and soil analysis.

Application date	June 1, 1996
Spring barley growth stage	3 leaf
Air temperature (F)	50
Relative humidity (%)	73
Wind speed (mph, direction)	5, W
Cloud cover (%)	0
Soil temperature at 2 in. (F)	55
pH	5.8
OM (%)	3.59
CEC (meq/100g)	17.8
Texture	silt loam

No treatment visually injured pea or lentil (Table 2). Metsulfuron at all three rates injured canola 10 to 20 % but was not significantly different from the standard (bromoxynil/MCPA). Pea and canola seed yield with all rates of metsulfuron did not differ significantly from bromoxynil/MCPA. Metsulfuron at the 0.0063 and 0.025 lb/A rates significantly decreased lentil yield. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Spring pea, lentil and canola injury and yield with metsulfuron.

Treatment[1]	Rate	Injury pea	Injury lentil	Injury canola	Yield pea	Yield lentil	Yield canola
	lb/A	%			lb/A		
Metsulfuron	0.0063	0	0	11	1720	1875	2219
Metsulfuron	0.0125	0	0	10	1998	2085	2409
Metsulfuron	0.025	0	0	20	2086	1906	2365
Prosulfuron	0.0179	0	0	0	1775	2117	2377
Bromoxynil/MCPA	0.0375	0	0	3	1999	2225	2224
LSD (0.05)		NS	NS	NS	NS	313	NS

[1] R-11, a nonionic surfactant, was added at 0.25% v/v to all metsulfuron and prosulfuron treatments. Bromoxynil/MCPA was applied as a commercial formulation of bromoxynil and MCPA.

Postemergence weed control in field corn. Gary A. Lee and Brenda M. Waters. The objective of this trial was to determine the performance of postemergence herbicide treatments for control of annual weeds and crop tolerance in field corn. The field corn (cultivar 'Pioneer 3751') was planted April 30 at a depth of 2 in. with a seeding rate of 43,500 plants/A in 30 in. rows. The location at the Parma Research and Extension Center is a Greenleaf-Owyhee Silt Loam soil (32% sand, 58% silt, 10% clay, 1.25% organic matter and 7.7 pH), and the surface conditions at the time of herbicide applications were moderately smooth (0.5 to 1.0 in. clods) with no visible organic debris on the surface. The plots were arranged in a randomized complete block design with four replications, and each plot was 7 by 30 ft. The corn emerged on May 12 and herbicide treatments were sprayed at three different times (Table 1). Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Plots were visually evaluated on July 5, 1997. The trial was terminated on July 9, 1997.

Table 1. Application information

	May 12	May 27	June 15
Crop stage	1 in.; spike	8 in.; 6 lf	20 in.; 10 lf
Weed stage	SOLSA, cotyl; KCHSC, Cotyl; ECHCG, PRE; AMARE, Cotyl; SONOL, 5 lf	SOLSA, 6-20 lf; KCHSC; 12-36 lf; ECHCG, 4-11 lf; AMARE, 4-8 lf; SONOL, 8 lf	SOLSA, flow; KCHSC, 40+ lf ECHCG, 10 lf AMARE, 16-18 lf SONOL, 10 lf
Air temp. (F)	88	74	80
Relative humidity (%)	18	41	45
Sky (% cloud cover)	0	100	10
Soil temp. (F at 4 in.)	79	61	73
Soil moisture	Adequate	Excessive	Adequate
First significant rainfall	0.12 in. May 24	0.17 in. May 29	0.15 in. June 18

All herbicide treatments except metolachlor + primisulfuron/prosulfuron + SOL32 + COC at 1.22 + 0.036 lb/A + 4% v/v + 1% v/v controlled 92% or better of all annual broadleaf and grass weed species (Table 2). Metolachlor + primisulfuron/prosulfuron + CGA-248757 + COC at 1.22 + 0.029 + 0.004 lb/A + 1% v/v eliminated all target weeds. No herbicide treatment caused visually detectable damage to the field corn plants. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699).

Table 2. Effect of postemergence herbicides on weed control and field corn injury

Treatment	Rate	Weed Control					Corn
		SOLSA	AMARE	CHEAL	KCHSC	ECHCG	Injury
	lb/A	%					
Rimsulfuron/thifensulfuron[5,6,8]	0.016	92.5	95.8	96.5	95.8	96.5	0.0
Rimsulfuron/thifen[1] + dicamba[5,6,8]	0.016 + 0.0625	96.5	96.5	95.8	95.8	96.5	0.0
Rimsulfuron/thifen[1] + dicamba/atrazine[5,6,8]	0.016 + 0.4	100.0	100.0	100.0	100.0	95.8	0.0
Rimsulfuron/thifensulfuron + atrazine[5,6,8]	0.016 + 0.75	99.5	100.0	99.5	99.5	98.0	0.0
Metolachlor[7] + primi/prosulf[2,5,8]	1.22 + 0.036	85.0	90.0	88.8	90.0	95.8	0.0
Metolachlor[7] + primi/prosulf[2,8] + pyrid[3,5,8]	1.22 + 0.029 + 0.47	98.3	99.3	99.5	98.8	96.5	0.0
Metol[4,7] + primi/prosulf[2] + CGA-248757[5,8]	1.22 + 0.029 + 0.004	100.0	100.0	100.0	100.0	100.0	0.0
Metol[4,7] + atrazine + primi/prosulf[2,5,8]	1.22 + 1.5 + 0.036	97.0	100.0	100.0	98.8	97.8	0.0
Paraquat[9]	0.5	95.0	96.5	95.3	96.3	93.8	0.0
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		2.8	1.2	3.6	1.9	1.8	NS

[1]Thifen = thifensulfuron
[2]Primi/prosulf = primisulfuron/prosulfuron
[3]Pyrid = pyridate
[4]Metol = metolachlor
[5]Crop Oil Concentrate added at 1.0% v/v.
[6]SOL 32 (32% nitrogen solution) added at 4.0% v/v
[7]Applied on May 12, 1997; [8]applied on May 27, 1997; [9]applied as directed spray on June 15,1997.

Preemergence weed control in field corn. Gary A. Lee and Brenda M. Waters. A trial was conducted at the Parma Research and Extension Center, Parma Idaho to evaluate preemergence herbicide treatment for control of yellow nutsedge and annual weeds and subsequent corn tolerance. The location is a Greenleaf-Owyhee Silt Loam soil (32% sand, 58% silt, 10% clay, 1.25% organic matter and 7.7 pH). Corn (cultivar 'Pioneer 3751') was planted on April 30, 1997 at a population of 43,500 plants/A to a depth of 2 in. in 30 in. rows (Table 1). The study was arranged in a randomized complete block design with four replications and individual plots were 7 by 30 ft. Herbicide treatments were applied on May 9, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi.

Table 1. Application information.

	May 9
Crop stage	Preemergence
Weed stage	SOLSA-2 lf; KCHSC-8 lf; AMARE-pre; CYPES-2 lf; ECHCG-pre
Air temperature (F)	66
Relative humidity (%)	35
Wind (mph)	4
Sky (% cloud cover)	0
Soil temperature (F at 4 in.)	69
Soil moisture	dry surface, good moisture at 1 in.

First significant rainfall after herbicide application was 0.2 in. on May 24, 1997.

No treatment provided acceptable control of all weed species present (Table 2). However, all herbicide treatments gave 90% or better control of redroot pigweed (AMARE), hairy nightshade (SOLSA) and kochia (KCHSC) except isoxaflutole at 0.047 lb/A. There is no obvious reason for isoxaflutole at 0.047 lb/A to give no weed control while the 0.059 lb/A rate provided 93% or better control of the annual broadleaf weed species present. Acetochlor at 1.88 lb/A gave significantly higher control of barnyardgrass (ECHCG) than all other treatments. Although control was below acceptable levels, isoxaflutole + acetochlor at 0.059 + 1.0 lb/A and isoxaflutole + metolachlor at 0.059 + 1.25 lb/A did suppress the yellow nutsedge (CYPES) populations. No herbicide treatment caused visible damage to the corn. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699).

Table 2. Effect of preemergence herbicides on weed control and field corn injury.

Treatment	Rate	Weed Control					Corn
		AMARE	SOLSA	KCHSC	ECHCG	CYPES	Injury
	lb/A	%					
Isoxaflutole	0.047	0.0	0.0	0.0	0.0	0.0	0.0
Isoxaflutole	0.059	96.3	96.7	94.8	0.0	0.0	0.0
Isoxaflutole	0.071	95.0	93.3	93.8	0.0	0.0	0.0
Isoxaflutole + acetochlor	0.059 + 1.0	98.3	95.3	98.3	22.5	38.8	0.0
Isoxaflutole + metolachlor	0.059 + 1.25	99.5	91.3	98.8	27.5	25.0	0.0
Isoxaflutole + atrazine	0.059 + 0.75	100.0	100.0	100.0	5.0	0.0	0.0
EXP31430A	0.54	99.5	91.3	97.0	11.3	0.0	0.0
EXP31430A	0.67	97.5	91.3	95.0	21.3	0.0	0.0
EXP31498A	0.41	91.3	90.0	93.8	0.0	0.0	0.0
EXP31498A	0.55	100.0	92.5	100.0	10.0	0.0	0.0
Metolachlor + atrazine	1.22 + 1.2	100.0	97.8	99.5	46.3	0.0	0.0
Acetochlor	1.88	100.0	100.0	99.5	88.8	0.0	0.0
Weedy check	----	0.0	0.0	0.0	0.0	0.0	0.0
LSD (0.05)		3.8	5.1	4.3	29.4	11.4	NS

Comparison of selected preemergence herbicides for weed control in corn. John O. Evans, R.William Mace and Caleb Dalley. An experiment was established near Benson, UT on the Falslev farm to evaluate several selective herbicides to control annual weeds in field corn. The soil type was a Kidman silt loam with 7.5 pH and an OM content of less than 2%. Corn was planted May 15, 1997 and preemergence treatments established May 16 in a randomized block design, with three replications. Individual treatments were applied to 10 by 30 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 10 foot spray width calibrated to deliver 25 gpa at 39 psi. On June 19 a directed application of paraquat was applied as one treatment when the corn was 10 inches high. Predominate weeds were bristly foxtail (SETVE) at a density of 50 plants /ft^2 and kochia (KCHSC) at 2 plants/ft^2. Visual evaluations were completed June 4, July 7, and at harvest September 8.

All treatments gave excellent control of both bristly foxtail and kochia. Altered leaf color and streaking in corn leaves at the first evaluation indicated some injury using the EXP compounds but these were not evident in later evaluations. Yields did not reveal differences among treatments nor was crop injury evident at harvest time. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. A comparison of selected preemergence herbicide control of bristly foxtail and kochia in corn. Benson, UT. 1997.

			Corn							
			injury			Silage	SETVE			KCHSC
Treatment	Rate	Unit	6/4	7/7	9/8	Yield	6/4	7/7	9/8	7/7
			%			T/A	% Control			
EXP31130A	0.75	oz ai/A	13	0	0	33	79	92	92	95
EXP31130A	0.94	oz ai/A	3	0	0	30	88	99	94	100
EXP31130A	1.13	oz ai/A	28	0	0	29	90	93	82	98
EXP31130A+ Acetochlor	0 94 1	oz ai/A lb ai/A	7	0	0	31	100	100	97	100
EXP31130A+ Metolachlor	0.94 1.25	oz ai/A lb ai/A	13	0	0	29	100	100	97	100
EXP31130A+ Atrazine	0.94 0.75	oz ai/A lb ai/A	18	0	0	30	100	99	95	100
EXP31430A	0.54	lb ai/A	2	0	0	31	99	98	95	100
EXP31430A	0.67	lb ai/A	8	0	0	32	100	100	94	100
EXP31498A	0.41	lb ai/A	2	0	0	28	100	100	95	100
EXP31498A	0.55	lb ai/A	7	0	0	30	100	100	94	100
Metola/Atraz	2.4	qt/A	0	0	0	32	100	100	94	97
Acetochlor	1.6	lb ai/A	0	0	0	31	100	100	98	100
Acetochlor	2	pt/A	0	0	0	25	100	100	95	97
Paraquat[1]	2	pt/A	0	5	0	28	0	92	92	85
Thiaflu/Metola	0.72	lb ai/A	0	0	0	30	100	100	91	95
Thiaflu/Metola+ Atrazine	0.68 1.6	lb ai/A lb ai/A	0	0	0	30	100	100	89	97
Untreated			0	0	0	23	0	0	0	0
LSD(0.05)			9	NS	NS	NS	10	3	8	4.3

[1] Praquat with a nonionic surfactant at 0.25% v/v applied June 19 when corn was ten inches tall.

Wild proso millet and redroot pigweed controlled in silage corn with postemergence KV141 treatments. John O. Evans and R.William Mace. Silage corn was planted May 14, 1997 on the Jensen farm near Nibley UT and a 2:1 mixture of rimsulfuron and thifensulfuron (KV141) was used alone or in combination with existing herbicides to control wild proso millet (PANMI) and redroot pigweed (AMARE). The soil type was Nibley silt loam with 7.6 pH and OM content less than 2%. Treatments were applied June 6 in three replications using a randomized block design when the corn was five inches tall with 3 to 4 leaves. Wild proso millet and redroot pigweed were 2 to 3 inches high at the time of herbicide application with respective population densities of 20 and 5 plants/ft^2. Individual treatments were applied to 10 by 30 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 10 foot spray width calibrated to deliver 25 gpa at 39 psi. Visual evaluations were completed June 18 and July 21, for weed control. The plots were harvested by collecting plants for 1.5 meters from within the center of each plot on September 25.

Crop injury was not evident in the corn. A six to twelve inch height increase existed in the treated corn compared to the check. The observable height differential between treated plots and the untreated checks could have resulted from the nitrogen applied (2 qts/A of 28% N) with the herbicides or from enhanced soil nitrogen use efficiency due to excellent weed control with all treatments. Yields were not significantly different among treatments. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Corn injury and yield in the presence of KV141 alone and in combination with other herbicides for wild proso millet and redroot pigweed control. Nibley, UT.1997

		Corn		Weed Control			
		Injury	Yield	PANMI		AMARE	
Treatment[1]	Rate	7/18	9/25	6/18	7/21	6/18	7/21
	oz ai/A	--%--	T/A	%			
KV141	0.25	0	15.5	98	97	98	100
KV141+ Dicamba	0.25+ 2.0	0	15.2	96	93	100	100
KV141+ Dicamba/Atraz	0.25+ 16.0	0	16.7	93	92	100	100
KV141+ Atrazine	0.25+ 12.0	0	15.8	90	90	100	100
Nicosulfuron	0.5	0	15.5	92	93	95	95
Check		0	13.8	0	0	0	0
LSD(0.05)			NS	4.3	3.6	4	3.7

[1] Crop oil concentrate added at 1%v/v and 28%N at 2qt/A.

Preplant incorporated herbicides for weed control in field corn. Corey V. Ransom, Joey Ishida, and Monty Saunders. Registered and experimental herbicides were evaluated for weed control and crop safety to field corn in trials conducted at the Malheur Experiment Station, Ontario, OR. Plots were 10 by 30 feet arranged as a randomized complete block design with 3 replications. Treatments were applied to a Nyssa silt loam soil (pH 8.0, 1.2% O. M.) with a CO_2 pressurized backpack sprayer delivering 20 gpa at 35 psi. Treatments were applied to the center 7 feet of each plot and incorporated by a single pass with a spike-tooth harrow prior to planting on May 13, 1997. Pioneer 3489 corn was planted at 27,000 seeds per acre in 30 inch rows with a John Deere model 71 flexi planter. Postemergence treatments were applied June 6 to corn averaging 10 inches in height. Corn injury was evaluated May 23 and 30. Weed control was evaluated June 6 and 25. Corn yield was determined October 3 by harvesting corn ears from 20 ft of the two center rows of each plot, threshing the ears and recording the dry weight of the grain. Grain yields were adjusted to 12% moisture.

No corn injury was visible from herbicide treatments. Redroot pigweed control was similar among treatments with metolachlor at 1.25 lb/A providing among the lowest control and treatments containing acetochlor or dicamba providing among the highest control. The addition of isoxaflutole to acetochlor and FOE-5043 + metribuzin treatments increased control of common lambsquarters. Isoxaflutole and FOE-5043 applied alone were among the least active on barnyardgrass. However, the tank mixture of isoxaflutole with FOE-5043 + metribuzin provided barnyardgrass control comparable to metolachlor, acetochlor, alachlor, and acetochlor + safener. All herbicide treatments increased corn yield compared to the control except for metolachlor at 2.0 lb/A. The reduced yield from metolachlor (2.0 lb/A) cannot be explained given that the lower rate of metolachlor and the same rate of metolachlor followed by a postemergence treatment of dicamba both yielded higher than the control. (Malheur Experiment Station, Oregon State University, Ontario, OR 97914)

Table. Weed control and corn yield with preplant incorporated herbicides.

			Weed control[a]			Corn
Treatment	Rate	Timing	AMARE	CHEAL	ECHCG	Yield[b]
	lb/A		%			bu/A
Metolachlor	2.0	PPI	82	47	83	176
Dimethenamid	1.17	PPI	72	66	77	203
Acetochlor	1.6	PPI	88	60	80	213
Alachlor	2.0	PPI	92	60	75	199
Acetochlor + safener	1.6	PPI	87	74	83	205
Isoxaflutole	0.047	PPI	82	68	62	220
Isoxaflutole	0.059	PPI	77	83	58	218
Isoxaflutole + metolachlor	0.059 + 1.25	PPI	85	79	85	222
Isoxaflutole + acetochlor	0.059 + 1.0	PPI	95	83	76	226
Metolachlor	1.25	PPI	63	50	68	210
Acetochlor	1.0	PPI	93	65	73	216
Exp 31498A	0.41	PPI	77	77	73	228
Exp 31498A	0.55	PPI	87	83	81	215
FOE-5043 + metribuzin	0.64	PPI	78	66	65	211
FOE-5043 + metribuzin + isoxaflutole	0.32 + 0.059	PPI	87	85	78	218
Metolachlor + dicamba	2.0 + 0.5	PPI + POST	95	73	75	216
FOE-5043 + metribuzin + dicamba	0.64 + 0.5	PPI + POST	97	76	79	211
Untreated			0	0	0	164
LSD (0.05)			18	15	9	22.6

[a]Weed control evaluated June 25, 1997. AMARE = redroot pigweed, CHEAL = common lambsquarters, ECHCG = barnyardgrass.

[b]Corn yield taken October 3, 1997 and adjusted to 12% moisture.

Annual grass and broadleaf weed control in field corn with preemergence and postemergence herbicides. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 7, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525), annual grass and broadleaf weeds to preemergence and postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content less then 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preemergence treatments were applied May 7 and were immediately incorporated with 0.75 in of. sprinkler applied water. Postemergence treatments were applied on June 3 when corn was in the fifth leaf stage and weeds were small. Black nightshade infestations were heavy and redroot and prostrate pigweed, barnyardgrass and green foxtail infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made June 9 and July 2. Results obtained were subjected to analysis of variance at P=0.05.

Acetochlor plus atrazine and dimethenamid plus atrazine applied at 2.7 and 2.5 lb/A had the highest injury rating of 5, respectively. All treatments gave excellent control of annual grass and broadleaf weeds except the check. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Annual grass and broadleaf weed control in field corn with preemergence and postemergence herbicides.

Treatment[1]	Rate	Crop Injury	Weed Control AMARE	AMABL	SOLNI	ECHCG	SETVI
	lb/A	%					
Acetochlor + atrazine (pm)	2.5	0	100	100	100	100	100
Acetochlor + atrazine (pm)	2.7	5	100	100	100	100	100
Acetochlor + atrazine (pm)	2.0	0	100	100	100	100	100
Acetochlor	1.6	0	100	100	100	100	100
Acetochlor	1.8	0	100	100	100	100	100
Dimethenamid + atrazine (pm)	2.5	5	100	100	100	100	100
Acetochlor + atrazine[2] (pm)	2.5	0	100	100	100	96	97
Acetochlor + atrazine[2] (pm)	2.7	0	100	100	100	96	100
Dimethenamid + atrazine[2] (pm)	2.5	0	100	100	100	99	99
Dimethenamid	1.2	0	100	100	100	100	100
S-dimethenamid	0.66	0	100	100	100	100	100
Metolachlor II	2.0	0	100	100	100	100	100
Metolachlor II Mag	1.26	0	100	100	100	100	100
Handweeded check		0	100	100	100	100	100
Check		0	0	0	0	0	0
LSD 0.05			1	1	1	1	1

1. pm = packaged mix
2. Treatments applied postemergence and rated on July 2.

Annual grass and broadleaf weed control in field corn with preemergence and postemergence herbicides. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 7, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525), annual grass and broadleaf weeds to preemergence and postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preemergence treatments were applied May 7 and were immediately incorporated with 0.75 in of sprinkler applied water. Three postemergence treatments were applied on June 2 when corn was in the fifth leaf stage and weeds were small. Black nightshade infestations were heavy and redroot and prostrate pigweed, barnyardgrass and green foxtail infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made June 9 and July 2. Results obtained were subjected to analysis of variance at P= 0.05.

Those treatments containing fluthiamide plus metribuzin (pm) caused significant crop injury. All treatments gave excellent control of redroot and prostrate pigweed , barnyardgrass and green foxtail except the check. Black nightshade control was excellent with all treatments except fluthiamide plus metribuzin at 0.55 lb/A and the check. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Annual grass and broadleaf weed control in field corn with preemergence and postemergence herbicides.

Treatment[1]	Rate	Crop Injury	Weed Control AMARE	AMABL	SOLNI	ECHCG	SETVI
	lb/A	%					
Bay 06550	1.2	38	100	100	100	100	100
Fluthiamide + metribuzin (pm)	0.55	27	100	100	83	100	100
Fluthiamide + metribuzin (pm) + flumetsulam + clopyralid (pm)	0.47+.17	53	100	100	100	100	100
Fluthiamide + metribuzin (pm) + isoxaflutole	0.25+0.5	32	100	100	100	100	100
USA 1000	0.29	23	100	100	100	100	100
Metolachlor II + atrazine (pm)	1.8	0	100	100	100	100	100
Fluthiamide + metribuzin (pm) + atrazine	0.39+0.8	22	100	100	100	100	100
Fluthiamide + metribuzin (pm) + atrazine	0.25+0.8	12	100	100	100	100	100
Isoxaflutole	0.05	23	100	100	100	100	100
Dimethenamid + atrazine (pm)	1.5	1	100	100	100	100	100
Acetochlor + atrazine (pm)	1.2	0	100	100	100	100	100
Nicosulfuron + rimsulfuron + atrazine[2] (pm)	0.78	0	100	100	100	97	98
Nicosulfuron + rimsulfuron + atrazine[2] (pm) + dicamba	0.78+0.125	0	100	100	100	97	98
Nicosulfuron + rimsulfuron + atrazine[3] (pm) + dicamba	0.78+0.125	0	100	100	100	98	98
Handweeded check		0	100	100	100	100	100
check		0	0	0	0	0	0
LSD 0.05		4	1	1	1	1	1

1. pm = packaged mix.
2. Applied postemergence with COC and 32% N solution at 1.0 and 2 qt/A and rated on July 2.
3. Applied postemergence with a surfactant and 32% N solution at 0.25% v/v and 2 qt/A and rated on July 2.

Annual grass and broadleaf weed control in sethoxydim resistant field corn. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 7, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Dekalb 561SR), annual grass and broadleaf weeds to herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preemergence treatments were applied on May 7 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied June 2 when corn was in the fifth leaf stage with annual grass less than three in and broadleaf weeds less than two inch in height. Black nightshade infestations were heavy and redroot and prostrate pigweed, green foxtail and barnyardgrass infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made July 2. Results obtained were subjected to analysis of variance at P=0.05.

Dimethenamid applied preemergence at 1.0 lb/A followed by a postemergence treatments of sethoxydim plus BASF 1269 applied at 0.19 plus 0.263 with additives caused the highest injury rating of 14. Barnyardgrass and green foxtail control was excellent with all treatments except the check. Dimethenamid plus sethoxydim applied postemergence at 1.0 plus 0.19 lb/A gave poor control of broadleaf weeds. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Annual grass and broadleaf weed control in sethoxydim resistant field corn.

Treatment	Rate	Crop Injury	Weed Control ECHCG	SETVI	SOLNI	AMARE	AMABL
	lb/A	---%---	---------------%-------------				
Dimethenamid/sethoxydim[1]	1.0+0.19	2	100	100	95	98	98
Dimethenamid/sethoxydim + dicamba[2]	1.0/0.19+0.25	4	100	100	98	100	99
Dimethenamid/sethoxydim + dicamba[2]	1.0/0.19+0.25	7	100	100	95	100	100
Dimethenamid + sethoxydim[4]	1.0+0.19	0	100	100	10	10	10
Dimethenamid + sethoxydim + dicamba[4]	1.0+0.19+0.25	0	100	100	96	100	96
Dimethenamid + sethoxydim + dicamba[3]	1.0+0.19+0.25	0	100	100	90	100	97
Dimethenamid/sethoxydim + BASF 1269[3]	1.0/0.19+0.263	7	100	100	97	100	99
Dimethenamid/sethoxydim + BASF 1269[1]	1.0/0.19+0.263	14	100	100	100	100	100
Dimethenamid + sethoxydim + BASF 1269[3]	1.0+0.19+0.263	0	100	100	91	96	100
Dimethenamid + sethoxydim + BASF 1269[4]	1.0+0.19+0.263	0	100	100	99	100	100
Dimethenamid/sethoxydim + dicamba[1]	0.5/0.19+0.25	3	100	100	97	100	100
Dimethenamid/sethoxydim + dicamba[1]	0.75/0.19+0.25	0	100	100	94	100	100
Dimethenamid + sethoxydim + dicamba[4]	0.5+0.19+0.25	0	100	100	91	100	100
Dimethenamid + sethoxydim + dicamba[4]	0.75+0.19+0.25	0	100	100	99	100	93
Sethoxydim + dicamba[4]	0.19+0.25	0	100	100	97	99	96
Check		0	0	0	0	0	0
LSD 0.05		2	1	1	2	1	2

1. First treatment applied preemergence followed by a postemergence treatment with COC and 32% N solution at 1 qt and 2 qt/A.
2. First treatment applied preemergence followed by a postemergence treatment with no additives.
3. Additives were not added to postemergence treatments.
4. Treatments applied postemergence with additives.

Broadleaf weed control in field corn with preemergence followed by postemergence herbicides. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 8, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525) and broadleaf weeds to preemergence followed by postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preemergence treatments were applied May 8 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied on June 3, when corn was in the fifth leaf stage and weeds were small. Black nightshade infestations were heavy, prostrate and redroot pigweed infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made August 4. Results obtained were subjected to analysis of variance at P=0.05.

All treatments gave 100 percent control of broadleaf weeds on July 2. Metolachlor II Mag applied preemergence at 1.19 lb/A followed by prosulfuron plus primisulfuron at 0.0287 (pm) lb/A plus pyridate at 0.468 lb/A caused the highest injury rating of 3 percent, respectively (data not presented). On August 4 broadleaf weed control was good to excellent with all treatments except the check. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Broadleaf weed control in field corn with preemergence followed by postemergence herbicides on August 4.

Treatment[1,2]	Rate	Weed Control AMABL	AMARE	SOLNI
	lb/A	----------%--------		
Metolachlor II Mag/prosulfuron + primisulfuron[3] (pm)	1.19+0.0356	100	100	97
Metolachlor II Mag + atrazine/ (pm) + prosulfuron + primisulfuron (pm) + fluthiacet-methyl[3]	1.37/0.0287+0.0037	100	99	97
Metolachlor II Mag/pyridate + atrazine	1.19/0.687+1.0	100	100	100
Metolachlor II Mag/prosulfuron + primisulfuron (pm) + dicamba[3]	1.19/0.0287+0.187	100	100	99
Metolachlor II Mag/prosulfuron + primisulfuron (pm) + pyridate[3]	1.19/0.0356+0.468	100	99	98
Metolachlor II Mag/prosulfuron + primisulfuron (pm) + fluthiacet-methyl[3]	1.19/0.0287+0.0031	100	100	97
Metolachlor II Mag/prosulfuron + primisulfuron (pm) + dicamba[4]	1.19/0.0287+0.187	100	100	98
Metolachlor II Mag/primisulfuron + pyridate[3]	1.19/0.018+0.468	100	97	97
Metolachlor II Mag/pyridate + nicosulfuron[3]	1.19/0.468+0.0156	100	98	98
S-dimethenamid/dicamba + atrazine (pm)	0.62/0.8	100	99	98
S-dimethenamid/dicamba	0.62/0.25	100	97	98
Dimethenamid/dicamba + atrazine (pm)	1.12/0.8	100	100	99
Dimethenamid/dicamba	1.12/0.25	100	97	95
Metolachlor II Mag/prosulfuron + primisulfuron (pm) + dicamba[4]	1.19/0.0178+0.25	100	100	97
Handweeded check		100	100	100
Check		0	0	0
LSD 0.05		1	1	1

1. pm = packaged mix.
2. First treatment applied preemergence followed by a postemergence treatment.
3. A COC was added at 1 qt/A.
4. A surfactant was added at 0.25% v/v.

Broadleaf weed control in field corn with postemergence herbicides. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established on May 7, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Dekalb 561SR) and broadleaf weeds to postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Nine postemergence treatments were applied June 2 when corn was in the fifth leaf stage (<8 in height) and weeds were small. Five postemergence treatments were applied June 11 when corn was in the seventh leaf stage (>8 in height) and broadleaf weeds greater than two inch in height. Black nightshade, infestations were heavy, redroot and prostrate pigweed infestations were moderate throughout the experimental area. Treatments were rated visually for crop injury and weed control on July 2 and July 14. Results obtained were subjected to analysis of variance at P=0.05

BASF 1269 applied at 0.263 lb/A to corn less than eight in tall was the only treatment than injured corn, respectively. Redroot pigweed control was good to excellent with all treatments except flumetsulam plus clopyralid applied at 0.086 lb/A to corn greater than eight in tall and the check. Flumetsulam plus clopyralid applied at 0.17 and 0.086 lb/A to corn greater than eight in tall gave poor control of prostrate pigweed. Flumetsulam plus clopyralid applied at 0.17 and 0.086 lb/A and flumetsulam plus clopyralid plus 2,4-D applied at 0.21 lb/A to corn less than eight in tall gave poor control of black nightshade. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Broadleaf weed control in field corn with postemergence herbicides.

Treatments[1]	Rate	Crop Injury	Stand Count	Weed Control AMARE	AMABL	SOLNI
	lb/A	---%---	no	----------%---------		
Prosulfuron + primisulfuron[2,3] (pm)	0.036	0	14	100	100	97
Prosulfuron + primisulfuron (pm) + dicamba[2,4]	0.036+0.125	0	14	100	100	97
BASF 1269[2,4]	0.0263	9	14	100	99	100
BASF 1269[4,5]	0.175	0	15	100	97	100
BASF 1269[4,5]	0.263	0	15	100	97	100
Flumetsulam + clopyralid[2,3] (pm)	0.17	0	15	99	99	10
Prosulfuron + primisulfuron (pm) + dicamba[2,4]	0.0178+0.25	0	14	99	95	93
BASF 1269[2,4]	0.175	0	14	99	99	95
Dicamba[2,4]	0.25	0	14	97	98	93
Flumetsulam + clopyralid + 2,4-D[2,3] (pm)	0.21	0	14	97	97	10
Flumetsulam + clopyralid[3,5] (pm)	0.17	0	15	93	47	96
Flumetsulam + clopyralid[3,5] (pm)	0.25	0	15	92	72	99
Flumetsulam + clopyralid[2,3] (pm)	0.086	0	14	89	89	10
Flumetsulam + clopyralid[3,5]	0.086	0	15	83	42	93
Handweeded check		0	14	100	100	100
Check		0	14	0	0	0
LSD 0.05		1	ns	2	3	2

1. pm = packaged mix.
2. Treatments applied postemergence to corn less than eight in tall and evaluated July 2.
3. COC added to treatments at 1.2% v/v.
4. Surfactant plus 32% N solution added to treatments at 0.25% v/v and two qt/A.
5. Treatments applied to corn greater than eight in tall and evaluated July 14.

Effect of pyrithobac combinations for johnsongrass control in cotton. Steven D. Wright and M.R. Jimenez Jr. One of the objectives of this study was to examine whether pyrithobac herbicide had an antagonistic effect on sethoxydim, fluazifop, or clethodim herbicides. The first application was made on April 24 to a uniform population of johnsongrass that was 3 to 8 leaf stage and 1 to 10 in tall. Maxxa cotton was in the 2 true leaf stage. Treatments were applied with a CO_2 backpack sprayer using 8002 EVS nozzles at 38 psi delivering 20 gpa. Walking speed was 2 mph. Wind speed was 0-5 mph and air temperature 70 F. Treatments received a second application on May 1. Air temperature was 80 F and wind speed 0 to 3 mph. Some of the treatments received a third application on May 15. Air temperature was 80 F and wind speed 0 to 4 mph. Plots were arranged in a randomized complete block design with 4-38 in rows by 40 ft with 4 replications.

This study showed that there were no antagonistic effects with combinations of pyrithobac and fluazifop or with pyrithobac and clethodim herbicides. However, we did observe a clear antagonistic effect when pyrithobac was tank mixed with sethoxydim. The 21, 28 and 35 day evaluations showed that the tank mix of pyrithobac and sethoxydim herbicides, exhibited significantly lower control of johnsongrass than the sequential application of pyrithobac and sethoxydim.

Johnsongrass control results were as follows. At the 7 DAT evaluation all treatments with fluazifop, sethoxydim, and clethodim exhibited higher control than those treatments that only had pyrithobac in the first application. At the 15 DAT evaluation, pyrithobac + fluazifop, pyrithobac + clethodim, clethodim, and sethoxydim treatments exhibited the highest level of control ranging from 26 to 30 percent. At the 21 DAT evaluation, pyrithobac followed by clethodim, pyrithobac + clethodim, clethodim, and pyrithobac followed by sethoxydim treatments exhibited the highest level of control ranging from 58 to 60 percent. At the 28 DAT evaluation, pyrithobac followed by clethodim[1], pyrithobac + clethodim[1], pyrithobac followed by fluazifop[3], clethodim, pyrithobac + fluazifop[3] treatments exhibited the highest level of control ranging from 77 to 88 percent. At the 35 DAT evaluation, pyrithobac followed by clethodim[1], pyrithobac + clethodim[1], clethodim[1], pyrithobac followed by fluazifop[3], fluazifop[3], and pyrithobac + fluazifop[3] treatments exhibited the highest level of control ranging from 85 to 91 percent. (UC Cooperative Extension, Visalia CA 93291-4584)

Table. Johnsongrass Control 1997

Treatment	ai/A	7 DAT * 1-May	15 DAT ** 9-May	21 DAT ** 15-May	28 DAT *** 22-May	35 DAT *** 29-May
Pyrithobac [1]	1 oz	0	1	3	13	33
Clethodim [1]	0.062 lb	18	20	34	64	83
Sethoxydim [2]	0.5 lb	20	26	36	67	72
Fluazifop [3]	0.25 lb	20	24	48	66	84
Pyrithobac +Clethodim [1]	1 oz + 0.062 lb	10	10	9	24	48
Pyrithobac + Sethoxydim [2]	1 oz + 0.5 lb	18	25	38	39	45
Pyrithobac + Fluazifop [3]	1 oz + 0.25 lb	18	30	49	77	85
Pyrithobac B. Clethodim [1]	1 oz 0.125 lb	0	20	60	88	91
Pyrithobac B. Sethoxydim [2]	1 oz 2.5 pt	0	24	58	74	79
Pyrithobac B. Fluazifop [3]	1 oz 1 pt	0	21	48	79	89
Pyrithobac + Clethodim [1]	1 oz + 0.125 lb	15	30	59	84	93
Clethodim [1]	0.125 lb	20	26	58	78	91
Untreated [1]	----	0	0	0	14	23
LSD 0.05	----	3.7	4.9	12.5	8.8	8.6
% CV	----	24.5	17.3	22.8	10.5	8.6

Note: All treatments had Agridex. Those with sethoxydim had Agridex at 1 qt/A, all others had 1% v/v.

[1] Treated with clethodim 0.125 lb ai/A + Agridex 1 % v/v following the 21 day evaluation.
[2] Treated with sethoxydim at 0.5 lb ai/A + Agridex 1 qt/A following the 21 day evaluation.
[3] Treated with fluazifop 0.25 lb ai/A + Agridex 1 % v/v following the 21 day evaluation.

* Evaluated following the 1st application
** Evaluated following the 2nd application
*** Evaluated following the 3rd application

Control of ivyleaf morningglory with tank mix combinations. Steven D. Wright, M. R. Jimenez Jr., L.Banuelos. The objective of this study was to evaluate varying rates of herbicides and treatment combinations with UN-32 or MSMA for control of ivyleaf morningglory. The first application was made on June 6 to a uniform population of ivyleaf morningglory in the 3 true leaf stage with a Hagie high clearance sprayer. Treatments were applied using 8002 flat fan nozzles directed to the base of the cotton at a volume of 20 gpa going 2 mph at 25 psi. Air temperature was 95°F. Wind velocity was 0 to 3 mph. A second application was made on June 23 for a few of the treatments. Plot size was 4-38 in rows by 25 ft with 4 replications.

Many treatments provided excellent control of ivyleaf morningglory; however, cotton injury in some instances was too high. Treatments with paraquat exhibited high levels of control but also caused the highest levels of cotton injury. Paraquat treated cotton plants exhibited a blackening of the surface tissue that was contacted. In many instances Paraquat treated plants were girdled on the mainstem and eventually lodged and died. Cotton plants treated with Prometryn exhibited the second highest levels of cotton injury. The cyanazine + oxyfluorfen tank mix was the treatment that provided a high level of control with a relatively low level of cotton injury. The tank mix of UN-32 with prometryn or pyrithobac provided an additional 5 to 10 percent control. However, the tank mix of UN-32 with cyanazine seemed to have an antagonistic effect, reducing control nearly 20 percent. There was no significant difference between pyrithobac applied at 1 oz or 1.5 oz per acre. The sequential application of pyrithobac at 1.0 oz followed by pyrithobac at 1.0 oz exhibited higher control than did the lower rates applied sequentially. The tank mix of pyrithobac + MSMA provided similar control to the tank mix of pyrithobac + UN-32 for the first 14 days, thereafter the pyrithobac + MSMA treatment provided much higher control. Both pyrithobac and UN-32 alone treatments exhibited poor control. (UC Cooperative Extension, Visalia, CA 93291-4584)

Table. Ivyleaf morningglory control and cotton injury

		7DAT		14 DAT		21 DAT		28 DAT	
Treatment	ai/A	Control	Cotton Injury	Control	Cotton Injury	Control	Cotton Injury	Control	Cotton Injury
Pyrithobac *	1.0 oz	30	8	55	0	51	3	43	0
Pyrithobac *	1.5 oz	25	0	51	0	44	0	23	0
Pyrithobac *	0.5 oz	20	0	43	0	38	0	40	0
B. Pyrithobac *	0.5 oz								
Pyrithobac *	0.75 oz	21	0	48	0	30	0	45	0
B. Pyrithobac *	0.75 oz								
Pyrithobac *	1.0 oz	34	0	53	0	44	3	70	0
B. Pyrithobac *	1.0 oz								
Cyanazine *	19.2 oz	74	20	83	14	79	4	55	0
Prometryn *	25.6 oz	74	30	86	19	74	15	65	33
Paraquat *	0.25 lb	69	26	73	16	65	23	48	63
Paraquat *	0.375 lb	81	21	80	15	85	30	50	58
Paraquat *	0.5 lb	89	25	89	23	85	36	43	71
Cyanazine + UN-32	19.2 oz + 5 gal	56	19	56	9	45	5	60	0
Prometryn + UN-32	25.6 oz + 5 gal	75	14	83	14	84	6	78	0
Pyrithobac + UN-32	1.0 oz + 5 gal	45	8	58	6	51	3	50	0
Cyanazine + Oxyfluorfen	19.2 oz + 0.5 lb	76	23	90	15	83	10	90	5
UN-32	5 gal	26	10	13	8	18	0	5	0
Pyrithobac + MSMA	1.0 oz + 1.5 lb	40	3	58	0	66	3	84	0
Oxyfluorfen	1.0 lb	69	26	78	14	63	10	48	0
Untreated[1]	----	0	0	0	0	86	25	100	40
LSD 0.05		13.6	7.9	16.5	7.5	19.5	10.4	39.7	16.7
% CV		19.1	43.6	19.1	62.7	22.7	76.1	50.6	78.8

* also had Agridex at 0.25% v/v

[1] Treated with Paraquat 0.5 lb ai + Agridex 0.25 % v/v following the 14 DAT evaluation.

Chemical renovation of Kentucky bluegrass with glyphosate. Janice M. Reed, Jerry B. Swensen, Donald C. Thill, and Glen A. Murray. Two experiments were established in a five year-old stand of Kentucky bluegrass near Moscow, Idaho to evaluate chemical renovation of Kentucky bluegrass varieties with different rates of glyphosate, and to evaluate the effect of glyphosate rate and bluegrass variety on lentil seed yield. Both experiments were arranged as strip plot designs with four replications. The main plots for the first experiment were five rates of glyphosate (0.5, 0.75, 1, 1.25, and 1.5 lb/A), and five bluegrass varieties were the sub-plots. Each sub-plot was 4 by 8 ft. The main plots for the second experiment were two rates of glyphosate (1 and 1.5 lb/A), and sixteen bluegrass varieties were the sub-plots. Each sub-plot was 8 by 10 ft. Glyphosate treatments were applied to the bluegrass in both experiments on April 8, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 40 psi (Table 1). In experiment 2, four inch sod cores were taken from each bluegrass sub-plot two weeks after glyphosate application and grown in the greenhouse. After six weeks, grass shoots and rhizome sprouts were counted and compared to core samples taken one week prior to herbicide application. 'Pardina' small brown lentils were seeded in both experiments at a rate of 52 lb/A using a no-till drill on May 14, 1997. Fertilizer (16-20-0) was banded between rows at 150 lb/A during seeding. Lentils were harvested from each sub-plot at maturity with a small plot combine on August 22 (experiment 2) and August 23, 1997 (experiment 1).

Table 1. Application data.

Bluegrass stage	Vegetative, 1 inch tall
Air temp (F)	53
Relative humidity (%)	59
Wind (mph)	3
Cloud cover(%)	80
Soil temp at 2 in. (F)	38

In experiment 1, lentil seed yield increased with increasing glyphosate rate regardless of bluegrass variety (Table 2). Yield from lentils seeded into early maturing bluegrass varieties such as South Dakota was significantly higher than lentil yield from late maturing varieties such as Glade (Table 3). Early maturing bluegrass varieties sustained more damage from glyphosate due to greater vegetative growth, and thus were less competitive with the lentil crop. Also, the regrowth potential of South Dakota from remaining plants was less, because it is less aggressive than Glade.

In experiment 2, no bluegrass varieties were affected differently by glyphosate rate (data not shown). Pre-glyphosate rhizome weights were not different between varieties (Table 4). Cheri had the highest pre-glyphosate tiller number and Kenblue had the lowest, while most other varieties had similar tiller numbers. Pre-glyphosate rhizome weights and tillers were not significantly correlated ($P=0.05$) with post-glyphosate shoot re-establishment, rhizome sprouts, or lentil seed yield. The number of rhizomes that sprouted after application was not affected by glyphosate rate, but varied with variety. Midnight and Glade, late maturing varieties, had the highest number of new rhizome sprouts, while Huntsville and Baron, early maturing varieties, had the lowest. Late maturing varieties sustained less damage at the time of application, and thus had greater root and shoot regeneration. This also was due to genetic differences in aggressivity between early and late maturing varieties. Post-glyphosate rhizome regeneration and lentil seed yield were not significantly correlated ($P=0.05$), but grass shoot re-establishment did correlate significantly with lentil yield and had a correlation coefficient of -0.22 (data not shown). Yield was highest from lentils seeded into early maturing bluegrass varieties such as Huntsville and Kenblue, while late maturing, aggressive varieties such as Ram I and Midnight reduced lentil yield. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. The effect of glyphosate rate on lentil seed yield (experiment 1).

Glyphosate rate	Lentil seed yield[1]
lb ai/A	lb/A
0.5	590 b
0.75	570 b
1.0	757 ab
1.25	818 a
1.5	816 a

[1] Values are means of five bluegrass varieties and four replications. Values with different letters are significant at P<0.05.

Table 3. The effect of bluegrass variety on lentil seed yield (experiment 1).

Bluegrass variety	Lentil seed yield[1]
	lb/A
South Dakota	888 a
Suffolk	759 ab
Liberty	644 b
Adelphi	643 b
Glade	618 b

[1] Values are means of five glyphosate rates and four replications. Values with different letters are significant at P<0.05.

Table 4. The effect of glyphosate on grass re-establishment and rhizome sprouting, and lentil yield from bluegrass varieties (experiment 2).

Bluegrass	Pre-glyphosate		Post-glyphosate[1]		Lentil
variety	Rhizome wt	Tillers	Grass shoots[2]	Rhizome sprouts	seed yield
	oz/ft^2	-----------	no/ft^2	-----------	lb/A
Adlephi	0.31	756	14	66	857
Argyle	0.26	661	13	37	1016
Baron	0.23	933	11	34	1023
Cheri	0.44	1116	16	54	743
Eclipse	0.24	552	21	89	791
Glade	0.39	558	17	140	768
Huntsville	0.37	461	9	20	1064
Julia	0.35	784	18	80	893
Kenblue	0.24	455	14	49	1025
Liberty	0.43	736	20	43	569
Midnight	0.36	590	26	152	754
Newport	0.35	684	16	29	940
Ram I	0.28	544	22	52	662
South Dakota	0.43	573	16	60	957
Suffolk	0.49	747	16	57	660
Wabash	0.58	698	9	26	877
LSD (0.05)	NS	310	NS	8	267

[1] Values for grass shoots and rhizome sprouts are means of two glyphosate rates (1 and 1.5 lb ai/A).
[2] Grass shoot re-establishment evaluated after 6 weeks of growth; includes bluegrass and annual grass seedlings.

Seedling Kentucky bluegrass tolerance to imazamethabenz, difenzoquat, and primisulfuron. Traci A. Rauch and Donald C. Thill. Studies were established in seedling Kentucky bluegrass near Colton, WA to evaluate bluegrass tolerance to imazamethabenz and difenzoquat and near Nezperce, ID to evaluate bluegrass tolerance and weed control with primisulfuron. Kentucky bluegrass (var. Palouse at both locations) was planted on April 27, 1996 at Colton in a silt loam soil (24% sand, 60% silt, 16% clay, pH 5.0, and 3.2% organic matter) and on October 28, 1995 at Nezperce in a silt loam soil (32% sand, 52% silt, 16% clay, pH 5.8, and 5.3% organic matter). The experimental design at both locations was a randomized complete block with four replications, and individual plots were 8 by 20 ft. Herbicide treatments were applied postemergence at two timings: June 5 and June 14, 1996 at Colton (Table 1) and May 20 and May 31, 1996 at Nezperce (Table 2) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Bluegrass seed was harvested by hand from a 2.7 ft^2 area at Colton on June 22, 1997 and at Nezperce on July 7, 1997.

Table 1. Application data at Colton, WA.

	June 5, 1996	June 14, 1996
Crop stage	1 to 3 leaves	3 to 4 leaves
Air temp (F)	65	79
Relative humidity (%)	62	54
Wind (mph)	3 to 7	2 to 4
Cloud cover	clear	clear
Soil temp at 2 inches (F)	64	64

Table 2. Application data at Nezperce, ID.

	May 20, 1996	May 31, 1996
Crop stage	1 to 3 leaves	1 to 2 tillers
Weed stage		
broadleaves	1 to 4 inches	2 to 6 inches
grasses	2 to 3 tillers	jointing
Air temp (F)	60	70
Relative humidity (%)	64	64
Wind (mph)	0 to 3	0 to 2
Cloud cover	partly cloudy	mostly clear
Soil temperature at 2 inches (F)	58	54

The early timing of difenzoquat alone or with imazamethabenz injured bluegrass 11 to 16% on June 17, 1996, and the late timing injured bluegrass 1 to 5% on June 21, 1996 (Table 3). Both timings of imazamethabenz at the 0.47 lb/A rate injured bluegrass 25 to 36% on June 22, 1997. Panicle number in the difenzoquat treatment at the 0.5 lb/A rate at the early timing was greater than the untreated check. Panicle numbers for all other treatments did not differ from the untreated check. Imazamethabenz + difenzoquat at the early timing and imazamethabenz at the 0.47 lb/A rate (both timings) had the lowest seed yields. However, seed yield for all treatments was not significantly different from the untreated check.

Primisulfuron treatments injured bluegrass 11 to 25% on July 8, 1996 (Table 4). The split application of primisulfuron injured bluegrass the most. The split application and the late timing of primisulfuron at both rates controlled pinnate tansymustard (DESPI) and downy brome (BROTE) 42 to 84%. Both rates of the early timing of primisulfuron only suppressed pinnate tansymustard and downy brome 18 to 30%. Panicle number and seed yield for all treatments did not differ from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 3. Seedling Kentucky bluegrass injury and yield with imazamethabenz and difenzoquat at Colton, WA.

Treatment[1]	Rate	Timing	Injury 6/17/96	Injury 6/21/96	Injury 6/22/97	Panicle	Yield
	lb/A		-------------------	%	-------------------	no./ft²	lb/A
Imazamethabenz	0.23	1-2 leaf	0	0	0	58	719
Imazamethabenz	0.47	1-2 leaf	0	0	25	49	531
Imazamethabenz + difenzoquat	0.23 + 0.5	1-2 leaf	14	0	7	45	546
Difenzoquat	1.0	1-2 leaf	16	0	0	54	913
Difenzoquat	0.5	1-2 leaf	11	0	1	93	1196
Imazamethabenz	0.23	3-4 leaf	0	1	1	80	1134
Imazamethabenz	0.47	3-4 leaf	0	2	36	47	704
Imazamethabenz + difenzoquat	0.23 + 0.5	3-4 leaf	0	5	4	69	992
Difenzoquat	1.0	3-4 leaf	0	0	0	72	750
Difenzoquat	0.5	3-4 leaf	0	0	0	82	988
Local standard	mowing		--	--	--	79	762
Untreated check			--	--	--	67	793
LSD(0.05)			3	3	11	26	NS

[1] Imazamethabenz + difenzoquat was applied as a tank mixture. All treatments applied with a 90% nonionic surfactant at 0.25% v/v.

Table 4. Seedling Kentucky bluegrass response and weed control with primisulfuron at Nezperce, ID.

Treatment[1]	Rate	Timing	Injury 7/8/96	Weed control[2] DESPI	Weed control[2] BROTE	Panicle	Yield
	lb/A		-------------------	%	-------------------	no./ft²	lb/A
Primisulfuron	0.018	1-2 leaf	11	20	20	162	566
Primisulfuron	0.036	1-2 leaf	16	30	18	157	773
Primisulfuron	0.018	1-2 tiller	16	84	52	269	864
Primisulfuron	0.036	1-2 tiller	20	74	54	172	528
Primisulfuron + primisulfuron	0.018 + 0.018	1-2 leaf + 1-2 tiller	25	42	42	205	673
Bromoxynil	0.5	1-2 tiller	0	56	49	216	530
Untreated check			--	--	--	185	587
LSD (0.05)			5	36	25	NS	NS
Density (plants/ft²)				11	1		

[1] All primisulfuron treatments applied with crop oil concentrate at 1 qt/A.
[2] June 16, 1997 evaluation.

Windgrass control in Kentucky bluegrass with primisulfuron combinations. Traci A. Rauch and Donald C. Thill. A study was established in 'South Dakota' Kentucky bluegrass near Nezperce, ID to evaluate bluegrass injury and interrupted windgrass control with primisulfuron alone and in combination with other herbicides. The experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence on April 11, 1997 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1). Bluegrass injury and weed control were evaluated visually on April 17, May 9, and June 16, 1997. Interrupted windgrass biomass was harvested by hand from a 2.7 ft^2 area on June 16, 1997.

Table 1. Application and soil data.

Bluegrass age	3 years
Bluegrass stage	4 inches of regrowth
Windgrass stage	1 to 2 leaves
Air temp (F)	40
Relative humidity (%)	55
Wind (mph)	3
Cloud cover	Clear
Soil temp at 2 inches (F)	34
Soil Texture	silt loam
pH	5.3
OM%	4.85
CEC (meq/100g)	28

Primisulfuron + metribuzin with nonionic surfactant (NIS) or crop oil concentrate (COC) injured bluegrass 17 to 22% on April 17, 1997 (Table 2), but no injury with any treatment was observed by June 16, 1997 (data not shown). All treatments, except primisulfuron (0.018 lb/A) + COC, controlled interrupted windgrass 83 to 97%. Interrupted windgrass biomass for the primisulfuron + 2,4-D amine + NIS and primisulfuron (0.018 lb/A) + COC treatments did not differ from the untreated check. Interrupted windgrass biomass for all other treatments was less than the untreated check. Bluegrass seed was not harvested because many plots were infested with moderate to high infestations of Canada thistle that emerged after the herbicide treatments were applied. None of the treatments controlled Canada thistle. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Kentucky bluegrass injury and windgrass control and biomass with primisulfuron combinations.

Treatment[1]	Rate	Bluegrass injury[2]	Interrupted windgrass control[3]	Interrupted windgrass biomass
	lb/A	%	%	oz/yd^2
Primisulfuron + COC	0.018	0	74	1.41
Primisulfuron + COC	0.036	0	96	0.05
Primisulfuron + 2,4-D amine + NIS	0.018 + 0.5	0	83	1.15
Primisulfuron +2,4-D amine + COC	0.018 + 0.5	0	88	0.16
Primisulfuron + dicamba + NIS	0.018 + 0.25	0	90	0.25
Primisulfuron + dicamba + COC	0.018 + 0.25	0	94	0.17
Primisulfuron + bromoxynil + NIS	0.018 + 0.25	0	96	0.05
Primisulfuron + bromoxynil + COC	0.018 + 0.25	0	96	0.02
Primisulfuron + clopyralid/2,4-D + NIS	0.018 + 0.6	0	88	0.06
Primisulfuron + clopyralid/2,4-D + COC	0.018 + 0.6	0	94	0.02
Primisulfuron + tribenuron + NIS	0.018 + 0.016	0	95	0.04
Primisulfuron + tribenuron + COC	0.018 + 0.016	0	94	0.14
Primisulfuron + metribuzin + NIS	0.018 + 0.188	17	97	0.17
Primisulfuron + metribuzin + COC	0.018 + 0.188	22	94	0
Untreated check		--	--	1.48
LSD (0.05)		1	18	1.19
Density (plants/ft^2)			11	

[1] COC = crop oil concentrate was applied at the 1 qt/A rate. NIS = 90% nonionic surfactant applied at the 0.25% v/v rate. Clopyralid/2,4-D applied as the commercial formulation.
[2] April 17, 1997 evaluation.
[3] June 16, 1997 evaluation.

Tolerance of spring planted seedling Kentucky bluegrass to primisulfuron. Daniel A. Ball and Devesh Singh. A study was initiated on a commercial Kentucky bluegrass field near LaGrande, OR to evaluate postemergence timings, and split applications of primisulfuron for crop tolerance in spring planted seedling Kentucky bluegrass grown for seed. The experimental area was located in a newly planted stand of Kentucky bluegrass var. 'Barticia' seeded on May 7, 1997. Weed populations in the plot area were negligible. EPOST treatments were made on October 11, 1996 (air temp. 71 F, sky clear, wind N at 4 mph, relative humidity 70%, soil temp. at 2 inch 72 F) to tillering bluegrass at 3.5 inch height. MPOST treatments were made on November 20 (air temp. 41 F, sky partly cloudy, N at 3 mph, relative humidity 76%, soil temp. at 2 inch 42 F) to partially dormant bluegrass at 4 inch height. LPOST treatments were made on April 7, 1997 (air temp. 52 F, mostly cloudy, wind calm, relative humidity 68%, soil temp. at 2 inch 46 F) to dormant bluegrass. All treatments were made with a hand-held CO_2 sprayer delivering 15 gpa at 30 psi. Plots were 10 by 40 ft in size, in an RCB arrangement, with 4 replications. Soil at the site was a silt loam with 33% sand, 51% silt, and 16% clay, 2.4% organic matter, 8.5 soil pH, and a CEC of 29.4 meq/100g. Evaluations of visual crop injury were made on April 25 and May 9, 1997. Plots were cut on July 8, 1997 with a small plot swather, and harvested with a plot combine on August 7. Seed samples were delinted and cleaned prior to seed yield determination.

The higher primisulfuron application rates at EPOST and MPOST timings and the EPOST/MPOST split application timing produced reductions in seed yield despite a lack of visual injury. The later timed split applications produced minor visual injury at the early observation date, but no significant reduction in seed yield. The treatment combination of oxyfluorfen and primisulfuron also reduced seed yield of Kentucky bluegrass. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table. Spring planted Kentucky bluegrass injury and seed yield from postemergence herbicide treatments.

Treatment	Rate	Timing	Visual crop injury 27 Apr	Visual crop injury 9 May	Clean seed yield *
	lb/A		-------- % --------		lb/A
Primisulfuron	0.018	EPOST	1	0	880 ab
Primisulfuron	0.023	EPOST	0	0	820 bc
Primisulfuron	0.035	EPOST	0	0	810 bc
Primisulfuron	0.070	EPOST	0	0	810 bc
Primisulfuron	0.035	MPOST	0	0	820 bc
Primisulfuron	0.035	LPOST	2	0	930 a
Primisulfuron / primisulfuron	0.018/ 0.018	EPOST/ MPOST	1	0	750 c
Primisulfuron / primisulfuron	0.018/ 0.018	EPOST/ LPOST	3	0	920 a
Primisulfuron / primisulfuron	0.018/ 0.018	MPOST/ LPOST	3	0	880 ab
Oxyfluorfen + primisulfuron	0.125 + 0.018	EPOST	0	0	800 bc
Oxyfluorfen + primisulfuron	0.125 + 0.035	EPOST	0	0	820 bc
Control	--		0	0	930 a
LSD (0.05)			1.5	ns	100

All treatments recevied Crop oil concentrate applied at 1 qt/A
* Seed yield numbers followed by the same letter are not different at the 0.05 probability level.

Tolerance of fall planted seedling Kentucky bluegrass to primisulfuron. Daniel A. Ball and Devesh Singh. A study was initiated on a commercial Kentucky bluegrass field near Patterson, WA to evaluate postemergence timings, and split applications of primisulfuron for crop tolerance in fall planted seedling Kentucky bluegrass grown for seed. The experimental area was located in a newly planted stand of Kentucky bluegrass var. 'Wildwood' seeded on August 15, 1996. EPOST treatments were made on October 31, 1996 (air temp. 40 F, sky partly cloudy, wind N at 3 mph, relative humidity 100%, soil temp. at 2 inch 34 F) to 1-2 tiller bluegrass at 1.5 inch height. MPOST treatments were made on February 21, 1997 (air temp. 42F, sky partly cloudy, wind N 3 mph, relative humidity 72%, soil temp. at 2 inch 38 F) to dormant bluegrass at 1.5 inch height. LPOST treatments were made on March 25, 1997 (air temp. 58 F, clear sky, wind calm, relative humidity 60%, soil temp. at 2 inch 52 F) to 2-3 tiller bluegrass 1.5 inch in height. All treatments were made with a tractor mounted compressed air sprayer delivering 16 gpa at 30 psi. Plots were 15 by 50 ft in size, in an RCB arrangement, with 4 replications. Weed populations were negligible, so evaluations of crop tolerance were not confounded by weed interference. Soil at the site was a silt loam with 40% sand, 51% silt, and 10% clay, 1.1% organic matter, 6.3 soil pH, and a CEC of 18.6 meq/100g. Evaluations of visual crop injury were taken on April 8 and 24, 1997. Plots were cut on June 26, 1997 with a small plot swather, and harvested with a plot combine on July 3. Seed samples were delinted and cleaned prior to seed yield determination.

High rates of primisulfuron particularly at the EPOST timing caused substantial visual crop injury. The EPOST/MPOST split application also caused visible injury to bluegrass. Injury from the EPOST and split applications of primisulfuron negatively impacted seed yield. Primisulfurnon applied at the LPOST timing did not impact seed yield compared to an untreated control. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table. Fall planted Kentucky bluegrass injury and seed yield from postemergence herbicide treatments.

Treatment	Rate	Timing	Crop injury 8 Apr	Crop injury 24 Apr	Clean seed yield *
	lb/A		-------- % --------		lb/A
Primisulfuron	0.018	EPOST	2	1	630 b
Primisulfuron	0.035	EPOST	7	5	610 b
Primisulfuron	0.070	EPOST	19	10	360 c
Primisulfuron	0.018	LPOST	6	4	890 a
Primisulfuron	0.035	LPOST	7	6	870 a
Primisulfuron	0.070	LPOST	8	11	920 a
Primisulfuron / primisulfuron	0.018/ 0.018	EPOST/ MPOST	53	21	430 c
Control	--		0	0	880 a
LSD (0.05)			9	7	170

All treatments recevied Crop oil concentrate applied at 1 qt/A

* Seed yield numbers followed by the same letter are not different at the 0.05 probability level.

The effects of triasulfuron and metsulfuron on established cool season forage grasses. Lawrence W. Lass and Donn C. Thill. Previous studies at the University of Idaho have shown triasulfuron will reduce the height of some grass species when applied to seedlings. Seedling grasses were shortened 10 to 40% in the first year after treatment but heights were similar the second year. This study was conducted in 1988 and the plots released back to the farmer in 1991. The farmer has maintained the grass strips in the Conservation Reserve Program (CRP). The same grass strips were used in 1997 to evaluate the effects of triasulfuron and metsulfuron on established grasses. Nine established species from the original 19 having defined borders and uniform stands were selected for this test.

The selected grass species were:

- Brome, meadow (Bromus bieberstenii R&S cv. Regar)
- Fescue, creeping red (Festuca rubra L. cv. Novarubra)
- Fescue, sheep (Festuca ovina L. cv. Covar)
- Fescue, tall (Festuca arundineae Schreb. cv. Fawn)
- Wheatgrass, crested (Agropyron cristatum Gaerthn. cv. Ephram)
- Wheatgrass, crested (Agropyron cristatum Gaerthn. cv. Hycrest)
- Wheatgrass, crested (Agropyron cristatum Gaerthn. cv. Nordan)
- Wheatgrass, intermediate (Thinopryrum intermedium spp. Intermedium (Host) Bark. & D.R. Dewey) cv. Oahe)
- Wheatgrass, pubescent (Thinopyrum intermedium spp. barbulatum (Schu) Bakw. cv. Luna)

The experiment had four replications in a randomized complete block design. The treatments were applied on April 22, 1997 with a CO_2 backpack sprayer equipped with 8001 flat fan nozzles and calibrated to 9.5 gpa. The air, soil surface, three inches soil depth, and six inches soil temperatures were all 48 F. The relative humidity was 68% and the sky was 30% cloud cover. Dew was present. The soil type was a Southwick silt loam. Grass height was measured and vegetation density was estimated on June 21, 1997.

The triasulfuron and metsulfuron treatments did not significantly effect the height of the grasses or the density of the grasses. In many cases, grasses in the treated areas tended to be slightly taller than the check. (University of Idaho, Department of Plant, Soil, & Entomological Science, Moscow, ID, 83844-2339)

Table. The effects of triasulfuron and metsulfuron on established cool season forage grasses.

	Treatments					
	Triasulfuron 0.013 lb/a	Triasulfuron 0.0268 lb/a	Metsulfuron 0.0187 lb/a	Metsulfuron 0.0375 lb/a	Check	LSD (P=0.05)
Height			(in)			
Brome, meadow	20	20	18	19	19	ns
Fescue, creeping red	8	10	10	10	10	ns
Fescue, sheep	9	11	10	10	11	ns
Fescue, tall	30	31	32	28	30	ns
Wheatgrass, crested, Ephram	16	15	16	16	16	ns
Wheatgrass, crested, Hycrest	24	22	24	24	21	ns
Wheatgrass, crested, Nordan	23	25	21	23	22	ns
Wheatgrass, intermediate	22	22	22	21	21	ns
Wheatgrass, pubescent	25	26	23	26	26	ns
Estimated vegetation density			(%)			
Brome, meadow	35	34	33	34	35	ns
Fescue, creeping red	10	10	10	11	11	ns
Fescue, sheep	9	9	8	9	10	ns
Fescue, tall	30	24	30	29	30	ns
Wheatgrass, crested, Ephram	10	10	10	10	10	ns
Wheatgrass, crested, Hycrest	30	29	31	30	31	ns
Wheatgrass, crested, Nordan	29	31	25	28	29	ns
Wheatgrass, intermediate	43	40	45	40	45	ns
Wheatgrass, pubescent	43	43	44	39	43	ns

ns = Not significantly different.

Pre-emergence and postemergence herbicides in lentil and pea. Joan Campbell and Donald Thill. Two experiments, one in pea and one in lentil, were established in, Latah and Nez Perce counties, Idaho, respectively, to determine the effect of pre-emergence and postemergence herbicides. The pea experiment was a split block design with tillage as the main plot, herbicide treatments as the subplots, and four replications. Tillage treatments were fall chisel and fall plow. Experimental units were 8 by 36 ft. The lentil experiment was a randomized complete block design with four replications. The field was disked in the fall. Experimental units were 8 by 30 ft. Herbicide treatments in both experiments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Imazethapyr and imazethapyr/pendimethalin were applied and incorporated into the soil with a cultivator/harrow before planting (PPI). Metribuzin was applied after planting, but before emergence (PPPre). The remainder of the herbicides were applied at the 7 to 8 node stage of pea and the bud stage of lentil (Post). Seed was harvested at maturity with a small plot combine.

Table 1. Application data.

	Lentil			Pea		
Application timing	PPI	PPPre	Post	PPI	PPPre	Post
Growth stage	-	-	bud	-	-	7-8 nodes
Application date	April 26	May 18	June 29	May 7	May 18	June 22
Air temperature (F)	58	50	52	52	68	68
Soil temperature (F) at 4 inches	48	54	57	52	56	71
Relative humidity (%)	72	52	81	49	38	45
Wind velocity (mph)	3 to 6 SE	0	0	0	0 to 3 S	0
Cloud cover (%)	0	0	100	0	0	50

Weed control was not evaluated due to low weed population at both sites. Imazamox reduced lentil stand 35%, reduced lentil vigor 50% , and delayed maturity. The imazamox treated plots were too green to harvest. Lentil yield did not differ among the harvested treatments (Table 2). Pea was not injured with any treatment and pea yield was not different among herbicide or tillage treatments (Table 3). (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Lentil yield affected by pre-emergence and postemergence herbicide treatments.

Treatment	Rate	Lentil yield
	lb/A	lb/A
Imazethapyr	0.047	963
Imazethapyr + quizalofop + crop oil concentrate	0.047 + 0.051 + 1% v/v	858
Metribuzin + quizalofop + crop oil concentrate	0.25 + 0.051 + 1% v/v	856
Imazamox + nonionic surfactant	0.024 + 0.25% v/v	not harvested
Imazamox + nonionic surfactant	0.048 + 0.25 % v/v	not harvested
Imazethapyr/pendimethalin	0.68	918
Untreated check	0	962

Table 3. Pea yield affected by pre-emergence and postemergence herbicide treatments.

Treatment	Rate	Tillage	Pea yield
	lb/A		lb/A
Imazethapyr	0.047	Chisel	2805
		Plow	2968
Imazethapyr + quizalofop + crop oil concentrate	0.047 + 0.051 + 1% v/v	Chisel	2738
		Plow	2855
Metribuzin + bentazon + crop oil concentrat	0.25 + 0.75 + 1% v/v	Chisel	2545
		Plow	2458
Metribuzin + quizalofop + crop oil concentrate	0.25 + 0.051 + 1% v/v	Chisel	2814
		Plow	2823
Imazamox + nonionic surfactant	0.024 + 0.25% v/v	Chisel	2884
		Plow	2824
Imazamox + nonionic surfactant	0.048 + 0.25% v/v	Chisel	2803
		Plow	2900
Imazethapyr/pendimethalin	0.68	Chisel	2446
		Plow	2660
Untreated check	0	Chisel	2659
		Plow	2614

Effects of imazethapyr and pendimethalin on weed-free lentil seed yield. Bradley D. Hanson and Donald C. Thill. Studies were established near Genesee and Potlatch, Idaho to determine the effects of imazethapyr and pendimethalin applied alone and in combinations on lentil seed yield. Plots were 8 by 30 ft arranged in a randomized complete block with four replications. Treatments at Potlatch were applied on April 18 and at Genesee on May 13 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 32 psi and 3 mph and were incorporated immediately with two passes of a field cultivator (Table 1). 'Brewer' and 'Spanish Brown' lentil were seeded on May 16 at Potlatch and May 14 at Genesee, respectively. Both sites were handweeded several times throughout the season. Visual injury was evaluated at Genesee on June 12 and at Potlatch on June 13. Lentil population counts were made on June 24 at both locations, and lentil biomass was collected on July 8 at Genesee and July 3 at Potlatch. Lentil seed was harvested from a 4.1 by 27 ft area on August 16 at Genesee and at Potlatch on August 21 with a small plot combine.

Table 1. Application data and soil analysis

Site	Potlatch	Genesee
Application and incorporation date	April 18, 1997	May 13, 1997
Air temperature (F)	84	46
Relative humidity (%)	41	85
Wind speed (mph)	2	7
Cloud cover (%)	0	100
Soil temperature at 2 in. (F)	58	44
pH	4.8	5.3
OM (%)	4.5	4.0
CEC (cmol/Kg)	19.0	20.4
Texture	silt loam	silt loam

Slight injury was visible 28 DAT with 2.0 lb/A of pendimethalin at Potlatch, however no injury was observed at Genesee. Plant population, plant biomass, and seed yield were not affected by herbicide treatment in these two experiments. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Effects of imazethapyr and pendimethalin on weed-free lentil yield.

Treatment	Rate	Potlatch Population	Potlatch Biomass	Potlatch Yield	Genesee Population	Genesee Biomass	Genesee Yield
	lb/A	no/ft^2	oz/ ft^2	lb/A	no/ft^2	oz/ ft^2	lb/A
Untreated check		10.0	0.131	1581	17.1	0.409	929
pendimethalin	0.5	9.0	0.118	1423	17.2	0.342	777
pendimethalin	1.0	10.0	0.131	1509	18.1	0.445	1027
pendimethalin	2.0	7.8	0.103	1376	18.0	0.326	1012
imazethapyr	0.024	9.6	0.125	1285	18.0	0.470	979
imazethapyr+ pendimethalin	0.024 0.5	9.2	0.120	1520	16.1	0.373	1004
imazethapyr+ pendimethalin	0.024 1.0	8.3	0.109	1568	17.6	0.425	941
imazethapyr+ pendimethalin	0.024 2.0	8.5	0.112	1326	16.2	0.395	916
imazethapyr	0.047	10.9	0.143	1551	16.3	0.396	1097
imazethapyr+ pendimethalin	0.047 0.5	8.5	0.112	1462	16.6	0.512	1013
imazethapyr+ pendimethalin	0.047 1.0	8.6	0.113	1487	18.4	0.448	895
imazethapyr+ pendimethalin	0.047 2.0	9.5	0.125	1546	18.8	0.419	973
imazethapyr	0.094	9.1	0.120	1582	18.4	0.333	907
imazethapyr+ pendimethalin	0.094 0.5	9.8	0.128	1587	18.6	0.496	1014
imazethapyr+ pendimethalin	0.094 1.0	9.3	0.122	1601	19.3	0.433	858
imazethapyr+ pendimethalin	0.094 2.0	9.4	0.123	1555	17.0	0.325	872
LSD (0.05)		NS	NS	NS	NS	NS	NS
CV, %		15.3	22.9	12.3	16.3	25.9	18.3

Weed control for poplar establishment. Corey V. Ransom, Joey Ishida, and Monty Saunders. Research was conducted at the Malheur Experiment Station, Ontario, OR to evaluate herbicides for weed control during poplar establishment. Poplar trees (var. OP 367) were planted using sticks 25 to 30 cm long spaced 3.5 feet apart in rows 14 feet apart. Plots were oriented down the center of the tree row and measured 14 by 28 ft. with 4 replications. Herbicide treatments were applied with a CO_2 pressurized backpack plot sprayer delivering 20 gpa at 30 psi. Treatments were applied preplant incorporated (PPI) or preemrgence (PRE) with PRE treatments being sprayed over the top of newly planted sticks. Treatments were applied with a CO_2 pressurized backpack sprayer delivering 20 GPA at 28 psi. Incorporation of PPI treatments was accomplished by a single pass with a field cultivator. Tree planting and treatment application was accomplished May 8. Trees were watered as needed with sprinkler irrigation. Visual injury and weed control were evaluated May 30 and June 6. Poplar height was taken June 6, September 8 and October 28. Poplar diameter at 20 cm and 4.5 ft from ground level were taken September 9 and October 28.

Treatments containing oxyfluorfen injured poplar trees. However, trees grew out of the injury as the season progressed and plots treated with oxyfluorfen alone were among the tallest and had among the largest diameter due to season long weed control. Injury from oxyfluorfen may have resulted from early bud break or from sprinklers splashing the herbicide onto newly developing leaves. All treatments reduced the number of red root pigweed and barnyardgrass plants. Trifluralin and ethalfluralin alone not adequately control hairy nightshade and common lambsquarters. Pendimethalin provided weed control similar to oxyfluorfen treatments but control decreased towards the end of the season. Weed competition reduced poplar tree height and diameter in plots where weeds were not controlled. Tree height and diameter were increased by all herbicides with the greatest tree growth occurring in plots treated with pendemithalin or oxyfluorfen. In the untreated plots, competition from weeds resulted in the death of over 75% of the poplar trees. (Malheur Experiment Station, Oregon State University, Ontario, OR 97914)

Table. Weed control and poplar response to soil applied herbicides.

			Poplar[a]		Weed density[a,c]				Poplar[b]			
										Diameter		
Treatment	Rate	Timing	Injury	Height	AMARE	CHEAL	SOLSA	ECHCG	Ht	20 cm	4.5 ft	Dead[d]
	lb/A		%	in	No./sq ft				ft	mm		No.
Trifluralin	1.0	PPI	0	9.2	0.1	1.1	1.5	0.9	6.6	17	9	1.0
Oxyfluorfen	2.0	PRE	48	6.4	0.0	0.0	0.0	0.0	9.3	33	17	0.3
Trifluralin + Oxyfluorfen	1.0 + 2.0	PPI + PRE	46	5.9	0.0	0.0	0.0	0.0	8.5	29	15	0.3
Pendimethalin	2.0	PRE	0	8.3	0.0	0.0	0.0	0.0	8.6	28	15	0.3
Ethalfluralin	1.5	PRE	0	8.5	0.0	1.8	1.8	0.0	6.4	17	9	0.5
Untreated			0	8.3	0.8	6.8	2.1	2.4	2.2	5	2	5.3
LSD (0.05)			7	2.1	0.4	1.3	1.0	1.1	2.4	8	5	1.5

[a]Poplar height and foliar injury, and weed densities taken June 6, 1997.
[b]Poplar height, diameter, and mortality taken October 28, 1997.
[c]AMARE = redroot pigweed, CHEAL = common lambsquarters, SOLSA = hairy nightshade, ECHCG = barnyardgrass.
[d]Tree death out of 7 trees.

Broadleaf weed control in field potato. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established in April 23, 1997 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of potato (var. Chipeta) and annual broadleaf weeds to herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Preemergence treatments were applied after drag-off on May 15 and were immediately incorporated with 0.75 in of sprinkler applied water. Three preemergence treatments were applied on May 15 followed by a postemergence treatment applied on June 2 when potato were four to six inch in height and weeds were small. Black nightshade infestations were heavy, prostrate and redroot pigweed infestations were moderate throughout the experimental area. Preemergence, preemergence/postemergence treatments and crop injury were evaluated visually on June 12 and July 2. The postemergence treatment was evaluated on July 2. Potato were harvested on September 9 by harvesting 2 rows 5 ft long from the center of each plot, using a tractor driven power digger. The harvested potatoes were then weighed and graded into sizes of 1 7/8 to 3 in and 3 in and bigger. Culls such as diseased or less than 1 7/8 in were not included. Results obtained were subjected to analysis of variance at P=0.05.

None of the treatments showed any noticeable crop injury. Redroot and prostrate pigweed control was good to excellent with all treatments except the check. Rimsulfuron applied preemergence at 0.0156 lb/A gave poor control of black nightshade. Metribuzin applied preemergence at 0.3 lb/A followed by rimsulfuron applied postemergence at 0.0156 lb/A had the highest total yield of 498 cwt/A. There were no significant differences among treatments for yield of 1 7/8 to 3 in. (New Mexico State University Agricultural Science Center, Farmington, NM 87499).

Table. Broadleaf weed control in field potato.

Treatment	Rate	Crop Injury	Weed Control SOLNI	AMABL	AMARE	Total Yield	1 7/8-3 in	>3 in
	lb/A	---	---	%	---	---	cwt/A	---
Dimethenamid	0.94	0	92	93	99	449	283	135
Dimethenamid	1.27	0	95	100	100	467	275	167
Metribuzin + dimethenamid	0.3+0.94	0	99	100	100	464	322	109
Metribuzin + dimethenamid	0.3+1.27	0	100	100	100	451	227	187
Rimsulfuron	0.0234	0	92	99	99	436	264	150
Rimsulfuron + metribuzin	0.0234+0.3	0	97	100	100	446	286	141
Rimsulfuron + metribuzin	0.0156+0.3	0	95	100	100	432	236	172
Rimsulfuron + dimethenamid	0.0156+0.94	0	96	100	100	464	256	188
Rimsulfuron + dimethenamid	0.0156+1.27	0	97	100	100	447	294	127
Rimsulfuron[2]	0.0156	0	100	100	100	497	308	167
Metribuzin/rimsulfuron[1]	0.3+0.0156	0	100	100	100	498	259	229
Dimethenamid/rimsulfuron[1]	0.98+0.0156	0	100	100	100	477	278	189
Dimethenamid/rimsulfuron[1]	1.27+0.0156	0	100	100	100	482	244	213
Rimsulfuron	0.0156	0	72	97	98	379	244	113
Metribuzin	0.3	0	92	96	98	419	276	120
Check		0	0	0	0	271	199	18
LSD 0.05		ns	3	2	1	89	ns	72

1. First treatment applied preemergence, second treatment applied postemergence with a surfactant at 0.25% v/v and evaluated July 2.
2. Treatment applied postemergence with a surfactant at 0.25% v/v and evaluated July 2.

Rimsulfuron vs cultivation on potato yield. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted, in Prosper, ND, to evaluate potato yield response to rimsulfuron versus cultivation. 'Red Norland' potato was seeded May 22, 1997 and one cultivation was performed on June 18 when potato plants were 6 in 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, 54% RH, 0% clouds, and 10 to 16 mph wind to 6 to 8 in potato, 1 to 2 in green foxtail, 2 to 6 in diameter rosette wild mustard, and 1 to 4 in common cocklebur. Treatments were applied to the center 8 feet of the 12 by 25 foot 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.

Table. Rimsulfuron vs cultivation on potato yield.

Treatment[1]	Rate	July 22 SINAR	July 22 KCHSC	August 8 SINAR	August 8 CHEAL	August 8 KCHSC	September 17 Tuber Yield
	oz/A	% control					cwt/A
Cultivation / rimsulfuron + NIS	- /0.25	96	99	99	98	99	378
Cultivation / rimsulfuron + NIS	- /0.375	99	96	99	99	94	439
Cultivation	-	99	99	98	99	99	383
Rimsulfuron + metribuzin + NIS	0.25+3	96	99	99	99	99	378
Untreated		0	0	0	0	0	244
LSD (0.05)		7	4	7	2	7	81

[1]NIS = Preference at 0.25% v/v.

All methods used gave excellent weed control. Herbicides did not injure potato at any evaluation. Control was 99% for green foxtail and common cocklebur, at the 21 DAT (July 22) rating, and for green 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. Potato yield did not differ among weed control treatments. Results validate effectiveness of grower practice of heavy reliance on cultivation for weed control. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Rimsulfuron with adjuvants. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted, in Fargo, ND, to evaluate adjuvants with rimsulfuron for weed control. POST treatments were applied July 17, 1997 at 9:00 am with 78 F air, 50% RH, 0% clouds, and 2 to 3 mph wind to 1 to 5 in green foxtail, 1 to 6 in diameter rosette wild mustard, 1 to 4 in redroot pigweed, and 2 to 4 in common cocklebur. Treatments were applied to the center 8 ft 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, because of poor weed emergence the trial was moved to at Fargo. The soil was not disturbed after herbicide application.

Table. Rimsulfuron (Rims) with adjuvants.

Treatment[1]	Rate	July 7 SETVI	July 7 AMARE	July 7 CHEAL	July 7 POLPY	July 7 HIBTR	July 7 XANST	August 13 SETVI	August 13 AMARE	August 13 POLPY	August 13 XANST
	oz/A	% control									
Rims + Activator 90	0.25	53	96	50	43	60	70	53	83	53	70
Rims + Herbimax	0.25	62	99	50	43	60	70	72	88	63	63
Rims + Scoil	0.25	85	99	57	43	60	70	90	83	60	73
Rims + Silwet L-77	0.25	48	99	50	33	60	70	38	83	53	33
Rims + Activator 90	0.375	53	99	50	40	60	70	37	86	43	60
Rims + Herbimax	0.375	82	99	50	43	60	70	83	83	50	70
Rims + Scoil	0.375	92	99	50	43	60	70	90	90	70	70
Rims + Silwet L-77	0.375	43	99	50	17	60	70	50	77	47	43
Rims + Activator 90	0.5	67	99	50	43	60	70	73	86	60	77
Rims + Herbimax	0.5	73	99	50	50	60	70	87	83	63	77
Rims + Scoil	0.5	98	99	60	63	67	73	95	91	73	80
Rims + Silwet L-77	0.5	53	89	43	33	60	70	62	77	60	63
Rims + Metribuzin + Activator 90	0.375 + 3	53	99	98	96	60	80	47	85	63	50
LSD (0.05)		14	8	9	11	3	3	12	15	18	18

[1]Activator 90 at 0.25% v/v, Herbimax at 1 qt/A, Scoil at 1.5 pt/A, Silwet L-77 at 0.125% v/v.

All treatments gave complete wild mustard control. Venice mallow and common lambsquarters population was low, and not rated, on Aug 13 due to severe curled dock infestation. Currently, the 0.375 lb/A rate of rimsulfuron is the maximum allowed in potato. Green foxtail control increased with increasing rimsulfuron rate from 0.25 to 0.5 oz/A. Adjuvant enhancement for green foxtail control with rimsulfuron was: Scoil > Herbimax > Activator 90 = Silwet L-77. Silwet L-77 with rimsulfuron gave less control of common lambsquarters and Pennsylvania smartweed than Rimsulfuron with other adjuvants. However, broadleaf weed control did not usually differ with Rimsulfuron rate or adjuvant use. These data may indicate that rimsulfuron 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, rimsulfuron probably can aid in control of these tolerant weeds if used in combination with normal hilling and cultivation practices. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Potato response to rimsulfuron. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted, in Prosper, ND, to evaluate potato response and weed control from rimsulfuron alone and in combination with metribuzin applied POST in potato. 'Red Norland' potato was seeded May 22, 1997 and one cultivation was performed on June 18. POST treatments were applied June 27 at 2:30 pm with 92 F air, 54% RH, 0% clouds, and 10 to 16 mph wind to 6 to 8 in potato, 1 to 3 in foxtail, 1 to 6 in diameter rosette wild mustard, and 1 to 4 in common cocklebur. Treatments were applied to the center 8 feet of the 12 by 25 foot 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.

Table. Potato response to rimsulfuron.

		July 22			August 8			Sept 9
Treatment[1]	Rate	SETVI	SINAR	KCHSC	SETVI	SINAR	KCHSC	Yield
	oz/A	% control						cwt/A
Rimsulfuron + NIS	0.016	99	99	99	99	99	99	378
Rims + NIS	0.023	99	99	96	99	99	98	439
Rims + Metribuzin + NIS	0.25 + 0.065	99	99	99	99	99	99	371
Rims + Metribuzin + NIS	0.25 + 0.13	99	99	99	99	99	99	384
Rims + Metribuzin + NIS	0.25 + 0.188	99	99	99	98	99	99	407
Rims + Metribuzin + NIS	0.25 + 0.25	96	96	99	98	99	99	383
Rims + Metribuzin + NIS	0.375 + 0.065	99	99	99	99	99	99	383
Rims + Metribuzin + NIS	0.375 + 0.13	99	99	99	99	99	99	392
Rims + Metribuzin + NIS	0.375 + 0.188	99	99	99	99	98	99	418
Rims + Metribuzin + NIS	0.375 + 0.25	99	99	99	99	99	96	380
Metribuzin + NIS	0.25	99	99	99	99	98	99	386
Metribuzin	0.5	93	99	86	96	98	96	401
Cultivated	-	99	80	99	99	98	99	375
Untreated		0	0	0	0	0	0	244
LSD (0.05)		6	12	11	3	2	3	78

[1]NIS = Activator 90 at 0.25% v/v.

This research was conducted to evaluate the response of a metribuzin sensitive potato variety to rimsulfuron and metribuzin at different rates applied alone or in combination. Herbicides did not injure potato at any evaluation. Common lambsquarters was 99% at July 22 and August 8. 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 treated potatoes yielded more than the untreated check. The cultivated potato yield was equal to any chemicals treated. These data support current potato production practices of chemical control used in less than half of potato acreage because of high weed control from hilling and cultivation. These data also indicate that potato has excellent tolerance to rimsulfuron at rates as high as 0.375 lb/A applied with metribuzin at rates as high as 0.25 lb/A with a NIS. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Potato vine kill, Oakes, ND. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted to evaluate irrigated potato vine desiccation from labeled and experimental herbicides. 'Russet Burbank' potato was seeded April 29, 1997 and one cultivation was performed on May 30. Vine kill chemicals were applied September 3 at 11:30 am with 75 F, 40% RH, 10% clouds, and 10 to 12 mph wind to vines which were still vigorous and green. Treatments were applied to the center 8 feet of the 9 by 25 foot 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.

Table. Potato vine kill, Oakes, ND.

		September 6	September 10	September 13
Treatment[1]	Rate	Potato vine	Potato vine	Potato vine
	lb/A	% desiccation		
V-53482 + PO	0.063	25	42	55
V-53482 + PO	0.094	29	45	63
V-53482 + PO	0.125	20	42	62
Diquat + NIS	0.25	25	50	63
Diquat + NIS	0.5	50	83	89
Untreated		0	0	0
LSD (0.05)		11	12	19

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

At time of application, vines were very thick, green and vigorous which may have prevented spray penetration through the canopy. V-53482 at all rates was as fast and produced the same degree of vine kill as 0.25 lb/A of diquat, but not as fast or to the same degree as 0.5 lb/A of diquat. Increased rates of V-53482 did not increase vine desiccation. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Potato vine kill, Prosper, ND. Richard K. Zollinger and Scott A. Fitterer. An experiment was conducted to evaluate dryland potato vine desiccation from labeled and experimental herbicides. 'NorValley' potato was seeded May 5, 1997and one cultivation was performed on June 18. Vine kill chemicals were applied September 9 at 2:00 am with 74 F, 31% RH, 40% clouds, and 7 to 10 mph wind. Treatments were applied to the center 8 feet of the 12 by 25 foot 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.

Table 1. Potato vine kill, Experiment 1.

		September 12	September 16	September 19
Treatment[1]	Rate	Potato vine	Potato vine	Potato vine
	lb/A	% desiccation		
V-53482 + PO	0.063	48	67	80
V-53482 + PO	0.094	53	73	85
V-53482 + PO	0.125	48	67	83
Diquat + NIS	0.25	58	78	93
Diquat + NIS	0.5	73	87	99
Untreated		0	0	0
LSD (0.05)		15	14	16

Table 2. Potato vine kill, Experiment 2.

		September 12	September 16	September 19
Treatment[1]	Rate	Potato vine	Potato vine	Potato vine
	lb/A	% desiccation		
V-53482 + PO	0.063	33	53	67
V-53482 + PO	0.094	33	60	82
V-53482 + PO	0.125	50	72	88
Diquat + NIS	0.25	58	78	93
Diquat + NIS	0.5	73	87	99
Untreated		0	0	0
LSD (0.05)		16	11	8

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

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 kill than diquat at the lowest rate. Potato vines were affected approximately 40% by late blight at the time of herbicide application. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Weed control in potato. Richard K. Zollinger and Scott A. Fitterer. Experiments were conducted, in Drayton and Oakes, ND, to evaluate tolerance and weed control in irrigated potato from experimental herbicides applied PRE and POST. At Drayton, 'Russet Burbank' potato was seeded May 26, 1997 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 in, 17% RH, 80% clouds, and 3 to 9 mph wind. POST treatments were applied June 26 at 11:30 am with 80 F air, 41% RH, 30% clouds, and 7 to 13 mph wind to 2 to 6 in potato, 1 in green foxtail, 0 to 2 in redroot pigweed, and 2 in common lambsquarters. At Oakes, 'Russet Burbank' potato was seeded April 29, 1997 and one cultivation was performed on May 30. PRE treatments were applied June 5 at 11:30 am with 80 F air, 66 F soil at 4 in, 40% RH, 20% clouds, and 5 to 8 mph wind. POST treatments were applied June 24 at 4:30 pm with 85 F air, 71% RH, 10% clouds, and 0 to 5 mph wind to 16 to 18 in potato. Treatments were applied to the center 8 feet of the 9 by 25 foot 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.

Table. Weed control in potato, Drayton, ND.

		July 7				July 30			
Treatment[1]	Rate	Potato	SETVI	AMARE	CHEAL	Potato	SETVI	SINAR	AMARE
	lb/A	% injury	% control			% injury	% control		
PRE									
Sulfentrazone	0.187	0	85	86	96	2	83	83	96
Sulfentrazone	0.25	0	92	92	96	2	96	89	96
Sulfentrazone	0.31	0	92	93	96	3	98	89	98
Sulfentrazone	0.375	0	96	98	98	0	96	93	98
Sulfentrazone + metribuzin	0.25+0.375	0	90	92	96	3	89	99	89
Sulfentrazone + rimsulfuron	0.25+0.016	0	92	90	96	5	89	99	99
RPA 201772	0.047	0	88	88	95	3	99	99	88
RPA 201772	0.07	0	92	88	96	22	99	99	99
RPA 201772	0.094	2	92	84	96	20	99	99	99
RPA 201772	0.12	2	94	92	96	25	98	98	99
RPA 201772 + metribuzin	0.07+0.375	1	93	93	96	5	99	99	99
POST									
RPA 201772	0.047	2	68	53	95	12	99	99	99
RPA 201772	0.07	3	92	60	92	15	99	99	98
RPA 201772 + metribuzin + NIS	0.07+0.188	7	67	62	95	18	89	89	89
RPA 201772 + rimsulfuron + NIS	0.07+0.016	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

[1]NIS = Preference at 0.25% v/v.

Sulfentrazone, registered for small seeded broadleaf weed control in soybean, and RPA 201772, registered for grass and broadleaf weed control in corn, were evaluated for weed control and potato injury. At Oakes, potato was not injured from any herbicide treatments (data not shown). Weed emergence was limited after hilling so weed control data was not taken. The results from this research indicates excellent potato tolerance to sulfentrazone and RPA 201772 applied in irrigated conditions.

In Drayton, both herbicides had excellent potato safety at the first evaluation. However, at the July 30 evaluation, RPA 201772 PRE caused at least 20% potato injury and RPA 201772 POST 12 to 15% injury. RPA 201772 caused a whitening and yellowing followed by a burn of leaf tips. At July 7, PRE treatments controlled green foxtail, redroot pigweed, and common lambsquarters. Sulfentrazone at the lowest rate gave at least 85% weed control. RPA 201772 POST or tankmixes containing RPA 201772 controlled common lambsquarters but did not control green foxtail or redroot pigweed. At July 30, all treatments, excluding the lowest rate of sulfentrazone, controlled all weeds. Vigorous potato growth and competition was probably responsible for the increase in weed control between the July 7 and 30 evaluation. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.)

Weed control in potato with isoxaflutole. Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate crop tolerance and weed control with isoxaflutole (EXP31130A) applied pre- or postemergence. The experimental area was fertilized according to soil test recommendations before planting 'Russet Burbank' potatoes. Potatoes were seeded at 11-inch intervals in 36-inch wide rows on May 7, 1997 in a Declo loam soil with 1.1% organic matter and pH 8.1 near Aberdeen, ID. Imidacloprid at 0.25 lb ai/A was applied at hilling on May 22, 1997 for insect control. Two postemergence insecticide applications also were made for green peach aphid control, endosulfan at 1.0 lb ai/A on July 26 and methamidophos at 1.0 lb ai/A Aug. 9. Potatoes were treated with chlorothalonil at 1.13 lb ai/A five times during the growing season, and with dimethomorph at 0.2 lb ai/A + mancozeb at 1.35 lb/A twice during the season for early and late blight control.

The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. Preemergence herbicides were applied with a CO_2-powered backpack sprayer that delivered 17.5 gal/A on May 26, 1997 before potatoes and weeds emerged and were incorporated by sprinkler irrigation with 0.75 inch of water. Postemergence herbicides were applied on June 11, 1997 when potatoes were 5 inches tall and volunteer oats were at the 3-leaf stage (3 inches tall), green foxtail was at the 1 to 3-leaf stage (0.5 to 1-inch tall), common lambsquarters was at the cotyledon to 4-leaf stage (0.5 inch tall), hairy nightshade was at the 1 to 2-leaf stage (0.5 inch tall), kochia was 0.5 to 1 inch tall, and redroot pigweed was at the cotyledon to 3-leaf stage (0.5 inch tall). Rainfall was 0.62 inch for the week following preemergence application and 0.93 inch for the week following postemergence application. Weed populations in the weedy control on July 7, 1997 were: 3 volunteer oats, 3 green foxtail, 1 common lambsquarters, 23 hairy nightshade, 1 kochia, and 0.3 redroot pigweed/ft^2.

Potato vines were desiccated with diquat at 0.25 lb/A + nonionic surfactant at 0.125% (v/v) on Sept 5, 1997. Tubers were mechanically harvested from 25 feet of each of the center two rows in each plot on September 29, 1997.

Initial potato injury from preemergence treatments (2 weeks after treatment) was minor, but by 3 weeks after treatment, serious injury was noted (Table 1). Symptoms included leaf chlorosis, leaf necrosis, and overall stunting of plant growth. Injury increased with time; maximum chlorosis occurred 4 weeks after treatment and maximum stunting occurred 5 weeks after treatment. Injury may have been due in part to leaching of isoxaflutole into the potato root zone. In a major rain storm on May 31, 0.54 inch of rain fell within 15 minutes, which resulted in standing water in the furrows. Isoxaflutole applied postemergence caused rapid injury development; by one week after treatment leaf chlorosis and necrosis were severe and plants were stunted compared to the untreated control.

Isoxaflutole was more effective on broadleaf weeds than on grass weeds. Season-long green foxtail and volunteer oat control ranged from about 30% to 70% with isoxaflutole alone, but common lambsquarters and redroot pigweed control were >90% with isoxaflutole applied pre- or postemergence, and kochia control with preemergence isoxaflutole was excellent (>98%) even at the lowest rate tested (0.75 oz/A) (Table 2). Kochia control with isoxaflutole postemergence was ≥90% with all rates except 0.75 oz/A; hairy nightshade control was >90% only with the highest rate postemergence (1.88 oz/A). Combinations of isoxaflutole with EPTC or with metribuzin usually provided ≥90% control of all species except hairy nightshade.

Although isoxaflutole shows potential for controlling several troublesome weeds in potatoes, injury to Russet Burbank with pre- or postemergence application is unacceptable. U.S. No. 1 and total tuber yields were reduced substantially in all isoxaflutole treatments, except isoxaflutole + EPTC, compared to the weed-free control (Table 3). (University of Idaho Aberdeen Research and Extension Center, PO Box AA, Aberdeen, ID 83210).

Table 1. Potato injury from isoxaflutole and isoxaflutole mixtures.

			Potato injury									
		Time of	June 9		June 18		June 23		July 1		July 7	
Treatment	Rate	Application	Chlorosis	Stunting	Chlorosis	Stunting	Chlorosis	Stunting	Chlorosis	Stunting	Chlorosis	Stunting
	ai/A		%									
Weedy control	0 lb		0	0	0	0	0	0	0	0	0	0
Isoxaflutole	0.75 oz	PRE	0	2	8	6	14	4	13	11	2	7
Isoxaflutole	1.13 oz	PRE	0	2	13	5	21	7	18	23	7	17
Isoxaflutole	1.5 oz	PRE	1	3	25	12	25	14	27	45	11	32
Isoxaflutole	1.88 oz	PRE	1	3	35	12	33	15	24	40	13	25
Isoxaflutole + metribuzin	1.13 oz + 0.375 lb	PRE	1	3	34	10	38	25	33	48	12	32
Isoxaflutole + EPTC	1.13 oz + 3.0 lb	PRE	0	3	9	7	17	9	13	18	6	17
Isoxaflutole	0.75 oz	POST			64	18	58	20	23	42	6	13
Isoxaflutole	1.13 oz	POST			74	27	67	25	27	52	7	27
Isoxaflutole	1.5 oz	POST			78	33	75	35	31	56	11	32
Isoxaflutole	1.88 oz	POST			84	38	82	43	27	60	15	42
Weed-free control[a]					0	0	0	0	0	0	0	0
LSD (0.05)			1	1	7	5	6	7	9	7	5	8

[a] The weed-free control was treated with a preemergence application of EPTC at 2.0 lb/A + metribuzin at 0.125 lb/A and was hand-weeded, as needed, throughout the growing season.

Table 2. Weed control in potatoes with isoxaflutole and isoxaflutole mixtures.

			Late season weed control (8/26/97)					
Treatment	Rate	Time of Application	AVESA	SETVI	AMARE	CHEAL	KCHSC	SOLSA
	ai/A		%					
Weedy control	0 lb		0	0	0	0	0	0
Isoxaflutole	0.75 oz	PRE	33	42	93	98	98	65
Isoxaflutole	1.13 oz	PRE	40	53	95	98	98	69
Isoxaflutole	1.5 oz	PRE	65	62	96	99	99	73
Isoxaflutole	1.88 oz	PRE	71	70	97	99	99	80
Isoxaflutole + metribuzin	1.13 oz + 0.375 lb	PRE	89	95	100	99	99	78
Isoxaflutole + EPTC	1.13 oz + 3.0 lb	PRE	91	98	100	99	99	77
Isoxaflutole	0.75 oz	POST	32	50	95	94	83	79
Isoxaflutole	1.13 oz	POST	42	62	99	98	90	83
Isoxaflutole	1.5 oz	POST	52	70	99	99	93	89
Isoxaflutole	1.88 oz	POST	55	70	99	99	98	92
Weed-free control[a]								
LSD (0.05)			16	13	2	2	2	10

[a] The weed-free control was treated with a preemergence application of EPTC at 2.0 lb/A + metribuzin at 0.125 lb/A and was hand-weeded, as needed, throughout the growing season.

Table 3. Potato tuber yield with isoxaflutole and isoxaflutole mixtures.

			Potato yield by grade							
Treatment	Rate	Time of Application	<4 oz	4-6 oz	6-12 oz	>12 oz	U.S. #2	Culls	Total U.S. #1	Total yield
	ai/A		cwt/A							
Weedy control	0 lb		135	50	12	0	5	8	62	210
Isoxaflutole	0.75 oz	PRE	79	69	81	15	18	14	166	276
Isoxaflutole	1.13 oz	PRE	76	73	82	4	14	16	159	265
Isoxaflutole	1.5 oz	PRE	78	70	64	4	6	15	138	237
Isoxaflutole	1.88 oz	PRE	78	70	68	7	15	19	144	256
Isoxaflutole + metribuzin	1.13 oz + 0.375 lb	PRE	75	76	84	14	20	10	174	278
Isoxaflutole + EPTC	1.13 oz + 3.0 lb	PRE	82	90	91	10	20	9	192	302
Isoxaflutole	0.75 oz	POST	85	69	66	5	8	7	140	240
Isoxaflutole	1.13 oz	POST	66	70	69	3	7	10	143	226
Isoxaflutole	1.5 oz	POST	70	69	73	6	8	6	148	231
Isoxaflutole	1.88 oz	POST	68	48	54	5	14	11	108	202
Weed-free control[a]			93	103	112	18	36	26	232	387
LSD (0.05)			18	23	28	15	13	14	51	58

[a] The weed-free control was treated with a preemergence application of EPTC at 2.0 lb/A + metribuzin at 0.125 lb/A and was hand-weeded, as needed, throughout the growing season.

Volunteer potato control with fluroxypyr. Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate volunteer potato control in spring wheat with fluroxypyr or fluroxypyr + 2,4-D applied at wheat jointing or fluroxypyr applied at flag leaf emergence. 'Russet Burbank' seed tubers were broadcast over the experimental area at 750 lbs/A and were disked in just before planting 'Penewawa' spring wheat at 100 lb/A on April 14, 1997. The soil type was a Declo silt loam with pH 8.3 and 1.1% organic matter. The experimental design was a randomized complete block with 4 replications. Plot size was 9 by 20 ft.

Herbicide treatments were applied with a CO_2 powered backpack sprayer that delivered 17.5 gpa on May 30 (early jointing) and June 9 (flag leaf emergence), 1997. Most volunteer potatoes were 4 inches tall (range 2 to 6 inches) at the first application and 13 inches tall (range 12 to 14 inches) at the second application. Volunteer potato populations in the weedy control were 3 plants/m^2 on June 17, 1997.

Volunteer potato control was evaluated in June, early July, and after wheat harvest (mid-Sept.). Wheat was harvested from the center 5 by 20 ft of each plot on August 29. The experimental area was watered with approximately 2 inches irrigation water on September 5 and a final volunteer potato control evaluation was made 10 days later.

Visual injury to wheat appeared mild, 5% or less on average for all treatments. However, yields were significantly lower with the fluroxypyr at 4 oz/A + 2,4-D at 0.31 lb/A treatment than with fluroxypyr at 4 oz/A applied alone; other fluroxypyr + 2,4-D treatments tended to yield less than their corresponding fluroxypyr alone treatment (Table 1). This suggests the need for further studies on varietal response to fluroxypyr + 2,4-D under weed free conditions. Penewawa typically produces higher yields but is less tolerant to stress than other spring wheat varieties grown in southern Idaho.

Volunteer potatoes showed moderate to severe epinasty and stem collapse within 48 hours after treatment, regardless of growth stage at treatment. Some haulms died, but some survived. At the early July evaluation (7/7), the wheat canopy was dense and very competitive, and volunteer potato control with a given rate of fluroxypyr often was better with the later application to 13-inch potatoes than with the earlier application to 4-inch potatoes (Table 2). Part of the apparent difference in control between early and late application occurred because not all potato haulms were emerged when fluroxypyr or fluroxypyr + 2,4-D was applied early; therefore, some "surviving" haulms did not receive a direct herbicide application. In contrast, when fluroxypyr was applied at wheat flag leaf emergence (13 inch potatoes), nearly all volunteers had emerged.

As the season progressed and the wheat matured, more light penetrated the wheat canopy and some injured potato haulms regrew. By mid-September, there usually were no statistically significant differences in volunteer potato control within a given rate regardless of time of application. The low mean for fluroxypyr at 4 oz/A + 2,4-D was due in large part to survival of haulms that emerged after herbicide application in one rep of that treatment. Disease observations were made on surviving potato haulms after potato harvest; many volunteers had early blight infection, and some plants with late blight were found.

Timing a fluroxypyr application for volunteer potato control may be problematic for best control of other broadleaf weeds; many early-emerging species like kochia and common lambsquarters are the proper size for treatment before potatoes emerge. Therefore, it may be necessary to apply a standard herbicide treatment early for general weed control followed later by a treatment for volunteer potato control. (University of Idaho Aberdeen Research and Extension Center, PO Box AA, Aberdeen, ID 83210).

Table 1. Wheat injury and yield with fluroxypyr or fluroxypyr + 2,4-D.

Treatment	Rate	Time of application	Wheat injury 6/4/97	6/9/97	6/16/97	6/23/97	7/7/97	Yield
	ae/A		%					bu/A
Fluroxypyr	0 lb	Jointing	0	0	0	0	0	112
Fluroxypyr	2 oz	Jointing	0	0	0	0	0	130
Fluroxypyr	3 oz	Jointing	1	0	0	0	0	135
Fluroxypyr	4 oz	Jointing	1	0	0	0	0	132
Fluroxypyr + 2,4-D	2 oz + 0.31 lb	Jointing	2	2	3	0	0	124
Fluroxypyr + 2,4-D	3 oz + 0.31 lb	Jointing	3	3	4	2	0	127
Fluroxypyr + 2,4-D	4 oz + 0.31 lb	Jointing	3	3	5	3	0	119
Fluroxypyr	2 oz	Flag leaf emergence	--	--	1	0	0	137
Fluroxypyr	3 oz	Flag leaf emergence	--	--	1	0	0	134
Fluroxypyr	4 oz	Flag leaf emergence	--	--	1	0	0	137
LSD (0.05)			1	1	1	1	0	12

Table 2. Volunteer potato control with fluroxypyr or fluroxypyr + 2,4-D.

Treatment	Rate	Time of application[a]	Volunteer potato control 6/13/97	6/23/97	7/7/97	9/15/97
	ae/A		%			
Fluroxypyr	0 lb	Jointing	0	0	0	0
Fluroxypyr	2 oz	Jointing	94	93	66	72
Fluroxypyr	3 oz	Jointing	95	96	78	85
Fluroxypyr	4 oz	Jointing	97	97	80	84
Fluroxypyr + 2,4-D	2 oz + 0.31 lb	Jointing	88	83	65	78
Fluroxypyr + 2,4-D	3 oz + 0.31 lb	Jointing	94	95	78	85
Fluroxypyr + 2,4-D	4 oz + 0.31 lb	Jointing	97	97	80	74
Fluroxypyr	2 oz	Flag leaf emergence	--	73	75	82
Fluroxypyr	3 oz	Flag leaf emergence	--	82	82	85
Fluroxypyr	4 oz	Flag leaf emergence	--	86	95	86
LSD (0.05)			3	6	7	12

[a] Volunteer potatoes averaged 4 inches tall with the early jointing application and 13 inches tall with the flag leaf emergence application.

Fenoxaprop/safener tank mixes with broadleaf weed herbicides for wild oat control. David S. Belles and Donald C. Thill. A study was established in Latah County, ID to evaluate the efficacy of fenoxaprop/safener for wild oat control in combination with broadleaf herbicides. Winter wheat (var. Cashup) was seeded October 2, 1997 in a loam soil (40% sand, 12% clay, 48% silt, pH 4.9, and 6% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence on May 7, 1997 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi. Wheat was 8 inches tall and the weed stages were; wild oat (AVEFA) 3 leaves, mayweed chamomile (ANTCO) 0.5-2 in. diameter, field pennycress (THLAR) 2 leaves, and common lambsquarters (CHEAL) 2 leaves. Environmental conditions at application were as follows; air temperature 60 F, relative humidity 52%, wind 5 mph, clear sky, and soil temperature 50 F at 2 inches. Spring wheat injury was evaluated May 14, June 3, and June 30, 1997. Wild oat, mayweed chamomile, field pennycress, and common lambsquarters were evaluated for chlorosis and stunting on May 14 and for control on June 3, and June 30, 1997. Spring wheat was harvested at maturity with a small plot combine on August 20, 1997.

Wheat was injured slightly by fenoxaprop/safener treatments, (chlorosis and/or stunting) when evaluated in May and on June 3 (Table). By June 30 all visible evidence of injury had disappeared. All treatments of fenoxaprop/safener controlled wild oat greater than 90%. No antagonism by the broadleaf herbicides was evident in any of the treatments with fenoxaprop/safener. The other wild oat herbicides controlled wild oat from 82 to 89% with the exception of imazamethabenz, where control was 20% at the end of the season. Thifensulfuron/tribenuron controlled mayweed chamomile best. All broadleaf treatments controlled field pennycress and common lambsquarters 100% by June 30. Wheat treated with a herbicide treatment yielded significantly more grain than the check except imazamethabenz. (Plant Science Division, University of Idaho, Moscow ID 83844-2399)

Table. Winter wheat response and weed control from herbicide treatments, Latah County, ID.

		Spring wheat		Weed control[3]			
Treatment[1]	Rate	Injury[2]	Yield	AVEFA	ANTCO	THLAR	CHEAL
	lb/A	---%---	lb/A	%			
Fenoxaprop/safener	0.105	3	5547	91	5	0	0
Fenoxaprop/safener + thifen/triben + NIS	0.105 + 0.014	1	5825	98	100	100	100
Fenoxaprop/safener + thifen/triben + NIS	0.119 + 0.014	1	5755	99	100	100	100
Fenoxaprop/safener + bromoxynil/MCPA	0.105 + 0.50	0	5821	95	71	100	100
Fenoxaprop/safener bromoxynil/MCPA	0.119 + 0.50	1	6001	98	73	100	100
Fenoxaprop/safener + bromoxynil	0.105 + 0.25	3	5430	97	48	100	100
Fenoxaprop/safener + MCPA ester	0.105 + 0.375	3	5380	93	51	100	100
Fenoxaprop/2,4-D/MCPA + bromoxynil	0.58 + 0.25	3	5711	89	70	100	100
Imazamethabenz + bromoxynil/MCPA[4]	0.375 + 0.50	0	4930	20	68	100	100
Tralkoxydim + bromoxynil/MCPA + TF8035[5]	0.18 + 0.50	0	5764	89	68	100	100
Diclofop + thifen/triben + NIS	1.0 + 0.014	1	5869	82	100	100	100
Untreated check	--------	0	4685	0	0	0	0
	LSD $_{(0.05)}$	3	534	5	15	NS	NS
	Density (plants/ft^2)			20	5	1	2

[1]Thifen/triben is the commercial formulation of thifensulfuron/tribenuron, fenoxaprop/2,4-D/MCPA applied as the commercial formulation, NIS = nonionic surfactant (R-11, Supercharge with tralkoxydim) added at 0.5% v/v.
[2]May 14, 1997 evaluation.
[3]June 30, 1997 evaluation.
[4]Applied with a methylated crop oil (Sun-It II) at 1.5 pt/A.
[5]TF8035 is a commercial nonionic, crop oil concentrate blend (Supercharge) added at 0.5% v/v.

Table. Winter wheat response and weed control from herbicide treatments, Latah County, ID.

Treatment[1]	Rate	Spring wheat Injury[2]	Spring wheat Yield	Weed control[3] AVEFA	ANTCO	THLAR	CHEAL
	lb/A	---%---	lb/A	------------	%	------------	
Fenoxaprop/safener	0.105	3	5547	91	5	0	0
Fenoxaprop/safener + thifen/triben + NIS	0.105 + 0.014	1	5825	98	100	100	100
Fenoxaprop/safener + thifen/triben + NIS	0.119 + 0.014	1	5755	99	100	100	100
Fenoxaprop/safener + bromoxynil/MCPA	0.105 + 0.50	0	5821	95	71	100	100
Fenoxaprop/safener bromoxynil/MCPA	0.119 + 0.50	1	6001	98	73	100	100
Fenoxaprop/safener + bromoxynil	0.105 + 0.25	3	5430	97	48	100	100
Fenoxaprop/safener + MCPA ester	0.105 + 0.375	3	5380	93	51	100	100
Fenoxaprop/2,4-D/MCPA + bromoxynil	0.58 + 0.25	3	5711	89	70	100	100
Imazamethabenz + bromoxynil/MCPA[4]	0.375 + 0.50	0	4930	20	68	100	100
Tralkoxydim + bromoxynil/MCPA + TF8035[5]	0.18 + 0.50	0	5764	89	68	100	100
Diclofop + thifen/triben + NIS	1.0 + 0.014	1	5869	82	100	100	100
Untreated check	--------	0	4685	0	0	0	0
	LSD $_{(0.05)}$	3	534	5	15	NS	NS
	Density (plants/ft^2)			20	5	1	2

[1]Thifen/triben is the commercial formulation of thifensulfuron/tribenuron, fenoxaprop/2,4-D/MCPA applied as the commercial formulation, NIS = nonionic surfactant (R-11, Supercharge with tralkoxydim) added at 0.5% v/v.

[2]May 14, 1997 evaluation.

[3]June 30, 1997 evaluation.

[4]Applied with a methylated crop oil (Sun-It II) at 1.5 pt/A.

[5]TF8035 is a commercial nonionic, crop oil concentrate blend (Supercharge) added at 0.5% v/v.

Carfentrazone in combination with fenoxaprop/safener in spring wheat. Wayne S. Belles and Donald C. Thill. This trial was established in Boundary County, Idaho to evaluate wild oat control and crop injury from carfentrazone and its premixes applied with fenoxaprop/safener in spring wheat. Spring wheat (var. 926R) was seeded June 2, 1997 in a loam soil (34% sand, 47% silt and 19% clay) with a pH of 7.1, CEC of 13.3 and 3.96% organic matter. Plots were 8 by 30 feet arranged in a randomized complete block design with four replications. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi to 4 to 5 leaf spring wheat, 2 to 5 leaf wild oat, and cotyledon to 4 leaf broadleaf weeds. Wild oat density was eight plants/ft^2. Environmental conditions at application were as follows; air temperature 72 F, relative humidity 57%, wind 2 mph, clear sky and soil temperature at 4 inches 60 F. Spring wheat injury and wild oat control were evaluated visually during the growing season. Broadleaf weeds were not evaluated as the area was inadvertently over-sprayed with thifensulfuron/tribenuron. Wheat was harvested September 9, 1997 from an area 4.1 by 27 feet in each plot with a small plot combine and yields determined.

Application problems occurred due to plugged screens with several treatments even though the recommended 100 mesh screens were used with the nozzle tips. Wheat injury (chlorosis) 8 days after treatment (DAT) was observed with all herbicide treatments containing carfentrazone or its premixes. Carfentrazone resulted in less injury than carfentrazone/2,4-D or carfentrazone/MCPA. Greater injury resulted when 32% N solution was added to carfentrazone/2,4-D and carfentrazone/MCPA. By July 25, 32 DAT, no injury was evident. Wild oat control ranged from 66 to 98%. Significant reduction in control compared to fenoxaprop/safener occurred with the high rate of carfentrazone and its premixes + 32% N solution indicating possible antagonism, which likely was caused by initial injury to the wild oat by some carfentrazone treatments. Grain yields from herbicide treated plots were not significantly different than those from the untreated check plots. (Plant Science Division, University of Idaho, Moscow, ID 83844)

Table. Crop injury, yield and wild oat control in spring wheat from herbicide treatments.

Treatment[1]	Rate[2]	Crop injury July 1	Crop injury July 25	Crop yield	Wild oat[3] control
	lb/A + v/v	%	%	lb/A	%
Fenox	0.105	0	0	3036	97
Fenox + 32% N solution	0.105 + 2.0	0	0	2899	98
Carf + fenox	0.015 + 0.105	5	0	3042	94
Carf + fenox + 32% N solution	0.015 + 0.105 + 2.0	6	0	2879	95
Carf + fenox	0.019 + 0.105	8	0	2817	98
Carf + fenox + 32% N solution	0.019 + 0.105 + 2.0	8	0	2908	92
Carf + fenox	0.023 + 0.105	9	0	2599	85
Carf + fenox + 32% N solution	0.023 + 0.105 + 2.0	6	0	2693	73
Carf/2,4-D + fenox	0.015/0.17 + 0.105	11	0	3037	96
Carf/2,4-D + fenox + 32% N solution	0.015/0.17 + 0.105 + 2.0	18	0	2792	93
Carf/2,4-D + fenox	0.019/0.22 + 0.105	11	0	2678	91
Carf/2,4-D + fenox + 32% N solution	0.019/0.22 + 0.105 + 2.0	19	0	2709	94
Carf/2,4-D + fenox	0.023/0.26 + 0.105	14	0	2916	82
Carf/2,4-D + fenox + 32% N solution	0.023/0.26 + 0.105 + 2.0	19	0	2502	66
Carf/MCPA + fenox	0.015/0.24 + 0.105	9	0	2549	83
Carf/MCPA + fenox + 32% N solution	0.015/0.24 + 0.105 + 2.0	20	0	2675	93
Carf/MCPA + fenox	0.019/0.30 + 0.105	16	0	2538	79
Carf/MCPA + fenox + 32% N solution	0.019/0.30 + 0.105 + 2.0	21	0	2421	83
Carf/MCPA + fenox	0.023/0.37 + 0.105	16	0	2878	91
Carf/MCPA + fenox + 32% N solution	0.023/0.37 + 0.105 + 2.0	20	0	2742	73
Untreated check	---------	--	--	2805	--
	LSD (0.05)	5	NS	477	14

[1]Fenox = fenoxaprop/safener, carf = carfentrazone.
[2]Fenoxaprop/safener, carfentrazone, carf/2,4-D and carf/MCPA rates are lb/A, 32% N solution rates are % v/v.
[3]July 25, 1997 evaluation taken at wild oat heading.

Carfentrazone with reduced surfactant rates in spring wheat. Wayne S. Belles and Donald C. Thill. This trial was established near Winona in Whitman County, Washington to evaluate the effect of reduced rates of a nonionic surfactant used in combination with carfentrazone/MCPA and carfentrazone/2,4-D premixes on weed control and spring wheat injury. Spring wheat (var. Edwall) was seeded April 12, 1997 in a silt loam soil (28% sand, 63% silt, 9% clay, pH 5.5, CEC 14.0 and 2.6% organic matter). Treatments were applied postemergence with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi using an 110015XR nozzle tip and recommended 100 mesh screens. At application, spring wheat had 4 to 5 leaves and 1 to 2 tillers. Russian thistle (SASKR) was 1 to 3 inches tall with 5 to 7 leaves. Environmental conditions at application were as follows; air temperature 72 F, relative humidity 32%, wind calm, clear sky and soil temperature at 4 inches 60 F. Plots were 8 by 30 feet arranged in a randomized complete block design with four replications. Wheat injury and weed control were evaluated visually during the growing season. Plots were not harvested due to poor Russian thistle control.

Screen plugging problems occurred with carfentrazone/2,4-D + 32% N solution treatments Wheat injury (chlorosis) 8 days after treatment ranged from 0 to 6%. In general, carfentrazone/MCPA resulted in higher crop injury than applications of carfentrazone/2,4-D. Injury symptoms were not evident at later evaluations (data not shown). No treatment provided commercially acceptable control of Russian thistle (SASKR). Russian thistle control was greatest with the three way combinations of carfentrazone/MCPA + NIS (0.125%) + 32% N (2%) solution. Poor Russian thistle control with carfentrazone/2,4-D + 32% N solution may be attributed to the screen plugging problem at application. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339).

Table. Russian thistle control and spring wheat injury with herbicide treatments.

Treatment[1]	Rate[2]	Spring wheat injury[3]	SASKR control[4]
	lb/A + v/v	%	%
Carfentrazone/MCPA + 32% N solution	0.023/0.37 + 2.0	1	55
Carfentrazone/MCPA + NIS	0.023/0.37 + 0.06	1	51
Carfentrazone/MCPA + NIS	0.023/0.37 + 0.125	6	63
Carfentrazone/MCPA + NIS	0.023/0.37 + 0.25	4	70
Carfentrazone/MCPA + NIS + 32% N solution	0.023/0.37 + 0.06 + 2.0	5	71
Carfentrazone/MCPA + NIS + 32% N solution	0.023/0.37 + 0.125 + 2.0	6	81
Carfentrazone/2,4-D + 32% N solution	0.023/0.26 + 2.0	1	43
Carfentrazone/2,4-D + NIS	0.023/0.26 + 0.06	0	50
Carfentrazone/2,4-D + NIS	0.023/0.26 + 0.125	0	58
Carfentrazone/2,4-D + NIS	0.023/0.26 + 0.25	0	61
Carfentrazone/2,4-D + NIS + 32% N solution	0.023/0.26 + 0.06 + 2.0	1	45
Carfentrazone/2,4-D + NIS + 32% N solution	0.023/0.26 + 0.125 + 2.0	1	45
Untreated control	----------	--	--
	LSD $_{(0.05)}$	4	13
	Density (plants/ft^2)		15

[1]NIS = 90% nonionic surfactant.

[2]Carfentrazone/MCPA and carfentrazone/2,4-D are lb/A, NIS and 32% N solution rates are %v/v.

[3]May 29, 1997 evaluation, 8 days after application.

[4]July 15 evaluation.

Carfentrazone applied at different spray volumes in spring wheat. Wayne S. Belles and Donald C. Thill. This trial was established near Moscow, Idaho to compare the effect of different spray volumes on the efficacy and crop safety of carfentrazone/MCPA and carfentrazone/2,4-D tank mixed with a 32% N solution in spring wheat Spring wheat (var. Vana) was seeded May 6, 1997 in a silt loam soil (28% sand, 60% silt, 12% clay, pH 5.3, CEC 21 and 4.0% organic matter). Treatments were applied postemergence with a CO_2 backpack sprayer calibrated to deliver 5, 10 or 20 gpa at 32 psi. on May 30, 1997 to 4 lf spring wheat and 2 to 5 lf common lambsquarters (CHEAL), wild buckwheat (POLCO) and field pennycress (THLAR). Plots were 8 by 30 feet arranged in a randomized complete block design with four replications. The entire area was treated with difenzoquat for wild oat control on June 30, 1997. Wheat injury and weed control were evaluated visually during the growing season. Plots were harvested September 2, 1997 with a small plot combine from an area 4.3 by 27 feet per plot and yields determined.

Wheat injury (chlorosis) ranged from 4 to 18% with the various carfentrazone premix treatments at the initial evaluation 6 days after treatment. Increasing the gallons per acre applied from 5 to 20 did not significantly increase injury with either the carfentrazone/2,4-D or carfentrazone/MCPA + Solution 32 treatments. Carfentazone/2,4-D + nonionic surfactant + 32% N solution applied at 10 gpa carrier volume resulted in significantly greater injury than the same treatment applied at 5 gpa. The addition of a nonionic surfactant to carfentrazone/MCPA and to 2,4-D + solution 32 resulted in significantly greater initial wheat injury regardless of spray volume, however, injury was not evident with any treatment at later evaluations. All herbicide treatments completely controlled field pennycress, wild buckwheat and common lambsquarters. Yield of spring wheat ranged from 4,895 to 5,564 lb/A. There were no significant yield differences. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339).

Table. Crop injury, grain yield and weed control from herbicide treatments.

Treatment[1]	Rate[2]	Volume	Crop injury June 5	Crop injury June 26	Crop yield	Weed control[3] CHEAL	Weed control[3] THLAR	Weed control[3] POLCO
	lb/A + v/v	gal/A	%	0	lb/A		%	
Carfen/MCPA	0.023/0.37	5	8	0	5183	100	100	100
Carfen/MCPA	0.023/0.37	10	6	0	4895	100	100	100
Carfen/MCPA	0.023/0.37	20	10	0	5376	100	100	100
Carfen/MCPA + NIS	0.023/0.37 + 0.25	5	18	0	5290	100	100	100
Carfen/MCPA + NIS	0.023/0.37 + 0.25	10	18	0	5148	100	100	100
Carfen/2,4-D	0.023/0.26	5	4	0	5182	100	100	100
Carfen/2,4-D	0.023/0.26	10	4	0	5494	100	100	100
Carfen/2,4-D	0.023/0.26	20	5	0	5403	100	100	100
Carfen/2,4-D + NIS	0.023/0.26 + 0.25	5	10	0	5284	100	100	100
Carfen/2,4-D + NIS	0.023/0.26 + 0.25	10	18	0	5158	100	100	100
Bromoxynil/MCPA	0.125/0.125	10	3	0	5564	100	100	100
Untreated check		--	0	0	5264	---	---	---
	LSD $_{(0.05)}$	--	4	NS	NS	NS	NS	NS
	Density (plants/ft^2)					5	3	1

[1]32% nitrogen solution at 2.0% v/v was added to all herbicide treatments; carfen = carfentrazone, NIS = 90% nonionic surfactant.
[2]All herbicide rates are lb/A, NIS rate is %v/v.
[3]June 26, 1997 evaluation.

Carfentrazone/MCPA in combination with various nitrogen sources in spring wheat. Wayne S. Belles and Donald C. Thill. This trial was established near Moscow, Idaho to evaluate various nitrogen sources and concentrations on efficacy and crop injury with carfentrazone/MCPA. Spring wheat (var. Vana) was seeded on May 6, 1997 in a silt loam soil (28% sand, 60% silt, 12% clay, pH 5.3, CEC 21 and 4.0% organic matter). The experimental design was a randomized complete block with four replications. Plot size was 8 by 30 ft. Treatments were applied postemergence on May 30, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi to 4 leaf spring wheat and 2 to 5 leaf common lambsquarters (CHEAL), wild buckwheat (POLCO) and field pennycress (THLAR). Environmental conditions at application were as follows; air temperature 65 F, relative humidity 37%, wind 4 mph, partly cloudy sky and soil temperature at 4 inches 69 F. Wheat injury and weed control were evaluated visually during the growing season. The entire plot area was treated with difenzoquat for wild oat control on June 20. Wheat was harvested September 2, 1997 with a small plot combine from an area 4.3 by 27 feet per plot and yields determined.

Plugging of the recommended 100 mesh screens occurred with several treatments and was generally more pronounced with the 100% liquid fertilizer concentrations. Wheat injury (chlorosis and sprawling) was pronounced from several treatments 6 days after treatment. Carfentrazone/MCPA + 0.25% nonionic surfactant caused more injury than the low (2%) concentration of any liquid fertilizer combined with carfentrazone/MCPA. Increasing concentrations of liquid fertilizers generally resulted in increased injury except for the highest concentration of 32% N solution and ammonium sulfate where application problems occurred (nozzle plugging). Wheat recovered from this initial injury and symptoms were not evident 27 days after treatment when wheat was in the 3-node stage (data not shown). Broadleaf weeds were completely controlled with all treatments in this test. Grain yield in any herbicide treated plot was not statistically greater than the untreated check. Grain yield from herbicide treated plots statistically lower than those of the untreated check plots, in general, corresponded with herbicide injury. Increased nitrogen from the liquid fertilizers may have compensated for early wheat injury with some treatments. Yield from carfentazone/MCPA treated plots were not significantly different than those from bromoxynil/MCPA treated plots. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Crop injury, wheat grain yield, and weed control.

		Spring Wheat		Weed control[3]		
Treatment[1]	Rate	Injury[2]	Yield	CHEAL	THLAR	POLCO
	lb/A + % v/v	%	lb/A		%	
Carf/MCPA + 90% NIS	0.023/0.38 + 0.25	15	5429	100	100	100
Carf/MCPA + 32% N solution	0.023/0.38 + 2.0	9	5524	100	100	100
Carf/MCPA + 32% N solution	0.023/0.38 + 25	14	5728	100	100	100
Carf/MCPA + 32% N solution	0.023/0.38 + 50	15	5630	100	100	100
Carf/MCPA + 32% N solution	0.023/0.38 + 100	6	5869	100	100	100
Carf/MCPA + amm sulf solution	0.023/0.38 + 2.0	6	5779	100	100	100
Carf/MCPA + amm sulf solution	0.023/0.38 + 25	8	5707	100	100	100
Carf/MCPA + amm sulf solution	0.023/0.38 + 50	10	5805	100	100	100
Carf/MCPA + amm sulf solution	0.023/0.38 + 100	2	5924	100	100	100
Carf/MCPA + 20% urea solution	0.023/0.38 + 2.0	10	5432	100	100	100
Carf/MCPA + 20% urea solution	0.023/0.38 + 25	23	5383	100	100	100
Carf/MCPA + 20% urea solution	0.023/0.38 + 50	31	5432	100	100	100
Carf/MCPA + 20% urea solution	0.023/0.38 + 100	35	5513	100	100	100
Bromoxynil/MCPA	0.25	2	5779	100	100	100
Untreated check	------	0	5843	---	---	---
	LSD (0.05)	4	356	NS	NS	NS
	Density (plants/ft²)			4	3	1

[1]Carf = carfentrazone, NIS = 90% nonionic surfactant, amm sulf = ammonium sulfate (8.5-0-0-9); 32% N solution contains 3.5 lb N/gallon, ammonium sulfate solution 0.836 lb N + 0.91 lb S/gallon, 20% urea solution 1.86 lb N/gallon.
[2]June 5, 1997, evaluation 6 days after application.
[3]August 6, 1997 evaluation.

Kochia and common lambsquarters control with fluroxypyr in irrigated spring wheat. Don W. Morishita and Robert W. Downard. A field experiment was conducted to compare fluroxypyr to two standard broadleaf herbicide treatments for the control of kochia and common lambsquarters in irrigated spring wheat ('Penawawa'). Wheat was planted March 27, 1997, at a seeding rate of 100 lb/A at the University of Idaho Research and Extension Center near Kimberly, Idaho. Soil type was a silt loam with a pH of 8.1, CEC of 16 meq/100 g soil, and 1.6% organic matter. Treatments were arranged in a randomized complete block design with four replications. Individual plots were 8 by 25 ft. All herbicide treatments were applied May 9 (air temperature 57 F, soil temperature 48 F, relative humidity 50%, and wind speed 0 to 6 mph) with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 24 psi. Grain was in the 3- to 5-leaf stage, kochia was in the 6- to 12-leaf stage and averaged 51 plants/ft^2, and common lambsquarters was in the cotyledon to 6-leaf stage and averaged 29 plants/ft^2. All herbicide treatments were evaluated visually for crop injury and weed control May 27 and June 30. Grain was harvested August 19 with a small-plot combine.

None of the herbicide treatments injured the wheat more than 4% (Table). All treatments containing fluroxypyr controlled kochia 89 to 97% at both evaluation dates. Kochia control with bromoxynil & MCPA at 0.75 lb/A averaged 76 and 78% at both evaluation dates. Common lambsquarters control ranged from 91 to 100% with all herbicide treatments except fluroxypyr alone at 0.125 lb/A. Grain yield of all herbicide treatments containing fluroxypyr were all higher than the check and were among the highest yielding treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table. Crop injury, weed control, and wheat yield following fluroxypyr application.

				Weed Control[1]				
		Crop injury		KCHSC		CHEAL		Grain
Treatment[2]	Rate	5/27	6/30	5/27	6/30	5/27	6/30	yield
	lb/A	%						bu/A
Check		-	-	-	-	-	-	86
Fluroxypyr	0.125 +	3	0	94	90	56	84	126
Fluroxypyr + 2,4-D	0.125 + 0.25	3	0	89	94	98	95	123
Fluroxypyr + bromoxynil & MCPA	0.125 + 0.25	4	0	96	95	97	94	120
Fluroxypyr + bromoxynil & MCPA	0.125 + 0.187	0	0	95	97	99	95	121
Fluroxypyr + thifensulfuron & tribenuron	0.125 + 0.0156	1	0	97	97	100	95	126
Bromoxynil & MCPA	0.75	4	0	78	76	98	91	114
Bromoxynil & MCPA + thifensulfuron & tribenuron	0.50 + 0.0156	3	0	89	88	99	95	124
LSD (0.05)		ns	ns	9	7	5	6	11

[1]Weeds evaluated were kochia (KCHSC) and common lambsquarters (CHEAL).

[2]Nonionic surfactant was added to all herbicide treatments at 0.25% v/v, except bromoxynil & MCPA applied at 0.75 lb/A.

F8426 in combination with bromoxynil and MCPA for weed control in irrigated spring wheat. Robert W. Downard and Don W. Morishita. The objective of this study was to evaluate crop injury and weed control with F8426 applied alone and in combination with bromoxynil and MCPA. The trial was conducted under sprinkler irrigation at the University of Idaho Research and Extension Center near Kimberly, Idaho. A preplant fertilizer application consisting of 95, 96, and 99 lb/A of nitrogen, phosphorus, and sulfur, respectively was applied broadcast March 24, 1997. Spring wheat ('Penawawa') was seeded at 100 lb/A March 27. Individual plots were 8 by 25 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.1, CEC of 16 meq/100 g of soil, and 1.6% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 24 psi using 11001 flat fan nozzles. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken May 17 and 27. Grain was harvested with a small-plot combine August 19.

Table 1. Application information.

Application timing	4 to leaf
Application date	5/9
Air temperature (F)	57
Soil temperature (F)	48
Relative humidity (%)	50
Wind speed (mph)	0 to 6
Weed growth stage	
Kochia	4 to 12 leaf
Common lambsquarters	cotyledon to 4 leaf
Weed density/ft^2	
Kochia	67
Common lambsquarters	9
Total	76

F8426 alone or with MCPA and bromoxynil & MCPA + tribenuron did not injure the wheat (Table 2). F8426 & MCPA + bromoxynil & MCPA at 0.403 + 0.2 or 0.3 lb/A or bromoxynil at 0.15 lb/A injured the wheat 11, 13 and 19%, respectively on May 17. Wheat injury was not significantly different among herbicide treatments on May 27. Kochia control averaged 96% on May 17 and 27 with F8426 & MCPA + bromoxynil & MCPA at 0.403 + 0.3 lb/A. It also controlled common lambsquarters 98% or better. Roundup was sprayed in the plots with high kochia populations two weeks before harvest. All herbicide treatments yielded higher than the untreated check. Bromoxynil & MCPA plus tribenuron was the highest yielding treatment. There were however, no statistical differences among the herbicide treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and grain yield from F8426 & MCPA alone or in combination with adjuvants.

		Crop injury		Weed control[1]				
				KCHSC		CHEAL		
Treatment	Rate	5/17	5/27	5/17	5/27	5/17	5/24	Yield
	lb/A	%						bu/A
Check		--	--	--	--	--	--	75
F8426 + UAN	0.023 + 2.0% v/v	0	1	55	69	84	85	124
F8426 + UAN	0.031 + 2.0% v/v	0	4	69	71	85	88	122
F8426 & MCPA + UAN	0.403 + 2.0% v/v	0	3	69	68	99	100	124
F8426 & MCPA + bromoxynil + UAN	0.403 + 0.15 + 2.0% v/v	13	3	80	80	100	97	122
F8426 & MCPA + bromoxynil + UAN	0.403 + 0.10 + 2.0% v/v	5	3	79	79	100	97	126
F8426 & MCPA + bromoxynil + UAN	0.403 + 0.05 + 2.0% v/v	3	4	78	78	100	99	123
F8426 & MCPA + bromoxynil & MCPA + UAN	0.403 + 0.30 + 2.0% v/v	19	3	95	96	100	98	119
F8426 & MCPA + bromoxynil & MCPA + UAN	0.403 + 0.20 + 2.0% v/v	11	3	75	78	100	99	117
F8426 & MCPA + bromoxynil & MCPA + UAN	0.403 + 0.10 + 2.0% v/v	4	4	88	90	96	97	125
Tribenuron + bromoxynil & MCPA + surfactant	0.0078 + 0.5 + 0.25% v/v	0	1	73	73	99	100	126
LSD (0.05)		4	ns	17	15	10	7	16

[1]Weeds evaluated were kochia (KCHSC) and common lambsquarters (CHEAL).

Adjuvant concentrations and combinations of F8426 with MCPA and 2,4-D in irrigated spring wheat. Robert W. Downard and Don W. Morishita. The objective of this study was to evaluate F8426 & MPCA and F8426 & 2,4-D with different adjuvant concentrations and combinations. The trial was conducted under sprinkler irrigation at the University of Idaho Research and Extension Center near Kimberly, Idaho. A preplant fertilizer application consisting of 95, 96, and 99 lb/A of nitrogen, phosphorus, and sulfur, respectively was applied broadcast March 24, 1997. Spring wheat ('Penawawa') was seeded at 100 lb/A March 27. Individual plots were 8 by 25 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.1, CEC of 16 meq/100 g of soil, and 1.6% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 24 psi using 11001 flat fan nozzles. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken May 17, and May 27. Grain was harvested with a small-plot combine August 18.

Table 1. Application information.

Application timing	3 to 5 leaf
Application date	5/9
Air temperature (F)	57
Soil temperature (F)	48
Relative humidity (%)	50
Wind speed (mph)	0 to 6
Weed growth stage	
Kochia	4 to 12 leaf
Common lambsquarters	cotyledon to 4 leaf
Weed density/ft^2	
Kochia	105
Common lambsquarters	48
Total	153

Kochia and common lambsquarters populations were extremely high in this study (Table 1). No herbicide significantly injured the wheat (Table 2). All herbicide treatments controlled common lambsquarters 84 to 98% 8 and 18 days after treatment. F8426 & 2,4-D plus surfactant at 0.125% or 0.06% v/v with or without solution 32 (UAN) controlled kochia 88 to 95% on May 27. F8426 & MCPA plus surfactant at 0.25% v/v controlled kochia 91% and was better than F8426 & MCPA without surfactant. Roundup was sprayed in the plots that had high kochia populations two weeks before harvest to facilitate grain threshing. Grain yields from all treatments were higher than the check but not different from each other. Overall weed control with F8426 & MCPA or F 8426 & 2,4-D was good and kochia control was improved with the addition of surfactant and to some extent UAN. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and grain yield with adjuvant concentrations and combinations with F8426 & MCPA, and F8426 & 2,4-D.

		Crop injury		Weed Control[1]				
				KCHSC		CHEAL		
Treatment	Rate	5/17	5/27	5/17	5/27	5/17	5/27	Yield
	lb/A	%						bu/A
Check		--	--	--	--	--	--	89
F8426 & MCPA + UAN	0.403 + 2.0% v/v	3	3	73	70	94	93	121
F8426 & MCPA + surfactant	0.403 + 0.25% v/v	0	3	94	91	96	98	129
F8426 & MCPA + surfactant	0.403 + 0.125% v/v	0	0	73	76	93	96	127
F8426 & MCPA + surfactant	0.403 + 0.06	0	4	76	85	92	95	126
F8426 & MCPA + UAN + surfactant	0.403 + 2.0% v/v + 0.125% v/v	0	4	85	84	99	97	123
F8426 & MCPA + UAN + surfactant	0.403 + 2.0% v/v + 0.06% v/v	1	1	85	88	96	97	128
F8426 & 2,4-D + UAN +	0.273 + 2.0% v/v +	0	1	80	80	89	88	123
F8426 & 2,4-D + surfactant	0.273 + 0.25% v/v	0	1	70	76	84	95	127
F8426 & 2,4-D + surfactant	0.273 + 0.125% v/v	1	3	79	88	95	96	123
F8426 & 2,4-D + surfactant	0.273 + 0.06% v/v	0	1	89	94	95	96	127
F8426 & 2,4-D[2] + UAN + surfactant	0.273 + 2.0% v/v + 0.125% v/v	0	1	91	94	95	97	135
F8426 & 2,4-D[2] + UAN + surfactant	0.273 + 2.0% v/v + 0.06% v/v	0	4	91	95	91	96	124
LSD (0.05)		ns	ns	15	12	6	5	18

[1]Weeds evaluated were kochia (KCHSC) and common lambsquarters (CHEAL).

Wild oat control in spring wheat with wild oat and broadleaf herbicide tank mixtures. Don W. Morishita and Robert W. Downard. A study was initiated near Burley, Idaho in sprinkler irrigated spring wheat ('Penawawa') to evaluate wild oat control with wild oat herbicides tank mixed with broadleaf herbicides. The experiment was established as a randomized complete block design with four replications and individual plots were 8 by 25 ft. Soil texture in this study was a silt loam with a pH of 8.3, CEC of 20.2 meq/100 g soil, and 2.5% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer equipped with 11001 flat fan nozzles and calibrated to deliver 10 gpa at 3 mph and 22 psi. Herbicide application information and wild oat density is shown in Table 1. Crop injury and wild oat control was evaluated visually July 17. The crop was harvested September 1 with a small-plot combine.

Table 1. Application information.

Application date	5/5	5/13
Application timing	1 to 4 leaf	3 to 5 leaf
Air temperature (F)	75	83
Soil temperature (F)	60	70
Relative humidity (%)	40	34
Wind velocity (mph)	6	5 to 9
Wild oat density/ft^2	25	18

None of the herbicide treatments injured the crop (Table 2). None of the tralkoxydim treatments controlled wild oat better than 51%. Imazethapyr and fenoxaprop in tank mixture with fluroxypyr, 2-4-D, or prosulfuron controlled wild oat 90 to 97% and were the best wild oat control treatments. These same tank mix combinations were among the highest yielding herbicide treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, wild oat control, and grain yield with different wild oat herbicides.

Treatment	Rate	Crop injury	Wild oat control	Yield
	lb/A	---------------%----------		bu/A
Check		-	-	41
Tralkoxydim[1]	0.18	0	50	70
Tralkoxydim[1]	0.25	0	51	78
Tralkoxydim + ammonium sulfate	0.18 + 1.5	0	30	42
Tralkoxydim + ammonium sulfate	0.25 + 1.5	0	28	40
Tralkoxydim + fluroxypyr methyl + 2,4-D	0.18 + 0.125 + 0.25	0	46	81
Imazamethabenz[2] + fluroxypyr methyl + 2,4-D	0.41 + 0.125 + 0.25	0	97	119
Difenzoquat + fluroxypyr methyl + 2,4-D	1.0 + 0.125 + 0.25	0	70	104
Fenoxaprop-p-ethyl + fluroxypyr methyl	0.12 + 0.125	0	91	122
Imazamethabenz[2] + prosulfuron	0.41 + 0.0178	0	90	115
Difenzoquat[2] + prosulfuron	1.0 + 0.0178	0	64	107
Diclofop[2] + prosulfuron	1.0 + 0.0178	0	69	101
Fenoxaprop-p-ethyl[2] + prosulfuron	0.12 + 0.0178	0	95	114
Tralkoxydim[2] + prosulfuron	0.18 + 0.0178	0	23	39
LSD (0.05)		NS	11	18

[1]Turbocharge was added at the rate of 0.5% v/v.

[2]Nonionic surfactant was added at the rate of 0.25% v/v.

Wild oat control with imazamethabenz and difenzoquat tank mixtures. Robert W. Downard and Don W. Morishita. The objective of this study was to evaluate crop injury and wild oat control with the full-labeled rate of difenzoquat plus the half labeled rate of imazamethabenz. The trial was conducted under sprinkler irrigation field near Declo, Idaho. Spring wheat ('Penawawa') was seeded at 110/A. Individual plots were 8 by 25 feet and treatments were arranged in a randomized complete block design with four replications. Soil type was a sandy clay with a pH of 8.4, CEC of 17.6 meq/100 g of soil, and 1.1% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 22 psi using 11001 flat fan nozzles. Additional application information is shown in Table 1. Crop injury was evaluated visually June 3 and July 10, 1997. Wild oat control was evaluated visually July 10. Grain was harvested with a small-plot combine on August 7.

Table 1. Application information.

Application timing	1 to 3 leaf	3 to 5 leaf
Application date	5/6	5/14
Air temperature (F)	55	67
Soil temperature (F)	50	56
Relative humidity (%)	66	56
Wind speed (mph)	2	0
Wild oat growth stage	1 to 3 leaf	3 to 5 leaf
Wild oat density/ft^2	12	9

Wheat injury was similar among herbicide treatments ranging from 1 to 6% (Table 2). Injury from difenzoquat plus imazamethabenz at 1.0 + 0.235 lb/A was equal to that of difenzoquat plus imazamethabenz at 0.5 + 0.235 lb/A or difenzoquat alone at 1.0 lb/A on June 3. No treatment injured the wheat on July 10. Difenzoquat 0.5 or 1.0 lb/A plus imazamethabenz at 0.235 controlled wild oat 92%. These two treatments also were among the highest yielding. Increasing the rate of difenzoquat from 0.5 lb/A to 1.0 lb/A in the tank mix with imazamethabenz did not increase injury. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, wild oat control, and grain yield in spring wheat with wild oat herbicides.

Treatment[2]	Rate	Crop injury 6/3	Crop injury 7/10	Wild oat[1] control	Yield
	lb/A	------	%	------	bu/A
Check		--	--	--	64
Imazamethabenz	0.47	1	0	76	83
Difenzoquat	1.0	5	0	83	90
Imazamethabenz + difenzoquat	0.235 + 0.5	5	0	92	106
Imazamethabenz + difenzoquat	0.235 + 1.0	5	0	92	108
Imazamethabenz + difenzoquat + bromoxynil + thifen & triben[3]	0.235 + 0.5 + 0.187 + 0.0156	3	0	70	93
Imazamethabenz + difenzoquat + bromoxynil & MCPA + thifen & triben	0.235 + 0.5 + 0.375 + 0.0156	1	0	79	92
Imazamethabenz + prosulfuron	0.47 + 0.0178	1	0	80	89
Difenzoquat + prosulfuron	1.0 + 0.0178	6	0	86	96
Diclofop	1.0	1	0	46	73
Tralkoxydim[4]	0.18	1	0	64	99
LSD (0.05)		4	ns	18	24

[1]Wild oat was evaluated July 10, 1997.
[2]Activator 90 nonionic surfactant was added at the rate of 0.25% v/v to all treatments except diclofop and tralkoxydim.
[3]Thifen & triben is a 2:1 commercially formulated mixture of thifensulfuron and tribenuron.
[4]Turbocharge was added at 0.5% v/v.

Evaluation of fenoxaprop with phenylpyrazolin for wild oat control in spring wheat. Don W. Morishita and Robert W. Downard. A field study was conducted near Burley, Idaho to evaluate fenoxaprop with phenylpyrazolin safener in combination with several broadleaf herbicides for wild oat and broadleaf weed control in spring wheat ('Penawawa') grown under sprinkler irrigation. Treatments were arranged in a randomized complete block design with four replications and individual plots were 8 by 25 feet. All herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer. The sprayer was calibrated to deliver 10 gpa at 22 psi using 11001 flat fan nozzles. Environmental conditions at herbicide application were as follows: air temperature 76 F, soil temperature 60 F, relative humidity 50%, and wind velocity 4 mph. Soil type was a silt loam with a pH of 8.3, CEC of 19.1 meq/100 grams of soil, and 1.6% organic matter. Wild oat and kochia densities averaged 8 and 3 plants/ft^2, respectively. Visual evaluation for crop injury and weed control was taken July 10, 1997. The plots were harvested August 21 with a small-plot combine.

No herbicide or herbicide combination injured the crop (Table). Wild oat control with fenoxaprop and phenylpyrazolin applied alone or in combination with thifensulfuron & tribenuron or MCPA ranged from 90 to 97%. This control was not significantly better than imazethapyr + bromoxynil & MCPA. Kochia control was not different among the herbicide treatments, including fenoxaprop applied alone. This was likely due to the low and erratic kochia population in this site. All of the herbicide treatments yielded higher than the untreated check. The highest yielding treatments included fenoxaprop & phenylpyrazolin + bromoxynil or MCPA. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control and yield.

Treatment	Rate	Crop injury	Weed control[1] AVEFA	Weed control[1] KCHSC	Yield
	lb/A	%	%	%	bu/A
Check		--	--	--	57
Fenoxaprop-p-ethyl	0.10	0	93	73	93
Fenoxaprop-p-ethyl	0.12	0	97	99	80
Fenoxaprop-p-ethyl + thifensulfuron & tribenuron[2]	0.10 + 0.25	0	93	80	85
Fenoxaprop-p-ethyl + thifensulfuron & tribenuron	0.12 + 0.25	0	91	83	86
Fenoxaprop-p-ethyl + bromoxynil & MCPA	0.10 + 0.5	0	76	81	84
Fenoxaprop-p-ethyl + bromoxynil & MCPA	0.12 + 0.5	0	81	81	91
Fenoxaprop-p-ethyl + bromoxynil	0.10 + 0.25	0	81	78	115
Fenoxaprop-p-ethyl + MCPA ester	0.10 + 0.375	0	90	56	99
Fenoxaprop-p-ethyl[3] + bromoxynil	0.58 + 0.25	0	51	81	89
Tralkoxydim[4] + bromoxynil & MCPA	0.18 + 0.5	0	59	83	85
Imazamethabenz[5] + bromoxynil & MCPA	0.41 + 0.5	0	87	80	94
LSD (0.05)		NS	9	NS	25

[1]Weeds evaluated were wild oats (AVEFA) and kochia (KCHSC).
[2]Nonionic surfactant was added at the rate of 0.25% v/v.
[3]Formulated as fenoxaprop & 2,4-D & MCPA
[4]Turbocharge added at a rate of 0.5% v/v.
[5]Sun-it methylated seed oil was added at the rate of 1.5 pt/A.

Control of oats in spring wheat. Bill D. Brewster, Carol A. Mallory-Smith, and Paul E. Hendrickson. Herbicide treatments were compared for oat control in spring wheat at the Hyslop research farm near Corvallis, OR. 'Cayuse' oats were broadcast-seeded at 80 lb/A and harrowed prior to drilling 'Penewawa' wheat in 6-inch-wide rows at 127 lb/A on March 25, 1997. The experimental design was a randomized complete block with three replications and 8-ft by 35-ft plots. Herbicide treatments were applied on May 8, 1997. The oats and wheat were 8- to 10-inches tall and had five leaves; the oats had 2 tillers and the wheat 3 to 6 tillers. A single-wheel, compressed-air plot sprayer that delivered 20 gpa at 20 psi was used to apply the herbicides. Besides the oats, there was a scattering of shepherdspurse, mayweed chamomile, prostrate knotweed, hairy nightshade, and lesser snapdragon. The wheat seed was harvested on August 6, 1997, and was cleaned before it was weighed.

Imazamethabenz was less effective than difenzoquat, tralkoxydim, or diclofop-methyl on the oats, but wheat yields were increased by about the same amount over the untreated control. The combination of imazamethabenz plus difenzoquat was also effective on the oats. The addition of sulfosulfuron increased the control of oats with imazamethabenz, but reduced the control of oats when applied in combination with tralkoxydim or diclofop-methyl. However, none of the other treatments produced wheat grain yields greater than those from the sulfosulfuron combinations. The carfentrazone combinations caused slightly more initial injury than the other treatments and did not increase wheat grain yields over those produced by the wild oat herbicides alone. No visible crop injury was present when evaluated on July 2. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Oat control, wheat injury, and grain yield following herbicide treatments near Corvallis, OR, 1997.

Treatment[1]	Rate	Wheat injury[2]	Oat control[3]	Wheat yield
	lb/A	---------- % ----------		bu/A
Imazamethabenz	0.47	0	53	81.1
Imazamethabenz + sulfosulfuron	0.47 + 0.023	0	80	84.0
Imazamethabenz + carfentrazone	0.47 + 0.023	5	55	82.3
Difenzoquat	1.0	8	95	80.0
Difenzoquat + sulfosulfuron	1.0 + 0.023	8	95	89.9
Difenzoquat + carfentrazone	1.0 + 0.023	11	96	76.1
Imazamethabenz + difenzoquat	0.23 + 0.5	0	95	77.7
Imazamethabenz + difenzoquat + sulfosulfuron	0.23 + 0.5 + 0.023	0	93	88.6
Imazamethabenz + difenzoquat + carfentrazone	0.23 + 0.5 + 0.023	3	94	80.5
Tralkoxydim	0.19	0	99	84.0
Tralkoxydim + sulfosulfuron	0.19 + 0.023	0	63	87.3
Tralkoxydim + carfentrazone	0.19 + 0.023	11	95	78.60
Diclofop-methyl	1.0	0	99	80.4
Diclofop-methyl + sulfosulfuron	1.0 + 0.023	0	60	89.1
Diclofop-methyl + carfentrazone	1.0 + 0.023	13	97	75.3
Check	0	0	0	69.8
$LSD_{(0.05)}$		4	6	7.4

[1] Surfactant R-11 added to imazamethabenz and difenzoquat treatments at 0.25% v/v; surfactant Supercharge added to tralkoxydim treatments at 0.5% v/v.

[2] Visual evaluation May 16, 1997.

[3] Visual evaluation July 2, 1997.

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.

Treatment	Crop stage	Rate	Canada thistle 1996 Sept	Canada thistle 1997 June	Canada thistle 1997 July	Pern.sowthistle 1996 Sept	Pern.sowthistle 1997 June	Pern.sowthistle 1997 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	46	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 containe glyphosate.

Effects on winter wheat growth and yield after an application of imazethapyr and pendimethalin on spring pea and lentil. Bradley D. Hanson and Donald C. Thill. Four sites at two locations were established near Genesee, Idaho to evaluate the effects of imazethapyr and pendimethalin on subsequently planted winter wheat. Two sites were established in 'Columbia' pea, one on the summit of a hill and the other on gently sloping "bottom ground" at the Zenner farm near Genesee, Idaho. Two other sites were established in 'Brewer' lentil on hilltop and bottom ground locations at the University of Idaho Kambitsch Farm near Genesee, Idaho. Individual plots were 16 by 40 ft arranged in a randomized complete block with four replications. Treatments were applied and incorporated on May 12, 1997 in the pea trials, and on May 14 in the lentil trials. All treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi and 3 mph (Table 1) and incorporation was performed with two right angle passes of a field cultivator. Visual ratings and weed counts were used to estimate weed control during the season, and pea and lentil seed was harvested from a 4.1 by 37 ft area on August 20 and September 23, 1997 respectively. Weed control estimates were taken for common lambsquarter (CHEAL). Weed populations in the check plots at the Kambitsch farm averaged 45 CHEAL/ft^2 at weed emergence. On July 23, CHEAL populations averaged 10/ft^2 due to crop competition. At the Zenner farm, CHEAL averaged 0.8 plants/ft^2 after the pea plants became competitive.

Table 1. Application data.

Site	Zenner farm	Kambitsch farm
Application and incorporation date	May 12, 1997	May 14, 1997
Air temperature (F)	80	70
Relative humidity (%)	35	52
Wind speed (mph)	2	2
Cloud cover (%)	0	0
Soil temperature at 2 in. (F)	62	50

Table 2. Soil analysis.

Site	Zenner farm		Kambitsch farm	
Location	Hilltop	Bottom	Hilltop	Bottom
pH	5.3	5.9	5.3	5.4
OM (%)	3.0	4.3	2.4	3.9
CEC (cmol/Kg)	21.6	20.8	20.2	20.9
Soil fractions (% sand-silt-clay)	25-58-16	26-62-12	25-60-14	25-60-14
Texture	silt loam	silt loam	silt loam	silt loam

Herbicide treatments did not affect pea or lentil yield at any location (Table 3 and 4). At the Zenner farm location, no injury was observed on the pea crop. Pea yields averaged 2270 lb/A on the hilltop and 2915 lb/A at the bottom site. At the Kambitsch farm bottom site, there was visible injury (stunting) to the lentil crop with treatments containing 2 lb/A of pendimethalin 28 DAT. Symptoms were not apparent at the hilltop site. This injury did not affect on seed yield. At the hilltop site on the Zenner farm, all pendimethalin treatments controlled CHEAL 92% or more. Imazethapyr alone controlled CHEAL 85 to 86%. All treatments except pendimethalin at 1.0 lb/A and imazethapyr at 0.047 lb/A controlled CHEAL 93% or more at the bottom site at the Zenner farm location. At the Kambitsch farm, lentil yields averaged 1255 lb/A at the hill top and 1590 lb/A at the bottom site. CHEAL control did not differ among treatments and ranged from 77 to 98%control. This study was reestablished during October, 1997 and plant growth and yield data will be collected on the subsequent winter wheat crop. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 3. Weed control and pea yield at the Zenner farm near Genesee, ID.

Treatment	Rate	Hilltop CHEAL control	Hilltop Yield	Bottom CHEAL control	Bottom Yield
	lb/A	%	lb/A	%	lb/A
Untreated	–	–	2366	–	3002
pendimethalin	1.0	95	2429	85	3086
pendimethalin	2.0	95	2148	94	3265
imazethapyr	0.047	86	2053	89	2857
imazethapyr + pendimethalin	0.047 1.0	97	2296	94	2592
imazethapyr + pendimethalin	0.047 2.0	97	2249	95	2871
imazethapyr	0.094	85	2292	93	2712
imazethapyr + pendimethalin	0.094 1.0	92	2316	95	3099
imazethapyr + pendimethalin	0.094 2.0	92	2287	95	2767
LSD (0.05)		8.4	NS	4.1	NS
CV, %		6.2	10.2	3.0	19.0

Table 4. Weed control and lentil yield at Kambitsch Research farm.

Treatment	Rate	Hilltop CHEAL control	Hilltop Yield	Bottom CHEAL control	Bottom Yield
	lbs/A	%	lb/A	%	lb/A
Untreated	–	–	1332	–	1585
pendimethalin	1.0	86	1394	88	1647
pendimethalin	2.0	89	1123	93	1478
imazethapyr	0.047	81	1226	89	1599
imazethapyr + pendimethalin	0.047 1.0	90	1277	92	1582
imazethapyr + pendimethalin	0.047 2.0	91	1218	90	1535
imazethapyr	0.094	78	1307	94	1593
imazethapyr + pendimethalin	0.094 1.0	88	1241	89	1654
imazethapyr + pendimethalin	0.094 2.0	86	1178	97	1640
LSD (0.05)		NS	NS	NS	NS
CV, %		8.0	14.7	5.2	10.9

Wild oat control in winter wheat with tralkoxydim and other wild oat herbicides. Suzy M. Sanders and Donald C. Thill. A study was established during spring, 1997 near Potlatch, Idaho to evaluate wild oat control in winter wheat with tralkoxydim alone and in combination with different rates and types of nitrogen fertilizer. Wild oat control with other herbicides also was assessed. 'Madsen' winter wheat was seeded October 1, 1996 in a silt loam soil (29.6% sand, 58.0% silt, 12.4% clay) having a pH of 5.5 and 3.7% organic matter. The experimental design was a randomized compete block with four replications and individual plots were 8 by 27 ft. Herbicide treatments were applied post-emergence on May 12, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). Crop injury was evaluated May 22 and June 26, 1997. Wild oat (AVEFA) control was evaluated visually on August 12, 1997. Winter wheat was harvested with a small plot combine from a 4.1 by 27 ft area on August 14, 1997.

Table 1. Application data.

Crop stage	4 tiller
Wild oat stage	3 leaf
Air temperature (F)	78
Wind (mph)	2 to 4
Cloud cover	Clear
Soil temperature at 2 in. (F)	58

Wheat was not injured by any herbicide treatments. Wild oat control with tralkoxydim treatments ranged from 74 to 95% except tralkoxydim plus OS (35%) (Table 2). Addition of nitrogen to tralkoxydim did not affect wild oat control. Clodinafop and fenoxaprop/safener treatments controlled wild oat 89 to 94%. No other treatments adequately controlled wild oat. Grain yield ranged from 53 to 69 bu/A and no treatment differed statistically from the untreated check. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Winter wheat yield and wild oat control with tralkoxydim and other wild oat herbicides.

Treatment	Rate	AVEFA control	Wheat yield
	lb/A	%	bu/A
Tralkoxydim + TF8035[1]	0.125	88	57
Tralkoxydim + AMS[2] + TF8035	0.125 + 1.5	76	69
Tralkoxydim + TF8035	0.18	95	62
Tralkoxydim + AMS[2] + TF8035	0.18 + 1.5	83	53
Tralkoxydim + TF8035	0.25	84	59
Tralkoxydim + AMS[2] + TF8035	0.25 + 1.5	91	61
Tralkoxydim + liquid AMS[3] + TF8035	0.18	74	63
Tralkoxydim + 32% UAN[4] + TF8035	0.18	89	58
Diclofop-methyl	1.0	58	59
Imazamethabenz + NIS[5]	0.47	43	59
Fenoxaprop/2,4-D/MCPA[6]	0.575	70	57
Fenoxaprop/MCPA + thifensulfuron/tribenuron	0.46 + 0.0141	61	57
Fenoxaprop/safener[6]	0.104	89	59
Fenoxaprop/safener[6]	0.119	90	59
Clodinafop + COC[7]	0.05	91	61
Clodinafop + COC[7]	0.06	94	56
Tralkoxydim + OS[8]	0.18	35	57
Tralkoxydim + MSO[9]	0.18	87	62
Untreated check	--	--	54
LSD $_{(0.05)}$	--	20	NS
Density (plants/ft^2)		15	

[1]TF8035 is a mineral oil/nonionic surfactant blend; all applications were at 0.5% v/v.
[2]Granular ammonium sulfate rates are lb product/A.
[3]AMS = ammonium sulfate at 17% v/v.
[4]UAN = urea ammonium nitrate applied at 2.5% v/v.
[5]NIS = 90% nonionic surfactant (R-11) added at 0.25% v/v.
[6]Fenoxaprop/MCPA (0.467 /2.16 lb/gal), fenoxaprop/2,4-D/MCPA (0.375/0.58/1.75 lb/gal), thifensulfuron/tribenuron, and fenoxaprop/safener (1.277 lb/gal) applied as the packaged formulations.
[7]COC = crop oil concentrate (Sunit II) added at 1% v/v.
[8]OS = organosilicone surfactant (Silwet L 77) added at 0.125% v/v.
[9]MSO = methylated seed oil (Sunit II) added at 1.25% v/v.

Quackgrass control in winter wheat with MON 37500. Suzy M. Sanders and Donald C. Thill. Studies were established during spring, 1997 near Potlatch and Bonners Ferry, Idaho to evaluate MON 37500 for quackgrass control. 'Rely' winter wheat was seeded near Potlatch in a silt loam soil (27.6% sand, 64.0% silt, 8.4% clay) with pH of 6.7 and 3.4% organic matter. 'Hill 81' winter wheat was seeded near Bonners Ferry in a silt loam soil (29.6% sand, 60.0% silt, 10.4% clay) with pH 7.6 and 4.1% organic matter. The experimental design at each location was a randomized compete block factorial with four replications and individual plots were 8 by 27 ft. MON 37500 was applied at the 3 to 5 and the 6 to 8 leaf stages of quackgrass at rates of 0.004, 0.008, 0.016, 0.023, 0.032, 0.064 lb/A and an untreated check. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). Wheat injury was evaluated visually at 2 and 4 weeks after treatment. Quackgrass (ELYRE) control was evaluated visually at 2 weeks after treatment and at heading. Winter wheat was harvested with a small plot combine from a 4.4 by 27 ft area on August 14, 1997 in Bonners Ferry and September 13,1997 in Potlatch.

Table 1. Application data.

	Potlatch		Bonners Ferry	
	April 25, 1997	May 11, 1997	May 9, 1997	May 19, 1997
Crop stage	3 leaf	2 tiller	2 to 3 tiller	4 tiller
Quackgrass stage	4 leaf	7 to 8 leaf	5 leaf	8 leaf
Air temperature (F)	61	83	69	77
Wind (mph)	Calm	Calm	0 to 2	3 to 4
Cloud cover	Clear	Mostly clear	Mostly clear	Mostly cloudy
Soil temperature at 2 in. (F)	58	76	65	61

At Potlatch, the 0.032 and 0.064 lb/A rates at the 6 to 8 leaf timing injured wheat 20 and 25% at 11 DAT. This injury was seen as stunting but was no longer visible by 29 DAT. At Potlatch, there was significant rate by time interaction for control. MON 37500 at 0.023 lb/A and higher rates controlled quackgrass 88 to 95% except MON 37500 at 0.023 lb/A applied to 6 to 8 leaf quackgrass (47%). At Bonners Ferry, 0.023 lb/A rate and above at both timings controlled quackgrass 75 to 83%. There was significant rate by time interaction for grain yield at both Potlatch and Bonners Ferry. At Potlatch, wheat grain yield ranged from 1,844 to 3,393 lb/A. Grain yield in most treatments was equivalent, except the 0.004 lb/A rate at the 6 to 8 leaf timing, and the 0.008 lb/A rate at the 3 to 5 leaf timing and the untreated checks, which had the lower yield. At Bonners Ferry, wheat grain yield ranged from 2,139 to 4,036 lb/A and varied greatly among treatments. However, grain yield was greater than the untreated control in all but four treatments. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Quackgrass control and wheat grain yield with MON 37500.

Treatment[3]	Rate	Timing	ELYRE control[1] Potlatch	ELYRE control[1] Bonners Ferry	Wheat yield[2] Potlatch	Wheat yield[2] Bonners Ferry
			%	%	lb/A	lb/A
MON 37500	0.004	3-5 leaf	8	52	2,756	2,939
MON 37500	0.004	6-8 leaf	13	48	2,508	2,969
MON 37500	0.008	3-5 leaf	10	59	2,610	2,664
MON 37500	0.008	6-8 leaf	25	66	2,825	2,564
MON 37500	0.016	3-5 leaf	43	69	3,206	3,250
MON 37500	0.016	6-8 leaf	45	80	2,827	3,080
MON 37500	0.023	3-5 leaf	91	75	3,055	3,423
MON 37500	0.023	6-8 leaf	47	80	2,721	2,849
MON 37500	0.032	3-5 leaf	95	80	3,393	3,423
MON 37500	0.032	6-8 leaf	88	83	2,755	2,801
MON 37500	0.064	3-5 leaf	95	80	3,258	4,036
MON 37500	0.064	6-8 leaf	94	80	3,110	3,115
Untreated check	0	3-5 leaf	--	--	2,213	2,139
Untreated check	0	6-8 leaf	--	--	1,844	2,151
Analysis of variance:[4]						
	Rate		**	**	**	**
	Time		**	NS	**	**
	Rate x Time		**	NS	**	**
LSD $_{(0.05)}$	--	--	12	12	690	764
Shoots/ft^2	--	--	5	6	--	--

[1] Evaluated at the time of quackgrass heading.
[2] Yield based on uncleaned samples.
[3] All treatments were applied with a nonionic surfactant (R-11) at 0.5% v/v.
[4] NS indicates not significant; ** indicates significant at 0.05 probability level.

Wild oat and quackgrass control with MON 37500 in winter wheat. Wayne S. Belles and Donald C. Thill. A study was established near Potlatch, Idaho to evaluate winter wheat response and wild oat control with MON 37500. Winter wheat (var. Rely) was seeded October 11, 1996 in a silt loam soil (33% sand, 56% silt, 10% clay, pH 5.8, CEC 15.7 and 5.8% organic matter). Treatments were applied postemergence May 7 and May 16, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi. May 7 rates are 80% of planned rates. Plots were 8 by 25 feet with treatments replicated three times in a randomized complete block design. Wheat was harvested September 13, 1997 with a small plot combine from an area 4.3 by 22 feet per plot.

Table 1. Application data.

	May 7, 1997	May 16, 1997
Crop stage	4 to 5 lf/2 to 3 tiller	5 to 6 lf/4 to 5 tiller
Grassweed stage	1 to 3 leaf	4 to 5 lf/1 tiller
Coast fiddleneck and mayweed chamomile	1 to 2 inches tall	3 to 4 inches tall
Field pennycress	4 to 5 inches tall	early bloom
Air temp (F)	60	73
Relative humidity (%)	64	49
Wind (mph)	6	2
Sky	clear	clear
Soil temp (F)	57	55

Winter wheat was not injured by herbicide treatments in this test. Wild oat (AVEFA) control at heading, July 8, 1997, ranged from 72 to 90%. The highest rate of MON 37500 controlled wild oat better than the lowest rate at both timings. Wild oat control with MON 37500 rates at the two timings was not different. Quackgrass (AGRRE), mayweed chamomile (ANTCO) and coast fiddleneck (AMSIN) control ranged from 85 to over 90% with all MON 37500 treatments except the low rate at the earlier timing (77 to 78% control). Field pennycress (THLAR) control ranged from 93 to 97% with the first timing and from 75 to 88% with the later timing. Tralkoxydim controlled wild oat better when applied early (90%) compared to later (75%). Grain yield was not different among herbicide treated plots and the untreated control. Grain yield in plots treated with MON 37500 at 0.031 lb/A at the later timing was statistically greater than yield from plots treated with tralkoxydim at the same timing. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Wild oat, quackgrass, and broadleaf weed control with MON 37500 and tralkoxydim in winter wheat.

		Wild oat	Winter wheat		Weed control[3]				
Treatment[1]	Rate	stage	Injury[2]	Yield	AVEFA	AGRRE	THLAR	ANTCO	AMSIN
	lb/A	leaves	%	lb/A			%		
MON 37500	0.013	1-3	0	5022	72	78	93	77	77
MON 37500	0.018	1-3	0	5071	75	90	97	85	85
MON 37500	0.025	1-3	0	5287	82	90	97	90	87
Tralkoxydim	0.2	1-3	0	4691	90	0	0	0	0
MON 37500	0.016	4-5	0	5275	70	90	75	95	92
MON 37500	0.023	4-5	0	5036	75	93	85	95	92
MON 37500	0.031	4-5	0	5565	80	88	88	97	94
Tralkoxydim	0.25	4-5	0	4537	75	0	0	0	3
Untreated	-----	---	0	4908	--	--	--	--	--
		LSD $_{(0.05)}$		966	7	6	15	5	5

[1]MON 37500 treatments were applied with a 90% nonionic surfactant at 0.2% v/v at the 1 to 3 leaf stage and 0.25% v/v at the 4 to5 leaf stage. TF8035 (crop oil and nonionic surfactant blend) at 0.4% v/v was applied with the tralkoxydim treatment at the 1 to 3 leaf stage and at 0.5% v/v at the 4 to 5 leaf stage.
[2]May 27 evaluation.
[3]June 11 evaluation for THLAR, July 8 evaluation at wild oat and quackgrass heading for all other species.

Italian ryegrass control with MON 37500 in winter wheat. Wayne S. Belles and Donald C. Thill. The objective of this study was to determine the effectiveness of MON 37500 for the control of Italian ryegrass in winter wheat. Winter wheat (var. Cashup) was seeded on October 3, 1996 in a silt loam soil (26% sand, 64% silt, 10% clay, pH 6.1, CEC 18.6 and 6.1% organic matter). Treatments were applied postemergence at two stages of Italian ryegrass development, on either May 5 or May 13 (Table 1) with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi. Treatments were replicated four times in a randomized complete block design. Plots were 8 by 30 feet. Weed control and crop injury evaluations were made visually during the growing season. Plots were harvested August 15, 1997 with a small plot combine from an area 4.1 by 27 feet per plot and yields determined.

Table 1. Application data.

	May 5, 1997	May 16, 1997
Crop stage	4 to 5 lf/2 to 3 tiller	5 to 6 lf/4 to 5 tiller
Italian ryegrass	1 to 4 leaf	2 to 5 lf/0 to 1 tiller
Mayweed chamomile	1 to 2 inches in diameter	4 to 6 inches tall
Air temp (F)	50	52
Relative humidity (%)	72	40
Wind (mph)	1	0
Sky	partly cloudy	clear
Soil temp at 4 inches (F)	55	62

Wheat was not injured with any herbicide treatment in this study. Italian ryegrass (LOLMU) control ranged from 53 to 91% with higher control achieved at the later timing, which may have been due, in part, to the reduced rates at the earlier application or to emergence of additional Italian ryegrass plants. The highest rate of MON 37500 and tralkoxydim applied at the later timing controlled Italian ryegrass approximately 90%. Mayweed chamomile (ANTCO) control was over 90% with all MON 37500 treatments. Winter wheat yields from herbicide treated plots were not significantly different than those from the untreated control. Grain yield from plots treated with MON 37500 at 0.018 lb/A applied at the earlier timing was greater than yield from plots treated with MON 37500 at 0.023 lb/A at the later timing. Plant Science Division, University of Idaho Moscow, ID 83844-2339)

Table 2. The effect of MON 37500 and tralkoxydim on Italian ryegrass control, winter wheat injury and grain yield.

Treatment[1]	Rate	Italian ryegrass stage	Winter wheat Injury[2]	Winter wheat Yield	Weed control LOLMU	Weed control ANTCO
	lb/A	leaves	%	lb/A	%	
MON 37500	0.013	1-4	0	5421	53	92
MON 37500	0.018	1-4	0	6175	65	98
MON 37500	0.025	1-4	0	5381	54	100
Tralkoxydim	0.2	1-4	0	6021	53	0
MON 37500	0.016	4-5	0	5403	68	99
MON 37500	0.023	4-5	0	5095	74	100
MON 37500	0.031	4-5	0	5978	88	100
Tralkoxydim	0.25	4-5	0	6061	91	0
Untreated	-----	---	-	5168	--	---
		LSD $_{(0.5)}$	NS	1071	18	8
		Density (plants/ft^2)			10	4

[1]MON 37500 treatments were applied with a 90% nonionic surfactant at 0.2% v/v at the 1 to 2 leaf stage and 0.25% v/v at the 4 to 5 leaf stage. TF8035 (crop oil and nonionic surfactant blend) at 0.4% v/v was mixed with the tralkoxydim treatment at the 1 to 2 leaf stage and at 0.5% v/v at the 4 to5 leaf stage. May 5 rates are 80% of planned rates.
[2]May 23 evaluation.
[3]June 27 evaluation at Italian ryegrass heading.

Downy brome control in winter wheat with Mon 37500. Sandra L. Shinn and Donald C. Thill. A study was established near LaCrosse, Washington to evaluate downy brome control in winter wheat with Mon 37500. 'Madsen' winter wheat was planted on September 23, 1996 in a silt loam soil with a pH of 6.2, 27.2% sand, 8.8% clay, 64% silt and 0.77% organic matter. The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence at two application times, November 2, 1996 and March 21, 1997, with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). Winter wheat injury was evaluated visually on March 28, 1997. Downy brome (BROTE) plants were counted on March 19, and April 16, 1997 and evaluated visually on March 19, May 20, and July 18, 1997. Downy brome biomass was collected on May 28, 1997. Plants were harvested from a 2.7 ft^2 area, dried for 48 hours and weighed. Winter wheat was harvested at maturity on July 28, 1997 with a small plot combine from a 4.1 by 27 ft area.

Table 1. Application data.

	November 2, 1996	March 21, 1997
Timing	Fall	Spring
Crop stage	2 leaf	3 to 9 tillers
Weed stage	1 leaf	2 to 8 tillers
Density plants/ft^2	14 wheat / 6 brome	12 brome
Air temperature (F)	42	50
Relative humidity (%)	89	64
Wind (mph)	0 to 2 west	0 to 2 southwest
Cloud cover (%)	20	30
Soil temperature at 2 in. (F)	44	50

In March, fall applied Mon 37500 controlled downy brome 42 to 93% (Table 2). On May 20, 1997 the Mon 37500 fall and spring treatments controlled the downy brome 72 to 99% and 40 to 71% respectively. No fall treatment visibly injured the winter wheat. However, the winter wheat was injured 15% (chlorosis) by all spring treatments. By 19 DAT the spring injury was not visible. Fall applied Mon 37500 reduced the downy brome density to 1.6 to 9.1 plants/ft^2 compared to the untreated check which had 14.5 plants/ft^2 (Table 3). Wheat grain yield from herbicide treated plots ranged from 109 to 129 bu/A and was not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Downy brome control and winter wheat injury after herbicide treatments.

Treatment[1]	Rate	Timing	Downy brome control Mar 19, 1997	Downy brome control May 20, 1997	Downy brome control July 18, 1997	Winter wheat injury Mar 28, 1997
			(%)			
Mon 37500	0.016	Fall	42	59	72	--
Mon 37500	0.032	Fall	84	90	95	--
Mon 37500	0.064	Fall	93	97	99	--
Triasulfuron	0.016	Fall	13	0	0	--
Mon 37500	0.016	Spring	--	39	50	15
Mon 37500	0.032	Spring	--	69	58	15
Mon 37500	0.064	Spring	--	71	58	15
Triasulfuron	0.016	Spring	--	0	0	15
Untreated check	--	--	--	--	--	--
LSD (0.05)			24	18	10	0

[1] All treatments were applied with a non-ionic surfactant (R-11) at 0.50% v/v with Mon 37500 and 0.25% v/v with triasulfuron.

Table 3. Downy brome dry weight and plant densities, and winter wheat yield.

Treatment[1]	Rate	Timing	Downy brome densities Mar 19, 1997	Downy brome densities Apr 16, 1997	Biomass May 28, 1997	Wheat yield
			plants/ft^2		oz/ft^2	bu/A
Mon 37500	0.016	Fall	9.1	8.9	0.03	121
Mon 37500	0.032	Fall	3.1	3.3	0.01	129
Mon 37500	0.064	Fall	1.6	3.1	0.01	114
Triasulfuron	0.016	Fall	16.7	13.7	0.26	126
Mon 37500	0.016	Spring	--	11.9	0.11	117
Mon 37500	0.032	Spring	--	9.9	0.06	124
Mon 37500	0.064	Spring	--	8.9	0.04	120
Triasulfuron	0.016	Spring	--	13.6	0.39	109
Untreated check	--	--	14.6	11.2	0.18	116
LSD (0.05)			7.9	5.1	0.23	24

[1] All treatments were applied with a non-ionic surfactant (R-11) at 0.50% v/v with Mon 37500 and 0.25% v/v with triasulfuron.

Weed control in imidazolinone resistant winter wheat. Wayne S. Belles and Donald C. Thill. This study was designed to determine crop tolerance and weed control with AC 299,263 in winter wheat. FS-4 IR winter wheat was seeded October 9, 1996 in a loam soil (45% sand, 18% silt, 36% clay, pH 4.6, CEC 39.6 and 6.0% organic matter). Treatments were applied postemergence May 8 or May 16, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi with water as the carrier. The May 8 application rates are 80% of planned rates. Plots were 8 by 25 feet with treatments replicated four times in a randomized complete block design. Weed control and crop injury evaluations were made visually during the growing season. Plots were harvested August 11, 1997 with a small plot combine from an area 4.1 by 22 feet per plot and yields determined.

Table 1 Application data.

	May 8, 1997	May 16, 1997
Crop stage	4 to 5 tiller	6 tiller
Wild oat stage	1 to 3 leaf	3 to 5 leaf
Montia, narrowleaf	20% bloom	late bloom
Other broadleaf weeds	1 to 3 inches tall	1 to 4 inches tall
Air temp (F)	45	86
Relative humidity (%)	51	31
Wind (mph)	2	2
Sky	clear	clear
Soil temp at 4 inches (F)	45	74

Low to moderate wheat injury, primarily as chlorosis, was evident May 27, 1997 (Table 2), but was not visible at later evaluations (data not shown). Wild oat(AVEFA) was controlled 90% or better with all AC 299,263 treatments applied at the 3 to 5 leaf wild oat stage except at the lowest rate applied alone. Wild oat control was generally higher at the later application time than earlier which may have been due, at least in part, to wild oat emergence after the first application. Herbicide rates also were 20% less at the 1 to 3 leaf stage application. AC 299,263 did not control mayweed chamomile(ANTCO). Control was 90% with diclofop + thifensulfuron/tribenuron. Douglas knotweed(POLDO) control was 90% or better with all treatments except the earlier applications timing of AC 299,263 applied without Sun-It II or bromoxynil/MCPA. As with Douglas knotweed, wild buckwheat was not controlled with the early applications of AC 299,263 applied without Sun-It II or bromoxynil/MCPA. Other treatments controlled wild buckwheat 75 to 90%. Commercially acceptable control of narrowleaf montia(MNTLI) was not obtained with any herbicide treatment. Winter wheat grain yields varied from 3,430 to 4,663 lb/A. Grain yield was greater than the untreated check in three treatments; AC 299,263 + Sun-It II at 0.019 + 0.8 and diclofop + thifensulfuron/tribenuron, applied on May 8 and the May 16 application of AC 299,263. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Winter wheat response and weed control from herbicide treatments.

Treatment[1]	Rate[2]	Wild oat stage	Winter wheat Injury[3]	Winter wheat Yield	AVEFA	Weed control[4] ANTCO	POLDO	POLCO	MNTLI
	lb/A + qts/A	leaves	%	lb/A		%			
AC 299,263	0.019	1-3	4	4207	35	0	0	0	0
AC 299,263	0.026	1-3	1	4120	39	0	0	0	0
AC 299,263	0.032	1-3	5	3955	43	0	0	0	0
AC 299,263	0.038	1-3	3	3858	25	0	0	0	3
AC 299,263 + bromoxynil/MCPA	0.019 + 0.6	1-3	4	4139	76	41	94	91	55
AC 299,263 + Sun-It II	0.019 + 0.8	1-3	5	4258	83	0	94	78	28
AC 299,263 + Sun-It II	0.026 + 0.8	1-3	4	3430	86	30	98	86	23
Diclofop + thifensulfuron/tribenuron	0.8 + 0.011	1-3	8	4663	89	90	94	90	69
AC 299,263	0.024	3-5	9	4230	84	39	93	81	0
AC 299,263	0.032	3-5	9	3969	90	36	94	81	0
AC 299,263	0.040	3-5	4	3768	93	63	90	75	5
AC 299,263	0.048	3-5	9	3941	94	63	91	88	5
AC 299,263 + bromoxynil/MCPA	0.024 + 0.75	3-5	3	3873	94	81	93	81	43
AC 299,263 + Sun-It II	0.024 + 1.0	3-5	11	4093	91	65	90	86	3
AC 299,263 + Sun-It II	0.032 + 1.0	3-5	14	3688	96	75	95	83	10
Untreated check	------	---	--	3490	--	--	--	--	--
	LSD (0.05)		6	727	11	7	5	13	21

[1]All herbicide treatments except those with Sun-It II(methylated seed oil) were applied with a 90% nonionic surfactant at 0.2% v/v (1 to 3 leaf stage) or 0.25% (4 to 5 leaf stage). The 32% N solution at 0.8 quarts/A (1 to 3 leaf stage) or 1.0 quart/A (3 to 5 leaf stage) was applied with all treatments except diclofop + thifensulfuron/tribenuron.

[2]Sun-It II applied in quarts/A, all herbicides applied in lb/A.

[3]May 27, 1997 evaluation.

[4]July 8, 1997 evaluation for all weed species except narrowleaf montia, which was evaluated May 27, 1997.

Grass and broadleaf weed control in winter wheat with MON 37500. Traci A. Rauch and Donald C. Thill. Studies were established in winter wheat near Tammany, ID and Harvard, ID to evaluate grass and broadleaf weed control with three application timings of MON 37500. 'Promontory' winter wheat was seeded on November 6, 1996 at Tammany, and 'Madsen' winter wheat was seeded on September 30, 1997 at Harvard. At both locations, the experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 ft. Herbicide treatments were applied at three timings: February 25, April 5, and April 17, 1997 at Tammany (Table 1) and April 2, May 12, and May 22, 1997 at Harvard (Table 2) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi and 3 mph. Winter wheat injury was evaluated visually on March 25, April 28, and May 21, 1997 at Tammany and April 9, May 22, and June 24, 1997 at Harvard. Weed control was evaluated visually for brome species at Tammany, and quackgrass (AGRRE), mayweed chamomile (ANTCO), prostrate knotweed (POLAV), lowland cudweed (GNAPA), and narrowleaf montia at Harvard. Winter wheat was harvested with a small plot combine from a 4.1 by 27 ft area on August 11, 1997 at Tammany. Wheat was not harvested at Harvard because the stand was sparse and variable.

Table 1. Application data at Tammany, Idaho.

Application date	February 25, 1997	April 5, 1997	April 17, 1997
Wheat growth stage	1 leaf	3 leaves	2 tillers
Brome species growth stage	preemergence	3 to 4 leaves	2 tillers
Air temperature (F)	35	38	59
Relative humidity (%)	85	50	79
Wind (mph, direction)	0 to 2, NW	2 to 4, NW	1, SE
Cloud cover (%)	99	80	90
Soil temperature at 2 inches (F)	32	32	50
Soil Texture		silt loam	
pH		4.4	
OM (%)		3.87	
CEC (meq/100g)		20.7	

Table 2. Application data at Harvard, Idaho.

Application date	April 2, 1997	May 12, 1997	May 22, 1997
Wheat growth stage	1 leaf	3 leaves	2 tillers
AGRRE growth stage	preemergence	1 to 2 leaves	1 tiller
ANTCO growth stage	preemergence	cotyledon	2 leaves
POLAV growth stage	preemergence	1 inch in diameter	3 inches in diameter
GNAPA growth stage	preemergence	2 inches in diameter	5 inches in diameter
Montia growth stage	1 inch tall	2 inches tall	2 inches tall
Air temperature (F)	42	49	49
Relative humidity (%)	46	76	72
Wind	Calm	Calm	Calm
Cloud cover (%)	0	25	2
Soil temperature at 2 inches (F)	32	46	50
Soil Texture		silt loam	
pH		5.4	
OM (%)		3.78	
CEC (meq/100g)		14.0	

Chlorsulfuron/metsulfuron + metribuzin injured winter wheat 5 to 6% at Harvard (Table 3). No treatment injured wheat at Tammany (data not shown). All MON 37500 treatments controlled quackgrass 86% or better. Chlorsulfuron/metsulfuron and triasulfuron, with or without metribuzin, suppressed quackgrass 22 to 52%. All treatments, except MON 37500 at 0.016 lb/A rate at the 3 leaf and 2 tiller wheat stage, controlled mayweed 95% or more. All treatments controlled prostrated knotweed, lowland cudweed, and montia 70 to 99%. MON 37500 at 0.031 lb/A for all timings controlled the brome species 84 to 96 %. Chlorsulfuron/metsulfuron + metribuzin and triasulfuron alone and with metribuzin only suppressed brome species 28 to 34%. Wheat seed yield ranged from 2848 to 3716 lb/A. Seed yield for wheat treated with MON 37500 at the 0.027 lb/A (1 leaf wheat stage) and 0.031 lb/A rate (2 tiller wheat stage) was greater than the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 3. Wheat response and weed control with MON 37500 at Harvard and Tammany, ID.

			Harvard						Tammany	
		Wheat	Wheat	Weed control						Wheat
Treatment[1]	Rate	stage	injury[2]	AGRRE	ANTCO	POLAV	GNAPA	Montia	Brome[3]	yield
	lb/A		%							lb/A
MON 37500	0.016	1 leaf	0	86	97	99	91	96	55	3001
MON 37500	0.023	1 leaf	0	98	98	99	82	97	85	3398
MON 37500	0.027	1 leaf	0	99	98	99	93	99	82	3656
MON 37500	0.031	1 leaf	0	99	98	99	88	99	96	3515
Triasulfuron	0.026	1 leaf	0	35	98	99	99	98	34	3260
Chlorsulfuron/metsulfuron	0.019	1 leaf	0	43	98	99	99	99	71	3394
Triasulfuron +	0.026	1 leaf	5	52	99	99	98	99	29	3084
metribuzin	0.234	1 tiller								
Chlorsulfuron/metsulfuron +	0.019	1 leaf	6	22	98	99	98	99	28	3032
metribuzin	0.234	1 tiller								
MON 37500	0.016	3 leaf	0	85	81	90	77	98	38	2761
MON 37500	0.023	3 leaf	0	99	98	99	88	99	74	3343
MON 37500	0.027	3 leaf	0	99	96	98	83	99	78	3419
MON 37500	0.031	3 leaf	0	99	97	98	80	99	84	3185
MON 37500	0.016	2 tiller	0	87	78	82	70	91	73	3459
MON 37500	0.023	2 tiller	0	99	95	90	70	88	80	3427
MON 37500	0.027	2 tiller	0	99	99	78	90	96	64	3344
MON 37500	0.031	2 tiller	0	99	99	94	72	91	88	3716
Untreated check			--	--	--	--	--	--	--	2848
LSD (0.05)			3	33	14	16	18	6	32	776
Density (plants/ft^2)				7	8	3	12	2	9	

[1] All treatments, except metribuzin, were applied with a 90% nonionic surfactant at the 0.5% v/v rate. Chlorsulfuron/metsulfuron is the commercial formulation for chlorsulfuron and metsulfuron.
[2] June 24, 1997 evaluation.
[3] Mixture of ripgut and downy brome.

Winter wheat response and weed control from fluroxypyr and grass herbicide combinations. Wayne S. Belles and Donald C. Thill. This study was established near Moscow, ID, to determine the effectiveness of fluroxypyr mixed with grass herbicides on the control of wild oat in winter wheat. Winter wheat (var. Madsen) was seeded October 4, 1996 in a silt loam soil (26% sand, 60% silt, 14% clay, pH 5.2, CEC 18.7 and 3.8% organic matter). Treatments were applied postemergence May 7, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi to winter wheat with 3 tillers, 1 to 3 leaf grass weeds and 1 to 4 leaf broadleaf weeds. Environmental conditions at application were as follows; air temperature 62 F, relative humidity 58%, wind 4 mph, partly cloudy sky and soil temperature at 4 inches 62 F. Treatment rates were 80% of planned rates. Treatments were replicated four times in a randomized complete block design. Plots were 8 by 30 feet. Weed control and crop injury evaluations were made visually during the growing season. Plots were harvested on August 28, 1997 with a small plot combine from an area 4.1 by 27 feet per plot and yields determined.

Wheat injury was 6% or less on May 15, 1997, 8 days after application. No injury was visible at the next evaluation June 2, 1997 (data not shown). Wild oat (AVEFA) control ranged from 66 to 89%. Control with fluroxypyr plus a grass herbicide was comparable to control with the grass herbicide applied alone, indicating no antagonism. Interrupted windgrass (APEIN) was controlled 61, 64, and 81% with fenoxaprop/safener, tralkoxydim and imazamethabenz, respectively. The addition of fluroxypyr to these treatments significantly increased control of APEIN. Quackgrass (AGRRE) and mayweed chamomile (ANTCO) were not controlled by any treatment in this study. Volunteer lentil (LENCU) control with the tank mix combination of fluroxypyr + imazamethabenz was significantly greater than with either compound applied alone. Erect knotweed (POLER) control ranged from 48 (fluroxypyr + fenoxaprop/safener) to 78% (fluroxypyr + imazamethabenz). Grain yield in all herbicide treated plots, except fluroxypyr applied alone, was significantly greater than those from the untreated control plots. Yield from fluroxypyr + tralkoxydim treated plots was statistically greater than yield from plots treated with fluroxypyr, diclofop, or imazamethabenz applied alone. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Winter wheat response and weed control from herbicide treatments.

		Winter wheat		Weed control[2]					
Treatment[1]	Rate	Injury	Yield	AVEFA	APEIN	AGRRE	ANTCO	LENCU	POLER
	lb/A	%	lb/A	%					
Fluro	0.075	0	3710	0	0	0	0	63	73
Fluro + tralkoxydim	0.075 + 0.144	0	4611	84	80	0	0	50	63
Fluro + diclofop	0.075 + 0.8	4	4408	83	0	0	0	68	45
Fluro + imazameth	0.075 + 0.38	0	4455	75	93	0	0	78	78
Fluro + difenzoquat	0.075 + 0.8	4	3979	66	0	0	0	66	53
Fluro + fenox	0.075 + 0.084	5	4344	89	80	0	0	64	48
Tralkoxydim	0.144	1	3943	83	64	0	0	0	0
Diclofop	0.8	3	3861	74	0	0	0	0	0
Imazameth	0.38	1	3852	83	81	0	0	55	0
Difenzoquat	0.8	6	4237	71	0	0	0	0	0
Fenox	0.084	0	4017	81	61	0	0	0	0
Untreated check	----	--	3146	--	--	--	--	--	--
LSD $_{(0.05)}$		4	678	9	14	NS	NS	13	14
Density (plants/ft^2)				20	8	2	17	7	2

[1]All treatments containing difenzoquat or imazamethabenz were applied with a 90% nonionic surfactant at 0.2% v/v, treatments containing tralkoxydim were applied with TF8035 at 0.4% v/v; fluro = fluroxypyr, imazameth = imazamethabenz, fenox = fenoxaprop/safener.
[2]July 7, 1997 evaluation taken at wild oat heading.

Carfentrazone and carfentrazone combinations with various grass herbicides. Wayne S. Belles and Donald C. Thill. This trial was established near Moscow, Idaho to evaluate combinations of carfentrazone and carfentrazone premixes with various grass herbicides in winter wheat. Winter wheat (var. Cashup) was seeded October 2, 1996 in a loam soil (40% sand, 46% silt, 14% clay, pH 4.9, CEC 29.7 and 6.0% organic matter). The experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 feet. Treatments were applied postemergence on May 7, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi, to winter wheat with 4 tillers, 2 to 3 leaf wild oat (AVEFA) and 2 to 4 leaf mayweed chamomile (ANTCO) and common lambsquarters (CHEAL). Rates applied were 80% of planned rates. Environmental conditions at application were as follows; air temperature 60 F, relative humidity 56%, wind 2 mph, clear sky and soil temperature at 4 inches 55 F. Wheat injury and weed control were evaluated visually during the growing season. Winter wheat was harvested with a small plot combine August18, 1997 from a 4.1 by 27 foot area of each plot.

Tralkoxydim tank mixes with carfentrazone or its premixes and the 3-way tank mixes of carfentrazone or carfentrazone/MCPA + imazamethabenz + difenzoquat injured wheat 14 to 23% on May 17, 1997 however, wheat injury was not evident June 2 (data not shown). Wheat yields in plots treated with fenoxaprop/safener and imazamethabenz applied alone or in combination with carfentrazone or its premixes were all statistically greater than yield from untreated check plots. Wheat yield was statistically greater than the untreated check when tralkoxydim was applied alone but not when applied in combination with carfentrazone or its premixes.

At wild oat heading, grass herbicides applied alone controlled wild oat 79 to 98%. Tralkoxydim and imazamethabenz + difenzoquat applied alone controlled wild oat better than when mixed with carfentrazone/MCPA. Wild oat control was not affected when carfentrazone alone or its premixes were combined with fenoxaprop/safener or imazamethabenz. Carfentrazone/2,4-D and carfentrazone/2,4-D + tralkoxydim were the only two treatments that controlled mayweed chamomile 89% or greater. In general, carfentrazone/2,4-D controlled mayweed chamomile better than carfentrazone or carfentrazone/MCPA. Carfentrazone alone or in premixes, tended to control mayweed chamomile better than when in combination with grass herbicides. This was due in part to increased wild oat competition with mayweed chamomile when no wild oat herbicide was applied. Broadleaf herbicide treatments controlled common lambsquarters 98 to 100%. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339).

Table. Winter wheat response and weed control from herbicide treatments.

Treatment[1]	Rate	Winter wheat Injury[2]	Winter wheat Yield	Weed control[3] AVEFA	Weed control[3] ANTCO	Weed control[3] CHEAL
	lb/A	%	lb/A		%	
Carfentrazone	0.018	7	3759	0	74	100
Carfentrazone/MCPA	0.018/0.28	6	3414	0	79	100
Carfentrazone/2,4-D	0.018/0.21	5	4177	0	93	100
Carfentrazone + fenoxaprop/safener	0.018 + 0.084	6	6015	93	50	100
Carfentrazone/MCPA + fenoxaprop/safener	0.018/0.28 + 0.084	9	5466	94	50	100
Carfenrazone/2,4-D + fenoxaprop/safener	0.018/0.21 + 0.084	6	5620	84	79	100
Fenoxaprop/safener	0.084	1	5623	98	8	0
Carfentrazone + imazamethabenz	0.018 + 0.38	8	4974	79	38	100
Carfentrazone/MCPA + imazamethabenz	0.018/0.28 + 0.38	3	5123	74	33	100
Carfentrazone/2,4-D + imazamethabenz	0.018/0.21 + 0.38	0	5294	70	61	100
Imazamethabenz	0.38	0	5019	85	0	0
Carfentrazone + tralkoxydim	0.018 + 0.144	23	4849	79	48	99
Carfentrazone/MCPA + tralkoxydim	0.018/0.28 + 0.144	23	4488	35	69	98
Carfentrazone/2,4-D + tralkoxydim	0.018/0.21 + 0.144	19	4621	70	89	100
Tralkoxydim	0.144	1	5900	85	0	0
Carfentrazone + imazamethabenz + difenzoquat	0.018 + 0.188 + 0.4	15	5141	58	43	100
Carfentrazone/MCPA + imazamethabenz + difenzoquat	0.018/0.28 + 0.188 + 0.4	14	4662	49	65	100
Carfentrazone/2,4-D + imazamethabenz + difenzoquat	0.018/0.21 + 0.188 + 0.4	7	4906	60	56	100
Imazamethabenz + difenzoquat	0.188 + 0.4	1	4831	79	0	10
Untreated check	---	--	3855	--	--	--
	LSD (0.05)	5	1051	16	16	7
	Density (plants/ft²)			15	5	1

[1]Tralkoxydim treatments were applied with TF8035 (mineral oil and nonionic surfactant blend) at 0.4% v/v, all other herbicide treatments were applied with a 90% non-ionic surfactant at 0.2% v/v.

[2]May 17, 1997 evaluation 10 days after treatment.

[3]June 30, 1997 evaluation at wild oat heading.

Prosulfuron, Bivert, and wild oat herbicide tank mixes in winter wheat. Wayne S. Belles and Donald C. Thill. This study was established near Moscow, Idaho to evaluate the efficacy of wild oat/broadleaf weed herbicide combinations in winter wheat, and to determine the effectiveness of Bivert for reducing possible antagonism. Winter wheat (var. Cashup) was seeded October 3, 1996 in a loam soil (40% sand, 48% silt, 12% clay, pH 4.8, CEC 27.8 and 5.4% organic matter). Treatments were applied postemergence on May 8, 1997 with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 32 psi. Treatments were applied at 80% the planned rate. Environmental conditions at application were as follows; air temperature 50 F, relative humidity 51%, wind 2 mph, clear sky and soil temperature at 4 inches 45 F. Winter wheat had 2 to 4 tillers, wild oat (AVEFA) 1 to 4 leaves, mayweed chamomile (ANTCO) was 2 to 3 inches tall with 5 to 7 leaves. Plots were 8 by 30 feet with treatments replicated four times in a randomized complete block design. Wheat injury and weed control were evaluated visually during the growing season. Plots were harvested August 19 with a small plot combine from an area 4.1 by 27 feet per plot and yields determined.

No crop injury occurred. At wild oat heading, July 3, 1997, wild oat control ranged from 0 to 93% with treatments containing grass herbicides. No significant difference in wild oat control occurred when prosulfuron was tank mixed with diclofop compared to diclofop alone. When MCPA-amine was added as a third component to the tank mix complete antagonism (0% wild oat control) resulted. No significant difference in wild oat control resulted from the addition of prosulfuron or prosulfuron + MCPA-amine to fenoxaprop/safener or to fenoxaprop/MCPA/2,4-D. Wild oat control with tralkoxydim + TF 8035 was reduced significantly when prosulfuron or prosulfuron and MCPA-amine were added to the tank mix. Premixing Bivert + tralkoxydim and prosulfuron separately (tralkoxydim + Bivert) + (prosulfuron + Bivert) controlled wild oat better than other tralkoxydim + prosulfuron tank mixes and control was equivalent to tralkoxydim alone. Bivert had no effect on the wild oat control of tralkoxydim + thifenuron/tribenuron tank mixes in this study. All treatments containing broadleaf herbicides except the premix of fenoxaprop/MCPA/2,4-D controlled ANTCO 95 to 100%. Grain yields ranged from 1155 to 2996 lb/A and in general reflected wild oat control. Grain yield in plots treated with all herbicide treatments containing grass herbicides had yields significantly greater than the untreated control except for the 3-way tank mix of prosulfuron + MCPA-amine + diclofop-methyl, and the 2-way tank mixes of tralkoxydim + (thifenuron/tribenuron + Bivert) and (tralkoxydim + thifenuron/tribenuron + Bivert). (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Winter wheat response and weed control with herbicide treatments.

Treatment[1]	Rate[2]	Winter wheat Injury[3]	Winter wheat Yield	Weed control[4] AVEFA	Weed control[4] ANTCO
	lb/A	%	lb/A	%	
Prosulfuron	0.0144	0	1593	0	100
Prosulfuron + MCPA-amine	0.0144 + 0.304	0	1512	0	100
Diclofop	0.8	0	2573	76	0
Prosulfuron + diclofop	0.0144 + 0.8	0	2544	79	100
Prosulfuron + MCPA-amine + diclofop	0.0144 + 0.304 + 0.8	0	1155	0	100
Fenoxaprop/safener	0.084	0	2643	91	0
Prosulfuron + fenoxaprop/safener	0.0144 + 0.084	0	2943	93	100
Prosulfuron + MCPA-amine + fenoxaprop/safener	0.0144 + 0.304 + 0.084	0	2967	85	100
Fenoxaprop/MCPA/2,4-D	0.46	0	2934	88	28
Prosulfuron + fenoxaprop/MCPA/2,4-D	0.0144 + 0.46	0	2739	88	100
Prosulfuron + MCPA-amine + fenoxaprop/MCPA/2,4-D	0.0144 + 0.30 4 + 0.46	0	2205	80	100
Tralkoxydim	0.144	0	2353	83	0
Prosulfuron + tralkoxydim	0.0144 + 0.144	0	2496	60	100
Prosulfuron + MCPA-amine + tralkoxydim	0.0144 + 0.304 + 0.144	0	2280	55	100
(Tralkoxydim + Bivert)	(0.144 + Bivert)	0	2433	83	0
Tralkoxydim + (Prosulfuron + Bivert)	0.144 + (0.0144 + Bivert)	0	2996	58	100
Tralkoxydim + thifensulfuron/tribenuron	0.144 + 0.011	0	2385	35	96
Tralkoxydim + (thifensulfuron/tribenuron + Bivert)	0.144 + (0.011 + Bivert)	0	1994	20	95
(Tralkoxydim + Bivert) + (thifensulfuron/tribenuron + Bivert)	(0.144 + Bivert) + (0.011 + Bivert)	0	2611	38	98
(Tralkoxydim + Bivert) + (prosulfuron + Bivert)	(0.144 + Bivert) + (0.0144 + Bivert)	0	2947	76	100
(Tralkoxydim + thifenuron/tribenuron + Bivert)	(0.144 + 0.011 + Bivert)	0	1872	15	95
Untreated check		--	1159	--	--
	LSD $_{(0.05)}$	NS	841	13	6
	Density(plants/ft^2)			75	4

[1]TF8035 (mineral oil and nonionic surfactant blend) at 0.4% v/v was added to all treatments containing tralkoxydim; a nonionic surfactant at 0.2% v/v was added to other treatments containing a broadleaf herbicide.
[2]Bivert applied at the rate of two oz. Bivert to one pound product of the material within a parenthesis.
[3]May 15, 1997 evaluation.
[4]July 3, 1997 evaluation taken at wild oat heading.

Wild oat control in winter wheat with tralkoxydim in combination with broadleaf herbicides. Traci A. Rauch and Donald C. Thill. A study was established in 'Madsen' winter wheat near Moscow, Idaho to evaluate wild oat control with different tralkoxydim combinations. The experimental design was a randomized complete block with four replications, and individual plot size was 8 by 30 ft. Herbicide treatments were applied postemergence on May 8, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi and 3 mph (Table 1). Wheat injury was evaluated visually on May 14, May 29, and June 27, 1997. Wild oat control was evaluated on June 27 and August 8, 1997. Wheat was harvested with a small plot combine on August 17, 1997 from a 4.1 by 27 ft area of each plot.

Table 1. Application and soil data.

Wheat growth stage	3 tillers
Wild oat growth stage	4 leaves
Air temperature (F)	68
Relative humidity (%)	49
Wind	Calm
Cloud cover	Clear
Soil temperature at 2 in. (F)	55
Soil texture	silt loam
Sand (%)	40
Silt (%)	51.2
Clay (%)	8.8
Organic matter (%)	3.9
pH	5.8

Tralkoxydim + bromoxynil injured wheat (stunting) 1 to 6% on May 14, but no injury was visible on June 27 (Table 2). Tralkoxydim + 2,4-D ester with and without ammonium sulfate (AMS) injured wheat 13 to 14 % on May 14 and 10 to 11% on June 27. Compared to tralkoxydim + AMS, tralkoxydim combined with all rates of prosulfuron, with or without AMS, reduced wild oat control 55 to 69%. When tralkoxydim was combined with 2,4-D ester, wild oat control was 50%. Grain yield ranged from 6556 to 7388 lb/A and was not significantly different from the untreated check. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Wild oat control, winter wheat injury and grain yield with tralkoxydim combinations.

Treatment[1]	Rate	Wheat injury 5/14/97	Wheat injury 6/27/97	Wild oat control[2]	Wheat yield
	lb/A	---%	---	---	lb/A
Tralkoxydim + AMS	0.18 + 1.5	0	0	95	6556
Tralkoxydim + bromoxynil/MCPA	0.18 + 0.75	4	0	88	6968
Tralkoxydim + bromoxynil/MCPA +AMS	0.18 + 0.75 +1.5	5	0	94	7268
Tralkoxydim + bromoxynil	0.18 + 0.5	6	0	89	7108
Tralkoxydim + bromoxynil + AMS	0.18 + 0.5 +1.5	1	0	94	7055
Tralkoxydim + fluroxypyr	0.18 + 0.094	0	0	95	6761
Tralkoxydim + fluroxypyr + AMS	0.18 + 0.094 + 1.5	0	0	99	6782
Tralkoxydim + 2,4-D ester	0.18 + 0.5	13	10	50	6570
Tralkoxydim + 2,4-D ester + AMS	0.18 + 0.5 +1.5	14	11	82	6954
Tralkoxydim + clopyralid/MCPA	0.18 + 0.61	1	0	98	6830
Tralkoxydim + clopyralid/MCPA +AMS	0.18 + 0.61 + 1.5	0	0	98	6894
Tralkoxydim + prosulfuron	0.18 + 0.009	0	0	43	7266
Tralkoxydim + prosulfuron + AMS	0.18 + 0.009 + 1.5	0	0	29	7279
Tralkoxydim + prosulfuron	0.18 + 0.018	0	0	43	7042
Tralkoxydim + prosulfuron + AMS	0.18 + 0.018 + 1.5	0	0	40	7388
Untreated check	--	--	--	--	6968
LSD (0.05)		4	2	23	NS
Density (plants/ft^2)				4	

[1]TF8035, an adjuvant, was applied with all treatments at 0.5% v/v. Bromoxynil/MCPA and clopyralid/MCPA wer applied as commercial formulations. AMS = ammonium sulfate.
[2]August 8, 1997 evaluation.

Wild oat control in winter wheat with wild oat and sulfonylurea herbicide. Suzy M. Sanders and Donald C.Thill. Experiments were established during spring, 1997 near Bonners Ferry, Idaho to evaluate wild oat control in winter wheat with thifensulfuron/tribenuron and metsulfuron in combination with wild oat herbicides. Difenzoquat and imazamethabenz were tested in one experiment and diclofop-methyl, fenoxaprop/safener, and tralkoxydim were tested in experiment two. 'Promontory' winter wheat was seeded in October, 1996 in a loam soil (31.6% sand, 42.0% silt, 26.4% clay) with a pH of 7.7 and 5.54% organic matter. The experimental design for both experiments was a randomized complete block with four replications and individual plots were 8 by 27 ft. Herbicide treatments were applied in both experiments post-emergence on May 14, 1997 with a CO_2 backpack sprayer delivering 10 gpa at 30 psi with additional applications on May 19, 1997 (Table 1). Crop injury was evaluated May 19, June 6, and July 1, 1997. Wild oat control was evaluated on June 6 and at heading on July 1, 1997. Winter wheat was harvested with a small plot combine from a 4.4 by 27 ft area on August 14, 1997.

Table 1. Application data.

	May 15, 1997	May 19, 1997
Crop stage	2 tiller	3 tiller
Wild oat stage	4 leaf	4 leaf
Air temperature (F)	72	68
Relative humidity (%)	52	48
Wind (mph)	0 to 2	0 to 2
Cloud cover	Partly cloudy	Mostly cloudy
Soil temperature at 2 in. (F)	65	64

All treatments with difenzoquat at 1.0 lb/A injured wheat 25 to 43% at 22 DAT (data not shown). Injury was seen as severe stunting and was still significant at 42 DAT. Wheat treated with difenzoquat at 0.5 lb/A was injured 0 to 23% at 22 DAT but grew out of injury by 42 DAT. In experiment one, thifensulfuron/tribenuron at 0.0071 lb/A with metsulfuron at 0.0019 lb/A and imazamethabenz at 0.47 lb/A controlled wild oat 81% and was the only treatment with greater than 64% control (Table 2). Difenzoquat, imazamethabenz, and difenzoquat + imazamethabenz, all combined with thifensulfuron/tribenuron + metsulfuron (0.0141 + 0.0038 lb/A) controlled wild oat 61, 63, and 56%, respectively. These herbicides were not antagonistic since applications of difenzoquat, imazamethabenz, and a combination of both applied alone and four days later at the same rates controlled wild oat 45, 30, 50, 30, 25, and 25% control respectively. Grain yield ranged from 30 to 60 bu/A and was highest with imazamethabenz at 0.47 lb/A + thifensulfuron/tribenuron at 0.0071 lb/A + metsulfuron at 0.0019 lb/A. Grain yield was statistically similar in all but three wild oat herbicide treatments.

All treatments with fenoxaprop/safener controlled wild oat 91% or greater, which was significantly higher than all other treatments (Table 3). Tralkoxydim at 0.18 lb/A controlled wild oat 75% and tralkoxydim at 0.18 lb/A with thifensulfuron at 0.0234 lb/A controlled wild oat 60%. No other treatments controlled wild oat greater than 40%. Wheat treated with fenoxaprop/safener had the highest grain yields, ranging from 70 to 78 bu/A. These yields were statistically similar to tralkoxydim at 0.18 lb/A, which was 64 bu/A and tralkoxydim at 0.18 lb/A with thifensulfuron at 0.0234 lb/A which was 62 bu/A. Grain yield in all other treatments with a wild oat herbicide ranged from 48 to 55 bu/A. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Wild oat (AVEFA) control and winter wheat yield with difenzoquat and imazamethabenz.

Treatment[1]	Rate	AVEFA control	Wheat yield
	lb/A	%	bu/A
Thifensulfuron	0.0234	0	50
Thifensulf/triben[2] + metsulfuron	0.0141 + 0.0038	8	33
Thifensulf/triben + metsulfuron	0.0071 + 0.0019	0	30
Thifensulfuron + difenzoquat	0.0234 + 1.0	64	52
Thifensulf/triben + metsulfuron + difenzoquat	0.0141 + 0.0038 + 1.0	61	43
Thifensulf/triben + metsulfuron + difenzoquat	0.0071 + 0.0019 + 1.0	55	41
Thifensulf/triben + metsulfuron + difenzoquat[3]	0.0141 + 0.0038 + 1.0	30	35
Difenzoquat	1.0	45	37
Thifensulfuron + imazamethabenz	0.0234 + 0.47	50	51
Thifensulf/triben + metsulfuron + imazamethabenz	0.0141 + 0.0038 + 0.47	63	47
Thifensulf/triben + metsulfuron + imazamethabenz	0.0071 + 0.0019 + 0.47	81	60
Thifensulf/triben + metsulfuron + imazamethabenz[3]	0.0141 + 0.0038 + 0.47	25	47
Imazamethabenz	0.47	30	49
Thifensulfuron + imazamethabenz + difenzoquat	0.0234 + 0.235 + 0.5	48	43
Thifensulf/triben + metsulfuron + imazamethabenz + difenzoquat	0.0141 + 0.0038 + 0.235 + 0.5	56	44
Thifensulf/triben + metsulfuron + imazamethabenz + difenzoquat	0.0071 + 0.0019 + 0.235 + 0.5	53	50
Thifensulf/triben + metsulfuron + imazamethabenz[3] + difenzoquat[3]	0.0141 + 0.0038 + 0.235 + 0.5	25	34
Imazamethabenz + difenzoquat	0.235 + 0.5	58	51
Untreated check	--	--	30
$LSD_{(0.05)}$	--	25	17
Density (plants/ft^2)		80	

[1]All treatments were applied with a 90% nonionic surfactant at 0.25% v/v.
[2]Thifensulf/triben = thifensulfuron/tribenuron applied as the packaged formulation.
[3]Applied 4 days after initial treatment of thifensulfuron/tribenuron + metsulfuron.

Table 3. Wild oat (AVEFA) control and winter wheat yield with diclofop-methyl, fenoxaprop/safener, and tralkoxydim.

Treatment[1]	Rate	AVEFA control	Wheat yield
	lb/A	%	bu/A
Thifensulfuron	0.0234	0	32
Thifensulf/triben[2] + metsulfuron	0.014 + 0.0038	3	35
Thifensulf/triben + metsulfuron	0.0071 + 0.0019	3	42
Thifensulfuron + diclofop-methyl	0.0234 + 1.0	8	48
Thifensulf/triben + metsulfuron + diclofop-methyl	0.0141 + 0.0038 + 1.0	20	54
Thifensulf/triben + metsulfuron + diclofop-methyl	0.0071 + 0.0019 + 1.0	10	53
Thifensulf/triben + metsulfuron + diclofop-methyl[3]	0.0141 + 0.0038 + 1.0	28	55
Diclofop-methyl	1.0	8	51
Thifensulfuron + fenoxaprop/safener[4]	0.0234 + 0.097	93	74
Thifensulf/triben + metsulfuron + fenoxaprop/safener	0.0141 + 0.0038 + 0.097	91	70
Thifensulf/triben + metsulfuron + fenoxaprop/safener	0.0071 + 0.0019 + 0.097	94	72
Thifensulf/triben + metsulfuron + fenoxaprop/safener[3]	0.0141 + 0.0038 + 0.097	94	71
Fenoxaprop/safener	0.097	93	78
Thifensulfuron + tralkoxydim	0.0234 + 0.18	60	62
Thifensulf/triben + metsulfuron + tralkoxydim	0.0141 + 0.0038 + 0.18	10	48
Thifensulf/triben + metsulfuron + tralkoxydim	0.0071 + 0.0019 + 0.18	15	51
Thifensulf/triben + metsulfuron + tralkoxydim[3]	0.0141 + 0.0038 + 0.18	40	54
Tralkoxydim	0.18	75	64
Untreated check	--	--	33
$LSD_{(0.05)}$	--	15	14
Density (plants/ft^2)		54	

[1]All treatments were applied with a 90% nonionic surfactant at 0.25% v/v.
[2]Thifensulf/triben = thifensulfuron/tribenuron applied as the packaged formulation.
[3]Applied 4 days after initial treatment treatment of thifensulfuron/tribenuron + metsulfuron.
[4]Fenoxaprop/safener was applied as the packaged formulation.

Field bindweed control in winter wheat with BAS 589 03H. Traci A. Rauch and Donald C. Thill. A study was established in 1996 near Moscow, Idaho to evaluate winter wheat response and field bindweed control with BAS 589 03H. The experimental design was a randomized complete block with four replications, and individual plots were 16 by 30 ft. Treatments were applied with a CO_2 pressurized backpack sprayer on August 30, 1996 delivering 10 gpa at 30 psi and on September 19, 1997 delivering 20 gpa at 40 psi (Table 1). Field bindweed control was evaluated visually on September 25, 1996, June 2, August 7, and September 30, 1997. 'Madsen' winter wheat was seeded on September 26, 1996. Winter wheat injury was evaluated visually on October 24, 1996. A 4.1 by 27 ft area was harvested on August 11, 1997. Wheat stubble was tilled with a moldboard plow on October 10, 1997. Additional applications will be made in 1998.

Table 1. Application data and soil analysis.

Application date	August 30, 1996		September 19, 1997
Growth stage	8 to 12 in. runners		6 to 10 in. runners
Air temperature (F)	59		68
Relative humidity (%)	54		50
Wind (mph)	0		1
Cloud cover (%)	0		40
Soil temperature at 2 in. (F)	54		60
pH		6.3	
OM (%)		4.0	
Texture		silt loam	

Winter wheat was not injured by any herbicide treatment on October 24, 1996 (data not shown). All herbicide treatments controlled bindweed 95% or better except 2,4-D (Table 2). Winter wheat yield ranged from 7653 to 8313 lb/A, and glyphosate/2,4-D+AMS was the only treatment where grain yield was greater than the untreated check. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Field bindweed control and wheat yield with BAS 589 03H and other herbicide combinations.

Treatment[1]	Rate	Timing	Field bindweed control[2]	Winter wheat yield
	lb/A		%	lb/A
BAS 589 03H	1.25	Summer 1996	98	7839
BAS 589 03H	0.62	Fall 1997		
BAS 589 03H	0.62	Summer 1998		
BAS 589 03H	1.25	Summer 1996	95	7788
BAS 589 03H	1.25	Fall 1997		
BAS 589 03H	0.62	Summer 1998		
Glyphosate/2,4-D + AMS	1+1.7	Summer 1996	98	8313
Glyphosate/2,4-D + AMS	1 +1.7	Fall 1997		
Glyphosate/2,4-D + AMS	1+1.7	Summer 1998		
2,4-D	0.95	Summer 1996	73	7964
2,4-D	0.95	Fall 1997		
2,4-D	0.95	Summer 1998		
Dicamba + 2,4-D	0.5 + 0.95	Summer 1996	96	8008
Dicamba + 2,4-D	0.5 + 0.95	Fall 1997		
Dicamba + 2,4-D	0.5 + 0.95	Summer 1998		
Untreated check	--	--	--	7653
LSD(0.05)			24	582
Density (shoots/ft^2)			1	

[1] All BAS 589 03H treatments were applied with 0.94% v/v sunflower oil. Glyphosate/2,4-D is a commercial premix formulation. AMS = liquid ammonium sulfate.
[2] August 7, 1997 evaluation.

Soil persistence in winter wheat with trifluralin. Traci A. Rauch and Donald C. Thill. Experiments were established near Potlatch, and Lapwai, Idaho to evaluate the effect of fall-applied granular and spring-applied liquid trifluralin on soil persistence as it may affect winter wheat yield. Plots were 40 by 1200 ft at Potlatch and 36 or 60 by 1200 ft at Lapwai arranged in a randomized complete block with four replications. Granular trifluralin was applied prior to planting spring canola with a 'Velmar' air-assisted spreader on October 27, 1995 at Potlatch to standing grain stubble, and on November 6, 1995 at Lapwai to plowed grain stubble (Table 1). The trifluralin was incorporated with a chisel plow and disc on October 27, 1996 at Potlatch and a field cultivator on November 7, 1996 at Lapwai. The liquid trifluralin was applied with a tractor pulled sprayer and incorporated with a cultivator on May 1, 1996 at Potlatch and May 7, 1996 at Lapwai. Winter wheat was seeded on September 30,1996 at Potlatch and October 22, 1996 at Lapwai. Winter wheat was evaluated visually for injury. Wheat was harvested at Potlatch from a 30 by 1200 ft area on August 8, 1997 and at Lapwai from a 27 by 1200 ft on August 13, 1997.

Table 1. Application and soil data.

Location		Potlatch, Idaho	Lapwai, Idaho
Seeding date		September 30, 1996	October 22, 1996
Variety		'MAC1'	'Madsen'
Application dates			
	Fall (granular)	October 27, 1995	November 6, 1995
	Spring (liquid)	May 1, 1996	May 7, 1996
Soil	pH	5.9	5.5
	% OM	3.15	5.09
	CEC (meq/100g)	15.7	28.8
	Texture	silt loam	silt loam

No treatment at Potlatch or Lapwai injured the winter wheat (data not shown). Winter wheat yield in trifluralin treatments was lower than the untreated check at both sites, but was not significantly different (Table 2). (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Winter wheat yield after trifluralin.

Treatment	Rate	Application timing	Winter wheat yield Potlatch	Winter wheat yield Lapwai
	lb/A		lb/A	lb/A
Untreated check			4792	4544
Trifluralin (granular)	0.75	Fall	4746	4282
Trifluralin (liquid)	0.75	Spring	4683	4312
LSD (0.05)			NS	NS

Reduced herbicide rates in a winter wheat-spring pea rotation. Joan M. Campbell and Donald C. Thill. The effects of continuous reduced herbicide rate in a winter wheat-spring pea rotation will be determined after 6 yr. Herbicides were applied to wheat in the fifth year of the experiment. The experimental design is a randomized complete block with four replications. Treated plots are 30 by 75 ft and check plots are 15 by 75 ft. Weed seedlings were counted in two, 1 yd^2 areas per plot before herbicide application. Bromoxynil and thifensulfuron/tribenuron were applied at 0.25 + 0.019 (1x), 0.17 + 0.012 (2/3x), and 0.08 + 0.006 (1/3x) lb/A. Nononionic surfactant was added at 0.25% v/v. An untreated check was included for comparison. Treatments were applied with a backpack CO_2 pressurized sprayer calibrated to deliver 10 gpa at 40 psi (Table 1). Weeds were counted and weighed 4 wk after treatment from the same areas that were counted pretreatment. Wheat grain was harvested at maturity with a small plot combine. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 1. Environmental data.

Application date	May 13, 1997
Growth stage	Tiller, 12 inches tall
Air temperature	70 F
Soil temperature	63 F
Relative humidity	54%
Cloud cover	clear sky
Wind velocity	2 to 3 mph, west

Fewer weeds emerged in the 1x and 2/3x rate treated plots compared to the untreated check plots after 4 yr of treatments (Table 2). Treated plots had fewer weeds compared to the untreated check after the fifth year of application and the 1/3x rate plots had more weeds compared to plots treated with the higher rates. Weed biomass tended to increase with a decrease in herbicide rate, but biomass was much higher in the untreated check plot. Prickly lettuce is mainly responsible for this trend as it is the dominant weed in the field (Table 3). Shepherd's-purse and mayweed chamomile also contributed. Although the 1/3x rate treated plots had more weeds compared to the higher rate treated plots, the weeds were small and weed biomass did not differ among treated plots.

Wheat test weight and grain yield also were greater in the treated plots compared to the untreated check. There is a trend for lower test weight and grain yield in the 1x rate compared to the other treated plots. This is consistent with previous years data. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Weed control and wheat yield after 5 yr of reduced herbicide input.

Herbicide rate	Total weeds[1] pre-application	Total weeds[2] post application Density	Biomass	Wheat test weight	Wheat grain yield
	no/yd^2	no/yd^2	oz/yd^2	lb/bu	bu/A
1 x	466ab	93a	0.25a	58.8a	58ab
2/3 x	399a	158a	1.07a	59.6a	64a
1/3 x	589bc	474b	1.90a	59.5a	56b
check	708c	716c	8.60b	53.7b	43c

[1] Field pennycress, mayweed chamomile, prickly lettuce, henbit, shepherd's-purse, common lambsquarters, and wild oat
[2] Field pennycress, mayweed chamomile, prickly lettuce, henbit, shepherd's-purse, wild oat, common lambsquarters, catchweed bedstraw, downy brome, interrupted windgrass, and volunteer pea

Table 3. Density and biomass of primary weed species in wheat after 5 yr.

Rate	Shepherd's-purse Density	Shepherd's-purse Biomass	Mayweed chamomile Density	Mayweed chamomile Biomass	Field pennycress Density	Field pennycress Biomass	Prickly lettuce Density	Prickly lettuce Biomass
	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2
1x	6a	0.03a	12a	0.03a	0a	0a	49a	6a
2x	10a	0.05a	12a	0.04a	2ab	0a	56a	28a
1/3x	51b	0.13a	112b	0.45a	0a	0a	234b	38a
check	59b	0.44b	237c	2.90b	4b	1b	356b	143b

Broadleaf weed control in winter wheat with prosulfuron and metsulfuron combinations. Sandra L. Shinn and Donald C. Thill. A study was established near Genesee, Idaho in winter wheat to evaluate broadleaf weed control, crop injury, and grain yield with different herbicides. 'Madsen' winter wheat was seeded on October 1, 1996 in a silt loam soil having 31.6% sand, 55.6% silt, 12.8% clay, and 5.4% organic matter, with a pH of 6.4. The experimental design was a randomized complete block with four replications and individual plots were 8 by 27 ft. All treatments were applied on May 5, 1997 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 32 psi and 3 mph (Table 1). Winter wheat injury and broadleaf weed control was evaluated visually on May 20, May 31, and July 1, 1997. Winter wheat was harvested at maturity with a small plot combine from a 4.1 by 27 ft area on August 20, 1997.

Table 1. Application data.

Winter wheat	4 to 5 leaf, 1 to 3 tiller
Mayweed chamomile (ANTCO)	cotyledon to 3 leaf
Volunteer lentil (LENCU)	2 to 3 leaf
Field pennycress (THLAR)	2 to 3 rosettes
Field horsetail (EQUAR)	1 to 3 leaf
Shepherd's purse (CAPBP)	4 to 6 leaf
Air temperature (F)	70
Relative humidity (%)	30
Wind (mph)	0 to 2
Cloud cover (%)	60
Soil temperature at 2 in. (F)	50

At 7 DAT, prosulfuron in combination with dicamba injured (sleepy wheat affect) the wheat. Injury was still present at 15 DAT, however by 26 DAT the wheat was not injured (data not shown). No treatment controlled field horsetail. At 57 DAT all treatments controlled shepherd's purse 98 to 100% and field pennycress 83 to 100% (Table 2). Prosulfuron applied alone or in combination with an additional broadleaf herbicide controlled mayweed chamomile and volunteer lentil 53 to 100%. Metsulfuron applied in combination with thifensulfuron and tribenuron and/or bromoxynil and MCPA controlled the mayweed chamomile and volunteer lentil 60 to 99%. Grain yield was greater than the untreated control for all treatments except bromoxynil/MCPA and prosulfuron + bromoxynil. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Broadleaf weed control and winter wheat yield.

		Weed control[2]					Wheat
Treatment[1]	Rate	ANTCO	LENCU	THLAR	CAPBP	EQUAR	yield
	lb/A	%					bu/A
Metsulfuron + thifen/triben[3]	0.0038 + 0.0141	85	60	99	100	0	99
Metsulfuron + thifen/triben	0.0019 + 0.0071	65	69	93	100	0	93
Metsulfuron + thifen/triben + bromoxynil/MCPA	0.0038 + 0.0141 + 0.375	99	93	100	100	0	102
Metsulfuron + thifen/triben + bromoxynil/MCPA	0.0019 + 0.0071 + 0.375	96	83	83	100	0	99
Prosulfuron	0.009	91	94	85	100	0	99
Prosulfuron	0.018	95	91	98	98	0	95
Prosulfuron + bromoxynil/MCPA	0.009 + 0.375	76	80	98	100	0	105
Prosulfuron + bromoxynil/MCPA	0.018 + 0.375	83	80	100	100	0	95
Thifen/Triben	0.0234	81	71	73	100	0	96
Bromoxynil/MCPA	0.5	24	88	88	100	0	89
Prosulfuron + bromoxynil	0.009 + 0.188	74	74	93	100	0	88
Prosulfuron + metribuzin	0.009 + 0.094	58	53	85	100	0	96
Prosulfuron + dicamba	0.009 + 0.094	89	86	94	100	0	96
Prosulfuron + Mon 37500	0.009 + 0.023	94	86	98	98	0	96
Prosulfuron + clopyralid/MCPA	0.009 + 0.61	100	95	100	100	0	98
Untreated check	--	--	--	--	--	--	79
$LSD_{(0.05)}$		26	33	20	3	0	13.7

[1] All treatments were applied with a 90% nonionic surfactant at 0.5% v/v.
[2] Weed control data is from July 1, 1997.
[3] thifen/triben = thifensulfuron/tribenuron applied as the commerical formulation.

The effects of two formulations of 2,4-D on winter wheat and wild chamomile (*Matricaria chamomilla*). Lawrence W. Lass and Donn C. Thill. The purpose of this test was to compare 2,4-D formulated without petroleum distillates (Solv-6) with a standard formulated 2,4-D (Weedone). The absence of petroleum solvents in the microemulsion formulation removes the potential risk of exposure from undesirable solvent-type additives. The microemulsion formulation has beer reported to have greater crop tolerance, improved weed control, less odor, and easier tank cleanup when compared to other 2,4-D formulations.

The experiment had four replications in a randomized complete block design. When herbicide treatments were applied, Madsen winter wheat had four to five tillers and was 9 inches tall. The herbicides were applied on May 1, 1997 with a CO_2 backpack sprayer equiped with 8001 flat fan nozzles and calibrated to deliver 10 gpa. The wind was three to seven mph and the sky was clear. The relative humidity was 50%. Air temperature was 63 F and the 5 inch soil temperature was 52 F. There was dew present at the time of application. The soil type was a Palouse silt loam. Replicates 3 and 4 were top dressed on May 28, 1997 with 40 lb/a ammonium sulfate with a hand-held rotary spreader because of observed nitrogen deficiency.

The lack of expected winter annual weeds in most winter wheat fields following lentil is unusual for this area. This phenomenon may be associated with soil carry-over of herbicides used to control weeds in pea and lentil crops. Weeds present at the time of application included wild chamomile (*Matricaria chamomilla* L.) at 10 to 20 plants/yd^2, field pennycress at 2 plants/yd^2 and henbit at 1 plant/yd^2. Henbit and field pennycress were not evaluated because of the low uneven densities across all treatments.

Wild chamomile was a recently discovered introduction to the wheat growing areas of northern Idaho and little is knowr regarding control with herbicides. Wild chamomile seedlings look and smell like pineappleweed (*Matricaria matricarioides*), but ray flowers are present when blooming. This first look at thifensulfuron + tribenuron controlled 100% of the wild chamomile. Bromoxynil caused leaf margin burning of wild chamomile, but the plants recovered and produced seed. Bromoxynil-treated wild chamomile were about 6 inches shorter than the plants in the control plots. Plants growing in the 2,4-D treated areas were the same height as plants in the control plots. Leaves of wild chamomile appeared to wilt slightly at 19 days after the 2,4-D treatments, but by 34 days after treatment plants had recovered.

In this test, Solv-6 and Weedone formulations tended to control wild chamomile best when R-11 or Bivert were not added. Regardless of the 2,4-D formulation, the bromoxynil and 2,4-D mix appeared to control wild chamomile about as-well-as 2,4-D. Wheat height was not affected by any of the herbicide treatments. Wheat in all treatments with 2,4-D had a wind blown appearance at 19 days after treatment, but visual evaluations of leaf twist could not quantify any measurable effect. The wind blown appearance was not visible at 34 days after treatment. Herbicide treatments did not effect grain yield. (Plant Science Division, University of Idaho, Moscow, 83844-2339)

Table. The effects of two formulations of 2,4-D on winter wheat and wild chamomile.

		Wild Chamomile			Winter Wheat			
		Leaf wilt	Height	Control	Height	Height	Leaf twist	Yield
Treatments	lb/a	5/19	6/05	6/05	5/19	6/05	5/19	Bu/Ac
		(%)	(in)	(%)	(in)	(in)	(deg)	
2,4-D(Solv-6)	0.231	4	14	69	18	26	225	117
2,4-D(Solv-6)	0.231	2	14	58	17	27	180	121
+R-11								
2,4-D(Solv-6)	0.231	7	15	54	16	29	270	116
+Bivert	0.052							
2,4-D(Weedone)	0.238	0	14	65	18	28	135	120
2,4-D(Weedone)	0.238	2	14	74	18	27	225	123
+R-11								
2,4-D(Weedone)	0.238	1	14	65	19	27	135	118
+Bivert	0.052							
2,4-D(Solv-6)	0.463	1	14	80	18	30	270	135
2,4-D(Solv-6)	0.463	3	12	31	18	25	180	105
+R-11								
2,4-D(Solv-6)	0.463	6	15	63	18	26	158	119
+Bivert	0.103							
2,4-D(Weedone)	0.475	8	15	71	18	26	225	129
2,4-D(Weedone)	0.475	4	13	60	18	29	225	120
+R-11								
2,4-D(Weedone)	0.475	3	14	27	19	27	135	117
+Bivert	0.103							
2,4-D(Solv-6)	0.231	9	10	73	18	27	180	123
+Bromoxynil	0.188							
2,4-D(Solv-6)	0.231	23	10	78	19	28	180	130
+Bromoxynil	0.188							
+Bivert	0.103							
2,4-D(Solv-6)	0.088	6	11	73	19	27	270	123
+Bromoxynil	0.188							
2,4-D(Weedone)	0.250	14	12	86	18	27	225	118
+Bromoxynil	0.188							
2,4-D(Weedone)	0.250	38	9	72	18	27	225	121
+Bromoxynil	0.188							
+Bivert	0.103							
2,4-D(Weedone)	0.094	26	11	77	19	28	225	121
+Bromoxynil	0.188							
Thifen\Triben	0.012	78	0	100	19	30	225	139
+Bromoxynil	0.250							
+R-11								
Thifen/Triben	0.012	55	0	100	18	28	270	119
+2,4-D(Solv-6)	0.231							
+R-11								
Untreated Check		0	18	0	18	27	135	105
LSD (P=.05)		22	5	67	3	3	127	23
					ns	ns	ns	ns

Thifen\Triben = thifensulfuron + tribenuron; ns = No significant difference; and R11 was applied at 0.25% v/v.

Azafenidin timing for Italian ryegrass control in winter wheat. Bill D. Brewster, Carol A. Mallory-Smith, and Paul E. Hendrickson. A field trial was conducted at the Hyslop research farm near Corvallis, OR to evaluate applications of azafenidin for Italian ryegrass control in winter wheat. The experimental design was a randomized complete block with four replications and 8-ft by 25-ft plots. Italian ryegrass seed was broadcast over the trial area after seeding 'Madsen' winter wheat at 105 lb/A on October 18, 1996. The herbicides were applied with a single-wheel, compressed-air plot sprayer that delivered 20 gpa at 15 psi. The soil was a Woodburn silt loam with a pH of 5.7 and an organic matter content of 2.9%.

All herbicide treatments provided complete control of Italian ryegrass. Azafenidin also controlled annual bluegrass, little bittercress, ivyleaf speedwell, and meadowfoam. Azafenidin at rates above 0.062 lb/A caused excessive visible injury and reduced potential wheat yield. The addition of a surfactant with azafenidin at the 0.062 lb/A rate increased the amount of crop injury to that caused by the 0.125 lb/A rate. The fluthiamide + metribuzin treatment produced wheat grain yields comparable to those provided by the lower rates of azafenidin--an increase of about 40 bu/A over the weedy check. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Italian ryegrass control, wheat injury, and wheat grain yield following applications of azafenidin at three timings.

Treatment[1]	Rate	Timing[2]	Wheat[3] injury	Ryegrass[3] control	Wheat[4] yield
	lb/A		---------- %	----------	bu/A
Fluthiamide + metribuzin	0.25 + 0.125	PES	5	100	108.0
Azafenidin	0.125	PES	36	100	94.9
Azafenidin	0.25	PES	90	100	67.5
Azafenidin	0.062	EPOE	11	100	109.7
Azafenidin	0.125	EPOE	40	100	98.6
Azafenidin + surfactant	0.062	EPOE	43	100	94.9
Azafenidin	0.031	POE	3	100	110.0
Azafenidin	0.062	POE	0	100	109.5
Azafenidin + surfactant	0.031	POE	3	100	103.2
Check	0		0	0	65.6
$LSD_{(0.05)}$			13		9.8

[1] Surfactant = (R-11) applied at 0.25% v/v

[2] PES applied October 22, 1996; EPOE applied November 13, 1996 to 1- to 2-leaf wheat and 1-leaf ryegrass; POE applied November 25, 1996 to 3-leaf wheat and 1- to 2-leaf ryegrass.

[3] Visual evaluations March 3, 1997.

[4] Harvested July 28, 1997.

Italian ryegrass control in winter wheat with fluthiamide treatments. Bill D. Brewster, Carol A. Mallory-Smith, and Paul E. Hendrickson. Six field trials were conducted in Polk and Yamhill Counties of western Oregon to evaluate fluthiamide-metribuzin treatments for the control of Italian ryegrass in winter wheat. The standard treatment of triallate plus metribuzin and chlorsulfuron-metsulfuron was included for comparison. Soil incorporation of the triallate was accomplished by hand-raking with a garden rake. The experimental design was a randomized complete block with four replications and 8-ft by 25-ft plots. Herbicides were applied with a single-wheel, compressed-air plot sprayer that delivered 20 gpa at 19 psi. A non-ionic surfactant, R-11, was added to the postemergence treatments at a rate of 0.25% v/v. The PEI and PES treatments were applied in the third or fourth week of October, 1996. The EPOE treatments were applied on November 20, 1996, except for those at Location 5, which were applied on December 9, 1996; the wheat was in the 2-leaf stage and the Italian ryegrass was in the 1- to 2-leaf stage. POE treatments were applied on January 22, 1997, at all locations; the wheat had 3 to 5 leaves and 0 to 1 tiller and the Italian ryegrass had 2 to 5 leaves and 0 to 2 tillers.

Minor crop stunting occurred in all treatments at some locations when evaluated in March (Table 1), but the injury was outgrown before harvest. The fluthiamide + metribuzin treatments followed by sulfosulfuron or chlorsulfuron-metsulfuron provided Italian ryegrass control comparable to the standard treatment (Table 2). None of the treatments provided adequate Italian ryegrass control at Location 6. Large increases in wheat grain yield over the weedy check occurred in all treatments at all locations (Table 3), while differences in grain yield between herbicide treatments were fairly small in all trials except Location 1. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table 1. Wheat injury from herbicide treatments at six locations in western Oregon.

			Wheat injury[1]					
			Location					
Treatment	Rate	Timing	1	2	3	4	5	6
	lb/A		%					
Triallate + metribuzin + chlorsulfuron-metsulfuron	1.25 + 0.14 + 0.019	PEI EPOE	0	0	5	6	8	0
Fluthiamide + metribuzin	0.25 + 0.135	PES	0	8	3	0	5	0
Fluthiamide + metribuzin + chlorsulfuron-metsulfuron	0.25 + 0.125 + 0.019	PES EPOE	0	6	6	8	5	3
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES EPOE	0	0	0	3	3	4
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES POE	3	5	8	5	5	3
Check	0	---	0	0	0	0	0	0
$LSD_{(0.05)}$			ns	6	ns	ns	ns	ns

[1] Visual evaluation March 7, 1997.

Table 2. Control of Italian ryegrass with herbicide treatments at six locations in western Oregon.

Treatment	Rate	Timing	Italian ryegrass control[1] Location 1	2	3	4	5	6
	lb/A		%					
Triallate + metribuzin + chlorsulfuron-metsulfuron	1.25 + 0.14 + 0.019	PEI EPOE	93	94	96	97	95	73
Fluthiamide + metribuzin	0.25 + 0.135	PES	78	89	93	94	80	68
Fluthiamide + metribuzin + chlorsulfuron-metsulfuron	0.25 + 0.125 + 0.019	PES EPOE	90	97	96	99	96	80
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES EPOE	86	94	97	96	91	83
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES POE	90	96	98	91	95	78
Check	0	---	0	0	0	0	0	0
$LSD_{(0.05)}$			6	19	4	15	17	8

[1] Visual evaluation July 15, 1997.

Table 3. Wheat grain yield following herbicide applications at six locations in western Oregon.

Treatment	Rate	Timing	Wheat yield[1] Location 1	2	3	4	5	6
	lb/A		bu/A					
Triallate + metribuzin + chlorsulfuron-metsulfuron	1.25 + 0.14 + 0.019	PEI EPOE	69.5	91.0	83.7	49.8	58.5	25.6
Fluthiamide + metribuzin	0.25 + 0.135	PES	53.2	84.1	88.8	50.3	57.8	30.6
Fluthiamide + metribuzin + chlorsufluron-metsulfuron	0.25 + 0.125 + 0.019	PES EPOE	70.2	85.7	84.7	53.3	57.2	32.2
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES EPOE	65.5	86.0	95.1	48.4	59.3	33.6
Fluthiamide + metribuzin + sulfosulfuron	0.25 + 0.125 + 0.023	PES POE	67.5	84.0	91.9	52.6	61.3	32.8
Check	0	---	1.7	58.0	53.1	21.1	8.0	7.7
$LSD_{(0.05)}$			3.3	11.5	12.7	13.6	7.6	7.8

[1] Harvested July 30 or August 4, 1997.

Downy brome response to sulfosulfuron applied at five different wheat growth stages. John O. Evans, R. William Mace and Caleb Daley. The MON 37536 formulation of sulfosulfuron was evaluated at four dosage levels in a field planted to 'Weston' winter wheat to manage a downy brome infestation on the Munk farm near Howell, UT. Each dosage was applied at each of five crop growth stages including: preemergence, early fall postemergence, late fall postemergence, early spring postemergence, and late spring postemergence. Wheat was planted September 3, 1996 and the preemergence treatments were applied September 17. Early and late fall postemergence treatments were applied October 1 and October 18, respectively. The two spring postemergence treatments were made April 17 and June 13, 1997. A randomized block design with three replications was employed and each treatment applied to 10 by 30 foot plots using a CO^2 backpack sprayer with 8001 flatfan nozzles arranged in a 10 foot spray width delivering 12.8 gpa at 39 psi. The soil was a Hansel silt loam with 7.7 pH and an OM content less than 2%. Downy brome stands were uniform in plots and within individual replications but varied noticeably among replications that extended deeper into the winter wheat field. Wheat was harvested with a Hege plot combine July 28.

No visual injuries occurred on the wheat throughout the season nor at harves. The untreated control resulted in lower yields compared to sulfosulfuron applied at any of the five wheat growth stages. Sulfosulfuron applied as a late fall postemergence spray resulted in the best grain yield and highest percentage downy brome control in this trial. All treatments increased winter wheat yields compared to untreated controls perhaps because of increased downy brome control. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Winter wheat response and downy brome control with varying dosages of sulfosulfuron applied at five crop growth stages. Howell, UT. 1997.

Treatment	Sulfosulfuron Rate	WHEAT Injury[2]	WHEAT Yield	BROTE 6-6-97	BROTE 7-8-9
	lb ai/A	%	Bu/A	% Control	
Preemergencee	0.016	0	38.0	48	83
"	0.023	0	40.7	52	85
"	0.027	0	34.0	70	83
"	0.031	0	36.1	55	78
Early fall post[1]	0.016	0	34.2	55	78
"	0.023	0	37.3	38	88
"	0.027	0	38.2	65	92
"	0.031	0	37.5	60	88
Late fall post[1]	0.016	0	39.2	35	78
"	0.023	0	42.8	63	92
"	0.027	0	43.2	70	88
"	0.031	0	48.6	80	90
Early spring post[1]	0.016	0	42.0	5	40
"	0.023	0	38.2	33	47
"	0.027	0	47.1	25	60
"	0.031	0	38.5	50	70
Late spring post[1]	0.016	0	33.0	40	33
"	0.023	0	42.3	35	72
"	0.027	0	40.3	53	13
"	0.031	0	29.1	33	35
Untreated		0	27.5	0	30
$LSD_{(0.05)}$			10.2	30	24

[1] Nonionic surfactant applied at 0.25% v/v with all postemergent treatments.
[2] Visual evaluation June 6,1997.

Postemergence canarygrass and broadleaf weed control in winter wheat. Mick Canevari, Matt Ehlhardt, Jim Knabke and Lee Jackson. A field study was conducted at Farmington, California to evaluate canarygrass and broadleaf weeds in hard red winter wheat (var. Yolo). Wheat was drill seeded November 10, 1996, and germinated under rain-fed moisture. Individual plots were 10 feet by 20 feet in a randomized complete block design with three replications. All spray treatments were applied with a CO_2 pressurized backpack sprayer at a volume of 20 gpa at 30 psi using 8002 nozzles. Additional data is presented in Table 1. Early treatment timing of fenoxaprop, 8426 and diclofop was December 16, 1996. The later timing treatments of fenoxaprop was January 7, 1997. Retreatment applications of MCPA or diclofop were applied January 7, to the early timing treatments and January 21, 1997, to late timing treatments to eliminate broadleaf weed competition in fenoxaprop treatments and canarygrass competition in the 8426 treatments.

Table 1. Application information, weed size and densities.

Application timing	Code	Early Timing (12/16/96)	Late Timing (1/7/97)
Wheat/population		3 leaf - 1 tiller/25 sq ft	4 leaf - 2 tiller
Hood canarygrass/population	PHAPA	1-3 leaf, 1/2"-2" height/12 sq ft	3 leaf - 1 tiller 2"-5" height
Black mustard/population	BRSNI	cotyledon - 4 leaf/2 sq ft	2-6 leaf
Crowfoot buttercup population	RANSC	cotyledon - 2 leaf/1 sq ft	4-6 leaf

Early crop injury ranged from 15 to 28% (Table 2). The early injury was a combination of crop stunting and chlorosis and aggravated in part to excessive rainfall and long periods of soil saturation. 8426 in tank mix combination with 2,4-D showed severe late season twisting and malformations of wheat heads. Yields were also affected by a 28% reduction in these treatments. The highest yields occurred when canarygrass was controlled early with the fenoxaprop rate of 0.089 and 0.067 Lb/A, respectively. Later timing applications of fenoxaprop resulted in lower yields compared to the same rates applied earlier except in the highest use rate of 0.112 Lb/A. The three-way tank mix combination of 8426 + MCPA + fenoxaprop provided excellent broadleaf weed control, but canarygrass control was reduced by 25% and a 450 lbs yield reduction. Treatments controlling canarygrass resulted in a 57% yield increase. (Cooperative Extension, University of California, Stockton, CA 95205).

Table 2. Crop injury, weed control and wheat yields near Farmington, California.

Treatment	Rate	Application Timing	Crop injury 1/17	Crop injury 4/23	Weed Control[1] PHAPA 1/17	PHAPA 4/23	BRSNI 1/17	BRSNI 4/23	RAN 1/17	Yield lbs/A	
	lb/A		%								
Untreated			15	0	0	0	0	0	0	1062	I
Fenoxaprop-p-ethyl + MCPA	0.045 0.5	12/16/96 1/7/97	25	0	68	63	64	100	40	2936	B(
Fenoxaprop-p-ethyl + MCPA	0.067 0.5	12/16/96 1/7/97	20	0	84	92	50	100	30	3328	AB
Fenoxaprop-p-ethyl + MCPA	0.089 0.5	12/16/96 1/7/97	23	0	88	100	50	100	33	3672	A
Fenoxaprop-p-ethyl + MCPA	0.112 0.5	12/16/96 1/7/97	25	0	91	100	50	100	38	3173	AB
Fenoxaprop-p-ethyl + MCPA	0.045 0.5	1/7/97 1/12/97	18	0	8	65	--	100	--	2768	B(
Fenoxaprop-p-ethyl + MCPA	0.067 0.5	1/7/97 1/12/97	17	0	10	100	--	100	--	2904	B(
Fenoxaprop-p-ethyl + MCPA	0.089 0.5	1/7/97 1/12/97	17	0	10	100	--	100	--	2803	B(
Fenoxaprop-p-ethyl + MCPA	0.112 0.5	1/7/97 1/12/97	17	0	27	100	--	100	--	3224	AB
[2,3] 8426 + MCPA	0.023 + 0.38	12/16/96	20	8	28	33	100	100	100	2968	B(
[2,3] 8426 + 2,4-D	0.023 + 0.25	12/16/96	27	33	27	37	100	100	100	2623	B(
[2,3] 8426 + MCPA + Fenoxaprop	0.023 + 0.38 0.089	12/16/96	20	10	85	75	100	100	92	3218	AB
[2,3] 8426 + 2,4-D + Fenoxaprop	0.023 + 0.25 0.089	12/16/96	22	32	83	73	100	100	95	2797	B(
[3]8426 + diclofop-methyl	0.023 1.0	12/16/96 1/7/97	20	10	23	13	97	100	63	2794	B(
Diclofop-methyl	1.0	12/16/96	28	0	86	93	0	0	0	2483	C
8426 + diclofop-methyl	0.023 + 1.0	12/16/96	20	0	84	40	100	42	40	2935	B(
LSD + (P=.05)										619. 5	

[1] Weeds evaluated for control were hood canarygrass (PHAPA), black mustard (BRSNI), crowfoot buttercup (RANSC
[2] 8426 + MCPA or 2,4-D is a DG Commercial pre-mix formulation
[3] UN 32 liquid fertilizer added @ 4% VV

Downy brome control in winter wheat with sulfosulfuron tank mixes. Daniel A. Ball and Darrin L. Walenta. A study was conducted in northeastern Oregon at the Columbia Basin Agricultural Research Station at Pendleton, OR to evaluate postemergence herbicide combinations for downy brome (BROTE), broadleaf weed control, and crop injury in winter wheat. The soil type was a Walla Walla silt loam (28.4% sand, 59.2% silt, 12.4% clay, 5.6 pH, 1.7% organic matter, 14.7 Meq/100 g CEC). Winter wheat var. 'Stephens' was seeded at 80 lb/A in 10 inch rows on October 4, 1996 to a 2.0 inch depth into moist soil with a Great Plains double disk drill. All postemergence treatments were applied with a hand-held CO_2 backpack sprayer in 15 gpa water at 30 psi. All treatments received R-11 surfactant at 0.5 % v/v. Plots were 10 ft by 30 ft in size with 4 replications. Downy brome seed was planted prior to winter wheat seeding with a drop spreader to insure uniformity of weed infestation. The resulting downy brome infestation was moderate and uniform throughout the plot area. Ratings of visual crop injury, and downy brome control were made on March 26, and June 2, 1997. Visual evaluation of tarweed fiddleneck (AMSLY) control was made on June 2, 1997. Wheat grain was harvested on August 4, 1997 with a HEGE 140 plot combine, and yields converted to bu/A based on a 60 lb/bu test weight.

Table 1. Application details.

	POST1	POST2
Pendleton		
Date	21 Oct 96	24 Feb 97
Air temp. (°F)	59	56
Relative humidity (%)	54	78
Wind speed (mph)	N 3	calm
Sky	mostly cloudy	clear
Soil temp. at 2 in. (°F)	55	55
Crop Stage	1.5 lf	5.5 lf
BROTE stage	1-2 lf	4.0 lf

Fall applications of sulfosulfuron provided more effective downy brome control than did spring applications. With the exception of metribuzin applied in the spring, herbicides mixed with sulfosulfuron did not improve downy brome control. Herbicide combinations with sulfosulfuron improved control of AMSLY in both fall and spring treatments. Treatments containing metribuzin caused some slight, transient wheat injury in both fall and spring applications. Wheat yield at Pendleton was substantially better from fall applied sulfosulfuron compared to spring applications. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table 2. Downy brome control, crop injury, and wheat grain yield with sulfosulfuron.

			26 March		2 June		4 Aug.
Treatment[1]	Rate	Timing	Crop Injury	BROTE Control	BROTE Control	AMSLY Control	Grain Yield
	(lb/A)		%				bu/A
sulfosulfuron	0.031	EPOST	0	87	89	77	69
sulfosulfuron +metribuzin	0.023 +0.19	EPOST	1	89	87	70	72
sulfosulfuron +metribuzin	0.031 +0.19	EPOST	4	89	93	100	72
sulfosulfuron +triasulfuron	0.023 +0.016	EPOST	0	86	88	100	71
sulfosulfuron +triasulfuron	0.031 +0.016	EPOST	0	87	87	100	80
sulfosulfuron +chlorsulfuron +metsulfuron	0.023 +0.016	EPOST	0	87	86	100	74
sulfosulfuron +chlorsulfuron +metsulfuron	0.031 +0.016	EPOST	0	91	89	100	76
sulfosulfuron +diuron	0.031 +0.8	EPOST	10	90	89	100	84
sulfosulfuron +MCPA-amine	0.031 +0.375	LPOST	0	75	69	100	74
sulfosulfuron +2,4-D-amine	0.031 +0.25	LPOST	0	80	69	95	69
sulfosulfuron +bromoxynil	0.031 +0.25	LPOST	0	69	66	100	72
sulfosulfuron +bromoxynil +MCPA	0.031 +0.25	LPOST	0	76	71	100	74
sulfosulfuron +metribuzin	0.031 +0.28	LPOST	1	90	93	100	86
sulfosulfuron +carfentrazone	0.031 +0.031	LPOST	3	77	67	100	70
Check	--		0	0	0	0	57
LSD (0.05)			2	9	10	21	10

[1] All treatments received R-11 non-ionic surfactant at 0.5% v/v. Metsulf+chlorsulf formulated as Finesse®. Bromoxynil +MCPA formulated as Bronate®.

Wild oat samples tested for triallate-resistance. Janice M. Reed and Donald C. Thill. Samples of wild oat seed suspected to be triallate resistant were collected from fields in southern Idaho, Montana and North Dakota in the fall of 1996 and tested in the University of Idaho greenhouse for resistance during the winter of 1996 to1997. A random sample was taken from each seed lot and soaked in a 1.4 mM solution of GA_3 for 24 hours prior to planting, to aid in germination. Sixty seeds from each sample were planted in Sunshine Mix #1 in each of three trays. Soil and seeds in trays 1 and 2 were sprayed at 15 gpa and 40 psi using a moving nozzle greenhouse sprayer with 1.25 lb ai/A of triallate and sealed with a ½ inch of moist soil to prevent volatilization. The third tray was not sprayed and served as an untreated control. Wild oat plants were evaluated as resistant or susceptible 2 weeks after treatment. Plants were counted as survivors and considered resistant if the first leaf was expanded.

The number of plants that emerged in the control and survived the triallate treatment in trays 1 and 2 are shown in Table 1. Resistant plants were divided into two categories; large and small. The plant was considered small if it was 1.5 inches or less in height and large if it was greater than 1.5 inches tall. The final column indicates whether the sample was considered triallate resistant (R) or susceptible (S). Several Idaho samples showed varied results between the two replications and were re-tested. Samples ID-16 and 17 showed resistance in one replication, but not the other. Five wild oat samples from Idaho were resistant. Two samples from Montana were resistant and none of the North Dakota samples were resistant; one tray from sample F4-07-02 was resistant to triallate (data not shown).

All samples were tested for cross-resistance to difenzoquat. If a wild oat sample was resistant to triallate, trays 1 and 2 from the triallate screening were sprayed with difenzoquat. If the wild oat sample was susceptible to triallate, the control tray from the triallate screening was sprayed with difenzoquat. Difenzoquat was applied at 1.0 lb/A with R-11, a non-ionic surfactant (0.25% v/v) at 15 gpa and 40 psi using a moving nozzle greenhouse sprayer when the wild oat was in the four leaf stage. Wild oat was evaluated as resistant or susceptible 4 weeks after treatment. The results for the difenzoquat test are shown in Table 2. All of the Idaho wild oat samples that were resistant to triallate showed cross-resistance to difenzoquat. Samples ID-2, 8, and 36 showed resistance in one tray but not the other. Samples ID-20, 29, 32, and 34 that were re-tested for triallate resistance and found to be susceptible, showed resistance to difenzoquat. One Montana sample that was resistant to triallate showed cross-resistance to difenzoquat and the other sample was not tested (data not shown). None of the wild oat from North Dakota showed cross-resistance to difenzoquat, and sample F4-07-02 showed partial cross-resistance to difenzoquat (data not shown).

Idaho samples were tested for cross-resistance to EPTC and diclofop, based on their field histories. Results for the EPTC and Hoelon tests are shown in Table 2. For the EPTC test the same experimental design was used as in the triallate test. Trays were sprayed with 4 lb ai/A of EPTC and sealed with ½ inch of soil to prevent volatilization. None of the samples showed resistance to EPTC. For the diclofop test, seeds from each sample were planted in three trays. One tray was the untreated control and the other two trays were sprayed with 1 lb ai/A of diclofop at 15 gpa and 40 psi using a moving nozzle greenhouse sprayer when the wild oat plants were in the 4 leaf stage. Plants were evaluated as resistant or susceptible 3 weeks after treatment. None of the samples were found to be resistant to diclofop. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 1. Wild oat testing for triallate resistance.

Sample #	Triallate					Triallate re-testing					R or S[1]
		Tray 1		Tray 2			Tray 1		Tray 2		
	Control	Large	Small	Large	Small	Control	Large	Small	Large	Small	
	# of plants										
ID-1	42	0	0	0	0						S
ID-2	55	2	1	0	0	27	2	2	0	1	S
ID-3	56	0	0	0	0						S
ID-4	45	0	0	0	0						S
ID-5	52	0	0	0	0						S
ID-6	53	45	4	21	3						R
ID-7	57	0	0	0	0						S
ID-8	58	14	0	4	1						S
ID-9	55	0	1	0	0						S
ID-10	50	0	0	0	0						S
ID-11	39	0	0	0	0						S
ID-12	14	1	0	0	0						S
ID-13	48	0	0	1	0						S
ID-14	58	3	0	0	0						S
ID-15	60	0	0	0	0						S
ID-16	51	25	2	5	0	29	0	10	6	6	S/R
ID-17	38	5	0	23	2	31	2	10	7	5	S/R
ID-18	38	25	2	8	0						R
ID-19	50	0	0	0	0						S
ID-20	41	6	0	1	1	27	0	1	0	3	S
ID-21	46	0	0	0	0						S
ID-22	53	0	0	0	0						S
ID-23	48	0	0	0	0						S
ID-24	59	0	0	0	0						S
ID-25	22	0	0	0	0						S
ID-26	60	0	0	0	0						S
ID-27	55	2	0	0	1						S
ID-28	27	0	0	0	0						S
ID-29	44	2	0	5	0	24	1	6	0	5	S
ID-30	44	0	1	0	0						S
ID-31	42	0	0	0	0						S
ID-32	50	18	7	2	2	22	0	2	1	7	S
ID-33	8	0	0	0	0						S
ID-34	48	46	2	0	0	21	0	1	1	3	S
ID-35	46	0	0	1	1						S
ID-36	54	11	11	1	8						R
ID-37	56	0	2	0	0						S
ID-38	49	0	16	0	5						S
ID-39	40	6	8	10	11						R
ID-40	51	0	0	0	0						S
ID-41	56	0	0	0	0						S
ID-42	29	12	4	3	1						R

[1] R = resistant, S = susceptible

Table 2. Wild oat samples tested for cross-resistance to EPTC, diclofop, and difenzoquat.

Sample #	Control	EPTC		Diclofop		Difenzoquat		
		Tray 1	Tray 2	Tray 1	Tray 2	Control	Tray 1	Tray 2
	# of plants	R or S[1]						
ID-1						S		
ID-2							S	S
ID-3						S		
ID-4						S		
ID-5						S		
ID-6							R	R
ID-7						S		
ID-8							R	S
ID-9	25	S	S			S		
ID-10						S		
ID-11						S		
ID-12	29	S	S			S		
ID-13						S		
ID-14						S		
ID-15						S		
ID-16	29	S	S	S	S		R	R
ID-17	31	S	S	S	S		R	R
ID-18							R	R
ID-19						S		
ID-20	27	S	S				R	R
ID-21						S		
ID-22						S		
ID-23						S		
ID-24						S		
ID-25						S		
ID-26						S		
ID-27						S		
ID-28	10	S	S			S		
ID-29	24			S	S		R	R
ID-30	22	S	S	S	S	S		
ID-31	25	S	S	S	S	S		
ID-32							R	R
ID-33						S		
ID-34	21			S	S		R	R
ID-35						S		
ID-36							R	S
ID-37						S		
ID-38						S		
ID-39							R	R
ID-40						S		
ID-41	30	S	S			S		
ID-42							R	R

[1] R = resistant, S = susceptible

Effect of adjuvants and rain on wild oat control with difenzoquat. Don W. Morishita and Robert W. Downard. Currently, difenzoquat application is not recommended if rain is expected within 6 hours. However, it has been suggested that certain adjuvants could shorten or eliminate the need to delay application if rain is expected. Thus, a study was conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho to evaluate three adjuvants' ability to shorten the time period for difenzoquat rainfastness. Wild oat was planted June 20, 1997, in 4-inch diameter pots and grown outside. Wild oat emerged June 27. Experimental design was a split plot randomized complete block with six replications. Main plots were adjuvant treatment and sub-plots were rain or no rain. The rain treatment consisted of 0.2 inches of simulated rainfall applied 2 hours after herbicide application. Rain was applied with a flat fan nozzle. Herbicides were applied with a CO_2-pressurized enclosed cabinet sprayer equipped with 11001 flat fan nozzles and calibrated to deliver 10 gpa at 3 mph. Difenzoquat was applied July 15 when the wild oats were in the 3- to 4-leaf stage. Wild oat control was evaluated visually three times at 5, 10, and 15 days after treatment (DAT). Wild oat was harvested 15 DAT and dry weight biomass was determined.

Rainfall reduced wild oat control 5 DAT with nonionic surfactant (NIS) and NuFilm® added to difenzoquat, but did not affect SilWet® (Table). However, wild oat control with SilWet added to difenzoquat with or without rainfall was less than with the other adjuvants. By 10 DAT, wild oat control with SilWet with or without rain was less than NIS or NuFilm followed by no rain. At the third evaluation, taken 15 DAT, rainfall reduced wild oat control of all three adjuvants used with difenzoquat (32 vs 46%) compared to no rainfall (data not shown). Regardless of rainfall, difenzoquat applied with NIS or NuFilm controlled wild oat 57 to 60% while SilWet added to difenzoquat controlled wild oat 40%. Average dry weight of all wild oat receiving rain (1.45 g/pot) was higher ($P>0.02$) than wild oat receiving no rain (1.14 g/pot). Also wild oat dry weight of difenzoquat applied with SilWet was equal to the untreated check and both were higher than difenzoquat applied with NIS or NuFilm. These data indicate that SilWet used with difenzoquat does not control wild oats as well as NIS or NuFilm. Also, using NIS or NuFilm with difenzoquat will help increase rainfastness of this herbicide. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table. Effect of simulated rainfall and adjuvant on wild oat control and dry weight with difenzoquat.

Treatment	Rate	Wild oat control 7/21	7/25	7/30	Wild oat dry weight
	lb/A	%	%	%	gm/pot
Difenzoquat + NIS no rain	1.0 + 0.25% v/v	21	50	57	1.10
Difenzoquat + NIS rain[1]	1.0 + 0.25% v/v	7	25		
Difenzoquat + NuFilm® no rain	1.0 + 6 fl oz/A	22	47	60	1.07
Difenzoquat + NuFilm rain	1.0 + 6 fl oz/A	11	21		
Difenzoquat + SilWet® no rain	1.0 + 12 fl oz/A	10	29	40	1.40
Difenzoquat + SilWet rain	1.0 12 fl oz/A	10	13		
Check		-	-	-	1.61
LSD (0.05)		8	12	9	0.26

[1]Simulated 0.2 inches rainfall 2 hours after treatment.

Effect of application method on weed control with glufosinate. Robert W. Downard and Don W. Morishita. The objective of this study was to determine if application method influenced glufosinate efficacy. The trial was conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho. The study was conducted in a previous grain field that was disced, corrugated, and irrigated to germinate weeds. Individual plots were 7.33 by 25 feet arranged in split plot design with four replications. Main plots were glufosinate with and without ammonium sulfate and sub-plots were application method (broadcast, even band, and twin jet even band). Soil type was a silt loam with a pH of 8.1, CEC of 16 meq/100 g of soil, and 1.6% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 20 gpa. Additional application information is shown in Table 1. Weed control evaluations were taken October 7, 14, and 21.

Table 1. Application information.

Application timing	4 leaf	7 days later	14 days later
Application date	9/16	9/24	9/30
Air temperature (F)	63	73	70
Soil temperature (F)	64	60	56
Relative humidity (%)	46	46	40
Wind speed (mph)	2 to 10	6 to 12	1 to 7
Weed growth stage			
TRZAX	4 to 5 leaf	4 to 6 leaf	6 to 7 leaf
CHEAL	2 to 4 leaf	2 to 5 leaf	6 to 7 leaf
AMARE	4 leaf	4 to 6 leaf	6 to 8 leaf
Weed density/ft^2			
TRZAX	12	15	15
CHEAL	12	12	12
AMARE	15	17	17
Total	39	44	44

The addition of ammonium sulfate to glufosinate did not significantly improve weed control efficacy of the species examined (data not shown). All weeds were at the correct growth stage for application timing. Applying glufosinate broadcast controlled all species 98 to 100% at all evaluation dates. Volunteer wheat control with broadcast application was significantly higher than band application with a twin jet even flat fan; which was statistically better than an even flat fan band application. On October 6, common lambsquarters followed this same pattern. On October 14 broadcast was significantly higher than either band method and there were no differences between banding. Redroot pigweed control on October 6 followed the same trends. Annual sowthistle control was 99 to 100% broadcast or banded applied. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. The effect of application method on weed control with glufosinate.

	Weed control[1]								
	TRZAX			CHEAL		AMARE		SONOL	
Treatment	10/6	10/14	10/21	10/6	10/14	10/6	10/14	10/6	10/14
	%								
Check	0	0	0	0	0	0	0	0	0
Banded with Even Flat Fan	79	79	74	92	96	93	99	100	100
Banded with Twin Even Flat Fan	89	89	90	95	98	95	99	99	100
Broadcast	98	99	99	100	100	100	100	100	100
LSD (0.05)	3	3	3	2	3	3	ns	ns	ns

[1]Weeds evaluated were volunteer wheat (TRZAX), common lambsquarters (CHEAL), redroot pigweed (AMARE) and annual sowthistle (SONOL).

Comparison of glyphosate and sulfosate for weed control in fallow. Robert W. Downard and Don W. Morishita. The objective of this study was to compare weed control with glyphosate and sulfosate rates and combinations with adjuvants. The trial was conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho. Prior to application a grain stubble field was disced, corrugated, and irrigated to germinate weeds. Weeds evaluated were volunteer wheat (TRZAX), common lambsquarters (CHEAL), common mallow (MALNE), and redroot pigweed (AMARE). Individual plots were 8 by 25 feet and treatments were arranged in randomized complete block design with four replications. Soil type was a silt loam with a pH of 8.1, CEC of 16 meq/100 g of soil, and 1.6% organic matter. Herbicides were applied with a CO_2-pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 24 psi using 11001 nozzles. Additional application information is shown in Table 1. Weed control evaluations were taken September 24, October 1 and 10.

Table 1. Application information.

Application date	9/30
Air temperature (F)	70
Soil temperature (F)	56
Relative humidity (%)	40
Wind speed (mph)	1 to 7
Weed growth stage	
Volunteer wheat	6 to 7 leaf
Common lambsquarters	6 to 7 leaf
Redroot pigweed	6 to 8 leaf
Weed density/ft^2	
Volunteer wheat	15
Common lambsquarters	12
Redroot pigweed	17
Total	44

Sulfosate at 0.39 and 0.52 lb/A plus Class Act® controlled volunteer wheat 96 to 98% on October 10. Glyphosate at 0.28 and 0.38 lb/A plus Actamaster® controlled volunteer wheat 88 to 96% on October 10. These four treatments controlled common lambsquarters, common mallow, and redroot pigweed best. Common lambsquarters and common mallow were the hardest to control. On the second and third evaluations sulfosate at 0.19, 0.28, 0.39, 0.52 lb/A plus Class Act increased volunteer wheat control significantly compared to sulfosate plus Preference®. The addition of Actamaster to glyphosate at 0.19 and 0.28 lb/A increased volunteer wheat control significantly. It also increased it at 0.38 lb/A but not significantly. On October 10 there was no difference in volunteer wheat, common lambsquarters, common mallow, and redroot pigweed control between glyphosate plus Actamaster and sulfosate plus Class Act at similar rates. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Weed control with glyphosate and sulfosate.

		Weed control[1]											
		TRZAX			CHEAL			MALNE			AMARE		
Treatment	Rate	9/24	10/1	10/10	9/24	10/1	10/10	9/24	10/1	10/10	9/24	10/1	10/1
	lb/A	%											
Check		--	--	--	--	--	--	--	--	--	--	--	--
Glyphosate	0.19	52	38	48	60	47	61	13	57	70	57	68	73
Glyphosate	0.28	63	60	62	68	70	53	20	65	55	60	88	86
Glyphosate	0.38	77	88	92	70	81	86	27	78	83	72	97	100
Sulfosate + Preference®	0.19 + 0.5% v/v	45	18	40	57	20	48	13	20	33	53	60	68
Sulfosate + Preference	0.26 + 0.5% v/v	53	47	55	62	58	55	17	52	57	55	68	88
Sulfosate + Preference	0.39 + 0.5% v/v	65	57	68	67	72	68	30	57	60	68	90	83
Sulfosate + Preference	0.52 + 0.5% v/v	73	68	68	70	60	67	20	67	63	65	83	77
Glyphosate + Actmaster®	0.19 + 2.5% v/v	72	68	72	70	68	63	23	75	70	65	92	96
Glyphosate + Actmaster	0.28 + 2.5% v/v	82	88	88	73	82	78	23	85	77	72	97	100
Glyphosate + Actmaster	0.38 + 2.5% v/v	82	96	96	78	92	90	33	85	83	75	99	99
Sulfosate + Class Act®	0.19 + 2.5% v/v	70	68	70	72	73	76	17	77	62	67	93	96
Sulfosate + Class Act	0.26 + 2.5% v/v	73	91	83	70	73	78	23	75	75	65	95	99
Sulfosate + Class Act	0.39 + 2.5% v/v	83	96	98	75	83	82	27	87	77	67	93	88
Sulfosate + Class Act	0.52 + 2.5% v/v	83	98	96	73	90	78	33	90	82	70	100	98
LSD (0.05)		11	13	11	8	34	ns	ns	27	18	12	NS	NS

[1]Weeds evaluated were volunteer wheat (TRZAX), common lambsquarters (CHEAL), common mallow (MALNE) an redroot pigweed (AMARE).

Comparison of sulfosate with glyphosate in fallow. Patrick W. Geier and Phillip W. Stahlman An experiment was conducted near Hays, KS to compare the efficacy of sulfosate (Touchdow BTU 5.0) with glyphosate (Roundup Ultra) at equal rates for weed control in fallow. Eac herbicide was applied alone or in combination with ammonium sulfate (AMS), dicamba, or 2,4-amine. Sulfosate treatments also contained Triton AG98 nonionic surfactant (NIS) at 0.25 v/v. Soil was a Crete silty clay loam with pH 6.2 and 2.3% organic matter. The experimen was a randomized complete block with three replicates. Plot size was 10 by 32 ft, with 8. by 22 ft receiving herbicides. Herbicides were applied on July 15, 1997, using a compressed air, rear-mounted, tractor plot sprayer equipped with TT11001 VP nozzles delivering 7.8 gp at 3.0 mph and 24 psi. Weed sizes and densities at application time were as follows: kochia 2 to 12 inches, 10 plants per ft^2; barnyardgrass, 5 to 12 inches, two plants per ft^2; gree foxtail, 3 to 14 inches, two plants per ft^2; and yellow foxtail, 2 to 6 inches, two plant per ft^2.

Kochia control with sulfosate alone or with NIS, AMS, or NIS and AMS generally was 50% o less regardless of herbicide rate or rating date (Table 1). The addition of NIS to th sulfosate treatments did not improve kochia control and decreased control at the 0.375 o 0.5 lb/A rate on August 12. Sulfosate plus AMS controlled kochia better than sulfosate plu NIS, and sulfosate plus dicamba with AMS and NIS treatments were more effective agains kochia than sulfosate plus 2,4-D amine with AMS and NIS. However, the best kochia contro occurred with glyphosate treatments containing 2,4-D amine or dicamba with AMS. Sulfosat alone controlled barnyardgrass 27 to 63% and was equal to or slightly less efficacious tha glyphosate alone (Table 1). Generally, the addition of NIS, AMS, AMS and NIS, or dicamb plus AMS and NIS did not improve barnyardgrass control compared to sulfosate alone, but th addition of 2,4-D amine plus AMS and NIS did. Glyphosate plus AMS controlled barnyardgras better than glyphosate alone, but the addition of dicamba or 2,4-D amine did not improv control compared to glyphosate plus AMS. Green foxtail control was 60 to 90% with al treatments within 7 days of application, 75 to 100% by 14 days, and 100% for all treatment by 28 days (Table 2). No treatment controlled yellow foxtail by more than 47% (Table 2). Little or no difference occurred among similar rates of sulfosate and glyphosate for yellow foxtail control. The inclusion of NIS, AMS, or 2,4-D amine did not improve yellow foxtail control compared to sulfosate alone, and the effects of AMS, dicamba, or 2,4-D amine on yellow foxtail control with glyphosate were inconsistent. (Kansas State University Agricultural Research Center, 1232 240th Ave., Hays, KS 67601-9228).

Table 1. Kochia and barnyardgrass control with sulfosate or glyphosate.

		Weed control					
		Kochia			Barnyardgrass		
Treatment'	Rate	7/22	7/30	8/12	7/22	7/30	8/1
	lb/A			%			
Sulfosate	0.25	3	10	7	27	38	23
Sulfosate	0.375	20	27	30	33	30	37
Sulfosate	0.5	23	43	47	53	60	63
Sulfosate+NIS	0.25+0.25%	3	7	7	7	7	3
Sulfosate+NIS	0.375+0.25%	10	20	17	27	37	47
Sulfosate+NIS	0.5+0.25%	20	30	30	40	47	77
Sulfosate+AMS	0.25+1%	13	20	33	20	33	57
Sulfosate+AMS	0.375+1%	40	43	47	40	60	67
Sulfosate+AMS	0.5+1%	33	50	67	47	57	73
Sulfosate+AMS+NIS	0.25+1%+0.25%	10	17	10	23	40	57
Sulfosate+AMS+NIS	0.375+1%+0.25%	7	17	33	30	43	80
Sulfosate+AMS+NIS	0.5+1%+0.25%	30	40	53	50	70	83
Sulfosate+dicamba+AMS+NIS	0.25+0.1251%+0.25%	47	60	60	33	47	37
Sulfosate+dicamba+AMS+NIS	0.375+0.125+1%+0.25%	57	70	60	47	60	70
Sulfosate+dicamba+AMS+NIS	0.5+0.125+1%+0.25%	57	67	77	57	80	87
Sulfosate+2,4-Da+AMS+NIS	0.25+0.25+1%+0.25%	30	37	43	47	53	70
Sulfosate+2,4-Da+AMS+NIS	0.375+0.25+1%+0.25%	40	50	47	60	80	90
Sulfosate+2,4-Da+AMS+NIS	0.5+0.25+1%+0.25%	43	47	57	72	80	97
Glyphosate	0.25	10	13	33	33	43	40
Glyphosate	0.375	23	27	43	37	43	57
Glyphosate	0.5	37	40	40	63	77	80
Glyphosate+AMS	0.25+1%	30	37	43	63	80	77
Glyphosate+AMS	0.375+1%	43	60	43	72	65	70
Glyphosate+AMS	0.5+1%	60	73	50	80	92	90
Glyphosate+dicamba+AMS	0.25+0.125+1%	47	53	60	47	53	73
Glyphosate+dicamba+AMS	0.375+0.125+1%	57	67	77	67	80	93
Glyphosate+dicamba+AMS	0.5+0.125+1%	70	83	94	83	92	87
Glyphosate+2,4-Da+AMS	0.25+0.25+1%	43	50	60	67	80	80
Glyphosate+2,4-Da+AMS	0.375+0.25+1%	67	77	77	70	90	98
Glyphosate+2,4-Da+AMS	0.5+0.25+1%	78	93	97	77	90	93
LSD (0.05)		12	13	12	15	14	13

'Treatments applied on July 15, 1997; NIS = Triton AG98 nonionic surfactant; AMS = ammonium sulfate; 2,4-Da = 2,4-D amine.

Table 2. Green and yellow foxtail control with sulfosate or glyphosate.

		Weed control					
		Green foxtail			Yellow foxtail		
Treatment'	Rate	7/22	7/30	8/12	7/22	7/30	8/1
	lb/A			%			
Sulfosate	0.25	70	80	100	9	8	8
Sulfosate	0.375	60	75	100	14	23	28
Sulfosate	0.5	90	90	100	29	33	38
Sulfosate+NIS	0.25+0.25%	50	70	100	9	3	13
Sulfosate+NIS	0.375+0.25%	75	93	100	19	23	13
Sulfosate+NIS	0.5+0.25%	90	95	100	13	23	23
Sulfosate+AMS	0.25+1%	70	88	100	20	23	23
Sulfosate+AMS	0.375+1%	80	98	100	23	30	20
Sulfosate+AMS	0.5+1%	83	100	100	17	30	37
Sulfosate+AMS+NIS	0.25+1%+0.25%	80	95	100	7	13	17
Sulfosate+AMS+NIS	0.375+1%+0.25%	80	100	100	11	21	17
Sulfosate+AMS+NIS	0.5+1%+0.25%	90	100	100	27	33	37
Sulfosate+dicamba+AMS+NIS	0.25+0.1251%+0.25%	73	93	100	17	23	0
Sulfosate+dicamba+AMS+NIS	0.375+0.125+1%+0.25%	87	93	100	29	30	20
Sulfosate+dicamba+AMS+NIS	0.5+0.125+1%+0.25%	83	95	100	23	30	30
Sulfosate+2,4-Da+AMS+NIS	0.25+0.25+1%+0.25%	85	93	100	27	30	17
Sulfosate+2,4-Da+AMS+NIS	0.375+0.25+1%+0.25%	87	100	100	30	37	33
Sulfosate+2,4-Da+AMS+NIS	0.5+0.25+1%+0.25%	87	100	100	27	43	47
Glyphosate	0.25	67	80	100	16	26	23
Glyphosate	0.375	70	88	100	20	27	40
Glyphosate	0.5	90	93	100	33	30	30
Glyphosate+AMS	0.25+1%	83	95	100	20	30	10
Glyphosate+AMS	0.375+1%	87	87	100	33	33	30
Glyphosate+AMS	0.5+1%	90	100	100	33	43	47
Glyphosate+dicamba+AMS	0.25+0.125+1%	77	97	100	33	37	20
Glyphosate+dicamba+AMS	0.375+0.125+1%	87	98	100	40	40	37
Glyphosate+dicamba+AMS	0.5+0.125+1%	90	100	100	30	43	43
Glyphosate+2,4-Da+AMS	0.25+0.25+1%	90	98	100	27	23	27
Glyphosate+2,4-Da+AMS	0.375+0.25+1%	90	100	100	37	40	37
Glyphosate+2,4-Da+AMS	0.5+0.25+1%	90	100	100	37	47	40
LSD (0.05)		12	10	NS	11	12	14

'Treatments applied on July 15, 1997; NIS = Triton AG98 nonionic surfactant; AMS = ammonium sulfate; 2,4-Da = 2,4-D amine.

PROJECT 4

TEACHING AND TECHNOLOGY TRANSFER

TIM MILLER, CHAIR

Newly reported weed species; potential weed problems in Idaho. Timothy W. Miller, Wayne S. Belles, Donald C. Thill, and Don W. Morishita. The occurrence and distribution of weed species is a dynamic phenomenon. Weed science works within a framework of ecological plant geography. Few programs devote resources to systematically surveying weed floras or documenting changes in weed species distributions. The distribution of weed species in Idaho submitted from all sources for identification by weed science diagnostic personnel, and of weed species in Idaho otherwise called to our attention, were examined to discover recent changes in distributions. As in previous years the distribution was categorized into three groups. One species was found to be new to the Pacific Northwest (Idaho, Oregon and Washington) in 1997. Two species were found to be new records for Idaho in 1997. Extensions of the ranges of several species that have been present in Idaho for several years were also recorded. Thirty-three species were found to be new records for individual counties in 1997. As this diagnostic service continues to build the data base, as extension weed identification programs increase, and as county staff and consultants gain in diagnostic ability, fewer questions are submitted, and fewer unrecorded species are reported. This is considered to be a measure of successful state and county extension programs. These new records document the reporting and verification of the presence of these species, not necessarily their time of entry into the state or county. Not all are recognized weeds; some are native to the continent, region, state or district; others are simply escaped ornamentals or crops; none are native to the location reported. The reporting period for these data was November 1, 1996 to October 31, 1997. The following lists cite the scientific name, Bayer code (when extant), Weed Science Society of America common name (or common name from other references when WSSA common name is not available), family name and location(s) of each new record. Additional data are maintained on permanent file. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho, 83844-2339)

GROUP I: New regional records: species not previously documented for Idaho, nor currently listed in Flora of the Pacific Northwest (new regional as well as state and county records).

1. *Cleome hassleriana* Chodat (CLEHA) spiderflower; Capparidaceae.
   County: Idaho.

GROUP II: New state records: species not previously documented for Idaho, although currently listed in Flora of the Pacific Northwest (new state as well as county records).

1. *Alhagi pseudalhagi* (Bieb.) Desv. (ALHPS) camelthorn; Fabaceae.
   County: Elmore.

2. *Suaeda occidentalis* S.Wats. (SUEOC) seepweed, western; Chenopodiaceae.
   County: Power.

GROUP III: New county records: species not previously reported in the county listed, although previously reported in one or more counties in Idaho.

1. *Abutilon theophrasti* Medicus (ABUTH) velvetleaf; Malvaceae.
   County: Twin Falls.

2. *Alyssum desertorum* Stapf (AYSDE) alyssum, dwarf; Brassicaceae.
   County: Gooding.

3. *Anchusa arvensis* (L.) Bieb. (LYCAR) bugloss, small; Boraginaceae.
   County: Boundary.

4. *Arabis glabra* (L.) Bernh. (ARCGL) tower-mustard; Brassicaceae.
   County: Caribou.

5. *Asperugo procumbens* L. (ASGPR) catchweed; Boraginaceae.
   Counties: Jerome and Owyhee.

6. *Astragulus cicer* L. (ASACI) milkvetch, cicer; Fabaceae.
   County: Caribou.

7. *Berteroa incana* (L.) DC. (BEFIN) alyssum, hoary; Brassicaceae.
   County: Ada.

8. *Camelina microcarpa* Andrz. ex DC. (CMAMI) falseflax, smallseed; Brassicaceae.
   County: Fremont.

9. *Cardaria pubescens* (C.A.Mey.) Jarmolenko (CADPU) whitetop, hairy; Brassicaceae.
   County: Owyhee.

10. *Centaurea diffusa* Lam. (CENDI) knapweed, diffuse; Asteraceae.
County: Power.

11. *Chenopodium foliosum* (Moench) Asch. (*) goosefoot, leafy; Chenopodiaceae.
County: Caribou.

12. *Echinochloa crus-galli* (L.) Beauv. (ECHCG) barnyardgrass; Poaceae.
County: Kootenai.

13. *Eragrostis cilianensis* (All.) E.Mosher (ERACN) stinkgrass; Poaceae.
County: Lincoln.

14. *Eragrostis pectinaceae* (Michx.) Nees (ERAPE) lovegrass, tufted; Poaceae.
County: Jerome.

15. *Erigeron divergens* T.&G. (*) fleabane, diffuse; Asteraceae.
County: Bonneville.

16. *Erodium cicutarium* (L.) L'Her. ex Ait (EROCI) filaree, redstem; Geraniaceae.
Counties: Caribou and Twin Falls.

17. *Euphorbia dentata* Michx. (EPHDE) spurge, toothed; Euphorbiaceae.
County: Twin Falls.

18. *Euphorbia maculata* L. (EPHMA) spurge, spotted; Euphorbiaceae.
County: Payette.

19. *Geranium pussilum* L. (GERPU) geranium, smallflower; Geraniaceae.
County: Teton.

20. *Glechoma hederacea* L. (GLEHE) ivy, ground; Lamiaceae.
County: Payette.

21. *Hesperis matronalis* L. (HEVMA) damesrocket; Brassicaceae.
County: Boundary.

22. *Holosteum umbellatum* L. (HLOUM) spurry, umbrella; Caryophyllaceae.
County: Minidoka.

23. *Knautia arvensis* (L.) T.Coult. (KNAAR) bluebuttons; Dipsacaceae.
Counties: Boundary and Butte.

24. *Lapsana communis* L. (LAPCO) nipplewort; Asteraceae.
County:Ada.

25. *Lepidium virginicum* L. (LEPVI) pepperweed,Virginia; Brassicaceae.
County: Gem.

26. *Lycium halimifolium* Mill. (LYUHA) matrimonyvine; Solanaceae.
County: Caribou.

27. *Myosurus minimus* L. (MYSMI) mousetail; Ranunculaceae.
County: Ada

28. *Onobrychis viciaefolia* Scop. (ONBVI) sainfoin; Fabaceae
County: Cassia.

29. *Oxalis corniculata* L. (OXACO) woodsorrel, creeping; Oxalidaceae.
Counties: Payette and Washington.

30. *Physalis subglabrata* Mackenz. & Bush (PHYSU) groundcherry, smooth; Solanaceae.
County: Minidoka.

31. *Ranunculus testiculatus* Crantz (CCFTE) buttercup, bur; Ranunculaceae.
County: Lemhi.

32. *Rorippa islandica* (Oeder) Borbas (RORIS) yellowcress, marsh; Brassicaceae
County: Canyon.

33. *Xanthium spinosum* L. (XANSP) cocklebur, spiny; Asteraceae.
County: Nez Perce.

(*) No Bayer Code listed in WSSA Composite List of Weeds.

AUTHOR INDEX 1998

WEED INDEX 1998

CROP INDEX 1998

HERBICIDE INDEX

CGA-248757 [fluthiacet] proposed (Action)	methyl[[2-chloro-4-fluoro-5-[(tetrahydro-3-oxo-1*H*,3*H*-[1,3,4]thiadiazolo [3,4-a]pyridazin-1-ylidene)amino]phenyl]thio]acetate	46,55,94,102
Carfentrazone-ethyl[F-8426] (Affinity)	(ethyl-2-chloro-3[2-chloro-4-fluoro-5-(4-difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl)phenyl-propanoate	8,18,28,30,31,51,57, 70,128,129,131,133, 134,138,150,164,165
Chlorsulfuron (Glean,Telar)	2-chloro-*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]= benzenesulfonamide	21,79,147,161
Clethodim (Select, Prism)	(e,e)-(±)-2-[1-[[3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexene-1-one	35,37,43,60,62,63, 64,66,80,90,104
Clodinafop	2-propenyl-R-2-[4-(5-chloro-3-fluoro-2-pyridyloxy)-phenoxy] propionate	141
Clomazone (Command)	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone	31,57
Clopyralid (Transline, Stiner, Lontrel)	3,6-dichloro-2-pyridinecarboxylic acid	2,8,12,13,19,21,22, 28,30,41,83,86,89,90, 103,110,139,152, 158
Cyanazine (Bladex)	2-[[4-chloro-6-(ethylamino)-1,3,5-triazin-2-yl]amino]-2-methylpropanenitrile	105
Cycolate (Ro-Neet)	*S*-ethyl cyclohexylethylcarbamothioate	82,86,89,91
Desmedipham (Betanex)	ethyl[3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate	80,82,83,84,85, 86,87,89,90,91
Dicamba (Banvel, Clarity)	3,6-dichloro-2-methoxybenzoic acid	2,7,8,9,10,11,13,19, 21,24,45,48,50,94, 97,100,101,102,103, 110,139,155,158,171
Diclofop (Hoelon)	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy]propanoic acid	69,126,135,136,138, 141,146,149,151, 153,164,166
Difenzoquat (Avenge)	1,2-dimethyl-3,5-diphenyl-1*H*-pyrazolium	67,69,108,135,136, 138,149,150,153, 166,168

Dimethenamid (Frontier)	2-chloro-*N*-(2,4-dimethyl-3-thienyl)-*N*-(2-methoxy-1-methylethyl)-acetamide	7,34,35,37,39,45,47, 52,54,55,59,72,73, 74,75,76,77,97,100, 101,102,117
Diquat (Various)	6,7,-dihydrodipyrido[1,2-α:2'1'*c*]pyrazinediium ion	33,119,120
Diuron (Karmex, others)	*N'*-(3,4-dichlorophenyl)-*N*,*N*-dimethylurea	41,62,165
EPTC (Eptam)	*S*-ethyl dipropyl carbamothioate	45,59,72,73,122,166
Ethalfluralin (Sonalan)	*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	34,59,72,73,75, 76,77,116
Ethofumesate (Nortron)	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate	34,35,37,80,82, 83,86,87,89,90,91
EXP-31130A [isoxaflutole] proposed (Balance)	5-cyclopropyl-4-methylsulphonyl)-4-trifluromethylbenzoyl isoxazole	55,69,70,95,96,97, 100,121,122
EXP-31430A	not available	95,96
EXP-31498A	not available	95,96,97
Fenoxaprop (Option, Acclaim, Puma)	(±)-2-[4-[(6-chloro-2-benzoxazoyl)oxy]phenoxy] propanoic acid	126,128,135,137,141, 149,150,151,153,164
Fluazifop-P (Fusilade DX)	(±)-2-[4-[[5-trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid	43,60,104
Flumetsulam (Broadstrike)	*N*-(2,6-diflurophenyl)-5-methyl[1,2,4]triazolo[1,5-*a*]pyrimidine-2-sulfonamide	76,77,103
Flumiclorac (Resource)	[2-chloro-4-fluoro-5-(1,3,4,5,6,7-hexahydro-1,3-dioxo-2*H*-isoindol-2-yl) phenoxy]acetic acid	55
Fluroxypyr (Starane)	4-amino-3,5-dichloro-6-fluoro-2-pyridyloxyacetic acid	8,19,124,132,149,152
Fluthiamide	See BAY FOE-5043	
Glufosinate (Liberty, Finale)	2-amino-4-(hyroxymethylphosphinyl)butanoic acid	33,85,169
Glyphosate (Roundup, others)	*N*-(phosphonomethyl)glycine	2,33,34,37,66,84, 106,137,155,170,171

Halosulfuron (formerly MON 12000) (Permit)	methyl-5-[[(4,6-dimethoxy-2-pyrimidinyl)amino] carbonylaminosulfonyl]-3-chloro-1-methyl-1-*H*-pyrazole-4-carboxylate	31,32,39,46, 48,49,55,57
H 1133	not available	141
Hexazinone	3-cyclohexyl-6-(dimethylamine)-1-methyl-1,3,5-triazine-2,4(1*H*,3*H*)-dione	64
Imazameth	See AC-263,222	
Imazamethabenz (Assert)	(±)-2-[4,5[dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-4= (and 5)-methylbenzoic acid (3:2)	67,69,108,135,136,137, 138,141,149,150,153
Imazomox	See AC-299,263	
Imazapic	See AC-263,222	
Imazethapyr (Pursuit)	2-[4,5[dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid	60,62,64,72,74,76, 77,114,115,140
KV 141	See individual herbicides rimsulfuron and thifensulfuron	
Lactofen (Cobra)	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate	41
Linuron (Lorox, Linex)	*N*-(3,4-dichlorophyenyl)-*N*-methoxy-*N*-methylurea	28
MCPA (several)	(4-chloro-2-methylphenoxy)acetic acid	69,93,126,128,129, 131,132,133,134,136, 137,141,146150,151, 152,158,164
MCPB (Thistrol)	4-(4-chloro-2-methylphenoxy) butanoic acid	44
Metham (Vapam)	methylcarbamodithic acid	54,89
Metolachlor (Dual II, Dual II Magnum)	2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl) acetamide	35,37,39,45,46,47, 50,52,72,75,76,77, 82,91,94,95,96,97, 99,100,102

Metribuzin (Lexone, Sencor)	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4*H*)-one	28,50,53,54,62,97, 100,110,114,117, 118,119,121,122, 147,158,160,161
Metsulfuron (Ally, Escort)	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl] benzoic acid	2,7,9,10,11,21,24, 79,93,113,147,153, 158,161,165
MON 37500 [sulfosulfuron] proposed (none)	{1-[2-ethylsulfonylimidazol(1,2-a)pyridin-3-yl-sulfonyl]-3-(4,6-dimethoxypyrimidin-2-yl)urea}	138,142,143,144,145, 147,158,161,163,165
Napronamide (Devrinol)	*N,N*-diethyl-2-(1-napthalenyloxy) propanamide	54
Nicosulfuron (Accent)	2[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-*N,N*-dimethyl-3-pyridinecarboxamide	97,100
Norflurazon (Zorial)	4-chloro-5-(methylamino)-2-(3-(trifluoromethyl)phenyl)-3(2*H*)-pyridazinone	62
Oxasulfuron proposed [CGA 27746] (Expert)	2-[[[[[4,6-dimethyl-2-pyrimidyl]amino]carbonyl]amino]benzoic acid,3-oxetanyl ester	55
Oxyfluorfen (Goal)	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	30,35,37,41,51,62, 105,111,116
Paraquat (Gramoxone, Extra)	1,1'-dimethyl-4,4' bipyridinium ion	33,41,62,64,94,96,105
Pebulate (Tillam)	*S*-propyl butylethylcarbamothioate	52,91
Pendimethalin (Prowl, others)	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	29,34,35,37,39,41,46, 47,50,62,72,74,76,77, 79,114,115,116,140
Phenmedipham (Spin-Aid, Betanal)	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl) carbama	80,82,83,84,85,86, 87,89,90,91
Picloram (Tordon)	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	2,6,8,9,11,12,13,15, 16,19,20,21,22,23,25
Primisulfuron (Beacon)	2-[[[[[4,6-bis(difluoromethoxy)-2-pyrimidinyl]amino]]carbonyl]amino] sulfonyl]benzoic acid methyl ester	50,94,102,103,108, 110,111,112

Pronamide (Kerb)	3,5-dichloro(*N*-1,1-dimethyl-2-propynyl)benzamide	66
[Prosulfuron] proposed (CGA-152005) [Peak]	1-(4-methoxy-6-methyl-triazin-2-yl)-3-[2-(3,3,3-trifluoropropyl)-phenylsulfonyl]-urea	50,55,93,91,102,103,135,136,151,152,158
Pyrazon (Pyramin)	5-amino-4-chloro-2-phenyl-3(2*H*)-pyridazinone	91
Pyridate (Tough)	0-(6-chloro-3-phenyl)-3(2*H*)-pyridazinone	30,41,102
Pyrithobac	2-chloro-6-[4,6-dimethoxy-2-pyrimidinyl)thio]benzoic acid	104,105
Quinclorac (Facet)	3,7-dichloro-8-quinolinecarboxylic acid	8,11,12,19,24,155
Quizalofop (AssureII)	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy]propanoic acid	43,80,114
RPA 201772	See EXP 31130A	
Rimsulfuron (Matrix)	*N*-[[4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(ethylsulfonyl)-2-pyridinesulfonamide	48,52,53,54,55,94,97,100,117,118,119,121
SAN 835 H	2-(1-[4-(3,5-difluorophenyl) semicarbazono]ethyl) nicotinic acid	45
Sethoxydim (Poast, Ultima 160)	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexene-1-one	35,37,43,60,66,74,80,84,85,101,104
Sulfentrazone (Authority)	*N*-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]phenyl]methanesulfonamide	30,31,41,55,57,72,121
Sulfosate (Touchdown)	*N*(phosphonomethyl) glycine	33,170,171
Terbacil (Sinbar)	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1*H*,3*H*)-pyrimidinedione	41,62
Thiafluamide	See BAY FOE 5043	
Thiazopyr (Visor)	methyl-2-(difluoromethyl)-5-(4,5-dihydro-2-thiazolyl)-4-(2-methylpropyl)-6-(trifluromethyl)-3-pyridinecarboxylate	55,64
Thifensulfuron (Pinnacle, Harmony)	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophene carboxylic acid	7,48,69,70,94,97,126,132,136,137,141,146,151,153,157,158,159