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FORWARD

The 1997 Research Progress Report of the Western Society of Weed Science (WSWS) is a compilation of contributed results of research investigations by weed scientists in the western United States. The overall objectives of the Research Progress Report is to provide an avenue for the presentation and exchange of on-going research to the weed science community. The information in this report is preliminary; therefore, it is netiher intended for publication, nor for development of endorsements or recommendations.

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Western Society of Weed Science;
1997

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PROJECT I

WEEDS OF RANGE AND FOREST

BRUCE KELPSAS, CHAIR

The competitive effects of five cool-season grasses on downy brome. Tom D. Whitson, David W. Koch and Larry Justesen. Downy brome (Bromus tectorum L.) is difficult to control because it has a five-year seed life in soils on arid rangeland. The use f herbicides will require sequential applications to provide long-term control of downy brome. A study was conducted to determine the competitive ability of five cool-season grasses on downy brome. 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, which was also present in the study area. All areas were seeded with 10 lbs. PLS/acre except Bozoisky Russian wildrye which was seeded at 6 lbs. PLS/acre. Dry matter yields were determined by harvesting four 1/4 M quadrats by species, then oven-drying and weighing the samples on August 27, 1996.

Sodar streambank wheatgrass, Luna pubescent wheatgrass and hycrest crested wheatgrass provided significant competition eliminating 85%, 100% and 91%, respectively, of downy brome. Critana thickspike wheatgrass and Bozoisky Russian wildrye provided 32 and 45% reductions of downy brome, respectively, but were not significantly lower than the unseeded control. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071).

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

		Downy Brome	
Perennial grass	lbs.(DM)/A	lbs.(DM)A	% reduction
(Critana) thickspike wheatgrass	720	830	32
(Bozoisky) Russian wildrye	818	670	45
(Sodar) streambank wheatgrass	1032	188	85
(Luna) pubescent wheatgrass	1558	0	100
(Hycrest) crested wheatgrass	1451	113	91
unseeded control		1215	0
LSD (0.5)	581	633	--

Control of wild caraway with various herbicides. J. Thomas, Tom D. Whitson, J. Jenkins, and L.E. Bennett. Wild caraway, *Carum carvi* L., #[1] CARCA, was introduced into the United States as a cultivated species, but escaped to become a weed in mountain meadows, hayfields and along irrigation ditches and roadways in these areas. Wild caraway is classified as a biennial or an occasional perennial. The first year's growth is a small, leafy rosette, resembling a small fern growing close to the ground. Growth the second year starts from a single tap root and then produces a brownish red hollow stem 1 to 3 feet tall with a white to pink floral top.

On June 16, 1994, a study was established to evaluate the efficacy of various herbicides for control of wild caraway near Meeteetse, Wyoming. The study site was located in an alfalfa and mixed grass species hay meadow which was densely infested with wild caraway. Plot size was 10 by 27 feet with four replications arranged as a randomized complete block design. Environmental conditions on June 16, 1994 were: air temperature 43F, soil surface 60F, 1 inch 65F, 2 inches 60F, 4 inches 50F with 90% relative humidity and a calm wind. Soils were a clay loam with 35% sand, 30% silt, 35% clay and 7.7 pH with 5.6% organic matter. Thirteen different treatments consisting of six different herbicides at various rates were applied in a water carrier with a CO_2 pressurized, hand-held sprayer calibrated to deliver 30 gpa at 40 psi. Wild caraway plants varied from the early rosette to early bloom stages of plant growth. Grass species were mostly 8 to 10 inches tall and in the early stages of seed formation. Evaluations were June 14, 1995 and September 5, 1996 by visually comparing the individual treatments to the untreated check and estimating percent control.

Metsulfuron applications of 0.6, 0.45 and 0.3 oz/A provided greater than 90% control in 1995 but metsulfuron at 0.6 oz/A was required to control 96% of the wild caraway in 1996, two years following the initial application. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071).

Table 2. Wild caraway control with various herbicides.

Herbicide[1]	Rate ai/A	Ave
Picloram	0.25 lb	13
Picloram	0.5 lb	19
Picloram	1.0 lb	40
Metsulfuron	0.6 oz	96
Metsulfuron	0.45 oz	78
Metsulfuron	0.3 oz	79
Metsulfuron	0.15 oz	63
Metsulfuron	0.08 oz	33
Clopyralid+2,4-D	0.1+0.5 lb	0
Clopyralid+2,4-D	0.19+1.0 lb	43
Clopyralid	0.23 lb	0
Glyphosate	1.0 lb	0
Check	---	0

Chemical control of oxeye daisy in full seed set with various herbicides. Tom D. Whitson, Scott Hininger and L.E. Bennett. Oxeye daisy, *Chrysanthemum leucantemum* L., #[1] CHYLE, is an erect rhizomatous perennial introduced from Eurasia. Although the flower is attractive, the plant has the competitive ability to displace native, more desirable vegetation. It can be found growing in meadows, roadsides, and waste places.

An experiment was established 27 June 1994 near Dayton, Wyoming to evaluate the efficacy of various herbicides and herbicide combinations for control of oxeye daisy when applied at the full seed growth stage. Herbicides were applied in a water carrier with a CO_2 pressurized, hand-held, sprayer calibrated to deliver 30 gpa at 41 psi. Plots were 10 by 27 feet arranged in a randomized complete block design with four replications. Environmental conditions on 27 June 1994 were: air temperature 75F, soil surface 85F, 1 in 80F, 2 in 75F and 4 in 75F with no wind and clear skies.

Treatments were evaluated one year after treatment on 31 May 1995 by visually comparing the individual treatments to the untreated check and estimating percent control. In 1995, all picloram treatments alone or in combination with 2,4-D at 1.0 lb. and dicamba at 0.5 lb provided greater than 96% control. Clopyralid+2,4-D at 0.38+2.0 lb. provided 99% control while clopyralid alone at 0.38 and 0.5 lb provided 92 and 96% control, respectively.

In 1996 (Table 1) all applications of picloram at 0.25 lb/A applied alone or in various combinations controlled greater than 91% of the oxeye daisy. Clopyralid at 0.5 lb/A controlled 98%, metsulfuron at 0.6 oz ai/A and metsulfuron at 0.038 lb plus dicamba at 0.5 lb/A controlled 90 and 93% of the oxeye daisy, respectively, two years after the application of the herbicides. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071.)

Table 2. Control of oxeye daisy with various herbicides.

Herbicide[1]	Rate lb ai/A	Ave. No
Picloram+2,4-D	0.25+1.0	91
Clopyralid+2,4-D+X-77	0.19+1.0+0.25	35
Clopyralid+2,4-D+X-77	0.28+1.5+.25	76
Clopyralid+2,4-D+X-77	0.38+2.0+.25	88
Clopyralid+X-77	0.13+.25	4
Clopyralid+X-77	0.19+.25	88
Clopyralid+X-77	0.25+.25	80
Clopyralid+X-77	0.38+.25	87
Clopyralid+X-77	0.5+.25	98
Clopyralid	0.19	43
Dicamba+2,4-D+X-77	0.5+1.0+.25	35
Dicamba+Metsulfuron+X-77	0-.5+0.0038+.25	30
Dicamba+Metsulfuron+X-77	0.5+0.038+0.25	93
Dicamba+Picloram	0.5+13	89
Dicamba+Picloram+X-77	0.5+.25+0.25	95
Dicamba+Picloram+X-77	0.5+0.25	56
Picloram+X-77	0.25+0.25	91
Picloram+X-77	0.5+0.25	95
Metsulfuron+X-77	0.6 oz/ai/A	90
Check	----	0

[1]Evaluations made visually July 9, 1996.

Control of houndstongue (Cynoglossum officinale L.) with various herbicides. Tom D. Whitson and Phil A. Rosenlund. Houndstongue is a biennial, poisonous plant that is rapidly invading disturbed areas, pastures and native rangeland in Wyoming. Plots were established in a Regar meadow brome hay meadow on July 15, 1995 when houndstongue was in the late bloom stage to evaluate the efficacy of various herbicides for control. Plots were 10 by 27 ft with four replications arranged in a randomized complete block. Herbicides were applied broadcast with a CO_2 knapsack sprayer delivering 30 gpa at 41 psi. Application in formation: July 15, 1995 (air temp. 80F, relative humidity 85%, wind calm, and soil temp. (0 inch - 85F, 2 inch 80F and 4 inch 78F). The soil was sandy loam (55% sand, 25% silt and 20% clay with 5.3% organic matter and a pH of 8.3). Houndstongue was sparsely populated but well distributed throughout the experimental area.

Herbicides failed to provide complete control the year following application but those controlling 80% of the houndstongue were: picloram at 0.38 and 0.5 lb/A, metsulfuron at 0.019 lb/A and the combinations of metsulfuron plus 2,4-D at 0.008+1.0 lb/A and metsulfuron plus picloram at 0.008+0.13 lb/A, respectively. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071).

Table 2. Control of houndstongue with various herbicides.

	Plants/treatment area[2]		
Herbicide[1]	Rate lb ai/A	Ave No	% Control
Picloram+X-77	0.13+0.25	3	40
Picloram+X-77	0.25+0.25	2	60
Picloram+X-77	0.38+0.25	1	80
Picloram+X-77	0.5+0.25	1	80
2,4-D(amine)+X-77	1.0+0.25	4	20
2,4-D(LVE)+X-77	1.0+0.25	5	0
Picloram+2,4-D(A)+X-77	0.13+1.0+0.25	2	60
Picloram+2,4-D(A)+X-77	0.25+1.0+0.25	4	20
Picloram+2,4-D(LVE)+X-77	0.25+.5+0.25	1	80
Picloram+2,4-D(LVE)+X-77	0.25+1.0+0.25	3	40
Metsulfuron+X-77	.019+0.25	1	80
Metsulfuron+X-77	.008+0.25	2	60
Metsulfuron+2,4-DLVE+X-77	.008+1.0+0.25	1	80
Metsulfuron+picloram+X-77	.008+.13+0.25	1	80
Dicamba+X-77	0.25+0.25	2	60
Dicamba+X-77	0.5+0.25	6	0
Dicamba+X-77	1.0+0.25	3	20
Dicamba+2,4-D(LVE)+X-77	0.5+1.0+0.25	5	0
Check		5	0

[1]Herbicides applied 7/18/95.
[2]Plant counts made 8/13/96.

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 and 1996. 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) and 73% of CENDE 455 DAT (Table 2). Dicamba (0.25 lb/ai) and quinclorac (1.0 lb/ai) controlled about 74% of CENDE 90 DAT and 74 and 91% CENDE, respectively, 455 DAT. Picloram (0.25 lb/ai) controlled 97% to 100% of CENDE from 90 to 455 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 m^2 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 1995	Control 1996	Cover 1995	Cover 1996	Density 1995	Density 1996	Grass Cover 1995	Grass Cover 1996
	(oz ai/a)	%				#		%	
metsulfuron	0.6	26	16	42	48	5	6	34	36
metsulfuron	1.2	51	33	16	30	2	3	37	43
metsulfuron + 2,4-D + dicamba	0.6 16.0 4.0	91	78	2	5	0	1	56	63
metsulfuron + 2,4-D + dicamba	1.2 16.0 4.0	89	73	4	7	1	1	55	64
2,4-D	16.0	68	66	14	14	1	1	42	53
dicamba	4.0	73	74	7	8	1	1	55	58
picloram	4.0	97	100	1	0	0	0	60	66
quinclorac	16.0	75	91	11	1	2	1	37	40
check		0	0	35	36	4	5	25	28
LSD (0.05)		12	10	14	13	2	2	19	17

[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.

The effects of fall applications of various herbicides on Russian knapweed (*Centaurea repens*). Tom D. Whitson, Steve D. Aagard and L.E. Bennett. Russian knapweed is a highly competitive perennial commonly found on sub-irrigated and riparian zones. It is common throughout the West. This experiment was conducted to evaluate fall applications of various herbicides for Russian knapweed control. Herbicides were applied with a six-nozzle knapsack unit delivering 30 gpa at 40 psi. Plots were 10 by 27 ft. arranged in a randomized complete block design with four replications. The soil was a loamy sand (74.2% sand, 7.6% silt and 18.2% clay with 2.8% organic matter and a pH of 7.5.
Application information on October 6 when Russian knapweed was going into fall dormancy following the first frost, temperature: air 60F, soil surface 70F, 1 inch 70F, 2 inches 69F, 4 inches 68F with 50% relative humidity and 2 to 3 mph west winds. Evaluations were made August 12, 1996. Applications of picloram at 0.38, 0.5, 0.75 and 1.0 lb/A controlled 92, 97, 99 and 100% of the Russian knapweed. Clopyralid at 0.5 lb/A controlled 92% of the Russian knapweed. Adjuvants did not influence control with picloram at 0.25 lb/A. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071.

Table 2. Control of Russian knapweed with various herbicides.

Herbicide	Rate ai/A	Ave.
Picloram+X-77	0.125+25%	29
Picloram+X-77	0.25+25%	64
Picloram+X-77	0.375+25%	92
Picloram+X-77	0.5+25%	97
Picloram+X-77	0.75+25%	99
Picloram+X-77	1.00+25%	100
Picloram,2,4-D AM4,+X-77	0.25+1.0+25%	66
Picloram	0.25%	68
Clopyralid+X-77	0.125+25%	9
Clopyralid+X-77	0.25+25%	19
Clopyralid+X-77	0.375+25%	83
Clopyralid+X-77	0.5+25%	92
Picloram+triclopyr	0.25+0.5%	83
Dicamba+X-77	2.0+25%	13
Untreated(UTC)	----	0

Control of Geyer larkspur and Drummond milkvetch with various herbicides. Mark A. Ferrell and Thomas D. Whitson. This research was conducted north of Cheyenne, Wyoming to evaluate Geyer larkspur and Drummond milkvetch control with applications of various herbicides. Plots were 10 by 27 ft. with four replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized hand-held sprayer delivering 30 gpa at 30 psi on June 23, 1995 (air temp. 70 F, soil temp. 0 inch 84 F, relative humidity 40%, wind north at 4 mph, sky clear). The soil was a sandy loam (57% sand, 24% silt, and 19% clay) with 4% organic matter and a 6.7 pH. Larkspur was in bud and 6 to 12 inches in height. Milkvetch was in full bloom and 12 to 14 inches in height. Infestations were heavy throughout the experimental area. Plant counts of the entire 10 by 27 ft plot were made June 16, 1995 immediately before herbicide application and July 16, 1996; 389 days after treatment. Pre-treatment counts were compared to post-treatment counts to obtain percent control.

Picloram at all rates and 0.5 lb of dicamba provided 90% or better control of Geyer larkspur. Picloram at 0.375 lb and 0.5 lb or 1.0 lb Hi Dep + 0.125 lb picloram gave 90% or better control of Drummond milkvetch. Other herbicides alone or in combination provided good to poor control of both species. (Wyoming Agric. Exp. Sta., Laramie, WY 82071.)

Table. Geyer larkspur and Drummond milkvetch percent control.

Treatment[1]	Rate	Weed control[2] Geyer larkspur	Drummond milkvetch
	lb/A	%	
Picloram[3]	0.125	93	53
Picloram[3]	0.25	94	69
Picloram[3]	0.375	98	95
Picloram[3]	0.5	99	90
2,4-D (Hi Dep)[3]	1.0	79	29
2,4-D ester[3]	1.0	69	17
Hi Dep+picloram	1.0+0.125	95	92
2,4-D (Hi Dep)	2.0	82	24
Picloram+2,4-D ester[3]	0.25+0.5	85	86
Picloram+ 2,4-D ester[3]	0.25+1.0	90	73
Metsulfuron[3]	0.019	89	70
Metsulfuron[3]	0.008	73	84
Metsulfuron+2,4-D ester[3]	0.008+1.0	82	67
Metsulfuron+picloram[3]	0.008+0.38	87	81
Hi Dep+metsulfuron[3]	0.5+0.008	89	86
Dicamba[3]	0.5	90	62
Dicamba[3]	1.0	80	75
Dicamba+ 2,4-D ester[3]	0.5+0.5	54	49
(LSD 0.05)		22	31
(CV)		19	35

[1]Treatments applied June 23, 1995.
[2] All plants were counted in the 10 by 27 ft plots immediately before herbicide application and July 16, 1996; 389 days after treatment. Pre-treatment counts were compared to post-treatment counts to obtain percent control.
[3]X-77 added at 0.25% v/v.

Fall applied herbicides for control of black oak in northern California. Joseph M. DiTomaso, Edward Fredrickson, Thomas E. Nishimura, Guy Kyser, and Patrick J. Minogue. Infestations of resprouted black oak (*Quercus kelloggii*) became widespread following the 1992 Fountain Fire in Shasta County, California. This study was conducted in a newly planted ponderosa pine plantation and was designed to compare the effect of current basal applications of triclopyr with broadcast applications of imazapyr and combinations of imazapyr and glyphosate.

Broadcast applications of imazapyr and glyphosate were made with a backpacker sprayer delivering 10 gpa at 30 psi on September 22 and 23, 1995. Each plot consisted of an individual clump with five replications. Treatments were made with a 1-8002 flat fan nozzle. Treatments applied broadcast were imazapyr at 0, 1, 2, 3, 4, and 8 oz ai/a without a surfactant , with 0.25% R-11, or with 0.15% Sylgard, and imazapyr at 0, 1, 2, 3, or 4 oz ai/a with 1.5 lb ae/a glyphosate plus 0.15% Sylgard. Triclopyr was applied in kerosene as a 5% conventional basal treatment or a 20% low volume basal treatment. First year visual evaluations of crown and living stem reduction were made one year later.

For the broadcast trials, there was a significant difference for imazapyr rates, surfactant comparisons, and imazapyr vs imazapyr plus glyphosate. Percent crown reduction demonstrated a dose response to imazapyr. In addition, both surfactant greatly enhanced the activity of imazapyr compared to treatments without a surfactant. The surfactant R-11 was more effective than Sylgard at 1 oz ai/a imazapyr, but no significant differences occurred at the higher herbicide rates. A combination of glyphosate at 1.5 lb ae/a (24 oz ae/a) plus 1 oz ai/a imazapyr was equally effective as imazapyr alone at 3 oz ai/a. Broadcast applications of imazapyr at 1 oz ai/a plus glyphosate provided equal or better control as basal applications of triclopyr. Reduction in living stems was low one year after broadcast treatments compared to basal triclopyr treatments. (Dept. Veg. Crops, Weed Sci. Prog., Univ. California, Davis, 95616).

Table. Herbicide control of respouted black oak.

Treatment	Rate	Surfactant and rate	Crown	Stem
	oz ai/A	---- % ----	% reduction	
control	0	-	3	0
imazapyr	1	-	20	1
imazapyr	2	-	22	1
imazapyr	3	-	30	2
imazapyr	4	-	67	3
imazapyr	8	-	97	3
control	0	R-11 (0.25%)	3	0
imazapyr	1	R-11 (0.25%)	63	1
imazapyr	2	R-11 (0.25%)	83	4
imazapyr	3	R-11 (0.25%)	97	2
imazapyr	4	R-11 (0.25%)	99	3
imazapyr	8	R-11 (0.25%)	100	14
control	0	Sylgard (0.15%)	5	0
imazapyr	1	Sylgard (0.15%)	18	1
imazapyr	2	Sylgard (0.15%)	83	4
imazapyr	3	Sylgard (0.15%)	94	5
imazapyr	4	Sylgard (0.15%)	98	4
imazapyr	8	Sylgard (0.15%)	100	2
glyphosate	24	Sylgard (0.15%)	23	0
imazapyr + glyphosate	1 + 24	Sylgard (0.15%)	96	2
imazapyr + glyphosate	2 + 24	Sylgard (0.15%)	98	2
imazapyr + glyphosate	3 + 24	Sylgard (0.15%)	99	5
imazapyr + glyphosate	4 + 24	Sylgard (0.15%)	100	2
Treatment	Rate	Carrier	Crown	Stem
	--- % ---		% reduction	
triclopyr	5	kerosene	90	62
triclopyr	20	kerosene	95	95

Imazameth for leafy spurge control. Rodney G. Lym. Imazameth (AC 263,222) has shown promise for leafy spurge control, especially when applied in the fall. Imazameth is classified as an ALS enzyme inhibitor with similar chemistry to imazapyr, imazaquin, and imazethapyr. These herbicides all provide fair to good leafy spurge control with some grass injury especially to cool-season species. The manufacturer has begun to sell imazameth for leafy spurge control in the region with limited research data available to the public. The purpose of this research was to evaluate imazameth for leafy spurge control as a fall-applied treatment in North Dakota.

The experiment was established on September 18, 1995, when leafy spurge was in the fall-regrowth stage and 18 to 36 inches tall with some red stems and leaves. The air temperature was 63 F, and the soil temperature at the 4 inch depth was 56 F. A light frost occurred the following morning and a killing frost of 24 F occurred on September 20. Herbicides were applied with a hand-held sprayer delivering 8.5 gpa at 35 psi. The soil was a silty clay with a 8.0 pH and 5.4% organic matter. The grass species present were generally bluegrass, prairie cordgrass, and ryegrass with some brome grass. Visual evaluations were based on percent stand reduction as compared to the control.

		Control		Grass injury	
Treatment	Rate	9 MAT[a]	12 MAT[a]	9 MAT[a]	12 MAT[a]
	— oz/A —		%		
Imazameth	2	79	13	11	3
Imazameth	4	92	8	25	5
Imazameth (fall) / (spring)[b]	2/1	78	25	10	25
Imazameth	8	100	99	64	42
Picloram + 2,4-D	8 + 16	54	23	0	2
LSD (0.05)		15	23	20	22

[a]Months after treatment.
[b]Sequential treatment.

Leafy spurge control in June 1996, 9 months after treatment (MAT) increased as imazameth rate increased and averaged 79 to 100% when imazameth was applied from 2 to 8 oz/A, respectively. Grass injury to cool-season species ranged from 10 to 64% with significant injury to the warm-season prairie cordgrass. Control decreased rapidly by 12 MAT for all treatments, except imazameth at 8 oz/A which averaged 99% control with 42% grass injury. Imazameth as a sequential treatment at 2 plus 1 oz/A did not improve leafy spurge control compared to imazameth at 2 oz/A alone but did result in more grass injury. Since this experiment was established imazameth has been labeled for leafy spurge control at 0.125 to 0.19 lb/A with methylated seed oil and nitrogen fertilizer adjuvants. The inclusion of the adjuvants in this study may have improved leafy spurge control, but also may have increased grass injury. Imazameth is currently being evaluated at lower rates, alone and with additives, and as a spring-applied treatment in an effort to obtain good leafy spurge control with minimal grass injury in North Dakota.

Imazameth activity on leafy spurge. Mark A. Ferrell. This research was conducted near Devil's Tower, Wyoming to evaluate the activity of imazameth on leafy spurge. Plots were 10 by 27 ft. with four replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized hand-held sprayer delivering 20 gpa at 40 psi on September 26, 1995 (air temp. 75 F, soil temp. 0 inch 97 F, relative humidity 23%, wind north at 3 mph, sky clear). The soil was a silt loam (27% sand, 55% silt, and 18% clay) with 2.6% organic matter and a 6.2 pH. Leafy spurge was post seed and 14 to 20 inches in height. Infestations were heavy throughout the experimental area. Visual estimations of percent leafy spurge control were made June 18, 1996; 266 days after treatment and September 17, 1996; 357 days after treatment.

The only treatment providing adequate control, 266 days after treatment, was 0.25 lb/A imazameth plus crop oil concentrate. The addition of a crop oil concentrate was necessary to achieve adequate control. No treatments gave adequate control 357 days after treatment. (Wyoming Agric. Exp. Sta., Laramie, WY 82071.)

Table. Leafy spurge percent control.

		Weed control[2]	
Treatment[1]	Rate	June 18, 1996	Sept. 17, 1996
	lb/A	%	
Imazameth	0.0625	8	5
Imazameth[3]	0.0625	11	1
Imazameth	0.125	39	15
Imazameth[3]	0.125	61	43
Imazameth	0.25	69	38
Imazameth[3]	0.25	87	74
Picloram	0.5	50	33
(LSD 0.05)		13	21
(CV)		22	55

[1]Treatments applied Sept. 26, 1995.
[2]Visual estimates.
[3]Crop oil concentrate added at 1 qt/A.

Herbicide application on an established *Aphthona* spp. flea beetle insectary for leafy spurge control. Katheryn M. Christianson and Rodney G. Lym. The flea beetles, *Aphthona czwalinae* and *A. lacertosa*, were released as biocontrol agents in a dense stand of leafy spurge near Valley City, North Dakota, in 1988. The flea beetles established very well at this location. Collection and redistribution of these insects has occurred since 1992, with over 25 million insects collected in 1995 alone. The leafy spurge stem density has decreased and plant emergence has been delayed often until July 1 or later. Previous research at North Dakota State University has shown that leafy spurge control increased when herbicides were used in conjunction with the biocontrol insects. The purpose of this research was to evaluate the effect of herbicide treatments on leafy spurge control and *Aphthona* spp. population at an established insectary.

The experiment was established on August 15, 1995, when the leafy spurge was in the vegetative growth stage. The insect feeding delayed emergence, so the leafy spurge was 12 to 24 inches tall and still in the vegetative growth stage about 2 months later than normal. There were three herbicide application dates, August 15 and 31, and September 14, 1995. Herbicides were applied using a hand-held sprayer delivering 8.5 gpa at 35 psi. The plots were 15 by 50 feet in a randomized complete block design with four replications. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

Treatment	Application date	Rate	Control		Grass injury	
			9 MAT[a]	12 MAT[a]	9 MAT[a]	12 MAT[a]
		— lb/A —	—— % ——		—— % ——	
Picloram + 2,4-D	Aug 15	0.5 + 1	100	82	0	0
2,4-D	Aug 15	1	100	80	0	0
Glyphosate + 2,4-D[b]	Aug 15	0.3 + 0.46	99	94	34	8
Picloram + 2,4-D	Sept 1	0.5 + 1	100	84	0	0
2,4-D	Sept 1	1	99	88	0	0
Glyphosate + 2,4-D[b]	Sept 1	0.3 + 0.46	99	90	23	0
Picloram + 2,4-D	Sept 15	0.5 + 1	100	78	0	0
2,4-D	Sept 15	1	99	83	0	0
Glyphosate + 2,4-D[b]	Sept 15	0.3 + 0.46	99	83	70	14
Insects only		...	99	77	0	0
LSD (0.05)			NS	NS	12	5

[a]Months after treatment.
[b]Commercial formulation - Landmaster BW.

Leafy spurge control was greater than 99% for all treatments 9 months after treatment (MAT)(Table). Grass injury ranging from 23 to 70% occurred with all glyphosate plus 2,4-D treatments regardless of application date. Leafy spurge control 12 MAT by insects alone averaged 77% compared to an average of 85% when herbicides were combined with insects. Leafy spurge control with the combination treatments of herbicides and biocontrol insects was similar or slightly increased compared to the insect alone, but leafy spurge was not eliminated.

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

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

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

Control was better at Valley City than Jamestown 24 MAFT and averaged 76% and 47%, respectively, over all treatments (Table 1). However, within a location, control was similar regardless of treatment following the 1994 applications. The original 1993 treatments were reapplied in 1995 to the same plots. Control averaged 91% over all treatments at Valley City 36 MAFT but was much lower at Jamestown which only averaged 71%. The original 1994 treatments were reapplied in June 1996. Again control 39 MAFT averaged 95% or higher with all treatments at Valley City, but varied at Jamestown.

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

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

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

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

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

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

1993 and 1995		1994 and 1996		12 MAFT[a]		24 MAFT[a]	36 MAFT[a]		39 MAFT[a]	
Treatment	Rate	Treatment	Rate	Control	Grass injury	Control	Control	Grass injury	Control	Grass injury
	— lb/A —		— lb/A —	%						
Jamestown										
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	47	0	48	71	8	55	40
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	59	0	54	64	0	77	0
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	68	0	53	67	0	75	0
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	23	0	27	53	0	93	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	22	0	32	71	0	91	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	65	0	61	79	0	86	21
Glyphosate+2,4-D[b]+pic[c]+X-7	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	69	0	44	76	0	91	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	65	0	53	86	0	94	0
LSD (0.05)				18	...	NS	NS	NS	11	17
Valley City										
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	88	0	67	76	11	95	98
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	94	5	81	97	10	99	0
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	93	0	89	97	8	98	0
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	43	0	70	93	1	98	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	30	0	71	89	3	95	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Gly+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	91	0	81	97	14	97	71
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	80	0	68	96	6	96	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	86	0	84	84	8	99	0
LSD (0.05)				17	3	NS	16	NS	3	38

[a]MAFT = months after first treatment.
[b]Commercial formulation - Landmaster BW.
[c]Picloram.

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

1995		1996		Control		Grass injury	Total
Treatment	Rate	Treatment	Rate	12 MAFT[a]	15 MAFT[a]	15 MAFT[a]	cost
	– lb/A –		– lb/A –	%			$/A
Glyphosate + 2,4-D[b]	0.4 + 0.6	Glyphosate + 2,4-D	0.4 + 0.6	61	75	15	18
Glyphosate + 2,4-D[b]	0.4 + 0.6	Picloram + 2,4-D	0.25 + 1	69	77	6	22
Glyphosate + 2,4-D[b]	0.4 + 0.6	Dicamba	2	64	71	0	50
Picloram + 2,4-D	0.25 + 1	Picloram	0.25 + 1	36	83	3	26
Dicamba	2	Dicamba	2	37	77	3	82
Picloram + 2,4-D	0.5 + 1	Picloram + 2,4-D	0.5 + 1	39	83	3	46
Glyphosate	0.4	Picloram + 2,4-D	0.25 + 1	44	84	1	20
Glyphosate	0.4	Dicamba	2	43	61	4	47
Glyphosate + 2,4-D[b]	0.3 + 0.46	Glyphosate + 2,4-D	0.3 + 0.46	59	65	2	13
Glyphosate + 2,4-D[b]	0.2 + 0.3	Glyphosate + 2,4-D	0.2 + 0.3	39	56	5	9
LSD (0.05)				18	12	9	

[a]Months after first treatment.
[b]Commercial formulation - Campaign.

Leafy spurge control with quinclorac, a regional study. Lym, R. G., K. G. Beck, R. Becker, E. Davis, M. A. Ferrell, J. Harris, and R. Masters. During the 1993 GPAC-14 annual meeting several weed scientists met to discuss the potential of quinclorac for leafy spurge control. Initial evaluations of the herbicide had varied by state. However, researchers had applied quinclorac at various leafy spurge growth stages and/or with dissimilar or no adjuvants. It was decided to establish a regional trial to evaluate quinclorac applied alone or with adjuvants and/or other herbicides.

Researchers from six states established the regional quinclorac experiment in the fall of 1993. The regional quinclorac trial was established in 1993 when leafy spurge was in the fall-regrowth growth stage. Previous research had shown that quinclorac provided the best leafy spurge control when fall-applied. Herbicides were applied from 16 Sept. in North Dakota to 13 Oct. in Nebraska in 1993 and reapplied in 1994 (Table 1). Herbicides were applied either using a tractor-mounted or a hand-held sprayer. The adjuvant Scoil, a methylated-seed oil, was applied with most treatments. Evaluations were based on a visual estimate of percent stand reduction as compared to the control.

Leafy spurge control with quinclorac varied by region when evaluated in June 1994, 9 months after treatment (MAT). Control averaged better than 90% in CO, MN, MT, and NE but was much lower in ND and WY where control only averaged 69% (Table 2). It is not known why control was lower in ND and WY compared to the other states but picloram plus 2,4-D, the standard treatment, also was much lower. The best overall treatment was a combination of quinclorac plus picloram plus Scoil which provided 95% control averaged over all states. No grass injury was reported at any location.

Control 12 MAT again varied sharply by location (Table 3). For example, control with quinclorac at 16 oz/A ranged from 82% in NE to 29% in WY with an overall average of 58%. The most consistent control again was with the combination treatment of quinclorac plus picloram plus Scoil which averaged 74%. Quinclorac at 16 or 20 oz/A provided similar or better control than picloram plus 2,4-D at 8 + 16 oz/A at all locations. Control was similar whether quinclorac was applied alone or with Scoil.

All treatments were reapplied in 1994 to the same plot area and provided excellent leafy spurge control at all locations except Wyoming in June 1995, which was 21 months after the first treatment (MAFT) (Table 4). Quinclorac at 16 oz/A alone or with Scoil provided 98% control in all states except Wyoming which averaged 70%. Control increased to 92% in Wyoming when quinclorac was applied at 20 oz/A with Scoil.

Control gradually declined regardless of treatment in September 1995, 24 MAFT in all states except Minnesota (Table 5). The research area in Montana could not be evaluated because it had been hayed, and an early snow storm in Nebraska prevented accurate evaluations. In general, quinclorac at 16 oz/A plus Scoil provided similar control to picloram at 8 oz/A and picloram plus 2,4-D at 8 + 16 oz/A. Quinclorac plus Scoil tended to provide better long-term leafy spurge control than quinclorac applied alone. All treatments 24 MAFT in Minnesota provided excellent leafy spurge control except quinclorac at 12 oz/A plus Scoil and picloram at 8 oz/A.

The experiment was terminated after the June 1996 evaluations, 33 MAFT. The best leafy spurge control was at the MN and MT locations where quinclorac at 20 oz/A and quinclorac plus picloram at 12 + 8 oz/A still averaged 90% and 97% control, respectively. These treatments averaged 95% and 62%, respectively in ND, but only 61% and 50%, respectively in WY. Quinclorac at 16 oz/A applied with Scoil provided similar control to quinclorac alone at all locations except ND.

Two desirable attributes of quinclorac were observed during the research. There was never any injury observed to desirable forage grasses at any location. Also, the researchers noted that quinclorac did not injure many desirable broadleaf species including lead plant, purple prairie clover and red clover in NE, prairie wild rose, willow, and anemone in ND, wild rose and wild raspberry in MN. In contrast, these species are injured by treatment with either picloram or 2,4-D. Thus, quinclorac could applied from the Great Plains to the Inter-Mountain West without damage to the grass species and many desirable broadleaf species.

Leafy spurge control with quinclorac varied by region, as did the standard treatment of picloram plus 2,4-D. Since quinclorac provided leafy spurge control at least equal to picloram plus 2,4-D, the herbicide would be a useful addition to the leafy spurge control program. The extent of quinclorac use will depend on marketing and cost. The herbicide may also be useful in areas where the picloram and 2,4-D cannot be used due to environmental restrictions.

Table 1. Establishment of GPAC-14 regional quinclorac study for leafy spurge control.

Location	Date	Researcher	Leafy spurge Height	Leafy spurge Growth stage	Air temp.	Relative humidity	Soil Temp.	Soil Moist.	Soil pH	Soil Type
			inches		F	%	F			
Colorado	10 Oct 93	K.G. Beck	14 to 24	Fall-45% red	57	65	50	Dry	6.5	60:30:10
	3 Oct 94		14 to 18	Fall-70% red	61	71	59	Dry		
Minnesota	23 Sept 93	R. Becker	20 to 30	Fall regrowth	58	44	53	Moist		
	8 Sept 94		11 to 18	Vegetative	84	45	64	Dry		
Montana	17 Sept 93	E. Davis	12 to 24	Fall regrowth	54	78	50	Moist	7.8	Loam
	19 Sept 94	J. Harris	12 to 16	Vegetative	63	55	55	Dry		
North Dakota	16 Sept 93	R. Lym	18 to 24	Fall regrowth	61	69	53	Moist	8.1	Silty-clay
	16 Sept 94		6 to 24	Vegetative	64	70	62	Moist		
Nebraska	13 Oct 93	R. Masters	5 to 15	Fall regrowth	67	49	50	Moist		Sand
	29 Sept 94		8 to 20	Fall regrowth	87	31	52	Dry		Sand
Wyoming	21 Sept 93	M. Ferrell	16 to 24	Fall regrowth	58	37	65	Mod	6.2	32:47:21
	16 Sept 94		16 to 24	Mature	67	43	80	Mod		

Table 2. Summary of GPAC-14 regional quinclorac study for leafy spurge, June 1994.

Treatment	Rate	Control 9 MAT[a] CO	MN	MT	NE	ND	WY	Mean CO MN MT NE	Mean ND WY	Mean All
	— oz/A —	% control								
Quinclorac + Scoil	12 + 1 qt	69	100	93	100	52	61	91	57	79
Quinclorac + Scoil	16 + 1 qt	81	100	90	100	44	72	93	58	81
Quinclorac + Scoil	20 + 1 qt	80	100	99	100	58	82	95	70	87
Quinclorac	16	84	100	93	100	63	76	94	70	86
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	91	100	98	100	93	89	97	91	95
Picloram	8	91	100	99	100	73	76	98	75	90
Picloram + 2,4-D	8 + 16	88	100	91	100	61	58	95	60	83
Control		0	0	0	0	0	0	0	0	0
LSD (0.05)		12	0	6	0	41	22	3	23	8

[a]Months after treatment.

Table 3. Summary of GPAC-14 regional quinclorac study for leafy spurge control, September 1994.

Treatment	Rate	Control 12 MAT[a] CO	MN	MT	NE	ND	WY	Mean CO MN WY	Mean All
	— oz/A —	% control							
Quinclorac + Scoil	12 + 1 qt	35	41	60	60	30	40	39	44
Quinclorac + Scoil	16 + 1 qt	58	53	61	73	15	58	56	52
Quinclorac + Scoil	20 + 1 qt	48	73	84	73	31	73	64	63
Quinclorac	16	50	65	65	82	29	63	59	58
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	70	67	82	97	58	76	71	74
Picloram	8	58	52	64	88	26	53	54	55
Picloram + 2,4-D	8 + 16	61	52	61	78	32	38	50	53
Control		0	0	0	0	0	0	0	0
LSD (0.05)		18	13	15	40	38	23	10	10

[a]Months after treatment.

Table 4. Summary of GPAC-14 regional quinclorac study for leafy spurge control, June 1995.

Treatment	Rate	Control 21 MAFT[a] CO	MN	MT	NE	ND	WY	Mean Except WY
	— oz/A —	% control						
Quinclorac + Scoil	12 + 1 qt	90	93	93	97	100	60	94
Quinclorac + Scoil	16 + 1 qt	100	96	98	100	100	70	98
Quinclorac + Scoil	20 + 1 qt	100	99	100	100	100	92	99
Quinclorac	16	97	99	99	100	99	76	99
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	100	100	100	100	100	91	100
Picloram	8	96	99	98	97	100	91	100
Picloram + 2,4-D	8 + 16	100	94	94	100	100	45	97
Control		0	0	0	0	0	0	0
LSD (0.05)		7	5	5	5	0.5	25	2

[a]Months after the first treatment.

Table 5. Summary of GPAC-14 regional quinclorac study for leafy spurge control, September 1995.

Treatment	Rate	Control 21 MAFT[a] CO	MN	MT[b]	NE[b]	ND	WY	Mean except MN
	— oz/A —	% control						
Quinclorac + Scoil	12 + 1 qt	50	75			76	63	63
Quinclorac + Scoil	16 + 1 qt	78	94			71	74	74
Quinclorac + Scoil	20 + 1 qt	76	99			80	92	83
Quinclorac	16	63	97			62	79	68
Quinclorac + picloram + Scoil	12 + 8 + 1 qt	84	99			82	92	87
Picloram	8	77	81			56	69	67
Picloram + 2,4-D	8 + 16	83	90			63	45	64
Control		0	0			0	0	0
LSD (0.05)		20	10			14	25	12

[a]Months after the first treatment.
[b]The research plots could not be evaluated in MT and were abandoned in NE in September 1995.

Table 6. Summary of GPAC-14 regional quinclorac study for leafy spurge control, June 1996.

Treatment	Rate	Control 33 MAFT[a] CO[b]	MN	MT	NE[c]	ND	WY	Mean MN & MT
	— oz/A —	% control						
Quinclorac + Scoil	12 + 1 qt		75	69		62	23	72
Quinclorac + Scoil	16 + 1 qt		94	75		52	28	82
Quinclorac + Scoil	20 + 1 qt		99	82		62	50	90
Quinclorac	16		97	76		37	25	85
Quinclorac + picloram + Scoil	12 + 8 + 1 qt		99	95		95	61	97
Picloram	8		81	92		67	34	87
Picloram + 2,4-D	8 + 16		90	84		72	14	82
Control			0	0		0	0	0
LSD (0.05)			10	16		26	26	10

[a]Months after the first treatment.
[b]Plots were over-sprayed and could not be evaluated.
[c]The research plots were abandoned in September 1995.

The effects of quinclorac with/without glyphosate pretreatment on yellow starthistle. Lawrence Lass and Robert Callihan. The development of phenoxy and pyridine herbicide resistance in yellow starthistle has limited chemical control options in several areas in Columbia County, WA. Quinclorac offers an alternative mode of action and has been shown to successfully control yellow starthistle in green house studies. A single field study has shown high rates when applied in the spring will provide excellent control. The objective of this project was to determine the effects of lower rates on yellow starthistle and two grasses used in rangeland renovation.

The experimental design for the herbicides was a split block with five replications. The plot size was 10 by 30 feet. A 16 oz ai/a glyphosate pretreatment was applied to half of the replicate on March 2, 1996. Quinclorac treatments (6, 4, 2, and 1 oz ai/a) were applied on April 6, 1996. The herbicides were sprayed with a CO^2 backpack sprayer. The sprayer delivered 9.4 gal/a using 8001 flat fan nozzles for the glyphosate application and 19 gal/a using 8002 flat fan nozzles for the quinclorac application. Both application dates had calm winds and the air temperature was 65F. Precipitation measuring 0.5 inches occurred 2 days after the quinclorac application. The yellow starthistle was in the cotyledon stage and downy brome had 4 leaves when the glyphosate was applied. At the time of the quinclorac application the yellow starthistle and downy brome in the glyphosate treatments was dead, but in the untreated area yellow starthistle had 2 leaves and the downy brome as about 2 inches tall.

The grasses were planted as two strip blocks across the herbicide treatments on April 15, 1996, with a seven-row drill seeder with 7-inch spacing. The conventional drill used in a no-till manner placed the seed at a depth of about 1 inch in the soil. A seeding rate of 13 seeds per ft was used. The grasses within each block were sheep fescue (Festuca ovina L. cv. Covar) and pubescent wheatgrass (Thinopyrum intermedium spp barbulatum (Schu.) Barkw. cv. Luna).

Measurement of yellow starthistle diameter and density and weed cover were recorded on May 22, 1996 of the quinclorac with glyphosate treatments. The quinclorac without glyphosate areas were not measured in May because downy brome dominated the plots. By August, yellow starthistle was evident in without glyphosate treatments. Yellow starthistle cover and height measurements were made for all plots on August 2, 1996. Grass establishment success will be recorded in 1997.

Yellow starthistle rosette diameter was reduced 50% by the 4 and 6 oz/a quinclorac treatments and by 30% by the 2 oz/a treatment (Table 1). The density of yellow starthistle was reduced by 75% when treated with 6 oz/a quinclorac. Downy brome was not significantly impacted by the quinclorac treatments (Table 1).

The glyphosate pretreatment killed all yellow starthistle present at the time of application. The time lag between glyphosate application and quinclorac application allowed some yellow starthistle and downy brome germination. Yellow starthistle height in the glyphosate treatments was nearly twice of areas not receiving glyphosate because of low plant competition (Table 2). Quinclorac at 4 and 6 oz/a reduced yellow starthistle height in the glyphosate areas to levels found with plant competition in the non-glyphosate areas.

Quinclorac will reduce the size of yellow starthistle with increased rates. Post emergence activity appears to be limited to suppression. Tank-mixing a short residual herbicide to remove seedling weeds may improve quinclorac's ability to provide long term control of yellow starthistle. (University of Idaho, Dept. PSES, Moscow 83844-2339)

Table 1. Effect of quinclorac with glyphosate pretreatment.

		Yellow Starthistle		Downy Brome	
Herbicide	Rate	Diameter	Density	Height	Density
	oz ia/a	(cm)	(no./m²)	(cm)	(no./m²)
Check	0	16 a	33 a	22 a	48 a
Quinclorac	1	14 a	24 ab	22 a	36 a
Quinclorac	2	11 ab	14 ab	21 a	33 a
Quinclorac	4	8 b	22 ab	17 a	42 a
Quinclorac	6	6 b	8 b	19 a	55 a

Evaluations made on May 22, 1996.
Means followed by the same letter are not different at the 0.05 level using LSmeans test.

Table 2. The effects of quinclorac with/without glyphosate pretreatment on yellow starthistle.

Herbicide		+ Rate			Cover	Height
					(%)	(cm)
Quinclorac	0	+	Glyphosate	0	78 a	40 bc
Quinclorac	0	+	Glyphosate	16	88 a	83 a
Quinclorac	1	+	Glyphosate	0	49 a	39 bc
Quinclorac	1	+	Glyphosate	16	71 a	75 a
Quinclorac	2	+	Glyphosate	0	58 a	43 b
Quinclorac	2	+	Glyphosate	16	74 a	71 a
Quinclorac	4	+	Glyphosate	0	42 a	47 bc
Quinclorac	4	+	Glyphosate	16	56 a	52 b
Quinclorac	6	+	Glyphosate	0	19 a	33 c
Quinclorac	6	+	Glyphosate	16	28 a	50 b

Herbicide + rate (oz ai/a)
Evaluations made on August 2, 1996.
Means followed by the same letter are not different at the 0.05 level using LSmeans test.

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)and August 20, 1996 (year 2). 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. Visual evaluations compared to non-treated control plots were taken in October 1995 and 1996. All initial treatments controlled 25 to 65% of LINVU in October 1995 and 0 to 73% in 1996 (Table 2). Slight decline in LINVU cover and density values were noted with the highest picloram and picloram plus 2,4-D treatments, although they are not statistically different. (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
Application time	6:00 AM	9:00 AM
Air temperature, C	16	14
Cloud cover, %	15	35
Relative humidity, %	64	63
Wind speed, mph	0	0 to 5

Application date	species	growth stage	height (in.)	density (shoots/ft^2)
August 3, 1995	LINVU	flowering	8 to 19	15 to 25
	POAPR	flowering	3 to 10	
	BROIN	flowering	10 to 19	
	AGRSM	late boot	3 to 10	
August 20, 1996	LINVU	flowering	7 to 19	15 to 20
	POAPR	flowering	2 to 6	
	BROIN	flowering	17 to 24	
	AGRSM	late boot	9 to 16	

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	Year of Treatment	Yellow Toadflax Control 1995	Control 1996	Cover 1995	Cover 1996	Density 1995	Density 1996	Grass Cover 1995	Grass Cover 1996
	(lb ai/A)		%				#		%	
picloram	0.25	1	30	0	53	55	20	16	34	37
		2	25	0	52	50	16	18	38	33
		3	29	0	60	52	20	18	34	35
picloram	0.5	1	53	30	46	42	19	15	40	44
		2	53	25	62	47	30	21	26	39
		3	56	28	41	21	15	9	39	46
picloram	0.8	1	55	41	44	27	17	8	23	40
		2	55	35	42	21	14	5	33	44
		3	54	43	55	41	21	14	22	39
picloram	1.0	1	59	60	31	19	11	5	49	56
		2	59	60	24	16	9	4	51	62
		3	56	60	39	20	11	6	49	52
picloram + 2,4-D	0.25 1.0	1	36	18	48	38	17	13	39	44
		2	40	21	33	34	9	10	46	46
		3	39	18	41	36	16	14	44	49
picloram + 2,4-D	0.5 1.0	1	65	73	19	3	7	1	44	53
		2	65	69	19	10	9	2	45	55
		3	64	64	29	18	11	6	47	55
control		1	0	0	51	60	20	21	35	26
		2	0	0	54	57	19	19	41	32
		3	0	0	37	41	13	15	35	27
LSD (0.05)			10	20	25	24	12	10	24	18

[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.

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 flowering on August 8, 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 and October 1996. Treatments controlled 4 to 60% of LINVU 60 and 380 days after treatment.

Baseline LINVU 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 three 0.1 m^2 quadrats per plot (12 total quadrats per treatment) taken approximately 60 and 380 DAT. CENDE density and cover and grass cover was not affected by any herbicide. (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	August 8, 1995
Application time	6:00 AM
Air temperature, C	16
Cloud cover, %	15
Relative humidity, %	64
Wind speed, mph	0

Application date	species	growth stage	height (in.)
June 12, 1995	LINVU	flowering	4 to 19
	POAPR	early flower	7 to 12
	BROIN	early flower	7 to 15
	AGRSM	late boot	3 to 10

Table 2. Yellow toadflax control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba on Colorado rangeland.

Herbicide[a]	Rate	Yellow toadflax Control 1995	Control 1996	Cover 1995	Cover 1996	Density 1995	Density 1996	Grass Cover 1995	Grass Cover 1996
	(oz ai/a)	%				#		%	
metsulfuron	0.6	25	14	31	21	14	8	27	35
metsulfuron	1.2	29	60	48	13	19	4	16	41
metsulfuron + 2,4-D + dicamba	0.6 16.0 4.0	36	6	38	36	12	13	17	28
metsulfuron + 2,4-D + dicamba	1.2 16.0 4.0	49	44	43	21	18	6	19	29
2,4-D	16.0	40	10	45	44	18	17	24	30
dicamba	4.0	29	5	43	49	17	18	26	28
picloram	4.0	36	9	47	36	22	15	14	27
picloram	8.0	35	38	36	33	14	9	23	43
quinclorac	16.0	23	16	20	22	7	6	36	45
check		0	0	39	46	17	15	14	20
LSD (0.05)		14	22	28	25	14	10	16	23

[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.

Control of dyer's woad on rangeland with sulfonylurea herbicides. Timothy W. Miller, Robert H. Callihan, and Tracy Holbrook. Plots were established on rangeland in Bannock county, Idaho to evaluate the efficacy of two sulfonylurea herbicides at 7 different rates on dyer's woad (ISATI). The site was a south-facing, 25% slope averaging < 10 inches mean annual precipitation. The experimental design was a randomized complete block with four replications and individual plots were 10 by 40 ft. Herbicides were applied on March 26, 1996 using an air-pressurized backpack sprayer delivering 20 gpa at 40 psi (air temp. 41 F, soil temp. at 4 inches 37 F, wind WSW 6 to 7 mph, relative humidity 52%, clear sky). Nonionic surfactant was added (0.5%, v/v) to all herbicide treatments. Weed density in the untreated checks was estimated at 0.6 plants/ft^2. Dyer's woad plants at the time of application were 3- to 7-inch rosettes, and a few were beginning to bolt. About 20% of the plants showed symptoms of rust infection (*Puccinia thlaspeos* Schub.). Approximately 2 inches of snow fell 3 days prior to the application and again 3 days after the application, but plots were free of snow and plants dry when treated.

The density of nonbolted dyer's woad rosettes was visually estimated on August 16, 1996. Metsulfuron provided excellent control and there were no statistical differences among rates ($LSD_{0.05}$ = 11). Triasulfuron had inadequate activity for satisfactory suppression of germinating dyer's woad. These data provide an indication of residual activity on germinating dyer's woad seedlings, the resultant 1996 rosettes, and consequent suppression of dyer's woad reproduction during 1997. They are not indicative of the effects upon plants emerged at the time of treatment. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Dyer's woad response to sulfonylurea herbicides 5 months after treatment[1].

Treatment	Rate	Live Rosettes[2]				
		Replicate				
		1	2	3	4	Ave.
	oz/A	%				
Metsulfuron	0.10	20	10	0	2	8
Metsulfuron	0.21	0	1	0	0	0
Metsulfuron	0.43	0	0	0	0	0
Triasulfuron	0.05	21	90	30	100	55
Triasulfuron	0.10	90	80	40	80	72
Triasulfuron	0.21	85	25	5	15	32
Triasulfuron	0.43	70	30	70	2	43
Check	--	100	100	100	100	100

[1]Treated 3/26/96; evaluated 8/16/96.
[2]Nonbolted rosette population expressed as a percentage of the nontreated check. Dyer's woad population in checks averaged 0.6/ft^2.

PROJECT 2

WEEDS OF HORTICULTURAL CROPS

ELAINE HALE, CHAIR

Evaluation of preemergence herbicide applications on seed carrots. Marvin D. Butler. The objective of this project was to evaluate preemergence applications of linuron at 0.5 lb/A and 1 lb/A, pendimethalin at 1 lb/a, and linuron at 0.5 lb/A plus pendimethalin at 1 lb/A on seed carrots grown commercially a two locations near Madras, Oregon. Treatments were applied August 16 with a CO_2 pressurized, hand-held boom sprayer at 40 psi and 20 gpa. Plots 10 by 20 ft were replicated three times in a randomized complete block design. Treatments were evaluated September 20 by counting the number of common groundsel, prickly lettuce, redroot pigweed, and hairy nightshade plants per plot at the Harris location, and common groundsel, prickly lettuce, redroot pigweed, and common mallow plants per plot at the Boyle location. Reduction in stand and crop injury were rated visually.

Linuron at 1 lb/A provided 100% control of common groundsel, prickly lettuce, redroot pigweed, and hairy nightshade at the Harris location, and 93% control of prickly lettuce, redroot pigweed, and common mallow at the Boyle location. Linuron at 0.5 lb/A completely controled redroot pigweed at both locations, but was weak on common groundsel. Pendimethalin at 1 lb/A provided inadequate control of common groundsel, and less overall control than linuron at either 0.5 lb/A or 1 lb/A. There was no reduction in carrot stand and no visible crop injury. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97743)

Table 1. Effect of preemergence herbicide applications on seed carrots at the Harris location near Madras, Oregon.

		Weed counts[1]				
Treatments[2]	Rate	Common groundsel	Prickly lettuce	Redroot pigweed	Hairy nightshade	Total weeds
	(lb/A)	(plants per plot)				
Linuron	0.5	1.7	0.3	0	0	2
Linuron	1.0	0	0	0	0	0
Pendimethalin	1.0	4	1.7	2	0	7.7
Linuron	0.5					
+ Pendimethalin	1.0	0.3	0.3	0	0	0.7
Untreated	----	4	5	8.3	0.7	18

Table 2. Effect of preemergence herbicide applications on seed carrots at the Boyle location near Madras, Oregon.

		Weed Counts[1]				
Treatments[2]	Rate	Common groundsel	Prickly lettuce	Common mallow	Redroot pigweed	Total weeds
	(lb/A)	(plants per plot)				
Linuron	0.5	1.8	1	0	0	2.8
Linuron	1.0	0.8	0	0	0	0.8
Pendimethalin	1.0	3	1	0	0	4
Linuron	0.5					
+ Pendimethalin	1.0	3.3	0	0	0	3.3
Untreated	----	3.5	1.8	1.3	5.5	12

[1] Visual evaluation was conducted September 20, 1996
[2] Treatments applied August 16, 1996

Evaluation of preemergence herbicide applications to carbon-banded seed carrots. Marvin D. Butler. The objective of this project was to evaluate preemergence applications of linuron at 0.5, 1, and 2.5 lb/A, diuron at 1.6 lb/A, and metribuzin at 0.2 lb/A on carbon-banded seed carrots. Commercial equipment was used to place a 2 inch-wide carbon band over the seed row following planting in a commercial seed carrot field near Culver, Oregon. Carbon at 17 lb/treated A and a dilute 10-34 fertilizer mixture were applied in a carrier rate of 45 gpa. Following carbon-banding, herbicide treatments were applied August 15 with a CO_2 pressurized, hand-held boom sprayer at 40 psi and 20 gpa.. Plots 10 by 20 ft were replicated three times in a randomized complete block design. Treatments were evaluated September 19 by counting the number of weeds per plot for hairy nightshade, common lambsquarters, common groundsel, and prickly lettuce. Reduction in stand and crop injury were rated visually.

Linuron at 2.5 lb/A provided 100 % control of four weed species. Linuron at 1 lb/A provided 95 % control of weeds evaluated, with 100 % control of hairy nightshade and prickly lettuce. Diuron provided with 100 % control of common groundsel and prickly lettuce, with 94 % control across all weeds evaluated. Linuron at 0.5 lb/A provided inadequate control of common lambsquarters, and metribuzin at 0.2 lb/A provide inadequate control of hairy nightshade. There was no reduction in carrot stand and no visible crop injury. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of preemergence herbicide applications to carbon-banded seed carrots near Culver, Oregon, 1996.

Treatments[2]	Rate	Weed counts[1] Hairy nightshade	Common lambsquarters	Common groundsel	Prickly lettuce	Total weeds
	(lb/A)	(plants per plot)				
Linuron	0.5	2	5.3	1.7	2	11
Linuron	1.0	0	0.3	0.7	0	1
Linuron	2.5	0	0	0	0	0
Diuron	1.6	1	0.3	0	0	1.3
Metribuzin	0.2	5.3	0.7	0	0.7	6.7
Untreated	----	6	7.3	3	4.7	21

[1] Visual evaluation was conducted September 20, 1996
[2] Treatments applied August 16, 1996

Evaluation of layby herbicide applications on seed carrots. Marvin D. Butler. The objective of this project was to evaluate layby applications of prometryn at 1 and 2 lb/A, prometryn at 0.5 and 1 lb/A plus linuron at 1 lb/A, prometryn at 0.5 lb/A plus metribuzin at 0.25 lb/A, prometryn at 0.5 lb/A plus pendimethalin at 1 lb/A, prometryn at 0.5 lb/A plus linuron at 1 lb/A plus metribuzin at 0.25 lb/A, and bromoxynil at 0.25 lb/A plus metribuzin at 0.25 lb/A on seed carrots grown commercially near Culver, Oregon. Treatments were applied June 19 with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. Plots 10 by 20 ft were replicated three times in a randomized complete block design. Treatments were evaluated July 2 for control of common groundsel and hairy nightshade. Reduction in stand and crop injury were rated visually.

Bromoxynil at 0.25 lb/A plus metribuzin at 0.25 lb/A provided 99 % control of common groundsel and 97 % control of hairy nightshade. Prometryn at 0.5 lb/A plus linuron at 1 lb/A plus metribuzin at 0.25 lb/A provided 98 % control of common groundsel and 97 % control of hairy nightshade. Prometryn at 0.5 lb/A plus metribuzin at 0.25 lb/A provided 94 percent control of groundsel and 88 percent control of hairy nightshade. All three of these treatments providing the highest level of weed control included metribuzin at 0.25 lb/A. Prometryn at 2 lb/A provided a total of 88 % weed control compared to 66 % at 1 lb/A. Inadequate weed control was provided by prometryn at 0.5 lb/A in combination with either linuron or pendimethalin at 1 lb/A. There was no reduction in carrot stand and the only visible crop injury was burning on the lower leaves in plots treated with bromoxynil at 0.25 lb/A plus metribuzin at 0.25 lb/A. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Evaluation of layby herbicide applications on commercial seed carrots near Culver, Oregon.

Treatments[2]	Rate	Weed Control[1] Common groundsel	Hairy nightshade	Total weeds
	(lb/A)	(%)		
Prometryn	1.0	62	70	66
Prometryn	2.0	83	93	88
Prometryn + linuron	0.5 1.0	60	53	57
Prometryn + linuron	1.0 1.0	65	90	78
Prometryn + metribuzin	0.5 0.25	94	88	91
Prometryn + pendimethalin	0.5 1.0	47	67	57
Prometryn + linuron + metribuzin	0.5 1.0 0.25	98	97	98
Bromoxynil + metribuzin	0.25 0.25	99	97	98
Untreated	----	0	0	0

[1] Visual evaluation was conducted July 2, 1996.
[2] Treatments applied June 19, 1996.

Evaluation of layby herbicide applications on seed coriander. Marvin D. Butler. The objective of this project was to evaluate spring-applied, layby applications of prometryn at 1 and 2 lb/A and prometryn at 1 lb/A plus linuron at 0.5 lb/A to coriander grown commercially for seed near Madras, Oregon. Treatments were applied July 11 with a CO_2 pressurized, hand-held boom sprayer at 40 psi and 20 gpa. Crop oil concentrate at 1% v/v was added to all treatments. Plots 10 by 20 ft were replicated three times in a randomized complete block design. Treatments were evaluated July 30 for control of redroot pigweed, common purslane, and grass species.

Prometryn at 2 lb/A provided 90 to 97% control for redroot pigweed, common purslane, and grass species. Total weed control for prometryn at 1 lb/A was 68% compared to 93% for prometryn at 2 lb/A. Prometryn at 1 lb/A plus linuron at 0.5 lb/A did not increase efficacy over prometryn alone at 2 lb/A. There was no reduction in coriander stand and no visible crop injury. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of spring-applied, layby herbicide applications on coriander grown for seed near Madras, Oregon.

		Weed Control[1]			
Treatments[2]	Rate	Redroot pigweed	Common purslane	Grass species	Total weeds
	(lb/A)	----------(%)----------			
Prometryn	1.0	77	88	40	68
Prometryn	2.0	92	97	90	93
Prometryn	1.0				
+ linuron	0.5	90	92	80	87
Untreated	---	0	0	0	0

[1] Visual evaluation was conducted July 30, 1996.
[2] Treatments applied July 11, 1996.

Evaluation of preemergence herbicide applications on seed radish. Marvin D. Butler. The objective of this project was to evaluate pre-plant, preemergence applications of metolachlor at 1 and 2 lb/A, trifluralin at 0.75 lb/A, and metolachlor at 1 lb/A plus trifluralin at 0. 5 lb/A on seed radish grown commercially near Madras, Oregon. Treatments were applied April 25 with a CO_2 pressurized, hand-held boom sprayer at 40 psi and 20 gpa. Plots 20 by 30 ft were replicated three times in a randomized complete block design. Herbicides were mechanically incorporated into the top 2 to 3 inches of soil with a commercial discing operation shortly after application. Treatments were evaluated June 10 for control of redroot pigweed, prickly lettuce, hairy nightshade, common groundsel, and common lambsquarters. Reduction in stand and crop injury were rated visually.

Treatments with trifluralin at 0.75 lb/A provided 100% control of hairy nightshade, and better control than metolachlor alone at 1 or 2 lb/A for redroot pigweed, prickly lettuce, and common lambsquarters. Metolachlor at 2 lb/A provided the best control of common groundsel at 95%. There was no reduction in radish stand and no visible crop injury. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of pre-plant, preemergence herbicide applications on commercial seed radish near Madras, Oregon.

		Weed control[1]				
Treatments[2]	Rate	Redroot pigweed	Prickly lettuce	Hairy nightshade	Common groundsel	Common lambsquarters
	(lb/A)	----------(%)----------				
Metolachlor	1.0	30	0	85	45	0
Metolachlor	2.0	40	20	95	95	0
Metolachlor	1.0					
+ trifluralin	0.5	60	60	100	85	55
Trifluralin	0.75	90	40	100	90	70
Untreated	---	0	0	0	0	0

[1] Visual evaluation was conducted June 10, 1996.
[2] Treatments applied April 25, 1996.

Evaluation of preemergence herbicide applications on seed onion and radish. Marvin D. Butler. The objective of this project was to evaluate post-plant, preemergence applications of pendimethalin at 1 lb/A, propachlor at 5 lb/A, and alachlor at 1.25 lb/A on seed onions and radishes grown commercially near Madras, Oregon. Treatments were applied July 27 with a CO_2 pressurized, hand-held boom sprayer at 40 psi and 20 gpa. Plots 18 by 25 ft were replicated three times in a randomized complete block design. Treatments were evaluated August 14 for control of redroot pigweed, common lambsquarters, and grass species. Reduction in stand and crop injury were rated visually.

Pendimethalin provided 100% control of common lambsquarters, 99% control of redroot pigweed, was ineffective on grass species, and reduced the radish stand by 53% and plant growth by 67%. Propachlor provided 90% control of redroot pigweed, did not provide adequate control of common lambsquarters at 63% or grass species at 70%, and reduced the onion stand by 47% and plant growth by 30%. Alachlor provided 98% control of redroot pigweed, 96% control of grass species, and 83% control of common lambsquarters, with 13% reduction or less in onion or radish stands and plant growth. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of post-plant, preemergence herbicide applications on commercial seed onion and radish near Madras, Oregon.

		Weed control[1]			Onion		Radish	
Treatments[2]	Rate	Redroot pigweed	Common lambsquarters	Grass species	Reduced stand	Reduced growth	Reduced stand	Reduced growth
	(lb/A)	(%)						
Pendimethalin	1.0	99	100	20	17	13	53	67
Propachlor	5.0	90	63	70	47	30	0	13
Alachlor	1.25	98	83	96	13	13	0	13
Untreated	---	0	0	0	0	0	0	0

[1] Visual evaluation was conducted August 14, 1996.
[2] Treatments applied July 27, 1996.

Preemergence 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, ID to evaluate preemergence herbicide treatments for the control of annual weeds in a dry bulb onion crop. Onions (var. 'Golden Cascade') were planted on April 1, 1996 at a rate of 8 lb/A and at a depth of 0.75 in. on 22 in. beds. Soil at the location is a Greenleaf-Owyhee Silt Loan (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH) and the surface was rough and cloddy (1-1.5 in. diameter). Herbicide treatments were applied on April 16 with a CO2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). The onion crop emerged on April 23 and weed control visual evaluations were taken on May 29 (43 DAT). No crop tolerance data could be recorded because of hail damage to the crop which occurred on May 18,1996. All herbicide treated plots were hand weeded on June 24, 1996 and were maintained weed free through the remainder of the growing season.

Table 1. Application information.

Crop stage	PRE
weed stage	PRE (dormant)
Air temp. (F)	59
Relative humidity (%)	61
Wind (mph)	03
Sky (% cloud cover)	95
Soil temp. (F at 4 in.)	52
Soil moisture	dry surface, good moisture at 2.5 in.
First significant rain fall after herbicide application was 0.14 in. occurring April 18, 1996.	

Pendimethalin at 1.5 lb/A, pendimethalin + ethalfluralin at 1.0 + 1.0 lb/A, pendimethalin + ethofumesate at 1.0 + 0.25 lb/A and pendimethalin + glyphosate at 1.0 + 0.38 lb/A gave 92% or better control of all annual weed species present (Table 2). Glyphosate at 0.38 lb/A did not provide satisfactory weed control because spring tillage operations dried the soil profile preventing weed seed germination and emergence prior to onion emergence.

Onions were harvested on September 27, graded for quality, yield weights recorded and percentage ratios for quality grade calculated. Quality grades used for this study were: colossal (> 4 in. diameter), jumbo (3-4 in. diameter), medium (2.25-3 in. diameter) and culls (< 2.25 in. diameter). In plots where herbicide treatments provided a high level of weed control (including the handweeded check), the ratio of colossal and jumbo grade onions were much higher than in plots where poor initial weed control was attained. Values for each quality grade was established (market quote from J. C. Watson Company, Parma, ID) as colossal at $6.00 /CWT, jumbo at $5.00 /CWT, medium at $3.00 /CWT and Culls at $0.00 /CWT. Value of the total crop was calculated for plots in the trial. The gross income/A for glyphosate + ethofumesate at 0.38 + 0.25 lb/A, glyphosate at 0.38 lb/A and the weedy check plots were not significantly different. All other herbicide treated plots produced gross income/A significantly higher than the nontreated check plots. Plots treated with pendimethalin + glyphosate at 1.0 + 0.38 lb/A produced a crop valued at $2266.00/A compared to the nontreated check plot crop value at $440.00/A. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preemergence herbcide treatments on annual weed species and onion yield.

Treatment	Rate	Weed Control				Onion Yield					
		SOLSA	CHEAL	AMARE	SETVI	Col	Jum	Med	Cull	lb/A	Gross $/A
	lb/A	---	---	---	--- % ---	---	---	---	---		
Pendimethalin	1.0	93	86	94	94	10.5	67.2	20.1	2.3	38788	1770
Pendimethalin	1.5	94	96	96	94	6.0	71.7	19.2	3.1	39828	1797
Pendimethalin + ethalfluralin	1.0 + 1.0	97	97	97	96	8.4	64.8	24.7	3.2	44342	1972
Pendimethalin + ethofumesate	1.0 + 0.25	92	98	100	93	17.0	62.8	19.6	0.6	46689	2212
Pendimethalin + glyphosate	1.0 + 0.38	94	93	95	95	16.7	60.5	19.4	3.5	49272	2266
Glyphosate + ethofumesate	0.38 + 0.25	49	48	48	92	0	31.6	57.5	10.9	9860	342
Glyphosate	0.38	60	60	53	55	3.8	32.4	56.7	7.2	19157	719
Handweeded Check	----	100	100	100	100	20.1	60.2	15.6	4.2	44045	2068
Weedy Check	----	0	0	0	0	0	37.2	48.8	14.0	12266	440
LSD (P=0.05)		9.2	10.0	6.3	4.7	14.4	17.8	18.9	7.4	10889	506

[1]Latron AG-98 nonionic surfactant and Solution 32 (32% nitrogen solution) added at 0.25% v/v and 1.0% v/v, respectively

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, ID to evaluate the effectiveness of sequentially applied preemergence and postemergence herbicide for annual weed control and subsequent influence on the quality of dry bulb onions. The onion (var. 'Golden Cascade') was planted on April 1,1996 at a seeding rate of 8 lb/A and at a depth of 0.75 in. on 22 in. rows. The onion seedlings were at the soil surface and ready to emerge on April 16 when the preemergence herbicide treatments were applied (Table 1). Postemergence herbicide treatments were applied on May 10,1996. The plots were arranged in a split block design. Whole plots (preemergence treatments) were 25 ft. in length and were split with the postemergence herbicide treatments resulting in individual sequential plots of 4 rows by 25 ft. The soil at the location is a Greenleaf-Owyhee Silt Loam (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH) and the surface condition at the time of herbicide applications was dry, rough (clods < 2 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 June 4,1996 (49 days after treatment). The crop was hand harvested on September 27 and graded for size and quality.

Table 1. Application information.

	April 16	May 10
Crop stage	emerging	1 true leaf
Weed stage	germinating	SOLSA 6 lf.; AMARE 2 lf.; CHEAL 6 lf.;
SETVI 2 lf.		
Air temp. (F)	59	67
Relative humidity (%)	61	32
Wind (mph)	3	1
Sky (% cloud cover)	95	80
Soil temp. (F at 4 in.)	52	66
Soil moisture	dry surface, good moisture at 2 in.	dry surface, good moisture at 1 in.

First significant rain fall after herbicide application (PRE) was 0.14 on April 18 and (POST) was 0.15 in. on May 14.

Visual rating of herbicide damage could not be performed because of hail damage occurring on May 18,1996. Weed control ratings for preemergence, postemergence and sequential preemergence-postemergence herbicide treatments are summarized in Table 2. Glyphosate at 0.38 lb/A was not effective as a preemergence treatment because dry soil conditions delayed the germination and emergence of annual weed seedlings in relation to the emergence of onion seedlings. Pendimethalin at 1.0 lb/A, as a preemergence treatment, controlled 80% or more of the weed seedlings. Oxyfluorfen + metolachlor + ethofumasate at 0.05+2.0 + 0.5 lb/A, clethodim + bromoxynil at 0.125 + 0.15 lb/A and sethoxydim + bromoxynil at 0.1 + 0.15 lb/A as postemergence treatments alone controlled 92% or more of the weed species present. In plots that received pendimethalin at 1.0 lb/A preemergence plus one of the postemergence herbicide treatments, 89% or more of the annual weed population was controlled. Although glyphosate did not effectively control emerging weeds because of lack of synchronization of weed emergence and herbicide applications, there appears to be a slight enhancement of postemergence herbicide performance when included in the sequential treatment.

Weeds compete effectively with an onion crop and can have significant impact on onion quality. Grower contract price for onions is based on bulb size and weight of the crop produced. The onions harvested from each herbicide treated plo were graded for size (colossal = > 4 in. diameter; jumbo = 3-4 in. diameter; medium = 2.25-3 in. diameter and culls = < 2.25 in. diameter) and percentage of the harvested crop calculated and value established (price quoted by J. C. Watson CO. Parma, ID for colossal = $6.00/CWT; jumbo =$5.00 / CWT; medium = $3.00 /CWT and culls = $0.00). Plots treated with pendimethalin at 1.0 lb/A (PRE) and oxyfluorfen at 0.05 lb/A (POST) yielded 51,678 lb/A valued at $2,542 /A compared to the nontreated check plot which yielded 6,772 lb/A at a value of $192 /A. The percentage of colossal and jumbo grade of the crop is directly related to the vigor of the individual onion plant throughout the growing season. Onion crop yields from 14 of the various herbicide treated plots provided a gross income of $1500 /A or greater. (Department of plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preemergence-postemergence sequential herbicide treatments on annual weed species and onion yield.

Treatment		Rate		Weed Control				Onion Yield					
PRE	POST	PRE	POST	SOLSA	AMARE	CHEAL	SETVI	lb/A	Col	Jum	Med	Cull	Gross $/A
		lb/A		%					%				
Pend	----	1.0	----	82	80	85	80	39026	2	74	22	3	1738
Glyph	----	0.38	----	26	0	0	0	7277	0	32	48	20	214
----	Dimethenamid	----	1.0	66	52	35	92	17018	0	60	32	7	677
----	Dimethenamid	----	1.5	74	58	38	94	10841	4	33	49	14	390
----	Oxyfluorfen [1]	----	0.05	89	55	58	86	24265	2	61	33	5	1059
----	Oxyfluorfen + metol + ethof [1]	----	0.05 + 2.0 + 0.5	96	95	94	98	27413	17	66	14	3	1309
----	Clethodim [2]	----	0.125	0	0	0	96	6504	9	54	28	9	272
----	Clethodim + bromoxynil [2]	----	0.125 + 0.5	98	100	100	92	47312	12	64	20	3	2151
----	Sethoxydim + bromoxynil [1]	----	0.1 + 0.15	98	100	100	92	34779	12	66	18	4	1592
Pend	Dimethenamid	1.0	1.0	95	96	90	98	37600	11	65	20	4	1721
Pend	Dimethenamid	1.0	1.5	94	94	89	96	39174	8	74	17	1	1825
Pend	Oxyfluorfen [1]	1.0	0.05	96	96	95	95	51678	21	66	12	1	2542
Pend	Oxyfluorfen + metol + ethof [1]	1.0	0.05 + 2.0 + 0.5	98	100	100	99	39353	16	62	18	3	1814
Pend	Clethodim [2]	1.0	0.125	94	94	92	99	41669	13	55	28	4	1836
Pend	Clethodim + bromoxynil [2]	1.0	0.125 + 0.15	97	98	100	100	53074	20	61	17	1	2549
Pend	Sethoxydim + bromoxynil [1]	1.0	0.1 + 0.15	98	96	95	99	45025	20	59	18	3	2116
Glyph	Dimethenamid	0.38	1.0	72	69	65	95	20018	1	64	26	8	850
Glyph	Dimethenamid	0.38	1.5	67	71	66	97	18563	1	40	49	10	722
Glyph	Oxyfluorfen	0.38	0.05	83	76	81	91	34244	4	75	19	2	1568
Glyph	Oxyfluorfen + metol + ethof [1]	0.38	0.05 + 2.0 + 0.5	97	99	98	99	34244	20	63	14	3	1641
Glyph	Clethodim [2]	0.38	0.125	0	0	0	94	7425	0	26	56	18	258
Glyph	Clethodim + bromoxynil [2]	0.38	0.125 + 0.15	94	92	95	94	49094	21	62	14	3	2377
Glyph	Sethoxydim + bromoxynil [1]	0.38	1.0 + 0.15	96	96	95	92	41461	12	64	22	3	1886
Weedy Check	Weedy Check	---	----	0	0	0	0	6772	0	16	67	17	192
LSD (P=0.05)				5.9	7.3	11.6	3.4	13427	11.5	21.1	16.2	8.2	637

[1]Latron Ag-98 nonionic surfactant added at 0.25 % v/v

[2]Crop oil concentrate added at 1.0 % v/v

[3]Pend = pendimethalin, gly = glyphosate, metol = metolachlor, ethof = ethofumasate

Postemergence 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, ID to evaluate the effectiveness of postemergence herbicide treatments on the for the control of annual weed species. Onions (var. 'Golden Cascade') were planted on April 1, 1996 at a rate of 8.0 lb/A and at a depth of .75 in. on a Greenleaf-Owyhee Silt Loam soil (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH).The experiment was arranged in a randomized complete block design with four replications and individual plots were 7 by 25 ft. Postemergence herbicides were applied on May 10, 1996 when the onion plants were in the 1 leaf stage of growth. Postemergence herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Visual weed control ratings were taken May 28 (18 DAT). Crop tolerance evaluations could not be obtained because of hail damage which occurred on May 18,1996.

Table 1. Application information.

Crop stage	1 true leaf
Weed stage	AMAR coty-2 lf.; SALSA 6 lf.;CHEAL 4-6 lf.; SETVI 2 lf.
Air temp. (F)	71
Relative humidity (%)	24
Wind (mph)	02
Sky (% cloud cover)	80
Soil temp. (F at 4 in.)	74
First significant rain fall after herbicide application was 0.15 in. on May 14, 1996.	

Oxyfluorfen + pendimethalin at 0.05 + 1.5 lb/A, Clethodim + bromoxynil at 0.045 + 0.15 lb/A, bromoxynil + ethofumesate + sethoxydim+ pendimethalin at 0.15 + 0.5 + 0.1 + 1.5 lb/A, pendimethalin + metolachlor + dimethenamid at 1.5 + 1.0 + 1.0 lb/A, dimethenamid + bromoxynil at 1.0 + 0.15 lb/A, and bromoxynil + metolachlor at 0.15 + 1.0 lb/A provided 92% or better of all annual weed species present (Table 2). As a postemergence treatment, dimethenamid at 1.0 and 1.5 lb/A did not effectively control annual broadleaf weed species present, but effectively controlled the green foxtail (SETVI). All plots were hand weeded on June 21, 1996, but the effect of weed competition was measurable in crop quality at harvest time.

The onion bulbs were harvested on September 27 and the crop was graded for size and total yield calculated. The grading scale used was: clossal = > 4 in. diameter; jumbo = 3-4 in. diameter; medium = 2.25-3.0 in.diameter; culls < 2.25 in. diameter. The crop value (gross $ income/A) was calculated on the weight of onion bulbs in each grade times the quoted price for the crop (Source: J. C. Watson Company, Parma,ID : colossal = $6.00/CWT; jumbo = $5.00/CWT; medium = $3.00/CWT; culls = $0.00/CWT). Plots treated with oxyfluorfen + pendimethalin at 0.05 + 1.5 lb/A, bromoxynil + ethofumesate + sethoxydim + pendimethalin at 0.15 + 0.5 + 0.1 + 1.5 lb/A and the handweeded check produced an onion crop valued above $2000.00 /A. Although cost for hand weeding as a substitute of herbicidal weed control was not recorded, excessive labor was required to maintain the plots in a weed-free condition. Income from six herbicide treated plots was above $1500.00/A. The total value of the crop from the weedy check plots was $368.00/A. (Department of Plant, Soil and Etomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Influence of postemergence herbicide treatments on annual weed species, yield, crop quality and gross income for dry bulb onions.

		Weed Control				Onion Yield					
Treatment	Rate	SOLSA	CHEAL	AMARE	SETVI	Col	Jum	Med	Cull	lb/A	Gross $/A
	lb/A	%									
Dimenthenamid	1.0	49	48	71	96	0	42	50	8	13484	531
Dimenthenamid	1.5	61	59	71	93	0	46	28	1	19275	810
Oxyfluorfen	0.05	59	61	70	74	8	51	37	4	20345	831
Oxyfluorfen + pendimethalin	0.05 + 1.5	94	95	93	92	10	64	24	2	46629	2133
Oxyfluorfen + ethofumesate + metolachlor	0.05 + 0.5 + 2.0	95	84	98	98	10	61	26	3	28750	1282
Clethodim[1]	0.045	18	19	49	72	0	25	61	14	12533	451
Clethodim[1]	0.094	35	18	65	89	0	16	48	12	4307	146
Clethodim[1] + bromoxynil	0.045 + 0.15	98	99	99	99	13	64	21	2	36175	1673
Bromoxynil + ethofumesate + sethoxydim + pendimethalin[1]	0.15 + 0.5 + 0.1 + 1.5	99	100	100	100	20	65	14	1	54203	2631
Pendimethalin + metolachlor + dimethenamid	1.5 + 1.0 + 1.0	97	99	98	97	19	65	15	2	40630	1975
Dimethenamid + bromoxynil	1.0 + 0.15	98	100	97	95	22	50	26	3	30205	1351
Dimethenamid + metolachlor	1.0 + 1.0	56	50	48	96	1	31	54	13	17672	766
Bromoxynil + metolachlor	0.15 + 1.0	98	96	96	92	8	69	21	3	35046	1575
Bromoxynil + pendimethalin	0.15 + 1.5	98	99	98	88	21	65	13	1	37808	1858
Sethoxydim	0.1	23	0	24	93	3	29	59	9	12801	489
Sethoxydim + pendimethalin	0.1 + 1.5	77	68	72	95	17	55	25	3	39115	1819
Handweeded check	--	100	100	100	100	10	71	17	1	43897	2063
Weedy check	--	0	0	0	0	0	24	41	10	10365	368
LSD (P=.05)		36.7	39.2	43.8	18.0	14.6	28.7	27.9	7.3	1589.4	770.3

[1] Treatment applied with crop oil concentrate at 1.0% v/v.

Postemergence weed control in peppermint. Gary A. Lee and Brenda M. Waters. A study was conducted in Canyon County, Idaho near Caldwell to evaluate postemergence herbicides for annual weed control in peppermint. The trial was established on a 1 year old stand of peppermint in a field which has a Purdam Silt Loam Soil (36% sand, 54% silt, 10% clay, 1.22% organic matter and 7.8 pH). The experimental design was a randomized complete block with four replications and each plot was 7 by 40 ft. Herbicide treatments were applied postemergence April 11,1996 (Table 1) except for the quizalofop treatments which were applied June 13 and July 2, respectively. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. On April 11, the peppermint plants had started to produce some foliage (< 1 in.), but were not actively growing. Weed control and crop tolerance evaluations were made May 22 and July 24, 1996 and the plots were hand harvested on July 24, samples allowed to partially dry for approximately two weeks, and samples distilled and oil recovered on August 8, 1996.

Table 1. Application information

	April 11	June 13	July 2
Crop stage	< 1 in. growth	30 in. tall	48 in. tall
Weed stage	CAPBP 16 lf.ros.;LACSE 6-8 lf.; CHEAL 4 lf.;DESSO 12 lf.ros.; KCHSH 8-14 lf.; SSYAL 12-16 lf.	PANMI 4-6lf.;ECHCG 4-6lf.	ECHCG 2-8 lf.
Air temp. (F)	49	79	71
Relative humidity (%)	77	55	63
Wind (mph)	3	0	0
Sky (% cloud cover)	0	0	0
Soil temp. (F)	47	77	69
Soil moisture	moist surface, excessive moisture at 1 in.		
First significant rain fall after herbicide application was 0.03 in. occurring on April 12,1996.			

No herbicide treatment gave satisfactory control of all weed species present (Table 2). Terbicil at 1.0 lb/A, oxyfluorfen at 0.5lb/A oxyflurofen + paraquat at 0.5 +0.5 lb/A and diuron at 1.25 lb/A controlled 90% or better of all weed species except kochia and caused slight to moderate initial crop damage. Oxyflurofen alone and in combination with paraquat caused initial burning of the peppermint leaves but the crop recovered so that no visible damage was detectable at harvest time. Mint oil yields from plots treated with oxyflurofen + paraquat at 0.5+0.5 lb/A were significantly lower than yields from the nontreated check plots. Pendimethalin at 1.5 and 2.0 lb/A caused moderate initial crop damage, but only the high rate caused a significant reduction in mint hay yields. The highest mint hay yields were obtained from plots treated with terbacil at 1.0 lb/A. The hand weeded check plots gave the highest oil yield on a per acre basis. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicide treatments on annual weed species, yield of hay and oil in peppermint.

		Weed Control								Peppermint		
Treatment	Rate	CAPBP	LACSE	CHEAL	DESSO	KCHSC	SSYAL	PANMI	ECHCG	Injury	Hay	Oil
	lb/A	%									lb/A	lb/A
Pendimethalin [1]	1.5	100	25	89	100	88	100	0	0	39	24634	48.5
Pendimethalin [1]	2.0	100	18	51	98	76	95	0	0	55	20136	46.8
Bromoxynil [1]	0.25	100	65	84	98	85	100	0	0	6	27422	54.9
Bromoxynil [1]	0.38	92	66	88	100	75	100	0	0	8	22728	59.6
Oxyfluorfen [1]	0.5	100	91	92	94	82	100	0	0	40	20408	53.0
Oxyfluorfen + paraquat [1]	0.5 + 0.5	100	99	95	98	88	100	0	0	46	22053	43.2
Paraquat [1]	0.5	100	82	25	85	40	96	0	0	9	23556	59.0
Diuron [1]	1.25	100	92	94	100	78	100	80	95	0	25026	47.7
Sethoxydim [1]	0.25	0	0	0	0	0	0	80	85	0	23669	56.4
Terbacil [1]	1.0	100	94	98	100	80	100	90	90	1	29110	68.8
Quizalofop-p [2,3]	0.048	25	0	0	0	0	0	90	90	12	25374	62.2
Quizalofop-p + quizalofop-p [2,4]	0.048 + 0.048	25	0	0	0	0	0	95	90	0	21421	54.3
Handweeded check	----	100	100	100	100	100	100	100	100	0	27040	69.9
Weedy Check	----	100	100	100	100	100	100	100	100	0	27324	62.2
LSD (P= 0.05)		27.2	17.3	18.0	8.7	9.3	4.6	28.3	26.4	11.9	7051	16.8

[1]Treatment applied with Latron Ag-98 at 0.25% v/v
[2]Treatment applied with COC at 1.0% v/v
[3]Treatment made June 13, 1996
[4]Treatment made July 2, 1996

Sweet corn herbicide weed control. Kai Umeda. A small plot field study was conducted at the University of Arizona Maricopa Agricultural Center. The test was set up as a randomized complete block design with four replicates with each plot consisting of two 40-inch beds measuring 35 feet in length. Two beds between the treated beds provided a buffer between treaments. On 18 Mar 1996, the field was listed and then preplant incorporated (PPI) herbicide treatments were applied with a pressurized CO_2 backpack sprayer at 40 psi with a hand-held boom having four flat fan 8002 nozzles tips spaced 20-inches apart and delivered 24 gallons per acre of water. The air temperature was 76°F and wind was negligible with clear skies. The soil was dry and temperature was 62°F and within 1-hour, a "sidewinder"power incorporator-bed shaper was used to incorporate the herbicide treatments. After the bed shaping, sweet corn cv. Seneca Arrow was planted with a single row on each bed. Preemergence (PREE) herbicide treatments were applied immediately after planting with soil temperatures at 70°F and air temperatures at 80°F. Following PREE applications, water was applied to the crop by furrow irrigation and beds were completely wetted across the surface to activate the PREE herbicides. Visual weed control ratings were taken at 3 weeks after treatment (WAT) of the soil applied herbicide treatments and weeds present in the study area were *Amaranthus sp.* (pigweeds), *Portulaca oleracea* (common purslane), and *Chenopodium album* (common lambsquarters). Postemergence (POST) herbicide applications were made on 08 Apr when the corn was at the 4- to 5-leaf growth stage. The weeds listed above were present at growth stages ranging from the 2- to 8-leaf stage. Subsequent visual ratings were taken at 5 and 7 WAT of the soil treatments.

Weed control was very good for all treatments at 3 WAT of the soil applications. At 7 WAT, all of the treatments provided acceptable levels (>85%) of weed control. The sequence of PREE herbicide metolachlor followed by POST herbicide mixture of primisulfuron plus prosulfuron provided season-long nearly complete weed control in sweet corn. Primisulfuron plus prosulfuron controlled lambsquarters and pigweeds that escaped metolachlor treatments. PPI treatments of dimethenamid, EPTC plus safener, and herbicide mixture of FOE 5043 (thiafluamide) plus metribuzin provided effective weed control for most of the season. Similar effective weed control was observed for PREE treatments of pendimethalin, dimethenamid, and the mixture of FOE 5043 plus metribuzin. Metolachlor, dimethenamid, and the mixture of FOE 5043 plus metribuzin appeared to be slightly more efficacious when applied PPI compared to PREE.

Soil-applied herbicide treatments did not cause any corn injury at any time. At 2 WAT of the POST treatments of the mixture of primisulfuron plus prosulfuron, very slight interveinal chlorosis was observed on the treated corn. In this test, the addition of crop oil concentrate or non-ionic surfactant to the mixture of primisulfuron plus prosulfuron did not decrease or increase corn injury or weed control efficacy.

Table. Sweet Corn Herbicide Weed Control Study

Treatment	Rate (lb AI/A)	Timing	Corn Injury 08 Apr	Corn Injury 23 Apr	Corn Injury 06 May	Weed Control 08 Apr CHEAL	08 Apr POROL	08 Apr AMARA	23 Apr CHEAL	23 Apr POROL	23 Apr AMARA	06 May CHEAL	06 May POROL	06 May AMABL	06 May AMAAL
			%												
Untreated Check			0	0	0	0	0	0	0	0	0	0	0	0	0
Pendimethalin	1.0	PREE	0	0	0	95	96	94	94	98	94	93	94	86	86
Dimethenamid	1.0	PREE	0	0	0	94	96	95	88	96	93	84	89	86	86
Metolachlor + Primisulfuron/ Prosulfuron+CO	1.5 + 0.06	PREE + POST	0	3	0	94	98	96	99	99	99	99	99	99	99
Metolachlor + Primisulfuron/ Prosulfuron+NI	1.5 + 0.06	PREE + POST	0	3	0	95	98	95	99	99	99	99	99	99	99
FOE 5043/ Metribuzin	0.55	PREE	0	0	0	96	99	95	97	95	94	90	91	90	88
Dimethenamid	1.0	PPI	0	0	0	96	96	98	90	95	96	85	88	91	90
Metolachlor	1.5	PPI	0	0	0	96	99	97	86	96	95	85	90	91	90
FOE 5043/ Metribuzin	0.55	PPI	0	0	0	97	99	98	95	96	94	90	86	85	86
EPTC + safener	4.0	PPI	0	0	0	99	98	95	95	97	93	91	89	90	89
LSD (P=0.05)			0.0	1.8	0.0	2.4	2.5	2.6	3.5	3.4	3.6	4.6	4.0	6.0	6.0

PPI and PREE applied on 18 Mar 1996, POST applied on 08 Apr.

CO = Agridex at 2 pt/A, NI = Activator 90 at 0.25% v/v.

Primisulfuron 28.5% and prosulfuron 28.5% commercial mixture.

FOE 5043 (thiafluamide) 54.4% and metribuzin 13.6% commercial mixture.

Evaluation of herbicides for weed control in cantaloupes. Kai Umeda. At the University of Arizona Maricopa Agricultural Center, several herbicides were evaluated for weed control efficacy and crop safety when applied preplant incorporated (PPI) or postemergence (POST). The test was established as a randomized complete block design with four replicates on a Casa Grande sandy loam soil with less than 1.0% organic matter and soil pH of 8.0. Single row plots were on 40-inch beds measuring 40 feet long. Every third bed was treated and planted to provide an untreated buffer between plots. The field was listed and beds were shaped before PPI applications on 16 Apr 1996. All treatments were applied with a hand-held boom with two flat fan 8002 nozzle tips spaced 20-inches apart and delivered in 26 gallons per acre of water pressurized with a CO_2 backpack sprayer at 45 psi. During PPI applications, the skies were clear with negligible wind, air temperature at 86°F, soil was dry and temperature was 70°F. Immediately after spraying, incorporation was done with a "sidewinder" power incorporator-bed shaper. Cantaloupe cv. Mission was then planted and furrow irrigated with beds being thoroughly wetted across. POST applications were made on 06 May when the cantaloupe was at the 2-leaf growth stage and *Amaranthus sp.* (pigweeds) and *Portulaca oleracea* (common purslane) at the 3- to 4-leaf growth stage. The air temperature was 82°F, skies clear, and winds negligible during the POST applications.

Crop injury ratings showed that clomazone at the lowest rate caused less injury and the degree of injury was acceptable (<15%) while the higher rate caused marginally unacceptable injury. Halosulfuron treated cantaloupes showed a rate response with greater injury from higher rates and increased injury over time that was not acceptable. Bensulide formulations did not significantly differ with respect to weed control or cantaloupe injury and caused minimal injury. Bentazon caused only marginally unacceptable injury at both rates tested. Clomazone provided very good control of both purslane and pigweeds at both rating dates (3 and 5 weeks after treatment). Halosulfuron and both formulations of bensulide gave good control of both weeds at the early rating date. Weed control declined at the later date for bensulide treatments. Halosulfuron was less effective on purslane than pigweeds. Bentazon gave good control of both weeds at 2 weeks after treatment. (University of Arizona Cooperative Extension, Maricopa County, 4341 E. Broadway, Phoenix, AZ 85040.)

Table. Evaluation of herbicides of weed control in cantaloupes.

Treatment	Rate	Timing[3]	Injury		Weed Control POROL		Weed Control AMARA	
			06 May	21 May	06 May	21 May	06 May	21 May
	lb/ A		---- % ----		-------------- % --------------			
Untreated check			0	0	0	0	0	0
Clomazone	0.50	PPI	6	11	96	86	94	81
Clomazone	0.75	PPI	20	21	97	93	95	80
Halosulfuron	0.025	PPI	14	29	91	74	94	89
Halosulfuron	0.05	PPI	20	39	88	74	94	90
Halosulfuron	0.10	PPI	35	45	89	75	96	89
Bensulide[1]	9.00	PPI	8	9	94	74	94	78
Bensulide[2]	9.00	PPI	13	9	90	76	93	79
Bentazon	0.50	POST	0	16	0	94	0	85
Bentazon	1.00	POST	0	19	0	93	0	86
LSD (0.05)			9.5	9.5	5.1	4.9	3.7	5

[1]Bensulide 4EC formulation

[2]Bensulide 6EC formulation

[3]PPI treatments applied on 16 Apr 1996. POST treatments applied on 06 May.

Tolerance of processing squash to herbicides. R. Ed Peachey and R. D. William. Processing squash (var. Golden Delicious) was planted on June 1, 1996, in finely tilled sandy loam soil at the Vegetable Research Farm, Corvallis, OR. Plots were 15 by 30 ft with three replications in a randomized complete block design. Two 30 inch rows were planted in each plot. Herbicides were applied preemergence on June 3 to dry soil with a unicycle sprayer at 26 gpa 40 psi and irrigation applied within one hour. Postemergence herbicides were applied on June 20, with 1% COC to squash that had 2-4 true leaves. Squash biomass was cut from 25 ft of one row in each plot on July 11 and squash fruit harvested from 27 ft of the second row of each plot on September 9. Cultivation and hand hoeing were used to minimize weed competition. Squash yields are not reported from the low rates of halosulfuron and FOE 5043 because these herbicides did not control hairy nightshade and weed competition was severe despite cultivation and hoeing.

Crop injury was not apparent with sulfentrazone, clomazone, and dimethenamid treatments on July 5. The biomass harvest on July 11 indicated that sulfentrazone treatments had the highest total biomass and average plant weight. The high rates of halosulfuron PRE and POST significantly reduced plant biomass and average plant weight. Squash fruit yield was greatest in the sulfentrazone treatment at 19.4 t/A. The high rate of sulfentrazone reduced yield by 3 t/A, but this yield was still greater than or nearly equal to all of the other treatments. This treatment produced fewer and slightly smaller fruit. The high rate of dimethenamid significantly reduced both fruit weight and yield. The clomazone treatment did not reduce yield but fruit color at harvest was bleached compared to other treatments. (Horticulture Dept., Oregon State University, Corvallis, OR, 97331)

Table 1. Herbicide effects on squash emergence and biomass accumulation, Corvallis OR, 1996.

Herbicide	Timing	Rate	Crop emergence 6/17	Crop injury 7/5	Squash plant biomass harvest[1] Plants harvested	Avg. plant wt	Total biomass
		lb/A	no./plot	%	no.	lbs	lbs
1. Halosulfuron	PRE	0.031	60	10	32	0.41	12.8
2. Halosulfuron	PRE	0.062	62	17	32	0.23	7.3
3. Halosulfuron	POST	0.031	72[2]	33	36	0.36	12.8
4. Halosulfuron	POST	0.062	65[2]	43	32	0.32	10.3
5. Sulfentrazone	PRE	0.1875	61	0	32	0.57	18.3
6. Sulfentrazone	PRE	0.375	64	0	32	0.59	18.9
7. Dimethenamid	PRE	0.75	66	0	32	0.52	16.6
8. Dimethenamid	PRE	1.5	65	0	32	0.52	16.5
9. Dimethenamid +	PRE	0.75	60	3	31	0.51	16.0
halosulfuron	PRE	0.031					
10. Dimethenamid +	PRE	0.75	72	7	37	0.39	14.7
ethalfluralin		0.85					
11. FOE 5043	PRE	0.45	61	13	33	0.35	11.1
12. FOE 5043	PRE	0.9	64	17	31	0.48	14.7
13. Acetochlor	PRE	1.25	62	0	32	0.48	14.4
14. Clomazone	PRE	0.25	65	0	30	0.58	18.3
15. Weeded check	-	-	67	7	29	0.51	14.7
FPLSD (0.05)			8	16	ns	0.05	4.4

[1] Squash plants were harvested from 25 ft of row and weighed on July 11, 1996.
[2] POST treatment not applied at this evaluation.

Table 2. Herbicide effects on squash yield from weeded and thinned plots, Corvallis, OR, 1996

Herbicide	Timing	Rate	Squash harvest[1] Fruit harvested	Total yield	Avg. fruit wt.
		lb/A	no.	t/A	lbs
2. Halosulfuron	PRE	0.062	28	14.5	9.5
4. Halosulfuron	POST	0.062	27	15.2	10.6
5. Sulfentrazone	PRE	0.1875	31	19.4	11.7
6. Sulfentrazone	PRE	0.375	26	16.0	11.2
7. Dimethenamid	PRE	0.75	28	16.7	11.2
8. Dimethenamid	PRE	1.5	27	14.2	9.7
9. Dimethenamid +	PRE	0.031	26	15.4	11.2
halosulfuron	PRE	0.031			
10. Dimethenamid +	PRE	0.75	27	14.6	9.9
ethalfluralin	PRE	0.85			
12. FOE 5043	PRE	0.9	23	13.1	10.8
13. Acetochlor	PRE	1.25	27	14.0	9.7
14. Clomazone	PRE	0.25	28	15.9	10.8
15. Weeded check	-	-	30	13.8	8.6
FPLSD (0.05)			ns	ns	1.8
(0.10)			ns	3.0	

[1] Squash fruit was harvested and each individual fruit weighed on September 9, 1996.

A comparison of preemergence herbicides for iceberg lettuce. Carl E. Bell and Brent E. Boutwell. Two field experiments were conducted in the Imperial Valley of southeastern California to compare pronamide and bensulide for weed control, crop injury, and yield in iceberg lettuce. Two formulations of pronamide were used in these experiments, both WP, one the commercial formulation (pronamide) and an experimental formulation (pronamide XF) that was thought to resist leaching with sprinkler irrigation. Both experiments were done in commercial lettuce fields with cooperative growers, one (Experiment 1) was near Brawley, CA and the other (Experiment 2) was near Holtville, CA.

Experimental design was a latin square with four treatments and four replications. Plot size in Experiment 1 was two beds, each 40 inches wide, by 25 feet long. In Experiment 2, plots were three beds, 40 inches wide by 25 feet long. Soil type in both fields was a Holtville silty clay. The lettuce in Experiment 1 was planted on September 29, 1995, herbicide application was made on October 2, and the sprinkler irrigation started on October 4. The sprinkler irrigation was applied for 30 hours, delivering about 3 inches of water. Planting date in Experiment 2 was November 2, 1995, herbicide treatments were made on November 3, and sprinkler irrigation started on November 4. Sprinklers ran a total of 48 hours to germinate the lettuce in this field, applying almost 5 inches of water. Applications of herbicide were made with a CO_2 pressured sprayer at 20 psi, using 8003 nozzles for a spray volume of 34 gpa.

Data collected were: visual evaluations of weed control and crop injury on November 6, 1995 in Experiment 1 and lettuce yield on December 15; and visual evaluation of weed control on November 20, 1995 and lettuce yield on February 14, 1996. Results are shown in the Tables below.

In Experiment 1, common purslane control was about equal between treatments, but nettleleaf goosefoot control was better with the two pronamide treatments than with bensulide. Crop phytotoxicity was apparent, but minor with the three herbicide treatments. Analysis of variance indicated that lettuce yield and weight per head was greater ($P = 0.075$ and 0.058, respectively) in the pronamide XF and bensulide treatments compared to the pronamide and untreated control. There were no visual differences between plots at harvest, these yield differences probably indicate delayed maturity from the pronamide and the increased weed competition in the untreated control. Weed control was poor overall in Experiment 2, which may relate to the large amount of overhead irrigation applied to germinate the crop. There was no differences between treatments for lettuce yield in this experiment. (Cooperative Extension, University o: California, Holtville, CA 92250.)

Table 1. Weed control, phytotoxicity, and lettuce yield in Brawley, CA, 1995.

Treatment[1]	Rate	Weed Control[2]		Phyto[3]	Lettuce Yield[4]		
		CHEMU	POROL		Number	Weight	Wt/Head
	lb/A	---------- % ----------				lbs	
Pronamide	2.0	97	100	0.8	34	27.50	0.81
Pronamide XF	2.0	99	100	0.8	36	31.25	0.87
Bensulide	6.0	77	99	0.5	36	32.00	0.89
Untreated control		0	0	0.0	34	26.50	0.78

[1] Treatments applied October 2, 1995, pronamide XF is an experimental 50 WP formulation.
[2] CHEMU = nettleleaf goosefoot, POROL = common purslane, visual evaluation on November 6, 1995
[3] Phyto - phytotoxicity, 0 = no injury, 10 = all plants dead.
[4] Lettuce yield data was taken on December 15, 1995 and is fresh weight in pounds from 10 feet of bed times two beds per plot, mean of four replications.

Table 2. Weed control and lettuce yield in Holtville, CA, 1995.

Treatment[1]	Rate	Weed Control[2]		Lettuce Yield[3]		
		CHEMU	CAPBP	Number	Weight	Wt/Head
	lb/A	-------- % --------			lbs	
Pronamide	2.0	76	68	30	55.25	1.85
Pronamide XF	2.0	83	68	30	57.50	1.90
Bensulide	6.0	83	66	28	54.75	1.94
Untreated control		0	0	31	57.00	1.86

[1] Treatments applied November 3, 1996, pronamide XF is an experimental 50 WP formulation.
[2] CHEMU = nettleleaf goosefoot, CAPBP = shepherd's purse, visual evaluation on November 20, 1995.
[b] Lettuce yield data is fresh weight taken on February 14, 1996, taken from 15 feet of the middle bed of the plot, mean of four replications.

PROJECT 3

WEEDS OF AGRONOMIC CROPS

ROBERT DOWNARD, CHAIR

Broadleaf weed control in spring-seeded alfalfa. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 14, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of spring-seeded alfalfa (var. Champ) and broadleaf weeds to postemergence applications of AC 299-263 and imazethapyr. All treatments except EPTC were applied postemergence with SUN-IT II at one qt/A. EPTC was applied preplant incorporated and rototilled to a depth of two in on May 14. 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 four replications. Individual plots were 10 by 30 ft in size. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 30 psi. Treatments were applied on June 4, when alfalfa was in the second trifoliolate leaf stage and weeds were small. Black nightshade infestations were heavy, redroot and prostrate pigweed infestations were moderate throughout the experimental area. Alfalfa stand counts, crop injury and weed control evaluations were made on July 8. Alfalfa was harvested August 8, using a self-propelled Almaco plot harvester.

All treatments had significantly higher plts/ft^2 than EPTC. AC 299-263 and imazethapyr at 0.12 and 0.094 lb/A caused significantly more injury (stunting only) than any other treatment. Black nightshade, redroot and prostrate pigweed control were excellent (>97%) with all treatments except the check. The check plot yielded significantly more T/A than any other treatment. All treatments had a significantly higher protein content than the check.

Table. Broadleaf weed control in spring-seeded alfalfa.

Treatment	Rate	Crop Injury	plts/ft^2	Weed Control SOLNI	AMARE	AMABL	Yield	Protein
	lb/A	--%---	no	--------%		--------	T/A	---%---
AC 299-263	0.032	0	49	100	100	99	2.1	20.0
AC 299-263	0.047	3	48	100	100	100	2.1	21.1
AC 299-263	0.064	9	49	100	100	100	2.1	20.6
AC 299-263	0.094	16	50	100	100	100	1.9	20.7
AC 299-263	0.12	20	49	100	100	100	1.9	20.4
Imazethapyr	0.094	9	50	100	100	100	2.1	20.7
EPTC	3.0	16	29	100	100	100	2.2	19.3
Imazethapyr	0.064	0	49	100	100	100	2.2	20.4
AC 299-263	0.024	0	48	98	99	98	2.0	19.1
Imazethapyr	0.047	0	50	97	99	98	2.0	19.1
Handweeded check		0	50	100	100	100	2.3	20.4
Check		0	49	0	0	0	3.2	14.0
Weeds/m^2				28	16	17		
LSD 0.05		2	4	1	1	1	0.2	1.2

Weed control in seedling alfalfa with imazethapyr. Robert W. Downard and Don W. Morishita. A field study was conducted at the University of Idaho Research and Extension Center, near Kimberly, Idaho to investigate weed control in seedling alfalfa (var. Blazer). Alfalfa was planted April 11, 1996, at a rate of 10 lb/A and grown under sprinkler irrigation. Individual plots were 8 by 30 feet and treatments were arranged in a randomized complete block design with four replications. All treatments were applied broadcast with a CO_2 pressurized bicycle-wheel sprayer. The sprayer was calibrated to deliver 10 gpa at 22 psi using 11001 flat fan nozzles. Additional application data and weed densities are shown in Table 1. Soil type at this site was a silt loam with a pH of 8.1, CEC of 14 meq/100 grams of soil, and 1.5% organic matter. Visual evaluations for crop injury and weed control were taken June 25 and July 12. Weed species evaluated were hairy nightshade, common lambsquarters, kochia, and redroot pigweed and annual sowthistle. Plots were harvested July 15 and September 17.

Table 1. Application information and weed densities.

Application timing	Postemergence
Application date	6/10
Air temperature (F)	65
Soil temperature (F)	60
Relative humidity (%)	51
Wind velocity (mph)	10
	Weed density (plants/ft^2)
Redroot pigweed	4
Hairy nightshade	2
Common lambsquarters	1
Kochia	<1
Annual sowthistle	-

Crop injury on June 25 was highest with imazethapyr plus bromoxynil and bromoxynil alone and was primarily due to temperatures above 70 F after application (Table 2). Injury symptoms disappeared by the second evaluation. On July 12, all treatments controlled hairy nightshade and kochia 85 to 100%. Additionally, bromoxynil alone had lower redroot pigweed control than the other treatments. Common lambsquarters and annual sowthistle were controlled 84 to 98% on July 12 by bromoxynil, bromoxynil plus imazethapyr, or imazethapyr plus 2,4-DB. These three treatments also had the lowest weed yields which were closely related to the good weed control they had. Alfalfa yield was not different among treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303)

Table 2. Crop injury, weed control, and alfalfa yield near Kimberly, Idaho.

				Weed control[1]												Yield			
		Crop injury		CHEAL		AMARE		KCHSC		SOLSA		SONOL				Weeds		Alfalfa	
Treatment	Rate	6/25	7/12	6/25	7/12	6/25	7/12	6/25	7/12	6/25	7/12	6/25	7/12			7/15	9/17	7/15	9/17
	lb/A	%														lb/A		tons/A	
Check		--	--	--	--	--	--	--	--	--	--	--	--			721	301	1	1
Imazethapyr +	0.063 +	4	0	69	74	88	89	89	88	80	89	73	31			515	136	1	1
MSO +	1.5 pt/A +																		
28% N	1.5 qt/A																		
Imazethapyr +	0.094 +	5	0	73	80	89	96	85	86	84	94	81	56			312	420	1	2
MSO +	1.5 pt/A +																		
28% N	1.5 qt/A																		
Imazethapyr +	0.063 +	10	1	90	97	94	98	100	90	94	100	95	93			29	63	1	1
bromoxynil +	0.25 +																		
COC +	1.5 pt/A +																		
28% N	1.5 qt/A																		
Imazethapyr +	0.063 +	5	0	68	66	91	97	96	99	80	95	80	71			655	571	1	1
sethoxydim +	0.4687 +																		
MSO +	1.5 pt/A +																		
28% N	1.5 qt/A																		
Imazethapyr +	0.063 +	5	3	81	96	84	95	96	93	85	98	84	98			53	25	1	1
2,4-DB +	0.875 +																		
MSO +	1.5 pt/A +																		
28% N	1.5 qt/A																		
Bromoxynil	0.375	10	3	96	94	79	70	90	85	99	93	100	84			373	73	1	1
LSD (0.05)		2	NS	8	9	NS	7	NS	NS	6	NS	7	31			367	NS	NS	NS

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

Postemergence weed control in newly seeded alfalfa. Gary A. Lee and Brenda M. Waters. Fall- or early spring-planted alfalfa fields frequently have serious late emerging weed infestations in eastern Oregon and southwest Idaho. Short residual preplant or preemergence herbicides often do not provide extended crop protection necessary for alfalfa seedling establishment and growth during the first growing season. The problem exists in alfalfa crops grown for both seed production and forage production. A study was established in Canyon County Idaho near Parma to evaluate postemergence herbicides for the control of large, escaped annual weed plants in an establishing alfalfa crop. A proprietary alfalfa cultivar was planted at 5 lb/A in 22 in. rows on March 10, 1996 on a Power-Purdam Silt Loam soil (44% sand, 46% silt, 10% clay, 1.15% organic matter, and 7.2 pH) and re-seeded on April 16, 1996 in the same rows. Postemergence herbicides were applied May 15, 1996 (Table 1) with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 30 psi. Crop tolerance and weed control were visually evaluated 14 days after treatment (DAT). No seed yield data were obtained from the establishing alfalfa seed crop.

Table 1. Application information.

Crop stage of Growth	6-8 leaf, 2 in. tall and 14-18 leaf, 6 in. tall, respectively for 3-10-96 and 4-16-96 seeding dates
Weed Stage	SSYAL 20 lf., bolting; CHEAL 16-18 lf, 3 in. tall; KCHSC 24 lf, 4 in. tall; SOLSA 12 lf, 3 in tall; SETVI 5 lf; ECHCG 5lf, 3 tiller; AMARE 6-8 lf, 2 in. tall.
Air temp. (F)	65
Relative humidity (%)	77
Wind (mph)	01
Sky (% cloud cover)	100
Soil temp. (F at 4 in.)	70
Soil moisture	dry surface, good moisture at 1 in.
First significant rain was 1.25 in. within 6 hr. after herbicide applications	

Tumble mustard (SSYAL), common lambsquarter (CHEAL), kochia (KCHSC), hairy nightshade (SOLSC), redroot pigweed (AMARE), green foxtail (SETVI) and barnyardgrass (ECHCG) were effectively controlled with bromoxynil + imazethapyr at 0.38 + 0.094 lb/A (Table 2). AC 299263 at 0.031 lb/A resulted in excellent control of all weed species except common lambsquarters and kochia. Imazethapyr alone and in combination with other herbicides and AC299263 provided the only effective control of green foxtail and barnyardgrass. No herbicide treatment caused significant phytotoxicity to the alfalfa plants regardless of stage of growth. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicide treatments on annual broadleaf and grass control and alfalfa injury.

		Weed Control							Alfalfa Injury
Treatment	Rate	SSYAL	CHEAL	KCHSC	SOLSA	AMARE	SETVI	ECHCG	
	lb/A	%							
Bromoxynil [1]	0.38	60	52	70	76	98	0	0	0
Bromoxynil [1]	0.5	61	62	89	94	100	0	0	2
Bromoxynil + 2,4-DB [1]	0.38 + 1.0	93	89	85	96	99	0	0	1
Bromoxynil + imazethapyr [1,2]	0.38 + 0.094	90	90	88	99	100	90	90	0
Imazethapyr [1,2]	0.094	79	0	12	79	99	92	92	1
Imazethapyr + 2,4-DB [1,2]	0.063 + 0.75	86	0	22	75	100	95	95	1
2,4-DB [1]	1.0	75	1	0	62	100	0	0	0
AC 299263 [1,2]	0.023	80	0	12	94	100	92	93	2
AC 299263 [1,2]	0.031	89	0	0	90	100	94	94	0
Weedy Check	----	0	0	0	0	0	0	0	0
LSD (P = 0.05)		25	26	35	21	3	7	7	3

[1]Treatments applied with Latron AG-98 nonionic surfactant at 0.25 % v/v
[2]Treatments applied with 32 % nitrogen solution at 1 qt/A

Water volume effect on wild oat control with imazamethabenz and difenzoquat. Traci A. Brammer, 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 water 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 water volume. An untreated control was included for comparison. Wild oat and spring barley were seeded perpendicular to each other on May 3 and May 5, 1996, 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 23, 1996. Barley grain was harvested at maturity on August 21, 1996 with a small plot combine.

Table 1. Application data and soil analysis.

Application date	June 1, 1996
Growth stage	
spring barley	3 leaf
wild oat	2 to 4 leaf
Air temperature (F)	70
Relative humidity (%)	50
Wind speed (mph)	0
Cloud cover (%)	95
Soil temperature at 2 in (F)	70
pH	5.8
OM (%)	3.59
CEC (meq/100g)	17.8
Texture	silt loam

All herbicide treatments at all water volumes (except imazamethabenz at 0.37 lb/A at 5 gpa) controlled wild oat 66 to 81% (Table 2). Wild oat control averaged over herbicide treatments was better with all water volumes higher than 5 gpa. Imazamethabenz at 0.37 lb/A did not control wild oat as well as the other two treatments, especially at low water volume. Barley grain yield was best with 20 gpa water volume (Table 3). Barley grain yield averaged 2976 lb/A for 9 wild oat plants/ft^2 and 2400 lb/A for 28 wild oat plants/ft^2. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

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

Herbicide	Rate	Water volume 5 gpa	10 gpa	15 gpa	20 gpa	*Mean*
	lb/A	-----% wild oat control-----				
Imazamethabenz	0.37	47	66	73	77	*68a*[1]
Imazamethabenz	0.47	72	76	79	77	*76b*
Imazamethabenz + difenzoquat	0.235 + 0.5	78	81	79	70	*77b*
Mean		*68a*[1]	*75b*	*77b*	*74b*	

[1]Treatments with different letters are significant at P<0.05.

Table 3. Effect of water volume on spring barley yield as averaged over rate and wild oat densities.

Water volume	Spring barley yield[1]
gpa	lb/A
5	2640ab
10	2592a
15	2736b
20	2784c

[1]Treatments with different letters are significant at P<0.05. Grain weight includes wild oat contamination.

Broadleaf weed control with metsulfuron in spring barley. Traci A. Brammer 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 broadleaf weed control, barley seed yield, and soil persistence of metsulfuron. Plots were 30 by 46 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). Weed control was evaluated visually on June 7 and June 23, 1996. Barley seed was harvested with a small plot combine from a 4 by 43 ft area in each plot on August 19, 1996.

Table1. Application data and soil analysis.

Application date	June 1, 1996
Growth stage	
spring barley	3 leaf
broadleaf weeds	cotyledon to 2 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

Barley was not injured by any herbicide treatment. All treatments controlled field pennycress, common lambsquarters, and mayweed chamomile 91% or better with no differences among treatments (Table 2). Spring barley seed yield ranged from 3030 to 3207 lb/A with no differences among treatments. Pea, lentil, and canola will be seeded during spring 1997. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Broadleaf weed control and spring barley seed yield with metsulfuron.

Treatment[1]	Rate	Weed control[2] THLAR	CHEAL	ANTCO	Spring barley seed yield
	lb/A		%		lb/A
Metsulfuron	0.0063	98	98	98	3079
Metsulfuron	0.0125	97	97	96	3178
Metsulfuron	0.025	93	97	96	3030
Prosulfuron	0.0179	91	97	94	3066
Bromoxynil/MCPA	0.0375	99	98	98	3207
LSD (0.05)		8	3	7	498
Plants/ft[2]		28	140	3	

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

[2] Weed control is the average of the two rating dates (June 7th and 23rd).

Broadleaf weed control in irrigated spring barley with F8426 alone and in combination with other broadleaf herbicides. Robert W. Downard and Don W. Morishita. Plots were established at the University of Idaho Research and Extension Center, Kimberly, Idaho to evaluate spring barley tolerance and weed control with F8426 alone or in combination with other broadleaf herbicides. Spring barley (var. Crystal) was planted on April 16, 1996, at 100 lbs/A and grown under sprinkler irrigation. 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 7.9, CEC of 17.5 meq/100 grams of soil, and 1.45% organic matter. Herbicides were broadcast on May 20 with a CO_2 pressurized bicycle-wheel sprayer equipped with 11001 flat fan nozzles calibrated to deliver 10 gpa at 22 psi. Treatments were applied May 20 and air temperature was 59 F, soil temperature 50 F, relative humidity 56%, and wind velocity 4 to 8 miles per hour. Weeds were at the cotyledon to two leaf growth stage at time of application. Average weed densities were as follows: common lambsquarters 10/ft^2, kochia 10/ft^2, redroot pigweed 20/ft^2, and annual sowthistle 20/ft^2. The grain was at the 1 to 5 leaf growth stage. Visual evaluations for crop injury were taken May 25, June 4, and June 20. Weed control evaluations were taken June 20 and August 12. Weed species evaluated for control were kochia, common lambsquarters, redroot pigweed and annual sowthistle. The barley was harvested August 22 with a small plot combine.

Crop injury among herbicide treatments ranged from 4 to 48% (Tables 1 and 2). In the four days prior to application, plots received rainfall that totaled 1.42 inches. This contributed to high soil moisture that increases potential crop injury from F8426. All injury levels tapered off by the third evaluation 21 days later. F8426 plus 2,4-D LVE or MCPA ester had higher injury ratings (30 to 48%) than most other treatments. The low rates of F8426 0.0075 and 0.015 lb/A alone or in combination with dicamba had the greatest margin of crop safety (Table 1). The addition of surfactant to F8426 alone or combination in with other herbicides injured barley more than when 32% N was used with the exceptions of F8426 plus dicamba. At harvest all herbicide treatments controlled common lambsquarters, kochia, redroot pigweed, and annual sowthistle 85 to 100% (Tables 1 and 2). Yields among treatments were not different from the untreated check. This may be attributed to good growing conditions. (Department of Plant, Soil and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83301)

Table 1. Crop injury, weed control, and yield in spring barley at Kimberly, Idaho.

					Weed control[1]						
		Crop injury			CHEAL		KCHSC		SONOL		
Treatment	Rate	5/25	6/4	6/20	6/20	8/12	6/20	8/12	6/20	8/12	Yield
	lb/A	%									bu/A
Check		--	--	--	--	--	--	--	--	--	101
F8426 + 32% N	0.023 + 2% v/v	11	4	1	96	98	100	100	94	98	115
F8426 + 32% N	0.031 + 2% v/v	14	3	0	93	95	100	96	91	94	115
F8426 + NIS	0.023 + 0.25% v/v	20	5	0	94	99	96	98	93	98	103
F8426 + NIS	0.031 + 0.25% v/v	28	8	3	89	96	93	98	89	98	102
F8426 + 2,4-D LVE + 32% N	0.023 + 0.25 + 2% v/v	31	6	1	97	97	100	100	95	98	104
F8426 + 2,4-D LVE + NIS	0.023 + 0.25 + 0.25% v/v	40	10	5	93	98	100	100	95	97	103
F8426 + dicamba + 32% N	0.023 + 0.10 + 2% v/v	10	3	0	96	100	100	100	98	100	98
F8426 + dicamba + NIS	0.023 + 0.10 + 0.25% v/v	35	5	4	98	100	100	100	98	100	109
F8426	0.015	11	1	0	96	100	94	100	89	98	102
F8426	0.0075	14	0	1	83	86	90	90	89	93	112
F8426 + dicamba	0.015 + 0.094	10	0	0	99	100	98	100	96	100	116
F8426 + dicamba	0.0075 + 0.094	9	0	1	96	100	95	100	100	99	109
F8426 + dicamba + tribenuron + NIS	0.0075 + 0.094 + 0.065 + 0.25% v/v	13	3	1	100	100	100	100	100	100	113
Dicamba + tribenuron + NIS	0.094 + 0.065 + 0.25% v/v	4	0	0	99	100	96	96	96	99	106
LSD (0.05)		7	3	2	8	7	7	6	7	6	NS

[1]Weeds evaluated for control were common lambsquarters (CHEAL), kochia (KCHSC) and annual sowthistle (SONOL).

Table 2. Crop injury, weed control, and yield in spring barley at Kimberly, Idaho.

Treatment[2]	Rate	Crop injury 5/25	Crop injury 6/4	Crop injury 6/2	Weed control[1] CHEAL 6/20	CHEAL 8/12	KCHSC 6/20	KCHSC 8/12	SONOL 6/20	SONOL 8/12	AMARE 6/20	Yield
	lb/A	%										bu/A
Check		--	--	--	--	--	--	--	--	--	--	91
F8426 + 32% N	0.023 + 2% v/v	9	8	1	88	93	90	98	84	88	96	88
F8426 + 32% N	0.031 + 2% v/v	11	1	0	96	100	96	98	91	97	99	97
F8426 + NIS	0.023 + 0.25% v/v	24	13	0	89	93	94	91	79	87	98	87
F8426 + NIS	0.031 + 0.25% v/v	24	13	0	88	96	91	93	85	92	95	92
F8426 + MCPA LVE + 32% N	0.023 + 0.38 + 2% v/v	30	14	1	88	100	95	98	88	91	98	91
F8426 + MCPA LVE + NIS	0.023 + 0.38 + 0.25% v/v	46	21	5	84	86	90	88	90	85	95	85
F8426 + MCPA LVE + 32% N	0.023 + 0.50 + 2% v/v	43	18	4	76	85	90	100	78	86	98	86
F8426 + MCPA LVE + NIS	0.023 + 0.50 + 0.25% v/v	48	26	4	83	90	88	93	88	91	91	91
Thif&trib + brom&MPCA + NIS	0.0106 + 0.25 + 0.25% v/v	4	3	1	100	95	90	90	93	92	100	92
LSD (0.05)		8	11	3	14	13	10	12	12	16	7	NS

[1]Weeds evaluated for control were common lambquarters (CHEAL), kochia (KCHSC), annual sowthistle (SONOL) and redroot pigweed (AMARE).
[2]Thif&trib is a commercial formulation of thifensulfuron and tribenuron. Brom&MCPA is a commercial formulation of bromoxynil and MCPA

Screen of thirteen herbicides across sixteen grass species. Dennis M. Gamroth, Bill D. Brewster, and Carol A. Mallory-Smith. In the Willamette Valley many annual grass weeds are problems in grass seed and grain production. Some of the species that are normally thought of as weeds are also grown for seed to be used in reclamation work. More information is needed on the effect herbicides used in grass and grain production have on the many grass species. A trial was conducted at the Hyslop Research Farm near Corvallis, OR to evaluate herbicide performance on seedling grasses. The trial was designed as a randomized complete block with three replications and 8-by 45-ft plots. The crops and weeds were planted in double rows 10 inches apart across each replication. Herbicides were applied with a single-wheel, compressed-air plot sprayer that delivered 20 gpa at 15 psi. Dates of the herbicide applications and growth stages of each of the species at the application timings are listed in Table 1.

Overall, the small grains were affected similarly by the herbicide treatments (Table 2); oat was the most injured and rye was the least injured by the herbicide treatments. Thiazopyr was very injurious to the grains at both application timings. The two higher rates of imazamox produced excellent control of all of the grains except for the 'Fidel' wheat which has an imidazolinone-resistant gene. Thiazopyr, ethofumesate at the two early timings, primisulfuron, and imazamox gave excellent control of most weed species. Adding chlorsulfuron-metsulfuron to metribuzin greatly enhanced control of many weed species. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table 1. Herbicide application dates and weed and crop growth stages.

Crop or weed	Five letter code	Application date and growth stage PES Oct. 9, 1995	EPOE Oct. 19, 1995	POE Oct. 31, 1995
Annual bluegrass	POAAN	preemergence	1 leaf	2 leaf
Roughstalk bluegrass	POATR	preemergence	1 leaf	2 leaf
Annual ryegrass	LOLMU	preemergence	1 leaf	2 leaf
Rattail fescue	VULMY	preemergence	1 leaf	2 leaf
Downy brome	BROTE	preemergence	1 leaf	2 leaf
Cheat	BROSE	preemergence	emerging - 1 leaf	2 leaf
California brome	BROCN	preemergence	emerging - 1 leaf	2 leaf
Ripgut brome	BRORI	preemergence	emerging	2 leaf
Oats ('Amity')	AVESA	preemergence	1 leaf	2 leaf
Barley ('Boyer')	HORVX	preemergence	1 leaf	3 leaf
Rye ('Wheeler')	RYEWH	preemergence	1 leaf	3 leaf
Triticale ('Breaker')	TRITI	preemergence	1 leaf	3 leaf
Winter wheat ('Fidel')	WHTFI	preemergence	1 leaf	3 leaf
Winter wheat ('Madsen')	WHTMA	preemergence	1 leaf	3 leaf

Table 2. Visual evaluations of weed control and crop injury from herbicide treatments on seedling grasses.

Treatment[1]	Rate	App. timing	Crop injury[2] AVESA	HORVX	RYEWH	TRITI	WHTFI	WHTMA	Weed control[2] BROCN	BRORI	BROSE	BROTE	LOLMU	POAAN	POATR	VULMY
	lb/A		%													
Pendimethalin	2.9	PES	75	7	15	15	12	5	30	72	40	63	97	100	100	98
Thiazopyr	0.5	PES	100	78	95	100	98	100	100	100	100	100	100	100	100	100
FOE 5043-metribuzin	0.375	PES	80	20	23	23	23	22	99	80	30	100	100	100	100	100
Dimethenamid	0.5	PES	63	40	43	43	37	43	23	7	37	83	100	100	83	95
Dimethenamid	1.0	PES	88	68	57	57	60	63	43	53	50	95	100	100	98	100
Metolachlor	1.5	PES	57	27	50	43	40	43	82	43	50	93	100	100	83	100
Ethofumesate	1.0	PES	90	83	60	86	93	96	99	100	100	100	35	100	92	100
FOE 5043-metribuzin	0.375	EPOE	73	7	27	23	7	15	99	87	17	90	100	100	100	100
Dimethenamid	0.5	EPOE	37	23	13	20	20	30	40	40	23	57	100	100	100	100
Dimethenamid	1.0	EPOE	60	40	30	35	20	40	98	53	53	91	100	100	100	100
Ethofumesate	1.0	EPOE	100	100	77	98	100	100	100	100	100	100	60	100	98	100
Thiazopyr	0.5	POE	100	95	98	100	100	100	100	100	100	100	100	100	100	100
Oxyfluorfen*	0.2	POE	100	85	60	50	37	47	57	98	37	63	87	67	75	80
Terbacil*	0.6	POE	95	50	40	73	47	63	43	78	98	97	100	100	100	47
Ethofumesate	1.0	POE	100	92	43	78	95	93	97	95	100	100	28	100	68	98
Metribuzin + chlor-met*	0.141 + 0.019	POE	47	12	12	13	3	3	7	47	37	50	93	98	100	23
Metribuzin*	0.141	POE	50	3	10	10	8	13	0	7	7	0	60	63	60	7
Diuron*	1.6	POE	37	20	30	43	47	43	7	63	43	27	97	98	100	100
Primisulfuron*	0.0175	POE	77	75	47	57	85	95	100	93	100	95	96	92	100	77
Primisulfuron*	0.035	POE	90	75	60	60	96	99	100	95	100	100	100	99	100	92
Imazamox	0.024	POE	100	96	85	93	7	100	93	96	93	100	87	17	91	53
Imazamox	0.04	POE	100	100	100	100	17	100	100	100	98	100	100	63	100	96
Imazamox	0.063	POE	100	100	97	100	23	99	100	100	100	100	100	85	100	98
Check			0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1]Non-ionic surfactant added to * @ 0.25 v/v; non-ionic surfactant @ 0.25% v/v and Solution 32 @ 1 qt/A added to all imazamox treatments; chlor-met = chlorsulfuron-metsulfuron.
[2]Evaluated February 20, 1996.

Broadleaf weed control in spring barley with dicamba and reduced rates of other broadleaf herbicides. Don W. Morishita and Robert W. Downard. A field study was conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho to evaluate broadleaf weed control with several herbicide combinations in spring barley (var. Crystal). Herbicides included dicamba in combination with reduced rates of bromoxynil, MCPA, prosulfuron, and tribenuron. Barley was planted April 16, 1996, at 100 lb/A and grown under sprinkler irrigation. Experimental design was a randomized complete block with four replications. Individual plots were 8 by 25 ft. Soil type at this location was a silt loam with 1.45% om, CEC of 17.5 meq/100 g soil, and pH of 7.9. 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 26 psi. All herbicide treatments were applied broadcast May 20 when the barley was in the 1 to 5-leaf stage. Environmental conditions at application time were as follows: air temperature 59 F, soil temperature 50 F, relative humidity 56%, wind speed ≤6 mph, and soil surface was wet. Weeds evaluated for control were common lambsquarters, kochia, redroot pigweed, and annual sowthistle growing at densities of 24, 19, 83, and 26 plants/ft^2, respectively. Crop injury was evaluated visually May 28, June 4, and 24 while weed control was evaluated June 24 and August 20. The crop was harvested August 22 with a small-plot combine.

Crop injury was 5% or less on any of the evaluation dates (Table). Kochia control generally was most effective with dicamba tank mixed with bromoxynil or bromoxynil & MCPA. Least effective kochia control was with prosulfuron alone at 0.009 or 0.018 lb/A and ranged from 64 to 75%. Common lambsquarters, redroot pigweed, and annual sowthistle control ranged from 89 to 100% for all herbicide treatments at each evaluation. All of the reduced rate combinations used with dicamba controlled the weeds equal to their respective higher application rate. Although total weed population averaged over 150 plants/ft^2, barley yields were not different among treatments. This may be attributed in part to the vigorous barley growth throughout the growing season. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table. Crop injury, weed control, and barley yield near Kimberly, Idaho.

					Weed control[1]								
		Crop injury			KCHSC		CHEAL		AMARE		SONOL		
Treatment[2,3]	Rate	5/28	6/4	6/24	6/24	8/20	6/24	8/20	6/24	8/20	6/24	8/20	Yield
	lb/A	%											bu/A
Check		--	--	--	--	--	--	--	--	--	--	--	105
Dicamba + brom&MCPA	0.094 + 0.25	1	0	0	94	98	100	100	99	100	93	100	115
Dicamba + brom&MCPA	0.094 + 0.5	5	1	0	97	100	95	99	100	100	98	100	113
Dicamba + bromoxynil + tribenuron	0.094 + 0.125 + 0.0052	4	0	1	95	100	91	100	98	99	97	100	110
Dicamba + bromoxynil + tribenuron	0.094 + 0.25 + 0.0052	3	0	1	99	100	100	100	98	100	97	100	115
Prosulfuron	0.009	0	1	0	68	75	90	96	89	98	98	98	114
Prosulfuron	0.018	0	0	0	64	65	93	98	98	100	98	100	109
Dicamba + prosulfuron	0.094 + 0.009	3	4	0	81	80	100	100	98	100	100	100	106
Dicamba + prosulfuron	0.094 + 0.018	5	0	0	89	96	98	100	99	100	98	100	100
Dicamba + MCPA LVE + prosulfuron	0.094 + 0.25 + 0.009	3	0	1	88	79	98	100	99	100	98	100	110
Dicamba + MCPA LVE + prosulfuron	0.094 0.25 + 0.018	1	0	0	89	90	100	100	100	100	100	100	111
Dicamba + tribenuron	0.094 + 0.0052	3	0	0	79	85	99	100	96	100	96	93	106
Dicamba + tribenuron	0.094 + 0.0078	4	0	0	80	85	96	99	96	100	96	94	108
LSD (0.05)		NS	2	NS	13	18	6	NS	6	NS	NS	NS	NS

[1]Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), and annual sowthistle (SONOL).
[2]Brom&MCPA is a commercial premix formulation of bromoxynil and MCPA.
[3]A nonionic surfactant was added to all treatments containing tribenuron or prosulfuron at 0.25% v/v.

Wild oat control in irrigated spring barley with tralkoxydim. Don W. Morishita and Robert W. Downard. A study was conducted near Picabo, Idaho in surface irrigated spring barley (var. Galena) to compare wild oat control among four postemergence herbicides. Barley was planted May 1, 1996, at 100 lb/A. The experiment was established as a randomized complete block design with four replications and 8 by 25 ft plots. Soil texture in this study was a silt loam with a pH of 8.4, CEC of 19.6 meq/100 g soil, and 2.6% om. 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 28 psi. All herbicide treatments were applied June 4 under mostly clear skies with an air temperature of 71 F, soil temperature 60 F, relative humidity 48%, with no dew present. At the time of application the crop was in the 2 to 4 leaf stage and the majority of wild oats were in the spike to 2 leaf stage. Crop injury was evaluated visually June 21 and August 16 and wild oat control was assessed August 16. The crop was harvested September 4 with a small-plot combine.

On the first crop injury evaluation only tralkoxydim + bromoxynil + ammonium sulfate significantly injured the crop and no injury was evident at the late-season evaluation (Table). None of the herbicides effectively controlled the wild oats. Six of the nine herbicide treatments had grain yields higher than the untreated check and they controlled wild oat ≥45%. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table. Crop injury, weed control, and barley yield, near Picabo, Idaho.

Treatment[1]	Rate	Crop injury 6/21	Crop injury 8/16	AVEFA control[2]	Yield
	lb/A	%			bu/A
Check		--	--	--	64
Tralkoxydim	0.18	0	0	26	76
Tralkoxydim + NH_4SO_4	0.18 + 1.5% v/v	0	0	49	83
Tralkoxydim + brom&MCPA + NH_4SO_4	0.18 + 0.25 + 1.5% v/v	4	0	58	82
Tralkoxydim + bromoxynil + NH_4SO_4	0.18 + 0.5 + 1.5% v/v	8	0	78	81
Tralkoxydim + MCPA LVE + NH_4SO_4	0.18 + 0.463 + 1.5% v/v	0	0	59	79
Tralkoxydim + 32% N	0.18 + 2.5% v/v	3	0	60	85
Imazamethabenz + nonionic surfactant	0.375 + 0.25% v/v	3	0	29	72
Imazamethabenz + difenzoquat + nonionic surfactant	0.187 + 0.5 + 0.25% v/v	4	0	45	82
Diclofop	1.0	1	0	4	67
LSD (0.05)		3	NS	21	12

[1]Turbocharge was added to all tralkoxydim treatments at 0.5% v/v.
[2]Weed evaluated for control was wild oat (AVEFA).

Wild oat control in spring barley and spring wheat using below-label rates of imazamethabenz applied at three growth stages. Mark J. Pavek, Don W. Morishita, Robert W. Downard, Charles C. Cheyney, and Stuart C. Parkinson. An experiment was conducted to compare a standard rate of imazamethabenz (1x = 0.41 lb/A) to five below-label rates, 5/6x, 2/3x, 1/2x, 1/3x, and 1/6x, for wild oat control, seed production (seed rain), and grain yield. Trials were established in two irrigated spring barley locations (Franklin and Twin Falls counties) and one irrigated spring wheat location (Butte county). Each imazamethabenz treatment was applied at three wild oat growth stages: spike to 1-leaf (EARLY), 1 to 3-leaf (MID), and 3 to 5-leaf (LATE). Each study was arranged as a split plot design with four replications. Main plots were application timing and sub-plots were herbicide rate. Sub-plots were 8 by 25 feet. Herbicides were applied using a CO_2-pressurized bicycle-wheel sprayer equipped with 11001 flat fan nozzles on 16-inch spacing. Grain was harvested using a small-plot combine. The sprayer was calibrated to deliver 10 gpa at 26 psi. Additional application data for each study are presented in Table 1.

Table 1. Application information, wild oat densities, and cultivars[1].

Location	Twin Falls County			Butte County			Franklin County		
Appl. Date	5/13	5/20	5/30	6/6	6/11	6/17	5/8	5/13	5/24
Appl. Time	Spike-1 lf	1-3 lf	3-5 lf	Spike-1 lf	1-3 lf	3-5 lf	Spike-1 lf	1-3 lf	3-5 lf
Air temp.(F)	82	64	52	46	73	75	70	80	64
Soil temp.(F)	64	56	52	48	52	61	59	61	52
RH (%)	30	50	74	60	29	42	39	61	54
Wind (mph)	4	6	1	3	2	5	4	1	1
Wild oats/ft^2	4	6	6	20	21	21	60	55	56
Cultivar	barley ('Crystal')			wheat ('Penawawa')			barley ('Colter')		

[1]lf = leaf, RH = relative humidity.

Wild oat control and seed rain at the Twin Falls site were influenced by an interaction of rate and application timing (Table 2). At the EARLY application timing, wild oat control at rates 1/2x through 1x did not differ and ranged from 83 to 91%, while at the MID and LATE applications, wild oats required at least the 2/3x dose for an equal level of control (79 to 80%). Wild oat seed rain was not significantly reduced below that of the untreated check by any treatment at the EARLY application timing. However, all MID- and LATE-treated sub-plots produced less seed than the MID- and LATE-untreated checks (except for the 1/3x rate, LATE application). Wild oat populations averaged 5 plants/ft^2 and were not very uniform throughout the study area. Due to harvest complications, barley yield was left out of this report.

In Butte county, application timing did not affect wild oat control, seedrain, or wheat yield (Table 3). Averaged across the three application timings, wild oat control at the 2/3x, 5/6x and 1x rates was not different and ranged from 80 to 88%. Wheat yield was not different between the imazamethabenz-treated sub-plots and all treated wheat yielded higher than the untreated. In addition, the untreated check produced more wild oat seed (1257 seeds/ft^2) than all treated sub-plots (270 to 50 seeds/ft^2). Wild oat seed production between the treated sub-plots did not differ.

Application timing and imazamethabenz rate affected wild oat control and barley yield in Franklin county (Table 4). Wild oat control and grain yield at the 1/2x rate and above applied EARLY, and the 1/3x and above applied MID, did not differ and were higher then those at the "full" 1x rate of the LATE application. Wild oat seedrain was not affected by application timing and averaged across application timing, was not different at the 1/3x rates and above (Table 5). Additionally, the 1/6x rate and untreated check produced equal amounts of wild oat seed (2010 and 2381 seeds/ft^2, respectively). These studies suggest that it is possible to achieve maximum grain yields and wild oat seed suppression at imazamethabenz rates below 0.41 lb/A in irrigated spring barley and wheat. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Effect of imazamethabenz rate and application timing on wild oat control and seed rain at Twin Falls county.

Treatment[1]	Rate		Application timing	Wild oat control	Wild oat seed rain
	lb/A		wild oat	%	seed/ft^2
Untreated check				-	135
Imazamethabenz	0.07	(1/6x)	Spike to 1 leaf	63	70
Imazamethabenz	0.14	(1/3x)	Spike to 1 leaf	70	94
Imazamethabenz	0.21	(1/2x)	Spike to 1 leaf	86	35
Imazamethabenz	0.27	(2/3x)	Spike to 1 leaf	83	54
Imazamethabenz	0.34	(5/6x)	Spike to 1 leaf	89	42
Imazamethabenz	0.41	(1x)	Spike to 1 leaf	91	28
Untreated check				-	158
Imazamethabenz	0.07	(1/6x)	1 to 3 leaf	55	81
Imazamethabenz	0.14	(1/3x)	1 to 3 leaf	65	34
Imazamethabenz	0.21	(1/2x)	1 to 3 leaf	75	39
Imazamethabenz	0.27	(2/3x)	1 to 3 leaf	80	102
Imazamethabenz	0.34	(5/6x)	1 to 3 leaf	71	47
Imazamethabenz	0.41	(1x)	1 to 3 leaf	80	93
Untreated check				-	383
Imazamethabenz	0.07	(1/6x)	3 to 5 leaf	23	162
Imazamethabenz	0.14	(1/3x)	3 to 5 leaf	59	342
Imazamethabenz	0.21	(1/2x)	3 to 5 leaf	58	86
Imazamethabenz	0.27	(2/3x)	3 to 5 leaf	79	82
Imazamethabenz	0.34	(5/6x)	3 to 5 leaf	81	111
Imazamethabenz	0.41	(1x)	3 to 5 leaf	83	90
LSD (0.05)				13	111

[1]Nonionic surfactant added at 0.25% v/v to all herbicide treatments.

Table 3. Effect of imazamethabenz rate averaged across three application timings on wild oat control, wheat yield and seed rain at Butte county.

Treatment[1]	Rate		Wild oat control	Wheat yield	Wild oat seed rain
	lb/A		%	bu/A	seed/ft^2
Untreated Check			-	64	1257
Imazamethabenz	0.07	(1/6x)	55	86	270
Imazamethabenz	0.14	(1/3x)	70	85	148
Imazamethabenz	0.21	(1/2x)	74	90	109
Imazamethabenz	0.27	(2/3x)	80	85	112
Imazamethabenz	0.34	(5/6x)	84	83	63
Imazamethabenz	0.41	(1x)	88	82	50
LSD (0.05)			8	10	353

[1]Nonionic surfactant added at 0.25% v/v to all herbicide treatments.

Table 4. Effect of imazamethabenz rate and application timing on wild oat control, seed rain, and barley yield at Franklin county.

Treatment[1]	Rate		Application timing	Wild oat control	Barley yield
	lb/A		wild oat	%	bu/A
Untreated check				-	19
Imazamethabenz	0.07	(1/6x)	Spike to 1 leaf	10	26
Imazamethabenz	0.14	(1/3x)	Spike to 1 leaf	73	55
Imazamethabenz	0.21	(1/2x)	Spike to 1 leaf	80	63
Imazamethabenz	0.27	(2/3x)	Spike to 1 leaf	85	62
Imazamethabenz	0.34	(5/6x)	Spike to 1 leaf	86	64
Imazamethabenz	0.41	(1x)	Spike to 1 leaf	93	59
Untreated check				-	20
Imazamethabenz	0.07	(1/6x)	1 to 3 leaf	35	45
Imazamethabenz	0.14	(1/3x)	1 to 3 leaf	83	61
Imazamethabenz	0.21	(1/2x)	1 to 3 leaf	87	63
Imazamethabenz	0.27	(2/3x)	1 to 3 leaf	89	63
Imazamethabenz	0.34	(5/6x)	1 to 3 leaf	94	62
Imazamethabenz	0.41	(1x)	1 to 3 leaf	93	58
Untreated check				-	17
Imazamethabenz	0.07	(1/6x)	3 to 5 leaf	15	23
Imazamethabenz	0.14	(1/3x)	3 to 5 leaf	33	30
Imazamethabenz	0.21	(1/2x)	3 to 5 leaf	46	29
Imazamethabenz	0.27	(2/3x)	3 to 5 leaf	54	33
Imazamethabenz	0.34	(5/6x)	3 to 5 leaf	61	29
Imazamethabenz	0.41	(1x)	3 to 5 leaf	65	32
LSD (0.05)				15	10

[1]Nonionic surfactant added at 0.25% v/v to all herbicide treatments.

Table 5. Franklin county wild oat seed production at each imazamethabenz rate average across 3 application timings.

	Imazamethabenz rate (lb/A)							
	0.0	0.07	0.14	0.21	0.27	0.34	0.41	LSD (0.05)
	seeds/ft^2							
Wild oat seed	2381	2010	1663	877	883	846	634	607

Broadleaf weed control in irrigated spring barley using reduced herbicide rates applied at three weed growth stages. Mark J. Pavek, Don W. Morishita, Robert W. Downard, and J. Reed Findlay. Two studies were conducted in south central Idaho (Kimberly and Paul) to evaluate broadleaf weed control, weed seed production (seed rain), crop injury, and spring barley yield using a tank mixture of bromoxynil & MCPA + tribenuron. The mixture was applied at six rates with the highest rate (1x) equal to 0.5 + 0.012 lb/A of bromoxynil & MCPA + tribenuron. The remaining rates were 5/6, 2/3, 1/2, 1/3, and 1/6 of the highest rate. An untreated check also was included. Each herbicide rate was applied to weeds at three growth stages: cotyledon to 2-leaf (EARLY), 2 to 4-leaf (MID), and 4 to 8-leaf (LATE). Treatments were arranged in a split plot design with four replications. Main plots were application timing and sub-plots were herbicide rate. Sub-plots were 8 by 25 feet. A CO_2-pressurized bicycle-wheel sprayer was calibrated to deliver 10 gpa at 26 psi, using 11001 flat fan nozzles. Additional application information and weed densities are presented in Table 1. Weed control and crop injury were evaluated visually two times.

Table 1. Application information and weed densities[1].

Location	Kimberly			Paul		
Application date	5/20	5/29	6/3	4/28	5/7	5/20
Application time	Cotyl-2 leaf	2-4 leaf	4-8 leaf	Cotyl-2 leaf	2-4 leaf	4-8 leaf
Air temp. (F)	50	48	75	35	53	50
Soil temp. (F)	48	50	61	41	53	52
RH (%)	74	80	62	62	59	52
Wind (MPH)	3	7	4	1	6	5
KCHSC/ft^2	8	10	10	-	-	-
CHEAL/ft^2	12	14	14	42	43	40
AMARE/ft^2	21	27	27	-	-	-
SONOL/ft^2	35	50	50	-	-	-
Total weeds/ft^2	76	101	101	42	43	40
Cultivar		'Crystal'			'Stander'	

[1]Cotyl = cotyledon, RH = relative humidity, KCHSC = kochia, CHEAL = common lambsquarters, AMARE = redroot pigweed, and SONOL = annual sowthistle.

No crop injury was seen at either the Paul or Kimberly locations and despite high weed populations in both studies, no yield differences were seen (Tables 2 and 3). There was no timing by rate interaction at the Paul location, yet overall common lambsquarters control (all rates combined and averaged) was equal and more effective at the MID and LATE application timings than the EARLY application (data not shown). All rates from 1/3x to 1x controlled common lambsquarters 95 to 99% and were not different from each other (Table 2). In addition, the 1/6x rate controlled 82 % of the common lambsquarters. Only two out of all 84 sub-plots contained common lambsquarters seed; both of these sub-plots were 1/6x treatments and each had less than 5 seeds/ft^2.

There was a significant timing by rate interaction at the Kimberly study (Table 3). Applied at the EARLY application timing, the 1/6x rate and above controlled all weeds 91 to 100% and were not different from each other except for kochia (1/6x = 65%), which required at least the 1/3x rate for similar control (96%). Overall weed control was less effective at the MID and LATE timings, yet control of common lambsquarters and annual sowthistle remained above 90% for all rates 1/3x and higher. Kochia, redroot pigweed, and annual sowthistle produced little or no seed in all herbicide treatments and did not differ from the untreated control (data not shown). However, untreated sub-plots yielded 742 to 886 common lambsquarters seed/ft^2 while all treated sub-plots averaged 0 to 79 seeds/ft^2 (Table 3). Weed seed production between the 1/6x and 1x rates was not different, nor was it affected by application timing. Data from both studies indicate that broadleaf weeds can be effectively controlled, while weed seed production is minimized and barley yield maximized, by using 1/6 of the bromoxynil & MCPA + tribenuron recommended label rate. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Common lambsquarters control and barley yield near Paul, Idaho averaged across three application timings.

Treatment[1]	Rate	CHEAL control[2]	Barley yield
	lb/A	%	bu/A
Untreated check		-	79
Bromoxynil & MCPA + tribenuron	0.083 + 0.002	82	82
Bromoxynil & MCPA + tribenuron	0.170 + 0.004	95	84
Bromoxynil & MCPA + tribenuron	0.250 + 0.006	95	85
Bromoxynil & MCPA + tribenuron	0.330 + 0.008	97	84
Bromoxynil & MCPA + tribenuron	0.042 + 0.010	99	87
Bromoxynil & MCPA + tribenuron	0.500 + 0.012	99	87
LSD (0.05)		7	NS

[1]Bromoxynil & MCPA is a commercial premix formulation of bromoxynil and MCPA. Nonionic surfactant was added to all herbicide treatments at 0.25% v/v.
[2]Weed evaluated for control was common lambsquarters (CHEAL).

Table 3. Effect of herbicide rate and application timing on weed control, barley yield, and seed rain near Kimberly, Idaho.

Treatment[2]	Rate	Application timing	Weed control[1] CHEAL	AMARE	KCHSC	SONOL	Yield	CHEAL seed rain
	lb/A		%				bu/A	seeds/ft[2]
Untreated check		Cotyl to 2 leaf	-	-	-	-	122	886
Brom&MCPA + tribenuron	0.083 + 0.002	Cotyl to 2 leaf	97	98	65	91	120	2
Brom&MCPA + tribenuron	0.170 + 0.004	Cotyl to 2 leaf	97	100	96	94	122	0
Brom&MCPA + tribenuron	0.250 + 0.006	Cotyl to 2 leaf	99	100	97	94	129	1
Brom&MCPA + tribenuron	0.330 + 0.008	Cotyl to 2 leaf	99	100	98	95	113	0
Brom&MCPA + tribenuron	0.042 + 0.010	Cotyl to 2 leaf	100	100	98	95	123	2
Brom&MCPA + tribenuron	0.500 + 0.012	Cotyl to 2 leaf	100	100	98	97	123	0
Untreated check		2 to 4 leaf	-	-	-	-	122	985
Brom&MCPA + tribenuron	0.083 + 0.002	2 to 4 leaf	99	80	71	85	120	0
Brom&MCPA + tribenuron	0.170 + 0.004	2 to 4 leaf	100	88	65	91	118	0
Brom&MCPA + tribenuron	0.250 + 0.006	2 to 4 leaf	100	90	88	97	125	0
Brom&MCPA + tribenuron	0.330 + 0.008	2 to 4 leaf	100	96	90	98	122	79
Brom&MCPA + tribenuron	0.042 + 0.010	2 to 4 leaf	100	87	82	97	128	0
Brom&MCPA + tribenuron	0.500 + 0.012	2 to 4 leaf	100	96	85	97	127	0
Untreated check		4 to 8 leaf	-	-	-	-	124	742
Brom&MCPA + tribenuron	0.083 + 0.002	4 to 8 leaf	62	60	54	61	122	0
Brom&MCPA + tribenuron	0.170 + 0.004	4 to 8 leaf	95	80	75	91	123	0
Brom&MCPA + tribenuron	0.250 + 0.006	4 to 8 leaf	100	92	74	94	124	0
Brom&MCPA + tribenuron	0.330 + 0.008	4 to 8 leaf	100	90	76	92	120	0
Brom&MCPA + tribenuron	0.042 + 0.010	4 to 8 leaf	100	84	78	97	125	0
Brom&MCPA + tribenuron	0.500 + 0.012	4 to 8 leaf	100	91	80	98	126	0
LSD(0.05)			10	10	15	10	NS	795

[1]Weeds evaluated for control were common lambsquarters (CHEAL), redroot pigweed (AMARE), kochia (KCHSC) and annual sowthistle (SONOL).

[2]Brom&MCPA is a commercial premix formulation of bromoxynil and MCPA. A nonionic surfactant was added to herbicide treatments at 0.25% v/v.

Wild oat control in spring barley with tralkoxydim in combination with broadleaf herbicides. Janice M. Reed and Donald C. Thill. A study was established in Boundary County, ID to evaluate wild oat control in spring barley with different tralkoxydim combinations. Spring barley (var. Baronesse) was seeded on May 20, 1996. The experimental design was a randomized complete block with four replications, and the individual plot size was 8 by 27 ft. Herbicide treatments were applied postemergence on July 1, 1996 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1). Barley injury was evaluated on July 16 and July 30, 1996, and wild oat (AVEFA) control was evaluated on July 30, 1996. Barley was harvested at maturity with a small plot combine on September 12, 1996 from a 4.3 by 27 foot area of each plot.

Table 1. Application and soil data.

Barley growth stage	4 to 5 leaves, 1 to 2 tillers
Wild oat growth stage	2 to 4 leaves
Air temperature (F)	72
Relative humidity (%)	70
Wind (mph, direction)	1 to 3, south
Cloud cover	mostly clear
Soil temperature at 2 inches (F)	54
Soil texture	silt loam
Sand (%)	37.6
Silt (%)	48
Clay (%)	14.4
Organic matter (%)	3.8
pH	7.6

No tralkoxydim treatments injured barley (Table 2). Fenoxaprop/safener injured the barley slightly on July 16, but no injury was noted on July 30. MON 37500 injured the barley 22 % on July 16 and 11% on July 30. All tralkoxydim treatments controlled wild oat 80 to 91%. Ammonium sulfate applied with the tralkoxydim treatments did not increase wild oat control, and combinations with broadleaf herbicides did not reduce control. All treatments controlled wild oat 75% or better except diclofop. Grain yield ranged between 75 and 98 bu/A and was not statistically different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Wild oat control and barley yield with tralkoxydim treatments.

Treatment[1]	Rate	Barley injury 7/16/96	Barley injury 7/30/96	AVEFA control	Barley yield
	lb/A	%	%	%	bu/A
Tralkoxydim	0.18	0	0	91	88
Tralkoxydim + ammonium sulfate	0.18 + 1.5	0	0	91	75
Tralkoxydim + bromoxynil/MCPA	0.18 + 0.75	0	0	94	91
Tralkoxydim + bromoxynil/MCPA + ammonium sulfate	0.18 + 0.75 1.5	0	0	94	85
Tralkoxydim + bromoxynil	0.18 + 0.5	0	0	93	89
Tralkoxydim + bromoxynil + ammonium sulfate	0.18 + 0.5 1.5	0	0	91	96
Tralkoxydim + MCPA ester	0.18 + 0.46	0	0	86	92
Tralkoxydim + MCPA ester + ammonium sulfate	0.18 + 0.46 1.5	0	0	89	96
Tralkoxydim + 2,4-D ester	0.18 + 0.475	0	0	80	98
Tralkoxydim + 2,4-D ester + ammonium sulfate	0.18 + 0.475 1.5	0	0	89	88
Tralkoxydim + clopyralid	0.18 + 0.09	0	0	89	92
Tralkoxydim + clopyralid + ammonium sulfate	0.18 + 0.09 1.5	0	0	89	90
Diclofop	1.0	0	0	68	89
Fenoxaprop/safener	0.096	6	0	95	87
Imazamethabenz + NIS	0.47	0	0	76	81
Difenzoquat + NIS	1.0	0	0	98	83
Imazamethabenz + difenzoquat + NIS	0.235 + 0.5	0	0	96	88
MON 37500 + NIS	0.031	22	11	79	76
Untreated check	---	---	---	---	83
	LSD (0.05)	5	1	12	NS
	Density (plants/ft^2)			2	

[1]NIS is 90% nonionic surfactant applied at 0.25% v/v. Thifen/triben is the commercial formulation of thifensulfuron/tribenuron, and fenox is fenoxaprop.

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 22, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of pinto beans (var. Bill Z) and annual broadleaf weeds to dimethenamid 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 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 22 and immediately incorporated to a depth of two to four in using a tractor driven rototiller. Preemergence treatments were applied May 23 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied June 12 when the bean plants were in the 1st trifoliolate leaf stage and weeds were small. Black nightshade infestations were heavy, redroot and prostrate pigweed infestations were moderate throughout the experimental area. Crop injury, preplant incorporated and preemergence treatments were evaluated visually on June 24. Crop injury and postemergence treatments were evaluated visually on July 12. Stand counts were made on June 24 and July 12 by counting individual plants per 10 ft of the third row of each plot. Pinto beans were cut and left in the field for one week before combining. Pinto beans were harvested on August 30 by combining the center two rows of each plot using a John Deere 3300 combine equipped with a load cell.

Dimethenamid plus imazethapyr applied preemergence at 1.0 plus 0.047 lb/A gave the highest injury rating of 14. All treatments gave excellent control of redroot and prostrate pigweed. Black nightshade control was excellent with all treatments except pendimethalin applied preemergence, dimethenamid at 1.0 lb/A followed by a postemergence treatment of dimethenamid applied at 0.25 lb/A and the check. Yields were 1383 to 3013 lb/A higher in herbicide treated plots as compared to the check.

Table. Broadleaf weed control in pinto beans with dimethenamid alone or in combination.

Treatment	Rate	Crop Injury	Stand Count	Weed Control AMARE	AMABL	SOLNI	Yield
	lb/A	---%---	no	----------%--------			lb/A
Pendimethalin[1]	1.0	0	35	100	100	18	2106
Pendimethalin + dimethenamid[1]	1.0+1.0	0	37	100	100	93	3382
Pendimethalin + dimethenamid[2]	1.0+1.0	0	35	100	100	99	3336
Dimethenamid[2]	1.0	0	38	100	100	93	3182
Dimethenamid + imazethapyr[2]	1.0+0.047	14	35	100	100	100	3736
Dimethenamid/imazethapyr + bentazon[3]	1.0/0.032+0.5	0	37	100	99	97	3536
Dimethenamid + imazethapyr + bentazon[4]	1.0+0.032+0.5	0	36	100	98	97	3382
Dimethenamid + imazethapyr[4]	1.0+0.047	0	35	99	100	95	3275
Dimethenamid/dimethenamid[3]	0.75/0.75	0	35	99	99	94	3229
Imazethapyr + bentazon[4]	0.032+0.5	0	35	99	95	94	3229
Dimethenamid/dimethenamid[3]	0.75/0.5	0	36	97	97	93	3182
Dimethenamid/imazethapyr[3]	1.0/0.047	0	35	97	98	97	3382
Dimethenamid/dimethenamid[3]	0.75/0.25	0	37	95	95	75	3121
Dimethenamid/bentazon[3]	1.0/1.0	0	36	95	95	90	3029
Handweeded check		0	35	100	100	100	3643
Check		0	35	0	0	0	723
Weeds/m^2				20	20	42	
LSD 0.05		1	ns	2	3	4	294

1. Treatment applied preplant incorporated.
2. Treatments applied preemergence.
3. First treatment applied preemergence followed by a postemergence with a surfactant and 32% nitrogen solution applied at 4 and 0.25% v/v.
4. Treatments applied postemergence with a surfactant and 32% nitrogen solution at 4 and 0.25% v/v.

Preplant-preemergence sequential herbicide treatments for weed control in dry beans. Gary A. Lee and Brenda M. Waters. The objective of this study was to determine the performance of various herbicides applied as PPI, PRE and PPI-PRE sequential treatments for annual weed control in dry beans. Pinto beans (var. 'UI-129') were planted on June 14, 1996 at the Parma Research and Extension Center, Parma, ID on a Greenleaf-Owyhee Silt loam soil (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH) and the surface conditions at the time of herbicide applications were smooth, no visible organic debris and moist surface (40% field capacity). The PPI herbicide treatments were applied and incorporated with a spiketooth harrow on June 10, 1996, beans planted four days later and the PRE herbicide treatments were applied on June 17. The plots were arranged in a randomized complete block design with four replications and individual plots were 7 by 20 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 July 8, 1996 and hand harvested (two center rows 10 ft. long) on September 25, 1996.

Table 1. Application data.

	June 10	June 17
Crop stage	PPI	PRE
Weed stage	dormant	dormant
Air temp. (F)	82	69
Relative humidity (%)	23	34
Wind (mph)	02	03
Sky (% cloud cover)	15	15
Soil temp. (F at 4 in.)	79	72
Soil moisture	surface moist (40% field capacity)	
First significant rain fall after herbicide applications was 0.16 in. on June 24.		

No appreciable differences were detected in the performance of ethalfluralin + dimethenamid at 0.56 + 1.0 lb/A as a single PPI tank mix and split applications of ethalfluralin + dimethenamid (PPI) and dimethenamid at 0.33, 0.5 and 0.67 lb/A, respectively, as a PRE treatment. These treatments maintained control of the annual weeds equally well throughout the remainder of the growing season. The PPI tank-mix of ethalfluralin + dimethenamid at 0.56 + 1.0 lb/A did cause a significant bean stand reduction, but crop yields were not significantly reduced compared to yields in plots that received the split applications. Dimethenamid applied PPI provided significantly better overall weed control than when applied PRE. Although not significantly different, bean yields tended to be higher in plots which received dimethenamid as a PPI treatment compared to PRE treatments. Pendimethalin and dimethenamid appears to give better overall weed control when applied as a sequential treatment (regardless of which herbicide is applied PPI or PRE) compared to the performance of the PPI tank-mix. Pendimethalin at 1.0 lb/A (PPI) also provided better weed control than when applied PRE. Pendimethalin + dimethenamid at 1.0 + 1.0 lb/A (PPI) satisfactorily controlled all weeds except hairy nightshade (SOLSA), but the sequential treatment of the two herbicides gave satisfactory control of the hairy nightshade as well as other species present. PRE applications of sulfentrazone at 0.375 lb/A resulted in excellent broadleaf weed control, but only provided good control of the green foxtail (SETVI) and barnyardgrass (ECHCG). Dimethenamid at 1.0 lb/A (PPI) + pendimethalin at 1.0 lb/A (PRE) treated plots yielded significantly less beans than plots treated with sulfentrazone at 0.313 lb/A (PRE), dimethenamid at 0.94 lb/A (PPI) and ethalfluralin + dimethenamid at 0.56 + 0.5 lb/A (PPI) + dimethenamid at 0.5 lb/A (PRE). All herbicide treated plots yielded significantly more beans than the nontreated check plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of preplant incorporated-preemergence sequential herbicide treatments on annual weeds, crop injury and pinto bean yield.

Treatment		Rate		Weed Control						Pinto Bean	
				AMARE	CHEAL	POROL	SOLSA	SETVI	ECHCG	Injury	Yield
PPI	PRE	PPI	PRE	%							lb/A
Ethalfluralin + EPTC	----	0.56 + 2.2	----	98	98	99	95	95	96	2	2888
Ethalfluralin + dimethenamid	----	0.56 + 1.0	----	96	99	96	96	96	96	2	2930
Ethalfluralin	Dimethenamid	0.56	1.0	95	94	94	91	98	98	7	2654
Ethalfluralin + dimethenamid	Dimethenamid	0.56 + 0.67	0.33	94	96	98	90	95	94	2	2756
Ethalfluralin + dimethenamid	Dimethenamid	0.56 + 0.5	0.5	94	95	95	95	94	94	3	2997
Ethalfluralin + dimethenamid	Dimethenamid	0.56 + 0.33	0.67	96	98	100	98	96	96	4	2606
Ethalfluralin + metolachlor	----	0.56 + 0.34	----	96	95	98	95	98	98	2	2718
Ethalfluralin	Metolachlor	0.56	0.34	100	100	98	95	96	96	3	2601
Pendimethalin	----	1.0	----	100	100	96	98	94	94	1	2845
----	Pendimethalin	----	1.0	87	92	91	82	92	92	2	2724
Dimethenamid	----	0.94	----	98	98	99	99	94	94	3	3056
----	Dimethenamid	----	0.94	79	89	77	91	70	70	4	2798
Pendimethalin + dimethenamid	----	1.0 + 1.0	----	99	99	98	74	97	97	2	2642
Pendimethalin	Dimethenamid	1.0	1.0	98	98	98	90	94	94	2	2680
Dimethenamid	Pendimethalin	1.0	1.0	99	99	94	94	96	96	4	2413
Pendimethalin + metolachlor	----	1.0 + 1.7	----	86	90	68	74	89	89	4	2938
----	Sulfentrazone	----	0.313	96	98	66	98	41	41	1	3047
----	Sulfentrazone	----	0.375	95	99	95	96	76	76	3	2535
Weedy Check	Weedy Check	----	----	0	0	0	0	0	0	0	1671
LSD (P=0.05)				13.6	9.5	23.4	12.4	20.3	20.4	2.3	562

Postemergence weed control in dry beans. Gary A. Lee and Brenda M. Waters. A study was established at the Parma Research and Extension Center, Parma, ID to evaluate postememergence herbicides for control of annual weeds in dry beans. Pinto beans (var. 'UI-129') were planted, in 22 in. bedded rows, on May 10, 1996 at a rate of 75 lb/A and at a depth of 2 in. Soil at the location is a Greenleaf-Owyhee Silt Loam (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH). Herbicide treatments were applied on June 3 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi (Table 1). Plots were visually evaluated for crop tolerance and weed control on June 16 (14 DAT). The weed infestation was removed from all plots with hand labor on July 10 and was maintained weed-free for the remainder of the growing season.

Table 1. Application information.

Crop stage	first trifoliate developing; second trifoliate emerging
Weed Stage	SOLSA 12-14 lf.; AMARE 8 lf.; POROL 2-4 lf.; ECHCG 2-4 lf.; SETVI 3-5 lf.; SONOL coty-2 lf.; CHEAL 6-8 lf.
Air temp. (F)	92
Relative humidity (%)	29
Wind (mph)	0
Sky (% cloud cover)	90
Soil temp. (F at 4 in.)	84
Soil moisture	dry surface, good moisture at 1 in.

First significant rain fall after herbicide application was 0.16 in. occurring June 24, 1996.

AC299,263 at 0.032 lb/A and 0.04 lb/A and AC299,263 + dimethenamid at 0.024 + 1.0 lb/A and 0.032 + 1.0 lb/A controlled 94% or better of the broadleaf and grassy weed species present (Table 2). Dimethenamid and sulfentrazone alone did not give satisfactory control of broadleaf or grassy weed species. No herbicide treated plots produced yields significantly higher than the nontreated check plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Influence of postemergence herbicide treatments on annual weed species, crop injury and pinto bean yield.

Treatment	Rate	Weed Control							Pinto Bean	
		SOLSA	AMARE	POROL	ECHCG	SETVI	SONOL	CHEAL	Injury	Yield
	lb/A	%								lb/A
Dimethenamid	1.0	24	0	40	35	0	25	0	5	1711
Dimethenamid	1.5	44	0	45	48	13	0	0	3	1969
AC299,263 [1]	0.024	95	100	95	95	97	85	93	3	2272
AC299,263 [1]	0.032	98	99	97	97	98	90	95	2	2395
AC299,263 [1]	0.04	97	100	97	96	97	100	95	4	2596
AC299,263 + dimethenamid [1]	0.024 + 1.0	98	100	97	96	98	95	95	2	2225
AC299,263 + dimethenamid [1]	0.032 + 1.0	97	100	97	96	96	98	94	3	1906
Sulfentrazone	0.313	0	0	0	0	0	0	0	1	1580
Sulfentrazone	0.375	0	0	0	0	0	0	0	1	1652
Weedy Check	----	0	0	0	0	0	0	0	0	1891
LSD (P=0.05)		8.2	1.2	5.2	4.1	11.7	28.1	5.6	1.2	800

[1]Latron AG-98 nonionic surfactant and Solution 32 (32% nitrogen solution) added at 0.25% v/v and 1.0% v/v, respectively

Tolerance of dry bean market classes to preplant incorporated herbicides. Gary A. Lee and Brenda M. Waters. A study was conducted at the Parma Research and Extension Center, Parma, ID to evaluate the tolerance of five market classes of dry beans to standard preplant incorporated herbicide treatments. On May 10,1996, black (var. 'UI-911'), great northern (var. 'UI-425'), pink (var. 'UI-537'), pinto (var. 'UI-129') and small white (var. 'UI-137') market class of dry beans were planted at 40, 75, 65, 80, 38 lb/A, respectively, at a depth of 2 in. on 22 in. bedded rows. The soil at the site is a Greenleaf-Owyhee Silt Loam (34% sand, 56% silt, 10% clay, 1.10% organic matter and 7.7 pH). The experiment was arranged in a split block design with four replications and individual plots were 7 by 10 ft. Herbicide treatments were applied with a pressurized CO_2 backpack sprayer calibrated to deliver 10 gpa at 30 psi. Treatments were incorporated into the soil to a depth of 2-2.5 in. with a spiketooth harrow immediately after application.

Table 1. Application information

Crop stage	PPI
Weed stage	dormant
Air temp. (F)	69
Relative humidity (%)	35
Wind (mph)	01
Sky (% cloud cover)	100
Soil temp. (F at 4 in.)	57
Soil moisture	dry surface, good moisture at 1.5 in.
First significant rain fall after herbicide application was 0.15 in. on May 14, 1996.	

Hairy nightshade control with EPTC + trifluralin at 3.5 + 0.5 lb/A was significantly less than with the other PPI herbicide treatments studied (Table 2). Redroot pigweed(AMARE), common lambsquarters (CHEAL) and green foxtail (SETVI) control were not significantly different with all herbicide treatments.

Some herbicide treatments caused significant reductions in small white and black bean stands (Table 3). Plots treated with EPTC at 3.5 lb/A had significantly greater small white bean stands than in plots treated with pendimethalin at 1.0 lb/A, ethalfuralin + EPTC at .75 + 3.5 lb/A, ethalfuralin at 1.1 lb/A, EPTC + trifluralin at 3.5 + 0.5 lb/A, handweeded check and nontreated check. Black bean stands were significantly higher in the nontreated check plot than in the handweeded check, EPTC at 3.5 lb/A and pendimethalin + EPTC at 1.0 + 3.1 lb/A. No herbicide treatment caused visible damage to any of the bean varieties representing the various market classes. Yields in black bean plots treated with EPTC + trifluralin at 3.5 + 0.5 lb/A were significantly lower than plots treated with pendimethalin at 1.0 lb/A, pendimethalin + EPTC at 1.0 + 3.1 lb/A and ethalfuralin + EPTC at 0.75 + 3.5 lb/A, but were not different than the yields from the handweeded and nontreated check plots. Great northern yields from the handweeded check were not significantly different than the herbicide treated plots. Although weeds were removed from the nontreated check plots on July 10, 1996 (61 DAT), exposure to the competition pressure from the annual weeds was sufficient for reduced yields compared to the herbicide treated plots. Data from this one year study indicate that there is no obvious phytotoxic influence of these standard herbicide treatments on various market classes of beans. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma,ID 83660-6699)

Table 2. Percent control of annual weeds with preplant incorporated herbicides in dry beans.

Treatment	Rate	Weed Control			
		AMARE	SOLSA	CHEAL	SETVI
	lb/A	------------ -- % ------------			
Pendimethalin	1.0	98.3	92.8	100	94.1
Pendimethalin + EPTC	1.0 + 3.1	97.9	92.9	100	95.0
Ethalfluralin + EPTC	0.75 + 3.5	98.8	94.3	100	95.4
Ethalfluralin	1.1	97.1	94.0	100	96.0
EPTC	3.5	98.7	94.1	100	95.0
EPTC + trifluralin	3.5 + 0.5	92.4	86.4	100	89.1
Handweeded Check	----	100	100	100	100
Nontreated Check	----	0	0	0	0
LSD (P=0.05)		7.3	6.3	1.0	7.9

Table 3. Comparison of preplant incorporated herbicide treatments on stand, injury and yield of five bean market classes.

Treatment	Rate	Small White			Black			Pink			Great Northern			Pinto		
		Stand	Injury	Yield	Stand	Injury	Yield	Stand	Injury	Yield	Stand	Injury	Yield	Stand	Injury	Yield
	lb/A	--- % ---		lb/A	--- % ---		lb/A	--- % ---		lb/A	--- % ---		lb/A	--- % ---		lb/A
Pendimethalin	1.0	60	0	2101	70.0	0	2095	79	0	2155	80	0	2456	94	0	2020
Pendimethalin + EPTC	1.0 + 3.1	70	0	1993	62.0	0	2035	85	0	2102	87	0	1976	92	0	1893
Ethalfluralin + EPTC	0.75 + 3.5	62	0	2073	71.7	0	2052	87	0	2360	83	0	2111	92	0	1865
Ethalfluralin	1.1	65	0	1885	78.3	0	1993	87	0	2033	85	0	2498	89	0	2154
EPTC	3.5	84	0	1959	60.0	0	1804	83	0	2598	88	0	2540	90	0	1976
EPTC + trifluralin	3.5 + 0.5	57	0	1973	68.0	0	1421	85	0	1957	77	0	2092	90	0	1789
Handweeded Check	----	53	0	1605	52.0	0	1595	85	0	2124	87	0	2192	92	0	2094
Nontreated Check	----	62	0	1818	82.0	0	1811	85	0	1899	92	0	1560	89	0	1671
LSD (P =0.05)		18	NS	575	18	NS	575	18	NS	575	18	NS	575	18	NS	575

Dry bean tolerance to AC 299,263 in combination with spray additives 1996. Thomas W Kleven, and Richard K Zollinger. Experiments were conducted at Glyndon and Rothsay, MN in 1996 to evaluate dry bean tolerance to AC 299,263 applied with X-77, Mor-Act, Sun-It II and 28% N. Treatments were applied to plots 10 ft wide by 40 ft long with a bicycle-wheel-type plot sprayer delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. 'Upland' navy bean and 'Othello' pinto bean were planted 1.5 inches deep in rows spaced 30 inches apart. The experiment had a randomized complete block design with four replicates per treatment.

Location	Glyndon 1996	Rothsay 1996
Planting	1-Jun	10-Jun
POST conditions		
App. date	27-Jun	10-Jul
Air temp	80 F	82 F
Wind speed	5-7 mph	10-12 mph
Rel. humidity	85%	65%
Bean leaf stage	2-3 trifol	3-4 trifol
Cloud cover	50%	30%

Trifol. = Trifoliolate

This experiment was conducted in a weed free environment. Dry bean injury was observed as reduction in vegetative growth and leaf chlorosis. AC 299,263 at 0.032, 0.063 lb/A caused greater injury, and reduced yield of Upland navy bean compared to Othello pinto bean at both locations. AC 299,263 applied with X-77 caused less injury, less delay in maturity, lower seed moisture, and reduced yield of Upland navy bean and Othello pinto bean less than AC 299,263 applied with either Mor-Act or Sun-It II at Glyndon and Upland navy bean at Rothsay. AC 299,263 applied with Sun-I II caused more injury, caused greater delay in maturity, higher seed moisture and reduced yields more than AC 299,263 applied with Mor-Act or X-77 with the exception of Rothsay Othello pinto bean yield. The addition of 28% urea ammonium nitrate increased injury to Upland navy bean at all locations. AC 299,263 at 0.032 lb/A caused more injury, caused greater delay in maturity, higher seed moisture, and reduced yield more than the labeled rate of imazethapyr, 0.032 lb/A with the exception of Rothsay Othello pinto bean yield and Upland navy bean yield. There was no significant reduction in Othello pinto bean Yield at Rothsay. Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.

Table 1. Dry bean tolerance to AC 299,263 in combination with different spray additives, Glyndon 1996.

Treatment[a]	Rate	Upland navy bean					Othello pinto bean				
		Injury		Maturity[b]	Moisture	Yield	Injury		Maturity[b]	Moisture	Yield
		15 DAT	30 DAT				15 DAT	30 DAT			
	lb/A	----------	----------	%----------	----------	lb/A	----------	----------	%----------	----------	lb/A
Imazethapyr + X-77	0.032	5	1	86	13	1892	4	2	94	11	2077
AC 299,263 + X-77	0.032	10	3	82	14	2060	7	2	92	11	2360
AC 299,263 + X-77	0.063	14	5	63	17	1870	12	5	83	15	2108
Imazethapyr + X-77 + 28%N	0.032	10	3	75	16	2076	7	3	88	11	2547
AC 299,263 + X-77 + 28%N	0.032	12	6	79	14	2105	8	3	87	11	2319
AC 299,263 + X-77 + 28%N	0.063	22	7	56	20	1650	14	5	78	16	2122
Imazethapyr + Mor-Act	0.032	14	5	75	17	1956	11	4	88	12	2321
AC 299,263 + Mor-Act	0.032	18	6	60	22	1824	14	6	78	18	2247
AC 299,263 + Mor-Act	0.063	26	8	47	25	1606	17	7	72	23	2008
Imazethapyr + Mor-Act + 28%N	0.032	15	6	63	19	1944	12	5	85	13	2401
AC 299,263 + Mor-Act + 28%N	0.032	16	5	60	20	1925	9	5	85	13	2222
AC 299,263 + Mor-Act + 28%N	0.063	30	10	42	25	1542	23	8	69	21	2060
Imazethapyr + Sun-It II	0.032	15	6	67	18	2117	11	5	84	13	2277
AC 299,263 + Sun-It II	0.032	21	7	63	19	1760	13	6	82	15	2265
AC 299,263 + Sun-It II	0.063	29	11	45	34	1617	20	8	68	23	1811
Imazethapyr + Sun-It II + 28%N	0.032	17	7	61	22	1829	10	5	83	15	2197
AC 299,263 + Sun-It II + 28%N	0.032	25	9	54	26	1557	17	6	79	19	2182
AC 299,263 + Sun-It II + 28%N	0.063	39	16	36	35	1390	27	11	62	31	2002
Untreated		0	0	100	13	1788	0	0	100	10	1842
LSD (0.05)		3	1	7	8	224	3	1	4	7	291

[a]X-77 was applied a 0.25% v/v, Mor-Act was applied at 1 qt/A, Sun-It II was applied at 0.75 qt/A.
[b]Maturity = % of mature untreated check (90% of pods turned buckskin in color and texture).

Table 2. Dry bean tolerance to AC 299,263 in combination with different spray additives, Rothsay 1996.

Treatment[a]	Rate	Upland navy bean					Othello pinto bean				
		Injury		Maturity[b]	Moisture	Yield	Injury		Maturity[b]	Moisture	Yield
		15 DAT	30 DAT				15 DAT	30 DAT			
	lb/A	----------	----------	%	----------	lb/A	----------	----------	%	----------	lb/A
Imazethapyr + X-77	0.032	9	0	91	21	1194	5	0	96	19	1449
AC 299,263 + X-77	0.032	11	2	91	22	1750	11	0	93	19	1661
AC 299,263 + X-77	0.063	15	5	85	23	1507	13	5	90	19	1629
Imazethapyr + X-77 + 28%N	0.032	12	3	75	26	1609	9	4	88	19	1769
AC 299,263 + X-77 + 28%N	0.032	13	6	86	22	1510	10	3	91	18	1570
AC 299,263 + X-77 + 28%N	0.063	29	9	75	28	1058	19	5	85	20	1520
Imazethapyr + Mor-Act	0.032	11	6	86	24	1545	9	3	94	18	1691
AC 299,263 + Mor-Act	0.032	18	6	71	29	1391	16	3	84	21	1762
AC 299,263 + Mor-Act	0.063	18	8	71	29	1143	15	7	83	22	1534
Imazethapyr + Mor-Act + 28%N	0.032	19	7	76	31	1282	17	5	89	21	1680
AC 299,263 + Mor-Act + 28%N	0.032	18	5	69	36	1223	11	5	84	21	1728
AC 299,263 + Mor-Act + 28%N	0.063	28	11	66	37	937	25	8	80	24	1667
Imazethapyr + Sun-It II	0.032	12	4	76	26	1896	10	4	84	23	1943
AC 299,263 + Sun-It II	0.032	20	7	74	29	1211	14	6	86	21	1604
AC 299,263 + Sun-It II	0.063	33	18	61	47	985	29	11	74	31	1322
Imazethapyr + Sun-It II + 28%N	0.032	15	8	65	37	1293	10	6	80	23	1750
AC 299,263 + Sun-It II + 28%N	0.032	30	11	65	42	1180	21	6	76	27	1621
AC 299,263 + Sun-It II + 28%N	0.063	50	23	44	63	547	34	14	61	49	1183
Untreated		0	0	100	22	1101	0	0	100	17	680
LSD (0.05)		3	3	10	12	513	8	2	8	7	NS

[a]X-77 was applied a 0.25% v/v, Mor-Act was applied at 1 qt/A, Sun-It II was applied at 0.75 qt/A.
[b]Maturity = % of mature untreated check (90% of pods turned buckskin in color and texture).

Desmedipham plus phenmedipham plus ethofumasate co-formulation differences in sugarbeets. Carl E. Bell, Brent Boutwell, and Phil Odom. This project was a comparison of two different co-formulations of desmedipham plus phenmedipham plus ethofumasate for postemergence weed control and phytotoxicity in sugarbeets. The co-formulations were the current commercial formulation (Betamix Progress) and an experimental formulation, NA-308- Two field trials were conducted, one at the UC Desert Research and Extension Center near Holtville, CA (Experiment 1) and the other in a cooperative grower's field near Brawley, CA (Experiment 2).

Experimental design was a randomized complete block with four replications in both experiments. Plot size was 2 bed each 30 inches wide, by 25 feet. Herbicide treatments were made sequentially, beginning when the crop was in the cotyledon stage of growth on September 19, 1995 in Experiment 1 and on October 25, 1995 in Experiment 2. The second treatment was made six days later in Experiment 1 and 7 days later in Experiment 2, when the crop was in the leaf stage. Applications were made with a CO_2 pressured sprayer at 20 psi, using 8003LP nozzles for a spray volume c 30 gallons/acre. Soil type was a clay loam in both fields. Applications were made in the morning on sunny days, whicl should increase crop injury potential with this herbicide.

Data collected were: visual estimates of nettleleaf goosefoot and tumble pigweed control and crop phytotoxicity in Experiment 1 on October 2 and October 13; and visual estimates of nettleleaf goosefoot control and crop phytotoxicit in Experiment 2 on October 31, November 9 and November, 20, 1995. Results are shown in the Tables below.

According to the visual evaluations, control of nettleleaf goosefoot and tumble pigweed was about the same for both formulations. Crop injury was similar in Experiment 1, but greater for the NA-308-2 formulation in Experiment 2. Th crop injury was still evident at a visit to the field on December 6, 1995 (data not shown). (Cooperative Extension, University of California, Holtville, CA 92250 and AgrEvo Chemical Co., Phoenix, AZ 85044.)

Table 1. Comparison of two co-formulations of desmedipham plus phenmedipham plus ethofumasate for weed contr and crop injury in sugarbeet, Experiment 1 near Holtville, CA.

Treatment[1]	Applications		Visual evaluations[2]					
			October 2			October 13		
	Sept. 19	Sept. 25	AMAAL	CHEMU	Phyto[3]	AMAAL	CHEMU	Phyto
	lbai/A		%			%		
Des/Phen	0.33 +	0.40	99	99	2.00	100	96	1.75
Des/Phen	0.50 +	0.60	99	99	3.00	98	96	2.50
NA308-2	0.33 +	0.40	98	98	1.25	95	91	1.25
NA308-2	0.50 +	0.60	98	99	3.00	99	99	3.00
Untreated control			0	0	0	0	0	0

[1] Treatment; Des/Phen - commercial co-formulation (Betamix Progress); NA308-2 is an experimental co-formulation.
[2] AMAAL - tumble pigweed, CHEMU - nettleleaf goosefoot.
[3] Phyto- phytotoxicity, 0 = no crop injury, 10 = all plants dead.

Table 2. Comparison of two co-formulations of desmedipham plus phenmedipham plus ethofumasate for weed contr and crop injury in sugarbeet, Experiment 2 near Brawley, CA.

Treatment[1]	Applications		Visual evaluations[2]					
			CHEMU control			Phytotoxicity		
	Oct. 25	Nov. 1	Oct. 31	Nov. 9	Nov. 20	Oct. 31	Nov. 9	Nov. 20
	lbai/A		%					
Des/Phen	0.25 +	0.33	99	100	100	2.50	1.00	1.75
NA308-2	0.25 +	0.33	100	100	100	2.75	4.00	1.50
Untreated control			0	0	0	0	0	0

[1] Treatment; Des/Phen - commercial co-formulation (Betamix Progress); NA308-2 is an experimental co-formulation.
[2] CHEMU - nettleleaf goosefoot; Phytotoxicity, 0 = no crop injury, 10 = all plants dead.

Preemergence and postemergence herbicide applications on sugar beets. Marvin D. Butler. The objective of this project was to evaluate herbicides applied preemergence and postemergence to sugar beets in a commercial field near Prineville, Oregon. Preemergence treatments included ethofumesate, pyrazon, cycloate, and a combination of ethofumesate and pyrazon. Postemergence applications included phenmedipham and desmedipham, phenmedipham and desmedipham and ethofumesate, triflusulfuron, and clopyralid. Treatments applied preemergence were made April 15 except cycloate, which was applied April 22. Treatments applied postemergence were made at the cotyledon stage May 28, the four-leaf stage June 3, and the eight-leaf stage June 10. Treatments were applied with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. Plots 10 by 25 ft were replicated four times in a randomized complete block design. Crop oil concentrate was added to triflusulfuron treatments at 1% v/v. Treatments were evaluated for crop injury and percent control of common lambsquarters, redroot pigweed, hairy nightshade, redstem filaree, common mallow, and mustard species June 27. The center 25-foot row of each plot was harvested October 9. Samples were weighed and 10 beet sub-samples evaluated for percent sugar and parts per million nitrate by Spreckles Sugar.

Plots treated preemergence with pyrazon alone, or in combination with ethofumesate, followed by postemergence treatments of phenmedipham and desmedipham and ethofumesate plus triflusulfuron provided 100% control of common lambsquarters, redroot pigweed, hairy nightshade, redstem filaree, common mallow, and mustard species. Plots treated preemergence with ethofumesate, pyrazon, or a combination of the two, had 89-100% weed control compared to 83% for plots receiving only postemergence applications. Preemergence application of ethofumesate followed by postemergence applications of phenmedipham and desmedipham plus triflusulfuron provided 99% control of total weeds evaluated compared to 93% for preemergence applications of ethofumesate followed by postemergence applications of phenmedipham and desmedipham and ethofumesate plus triflusulfuron.

Yields were not reduced following slight stunting in plots treated preemergence with ethofumesate, or moderate stunting in plots following preemergence treatment with pyrazon or pyrazon plus ethofumesate. Treated plots had yields ranging from 25.2 to 28.1 T/A compared to 13.0 T/A for untreated plots. There were no significant differences among treatments when evaluated for sugar content, which ranged from 18.3 to 18.8% and nitrate, which ranged from 14 to 31%. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of herbicide applications on sugar beets near Prineville, Oregon.

Treatments[2]	Rate: Pre	Post 1	Post 2	Post 3	Weed Control[1]: Common lambsquarters	Redroot pigweed	Hairy nightshade	Redstem filaree	Common mallow	Mustard species	Total weeds
	(lb/A)				(%)						
Ethofumesate phen & desm & etho	1.5	 0.27	 0.38		96	99	83	99	63	96	89
Ethofumesate phen & desm & etho + triflusulfuron	1.5	 0.27 0.016	 0.38 0.016		98	100	71	96	95	100	93
Ethofumesate phen & desm & etho + clopyralid	1.5	 0.27	 0.38 0.09		97	100	73	71	96	96	89
Ethofumesate phen & desm & etho	1.5	 0.27	 0.38	 0.50	100	100	96	100	83	99	96
Ethofumesate phenmedipham & desmedipham + triflusulfuron	1.5	 0.24 0.016	 0.33 0.016		99	100	99	99	98	98	99
Ethofumesate + pyrazon phen & desm & etho + triflusulfuron	1.5 2.7	 0.27 0.016	 0.38 0.016		100	100	100	100	100	100	100
Pyrazon phen & desm & etho + triflusulfuron	3.01	 0.27 0.016	 0.27 0.016		100	100	100	100	100	100	100
Cycloate phen & desm & etho + triflusulfuron	3.0	 0.27 0.016	 0.38 0.016		96	95	70	30	100	85	79
Phen & desm & etho + triflusulfuron		0.27 0.016	0.38 0.016	0.50 0.016	95	95	88	58	65	96	83
Untreated	-----	-----	-----	-----	0	0	0	0	0	0	0

[1] Visual evaluation was conducted June 27

[2] Postemergence treatments were applied at the cotyledon, 4-leaf, and 6-leaf stages

Phen & desm & etho = phenmedipham & desmedipham & ethofumesate commercial formulation.

Lay-by applications for late season weed control in sugar beets. Robert W. Downard and Don W. Morishita. A field study was conducted at the University of Idaho Research and Extension Center at Aberdeen, Idaho to investigate lay-by applications for late season weed control in sugar beets (var. WS PM9). Sugar beets were planted April 26, 1996, at a rate of 47,520 seeds/A on 22-inch rows 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 treatments 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. Lay-by treatments were incorporated with 0.5 inch of irrigation water immediately after application. Additional application data and weed densities are shown in Table 1. Crop injury and weed control evaluations were taken June 13 and July 2. The center two rows were harvested October 3 with a two row lifter.

Table 1. Application information and weed densities.

Application timing	Cotyledon	7 days later	14 days later	Lay-by
Application date	5/21	5/29	6/6	6/13
Air temperature (F)	54	58	58	68
Soil temperature (F)	44	52	51	62
Relative humidity (%)	62	76	20	66
Wind velocity (mph)	4	2 to 4	5 to 8	2
	Weed density (plants/ft^2)			
Common lambsquarters	2	4	9	-
Redroot pigweed	6	14	16	-
Kochia	-	-	<1	-

Early crop injury ranged from 9 to 11% (Table 2). The injury observed was a combination leaf miner insect and herbicide damage. The pendimethalin lay-by application was the only treatment with significant injury on July 2. The high crop injury may be a result of using sprinkler irrigation to incorporate the herbicide. All herbicide treatments, including pendimethalin applied lay-by and ethofumesate, desmedipham, and phenmedipham premix plus triflusulfuron with no lay-by application had root and extractable sucrose yields greater than the check. There were no differences in root yield or extractable sucrose yield among the herbicide treatments which mean two things. First, the severe pendimethalin injury observed nearly 3 weeks after application did not impact yield, although several sugar beet roots were deformed. Second, lay-by herbicide applications did not benefit weed control or sugar beet yields. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control and sugar beet root yield and extractable sucrose at Aberdeen, Idaho.

Treatment[2]	Rate	Applic. timing	Crop injury 6/13	Crop injury 7/2	Weed control[1] CHEAL 6/13	CHEAL 7/2	AMARE 6/13	AMARE 7/2	KCHSC 6/13	PANCA 7/2	Yield	Extractable sucrose
	lb/A		%								tons/A	lb/A
Check			--	--	--	--	--	--	--	--	12	3482
Ethfmst&desm&phen +	0.33 +	cotyledon/	10	0	100	100	100	96	100	99	26	7430
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later										
Ethfmst&desm&phen +	0.33 +	cotyledon/	9	1	100	99	100	99	100	100	27	7741
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
EPTC	3.0	lay-by										
Ethfmst&desm&phen +	0.33 +	cotyledon/	9	40	100	100	100	100	100	100	25	6613
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
pendimethalin	1.0	lay-by										
Ethfmst&desm&phen +	0.33 +	cotyledon/	13	3	100	100	100	100	100	100	24	6783
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
pyrazon	3.5	lay-by										
Ethfmst&desm&phen +	0.33 +	cotyledon/	10	3	100	100	100	100	100	100	28	7941
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
cycloate	3.0	lay-by										
Ethfmst&desm&phen +	0.33 +	cotyledon/	11	3	100	100	100	99	100	99	26	7129
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
ethalfluralin	1.5	lay-by										
Ethfmst&desm&phen +	0.33 +	cotyledon/	10	0	100	100	100	99	100	100	28	7965
triflusulfuron	0.0156	7 days later/										
ethfmst&desm&phen	0.33	14 days later/										
trifluralin	0.75	lay-by										
LSD (0.05)			NS	6	NS	NS	NS	NS	NS	NS	3	809

[1]Weeds evaluated for control were common lambsquarters (CHEAL), redroot pigweed (AMARE), kochia (KCHSC), and witchgrass (PANCA).
[2]Ethfmst&desm&phen is a commercial premix formulation of ethofumesate, desmedipham, and phemedipham.

Broadleaf weed control in sugar beets with preplant and preemergence herbicides. Robert W. Downard and Don W. Morishita. Preplant and preemergence herbicides are commonly used to control early germinating weeds. A field study was conducted at the University of Idaho Research and Extension Center, Kimberly, Idaho to investigate broadleaf weed control in sugar beets (var. Beta 8450). A preplant fertilizer application consisting of 90, 135, and 50 lb/A of nitrogen, phosphorus, and potassium, respectively was applied broadcast. Sugar beets were planted May 2, 1996, at a rate of 71,280 seeds/A on 22-inch rows 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 treatments 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 data and weed densities are shown in Table 1. Soil type at this site was a silt loam with a pH of 8.1, CEC of 16 meq/100 grams of soil, and 1.6% organic matter. Crop injury and weed control were evaluated visually June 25 and July 1. Weed species evaluated were kochia, common lambsquarters, and redroot pigweed. The center two rows were harvested October 8 with a mechanical harvester.

Table 1. Application information and weed densities.

Application timing	PPI	PRE	Cotyledon	7 days later	14 days later
Application date	3/15	4/6	5/20	5/27	6/3
Air temperature (F)	62	64	55	65	86
Soil temperature (F)	42	60	44	58	58
Relative humidity (%)	30	--	50	66	34
Wind velocity (mph)	2	0 to 10	5	0	2 to 4
			Weed density (plants/ft^2)		
Common lambsqaurters		5	9	6	7
Redroot pigweed		4	11	8	8
Kochia		1	1	1	0

There was no difference in crop injury among herbicide treatments (Table 2). All herbicide treatments controlled kochia, common lambsquarters, and redroot pigweed 86 to 100%. Pyrazon plus ethofumesate at 1.0 + 1.12 lb/A applied preemergence followed by two postemergence applications of ethofumesate, desmedipham, and phenmedipham was among the highest yielding treatments and produced the most extractable sucrose. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, broadleaf weed control, and sugarbeet yield at Kimberly, Idaho

					Weed control[1]							
		Applic.	Crop injury		KCHSC		CHEAL		AMARE			Extractable
Treatment[2]	Rate	timing	6/25	7/1	6/25	7/1	6/25	7/1	6/25	7/1	Yield	sucrose
	lb/A		%								tons/A	lb/A
Check			--	--	--	--	--	--	--	--	10	2491
Pyrazon	1.00	PRE	1	0	94	89	97	95	98	96	22	5348
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Pyrazon	2.34	PRE	1	3	93	88	92	90	90	89	16	3886
ethfmst&desm&phen	0.33 +	cotyledon & 2 leaf										
Ethofumesate +	1.12 +	PRE	4	1	99	90	97	91	97	93	19	4686
ethfmst&desm&phen	0.33 +	cotyledon & 2 leaf										
Pyrazon +	1.00 +	PRE	4	1	100	100	100	98	100	100	27	6576
ethofumesate	1.12											
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Pyrazon +	2.34 +	PRE	4	4	100	98	98	94	95	94	24	5900
ethofumesate	1.12											
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Pyrazon +	1.00 +	PRE	4	0	100	100	99	95	99	98	23	5765
ethofumesate	1.50											
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Pyrazon +	1.50 +	PRE	5	4	95	94	100	98	100	99	23	5789
ethofumesate	2.25											
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Cycloate	2.00	PPI	4	1	91	86	90	86	91	91	21	5111
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Cycloate	3.00	PPI	3	0	98	93	95	93	95	93	21	5118
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Cycloate	4.00	PPI	6	4	100	100	99	99	100	100	24	6024
ethfmst&desm&phen	0.33	cotyledon & 2 leaf										
Ethfinst&desm&phen[3]	0.50/0.33	2 & 4 leaf	8	4	100	98	100	100	100	100	21	5286
Ethfmst&desm&phen	0.33	cotyl & 2 & 4 leaf	3	3	95	91	97	96	97	97	25	6233
LSD (0.05)			NS	NS	NS	NS	NS	NS	7	NS	7	1776

[1]Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL) and redroot pigweed (AMARE).
[2]Ethfmst&desm&phen is a commercial premix formulation of ethofumesate, desmedipham and phenmedipham.
[3]This treatment was applied at 0.5 lb/A at the 1-2 leaf, followed by 0.33 lb/A 7d later.

Broadleaf weed control in sugar beets with postemergence herbicides. Robert W. Downard and Don W. Morishita. A field study was conducted at the University of Idaho Research and Extension Center, Kimberly, Idaho to investigate broadleaf weed control in sugar beets (var. Beta 8450). A preplant fertilizer application consisting of 90, 135, and 50 lb/A of nitrogen, phosphorus, and potassium, respectively was applied broadcast. Sugar beets were planted May 2, 1996, at a rate of 71,280 seeds/A on 22-inch rows 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 treatments 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 data and weed densities are shown in Table 1. Soil type at this site was a silt loam with a pH of 8.1, CEC of 16 meq/100 grams of soil, and 1.6% organic matter. Visual evaluations for crop injury and weed control were taken June 10 and June 25. Weed species evaluated were hairy nightshade, common lambsquarters, kochia, common mallow, and redroot pigweed. The two center rows were harvested October 8 with a mechanical harvester.

Table 1. Application information and weed densities.

Application timing	Cotyledon	7 days later	14 days later
Application date	5/20	5/27	6/3
Air temperature (F)	55	65	86
Soil temperature (F)	44	58	71
Relative humidity (%)	50	66	34
Wind velocity (mph)	5	0	2 to 4
		Weed density (plants/ft^2)	
Hairy nightshade	1	3	1
Kochia	-	12	9
Common lambsquarters	7	10	8
Redroot pigweed	7	5	6
Common mallow	-	-	6

Desmedipham & phenmedipham (desm&phen) applied alone or with clopyralid had the lowest injury (Table 2). Initial injury observed in the other treatments was not significant at the later evaluation. All treatments controlled common lambsquarters, redroot pigweed, and hairy nightshade 85 to 100%. Kochia control with desm&phen at the first evaluation was better than ethofumesate, desmedipham & phenmedipham (etho&desm&phen). On the second evaluation, kochia control was not significantly different between these two treatments. However, kochia control with ethfmst&desm&phen was less consistent than desm&phen. Common mallow was controlled best when triflusulfuron was included with desm&phen plus clopyralid or ethfmst&desm&phen plus clopyralid. Sugar beet root yields and extractable sucrose were not different among the herbicide treatments and all herbicide treatments had higher yields than the check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303)

Table 2. Crop injury, broadleaf weed control, and sugarbeet yield at Kimberly, Idaho.

					Weed control[1]										
		Number of	Crop injury		CHEAL		KCHSC		AMARE		SOLSA	MALNE		Extractable
Treatment[2]	Rate	applic.[3]	6/10	6/25	6/10	6/25	6/10	6/25	6/10	6/25	6/10	6/25	Yield	sucrose
	lb/A		-------	-------	-------	-------	-------	%	-------	-------	-------	-------	tons/A	lb/A
Check			-	-	-	-	-	-	-	-	-	-	4	1127
Desm&phen	0.33	3 times	5	0	100	97	94	83	100	90	100	36	23	5923
Desm&phen	0.33	1 time	3	0	100	98	95	84	100	91	100	34	22	5897
desm&phen +	0.33 +	2 times												
clopyralid	0.094													
Desm&phen +	0.33 +	1 time	9	0	100	99	90	86	100	96	100	94	24	6416
triflusulfuron	0.0156													
desm&phen +	0.33 +	2 times												
triflusulfuron +	0.0156 +													
clopyralid	0.094													
Ethfmst&desm&phen	0.33	3 times	9	0	100	97	78	61	97	85	100	38	17	4461
Ethfmst&desm&phen	0.33	1 time	10	3	100	100	85	84	100	90	100	49	19	5109
ethfmst&desm&phen +	0.33 +	2 times												
clopyralid	0.094													
Ethfmst&desm&phen +	0.33 +	1 time	10	0	100	98	89	71	99	91	100	95	21	5482
triflusulfuron	0.0156													
ethfmst&desm&phen +	0.33 +	2 times												
clopyralid +	0.094 +													
triflusulfuron	0.0156													
LSD (0.05)			4	NS	NS	NS	11	NS	NS	NS	NS	31	7	1821

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

[2]Desm&phen is a commercial premix formulation of desmedipham and phenmedipham. Ethfmst&desm&phen is a commercial premix formulation for ethofumesate, desmedipham and phenmedipham.

[3]All herbicides were applied a total of one, two or three times. The first, second, and third application were made at the cotyledon stage, 7 days later and 14 days later, respectively.

Dimethenamid application timing for weed control in sugar beets. Don W. Morishita and Robert W. Downard. Dimethenamid was evaluated in the second year of a two year field study at the University of Idaho Research and Extension Center near Kimberly, Idaho to determine its potential as a sugar beet herbicide. Sugar beets (var. Beta 8450) were planted May 2, 1996, at a rate of 71,280 seeds/A on 22-inch row spacing. A preplant fertilizer application consisting of 90, 135, and 50 lb/A of nitrogen, phosphorus, and potassium, respectively was applied broadcast. Individual plots were 4 rows by 30 ft and the treatments were arranged in a randomized complete block design with four replications. All herbicides were applied postemergence in a 10 inch band with a CO_2-pressurized bicycle-wheel sprayer equipped with 8001 even fan nozzles and calibrated to deliver 20 gpa at 38 psi. Additional application information is shown in Table 1. All herbicide treatments included a commercial premix formulation of ethofumesate, desmedipham, and phenmedipham (ethfmst&desm&phen) applied at 0.33 lb/A to the sugar beets at the cotyledon and 2- to 3-leaf growth stages. Dimethenamid was applied to individual treatments at 2- to 3-leaf, 4- to 5-leaf, and lay-by. These applications were spaced approximately 7 days apart. Crop injury and weed control were evaluated visually 2 days before and 13 days after the lay-by application. Weeds evaluated for control were common lambsquarters, kochia, redroot pigweed, and green foxtail. The crop was harvested October 7 with a mechanical harvester.

Table 1. Application and weed species density information.

Application timing	Cotyledon	1 to 2 leaf	3 to 4 leaf	Lay-by
Application date	5/20	5/27	6/3	6/12
Air temperature (F)	55	65	86	78
Soil temperature (F)	44	58	71	62
Relative humidity (%)	50	66	34	48
Wind velocity (mph)	0 to 5	0	0 to 4	0 to 6
Weed species	common lambsquarters	kochia	redroot pigweed	green foxtail
Weed density (plants/ft^2)	24	15	4	2

At the first evaluation, all herbicide treatments injured the sugar beets 6 to 11% (Table 2). This was most likely due to high air temperatures during and after the third ethfmst&desm&phen application. Little or no injury was observed at the second evaluation which was 13 days after the lay-by treatment application. Broadleaf weed control among all herbicide treatments ranged from 80 to 100% and was statistically the same. The same was true for green foxtail control with one exception. At the first evaluation, green foxtail control was only 75% with ethfmst&desm&phen applied two times followed by dimethenamid at the 4-leaf stage. By the second evaluation, green foxtail control was 94% and equal to all other treatments. Sugar beet root and extractable sugar yields of all herbicide treatments were higher than the untreated check. There were no differences in root or extractable sugar yields among the herbicide treatments. Data from this study and from 1995 (see WSWS Res. Prog. Rep. 47:58.) show that dimethenamid can effectively control weeds in sugar beets and may permit elimination of a third or fourth postemergence herbicide application. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and sugar beets yield near Kimberly, Idaho.

					Weed control[1]								
		Applic.	Crop injury		CHEAL		KCHSC		AMARE	SETVI			Extractable
Treatment[2]	Rate	timing	6/10	6/25	6/10	6/25	6/10	6/25	6/10	6/10	6/25	Yield	sugar
	lb/A		%									tons/A	lb/A
Check			--	--	--	--	--	--	--	--	--	3	2196
Ethfmst&desm&phen	0.33	Cotyledon	10	0	100	99	96	94	100	90	83	18	15862
ethfmst&desm&phen	0.33	2 leaf											
ethfmst&desm&phen	0.33	4 leaf											
Ethfmst&desm&phen	0.33	Cotyledon	8	0	93	89	96	91	100	95	91	21	19703
ethfmst&desm&phen +	0.33 +	2 leaf											
dimethenamid	1.25												
Ethfmst&desm&phen	0.33	Cotyledon	6	0	98	98	91	80	99	75	94	19	19636
ethfmst&desm&phen	0.33	2 leaf											
dimethenamid	1.25	4 leaf											
Ethfmst&desm&phen	0.33	Cotyledon	11	4	99	100	99	98	100	99	100	21	17575
ethfmst&desm&phen	0.33	2 leaf											
ethfmst&desm&phen +	0.33 +	4 leaf											
dimethenamid	1.25												
Ethfmst&desm&phen	0.33	Cotyledon	11	0	100	100	99	98	100	91	97	25	27181
ethfmst&desm&phen	0.33	2 leaf											
ethfmst&desm&phen	0.33	4 leaf											
dimethenamid	1.25	Lay-by											
LSD (0.05)			NS	NS	NS	NS	NS	NS	NS	14	NS	7	7611

[1]Weeds evaluated for control were common lambsquarters (CHEAL), kochia (KCHSC), redroot pigweed (AMARE), and green foxtail (SETVI).
[2]Ethfmst&desm&phen is a commercial premix formulation of ethofumesate, desmedipham, and phemedipham.

Comparison of postemergence grass and broadleaf herbicides for weed control in sugar beets. Don W. Morishita and Robert W. Downard. A field experiment was initiated to compare three postemergence grass herbicides applied in combination with broadleaf herbicides for weed control and effect on sugar beet (var. WS-91) yield. The experiment was established under sprinkler irrigation at the University of Idaho Research and Extension Center, near Kimberly, Idaho. The crop was planted May 2, 1996, on 22-inch rows at a density of 71,280 seeds/A. Plots were 4 rows by 30 ft and the treatments were arranged in a randomized complete block design with four replications. A broadcast application of nitrogen, phosphorus, and potassium at 90, 135, and 50 lb/A, respectively was applied prior to planting. All herbicides were applied in a 10-inch band with a CO_2-pressurized bicycle-wheel plot sprayer equipped with 8001 even fan nozzles. The sprayer was calibrated to deliver 20 gpa at 38 psi. Soil type was a silt loam with a pH of 8.1, 1.6% om, and CEC of 16 meq/100 g soil. Application information and weed species densities are listed in Table 1. All herbicide treatments were sprayed at the cotyledon stage with an application of desmedipham & phenmedipham (desm&phen), followed by the postemergence grass herbicide applications. Crop injury and weed control were evaluated visually July 8. Sugar beet yield was estimated by harvesting the two center rows from each plot with a mechanical harvester October 7.

Table 1. Application and weed species density information

Application date	5/20		5/27		6/10
Application timing	Cotyledon		1 to 3 leaf		4 to 5 leaf
Air temperature (F)	55		65		65
Soil temperature (F)	44		58		55
Relative humidity (%)	50		66		60
Wind speed (mph)	4 to 6		0 to 6		0 to 6
Cloud cover (%)	40		-		70
Weed species	Common lambsquarters	Redroot pigweed	Hairy nightshade	Annual sowthistle	Barnyardgrass
Average weed density (plants/ft²)	17	3	5	1	2

None of the herbicides injured the crop (data not shown). Common lambsquarters was not satisfactorily controlled when clethodim was tank mixed with desm&phen or when quizalofop at 0.083 lb/A was applied alone; yet sugar beet and extractable sucrose yields were not different from the other treatments. When crop oil concentrate was included in the clethodim + desm&phen tank mixture, common lambsquarters control was 90%. Control of redroot pigweed, hairy nightshade, annual sowthistle, and barnyardgrass was equal among herbicide treatments and ranged from 85 to 100%. Sugar beet root yield and extractable sugar yield of the herbicide treatments were all greater than the untreated check. There were no yield differences among herbicide treatments. These data do not indicate potential compatibility problems when tank mixing clethodim, sethoxydim, or quizalofop with broadleaf sugar beet herbicides with the exception of clethodim + desm&phen without crop oil concentrate for common lambsquarters control. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and yield in sugarbeets, near Kimberly, Idaho.

Treatment[2]	Rate	Application timing	Weed control[1] CHEAL	AMARE	SOLSA	SONAR	ECHCG	Yield	Extractable sucrose
	lb/A		%					tons/A	lb/A
Check			–	–	–	–	–	7	1731
Desm&phen	0.25	Cotyl	89	98	99	100	100	26	6167
clethodim + COC[3]	0.094	1-3 leaf							
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	85	99	85	93	100	23	5356
clethodim + COC	0.125	1-3 leaf							
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	90	96	100	95	100	25	5790
clethodim +	0.125 +	1-3 leaf							
desm&phen + COC	0.33 +								
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	78	92	100	100	100	24	5681
clethodim +	0.125 +	1-3 leaf							
desm&phen	0.33								
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	84	93	91	100	90	19	4490
clethodim +	0.125 +	1-3 leaf							
clopyralid + COC	0.094								
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	88	93	100	100	100	23	5356
quizalofop + COC	0.048	1-3 leaf							
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	78	93	94	100	100	21	5032
quizalofop + COC	0.083	1-3 leaf							
desm&phen	0.33	4 leaf							
Desm&phen	0.30	Cotyl	95	99	93	100	93	26	6167
ethfmst&desm&phen +	0.25 +	1-3 leaf							
quizalofop +	0.048 +								
triflusulfuron	0.0156								
desm&phen	0.33	4 leaf							
Desm&phen +	0.33 +	Cotyl	97	99	100	100	96	23	5464
ethfmst&desm&phen +	0.25 +	1-3 leaf							
sethoxydim +	0.30 +								
triflusulfuron	0.0156								
desm&phen	0.33	4 leaf							
Desm&phen	0.25	Cotyl	88	96	95	95	96	24	5519
sethoxydim + COC	0.30	1-3 leaf							
desm&phen	0.33								
Desm&phen	0.25	Cotyl	81	89	98	96	96	22	5194
ethfmst&desm&phen +	0.25 +	1-3 leaf							
sethoxydim	0.30								
desm&phen	0.33	4 leaf							
LSD (0.05)			NS	NS	NS	NS	NS	7	1552

[1]Weeds evaluated were common lambsquarters (CHEAL), redroot pigweed (AMARE), hairy nightshade (SOLSA), annual southistle (SONOL), and barnyardgrass (ECHCG)

[2]Desm&phen is a commercial premix formulation of desmedipham and phenmedipham. Ethfmst&desm&phen is a commercial premix formulation of ethofumesate, desmedipham and phenmedipham.

[3]Crop oil concentrate added at 1.0% v/v to clethodim and 1.25% v.v to quizalofop.

Quackgrass control in established Kentucky bluegrass with primisulfuron. Traci A. Brammer, Terry L. Neider and Donald C. Thill. Studies were established in Kentucky bluegrass fields in Lewis County, ID to evaluate quackgrass control with primisulfuron. The first bluegrass field (var. Palouse) was in the 7th year of seed production in 1995 and the second bluegrass field (var. Newport) was in the 12th year of seed production in 1996. The soil at site one was a silt loam with 30% sand, 56% silt, 13% clay, pH 5.4 and 4.6% organic matter, and the soil at site two was a silt loam with 32% sand, 54% silt, 14% clay, pH 5.2 and 6.9% organic matter. The experimental design at both locations was a randomized complete block with four replications, and individual plots were 16 by 20 ft. Primisulfuron was applied postemergence two times at each site; April 17 and May 18, 1995 at site one (Table 1) and April 22 and May 31, 1996 at site two (Table 2) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi and 3mph. Kentucky bluegrass injury and quackgrass (AGRRE) control were evaluated visually on May 16 and June 1, 1995 at site one, and May 31 and July 7, 1996 at site two. Bluegrass seed was hand harvested from a 8 by 12 inch area on July 7, 1996 at site two. No seed was harvested at site one because the bluegrass stand was extremely sparse.

Table 1. Application data at site one.

	April 17, 1995	May 18, 1995
Timing	early spring	spring
Crop stage	vegetative, 1 to 2 in regrowth	vegetative, 4 to 6 in regrowth
Weed stage	2 to 3 in regrowth	2 to 3 in regrowth
Air temp (F)	54	68
Relative humidity (%)	56	65
Wind (mph)	0-4	0-3
Cloud cover	mostly clear	partly cloudy
Soil temp at 2 in (F)	40	65

Table 2. Application data at site two.

	April 22, 1996	May 31, 1996
Timing	early spring	spring
Crop stage	vegetative, 3 to 4 in regrowth	heading, 6 to 12 in tall
Weed stage	vegetative, 3 to 4 in regrowth	heading, 4 to 6 in tall
Air temp (F)	60	70
Relative humidity (%)	68	64
Wind (mph)	0 to 3	0 to 1
Cloud cover	mostly cloudy	mostly clear
Soil temp (F)	40	50

Kentucky bluegrass was injured 4 to 14% by all primisulfuron treatments at site one in 1995 but showed no injury at site two in 1996. Quackgrass was controlled less at site two in 1996 than site one in 1995 due to a long period of high moisture following the early spring application, which allowed for some shoot regrowth. Quackgrass control ranged from 83 to 94% in 1995 and 50 to 60% in 1996 at bluegrass harvest. Bluegrass panicle number and seed yield were not significantly different from the untreated check for all treatments. (Plant Science Division, University of Idaho, Moscow Idaho 83844-2339)

Table 3. Kentucky bluegrass response and quackgrass control with primisulfuron in Lewis County, Idaho.

			Site one		Site two				
			Bluegrass	AGRRE	Bluegrass	AGRRE control		Bluegrass	
Treatment[1]	Rate	Timing	injury	control[2]	injury[3]	5/31/96	7/9/96	panicles	yield
	lb/A		--------------	----------	--%	----------	--------------	no./ft^2	lb/A
Untreated check	--	--	--	--	--	--	--	212	382
Primisulfuron + coc	0.018	Early spring	14	94	0	65	50	282	414
primisulfuron + coc	0.018	Spring							
Primisulfuron + coc	0.027	Early spring	6	83	0	78	53	185	396
Primisulfuron + coc	0.036	Early spring	4	90	0	85	60	174	338
LSD(.05)			5	5	0	8	17	108	262
Density (shoots/ft^2)				37		12			

[1] coc = crop oil concentrate applied at 1 qt/A.
[2] June 1, 1995 evaluation.
[3] July 9, 1996 evaluation.

Seedling Kentucky bluegrass tolerance to imazamethabenz and difenzoquat. Traci A. Brammer, Terry L. Neider, and Donald C. Thill. Studies were established in seedling Kentucky bluegrass near Nezperce, ID and near Colton, WA to evaluate seedling bluegrass tolerance to two application timings of imazamethabenz and difenzoquat. Kentucky bluegrass (var. Palouse) was planted on May 2, 1995 at the Nezperce site in a silt loam soil (33% sand, 54% silt, 13% clay, pH 5.2, and 6.4% organic matter). Kentucky bluegrass (var. Palouse) was planted on April 27, 1996 at the Colton site in a silt loam soil (24% sand, 60% silt, 16% clay, pH 5.0, and 3.2% organic matter). At both locations, the experimental design was a randomized complete block with four replications, and individual plots were 8 by 20 ft. Herbicide treatments were applied postemergence at two timings: May 18 and June 1, 1995 at Nezperce (Table 1) and June 5 and June 14, 1996 at Colton (Table 2) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Bluegrass seed was harvested by hand from a 8 by 12 inch area on July 7, 1996 at Nezperce. Bluegrass seed was not harvested at Colton because 1996 was the establishment year.

Table 1. Application data at the Nezperce, ID site.

	May 18, 1995	June 1, 1995
Crop stage	1 to 2 leaves	2 to 4 leaves
Air temp (F)	68	82
Relative humidity (%)	65	46
Wind (mph)	0 to 3	0 to 3
Cloud cover	partly cloudy	mostly clear
Soil temp at 2 in (F)	64	86

Table 2. Application data at the Colton, WA site.

	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 in (F)	64	64

Difenzoquat alone or with imazamethabenz applied early injured bluegrass 15 to 19% on June 1,1995 at Nezperce and 11 to 16% on June 17, 1996 at Colton (Table 3). The late timing of imazamethabenz alone or with difenzoquat injured bluegrass 6 to 18% on June 26, 1995 at Nezperce and 1 to 5% on June 21, 1996 at Colton. No injury was observed from any treatment by April 3, 1996 at Nezperce and August 15, 1996 at Colton (data not shown). At the Nezperce site, panicle number in imazamethabenz alone treatments (both rates) applied at the early timing and 0.47 lb/A rate at the late timing did not differ from the untreated check. Planicle number in other treatments was greater than the untreated check. Seed yield for all treatments did not differ from the untreated check. The study at Colton will be continued and seed yields determined in 1997. See 1996 WSWS Research Progress Report, page 67, for weed control during the estabishment year for the Nezperce site. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 3. Seedling Kentucky bluegrass injury and yield from imazamethabenz and difenzoquat treatments near Nezperce, ID and Colton, WA.

			Nezperce, ID				Colton, WA	
			Injury				Injury	
Treatment[1]	Rate	Timing	6/1/95	6/26/95	Panicle	Yield	6/17/96	6/21/96
	lb/A		----------%----------		no./ft^2	lb/A	----------%----------	
Imazamethabenz	0.23	1-2 leaf	0	0	302	1088	0	0
Imazamethabenz	0.47	1-2 leaf	0	5	313	913	0	0
Imazamethabenz + difenzoquat	0.23 + 0.5	1-2 leaf	18	5	366	1259	14	0
Difenzoquat	1.0	1-2 leaf	19	5	359	1197	16	0
Difenzoquat	0.5	1-2 leaf	15	3	353	1292	11	0
Imazamethabenz	0.23	3-4 leaf	--	6	350	1260	0	1
Imazamethabenz	0.47	3-4 leaf	--	6	285	920	0	2
Imazamethabenz + difenzoquat	0.23 + 0.5	3-4 leaf	--	18	429	1305	0	5
Difenzoquat	1.0	3-4 leaf	--	0	342	1072	0	0
Difenzoquat	0.5	3-4 leaf	--	0	380	1163	0	0
Local standard	mowing		--	--	263	1042	--	--
Untreated check			--	--	254	972	--	--
LSD(0.05)			5	7	82	NS	3	3

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

Weed control in seedling Kentucky bluegrass with primisulfuron. Traci A. Brammer, Terry L. Neider, and Donald C. Thill. Studies were established in seedling Kentucky bluegrass near Nezperce, ID to evaluate seedling bluegrass tolerance and weed control with primisulfuron. Kentucky bluegrass (var. Palouse at both locations) was planted on May 2, 1995 at site one in a silt loam soil (33% sand, 54% silt, 13% clay, pH 5.2, and 6.4% organic matter) and October 28, 1995 at site two 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 application timings: May 18 and June 1, 1995 at site one (Table 1) and May 20 and May 31, 1996 at site two (Table 2) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Bluegrass seed was harvested by hand from a 8 by 12 inch area on July 7, 1996 at site one. Bluegrass seed was not harvested at site two because 1996 was the establishment year.

Table 1. Application data at site one.

	May 18, 1995	June 1, 1995
Crop stage	1 to 2 leaf	1 to 2 tiller
Weed stage	0.5 to 1 inch	1 to 2 inch
Air temp (F)	68	82
Relative humidity (%)	65	46
Wind (mph)	0 to 3	0 to 3
Cloud cover	partly cloudy	mostly clear
Soil temperature at 2 in (F)	64	86

Table 2. Application data at site two.

	May 20, 1996	May 31, 1996
Crop stage	1 to 3 leaf	1 to 2 tiller
Weed stage		
broadleaves	1 to 4 inch	2 to 6 inch
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 in (F)	58	54

Primisulfuron treatments injured bluegrass 34 to 61% at site one and 11 to 25% at site two (Tables 3 and 4). The split application of primisulfuron had the highest rate of injury at both sites. No injury was observed with any treatment by April 3, 1996 at site one and August 8, 1996 at site two (data not shown). Field pennycress (THLAR), henbit (LAMAM), mayweed chamomile (ANTCO), shepherd's-purse (CAPBP), and common tansy (CHYNU) control ranged from 83 to 100% with all primisulfuron treatments at both sites. All primisulfuron treatments controlled catchweed bedstraw (GALAP) 70 to 94% and wild oat (AVEFA) 70 to 88%, but only suppressed downy brome (BROTE) and volunteer wheat 5 to 26% and 28 to 49%, respectively. Panicle number for primisulfuron treatments applied at one to two leaf stage (both rates) and the 0.036 lb/A rate at the one to two tiller stage were greater than the untreated check. Seed yield was greatest for the highest rate of primisulfuron applied at the one to two leaf and the one to two tiller stage compared to the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2239)

Table 3. Seedling Kentucky bluegrass response and weed control with primisulfuron at site one.

			Bluegrass			Weed control			
Treatment	Rate	Timing	injury	panicles	yield	THLAR	LAMAM	ANTCO	AVEFA
	lb/A		--%--	no/ft^2	lb/A		%		
Primisulfuron	0.018	1-2 leaf	34	403	1397	98	83	100	70
Primisulfuron	0.036	1-2 leaf	44	480	1506	100	96	100	83
Primisulfuron	0.018	1-2 tiller	40	383	1246	95	86	100	86
Primisulfuron	0.036	1-2 tiller	38	435	1571	96	88	100	88
Primisulfuron + primisulfuron	0.018 + 0.018	1-2 leaf + 1-2 tiller	61	347	972	100	99	100	86
Bromoxynil	0.5	1-2 tiller	0	381	1123	98	68	100	0
Untreated check			--	280	1021	--	--	--	--
LSD (0.05)			8	117	451	NS	10	NS	12
Density (plants/ft^2)						4	3	1	1

Table 4. Seedling Kentucky bluegrass response and weed control with primisulfuron at site two.

			Bluegrass	Weed control					
Treatment	Rate	Timing	injury	THLAR	CAPBP	CHYVU	GALAP	BROTE	Whea
	lb/A					%			
Primisulfuron	0.018	1-2 leaf	11	93	88	90	70	5	28
Primisulfuron	0.036	1-2 leaf	16	100	91	99	82	8	32
Primisulfuron	0.018	1-2 tiller	16	95	92	100	70	16	32
Primisulfuron	0.036	1-2 tiller	20	100	100	100	91	24	49
Primisulfuron + primisulfuron	0.018 + 0.018	1-2 leaf + 1-2 tiller	25	100	100	100	94	26	49
Bromoxynil	0.5	1-2 tiller	0	95	88	95	78	0	0
Untreated check			--	--	--	--	--	--	--
LSD (0.05)			5	6	5	6	10	7	12
Density (plants/ft^2)				3	1	30	1	1	3

Evaluation of herbicides for control of roughstalk bluegrass and injury to Kentucky bluegrass. Marvin D. Butler. The objective of this project was to evaluate eight fall-applied herbicides for control of roughstalk bluegrass in Kentucky bluegrass. Combinations of terbacil, diuron, primisulfuron, metribuzin, oxyfluorfen, and imazamethabenz were applied October 14 to two roughstalk bluegrass fields to evaluate control of established and seedling plants, and two Kentucky bluegrass fields to determine crop injury. Treatments were applied with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. Plots 10 by 20 ft were replicated three times in a randomized complete block design. A nonionic surfactant was applied at 0.25% v/v in combination with all herbicides. Visual evaluation for control of established and seedling roughstalk bluegrass and crop injury based on reduction in plant biomass to Kentucky bluegrass was conducted January 5, 1996. Pre-harvest evaluation of percent reduction in seed set was conducted for roughstalk bluegrass June 23, and for Kentucky bluegrass June 26, 1996.

Seedling roughstalk bluegrass was more easily controlled than established plants. Terbacil at 0.4 lb/A plus diuron at 1.6 lb/A provided the greatest control of roughstalk seedling and established plants at 89% and 39% control, respectively. Primisulfuron at 0.035 lb/A plus diuron at 1.6 lb/A provided 86% control of roughstalk seedling plants but only 9% control of established plants. Treatments that included oxyfluorfen produced 20% injury to Kentucky bluegrass, more than any other treatment. No difference among treatments could be detected in seed set prior to harvest for either roughstalk bluegrass or Kentucky bluegrass. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table. Effect of selected fall-applied herbicide applications on established and seedling roughstalk bluegrass, and crop injury to Kentucky bluegrass near Madras and Culver, Oregon.

		Roughstalk bluegrass control[1]		
Treatments[2]	Rate	Seedling plants	Established plants	Injury to Kentucky bluegrass
	(lb/A)	-----------	(%)	-----------
Terbacil	0.4			
+ diuron	1.6	89	39	9
Terbacil	0.4			
+ primisulfuron	0.035	83	3	12
Terbacil	0.4			
+ oxyfluorfen	0.19	80	8	20
Terbacil	0.4			
+ metribuzin	0.25	80	17	7
Terbacil	0.4			
+ imazamethabenz	0.23	70	15	15
Terbacil	0.2			
+ diuron	1.6	80	20	9
Metribuzin	0.125			
+ oxyfluorfen	0.19	74	1	20
Primisulfuron	0.035			
+ diuron	1.6	86	9	10
Untreated	----	0	0	0

[1] Visual evaluations were conducted January 5, 1996.
[2] Treatments were applied October 14, 1995.

Evaluation of fall-applied, preemergence herbicide applications on carbon-banded roughstalk bluegrass. Marvin D. Butler. The objective of this project was to evaluate eight fall-applied, preemergence herbicides on carbon-banded roughstalk bluegrass in commercial fields near Madras and Culver, Oregon. Commercial equipment was used to place a 1.5 inch-wide band of carbon over the seed row at the rate of 30 lb/treated A or 300 lb/total A. Treatments included diuron at 2 and 4 lb/A, metribuzin at 0.25 and 0.5 lb/A, terbacil at 0.5 and 1 lb/A, diuron at 2 lb/A with metribuzin at 0.25 lb/A, and diuron at 0.5 lb/A with terbacil at 0.5 lb/A. Treatments were applied preemergence with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa at the Roff location September 7, at the DuRette location September 8, and at the Grote location October 4. Plots 10 by 30 ft were replicated three times in a randomized complete block design. Treatments were evaluated for crop injury and stand reduction, and percent control of common groundsel, prickly lettuce, common mallow, henbit, downy brome, volunteer wheat, and volunteer barley. Evaluations were conducted January 18 at the DuRette location, and February 16, 1996, at the Roff and Grote locations.

Diuron at 0.5 lb/A plus metribuzin at 0.25 lb/A provided overall weed control of 95%. Terbacil at 1 lb/A provided 96% weed control or better for all weeds except common groundsel at 33%. Diuron at 0.5 lb/A plus terbacil at 0.5 lb/A provided 94% control or better for all weeds except common groundsel at 40%. Diuron at 2 lb/A provided inadequate control of all weed species evaluated, except 87% control of common groundsel and volunteer wheat. The greatest crop injury and stand reduction resulted from terbacil at 1 lb/A, followed by metribuzin at 0.5 lb/A, diuron at 0.5 lb/A with terbacil at 0.5 lb/A, and terbacil at 0.5 lb/A. Diuron at 2 lb/A, followed by diuron at 4 lb/A and metribuzin at 0.25 lb/A caused the least amount of crop injury and stand reduction in roughstalk bluegrass. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741)

Table 1. Effect of fall-applied, preemergence herbicide applications on carbon-banded roughstalk bluegrass near Madras and Culver, Oregon.

		Weed control[1]						
		DuRette location					Roff location	Grote location
Treatments[2]	Rate	Common groundsel	Prickly lettuce	Common mallow	Henbit	Downy brome	Volunteer wheat	Volunteer barley
	(lb/A)	(%)						
Diuron	2.0	87	20	63	0	20	87	23
Diuron	4.0	93	100	100	100	65	83	53
Metribuzin	0.25	93	0	92	100	67	90	67
Metribuzin	0.5	97	83	97	100	94	81	69
Terbacil	0.5	0	43	100	100	90	95	96
Terbacil	1.0	33	97	100	100	99	96	99
Diuron	2.0							
+ metribuzin	0.25	92	97	100	100	91	97	85
Diuron	0.5							
+ terbacil	0.5	40	100	100	100	94	90	95
Untreated	---	0	0	0	0	0	0	0

[1] Visual evaluations were conducted January 18, 1996.
[2] Treatments were applied September 8, 1995.

Table 2. Effect of fall-applied, preemergence applications treatments on carbon-banded roughstalk bluegrass near Madras and Culver, Oregon.

		Crop injury[1]			Stand reduction[1]		
Treatments[2]	Rate	DuRette location	Roff location	Grote location	DuRette location	Roff location	Grote location
	(lb/A)	(%)					
Diuron	2.0	0	0	8	0	0	7
Diuron	4.0	0	15	8	2	12	5
Metribuzin	0.25	0	13	20	0	8	12
Metribuzin	0.5	17	32	17	8	32	7
Terbacil	0.5	20	23	18	12	22	10
Terbacil	1.0	92	38	75	92	6	85
Diuron	2.0						
+ metribuzin	0.25	7	10	17	0	7	8
Diuron	0.5						
+ terbacil	0.5	30	30	17	10	32	11
Untreated	—	0	0	0	0	0	0

[1] Visual evaluations were conducted January 18, 1996.
[2] Treatments were applied September 8, 1995.

Weed control in established Kentucky bluegrass. Terry L. Neider and Donald C. Thill. Studies were established in Kentucky bluegrass near Rockford and Spangle, WA to evaluate fall and spring applied herbicide treatments for broadleaf and grass weed control. The Rockford site (var. Newport) was in the 9th year of seed production and the Spangle site (var. South Dakota) was in the 1st year of seed production. 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 preemergence on October 13, 1995 at Rockford and postemergence on May 2, 1996 at Spangle (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Bluegrass injury was evaluated visually, panicle number determined, and seed harvested by hand at maturity at both sites. Weed control was evaluated visually for henbit (LAMAM), shepherd's-purse (CAPBP), panicle willowweed (EPIPC), hairy chess (BROCO), and spike bentgrass, at Spangle, and ventenata (VETDU), at both sites.

Table 1. Application and soil data.

Location	Rockford, WA	Spangle, WA
Crop stage	Vegetative	Jointing
Weed stage		
broadleaves	--	0.5 to 1 inch
Grasses	--	1 to 2 tillers
Air temp (F)	54	66
Relative humidity (%)	64	54
Wind (mph)	4 to 6	1 to 4
Cloud cover	Partly cloudy	Partly cloudy
Soil temp at 2 inches (F)	48	40
Soil type	Silt loam	Silt loam
Soil fractions (% sand-% silt-% clay)	28-58-14	24-62-14
Soil pH	4.4	5.6
Organic matter (%)	3.2	3.6

No herbicide treatments injured the Kentucky bluegrass at either site (data not shown). Metolachlor at 2 lb/A and RH 123652 at 0.5 lb/A controlled ventenata 83 and 86%, respectively, on July 3, 1996 (Table 2). All other herbicide treatments suppressed ventenata 73% or less. Panicle number and seed yield tended to follow ventenata control; however, there was no significant difference between any treatment or the untreated check.

Tribenuron applied alone at 0.0156 lb/A and all tribenuron plus 2,4-D treatments applied with a non-ionic surfactant controlled all broadleaf weeds 80% or better on June 7, 1996 (Table 3). Primisulfuron applied at 0.036 lb/A alone or applied at 0.018 lb/A in combination with an additional broadleaf herbicide controlled all broadleaf weeds 75% or better on June 7, 1996. Primisulfuron combinations or alone at the 0.018 lb/A suppressed hairy chess 39 to 51%, and primisulfuron applied alone at 0.036 lb/A controlled hairy chess 76% on July 3, 1996. No herbicide treatment effectively controlled ventenata or spike bentgrass. Tribenuron (0.0078 and 0.0156 lb/A rates) with 2,4-D, primisulfuron plus 2,4-D and primisulfuron plus bromoxynil had lower panicle numbers than the untreated check. Seed yield for all treatments was not significantly different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Kentucky bluegrass response and weed control from fall preemergence herbicide treatments at Rockford, WA.

		Kentucky bluegrass		Ventanata control	
Treatment	Rate	Panicles	Yield	5/1/96	7/3/96
	lb/A	no./ft^2	lb/A	--------------%--------------	
Dimethenamid	0.75	503	1309	30	30
Dimethenamid	1.5	422	1159	80	68
Metolachlor	2.0	392	1218	77	83
Pendimethalin	3.0	377	758	0	0
Metolachlor + pendimethalin	0.5 + 1.5	404	978	50	15
Metolachlor + pendimethalin	1.0 + 2.0	403	1038	75	20
FOE 5043	0.25	307	907	70	40
FOE 5043	0.5	401	756	65	70
Metribuzin	0.14	477	976	10	0
FOE 5043 + metribuzin	0.25 + 0.14	366	847	80	73
RH-123652	0.25	395	929	63	48
RH-123652	0.5	433	1235	83	86
Terbacil	0.75	367	1104	60	40
Untreated check		357	838	0	0
LSD (0.05)		NS	NS	21	12
Density (plants/ft^2)				14	

Table 3. Kentucky bluegrass response and weed control from spring postemergence herbicide treatments at Spangle, WA.

Treatment[1]	Rate	Kentucky bluegrass panicles	Kentucky bluegrass yield	Weed control[3] LAMAM	CAPBP	EPIPC	BROCO	VETDU	Spike bentgrass
	lb/A	no./ft²	lb/A	%					
Tribenuron[2]	0.0078	294	1395	58	78	78	0	0	0
Tribenuron + 2,4-D	0.0078 + 0.238	191	819	28	35	40	0	0	0
Tribenuron + 2,4-D[2]	0.0078 + 0.238	213	967	80	83	80	0	0	0
Tribenuron + 2,4-D	0.0078 + 0.356	238	1133	25	38	44	0	0	0
Tribenuron[2]	0.0156	269	1048	81	91	86	0	0	0
Tribenuron + 2,4-D	0.0156 + 0.238	181	668	40	54	51	0	0	0
Tribenuron + 2,4-D[2]	0.0156 + 0.238	294	1443	84	90	84	0	0	0
Tribenuron + 2,4-D	0.0156 + 0.356	257	972	50	70	71	0	0	0
Primisulfuron	0.018	272	1204	54	73	68	51	0	0
Primisulfuron + 2,4-D	0.018 + 0.238	200	774	86	89	90	49	0	0
Primisulfuron + dicamba	0.018 + 0.25	204	1106	89	89	90	53	0	0
Primisulfuron + bromoxynil	0.018 + 0.25	201	1285	78	88	83	39	0	0
Primisulfuron + clopyralid	0.018 + 0.094	263	1222	75	90	90	51	0	0
Primisulfuron	0.036	323	1161	75	91	91	76	30	0
Diuron + dicamba	0.75 + 0.25	340	1280	78	74	75	0	0	0
Bromoxynil	0.5	207	909	59	69	68	0	0	0
Untreated check		275	991	--	--	--	--	--	--
LSD (0.05)		73	NS	12	8	9	11	3	NS
Density (plants/ft²)				3	2	2	8	12	2

[1]Primisulfuron treatments applied with a crop oil concentrate at 1 qt/A.
[2]Applied with a 90% non-ionic surfactant at 0.25% v/v.
[3]Broadleaf weed control was evaluated visually on June 7, 1996 and grass weed control on July 3, 1996.

Downy brome control and seedling Kentucky bluegrass tolerance to primisulfuron application. Darrin L. Walenta and Daniel A. Ball. A study was established in a commercial Kentucky bluegrass field east of Athena, OR in Umatilla County to evaluate postemergence timings and split applications of primisulfuron for downy brome (BROTE) control and crop tolerance in seedling Kentucky bluegrass grown for seed. The experimental area was located in a first year stand of Kentucky bluegrass var. 'Barblue' seeded August 10, 1995. EPOST treatments were made on October 4, 1995 to bluegrass with 2 inches growth and fully tillered downy brome. MPOST treatments were made on October 27, 1995 to bluegrass with 2 to 3 inches growth and fully tillered downy brome. LPOST treatments were made on February 12, 1996 to bluegrass with 3 inches growth and fully tillered downy brome 4 to 6 inches in height. All treatments were made with a hand held CO_2 sprayer delivering 17 gpa at 30 psi. Plots were 8 ft by 30 ft in size, in an RCB arrangement, with 3 replications. Soil at the site was a silt loam (15.2% sand, 66.0% silt, 18.8% clay, 2.6% organic matter, 6.3 soil pH, and CEC of 15.2 meq/100g). Evaluations of visual crop injury and downy brome control were made on February 12, 1996. Plots were swathed on July 4, 1996 with a small plot swather. Yield samples were hand threshed with a small grain thresher on July 18, 1996. Seed samples were cleaned prior to yield determination.

Table 1. Application details.

Timing	EPOST	MPOST	LPOST
Date	4 October 95	27 October 95	12 February 96
Air temperature (°F)	46	49	44
Relative humidity (%)	94	78	88
Wind speed (mph)	SW 4-6	SW 3-8	NE 5-6
Sky	clear	clear	clear
Soil temperature at 2 in (°F)	46	47	39

Results indicate that primisulfuron applied EPOST at the high rate and as split applications provided very good to excellent control of downy brome (Table 2). Downy brome control at other timings was unacceptable. LPOST treatments were ineffective for downy brome control which resulted in complete crop loss. No crop injury from primisulfuron application was observed.

Table 2. Downy brome control and seedling Kentucky bluegrass tolerance to primisulfuron application.

Treatment[1]	Rate	Timing	February 12, 1996 Crop injury	February 12, 1996 BROTE control	July 4, 1996 Seed Yield
	lb/A		---%---		lbs/A
Primisulfuron	0.018	EPOST	0	87	200
Primisulfuron	0.023	EPOST	0	90	152
Primisulfuron	0.035	EPOST	0	95	158
Primisulfuron	0.018	MPOST	0	72	0
Primisulfuron	0.023	MPOST	0	75	23
Primisulfuron	0.035	MPOST	0	82	75
Primisulfuron	0.018	LPOST	--[2]	--	0
Primisulfuron	0.023	LPOST	--	--	0
Primisulfuron	0.035	LPOST	--	--	0
Primisulfuron/ primisulfuron	0.018/ 0.018	EPOST/ MPOST	0	98	126
Primisulfuron/ primisulfuron	0.018/ 0.018	EPOST/ LPOST	--	--	148
Control			0	0	0
LSD (0.05)			ns	9	93

[1] All treatments received OC - oil concentrate (MorAct®) at 1 qt/A.
[2] Treatments were not applied at time of evaluation.

Wheat residual herbicide carry-over to canola and spring peas. Daniel A. Ball and Darrin L. Walenta. A study was established near Pendleton, OR to evaluate winter wheat residual herbicide carry-over to fall and spring seeded canola and spring seeded peas. Winter wheat var. "Stephens" was seeded on October 6, 1994 at 80 lb/A with a Great Plains double disk drill. Postemergence (POST) herbicide applications were made on April 3, 1995 (air temp. 64°F, relative humidity 52%, wind NW at 1-2 mph, sky clear, soil temp. at 2 in. 59°F) to wheat in the 6.5 leaf stage, tumble mustard at 4 to 8 inch height, and prickly lettuce at 2 to 6 inch height. Applications were made with a tractor mounted, CO_2 pressurized sprayer delivering 12 gpa at 29 psi. Plots were 15 ft by 30 ft in size with 4 replications arranged in a randomized complete block design. All treatments received R-11 surfactant at 0.25% v/v. Soil type was a loam (45.6% sand, 38.8% silt, 5.6% clay) with 1.5% organic matter, 5.7 soil pH, and a CEC of 18.7 meq/100g. Wheat grain was harvested with a small plot combine on July 21. Weed populations were light and variable. No visible wheat injury was observed from any treatment. All treatments except imazamethabenz provided acceptable control of tumble mustard and prickly lettuce. Wheat yield and test weight were unaffected by weed control treatment (data not shown).

Winter wheat stubble was distributed by rotary mowing, followed by a skew treader twice, chiseled twice to a depth of 12 inches, and skew treaded twice. The entire plot area was sprinkler irrigated on August 31, 1995 and September 6, 1995. Irrigation water applied equaled 5.12 inches with an 18 inch depth of wetting. Fall canola var. '120-91' was seeded on September 13, 1995 at a seeding rate of 10 lb/A with a Great Plains double disk drill. Spring canola var. 'Legend' was seeded on March 22, 1996 at a seeding rate of 10 lb/A. Spring pea var. 'Columbia' was seeded on March 22, 1996 at a seeding rate of 210 lb/A. Prior to seeding each of the rotational crops, trifluralin was applied at a rate of 1.0 lb/A as a PPI treatment with a CO_2 backpack sprayer with a hand boom system delivering 15 GPA at 30 psi. Trifluralin was incorporated twice by a tandem disk set to operate at a 6 inch depth. Visual evaluations of spring crop injury were made on April 24, 1996. Fall canola was swathed on July 3, 1996 and seed harvested with a small plot combine on July 8, 1996. Spring canola was swathed on July 15, 1996 and seed harvested on July 23, 1996. Spring peas were direct harvested with a small plot combine on July 18, 1996. All grain samples were cleaned and yields converted to lb/A. Spring canola and spring peas did not show any symptoms of injury from herbicide carry-over. Fall canola did exhibit injury symptoms that were not consistent with applied treatments but were possibly a result of off-target drift of a broadleaf herbicide material. Herbicide treatment applied the previous season to small grains had no observable effects on visual growth or pea and canola yield.

Table. Wheat residual herbicide carry-over to canola and spring peas.

Treatment[1]	Rate	Crop injury - April 24, 1996 Fall canola	Crop injury - April 24, 1996 Spring pea	Crop injury - April 24, 1996 Spring canola	Dry seed yield - July 1996 Fall canola	Dry seed yield - July 1996 Spring pea	Dry seed yield - July 1996 Spring canola
	lb/A	---%---			---lb/A---		
Prosulfuron	0.009	10	0	0	410	1964	498
Prosulfuron	0.018	7	0	0	437	2395	476
Prosulfuron	0.036	9	0	0	454	2100	530
Imazamethabenz	0.235	1	0	0	462	2114	565
Imazamethabenz	0.470	7	0	0	395	1936	432
Imazamethabenz	0.940	14	0	0	415	2098	511
Metsulfuron	0.005	15	0	0	383	1923	481
Metsulfuron	0.009	15	0	0	380	1978	516
Control	--	10	0	0	417	1982	506
LSD (0.05)		ns	ns	ns	ns	ns	ns

Herbicide applications made April 3, 1995 to winter wheat.

Wild oat control in spring-planted canola and soil persistence in winter wheat with trifluralin. Traci A. Brammer and Donald C. Thill. Experiments were established near Genesee, Potlatch, and Lapwai, Idaho to evaluate the effec of fall-applied granular and spring-applied liquid trifluralin on wild oat control, and soil persistence as it may affect winter wheat yield. Plots were 40 by 900 ft at Genesee, 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 December 13, 1994 at Genesee and 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 on December 14, 1994 at Genesee; 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 April 5, 1995 at Genesee; May 1, 1996 a Potlatch; and May 7, 1996 at Lapwai. Canola was seeded on April 5, 1995. Winter wheat was seeded on October 15, 1995 at Genesee. Canola was seeded after herbicide incorporation at Potlatch and Lapwai on May 2 and May 8, 1996, respectively. Wild oat control (AVEFA) was evaluated visually on June 9, 1995 at Genesee; June 7, 1996 at Potlatch; and June 25, 1996 at Lapwai. Wheat was harvested at Genesee from a 24 by 900 ft area on August 8, 1996. Canola seed was not harvested for yield at any location.

Table 1. Application and soil data.

Location		Genesee, Idaho	Potlatch, Idaho	Lapwai, Idaho
Seeding date/variety				
	winter wheat	October 15, 1995/ 'Madsen'	--	--
	spring canola	April 5, 1995/ 'IMC 02'	May 2, 1996/ 'IMC 03'	May 8, 1996/ 'IMC 03'
Application dates				
	Fall (granular)	December 13, 1994	October 27, 1995	November 6,1995
	Spring (liquid)	April 5, 1995	May 1, 1996	May 7, 1996
Soil	pH	5.9	5.9	5.5
	% OM	2.61	3.15	5.09
	CEC (meq/100g)	20.4	15.7	28.8
	Texture	silt loam	silt loam	silt loam

Wild oat control with the fall-applied granular and spring-applied liquid trifluralin ranged from 66 to 95% at Genesee and 73 to 88% at Lapwai. The two treatments did not differ statistically from each other at these two sites At the Potlatch site, fall-applied granular and spring-applied liquid trifluralin controlled wild oat 65 and 89%, respectively. At Genesee, wheat yield for both treatments was not significantly different from the untreated check. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Wild oat control and wheat yield with trifluralin.

			AVEFA control			Genesee
Treatment	Rate	Application timing	Genesee 6/10/95	Potlatch 6/7/96	Lapwai 6/25/96	wheat seed yield[1]
	lb/A		%			bu/A
Untreated check			--	--	--	81
Trifluralin G	0.75	Fall	66	65	73	80
Trifluralin EC	0.75	Spring	95	89	88	80
LSD (0.05)			NS	7	NS	NS

[1] Only three replications were harvested because of a misapplication.

The effect of glufosinate and imazethapyr on weed control and crop tolerance in canola. Janice M. Reed and Donald C. Thill. Two studies were established in Latah County, Idaho to evaluate weed control with and crop tolerance to glufosinate in transgenic herbicide-resistant canola (one study) and imazethapyr in herbicide-tolerant (mutation breeding) canola (second study). Liberty (glufosinate-resistant) and Pioneer (imazethapyr-tolerant) canola were seeded at 8 lb/A on May 9, 1996 in a silt loam soil. The experimental design for both studies was a randomized complete block with four replications and the individual plot size was 8 by 30 ft. Herbicide treatments for both studies were applied postemergence on June 14, 1996 (4 leaf stage) and June 25, 1996 (row closure) with a CO_2 backpack sprayer delivering 10 gpa at 30 psi (Table 1). Weed control and canola injury were evaluated on July 7 and 18, 1996 for the 4 leaf and row closure timings, respectively. Weed species evaluated were field pennycress (THLAR), mayweed chamomile (ANTCO), red sandspurry (SPERU), common lambsquarters (CHEAL), and redroot pigweed (AMARE). Canola seed was harvested at maturity with a small plot combine on September 10, 1996 from a 4.3 by 30 foot area in each plot.

Table 1. Application data

	June 14, 1996	June 25, 1996
Canola growth stage	4 leaf	Row closure
Air temperature (F)	52	72
Relative humidity (%)	85	55
Wind (mph, direction)	0 to 3, NW	0 to 2, W
Cloud cover	clear	partly cloudy
Soil temperature at 2 inches (F)	50	60

Canola was injured slightly (chlorosis) with 0.893 lb/A (2X rate) of glufosinate applied at both timings. No injury was noted 3 weeks after application (data not shown). Glufosinate controlled all weed species 89 to 100 % at both rates and timings (Table 2). Canola seed yield ranged from 489 to 591 lb/A and was not different from the untreated check.

Imazethapyr did not injure canola at either rate or timing (data not shown). Imazethapyr controlled all weed species 70 to 93 % at 0.047 lb/A (1X rate) and 80 to 99% at 0.094 lb/A (2X rate) (Table 3). Canola seed yield ranged from 410 to 514 lb/A and was not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Weed control and canola yield with glufosinate.

Treatment	Rate	Timing	Weed control[1] THLAR	ANTCO	SPERU	CHEAL	AMARE	Canola yield
	lb/A				%			lb/A
Untreated check	----	----	----	----	----	----	----	498
Glufosinate	0.44	4 leaf	100	100	90	100	100	553
Glufosinate	0.893	4 leaf	100	100	95	100	100	570
Glufosinate	0.44	Row closure	100	93	89	94	100	591
Glufosinate	0.893	Row closure	100	99	94	98	100	567
LSD (0.05)			0	3	4	3	0	NS
Density (plants/ft^2)			11	3	7	4	3	

[1] Weed control was evaluated at the 4 leaf timing on July 8, 1996 and at the row closure timing on July 17, 1996.

Table 3. Weed control and canola yield with imazethapyr.

Treatment[1]	Rate	Timing	Weed control[2] THLAR	ANTCO	SPERU	CHEAL	AMARE	Canola yield[3]
	lb/A				%			lb/A
Untreated check	----	----	----	----	----	----	----	514
Imazethapyr	0.047	4 leaf	93	79	73	78	85	321
Imazethapyr	0.094	4 leaf	99	88	80	88	95	466
Imazethapyr	0.047	Row closure	93	75	70	75	81	522
Imazethapyr	0.094	Row closure	98	85	75	88	91	410
LSD (0.05)			3	5	NS	4	4	NS
Density (plants/ft^2)			10	2	5	3	4	

[1] All imazethapyr treatments applied with 32% liquid urea at 1 qt/A and nonionic surfactant at 0.25% v/v.
[2] Weed control was evaluated at the 4 leaf timing on July 8, 1996 and at the row closure timing on July 17, 1996. Weed control data for SPERU is based on 2 replications due to absence of the weed in replications 3 and 4.
[3] Canola yield data is based on 3 replications due to poor stand in the 4th replication.

Broadleaf weed control in field corn with preplant incorporated and preemergence herbicides. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 6, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525) and annual broadleaf weeds to preplant incorporated and preemergence 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. Preplant incorporated treatments were applied May 6, and immediately incorporated with a tractor driven rototiller to a depth of two to four in. Preemergence treatments were applied May 7 and were 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 were made June 7. Stand counts were made on June 7, by counting individual plants per 10 ft of the third row of each plot.

FOE 5043 plus cyanazine applied preemergence at 0.55 and 1.5 lb/A had the highest injury rating and the lowest stand count of 33 and 14, respectively. Redroot pigweed control was good to excellent with all treatments except FOE, metolachlor and dimethenamid all applied preplant incorporated at 0.55, 2.0 and 1.0 lb/A and the check. FOE plus cyanazine applied preplant incorporated at 0.55 plus 1.5 gave poor control of prostrated pigweed. FOE 5043 plus atrazine and cyanazine applied preemergence at 0.55 plus 1.0 and 1.5 lb/A gave excellent control of black nightshade.

Table. Broadleaf weed control in field corn with preplant incorporated and preemergence herbicides.

Treatment[1]	Rate	Crop Injury	Stand Count	Weed Control AMARE	AMABL	SOLNI
	lb/A	---%---	no	--------%--------		
FOE 5043[2] (pm)	0.55	0	17	72	50	10
FOE 5043 (pm) + atrazine[2]	0.55+1.0	0	17	96	93	93
FOE 5043 (pm) + cyanazine[2]	0.55+1.5	10	14	91	40	88
FOE 5043 (pm) + flumetsulam[2]	0.55+0.17	4	16	97	96	10
Metolachlor[2]	2.0	3	17	82	77	27
Dimethenamid[2]	1.0	0	17	85	86	17
FOE 5043[3] (pm)	0.55	0	16	93	98	91
FOE 5043 (pm) + atrazine[3]	0.55+1.0	15	17	99	96	98
FOE 5043 (pm) + cyanazine[3]	0.55+1.5	33	14	100	72	96
FOE 5043 (pm) + flumetsulam[3]	0.55+0.17	0	16	97	97	10
Metolachlor[3]	2.0	0	17	91	68	23
Dimethenamid[3]	1.0	0	17	99	97	53
Acetochlor[2]	1.6	0	17	99	97	10
Acetochlor[3]	1.6	0	17	99	96	17
Handweeded check		0	17	100	100	100
Check		0	17	0	0	0
Weeds/m^2				11	23	41
LSD 0.05				3	7	6

1. pm = packaged mix
2. Applied preplant incorporated.
3. Applied preemergence.

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 6, 1996 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 7 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied on May 21, when corn was in the three to four leaf stage and weeds were small. Black nightshade infestations were heavy, prostrate and redroot pigweed were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made June 21. Stand counts were made on June 23, 1994 by counting individual plants per 10 ft of the third row of each plot.

Metolachlor applied preemergence at 2.0 lb/A followed by prosulfuron plus primisulfuron (pm) plus CGA-248757 plus COC applied postemergence at 0.035 plus 0.0037 lb/A gave the highest injury rating of 20. This injury was yellowing of leaves and stunting. All treatments gave excellent control of broadleaf weeds except the check.

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

Treatment[1]	Rate	Crop Injury	Stand Count	Weed Control AMARE	AMABL	SOLNI
	lb/A	---%--	no	--------%--------		
Metolachlor/prosulfuron + primisulfuron (pm) + COC[2]	2.0/0.035	11	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + NIS + UAN[2]	2.0/0.035	18	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + dicamba + NIS[2]	2.0/0.035+0.125	17	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + bromoxynil + COC[2]	2.0/0.035+0.125	19	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + bromoxynil + NIS + UAN[2]	2.0/0.035+0.125	9	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + CGA-248757 + COC[2]	2.0/0.035+0.0037	20	17	100	100	100
Metolachlor/prosulfuron + primisulfuron (pm) + CGA-248757 + NIS + COC[2]	2.0/0.035+0.0037	10	16	100	100	100
Handweeded check		0	17	100	100	100
check		0	17	0	0	0
Weeds/m^2				16	15	21
LSD 0.05		4	ns	1	1	1

1. COC = crop oil concentrate, UAN = 32% nitrogen solution and NIS - nonionic surfactant applied at 2, 4 and 0.25% v/v and pm = packaged mix.
2. First treatment applied preemergence followed by a postemergence treatment.

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 6, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525) 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 immediately incorporated with 0.75 in of sprinkler applied water. Three postemergence treatments were applied May 21 when corn was in the fifth leaf stage (<8 in height) and weeds were small. Two postemergence treatments were applied when corn was in the seventh leaf stage (>8 in height) with broadleaf weeds greater than two inch in height. Black nightshade, infestations were heavy, redroot and prostrate pigweed infestations were moderate throughout the experimental area. Preemergence and postemergence treatments were rated visually for crop injury and weed control on June 7, 25 and July 8. Stand counts were made on June 7, 21 and July 8 by counting individual plants per 10 ft of the third row of each plot.

No injury was observed in any of the treatments. All treatments gave good to excellent control of broadleaf weeds. Flumetsulam in combination with clopyralid or clopyralid plus 2,4-D at 0.086, 0.17, and 0.21 lb/A applied postemergence with corn <8 inch in height gave better control of black nightshade as compared to postemergence treatments applied to corn >8 inch in height, preemergence treatments, or the check.

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

Treatments[1]	Rate	Stand Count	Weed Control AMARE	AMABL	SOLNI
	lb/A	no	---------%	----------	----------
Flumetsulam + clopyralid + 2,4-D[2] (pm)	0.21	17	100	100	99
Flumetsulam + clopyralid[2] (pm)	0.086	17	100	100	94
Flumetsulam + metolachlor[4] (pm)	1.54	17	100	99	25
Flumetsulam + metolachlor[4] (pm)	1.93	17	100	100	76
Flumetsulam + clopyralid (pm) + metolachlor[4]	0.21+1.5	17	100	100	27
Flumetsulam + clopyralid (pm) + metolachlor[4]	0.17+1.5	17	99	100	25
Flumetsulam + clopyralid[3] (pm)	0.17	17	99	97	85
Flumetsulam + clopyralid[3] (pm)	0.086	17	99	96	20
Flumetsulam + clopyralid[2] (pm)	0.17	17	99	100	95
Acetochlor[4]	1.6	17	94	91	10
Metolachlor[4]	2.0	17	91	92	10
Dimethenamid[4]	1.0	17	90	93	10
Handweeded check		17	100	100	100
Check		17	0	0	0
Weeds/m^2			13	15	31
LSD 0.05		ns	3	3	3

1. pm = packaged mix.
2. Metolachlor applied preemergence at 1.5 lb/A. Treatments applied postemergence with corn <8 inch in height with X-77 and 32 percent nitrogen solution at 0.25 and 2.5 percent v/v.
3. Metolachlor applied preemergence at 1.5 lb/A. Treatments applied postemergence with corn >8 inch in height with X-77 and 32 percent nitrogen solution at 0.25 and 2.5 percent v/v.
4. Treatments applied preemergence.

Annual grass control in sethoxydim resistant field corn with postemergence herbicides. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 6, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of sethoxydim resistant field corn (var. Cargill 7800SR) and annual grass 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. Treatments were applied postemergence on June 4, when corn was in the fifth leaf stage and annual grass was <3 in. Barnyardgrass and green foxtail infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made July 8. Stand counts were made on July 8 by counting individual plants per 10 ft of the third row of each plot.

No injury was observed in any of the treatments. All treatments gave good to excellent control of barnyardgrass except nicosulfuron plus atrazine plus dicamba applied at 0.031 plus 0.8 lb/A and sethoxydim plus atrazine plus dicamba applied at 0.19 plus 0.8 lb/A and the check. Green foxtail control was good to excellent with all treatments except sethoxydim plus atrazine plus dicamba applied at 0.19 plus 0.8 lb/A and dimethenamid applied at 0.94 lb/A and the check.

Table. Annual grass control in sethoxydim resistant field corn with postemergence herbicides.

Treatment[1]	Rate	Stand Count	Weed Control ECHCG	SETVI
	lb/A	no	------%------	
Nicosulfuron + dimethenamid + dicamba	0.031+0.94+0.25	17	98	99
Nicosulfuron + dimethenamid	0.031+0.94	17	95	99
Nicosulfuron + dicamba	0.031+0.25	17	94	92
Nicosulfuron + atrazine/dicamba (pm)	0.031+0.8	17	83	90
Nicosulfuron	0.031	17	90	90
Sethoxydim + dicamba	0.094+0.25	17	88	87
Sethoxydim + atrazine/dicamba (pm)	0.19+0.8	17	80	80
Sethoxydim + dimethenamid	0.19+0.94	17	100	100
Dimethenamid	0.94	17	95	85
Sethoxydim + dicamba	0.28+0.25	17	100	98
Sethoxydim + dicamba	0.19+0.25	17	95	95
Sethoxydim	0.28	17	100	100
Sethoxydim	0.19	17	100	100
Handweeded check		17	100	100
Check		17	0	0
Weeds/m^2			19	19
LSD 0.05		ns	5	4

1. All treatments were applied with 32% nitrogen solution and a surfactant at 4 and 0.25% v/v and pm = packaged mix.

Evaluation of acetochlor for annual weed control in corn. John O. Evans and R.William Mace. Treatments were applied to field corn (var. Heritage 2588) to evaluate preemergence and postemergence broadleaf weed control. Plots were established near Smithfield, Utah on Cleon Chamber's farm. The soil type was a Nibley silty clay loam with 7.6 pH and an organic matter content of less than 2%. Corn was planted and preemergence treatments established May 14, 1996. Treatments were applied in a randomized block design, with three replications. Postemergence treatments were applied June 13, 1996 when the corn was six inches high with 4 to 5 leaves. Weeds evaluated were redroot pigweed (AMARE) and lambsquarter (CHEAL) with respective population densities of 42 and 31 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 13, June 24 and July 18, 1996 for weed control. The plots were harvested September 25, 1996.

No treatment injured corn but slight height differences (2 to 10%) were evident with PPI thiafluamide treatments. There were minor pigweed and lambsquarter control differences among the various herbicide treatments. The highest yield and weed control was recorded with metolachlor plus atrazine followed closely by the two preemergence treatments of thiafluamide. The PPI treatments tended to be short lived over time. The split treatment of metolachlor applied PPI and primisulfuron/prosulfuron applied Post extended the time period of acceptable weed control. Yields were not significantly different between treatments but all treatment yields were greater than untreated corn. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Evaluation of acetochlor for preemergence annual broadleaf weed control in corn. Smithfield, Ut. 1996.

			Corn			Weed Control					
			injury	height	Yield	AMARE			CHEAL		
Treatment	Stage	Rate	7/18	7/18	9/25	6/13	6/24	7/18	6/13	6/24	7/18
		lb/A	--%--	FT	T/A	%					
Dimethenamid	PPI	1.25	0	4.36	24	88	60	53	85	60	53
Metolachlor+ primi+prosulf[1]	PPI Post	2.0+ 0.036	0	4.43	24.3	82	99	97	84	93	97
Acetachlor	PPI	1.45	0	4.48	26.3	91	82	43	92	75	40
Acetachlor	PPI	1.6	0	4.26	25.7	93	82	50	90	78	48
Acetachlor	PPI	1.75	0	4.43	25.0	96	90	30	90	83	30
Metolachlor+ atrazine	PPI	1.62	0	5.47	29.3	99	100	97	100	100	96
Thiafluamide	PRE	0.68	0	5.25	27.7	99	91	88	97	92	85
Thiafluamide	PRE	0.77	0	5.25	28.5	98	89	87	98	91	87
Thiafluamide	PPI	0.68	0	3.77	24.7	87	65	32	90	73	32
Thiafluamide	PPI	0.77	0	3.94	28.8	87	67	63	91	72	63
Check			0	2.52	15.7	0	0	0	0	0	0
LSD(0.05)				0.76	5.5	6.1	19.1	8.6	5.1	14.3	8.4

[1] Crop oil concentrate added at 2pt/A to primisulfuron plus prosulfuron (Exceed).

Barnyardgrass control in cotton using variable herbicide rates and surfactants. Steven D. Wright and Manuel R. Jimenez Jr. The objective of this study was to examine barnyardgrass control with different herbicide rates and surfactant combinations. Plots were established in Pixley, California. Soil type was a Traver fine sandy loam. Individual plots were 6.5 by 25 feet. Treatments were arranged in a randomized complete block with three replications. Herbicides were applied broadcast on May 18, 1995 with a CO_2 pressurized back pack sprayer using 8002 nozzles. The delivery rate was 20 gpa at 30 psi. Application speed was 2 mph. Air temperature was 85° F. and wind speed 0 to 5 mph. Barnyardgrass was 2 to 6 inches tall and 2 to 8 inches in diameter. Maxxa cotton was 2 to 3 inches tall at first true leaf. All treatments had a surfactant applied at 1 percent volume per volume.

Clomazone gave excellent control of barnyardgrass at all rates tested. Sethoxydim and fluazifop also gave excellent control at most rates. Control was reduced about 15 percent at 14 days after application when half labeled rates were mixed with Spray Tech oil. By the 28 day rating all fluazifop and sethoxydim treatments were comparable. The trial was cultivated at 21 days after treatment which influenced final ratings. Cotton was not injured by any treatments. (University of California Cooperative Extension, Visalia CA 93291-4584)

Table. Barnyardgrass control with selected herbicides.

	Rate	Percent Barnyardgrass Control		
Treatments	lbs /A	7 DAT	14 DAT	28 DAT
Clomazone + Agridex	.094	72	97	97
Clomazone + Agridex	.071	67	90	100
Clomazone + Spray Tech oil	.071	67	90	92
Clomazone + Spray Tech oil	.047	66	91	98
Clomazone + Spray Tech oil	.047	75	93	98
Sethoxydim + Agridex	.38	75	99	100
Sethoxydim + Agridex	.285	77	97	100
Sethoxydim + Spray Tech oil	.285	72	97	97
Sethoxydim + Agridex	.19	65	96	100
Sethoxydim + Spray Tech oil	.19	66	82	93
Fluazifop + Agridex	.285	72	100	100
Fluazifop + Spray Tech Oil	.285	66	97	100
Fluazifop + Agridex	.191	66	86	93
Fluazifop + Spray Tech Oil	.191	70	82	100
Check		0	0	0
LSD .05		9.9	8.7	9.0
CV%		9.37	6.47	6.33

Purple nutsedge control in cotton with varying rates of herbicides and application timing. Steven D. Wright and Manuel R. Jimenez Jr. The objective of this study was to examine purple nutsedge control using different herbicides. Plots were established in Goshen, California. Soil type was a Fresno fine sandy loam. Individual plots were 12.6 by 30 feet. Treatments were arranged in a randomized complete block with four replications. Herbicides were applied broadcast at two dates; preplant incorporated (PPI) March 25, 1996; and postemergent (Post) May 10, 1996. A CO_2 driven back pack sprayer using 8002 flat fan nozzles was used to applied all herbicides. The herbicides were applied walking 2 mph at a rate of 20 gpa using 30 psi. Air temperature and wind speed were 60°F and 3-7 mph for the March 25 application; and 60°F and 0-3 mph for the May 10 application. The PPI application was incorporated with a rolling cultivator in two directions within four hours.

On May 10 purple nutsedge control was very low, ranging from 0 to 40 percent. Norflurazon herbicide gave 35 to 40 percent control with rates of 1.0 to 1.25 lbs ai/A. At the June 14 evaluation, nutsedge control ranged from 0 to 73 percent control. Treatments with Norflurazon at 1.0 lb ai/A and greater (PPI) and all Norflurazon rates followed by MSMA gave the best control, ranging from 63 to 73 percent purple nutsedge control. Single applications of Norflurazon at 1.0 lb ai/A and greater (PPI) gave statistically equivalent control to the double applications. All single postemergent treatments (Norflurazon, and Pyrithobac-Sodium) gave poor control, ranging from 30 to 43 percent control. There was no crop injury observed. There were no differences in lint yields between treatments. (University of California Cooperative Extension; Visalia, CA 93291-4584)

Table. Purple nutsedge control and cotton injury.

			% Nutsedge Control		% Cotton Injury	
Treatment	AI/A	Timing	May 10 [1]	June 14 [2]	May 10	June 14
Control	----	----	0	0	0	0
Norflurazon	.5 lb	PPI	8	30	0	0
Norflurazon	.75 lb	PPI	18	28	0	0
Norflurazon	1 lb	PPI	30	73	0	0
Norflurazon	1.25 lb	PPI	36	63	0	0
Norflurazon Norflurazon	.5 lb .5 lb	PPI Post	10	58	0	0
Norflurazon Norflurazon	.75 lb .75 lb	PPI Post	28	30	0	0
Norflurazon Norflurazon	1 lb 1 lb	PPI Post	29	65	0	0
Norflurazon Norflurazon	1.25 lb 1.25 lb	PPI Post	31	43	0	0
Norflurazon	.5 lb	Post	0	35	0	0
Norflurazon	.75 lb	Post	0	43	0	0
Norflurazon	1 lb	Post	0	30	0	0
Norflurazon	1.25 lb	Post	0	30	0	0
Pyrithobac-Sodium	1 oz	Post	0	40	0	0
Norflurazon MSMA	.5 lb 6 lb	PPI Post	18	68	0	0
Norflurazon MSMA	.75 lb 6 lb	PPI Post	26	58	0	0
Norflurazon MSMA	1 lb 6 lb	PPI Post	31	45	0	0
Norflurazon MSMA	1.25 lb 6 lb	PPI Post	35	58	0	0
LSD $_{.05}$	----	----	13	15	----	----
% CV	----	----	52.3	21.6	----	----

[1] Represents 46 days after the PPI application (only pertaining to treatments with Norflurazon PPI).
[2] Represents 35 days after the Postemergent application.

Established tall fescue crop tolerance to primisulfuron application. Darrin L. Walenta and Daniel A. Ball. A study was established on a commercial field west of Hermiston, OR to evaluate postemergence timings and split applications of primisulfuron for crop tolerance and volunteer fescue control in established tall fescue grown for seed. The experimental area was located in a second year stand of tall fescue var. 'Lexus'. EPOST treatments were made on October 13, 1995 to tall fescue with 2 to 4 inches of regrowth. MPOST treatments were made on November 1, 1995 to tall fescue with 4 inches of regrowth. LPOST treatments were made on February 16, 1996 to tall fescue with 4 to 6 inches of regrowth and volunteer fescue 1 to 2 inch height. All treatments were made with a hand held CO_2 sprayer delivering 15 gpa at 30 psi. Plots were 10 ft by 30 ft in size, in an RCB arrangement, with 4 replications. Soil at the site was a loamy sand (84.0% sand, 9.6% silt, 6.4% clay, 1.11% organic matter, 7.1 soil pH, and CEC of 6.9 meq/100g). Evaluations of crop injury were made on November 1, 1995, December 1, 1995, and April 24, 1996. Tall fescue was swathed on July 2, 1996 with a small plot swather. Seed was harvested on July 17, 1996 with a small plot combine. Yield samples were cleaned prior to yield determination.

Table 1. Application details

	EPOST	MPOST	LPOST
Date	13 October 95	1 November 95	16 February 96
Air temperature (°F)	53	43	48
Relative humidity (%)	74	77	86
Wind speed (mph)	0-2	1-3	calm
Sky	clear	clear	cloudy
Soil temperature at 2 in (°F)	57	45	43

Primisulfuron applied in the fall at all rates and as split applications caused substantial crop injury and had negative impacts on seed yield (Table 2). The standard treatments of oxyfluorfen + metribuzin and oxyfluorfen + terbacil caused significant injury when observed in the fall after application, but injury symptoms diminished by harvest with no adverse effect on yield. Primisulfuron was partically effective for control of 1 to 2 inch height volunteer tall fescue.

Table 2. Established tall fescue crop tolerance to primisulfuron application.

			11/1/95		12/1/95	4/24/96		7/17/96
Treatment[1]	Rate	Timing	Disc[2]	Stunt[3]	Crop injury	Crop injury	Vol. fescue control	Seed yield
	lb/A		——%——		%	——%——		lb/A
Primisulfuron + OC	0.018	EPOST	10	4	45	17	50	1248
Primisulfuron + OC	0.035	EPOST	16	6	54	14	32	1232
Primisulfuron + OC	0.070	EPOST	16	6	66	35	28	866
Primisulfuron + OC	0.035	MPOST	0	0	14	12	53	1530
Primisulfuron + OC	0.035	LPOST	--[4]	--	--	27	59	1841
Primisulfuron + OC/ primisulfuron + OC	0.018/ 0.018	EPOST/ MPOST	11	4	54	30	27	1225
Primisulfuron + OC/ primisulfuron + OC	0.018/ 0.018	EPOST/ LPOST	14	5	--	34	49	1427
Oxyfluorfen + primisulfuron + OC	0.125 + 0.018	EPOST	16	5	34	7	32	1557
Oxyfluorfen + primisulfuron + OC	0.125 + 0.035	EPOST	18	8	41	10	57	1577
Oxyfluorfen + metribuzin + R-11	0.125 + 0.25	EPOST	45	10	19	1	17	1742
Oxyfluorfen + terbacil + R-11	0.125 + 0.5	EPOST	81	15	43	15	35	1831
Control			0	0	0	0	0	1746
LSD (0.05)			8	4	10	12	24	345

[1] OC = Oil concentrate at 1 qt/A, R-11 non-ionic surfactant at 0.25% v/v..
[2] Disc = Percent discoloration/yellowing.
[3] Stunt = Percent stunting.
[4] Treatments were not applied at time of evaluation.

Weed control in seedling tall fescue with primisulfuron. Darrin L. Walenta and Daniel A. Ball. A study was established on a commercial field west of Hermiston, OR in Morrow County to evaluate postemergence timings and split applications of primisulfuron for crop tolerance and weed control in seedling tall fescue grown for seed. The experimental site was located in a first year stand of tall fescue var. 'Lexus' that was seeded in August 1995. EPOST treatments were made on October 13, 1995 to tall fescue with 3 to 4 tillers and 4 to 6 inches height, henbit (LAMAM) 6 inch height, and fully tillered downy brome (BROTE) 6 inch height. MPOST treatments were made on November 1, 1995 to tall fescue with 3 to 4 tillers at 6 inch height and fully tillered downy brome. LPOST treatments were made on February 16, 1996 to tall fescue at 5 to 7 inch height and fully tillered downy brome at 6 to 8 inch height. All treatments were made with a hand held CO_2 sprayer delivering 15 GPA at 30 psi. Plots were 10 ft by 30ft with 3 replications arranged in a randomized complete block. Soil at the site was a loamy sand (87.0% sand, 7.6% silt, and 5.4% clay, 0.79% organic matter, 7.3 soil pH, and a CEC of 6.9 meq/100g). Evaluations of crop injury and weed control were made on December 1, 1995 and April 24, 1996.

Table 1. Application Details

	EPOST	MPOST	LPOST
Date	October 13, 1995	November 1, 1995	February 16, 1996
Air temperature (°F)	63	41	49
Relative humidity (%)	60	76	80
Wind speed (mph)	calm	NW 1-3	calm
Cloud cover (%)	clear	clear	100
Soil temperature at 2 in (°F)	64	46	49

Severe crop injury from primisulfuron application to seedling tall fescue occurred at all application timings. Downy brome control from primisulfuron and oxyfluorfen treatments were unacceptable due to the advanced developmental stage of downy brome at all application timings.

Table 2. Weed control in seedling tall fescue with primisulfuron.

			December 1, 1995			April 24, 1996	
Treatment[1]	Rate	Timing	Crop Injury	BROTE[2]	LAMAM[3]	Crop Injury	BROTE
	lb/A		-------------%-------------			------%------	
Primisulfuron + OC	0.018	EPOST	48	67	99	48	43
Primisulfuron + OC	0.023	EPOST	55	73	100	45	20
Primisulfuron + OC	0.035	EPOST	43	48	77	35	17
Primisulfuron + OC	0.018	MPOST	22	43	52	37	40
Primisulfuron + OC	0.023	MPOST	22	37	75	35	38
Primisulfuron + OC	0.035	MPOST	32	50	79	53	40
Primisulfuron + OC	0.018	LPOST	--	--	--	17	17
Primisulfuron + OC	0.023	LPOST	--	--	--	37	27
Primisulfuron + OC	0.035	LPOST	--	--	--	67	17
Primisulfuron + OC/ Primisulfuron + OC	0.018/ 0.018	EPOST/ MPOST	52	65	100	86	57
Primisulfuron + OC/ primisulfuron+ OC	0.018/ 0.018	EPOST/ LPOST	--	--	--	88	47
Oxyfluorfen + primisulfuron + OC	0.075 + 0.018	EPOST	55	65	100	40	27
Glyphosate + AMS + R-11	0.094 + 1% + .25%	EPOST	78	99	99	58	88
Control			0	0	0	0	0
LSD (0.05)			22	29	35	23	34

[1] OC = Oil concentrate at 1 qt/A, R-11 = non-ionic surfactant at 0.25% v/v, AMS = ammonium sulfate at 8.5 lb/100 gal.
[2] BROTE = downy brome.
[3] LAMAM = henbit.

Bugloss control in lentil with imazethapyr and pendimethalin combinations. Sandra L. Shinn and Donald C. Thill. A study was established in a lentil field near Eden, Washington to evaluate different rates of pendimethalin alone and in combination with imazethapyr for bugloss control. Lentil (var. Brewer) was planted on May 6, 1996 in a silt loam having 58% silt, 12.4% clay, 29.6% sand, and 4.9% organic matter, with a pH of 5.7. The experimental design was a randomized complete block with four replications and individual plots were 8 by 27 ft. Preplant incorporated treatments were applied on May 4, and a preemergence treatment on May 9, 1996 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1). The treatments were incorporated the same day with two perpendicular passes of a cultivator. There were 13 lentil and 6 bugloss plants/ft^2. Lentil injury and bugloss control were evaluated visually on June 13 and 28, and July 31 1996. Lentil was harvested at maturity with a small plot combine from a 4.1 by 27 ft area on August 13, 1996.

Table 1. Application data

	May 4, 1996	May 9, 1996
Timing	preplant incorporated	preemergence
Air temp (F)	60	72
Relative humidity (%)	49	54
Wind (mph)	0	0
Cloud cover (%)	0	0
Soil temp at 2 in (F)	50	46

Imazethapyr alone and in combination with pendimethalin injured (chlorosis) lentil 30% on June 13, 1996. Injury was not visible at the later evaluations on June 28, and July 31, 1996. All pendimethalin treatments, in combination with imazethapyr, controlled bugloss 84% or better. Imazethapyr alone controlled bugloss 86% or better in comparison to pendimethalin alone, which controlled bugloss 51% or more. Lentil yield from herbicide treated plots ranged from 1634 to 1895 lb/A and was not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Lentil yield and bugloss control with imazethapyr and pendimethalin combinations.

Treatment	Rate	Timing	Lentil	Bugloss control			Yield
	lb/A		6-13-96	6-13-96	6-28-96	7-31-96	lb/A
			%				
Pendimethalin	0.5	PPI	0	58	63	52	1634
Pendimethalin	0.62	PPI	0	51	59	60	1815
Pendimethalin	0.75	PPI	0	64	64	81	1776
Pendimethalin	0.87	PPI	0	60	70	81	1863
Pendimethalin	1.00	PPI	0	66	75	78	1872
Imazethapyr	0.047	PPI	30	89	88	86	1643
Pendimethalin + imazethapyr[1]	0.75 + 0.047	PPI	30	94	89	92	1865
Pendimethalin + imazethapyr	0.82 + 0.047	PPI	30	95	95	95	1864
Pendimethalin/imazethapyr[2]	0.453	PPI	30	90	90	87	1896
Pendimethalin/imazethapyr	0.566	PPI	30	93	93	88	1767
Pendimethalin/imazethapyr	0.680	PPI	30	88	86	84	1873
Metribuzin	0.250	PRE	0	78	82	51	1726
Untreated Check	--	--	0	0	0	0	1655
LSD (0.05)	--	--	0	20	19	29	367

[1] Applied as a tank mixture.

[2] A prepackage formulation of 2.7 and 0.2 lb/gal of pendimethalin and imazethapyr, respectively.

Broadleaf weed control in spring pea with imazethapyr and pendimethalin combinations. Traci A. Brammer and Donald C. Thill. A study was established near Genesee, Idaho in 'Columbia' pea to evaluate broadleaf weed control and pea seed yield as affected by imazethapyr and pendimethalin applied alone and in combinations. Plots were 8 by 30 ft arranged in a randomized complete block with four replications. All treatments were applied on May 9, 1996 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 32 psi and 3 mph (Table 1). The treatments were incorporated the same day with two perpendicular passes of a field cultivator. Pea was seeded after herbicide incorporation on May 10, 1996. Spring pea injury and broadleaf weed control were evaluated visually on May 24 and June 12, 1996, respectively. Pea seed was harvested from a 4 by 27 ft area on August 12, 1996.

Table1. Application data and soil analysis.

Application and incorporation date	May 9, 1996
Air temperature (F)	48
Relative humidity (%)	76
Wind speed (mph, direction)	3, W
Cloud cover (%)	5
Soil temperature at 2 in (F)	45
pH	6.4
OM (%)	4.48
CEC (meq/100g)	23.7
Texture	silt loam

Spring pea was not injured by any treatment. All imazethapyr treatments (alone or in combination with pendimethalin) controlled field pennycress (THLAR), common lambsquarters (CHEAL), shepherd's purse (CAPBP), and mayweed chamomile (ANTCO) 83% or more (Table 2). All rates of pendimethalin alone suppressed field pennycress, shepherd's purse and mayweed chamomile 25 to 45%, while common lambsquarters control ranged from 55 to 92 %. Ethalfluralin controlled all weeds, except prickly lettuce (LACSE),equal to or better than all rates of pendimethalin applied alone. Prickly lettuce density and control was variable. Pea seed yield was not different from the check for all treatments. (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Broadleaf weed control and pea seed yield in spring pea with pendimethalin and imazethapyr combinations.

Treatment	Rate	Weed control					Pea seed
		THLAR	CHEAL	CAPBP	ANTCO	LACSE	yield
	lb/A	%					lb/A
Untreated Check	--	--	--	--	--	--	1445
Pendimethalin	0.5	30	54	18	42	61	1470
Pendimethalin	0.62	31	65	28	25	44	1422
Pendimethalin	0.75	25	65	26	25	60	1314
Pendimethalin	0.87	45	92	42	40	62	1186
Pendimethalin	1.0	28	92	12	26	70	1463
Imazethapyr	0.047	99	99	97	86	84	1238
Pendimethalin + imazethapyr[1]	0.75 + 0.047	99	99	93	89	94	1501
Pendimethalin + imazethapy[1]r	0.82 + 0.047	99	99	96	91	81	1261
Pendimethalin/ imazethapyr[2]	0.453	99	99	99	88	78	1298
Pendimethalin/ imazethapyr[2]	0.566	99	99	99	83	92	1337
Pendimethalin/ imazethapyr[2]	0.680	99	99	99	89	84	1509
Ethalfluralin	0.56	58	99	61	60	15	1306
LSD (0.05)		32	30	31	26	34	582
plants/ft²		20	4	20	6	1	

[1] Applied as a tank mixture.
[2] A prepackage formulation of 2.7 and 0.2 lb/gal of pendimethalin and imazethapyr.

Wild oat control in spring pea with quizalofop-P and different adjuvant combinations. Traci A. Brammer and Donald C. Thill. An experiment was established near Genesee, Idaho to evaluate wild oat control and pea seed yield with quizalofop-P in combination with different adjuvants. Plots were 8 by 30 ft arranged in a randomized complete block with four replications. 'Columbia' pea was seeded on May 10, 1996. All treatments were applied postemergence on June 10, 1996 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 32 psi and 3 mph (Table 1). Wild oat control was evaluated visually on June 23, 1996. Pea seed was harvested with a small plot combine on August 12, 1996.

Table 1. Application data and soil analysis.

Application date	June 10, 1996
Growth stage	
spring pea	4 to 5 node
wild oat	2 to 4 leaf
Air temperature (F)	51
Relative humidity (%)	51
Wind speed (mph, direction)	3 to 7, W
Cloud cover (%)	0
Soil temperature at 2 in (F)	58
pH	6.4
OM (%)	4.48
CEC (meq/100g)	23.7
Texture	silt loam

All treatments controlled wild oat 94% or better and pea seed yields were not different from the untreated check (Table 2). (Plant Science Division, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. Wild oat control and pea seed yield with quizalofop-P adjuvant combinations.

Treatment[1]	Rate	Wild oat control	Pea seed[2] yield
	lb/A	%	lb/A
Untreated check	--	--	1929
Quizalofop-P + nis	0.051 + 0.25	98	1708
Quizalofop-P + coc	0.051 + 1.0	94	2174
Quizalofop-P + nis	0.083 + 0.25	94	1591
Quizalofop-P + coc	0.083 + 1.0	98	1892
Sethoxydim + nis	0.305 + 0.25	95	1616
Sethoxydim +adj	0.305 + 1	99	1996
LSD (0.05)		5.0	NS
Plants/ft^2		1	

[1] nis = a nonionic surfactant (R-11) and coc = a methylated seed oil (Sunit II) with rates expressed as %v/v. adj = adjuvant (Dash HC) with rate expressed as pt/A.

[2] The cooperator inadvertently harvested two replications of the experiment. Thus, only data from two replications were analyzed.

Broadleaf weed control in peppermint with sulfentrazone treatments. Bill D. Brewster, Dennis M. Gamroth, and Carol A. Mallory-Smith. A trial was conducted to evaluate the efficacy of sulfentrazone treatments in peppermint. The experimental design was a randomized complete block with three replications and 8-by 20-ft plots. Herbicides were applied to dormant peppermint on March 5, 1996, with a single-wheel compressed-air plot sprayer that delivered 20 gpa at 15 psi. Plots were hand-weeded following each visual evaluation to minimize crop suppression.

Except for minor initial suppression, the treatments had no adverse effect on peppermint growth or oil yield (Table). Blue mustard was controlled most effectively when clomazone or diuron was added to sulfentrazone, but sulfentrazone alone provided complete control of kochia. Pendimethalin did not adequately control either weed. The unusually poor performance of pendimethalin may have been caused by a relatively warm, wet spring. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Response of peppermint and weeds to sulfentrazone treatments in Crook County, OR.

		Peppermint[2]			Weed control[3]	
Treatment[1]	Rate	Injury	Fresh weight	Oil	Blue mustard	Kochia
	lb/A	%	lb/yd^2	lb/A	%	
Sulfentrazone	0.25	20	4.2	42	72	100
Sulfentrazone + clomazone ME	0.25 + 0.5	13	3.4	37	93	100
Sulfentrazone + diuron	0.25 + 1.0	5	4.3	43	100	100
Sulfentrazone + pendimenthalin	0.25 + 1.0	5	3.5	36	85	100
Pendimethalin	1.0	7	---	---	30	53
Hand-weeded control	0	0	3.0	33	0	0
	$LSD_{(.05)}$		ns	ns		

[1]Clomazone ME = clomazone, micro-encapsulated; treatments applied March 5, 1996.
[2]Crop injury ratings April 18, 1996; mint harvest July 24, 1996.
[3]Blue mustard control rating March 21, 1996; kochia control rating June 12, 1996.

Susceptibility to bromoxynil of common groundsel growing under peppermint culture. Bill D. Brewster, Dennis M. Gamroth, and Carol A. Mallory-Smith. Two trials were conducted to evaluate the susceptibility to bromoxynil of common groundsel growing in peppermint fields. Bromoxynil seemed to be less effective in two mint fields where bromoxynil had been used for several years. Common groundsel plants were transplanted into 4-inch by 4-inch plastic pots from two mint fields in Lane County, OR on separate days. On each day that plants were collected from the mint fields, plants at the same growth stage were transplanted from an untreated peppermint planting on the Hyslop Research Farm at Corvallis, OR. Four plants were placed in each pot. The plants were maintained at the Hyslop Research Farm for 7 days after transplanting before they were treated with bromoxynil. There were four to eight leaves on 1- to 1.5-inch diameter common groundsel in Trial 1 and six to ten leaves on 1- to 2-inch diameter common groundsel in Trial 2. The bromoxynil treatments were applied through an XR 8003 flat fan nozzle tip at 15 psi in 20 gpa. Twelve days after application of the treatments the surviving groundsel plants were harvested and weighed. The experimental design was completely randomized with four replications.

No common groundsel from the Hyslop site survived the higher rate of application in either trial, and fresh weights of surviving plants were greatly reduced at the lower rate of application (Table). Although plants were stunted with some necrosis on the leaves, even the higher rate of bromoxynil did not kill the plants from the two fields in Lane County. These data indicate that there is greater than a two-fold difference in susceptibility of common groundsel at the Hyslop site compared to common groundsel at the Lane County sites. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Fresh weight of three common groundsel biotypes following use of bromoxynil.

Treatment[1]	Rate	Common groundsel fresh weight[2]			
		Trial 1		Trial 2	
		Junction City	Corvallis	Coburg	Corvallis
	lb/A	g/4 plants			
Bromoxynil	0.25	3.1 B	0.3 A	4.7 B	0.3 A
Bromoxynil	0.5	1.0 A	0 A	1.9 A	0 A
Control	0	4.5 B	6.1 C	6.9 CB	7.9 C

[1]Bromoxynil applied on June 7, 1996 in Trial 1 and July 17, 1996 in Trial 2.
[2]Trial 1 transplanted June 1 and harvested June 19, 1996; Trial 2 transplanted June 10 and harvested June 29, 1996. Means within a trial followed by the same letter or group of letters are not different at the 5% level of probability according to Duncan's Multiple Range Test.

Efficacy of micro-encapsulated clomazone in peppermint. Bill D. Brewster, Dennis M. Gamroth, and Carol A. Mallory-Smith. A micro-encapsulated formulation of clomazone was evaluated for residual control of broadleaf weeds in peppermint at Powell Butte, OR. The experimental design was a randomized complete block with three replications and 8-by 20-ft plots. Herbicides were applied to a dormant stand of peppermint and preemergence to the weeds on March 5, 1996. A single-wheel, compressed-air plot sprayer that delivered 20 gpa at 15 psi was used to apply the herbicide treatments.

The stand suffered from cold injury during the previous January, which may have made the peppermint more susceptible to herbicide injury. Crop stunting occurred in all treatments except pendimethalin, but by June 12 most of the stunting had been outgrown (Table). The micro-encapsulated formulation of clomazone was not more injurious than the standard formulation and was at least as effective on common groundsel and common lambsquarters. Tank-mixing other herbicides with micro-encapsulated clomazone did not greatly increase crop stunting. Pendimethalin was not effective on the weeds in this trial. A relatively warm, wet spring may have reduced the effectiveness of pendimethalin compared to previous years. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table. Peppermint injury and weed control ratings following application of clomazone treatments at Powell Butte, OR.

Treatment[1]	Rate	Peppermint injury[2]		Weed control[3]			
				Common groundsel		Common lambsquarters	
		May 21	June 12	June 12	July 3	June 12	July 3
	lb/A	%					
Clomazone ME	0.5	8	7	100	98	100	100
Clomazone	0.5	13	3	95	92	87	97
Clomazone ME + sulfentrazone	0.5 + 0.25	10	0	98	95	100	100
Clomazone ME + diuron	0.5 + 1.0	17	12	96	95	100	100
Clomazone ME + oxyfluorfen	0.5 + 1.0	17	7	93	95	100	100
Clomazone ME + pendimethalin	0.5 + 1.0	13	5	100	96	100	100
Pendimethalin	1.0	0	0	0	0	20	33
Check		0	0	0	0	0	0

[1]ME = micro-encapsulated; applied March 5, 1996.
[2]Evaluated May 21 and June 12, 1996.
[3]Evaluated June 12 and July 3, 1996.

Broadleaf weed control in field potatoes. Richard N. Arnold, Eddie J. Gregory and Daniel Smeal. Research plots were established in April 23, 1996 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of potatoes (var. FL 1291) 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 8, and were immediately incorporated with 0.75 in of sprinkler applied water. Three preemergence treatments were applied on May 8 followed by postemergence treatments applied on May 27 when potato were four to six inch in height and weeds were small. Black nightshade infestations were heavy, redroot and prostrate pigweed infestations were moderate throughout the experimental area. Preemergence treatments and crop injury were evaluated visually on June 14. Postemergence treatments were evaluated visually on June 27. Potatoes were harvested on September 18 by harvesting two rows five ft long from the center of each plot, with 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.

Rimsulfuron applied preemergence after drag-off at 0.0234 lb/A gave the highest injury rating of 6. Broadleaf weed control was excellent with all treatments except metribuzin applied at 0.3 lb/A and the check. Yields were outstanding with all treatments except the check. Yields for 1 7/8 to 3 in were 18 to 101 cwt/A higher in the herbicide treated plots as compared to the check.

Table. Broadleaf weed control in field potatoes on June 14 and June 27.

Treatment	Rate	Crop Injury	Weed Control AMARE	AMABL	SOLNI	Total Yield	1 7/8-3 in	>3 in
	lb/A	%	%	%	%	cwt/A	cwt/A	no
Dimethenamid	0.94	0	100	96	97	453	270	142
Dimethenamid	1.27	0	100	100	100	450	196	222
Metribuzin + dimethenamid	0.3+0.94	0	100	100	99	428	286	106
Metribuzin + dimethenamid	0.3+1.27	0	100	100	100	461	213	225
Rimsulfuron	0.0156	0	100	99	97	447	256	167
Rimsulfuron	0.0234	6	100	100	99	401	196	172
Rimsulfuron + metribuzin	0.0156+0.3	0	100	99	100	470	202	225
Rimsulfuron + dimethenamid	0.0156+0.94	0	100	100	100	413	186	201
Rimsulfuron + dimethenamid	0.0156+1.27	0	100	100	100	455	193	224
Metribuzin/ rimsulfuron[1]	0.3/0.0156	0	100	100	97	421	221	186
Dimethenamid/ rimsulfuron[1]	0.94/0.0156	0	100	100	100	470	218	227
Dimethenamid/ rimsulfuron[1]	1.27/0.0156	0	100	100	100	472	259	170
Handweeded check		0	100	100	100	599	451	112
Check		0	0	0	0	275	238	7
Weeds/m^2			13	17	24			
LSD 0.05		1	2	2	3	126	72	91

1. First treatment applied preemergence, second treatment applied postemergence with a surfactant at 0.025 v/v. Treatments evaluated on June 27.

Potato vine kill. Richard K. Zollinger and Duane Preston. An experiment was conducted to evaluate potato vine desiccation from nonlabeled products under investigation and from diquat with adjuvants. The experiment was located near Grand Forks, North Dakota in a field containing 'Goldrush' potato. The plots were sprayed on August 27, 1996 from 6:30 pm to 8:30 pm with a four-wheel all-terrain vehicle spraying four rows 100 feet in length applying 30 gpa at 30 psi at the nozzles. All the demonstration plots were evaluated and ranked from 0 - 100% vine and stem desiccation at three, seven and ten days after treatment.

A ten pound tuber sample was hand dug from each of the sixteen plots and placed into storage for stem and discoloration sampling. On October 1, 1996, five random tubers from each plot were sliced with a chip slicer on the stem end removing 0.05 inch with each slice. The first, third, and fifth slice were evaluated with five slices being a 0.25 inch in depth from the stem end. Tubers were ranked for vascular discoloration on the stem end by this method.

Table. Potato vine kill and tuber effect from herbicides, 1996.

		Desiccation/defoliation			Stem end discoloration[b] 5 tubers/treatment		
		Aug 30	Sept 2	Sept 7	Slice number		
Treatment[a]	Rate	3 DAT	7 DAT	10 DAT	1st	3rd	5th
	lb/A		%		No. of discolored slices		
Flumiclorac + PO	0.05 + 1 qt/A	5	5	15	2	0	0
Flumiclorac + PO	0.1 + 1 qt/A	5	10	15	4	2	0
Flumiclorac + PO	0.16 + 1 qt/A	5	15	25	2	0	0
Flum&lactoten + PO	0.12 + 1 qt/A	10	15	40	0	0	0
Flum&lactofen + PO	0.24 + 1 qt/A	15	15	40	2	1	0
Flum&lactofen + PO	0.36 + 1 qt/A	15	35	45	2	1	1
Diquat + Preference	0.25 + 0.25% v/v	60	80	95	2	1	0
Diquat + Preference	0.5 + 0.25% v/v	50	85	99	1	0	0
Diquat + 17% COC	0.25 + 1 qt	45	80	99	1	0	0
Diquat + Class Act	0.25 + 2.5% v/v	45	80	95	3	2	1
Diquat + Class Act IIDB	0.25 + 22 lb/100 ga	45	85	99	2	2	0
Diquat + Hasten	0.25 + 1 pt	45	85	95	3	1	1
Diquat + Eth-N-Gard	0.25 + 2 pt	50	90	99	2	3	0
Diquat + R-900	0.25 + 1 pt	50	85	95	3	2	1
Diquat + W-1961	0.25 + 1 pt	50	85	92	4	2	1
Untreated		0	0	0	2	0	0

[a]Flum = flumiclorac, Flum&lactofen = prepackaged mixture as Stellar, Preference and R-900 are nonionic surfactants, 17% COC is a petroleum oil adjuvant, Class Act and Class Act IIDB are nonionic surfactant plus ammonium sulfate or 28% urea ammonium nitrate fertilizer blend adjuvants from Cenex Land 'O Lakes. Hasten is an ethylated seed oil adjuvant, Eth-N-Gard is a ethylated seed oil plus 28% urea ammonium nitrate blend adjuvant, W-1961 is an experimental adjuvant, and all three are from WilFarm.
[b]Each slice was 0.05 inches thick.

Treatments containing flumiclorac or flumiclorac plus lactofen with petroleum oil adjuvant did not provide adequate potato vine kill desiccation and gave less than 45% potato vine kill. Diquat with Eth-N-Gard provided more rapid vine desiccation at 7 days after treatment but was similar to diquat with other adjuvants at 10 days after treatment. At 10 days after treatment, diquat with adjuvants gave greater than 92% vine kill. Vascular discoloration was observed from some treatments. However, Verticillium or Fusarium wilt evident in the field could have also caused these symptoms. Therefore, vascular discoloration cannot be attributed only to vine desiccation materials tested. Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.

Canada thistle control in potato. Richard K. Zollinger. An experiment was conducted in potato to determine Canada thistle control from rimsulfuron applied with adjuvants. The study was located at Fargo in an area where Canada thistle was well established with populations ranging from 2 to 6 shoots per sq. ft. POST treatments were applied on June 29, 1996 at 2:00 pm with 90 F air, 105 F at soil surface, 85% RH, 0% clouds, dry surface, slightly moist below surface, and 0 to 3 mph wind to 5 to 10 inch potato and 2 to 20 inch rosette to bolted Canada thistle. LPOST treatment were applied on July 8, 1996 at 7:00 am with 65 F air, 65 F on soil surface, 50% RH, 50% clouds, dry surface, dry below surface, and 0 to 5 mph wind to 7 to 12 inch potato and desiccated Canada thistle. Treatments were applied to an 8 ft wide area the length of 10 by 30 ft plots with a bicycle-wheel-type plot sprayer equipped with a shield delivering 8.5 gpa at 40 psi through 8001 flat fan nozzles. The experiment had a randomized complete block design with four replicates per treatment.

Table. Canada thistle control in potato, 1996.

		CIRAR	
Treatment[a]	Rate	July 22	Sept 13
	oz/A	----- % control	-----
POST			
Rimsulfuron + NIS	0.25 + 0.25% v/v	38	21
Rimsulfuron + Scoil	0.375 + 1.5 pt/A	43	28
Rimsulfuron + ND-4	0.375 + 1.5 pt/A	45	31
Rimsulfuron + Scoil	0.25 + 1.5 pt/A	43	29
POST fb LPOST			
Rims + Scoil/Rims + Scoil	0.25 + 1.5 pt/0.125 + 1.5 pt	45	34
Rims + Scoil/Rims + Scoil	0.25 + 1.5 pt/0.25 + 1.5 pt	45	43
Bentazon + PO/Bentazon + PO	1 qt + 1 qt/1 qt + 1 qt	94	91
Untreated		0	0
LSD (0.05)		14	6
C.V.		18	10

[a]Rims = rimsulfuron, NIS = Activator 90 was used for nonionic surfactant, PO = Herbimax was used for petroleum oil, Scoil and ND-4 are methylated seed oil (MSO) adjuvants.

Hot, dry conditons existed for 3 to 4 weeks prior to POST application. No visable injury to potato was observed with any rimsulfuron treatment. Bentazon treatment caused slight speckling of potato leaves and potato rapidly recovered. No after planting cultivation or tillage was performed anytime during the growing season. More Canada thistle leaf necrosis occurred with treatments containing Scoil and ND-4 than NIS. Applying rimsulfuron at the full labeled amount with nonionic surfactant or methylated seed oil adjuvants applied alone or in sequential applications did not provide greater than 45% Canada thistle control. Canada thistle control did not respond to rate or benifit from split applications. Symptoms on Canada thistle from rimsulfuron were typical ALS stunting, chlorosis (mainly in the growing points), and some leaf necrosis. All rimsulfuron treatments prevented Canada thistle plants from bolting, forming buds, and seed formation. Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.

Herbicide banding in grass seed crops. Dennis M. Gamroth, Bill D. Brewster, and Carol A. Mallory-Smith. Two trials were conducted southeast of Corvallis, OR to evaluate the practicality of banding non-selective herbicides in perennial ryegrass seed production. Each trial was designed as a randomized complete block with three replications and either 8- by 20-ft or 7-by 20-ft plots. A single-wheel, compressed-air plot sprayer was used to deliver 50 gpa at 22 psi. Row spacing was 12 inches at the Tangent site and 14 inches at the Shedd site. The perennial ryegrass crop was 2 to 6 inches tall and the annual bluegrass was emerging to eight tillers at the time of herbicide application. A 4-inch-wide band was sprayed between each row. The clomazone used in both trials was a micro-encapsulated formulation.

The control of annual bluegrass was very good to excellent with glufosinate, glyphosate, and paraquat at the Tangent site (Table 1). Crop injury and weed control were both lower at the Shedd site, which may have been affected by the wider row spacing (Table 2). The clomazone did not improve control of annual bluegrass at either site compared to using the other herbicides alone. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table 1. Visual evaluations of perennial ryegrass injury and annual bluegrass control at Tangent, OR.

Treatment[1]	Rate	Perennial ryegrass injury[2]	Annual bluegrass control[2] In row	Annual bluegrass control[2] Between row
	lb/A	%	%	%
Glufosinate	0.75	3	3	95
Glyphosate	0.75	7	13	96
Paraquat	0.62	20	33	98
Clomazone	1.0	0	0	23
Glufosinate + clomazone	0.75 + 1.0	0	10	90
Glyphosate + clomazone	0.75 + 1.0	17	3	93
Paraquat + clomazone	0.62 + 1.0	17	43	100
Check		0	0	0

[1]Treatments applied December 7, 1995; non-ionic surfactant added to all treatments at 0.25% v/v.
[2]Evaluated February 22, 1996.

Table 2. Visual evaluations of perennial ryegrass injury and annual bluegrass control at Shedd, OR.

Treatment[1]	Rate	Perennial ryegrass injury[2]	Annual bluegrass control[2] Between row
	lb/A	%	%
Glufosinate	0.5	0	70
Glyphosate	0.75	3	78
Paraquat	0.5	3	57
Clomazone	0.5	8	37
Glufosinate + clomazone	0.5 + 0.5	0	57
Glyphosate + clomazone	0.75 + 0.5	3	77
Paraquat + clomazone	0.5 + 0.5	7	70
Check		0	0

[1]Treatment applied February 14, 1996; non-ionic surfactant added to all treatments at 0.25% v/v.
[2]Evaluated April 17, 1996.

Jointed goatgrass and downy brome control in imidazolinone resistant winter wheat. Daniel A. Ball and Darrin L. Walenta. A study was established at the Columbia Basin Agricultural Research Center near Moro, OR in Sherman County to evaluate AC299,263 application timings and rates for control of downy brome (BROTE) and jointed goatgrass (AEGCY) in a herbicide resistant winter wheat. PPI treatments were applied on October 4, 1995 and hand incorporated with raking. Jointed goatgrass and downy brome seed was broadcast over the plot area prior to seeding wheat. Winter wheat var. 'Fidel' was seeded at 70 lb/A on October 4, 1995 at 2 inch depth into moist soil with a John Deere HZ deep furrow drill with 16 inch row spacing. EPOST treatments were applied November 16, 1995 to 2.5 leaf wheat and 0.5 to 2.5 leaf downy brome and 2 leaf jointed goatgrass. LPOST treatments were applied on March 13, 1996 to 6.0 leaf wheat, 5 to 6 leaf downy brome and 4.0 leaf jointed goatgrass with the same hand-held equipment. All treatments were made with a CO_2 backpack sprayer with a hand-held boom delivering 17 gpa at 30 psi. All postemergence treatments received 32% N solution at 1 qt/A and R-11 non-ionic surfactant at 0.25 % v/v. Plots were 8 ft by 30 ft in size with 4 replications arranged in a randomized complete block. Soil at the site was a silt loam (25.2% sand, 58.0% silt, 16.8% clay, 1.31% organic matter, 6.2 soil pH, and CEC of 13.9 meq/100g). Downy brome and jointed goatgrass infestation was light and uniform throughout the plot area. Plots were evaluated for visual downy brome and jointed goatgrass control and crop injury on April 30 and May 29, 1996. Winter wheat was harvested on August 1, 1996 with a small plot combine and yields converted to bu/A based on a 60 lb/bu basis.

Table 1. Application details

	PPI	EPOST	LPOST
Date	October 4, 1995	November 16, 1995	March 13, 1996
Air temperature (°F)	59	56	49
Relative humidity (%)	68	94	88
Wind speed (mph)	NW at 3-8	NE at 4-6	calm
Cloud cover (%)	clear	90	clear
Soil temp at 2 inch (°F)	61	56	46

AC 299,263 treatments at both EPOST and LPOST timings at higher rates provided very good control of downy brome and jointed goatgrass. Crop injury from AC 299,263 was not evident at any application rate. Grain yield was not significantly affected by herbicide treatment. Triallate + MON 37500 applied PPI suppressed downy brome but not jointed goatgrass.

Table 2. Grass weed control in imidazolinone resistant wheat.

			April 30		May 29			August 1
Treatment[1]	Rate	Timing	BROTE[2] Control	AEGCY[3] Control	Crop injury	BROTE Control	AEGCY Control	Grain Yield
	lb/A		%					bu/A
AC 299,263	0.024	EPOST	68	70	0	79	25	69.7
AC 299,263	0.032	EPOST	73	89	0	86	48	68.3
AC 299,263	0.040	EPOST	94	90	0	88	49	67.1
AC 299,263	0.048	EPOST	97	73	0	90	53	70.6
AC 299,263	0.063	EPOST	98	94	0	96	88	69.2
AC 299,263	0.024	LPOST	78	86	0	55	69	61.7
AC 299,263	0.032	LPOST	76	64	0	60	83	64.1
AC 299,263	0.040	LPOST	86	88	0	71	85	65.6
AC 299,263	0.048	LPOST	70	88	0	68	86	62.2
AC 299,263	0.063	LPOST	93	92	0	80	90	64.1
Triallate + MON37500	0.80 + 0.25	PPI	41	15	0	66	18	64.1
Triallate + MON37500	1.25 + 0.25	PPI	80	13	0	78	11	62.9
Diclofop	1.0	PPI	63	28	0	64	33	63.8
Control	--	--	0	0	0	0	0	64.2
LSD (0.05)			32	25	ns	13	22	ns

[1] All EPOST and LPOST treatments received 32% N solution at 1 qt/A and R-11 non-ionic surfactant at 0.25% v/v.
[2] BROTE - downy brome.
[3] AEGCY - jointed goatgrass.

Downy brome control in winter wheat with MON37500. Daniel A. Ball and Darrin L. Walenta. Two studies were conducted in northeastern Oregon at the Columbia Basin Agricultural Research Stations at Moro and Pendleton, OR to evaluate postemergence herbicide rates and timings for downy brome (BROTE) control and crop injury in winter wheat. At Moro, the soil type was a Walla Walla silt loam (22.4% sand, 68.0% silt, 16.8% clay, 6.3 pH, 1.39% organic matter, 11.9 Meq/100 g CEC). Winter wheat var. 'Stephens' was seeded at 70 lb/A in 14 inch rows on October 4, 1995 to a 1.0 inch depth into moist soil with a John Deere HZ split packer wheel drill. All postemergence treatments were applied with a hand-held CO_2 backpack sprayer in 17 gpa water at 30 psi. All treatments received R-11 surfactant at 0.5 % v/v. Plots were 8' x 30' 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 light and uniform throughout the plot area. Ratings of visual crop injury and downy brome control were made on May 29, 1996. Wheat grain was harvested on August 1, 1996 with a HEGE 140 plot combine, and yields converted to bu/A based on a 60 lb/bu test weight. At Pendleton, the soil type was a Walla Walla silt loam (16.4% sand, 66.8% silt, 16.8% clay, 2.03% organic matter, 6.3 pH, 17.3 Meq/100 g CEC). Winter wheat var. 'Stephens' was seeded at 80 lb/A in 10 inch rows on October 3, 1995 to a 0.5 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' x 30' in size with 4 replications. Downy brome infestation was heavy and uniform throughout plot area. Ratings of visual crop injury and downy brome control were made on May 13, 1996. Wheat grain was harvested on July 26, 1996 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	POST3	POST4	POST5
Moro					
Date	2 Nov 95	16 Nov 95	12 Dec 95	15 Feb 96	13 Mar 96
Air temp. (°F)	36	58	30	49	49
Relative humidity (%)	80	94	100	80	58
Wind speed (mph)	calm	NE 5	NE 6	NE 7	NW 3
Sky	clear	cloudy	cloudy,light snow	clear	clear
Soil temp. at 2 in. (°F)	37	56	32	48	46
Crop Stage	1.5-2.0 lf	2.5 lf	4 lf, 1 tiller	4.5 lf. 1 tiller	6 lf. 2 tiller
BROTE stage	1-2 lf	2.5 lf	4 lf, 1 tiller	4.5 lf, 1 tiller	6.5 lf, 2 tiller
Pendleton					
Date	30 Oct 95	20 Nov 95	4 Dec 95	12 Feb 96	6 Mar 96
Air temp. (°F)	45	44	39	50	56
Relative humidity (%)	86	95	82	87	70
Wind speed (mph)	SW 3	calm	SW 5	NE 2	SW 3
Sky	mostly cloudy	cloudy	partly cloudy	clear	partly cloudy
Soil temp. at 2 in. (°F)	52	46	40	45	55
Crop Stage	2 lf	3.5 lf. 1 tiller	4 lf, 1 tiller	6.5 lf. 4 tiller	7.5 lf, 5 tiller
BROTE stage	1 lf	2.5 lf	4 lf, 1 tiller	5 lf, 3 tiller	6 lf, 4 tiller

Downy brome control was improved by increasing application rates of fall applied MON37500, particularly at the Pendleton site (Table 2). Fall application timings of MON37500 generally provided better downy brome control than did spring MON37500 or herbicide standard applications at both locations. The latest spring application timing (POST5) caused some slight, transient stunting of wheat. Wheat yield at Pendleton was substantially better from fall treatments of MON37500 compared to spring applications. Yield at Moro was not improved by herbicide treatments where downy brome infestation was light.

Table 2. Downy brome control, crop injury, and wheat grain yield with MON37500.

			Pendleton			Moro		
Treatment[1]	Rate	Timing	Crop Injury	BROTE Control	Grain Yield	Crop Injury	BROTE Control	Grain Yield
	(lb/A)		------- % -------		bu/A	------- % -------		bu/A
MON37500	.016	POST1	1	64	101	0	50	72
MON37500	.023	POST1	1	65	94	0	59	78
MON37500	.031	POST1	3	76	97	0	63	82
MON37500	.016	POST2	1	63	94	0	83	72
MON37500	.023	POST2	1	66	95	0	91	80
MON37500	.031	POST2	1	88	97	0	95	80
MON37500	.016	POST3	3	66	84	0	64	73
MON37500	.023	POST3	3	78	91	0	73	75
MON37500	.031	POST3	1	91	100	0	81	79
MON37500	.016	POST4	3	34	79	0	45	73
MON37500	.023	POST4	1	51	89	0	46	78
MON37500	.031	POST4	3	33	75	0	54	79
MON37500	.016	POST5	5	40	74	0	40	74
MON37500	.023	POST5	3	50	86	0	35	78
MON37500	.031	POST5	5	45	65	0	41	81
Metribuzin + metsulf+chlorsulf	0.187 + 0.019	POST2	0	26	61	0	88	81
Metribuzin + metsulf+chlorsulf	0.187 + 0.019	POST4	0	34	83	0	61	80
Control	-	-	0	0	58	0	0	71
LSD (0.05)			3	18	19	NS	12	NS

[1] All treatments received R-11 non-ionic surfactant at 0.25% v/v. Metsulf+chlorsulf formulated as Finesse®.

Italian ryegrass control in winter wheat in the Willamette Valley of Oregon. Bill D. Brewster, Dennis M. Gamroth, and Carol A. Mallory-Smith. Six trials were conducted to evaluate the efficacy of herbicide treatments in controlling Italian ryegrass in winter wheat. Some of the treatments are presented in the following tables. The experimental design was a randomized complete block with four replications and 8-by 25-ft plots. Herbicides were applied with a single-wheel compressed-air plot sprayer that delivered 20 gpa at 15 psi. A non-ionic surfactant, R-11, was added to each treatment at a rate of 0.5% v/v.

Crop injury was greatest with the standard treatment of metribuzin plus chlorsulfuron-metsulfuron at the Millhouser site (Table 2). The wheat at this site was 'Yamhill', a metribuzin-sensitive cultivar. In spite of this early injury, grain yield was increased compared to the untreated control at all sites (Table 3). The low grain yield at the Fast site was due to the poor performance of the herbicide treatments on the Italian ryegrass (Table 4). Further tests are being conducted to determine whether the failure to control the ryegrass at this site was due to herbicide resistance or environmental conditions following herbicide application. Sulfosulfuron was at least as effective when applied on ryegrass at the 4-leaf stage as at the 2-leaf stage. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table 1. Herbicide application dates and growth stages for six wheat and ryegrass trials in the Willamette Valley of Oregon.

Growth	Farm					
stage	Millhouser	McRae	Rossner	Fast	DeJong	Aebi
2 leaf	11/13/95	11/22/95	12/05/95	11/22/95	11/13/95	10/27/95
4 leaf	12/19/95	01/12/96	01/12/96	12/19/95	12/19/95	12/04/95

Table 2. Visual evaluations of wheat injury from herbicide applications at six locations in the Willamette Valley of Oregon.

Treatment[1]	Rate	Application timing	Wheat injury[2] Millhouser	McRae	Rossner	Fast	DeJong	Aebi
	lb/A		%					
Metribuzin + chlor-met	0.14 + 0.019	2 leaf	26	3	5	4	5	15
Sulfosulfuron	0.023	2 leaf	0	0	0	0	6	3
Sulfosulfuron	0.023	4 leaf	0	0	0	0	0	0
Control	0	---	0	0	0	0	0	0

[1]Chlor-met = chlorsulfuron-metsulfuron
[2]Visual evaluations June 14, 1996

Table 3. Wheat grain yield following herbicide applications at six locations in the Willamette Valley of Oregon.

Treatment[1]	Rate	Application timing	Wheat yield[2] Millhouser	McRae	Rossner	Fast	DeJong	Aebi
	lb/A		bu/A					
Metribuzin + chlor-met	0.14 + 0.019	2 leaf	42	78	99	12	100	67
Sulfosulfuron	0.023	2 leaf	51	51	100	2	84	59
Sulfosulfuron	0.023	4 leaf	58	60	98	2	92	77
Control	0	---	21	13	80	4	26	41
		$LSD_{(.05)}$	11	11	8	8	9	17
		CV (%)	18	11	5	28	7	18

[1]Chlor-met = chlorsulfuron-metsulfuron
[2]Harvested August, 1996

Table 4. Visual evaluations of Italian ryegrass control from herbicide applications at six locations in the Willamette Valley of Oregon.

Treatment[1]	Rate	Application timing	Italian ryegrass control[2] Millhouser	McRae	Rossner	Fast	DeJong	Aebi
	lb/A		%					
Metribuzin + chlor-met	0.14 + 0.019	2 leaf	88	90	93	53	95	90
Sulfosulfuron	0.023	2 leaf	84	68	85	28	88	81
Sulfosulfuron	0.023	4 leaf	91	78	87	18	88	90
Control	0	---	0	0	0	0	0	0

[1]Chlor-met = chlorsulfuron-metsulfuron
[2]Visual evaluations June 14, 1996

Control of annual grasses in imidazolinone-resistant winter wheat with imazamox. Bill D. Brewster, Dennis M. Gamroth, and Carol A. Mallory-Smith. A trial to evaluate imazamox on an imidazolinone-resistant wheat cultivar was established at the Hyslop Research Farm near Corvallis, OR. Italian ryegrass (LOLMU) and California brome (BROCA) were seeded across each plot prior to seeding the wheat. Annual bluegrass (POAAN) also infested the trial site. The experimental design was a randomized complete block with four replications and 8-by 35-ft plots. Herbicides were applied with a single-wheel, compressed-air plot sprayer that delivered a broadcast spray of 20 gpa at 15 psi. The soil was a Woodburn silt loam with an organic matter content of 2.6% and a pH of 5.9. Diclofop-methyl applied preemergence to the wheat and grasses followed by metribuzin plus chlorsulfuron-metsulfuron at the 4-leaf stage of growth was included as a standard. A 32% liquid nitrogen fertilizer was added to the imazamox treatments at 1 qt/A. A non-ionic surfactant, R-11, was added to all postemergence treatments at 0.25% v/v. Heavy precipitation occurred throughout the initial phase of the trial with about 20 inches falling in the first 2 months after the 2-leaf applications. Herbicide application timing information is presented in Table 1.

The Italian ryegrass was controlled by all treatments. Imazamox was more effective on California brome and annual bluegrass at the earlier timing (Table 2). Moderate to severe injury to the wheat occurred in all treatments with stand thinning at the higher rates of application. However, the wheat recovered dramatically in all treatments, and even those plots that were most severely injured outyielded the weedy control. The resistance gene greatly increased the selectivity between wheat and ryegrass; in other research, non-resistant wheat was as susceptible to imazamox as were the weedy grasses. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002).

Table 1. Herbicide timing and stage of crop and weed growth.

	Stage of growth			
Application timing	Wheat	LOLMU	BROAC	POAAN
PES, October 9, 1995	preemergence	preemergence	preemergence	preemergence
2 leaf, November 14, 1995	2 leaf	2 leaf	2 leaf	2 leaf
4 leaf, December 4, 1995	4-5 leaf	3-5 tillers	3-5 leaf	4-5 leaf

Table 2. Wheat injury and yield and grass control following imazamox applications.

		Application	Wheat[2]		Grass control[3]		
Treatment[1]	Rate	timing	Injury	Yield	LOLMU	BROCA	POAAN
	lb/A		%	bu/A	%		
Diclofop Metri + chlor-met	1.0 0.14 + 0.019	PES 4 leaf	13	132	100	58	90
Imazamox	0.024	2 leaf	14	133	98	85	45
Imazamox	0.032	2 leaf	35	133	100	96	63
Imazamox	0.04	2 leaf	50	131	98	97	73
Imazamox	0.048	2 leaf	53	114	100	99	81
Imazamox	0.063	2 leaf	83	77	100	99	91
Imazamox	0.024	4 leaf	3	139	98	70	40
Imazamox	0.032	4 leaf	13	135	100	66	40
Imazamox	0.04	4 leaf	9	138	100	76	55
Imazamox	0.048	4 leaf	30	131	100	88	70
Imazamox	0.063	4 leaf	63	111	100	91	75
Control	0	---	0	38	0	0	0
			$LSD_{(.05)}$	15			
			CV (%)	8.7			

[1]Metri = metribuzin and chlor-met = chlorsulfuron-metsulfuron
[2]Visual evaluation of wheat injury January 29, 1996; harvest July 29, 1996.
[3]Visual evaluation of weed control February 20, 1996.

Downy brome control in wheat with MON 37500. John O. Evans and R.William Mace. MON 37500 was applied to *Pioneer* winter wheat to evaluate downy brome control. Plots were established at the Blue Creek research station. The soil type was a Hansel silt loam with 7.3 pH and an organic matter content of less than 2%. Wheat was planted October, 1995, and treatments established May 9, 1996 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. Wheat was 8 inches high with eight leaves and an average population density of 10 to 12 plants/ft^2 when treated. The downy brome was three inches high with approximately 6 leaves at treatment time. Visual evaluations for downy brome control and crop injury were recorded June 14, and July 3,1996. The plots were harvested August 4, 1996 with a small plot combine.

No treatment of MON 37500 injured the grain and wheat yields were not significantly different among treatments. Downy brome control was highest for the 15 gm ai/A Mon 37500 rate and it was also the highest yielding treatment. Wheat production fell 15 percent and downy brome control decreased 10 percent when plots were treated with 22.5 gm ai/A MON 37500 compared to the two lower dosages of the herbicide. Weed control and wheat yields were equal at the two lowest dosages of MON 37500. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Downy brome control in winter wheat treated with various dosages of MON 37500 as postemergence sprays.

		—WHEAT—		— BROTE Control —	
Treatment[1]	Rate	Injury[2]	Yield	6-14-96	7-3-96
	gm ai/A	%	bu/A	—%—	
MON 37500	10	0	53.9	43.3	80
MON 37500	15	0	54.3	53.3	81.7
MON 37500	22.5	0	47.0	50.0	70
Untreated		0	43.3	0.0	0.0
$LSD_{(0.05)}$			NS	18.5	9.6

[1] Nonionic surfactant applied at 0.25% v/v.
[2] Visually evaluated 6-14-96

Jointed goatgrass control with MON 37500. John O. Evans, Steven A. Dewey and R.William Mace. MON 37500 was applied postemergence to *Weston* winter wheat to selectively control jointed goatgrass. Plots were established (near Trenton, Ut) on the Perry Spackman farm. The soil was a Trenton silty clay loam with 7.6 pH and an organic matter content of less than 2%. The wheat was planted October 10, 1995 and treatments applied April 3,1996 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 10 foot spray widths calibrated to deliver 25 gpa at 39 psi. Wheat was 6 inches high with 4 to 5 leaves and an average population density of 10 plants/ft^2 when treated. A dense stand of jointed goatgrass, 4 inches high and tillered made up a population averaging 9 plants/ft^2. Visual evaluations for jointed goatgrass control and crop injury were recorded May 17, and May 30,1996. Plots were harvested August 6, 1996 with a small plot combine and jointed goatgrass was separated from wheat to provide weed biomass yields.

Neither MON 37500 dosage injured grain nor controlled jointed goatgrass to an acceptable commercial level. There were significant wheat yield differences between the high rate of MON 37500 and untreated controls. Yields of jointed goatgrass were not significantly different from one another but indicate a possible correlation between yield and treatment. Jointed goatgrass populations varied considerably within replication accounting for the large LSD for jointed goatgrass yield. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Selective jointed goatgrass control with herbicide MON 37500 in 1996 on Spackman's farm near Trenton, Ut.

		—WHEAT—		— AEGCY —		
Treatment[1]	Rate	Injury[2]	Yield	5-17	5-30	Yield[3]
	gm ai/A	%	bu/A	—% Control—		lb/A
MON 37500	10	0	27	56.7	66.7	121.4
MON 37500	15	0	32	75.0	70.0	68.4
Untreated		0	24	0	0	168.3
$LSD_{(0.05)}$			5	13.6	25.6	NS

[1] Nonionic surfactant applied at 0.25% v/v.
[2] Visually evaluated 5-30-96
[3] Jointed goatgrass spikelets separated from wheat seed.

Comparison of bromoxynil+MCPA with other postemergence herbicides for broadleaf weed control in winter wheat. John O. Evans, Steven A. Dewey and R.William Mace. An experiment was established near Trenton, Utah at the Perry Spackman farm to evaluate several selective herbicides to control broad leaved weeds in *Weston* winter wheat. A Trenton silty clay loam with 7.6 pH and an organic matter content of less than 2% characterized the experimental site. Wheat was planted October 10, 1995 and treatments established April 3,1996 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. Wheat was 6 inches high with 4 to 5 leaves and an average population density of 10 plants/ft^2 when treated. Burr buttercup (RANBU), pennycress (THLAR) and snow speedwell (VEROF) had plant populations of 8,10, and 14 plants/ft^2, respectively. Visual evaluations were completed May 17, and May 30, 1996 for weed control and wheat injury. The plots were harvested August 6, 1996 with a small plot combine.

No signs of injury to the wheat crop were evident with any treatment. Yields were not significantly different but there was nearly 13 bushels difference between the lowest yield (2,4-D alone) compared to the bromoxynil/MCPA plus tribenuron treatment. The low yield trend with the 2,4-D treatment was probably du to poorer burr buttercup and snow speedwell control for this treatment. The best over-all weed control was the combination of bromoxynil/MCPA plus thifensulfuron/tribenuron. All three rates effectively controlled broadleaf weeds that were present. Bromoxynil/MCPA alone provided excellent weed control except for snow speedwell. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Bromoxynil+MCPA compared with other herbicide combinations to control broadleaved weeds in winter wheat. Trenton, Ut. 1996.

		Wheat			Weed Control					
		injury			RANBU		THLAR		VEROF	
Treatment[1]	Rate	5/17	5/30	Yield	5/17	5/30	5/17	5/30	5/17	5/30
	lb/A	%		bu/A	%					
Control	0.0	0	0	31.5	0	0	0	0	0	0
Bromox/MCPA	0.75	0	0	37.8	96.7	91.7	99.3	98.3	61.7	68.3
Bromox/MCPA+ Thifensul/triben	0.5+ 0.028	0	0	32.7	100	100	98.3	100	96	100
Bromox/MCPA+ Tribenuron	0.5+ 0.008	0	0	39.3	100	100	70	100	86.7	95
Bromox/MCPA+ Tribenuron	0.625+ 0.007	0	0	37.7	100	100	100	100	91.7	99.3
Bromox/MCPA+ Tribenuron	0.625+ 0.014	0	0	36.3	100	100	100	100	93.3	96.7
Dicamb+ Thifensul/triben	0.125+ 0.028	0	0	37.4	65	93.3	76.7	100	73.3	93.3
2,4-D ester+ Thifensul/triben	0.25+ 0.028	0	0	38.7	56.7	88.3	75	96.7	73.3	91.7
MCPA Ester+ Thifensul/triben	0.25+ 0.028	0	0	31.3	53.3	85	83.3	100	68.3	90
2,4-D ester	0.75	0	0	26.6	20	75	81.7	95	60	80
LSD(0.05)				NS	17.4	6.9	28.6	3.3	17.9	7.6

[1] Nonionic surfactant applied at 0.25% v/v except for bromoxynil/MCPA and 2,4-D ester treatments.

Comparison between early and late growth stage 2,4-D ester applications in spring wheat. John O. Evans, Steven Dewey and R.William Mace. 2,4-D ester was applied to *Rick* spring wheat at three rates and two growth stages, 3 to 4 leaf and late 7 leaf stage. These were compared to a treatment combination of thifensulfuron, tribenuron and bromoxynil applied at the 3 to 4 leaf stage. Plots were established at the Greenville research farm in North Logan, Utah. The soil was a Millville silt loam with a 7.5 ph and an organic matter content of less than 2%. Treatments were applied in a randomized block design, with three replications on June 24, and July 8, 1996. Individual treatments were applied to 7 by 25 foot plots with a CO_2 backpack sprayer using flatfan 8002 nozzles providing a 6 foot spray width calibrated to deliver 22 gpa at 39 psi. Visual evaluations for redroot pigweed (AMARE) control and crop injury were completed July 8, July 22 and August 6. Plots were harvested September 4, 1996.

All three rates of 2,4-D ester were effective in controlling redroot pigweed as was the thifensulfuron/ tribenuron/ bromoxynil treatment. The 3 to 4 leaf treatment of 2,4-D provided better redroot pigweed control than the 7 leaf stage. No wheat injury resulted from any herbicide treatment at either growth stage. Yields were not significantly different among any treatments. (Utah Agricultural Experiment Station, Logan UT. 84322-4820)

Table. Comparison between early and late growth stage 2,4-D ester applications in spring wheat. Logan, UT. 1996.

			AMARE			Wheat		
			Control			Injury		Yield
Treatment	Rate	Stage	7/8	7/22	8/6	7/8	8/6	9/4
	lb/A			%			%	bu/A
2,4-D ester	0.4	3 to 4	83	98	100	0	0	16.8
2,4-D ester	0.6	3 to 4	87	97	100	0	0	14.2
2,4-D ester	0.8	3 to 4	93	98	100	0	0	13.6
2,4-D ester	0.4	6 to 7	0	80	93	0	0	17.6
2,4-D ester	0.6	6 to 7	0	77	88	0	0	17.1
2,4-D ester	0.8	6 to 7	0	78	95	0	0	15.6
Thifensul+ triben+ bromoxynil	0.018+ 0.8	3 to 4	100	98	100	0	0	15.3
Check			0	0	0	0	0	16
LSD(0.05)			5.2	4.3	2.3	0	0	NS

Influence of spray carrier volume on carfentrazone-ethyl performance. Gary A. Lee and Brenda M. Waters. A study was established in Canyon County, ID to evaluate the influence of spray volume on the effectiveness of carfentrazone-ethyl for broadleaf weed control, crop tolerance and subsequent yield in irrigated spring wheat. Herbicides were applied to soft white spring wheat (var. 'Centennial') in the 4 leaf, 4 tiller (principal growth stage: 24) stage of growth. Soil at the location is an Owyhee Silt Loam (30 % sand, 58 % silt, 12 % clay, pH 7.4, 1.19 % organic matter) and the surface condition at the time of herbicide application was slightly rough with small clods (< 2.0 inch) and no visible crop residue. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 7 by 25 ft. Herbicide treatments were applied postemergence on May 21, 1996 (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 5, 10 and 20 gpa at 30 psi and appropriate ground speed and nozzle tip size. Crop tolerance and weed control ratings were taken 31 days after treatment (DAT) on June 21, 1996 and the crop was harvested on August 5, 1996. Yield was determined by harvesting two 3 by 3 ft areas in each plot. Subsamples were hand cleaned and yields and bushel test weights calculated on the final combined sample for each plot.

Table 1. Application data

Crop stage	4 leaf, 4 tillers (principal growth stage: 24)
Weed stage	KCHSC: 16-18 leaf (2 in. tall); CHEAL: 6-8 leaf (2 in. tall); SOLSA: 8-10 leaf (2 in. tall); HELAN: cotyledon; SOLTR: cotyledon; LACSE: cotyledon
Air temp. (F)	59
Relative humidity (%)	66
Wind (mph)	02
Sky	100% cloud cover
Soil temp. (F at 4 in.)	57
Soil moisture	dry surface, good moisture at 1 in.

Light mist rain occurred immediately after herbicide application (trace). First significant rain fall after herbicide application was 0.16 in. occurring on June 23, 1996.

All herbicide treatments included Latron AG-98 nonionic surfactant at 0.25% V/V (Table 2). Carfentrazone-ethyl at 0.031 lb/A and carfentrazone-ethyl at 0.031 lb/A + thifensulfuron/tribenuron at 0.23 oz/A controlled 100% of all weed species present 31 days after treatment when applied in 5, 10 and 20 gpa water carrier, respectively. The volume of spray carrier had no detrimental influence on the weed control performance of carfentrazone-ethyl alone or in combination with thifensulfuron/tribenuron. Thifensulfuron/tribenuron at 0.23 oz/A applied in 10 gpa carrier provided 100% control of all weed species present including kochia. This indicates that the kochia population at this location is susceptible to sulfonylurea herbicides.

All herbicide treatments caused some visible phytotoxicity to the wheat plants. Carfentrazone-ethyl at 0.031 lb/A + thifensulfuron/tribenuron at 0.23 oz/A applied in 10 gpa water carrier resulted in 25% vigor reduction. Symptoms included necrosis of more than 50% of the leaf area and moderate plant stunting. New leaf tissue which emerged after herbicide application appeared healthy and exhibited no chlorosis. However, plant height was visibly reduced throughout the growing season. All herbicide treatments containing carfentrazone-ethyl at 0.013 lb/A alone or in combination with thifensulfuron/tribenuron at 0.23 oz/A applied in 5, 10 and 20 gpa of water carrier caused significant initial phytotoxicity to the wheat plants. The enhanced crop damage can be attributed to the excessive wetting from water droplets accumulated on the plant leaves due to precipitation which was received immediately after herbicide application. Because a small amount of misty rain fell at the location, it is speculated that a heavy dew may also result in increased carfentrazone-ethyl phytotoxicity on a wheat crop.

Phytotoxic symptoms observed on the wheat plants was not an indicator of crop yield reduction. Grain test weights obtained from herbicide treated plots ranged from 59 to 62 lb/bu, but were not significantly different from the 61 lb/bu average test weight from the nontreated check plots. All herbicide treated plots yielded significantly more grain than the nontreated check plots. Although wheat yields ranged from 44 to 49 bu/A, no significant differences were detected between herbicide treatments applied in 5, 10 and 20 gpa of water carrier. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660).

Table 2. Influence of spray carrier volume on carfentrazone-ethyl performance.

Treatment	Rate/A	Weed Control						Wheat		
		HELAN	CHEAL	KCHSC	SOLSA	SOLTR	LACSE	Injury	Yield	
		%							lb/bu	bu/A
Carfentrazone-ethyl [1,2]	0.031 lb	100	100	100	100	100	100	15	61	46
Carfentrazone-ethyl [1,3]	0.031 lb	100	100	100	100	100	100	15	61	47
Carfentrazone-ethyl [1,4]	0.031 lb	100	100	100	100	100	100	20	62	49
Carfentrazone-ethyl + thifen/triben [1,2]	0.031 lb + 0.23 oz	100	100	100	100	100	100	20	60	49
Carfentrazone-ethyl + thifen/triben [1,3]	0.031 lb + 0.23 oz	100	100	100	100	100	100	25	60	44
Carfentrazone-ethyl + thifen/triben [1,4]	0.031 lb + 0.23 oz	100	100	100	100	100	100	20	61	49
Thifensulfuron/tribenuron [1]	0.23 oz	100	100	100	100	100	100	1.3	60	47
Weedy Check	----	0	0	0	0	0	0	0	60	35
LSD (P=0.05)		0	0	0	0	0	0	1.3	1.8	7.4

[1]Treatment applied with Latron AG-98 nonionic surfactant 0.25% v/v
[2]Treatment application rate of 5 gpa
[3]Treatment application rate of 10 gpa
[4]Treatment application rate of 20 gpa
[5]Thifen = thifensulfuron + thiben = thibenuron , a commercial mixture

Postemergence broadleaf weed control in irrigated spring wheat. Gary A. Lee and Brenda M. Waters. The objective of this experiment was to evaluate various herbicide treatments not in the sulfonylurea family for broadleaf weed control and wheat tolerance. Soft white spring wheat (var. 'Centennial') was seeded on March 16, 1996 at 120 lb/A and at a depth of 2 in. Soil at the location is an Owyhee Silt Loam (30% sand, 58% silt, 12% clay, 1.19% organic matter and 7.4 pH) and the surface condition at the time of herbicide application was smooth with sparse organic debris. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 7 by 2 ft. Herbicides were applied on May 21 and May 25, 1996 (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 30 psi. Excessive wind conditions resulted in the herbicide treatments being applied on May 21 and 25, 1996. Visual weed control evaluations were done on June 21, 1996 and crop tolerance ratings were recorded on May 29 and June 21, 1996. Crop yield data were obtained by harvesting two 3 by 3 ft. subsamples from each plot. Samples were threshed and hand cleaned before calculating the bushel test weight and yield per acre for the combined subsamples.

Table 1. Application information.

Crop stage	4 leaf, 4 tillers (principal growth stage: 24)	
Weed stage	KCHSH 12-18 lf, 2 in. tall; CHEAL 6-10 lf, 2 in. tall; HELAN 2 lf, 2 in. tall	
	May 21	May 25
Air temp. (F)	59	63
Relative humidity (%)	53	59
Wind (mph)	3-5	01
Sky (% cloud cover)	100	100
Soil temp. (F at 4 in.)	58	60
Soil moisture	dry at the surface, good moisture at 1 in.	
First significant rain fall after herbicide applications was 0.16 in. on June 24, 1996		

All herbicide treatments controlled 94% or more of kochia (KCHSC), common sunflower (HELAN) and common lambsquarter (CHEAL). Thifensulfuron + tribenuron + bromoxynil at 0.009 + 0.005 + 0.25 lb/A controlled 94% of the kochia population which was significantly less effective than carfentrazone-ethyl alone or in combination with other herbicides. Fluroxypyr gave excellent control of the weed species present. Carfentrazone-ethyl alone and in combination with other herbicides caused from 10 to 20% initial damage to the spring wheat plants. Phytotoxic symptoms observed 8 days after treatment (DAT) were complete necrosis of the top 50 to 60% of the individual leaves exposed to the herbicide treatment, but new growth appeared normal and healthy. At the later evaluation, no chlorosis or necrosis was visible, but some wheat plants were slightly to moderately stunted. No crop damage was detectable in plots treated with fluroxypyr alone and only slight stunting was visible in plots treated with fluroxypyr + bromoxynil at 0.094 + 0.38 lb/A. The carfentrazone-ethyl + dicamba at 0.023 + 0.094 lb/A treatment caused wheat plants to initially exhibit the "sleepy wheat" (prostrate growth) symptoms, but the plants grew out of the condition.

The highest wheat yield was recorded in the plots treated with fluroxypyr at 0.188 lb/A. The yield from this treatment was significantly higher than all carfentrazone-ethyl treatments except carfentrazone-ethyl + bromoxynil at 0.023 + 0.01 lb/A. Initial phytotoxicity induced by carfentrazone-ethyl appeared to have some effect on the spring wheat yields. However, no herbicide treatment adversely affected wheat test weight. Season-long competition from weeds, primarily kochia, caused a significant reduction in spring wheat yield in the nontreated check plots compared to the herbicide treated plots. (Department of Plant, Soil and Entomological Sci., University of Idaho, Parma, ID 83660-6699)

Table 2. Effect of postemergence herbicide treatments on broadleaf weed control, crop injury and spring wheat yield.

		Weed Control			Crop Injury		Spring Wheat	
Treatment	Rate/A	KCHSC	HELAN	CHEAL	5/29	6/20	Test Wt	Yield
		%					lb/bu	bu/A
Carfen[1,3]	0.023 lb	99	100	100	20	10	59.6	52.1
Carfen[2]	0.023 lb	97	100	100	15	10	59.7	54.5
Carfen[1]	0.031 lb	100	100	100	20	15	60.5	48.5
Carfen[2]	0.031 lb	100	100	100	20	20	59.2	48.4
Carfen + bromoxynil[1]	0.031 + 0.18 lb	100	100	100	20	20	59.2	47.7
Carfen + bromoxynil[2]	0.031 + 0.18 lb	100	100	100	20	20	60.0	48.4
Carfen + bromoxynil/MCPA[1]	0.031 + 0.25 lb	100	100	100	20	20	59.5	53.4
Carfen + bromoxynil/MCPA[2]	0.031 + 0.25 lb	100	100	100	20	20	59.7	47.7
Carfen + bromoxynil[1]	0.023 + 0.18 lb	100	100	100	15	10	59.9	57.6
Carfen + bromoxynil[2]	0.023 + 0.18 lb	100	100	100	14	10	60.4	54.5
Carfen + bromoxynil[1]	0.023 + 0.25 lb	100	100	100	15	16	60.7	50.2
Carfen + bromoxynil[2]	0.023 + 0.25 lb	100	100	100	15	15	60.8	50.0
Carfen + bromoxynil/MCPA[1,2]	0.023 + 0.18 lb	100	100	100	15	15	60.4	50.4
Carfen + bromoxynil/MCPA[2]	0.023 + 0.18 lb	100	100	100	15	14	61.5	51.0
Carfen + bromoxynil/MCPA[1,2]	0.023 + 0.25 lb	100	100	100	15	12	60.5	54.0
Carfen + bromoxynil/MCPA[2]	0.023 + 0.25 lb	100	100	100	15	12	60.1	50.6
Thifensulfuron/tribenuron + bromoxynil[2]	0.23 oz + 0.25 lb	94	100	100	0	0	59.8	52.0
Fluroxypyr[2]	0.094 lb	98	100	100	0	0	61.1	57.2
Fluroxypyr[2]	0.125 lb	96	100	100	0	0	60.4	62.2
Fluroxypyr[2]	0.188 lb	99	100	100	0	0	61.9	66.3
Fluroxypyr + bromoxynil[2]	0.094 + 0.38 lb	100	100	100	1	0	60.3	59.8
Fluroxypyr + 2,4-D LVE[2]	0.094 + 0.38 lb	99	100	100	0	0	61.4	52.6
Carfen + dicamba[2]	0.023 + 0.094 lb	100	100	100	15	10	61.8	48.3
Handweeded check		--	--	--	--	--	61.2	44.0
Weedy check		0	0	0	0	0	60.0	35.3
LSD (P=.05)		3.0	0	0	1.2	2.5	N.S.	8.6

[1] Crop oil concentrate was added at 1.0% v/v.
[2] Latron AG-98 nonionic surfactant was added at 0.25% v/v.
[3] Carfen = carfentrazone-ethyl

Kochia control in nonirrigated spring wheat. Gary A. Lee and Alex G. Ogg, Jr. Kochia (KCHSC) is a spring germinating annual broadleaf weed that is rapidly spreading in the dryland regions of the Pacific Northwest. Because kochia has significant genetic diversity due to outcrossing, repeated use of any one herbicide or herbicide class will result in selection pressure for resistant plants. For example, there is a high frequency of resistance to sulfonylurea herbicides in kochia populations in the Pacific Northwest. There is an urgent need to develop new herbicides with a mode of action different from sulfonylureas to control kochia in wheat and barley. A study was established near Dusty in Whitman County, WA to evaluate dicamba in combination with other herbicides for control of kochia and for tolerance of spring wheat to the herbicide treatments.

Spring wheat (var. 'Penawawa') was planted April 4,1996 at a rate of 75 lb/A at a depth of 1 in. and a 7 in. row spacing. The study area was heavily infested with interrupted windgrass (APEIN) and fenoxaprop at 13.7 fl.oz/A was applied on April 30,1996 to control the grass species. The spring wheat plants began to emerged April 14, 1996 and were in the 3 leaf, 1 tiller (principal growth stage: 21) at the time the broadleaf herbicide treatments were applied on May 7 & 8, 1996 (Table 1). Excessive wind prevented herbicide applications on the same day or time of day. Soil at the location is a Onyx Silt Loam (29.2% sand, 62% silt, 8.8% clay, pH 8.4, and organic matter 2.66%) and the surface condition was firm, smooth with light to moderate organic debris. The herbicide treatments were arranged in a randomized complete block design with four replications and each plot was 10 by 33 ft. Herbicides were applied postemergence to the crop and weeds with a CO_2 backpack sprayer calibrated to deliver 10 gpa at 24 psi. Crop tolerance and weed control were evaluated at 11 DAT (May 19) and 35 DAT (June 12). A late season weed control evaluation was made 89 DAT (August 5) and the crop was harvested with a Wintersteiger combine on August 26, 1996 and yield and bushel test weights were calculated on grain samples cleaned with a clipper cleaner.

Table 1. Application data

Crop stage	3 leaf, 1 tiller (principal growth stage: 21)		
Weed stage	6-12 leaves, 0.5-1 in. tall		
	5-7-96 A.M.	5-8-96 A.M.	5-8-96 P.M.
Air temp. (F)	44	43	54
Relative humidity (%)	52	55	50
Wind (mph)	5-7	3-7	4-3
Sky (% cloud cover)	0	10	5
Soil temp. (F at 2 in.)	42	44	56
Soil moisture	Surface dry, moist at 0.5 in.		
Rain fall, April 1 to August 26	6.21 in.		
First significant rain fall after herbicide application was 0.2 in. on May 12, 1996.			

Visual estimates of kochia control, visual crop injury and wheat yield data are summarized in Table 2. Only herbicide treatments that contained dicamba or carfentrazone-ethyl gave season-long control of kochia. Although tribenuron and the product mix tribenuron + thifensulfuron controlled most of the kochia initially, there were resistant plants that survived and grew vigorously. The escaped kochia plants produced sufficient biomass that the plots could not be combined with a mechanical harvester. Plots treated with bromoxynil + dicamba at 0.25 + 0.125 lb/A, carfentrazone-ethyl at 0.031 lb/A, dicamba at 0.094 lb/A + thifensulfuron + tirbenuron at 0.15 + 0.08 oz/A, dicamba at 0.094 lb/A + thifensulfuron + tribenuron at 0.08 + 0.04 oz/A + carfentrazone-ethyl at 0.016 lb/A, dicamba + carfentrazone-ethyl at 0.094 + 0.0.023 lb/A, dicamba + carfentrazone-ethyl + 2,4-D DF at 0.094 + 0.016 + 0.25 lb/A, dicamba + pyridate at 0.094 + 0.24 lb/A and dicamba + pyridate at 0.094 + 0.47 lb/A maintained good to excellent control of kochia throughout the growing season (August 5, 1996 evaluation). The only treatment that included dicamba that was not harvestable was dicamba + 2,4-D amine at 0.094 + 0.25 lb/A. At this time, there is no apparent explanation for the results since dicamba and 2,4-D are not considered to be antagonistic.

All herbicide treatments induced slight injury symptoms on the wheat plants. 2,4-D LVE at 0.75 lb/A caused significant malformation of the wheat heads, and even 0.25 lb/A of 2,4-D caused some visible symptoms. These 2,4-D treatments were made before the wheat was fully tillered. All treatments containing dicamba caused the "sleepy wheat" symptoms, i.e. wheat leaves became lax and laid nearly flat on the ground. The wheat recovered and about 30 days after treatment, the symptoms were no longer visible. Carfentrazone-ethyl caused temporary chlorosis and spotting on leaves present at the time of herbicide application; however, plants recovered rapidly and symptoms were nearly invisible 30 days after treatment.

All harvestable plots produced an average crop yield of 41.8 bu/A compared to 10.7 bu/A obtained from the nontreated control plots. No differences in bushel test weight were detected among the harvestable herbicide-treated plots, but season-long competition from kochia in the nontreated plots reduced wheat test weights.

In summary, dicamba at 0.094 lb/A and carfentrazone-ethyl at 0.031 lb/A controlled kochia effectively in spring wheat. Both herbicides should be tank mixed with other herbicides to control the spectrum of weed species that commonly occur in spring wheat fields in eastern Washington. (Department of Plant, Soil and Entomological Sci., Parma, ID 83660-6699 and Nonirrigated Weed Science Research Unit, USDA-ARS, Pullman, WA 99164-6416)

Table 2. Effect of postemergence herbicide treatments on kochia populations, crop injury, and spring wheat yield.

Treatment	Rate/A	KCHSC Control 5-19-96	KCHSC Control 6-12-96	KCHSC Control 8-5-96	Wheat Injury 5-19-96	Wheat Injury 6-12-96	Wheat Yield	
		------- %	---------		------ %	-----	bu/A	lb/bu
2,4-D LVE [1]	0.75 lb	61	73	34	14	16	NH[4]	----
Tribenuron [1]	0.19 oz	86	83	55	4	4	NH	----
Thifensulfuron/tribenuron + 2,4-D DF [2]	0.45 oz + .25 lb	87	87	41	1	4	NH	----
Bromoxynil + 2,4-D LVE [1]	0.25 + 0.5 lb	93	71	36	5	11	NH	----
Bromoxynil + dicamba [2]	0.25 + 0.125 lb	96	100	96	9	7	39.5	58.4
Dicamba + 2,4-D amine [2]	0.094 + 0.25 lb	71	88	66	5	2	NH	----
Carfentrazone-ethyl [2]	0.023 lb	95	83	61	9	5	42.9	58.4
Carfentrazone-ethyl [2]	0.031 lb	99	99	91	6	3	40.7	59.1
Carfentrazone-ethyl + 2,4-D DF [2]	0.023 + 0.5 lb	97	91	72	6	4	36.8	57.9
Carfentrazone-ethyl + 2,4-D DF [2]	0.031 + 0.5 lb	98	91	68	4	2	59.6	57.7
Dicamba + thifensulfuron/tribenuron [3]	0.094 lb+ 0.3 oz	90	98	91	13	7	39.4	58.7
Dicamba + 2,4-D amine + thifensulfuron/tribenuron [3]	0.094 + 0.25 lb + 0.15 oz	86	97	78	9	8	36.0	57.8
Dicamba + carfentrazone-ethyl + thifensulfuron/tribenuron [3]	0.094 + 0.016 lb + 0.15 oz	98	99	97	9	5	40.0	58.6
Dicamba + carfentrazone-ethyl [3]	0.094 + 0.016 lb	98	99	89	10	1	41.6	56.6
Dicamba + carfentrazone-ethyl [3]	0.094 + 0.023 lb	99	100	99	10	8	41.8	58.8
Dicamba + carfentrazone-ethyl + 2,4-D DF [3]	0.094 + 0.016 + 0.25 lb	99	99	96	9	1	42.8	56.4
Dicamba + pyridate [3]	0.094 + 0.235 lb	80	96	88	7	2	40.3	59.1
Dicamba + pyridate [3]	0.094 + 0.47 lb	90	100	96	12	5	43.2	58.6
Handweeded	----	100	100	98	0	3	40.9	58.0
Nontreated	----	0	0	0	0	0	10.7	47.3

[1]Treatment made 5-7-96 AM
[2]Treatment made 5-8-96 AM
[3]Treatment made 5-8-96 PM
[4]NH=not harvestable due to excessive kochia biomass

Weed control in wheat with F8426. Terry L. Neider and Donald C. Thill. Studies were established in Latah and Nezperce Counties in Idaho, and Spokane County in Washington to evaluate weed control in wheat with F8426. Winter wheat (var. Hill 81) was seeded on October 15, 1995 at site one and (var. Cashup) on October 14, 1995 at site two, and spring wheat (var. Wakanz) was seeded on March 6, 1996 at site three. The experimental design at all locations was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence May 9, 1996 at sites one and two with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi and at site three on May 20, 1996 with a CO_2 pressurized backpack sprayer delivering 5, 10, and 20 gpa at 30 psi (Table 1). Wheat injury and weed control was evaluated visually. Wheat seed was harvested at maturity with a small plot combine on August 6 at site three and August 14, 1996 at site one.

Table 1. Application and soil data.

	Site one	Site two	Site three
Location	Spokane Co.	Latah Co.	Nezperce Co.
Crop stage	2 to 3 tillers	2 to 3 tillers	4 to 5 tillers
Weed stage	0.5 to 1 inch	0.5 to 1 inch	0.5 to 1 inch
Air temp (F)	66	50	62
Relative humidity (%)	54	62	75
Wind (mph)	0 to 2	0 to 2	0 to 3
Cloud cover	Mostly cloudy	Partly cloudy	Partly cloudy
Soil temp at 2 in(F)	40	50	66
Soil type	Silt loam	Loam	Silt loam
pH	5.3	4.9	7.6
Organic matter	2.4	3.3	2.6

F8426 injury (chlorosis) was dependent on rate and type of adjuvant used. F8426 applied at 0.023 and 0.031 lb/A with non-ionic surfactant injured wheat 9 to16%, while all other treatments were 5% or less (Table 2). Herbicide treatments containing dicamba injured (prostrate growth) wheat 8 to 11%. All herbicide treatments controlled henbit and narrow-leaf montia 83 to 100%. F8426 applied in combination with sulfonylurea herbicides controlled mayweed chamomile 83 to 100%. Sulfonylurea herbicides suppressed interrupted windgrass 16 to 68%. Wheat yield for all treatments was not significantly different form the untreated check and averaged 28 bu/A.

Wheat injury (chlorosis) was highest (9 to 16%) when F8426 was applied with a non-ionic surfactant compared to 1 to 5% injury when it was mixed with liquid nitrogen alone (Table 3). F8426 applied with liquid nitrogen at 25 to 50% v/v controlled henbit 90% or better, which was comparable to F8426 applied with a non-ionic surfactant. Mayweed chamomile was not controlled by any treatment.

F8426 injured winter wheat (chlorosis) 10 to 14% when it was applied at 0.031 lb/A in 10 or 20 gpa, respectively (Tabl 4). However, injury was less when F8426 was applied at 0.023 lb/A with thifensulfuron/tribenuron at all spray volumes All F8426 plus thifensulfuron/tribenuron combinations controlled all weed species 88 to 100%. F8426 applied alone controlled henbit and common lambsquarters 53 to 91% and 70 to 100%, respectively, but only suppressed mayweed chamomile 14 to 45%. Percent weed control with F8426 applied alone was dose dependent. Wheat yield for all treatments was not significantly different form the untreated check and averaged 57 bu/A. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Winter wheat response and weed control with F8426 (site one).

Treatment[1]	Rate	Winter wheat injury[4] Prostrate growth	Winter wheat injury[4] Chlorosis	Weed control[5] ANTCO	Weed control[5] Narrow-leaf montia	Weed control[5] LAMAM	Weed control[5] Interrupted windgrass
	lb/A	%					
F8426[2]	0.007	0	4	0	83	87	0
F8426[2]	0.015	0	9	0	88	83	0
F8426[3]	0.023	0	2	0	100	100	0
F8426[2]	0.023	0	13	0	100	96	0
F8426[3]	0.031	0	2	10	100	100	4
F8426[2]	0.031	0	16	8	100	100	3
F8426 + dicamba[2]	0.007 + 0.094	10	2	26	98	99	3
F8426 + dicamba[2]	0.015 + 0.094	10	5	16	98	95	5
F8426 + dicamba[2]	0.023 + 0.094	8	9	14	100	99	4
F8426 + dicamba[3]	0.023 + 0.094	8	2	15	100	98	6
F8426 + dicamba[2]	0.031 + 0.094	9	10	30	95	95	6
F8426 + dicamba +thifen/triben[2]	0.007 + 0.094 + 0.007	11	0	89	100	100	25
F8426 + thifen/triben[3]	0.023 + 0.014	0	2	99	100	100	40
F8426 + thifen/triben[2]	0.023 + 0.014	0	15	95	100	100	43
F8426 + prosulfuron[2]	0.023 + 0.018	0	11	90	98	94	16
F8426 + metsulfuron[2]	0.023 + 0.004	0	12	93	100	98	50
F8426 + chlorosulf/metsulf[2]	0.023 + 0.009	0	13	100	100	100	68
F8426 + triasulfuron[2]	0.023 + 0.013	0	11	83	100	100	48
Thifen/triben + bromoxynil[2]	0.014 + 0.25	0	0	74	100	93	25
Untreated check		--	--	--	--	--	--
LSD (0.05)		3	4	26	5	6	17
Density (plants/ft^2)				20	5	4	4

[1]Thifen/triben is the commerical formulation thifensulfuron/tribenuron.
[2]Applied with a non-ionic surfactant at 0.25% v/v.
[3]Applied with a liquid fertilizer containing 32% solubilized urea at 2% v/v.
[4]May 16, 1996 evaluation.
[5]July 11, 1996 evaluation.

Table 3. Winter wheat response and weed control with F8426 (site two).

Treatment[1]	Rate	Winter wheat injury[2]	Weed control[3] ANTCO	Weed control[3] LAMAM
	lb/A + % v/v	%		
F8426 + LN	0.023 + 2	1	6	83
F8426 + LN	0.023 + 4	2	10	85
F8426 + LN	0.023 + 10	2	9	88
F8426 + LN	0.023 + 25	2	11	91
F8426 + LN	0.023 + 50	3	20	90
F8426 + LN	0.031 + 2	1	11	83
F8426 + LN	0.031 + 4	2	20	83
F8426 + LN	0.031 + 10	2	16	83
F8426 + LN	0.031 + 25	2	23	90
F8426 + LN	0.031 + 50	5	35	91
F8426 + NIS	0.023	9	18	91
F8426 + LN + NIS	0.023 + 2	11	20	90
F8426 + NIS	0.031	13	28	93
F8426 + LN + NIS	0.031 + 2	16	28	94
LSD (0.05)		3	12	8
Density (plants/ft^2)			6	4

[1]LN is a liquid fertilizer containing 32% solubilized urea, and NIS is a 90% non-ionic surfactant applied at 0.25% v/v.
[2]May 16,1996 evaluation.
[3]June 16, 1996 evaluation.

Table 4. Spring wheat response and weed control with F8426 (site three).

Treatment[1]	Rate	Water volume	Winter wheat injury[2]	Weed control[3] LAMAM	Weed control[3] ANTCO	Weed control[3] CHEAI
	lb/A	gpa	%	%		
F8426	0.031	5	0	53	14	70
F8426	0.031	10	10	89	33	100
F8426	0.031	20	14	91	45	100
F8426 + thifen/triben	0.023 + 0.014	5	3	88	100	100
F8426 + thifen/triben	0.023 + 0.014	10	5	96	100	100
F8426 + thifen/triben	0.023 + 0.014	20	7	96	100	100
Thifen/triben + bromoxynil	0.014 + 0.25	10	0	94	100	100
Untreated check		--	--	--	--	--
LSD (0.05)			3	8	10	5
Density (plants/ft^2)				6	2	2

[1]All treatments applied with a 90% non-ionic surfactant at 0.25% v/v. Thifen/triben is the commerical formulation thifensulfuron/tribenuron.
[2]May 29, 1996 evaluation.
[3]June 21, 1996 evaluation.

Weed control in imadazilinone resistant winter wheat with AC 299,263. Terry L. Neider and Donald C. Thill. A study was established near Lewiston, ID to evaluate weed control in winter wheat with AC 299,263. Winter wheat (var. Fidel) was seeded on October 26, 1995 in a silt loam soil (32% sand, 52% silt, 16% clay, pH 5.1 and 5.2% organic matter). The experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 ft. The diclofop preemergence treatment was applied November 8, 1995. Fall postemergence treatments were applied December 20, 1995 and spring postemergence treatments were applied April 24, 1996 (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Winter wheat injury was evaluated visually March 20, April 22, and June 21, 1996. Downy brome (BROTE), wild oat (AVEFA), and catchweed bedstraw (GALAP) control was evaluated visually April 22 and June 21, 1996. Plots were harvested at maturity with a small plot combine on August 6, 1996.

Table 1. Application data.

	11/8/95	12/20/95	4/24/96
Wheat stage	--	1 to 2 leaf	2 to 3 tiller
Weed stage			
grasses	--	1 to 2 leaf	2 to 3 tiller
broadleaves	--	--	1 to 2 in tall
Air temp (F)	50	33	62
Relative humidity (%)	90	93	66
Wind (mph)	1 to 3	0 to 1	2 to 6
Cloud cover	Mostly cloudy	Overcast	Overcast
Soil temp at 2 in (F)	40	30	46

Winter wheat was not injured by any herbicide treatment. Downy brome control was 93 to 98% on April 22, 1996 with AC 299,263 treatments applied at 0.032 to 0.063 lb/A during December 1995 (Table 2). AC 299,263 controlled downy brome 93% or better when applied in the fall at 0.048 or 0.063 lb/A, or in the spring at 0.063 lb/A when evaluated June 21, 1996. Since there was no wild oat control with any fall AC 299,263 treatment, a spring application of AC 299,263 or diclofop was applied over the fall treatments. Diclofop at 1 lb/A and AC 299,263 at 0.063 lb/A applied in the spring controlled wild oat 78% and 80%, respectively, while all other AC 299,263 treatments only suppressed wild oat 68% or less. All spring applications of AC 299,263 alone or in combination with a fall treatment controlled catchweed bedstraw 91 to 96%. Winter wheat yield was affected by wildlife grazing and did not differ between herbicide treatments or the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Winter wheat response and weed control with AC 299, 263 near Lewiston, ID.

				Weed control			
		Application	Wheat	BROTE		AVEFA	GALAP
Treatment[1]	Rate	timing	yield	4/22/96	6/21/96	6/21/96	6/21/96
	lb/A		bu/A	%			
AC 299,263 +	0.024	Fall	64	83	83	78	53
diclofop	1.0	Spring					
AC 299,263 +	0.032	Fall	61	93	85	45	96
AC 299,263	0.024	Spring					
AC 299,263 +	0.048	Fall	59	98	94	78	54
diclofop	1.0	Spring					
AC 299,263+	0.063	Fall	58	98	93	58	95
AC 299,263	0.016	Spring					
AC 299,263	0.024	Spring	61	--	60	43	91
AC 299,263	0.032	Spring	58	--	66	65	91
AC 299,263	0.048	Spring	57	--	78	68	94
AC 299,263	0.063	Spring	56	--	94	80	96
Diclofop +	1.0	Pre	60	50	43	15	0
metribuzin	0.25	Spring					
Untreated check			55	--	--	--	--
LSD (0.05)			NS	11	9	16	15
Density (plants/ft^2)				6		9	3

[1]AC 299,263 treatments were applied with a 90% non-ionic surfactant plus 28% liquid nitrogen package mix at 2.8 % v/v.

Combinations of wild oat and broadleaf herbicides for wild oat control in winter wheat. Janice M. Reed, Terry L. Neider, and Donald C. Thill. A study was established in Boundry County, ID to evaluate wild oat control in winter wheat with combinations of wild oat and broadleaf herbicides. Winter wheat (var. Symphony) was seeded at a rate of 100 lbs/A on October 1, 1995 in a silt loam soil. The experimental design was a randomized complete block with four replications, and the individual plot size was 8 by 27 ft. Herbicide treatments were applied postemergence on May 16, 1996 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1). Wheat injury was evaluated visually on June 6 and July 16, 1996; and wild oat (AVEFA) control was evaluated on July 16, 1996. Winter wheat was harvested at maturity with a small plot combine on August 21, 1996 from a 4.3 by 27 foot area of each plot.

Table 1. Application and soil data.

Crop growth stage	4 to 5 leaves, 1 to 2 tillers
Weed growth stage	2 to 4 leaves
Air temperature (F)	58
Relative humidity (%)	95
Wind	calm
Cloud cover	mostly clear
Soil temperature at 2 inches (F)	60
Soil texture	silt loam
Sand (%)	28
Silt (%)	54
Clay (%)	18
Organic matter (%)	3.9
pH	7.6

No treatments injured wheat (data not shown). Fenoxaprop (both formulations), diclofop, and tralkoxydim controlled wild oat 100, 90, and 88%, respectively (Table 2). Imazamethabenz and difenzoquat, either alone or combined together, did not control wild oat adequately. Broadleaf herbicides were not synergistic or antagonistic to any wild oat herbicide. Wheat yield ranged from 45 to 56 bu/A and no treatment differed statistically from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Wild oat control and wheat yield with wild oat and broadleaf herbicide combinations.

Treatment[1]	Rate	AVEFA control	Wheat yield
	lb/A	%	bu/A
Diclofop	1.0	90	53
Imazamethabenz + NIS	0.47	43	45
Difenzoquat + NIS	1.0	65	46
Tralkoxydim + ammonium sulfate	0.18 + 1.5	88	51
Fenoxaprop/2,4-D/MCPA	0.58	100	56
Fenoxaprop[2]	0.096	100	52
Fenoxaprop[2] + thifen/triben + bromoxynil	0.096 + 0.019 + 0.25	95	52
Fenoxaprop[2] + bromoxynil/MCPA	0.096 + 0.75	95	54
Fenoxaprop[2] + thifen/triben + MCPA ester + NIS	0.096 + 0.019 0.350	98	52
Diclofop + thifen/triben + bromoxynil + NIS	1.0 + 0.019 0.25	89	50
Fenox/2,4-D/MCPA + bromoxynil	0.58 + 0.25	98	51
Imazamethabenz + difenzoquat + bromoxynil/MCPA + NIS	0.023 + 0.50 0.75	40	46
Prosulfuron + NIS	0.018	0	45
Prosulfuron + diclofop + NIS	0.018 + 1.0	90	49
Prosulfuron + imazamethabenz + NIS	0.018 + 0.47	33	48
Prosulfuron + difenzoquat + NIS	0.018 + 1.0	58	51
Prosulfuron + tralkoxydim + ammonium sulfate	0.018 + 0.18 1.5	81	51
Prosulfuron + fenox/2,4-D/MCPA + NIS	0.018 + 0.58	98	51
Prosulfuron + fenoxaprop[2] + NIS	0.018 + 0.096	99	54
Untreated check	------	---	49
	LSD (0.05)	13	8
	Density (plants/ft^2)	9	

[1] NIS is 90% nonionic surfactant applied at 0.25% v/v. Tralkoxydim treatments applied with TF8035 at 0.50% v/v. Thifen/triben is the commercial formulation of thifensulfuron/tribenuron, and fenox is fenoxaprop.
[2] Fenoxaprop treatments applied as the commercial formulation with a chemical safener (Puma), unless mixed with 2,4-D/MCPA (Tiller).

Quackgrass and wild oat control in winter wheat with MON 37500 in combination with fenoxaprop/2,4-D/MCPA. Suzy M. Sanders, Terry L. Neider, and Donald C. Thill. A study was established during spring 1996 near Bonners Ferry, Idaho to evaluate the response of quackgrass (AGRRE) and wild oat (AVEFA) to varying rates of MON 37500 in combination with fenoxaprop/2,4-D/MCPA. Winter wheat (var. Promontory) was seeded on October 9, 1995 in a loam soil (38% sand, 48% silt, 14% clay) with a pH of 7.6 and 2.9% organic matter. The experiment was arranged as a split plot design. Four replications of MON 37500 at 0.008, 0.016, and 0.032 lb/A plus an untreated check were the main plot treatments, and fenoxaprop/2,4-D/MCPA at 0.58 lb/A was the subplot. Herbicide treatments were applied postemergence on May 8, 1996 (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi. Control was evaluated visually on May 17 and July 16, 1996. Winter wheat was harvested at maturity with a small plot combine on August 21, 1996.

Table 1. Application data.

	May 8, 1996
Crop stage	4 to 5 lf/1 to 2 tilller
Weed stage	
Wild oat (AVEFA)	12 lf/2 to 4 tiller
Quackgrass (AGRRE)	7 lf/3 to 4 tiller
Air temp (F)	48
Relative humidity (%)	76
Wind (mph)	Calm
Cloud cover (%)	80
Soil temp at 2 in. (F)	40

MON 37500, applied at 0.016 and 0.032 lb/A controlled quackgrass 78 to 90% (Table 2). Wild oat control with MON 37500 ranged from 33 to 78% and was dose dependent. Fenoxaprop/2,4-D/MCPA controlled wild oat 95%, but did not control quackgrass. Wild oat control with fenoxaprop/2,4-D/MCPA was reduced 15 to 40% when it was mixed with MON 37500, indicating possible antagonism. The herbicide combination with the lowest rate of MON 37500 (0.008 lb/A) controlled wild oat 33%. Control increased to 55% with MON 37500 at 0.016 lb/A and was 80% with MON 37500 at 0.032 lb/A. The increase in wild oat control likely resulted from the increased rate of MON 37500. Wheat yield was highest (83 bu/A) in plots treated with the highest rate of MON 37500 (0.032 lb/A) plus fenoxaprop/2,4-D/MCPA. This treatment controlled quackgrass 88% and wild oat 80%. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Quackgrass and wild oat control and winter wheat yield.

Treatment[1,2]	Rate	Weed control AGRRE	AVEFA	Wheat yield
	lb ai/A	---------------%---------------		bu/A
MON 37500 + Fenox/2,4-D/MCPA + NIS 90%	0.008 + 0.58	63	53	81
MON 37500 + NIS 90%	0.008	70	33	78
MON 37500 + Fenox/2,4-D/MCPA + NIS 90%	0.016 + 0.58	78	55	80
MON 37500 + NIS 90%	0.016	80	45	81
MON 37500 + Fenox/2,4-D/MCPA + NIS 90%	0.032 + 0.58	88	80	83
MON 37500 + NIS 90%	0.032	90	78	80
Fenox/2,4-D/MCPA	0.58	0	95	76
Untreated Check	--	0	0	66
LSD (0.05)		14	22	8

[1] NIS = non ionic surfactant added at 0.5% v/v

[2] Fenoxaprop/2,4-D/MCPA applied as a commercially mixed formula

Crop injury, weed control, and grain yield with Mon37500 and other herbicides in winter wheat. Sandra L. Shinn, Terry L. Neider, and Donald C. Thill. Studies were established near Tammany, Idaho and Uniontown, Washington in winter wheat to evaluate crop injury, weed control, and grain yield with different herbicide doses and application times. Near Tammany, 'Promontory' winter wheat was seeded on November 18, 1995 in a silt loam soil (32% sand, 52% silt, 16% clay, 5.2% organic matter, and pH 5.1) Near Uniontown, 'Madsen' winter wheat was seeded on October 10, 1995 in a silt loam soil (34% sand, 56% silt, 10% clay, 3.8% organic matter, and pH 5.8). At both sites, the experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 ft. Herbicides were applied postemergence at three and four application times at the Tammany and Uniontown sites, respectively, with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1 and 2). Crop and weed stage at application times are presented in Table 1 and 2. Winter wheat injury and weed control were evaluated visually May 29 and June 21, 1996 at Uniontown and Tammany, respectively. Winter wheat was harvested at maturity with a small plot combine from a 4.1 by 27 ft area on August 6 at Tammany and on August 19, 1996 at Uniontown.

Table 1. Application data at Tammany, Idaho.

	Tammany, Idaho		
	12/20/95	3/20/96	4/24/96
Winter wheat	1 to 2 leaf	3 to 4 leaf/1 tiller	4 to 5 leaf/1 tiller
Brome sp.	1 to 2 leaf	2 to 3 leaf	2 to 3 tiller
Wild oat (AVEFA)	--	--	1 to 2 leaf
Catchweed bedstraw (GALAP)	--	--	1 to 2 inches tall
Air temperature (F)	33	52	62
Relative humidity (%)	93	68	66
Wind (mph)	0 to 1	0 to 2	2 to 6
Cloud cover (%)	100	100	100
Soil temp at 2 in. (F)	30	42	46

Table 2. Application data at Uniontown, Washington.

	Uniontown, Washington			
	11/10/95	12/20/95	3/20/96	4/17/96
Winter wheat	1 to 2 leaf	2 to 3 leaf	3 to 4 leaf / 1 to 2 tiller	4 to 5 leaf / 3 to 4 tiller
Brome sp.	1 leaf	1 to 2 leaf	3 to 4 leaf	3 to 4 tiller
Catchweed bedstraw (GALAP)	--	--	--	2 to 4 inches tall
Field pennycress (THLAR)	--	--	--	4 to 6 inches tall
Shepherd's purse (CAPBP)	--	--	--	2 to 4 inches tall
Mayweed chamomile (ANTCO)	--	--	--	1 to 2 inches diameter
Prickly lettuce (LACSE)	--	--	--	2 to 4 inches diameter
Henbit (LAMAM)	--	--	--	2 to 4 inches tall
Air temperature (F)	44	33	58	44
Relative humidity (%)	80	95	60	86
Wind (mph)	0 to 1	0	0 to 3	0
Cloud cover (%)	60	100	100	60
Soil temp at 2 in. (F)	32	30	42	50

Only data from the proposed use rate of Mon 37500 (0.031 lb/A) is discussed in the following narrative. Annual brome control at the Tammany site ranged from 63 to 70% when Mon 37500 was applied at the highest rate (Table 3). At the Uniontown location, downy brome control ranged from 70 to 91% when Mon 37500 was applied at the highest rate (Table 4). Mon 37500 did not control wild oat effectively. Mon 37500 at 0.031 lb/A controlled catchweed bedstraw 70 to 90% at the Uniontown site, while control at the Tammany location was 53% or less. Field pennycress, shepherd's purse, henbit, and mayweed chamomile control ranged from 73 to 98% when Mon 37500 was applied at 0.031 lb/A. Control of prickly lettuce with Mon 37500 was variable. No herbicide treatment injured wheat at either location (data not shown). Grain yield was greatest in plots treated with Mon 37500 at 0.031 applied in March and April at the Tammany site and applied in November and December at the Uniontown site.

Table 3. Wheat yield and weed control with Mon 37500, and thifensulfuron/tribenuron combinations at Tammany.

Treatment	Rate	Timing	Weed control			Wheat yield
			Brome sp[2]	AVEFA	GALAP	
	lb/A		--%--			bu/A
Mon 37500	0.016	12/20/95	40	8	5	63
Mon 37500	0.023	12/20/95	65	8	5	71
Mon 37500	0.031	12/20/95	70	10	3	69
Mon 37500	0.016	3/20/96	45	13	20	70
Mon 37500	0.023	3/20/96	63	13	48	72
Mon 37500	0.031	3/20/96	70	25	53	76
Mon 37500	0.016	4/24/96	35	23	23	78
Mon 37500	0.023	4/24/96	53	48	58	73
Mon 37500	0.031	4/24/96	63	48	50	76
Thifen/triben + diclofop	0.019 + 1.0	4/24/96	0	83	5	73
Thifen/triben + diclofop + bromoxynil	0.019 + 1.0 + 0.125	4/24/96	0	80	63	72
Thifen/triben + diclofop + F8426	0.014 + 1.0 + 0.023	4/24/96	0	83	70	73
Metribuzin	0.25	4/24/96	15	0	0	64
Untreated check	--	--	--	--	--	65
LSD (0.05)	--	--	16	25	26	10
Plants/ft²	--	--	2	4	1	---

[1] All Mon 37500 treatments were applied with a 90% nonionic surfactant at 0.5% v/v, thifensulfuron/tribenuron treatments at 0.25% v/v.
Trifen/triben = a commercial formulation of thifensulfuron + tribenuron.
[2] Mixture of poverty and downy brome.

Table 4. Weed control with Mon 37500, and thifensulfuron/tribenuron combinations at Uniontown.

Treatment[1]	Rate	Timing	Weed Control							Wheat yield
			Brome sp[2]	GALAP	THLAR	CAPBP	LAMAM	LACSE	ANTCO	
	lb/A		--%--							bu/A
Mon37500	0.016	11/10/95	75	33	60	28	73	45	45	95
Mon37500	0.023	11/10/95	84	73	95	78	75	73	73	99
Mon37500	0.031	11/10/95	83	70	98	75	88	80	80	98
Mon37500	0.016	12/20/95	70	80	90	70	70	30	80	71
Mon37500	0.023	12/20/95	87	82	97	87	87	47	77	88
Mon37500	0.031	12/20/95	91	90	98	88	88	45	75	97
Mon37500	0.016	3/20/96	53	65	90	65	53	50	50	91
Mon37500	0.023	3/20/96	55	65	98	91	85	55	78	96
Mon37500	0.031	3/20/96	70	75	98	91	88	60	78	92
Metribuzin	0.25	3/20/96	45	18	95	23	90	48	15	90
Mon37500	0.016	3/20/96	73	65	93	88	75	33	73	86
Mon37500	0.023	4/17/96	84	70	95	83	88	35	70	81
Mon37500	0.031	4/17/96	88	83	95	90	88	35	73	90
Thifen/triben + Bromoxynil	0.019 0.25	4/17/96	0	57	97	87	77	80	90	85
Thifen/triben + Dicamba	0.019 0.094	4/17/96	33	73	98	93	87	87	92	86
Thifen/triben + F8426	0.014 0.023	4/17/96	0	27	93	93	87	90	27	86
Untreated check	--		--	--	--	--	--	--	--	79
LSD (0.05)			11	12	7	13	12	13	11	13
Plants/ft²			2	1	1	1	1	2	1	--

[1] All Mon 37500 treatments were applied with a 90% nonionic surfactant at 0.5% v/v and thifensulfuron/tribenuron (Thifen/triben) treatments at 0.25% v/v.
[2] Downy brome

Volunteer barley control in winter wheat with Mon 37500. Sandra L. Shinn and Donald C. Thill. A study was established in a winter wheat field near Ewartsville, Washington to evaluate Mon 37500 for 'Steptoe' volunteer barley control. 'Madsen' winter wheat was seeded in a silt loam soil having 25.6% sand, 60.0% silt, 14.4% clay, pH 5.9 and 3.25% organic matter. The experimental design was a randomized complete block with four replications and individual plots were 8 by 27 ft. Herbicide treatments were applied postemergence at two application times, March 27 and April 25, 1996 (Table 1), with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi. Winter wheat injury and volunteer barley control were evaluated visually on April 25 and May 28, 1996 (Table 2). Volunteer barley plants were collected from a 2.68 ft^2 area, counted, dried and weighed on May 31, 1996. Winter wheat was harvested at maturity with a small plot combine from a 4.1 by 27 ft area on August 15, 1996.

Table 1. Application data

	March 27, 1996	April 25, 1996
Timing	early spring (ES)	spring (S)
Crop stage	4 to 5 leaf; 2 to 4 tiller	4 tiller; starting to joint
Weed stage	2 to 3 leaf; 4 to 5 tiller	starting to joint
Density (plants/ft^2)	10 wheat / 3 barley	10 wheat / 3 barley
Air temp (F)	50	44
Relative humidity (%)	73	89
Wind (mph)	4	2
Cloud cover (%)	90	90
Soil temp at 2 in. (F)	40	45

Volunteer 'Steptoe' barley plants were chlorotic and showed moderate winter injury symptoms on March 27, the first application time. Barley plants were green and growing actively on April 25. All Mon 37500 rates controlled volunteer barley 98% or better at both application times (Table 2). Diclofop alone and in combination with silicone surfactant did not control the volunteer barley. Fenoxaprop/2,4-D/MCPA alone and in combination with silicone surfactant controlled the volunteer barley 64 to 75% when applied early and 86 to 97% when applied later. Fenoxaprop/2,4-D/MCPA with and without the silicone surfactant caused 10% stunting and 15% chlorosis on April 25. However, on May 28 the stunting was 3% and there was no signs of chlorosis. Volunteer barley plant density ranged from 0 to 0.19 plants/ft^2 in Mon 37500 treatments compared to the untreated check which had 7.2 plants/ft^2. Grain yield in all Mon 37500 treatments ranged from 134 to 138 bu/A compared to the untreated check which was 128 bu/A. Dockage and test weights will be determined later. This study will be repeated in 1997. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Winter wheat response and yield and volunteer barley densities and control from herbicide applications.

			April 25, 1996			May 28, 1996					
			Wheat		Barley	Wheat		Barley	Barley		Wheat
Treatment[1]	Rate	Timing	stunting	chlorosis	control	stunting	chlorosis	control	density	biomass	yield[2]
	lb/A		----------	----------	----------	%	----------	----------	plants/ft^2	oz/ft^2	bu/A
Diclofop	1.0	ES	0	0	0	0	0	0	6.10	0.83	140.4
Diclofop + SS	1.0	ES	0	0	0	3	0	0	5.00	0.79	131.8
Fenoxaprop/2,4D /MCPA	0.59	ES	10	15	98	3	0	75	0.74	0.16	131.0
Fenoxaprop/2,4D /MCPA + SS	0.59	ES	10	15	100	3	0	64	1.30	0.46	135.0
Mon 37500	0.016	ES	0	0	98	0	0	98	0.11	0.02	135.8
Mon 37500	0.023	ES	0	0	100	0	0	98	0.19	0.00	133.7
Mon 37500	0.031	ES	0	0	100	0	0	100	0.11	0.00	136.9
Diclofop	1.0	S	--	--	--	0	0	0	5.39	1.20	134.6
Diclofop + SS	1.0	S	--	--	--	0	0	0	4.09	1.20	130.1
Fenoxaprop/2,4D /MCPA	0.59	S	--	--	--	0	0	97	0.37	0.10	130.1
Fenoxaprop/2,4D /MCPA + SS	0.59	S	--	--	--	0	0	86	2.16	0.37	133.6
Mon 37500	0.016	S	--	--	--	0	0	100	0.0	0.00	135.0
Mon 37500	0.023	S	--	--	--	0	0	100	0.0	0.02	133.7
Mon 37500	0.031	S	--	--	--	0	0	100	0.0	0.00	137.5
Untreated check	--	--	0	0	0	0	0	0	7.18	1.36	128.4
LSD (0.50)	--	--	0	0	3.4	3.2	0	10.2	2.69	0.46	7.5

[1] SS = silicone surfactant (Sylgard) at 0.25% v/v, and all Mon 37500 treatments were applied with a non-ionic surfactant (R11) at 0.5% v/v.
[2] The grain yield was determined with uncleaned samples.

Mon 37500 winter wheat plant-back studies with canola, pea, lentil, and barley. Sandra L. Shinn, Donald C. Thill, and Dan A. Ball. Studies were established in winter wheat near Endicott, Washington; Moscow, Idaho; and Pendleton, Oregon to evaluate Mon 37500 injury to rotational crops that will be planted during spring 1997. 'Madsen' winter wheat was seeded near Moscow on October 9, 1995 in a loam soil with a pH of 5.4, 47.2% sand, 10.8% clay, 42% silt, and 2.60% organic matter. 'Stephens' winter wheat was seeded near Pendleton on October 5, 1995 in a silt loam with a pH of 6.1, 19.2% sand, 16.8% clay, 64% silt, and 2.04% organic matter. A winter wheat mixture of 'Madsen/Rod/Hill 81' was seeded near Endicott on October 28, 1995 in a silt loam with a pH of 5.4, 29.2% sand, 4.8% clay, 66% silt, and 2.75% organic matter. The experimental design was a randomized complete block with four replications. Individual plots were 20 by 64 ft in Moscow and Endicott, and 15 by 30 ft in Pendleton. Herbicide treatments were applied postemergence at two application times: on November 2, 1995 and March 19, 1996 at Pendleton; November 21, 1995 and March 19, 1996 at Endicott; and December 5, 1995 and April 19, 1996 at Moscow with a CO_2 pressurized backpack sprayer delivering 10 gpa at 40 psi at Moscow and Endicott, and 12.5 gpa at 30 psi at Pendleton (Table 1). Mayweed chamomile (ANTCO) at Endicott (April 9, and May 2, 1996) and pineappleweed (MATMA) at Moscow (April 29, 1996) were counted in a 2.68 ft^2 area. Winter wheat was harvested at maturity with a small plot combine from a 4.1 by 64 ft area at Moscow and Endicott, and a 5 by 25 ft area at Pendleton (Table 3). Barley, pea, lentil and canola will be planted at Moscow and Endicott, and at Pendleton, pea, barley and canola will be planted as rotation crops in the spring of 1997.

Table 1. Application data

	Endicott		Moscow		Pendleton	
	Nov 21, 1995	Mar 19, 1996	Dec 5, 1995	Apr 19, 1996	Nov 2, 1995	Mar 19, 1996
Timing	Fall	Spring	Fall	Spring	Fall	Spring
Crop stage	3 leaf	5 leaf 3 to 4 tiller	2 leaf	4 leaf 3 tiller	2 to 2.5 leaf	6.5 to 7.5leaf 8 tiller
Air temp (F)	34	57	30	60	43	56
Rel humidity (%)	92	70	84	65	--	76
Wind (mph)	0	4	0 to 2	0 to 5	0	2 to 4
Cloud cover (%)	100	80	90	0	0	0
Soil temp at 2 in.(F)	32	40	29	38	--	--

Mayweed chamomile averaged 1 to 2 plants/ft^2 in the plots treated with Mon 37500, compared to the triasulfuron and the untreated check which had 4 to 5 plants/ft^2 at Endicott. Mon 37500 reduced the number of mayweed chamomile plants by approximately 50%. Visually, Mon 37500 controlled mayweed 65 to 94 %. Henbit and jointed goatgrass plants were present at the Endicott site, although the populations densities were low and control did not differ among treatments compared to the untreated check. At harvest time, plots in replication one had a heavy infestation of jointed goatgrass, and plots in replication three had a heavy infestation of Canada thistle. The two species were evenly distributed throughout the plots and treatments appeared not to affect growth of either species. There was no jointed goatgrass or Canada thistle in other plots. At Pendelton, the winter wheat was weed free throughout the experiment. Plant lodging ranged from 0 to 25% on individual plots, although lodging did not effect yield. At the Moscow location, fall applied triasulfuron controlled pineappleweed while, there were 0.7 to 3 plants/ft^2 in the Mon 37500 and untreated check plots. Herbicide treatments did not injure the crop and grain yield differed little among treatments at all locations. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Wheat yield at Endicott, Moscow, and Pendleton and pineappleweed and mayweed chamomile plant counts and control.

						ANTCO		MATMA
						Endicott		Moscow
			Yield					
Treatment[1]	Rate	Timing	Moscow	Endicott	Pendleton	Apr 9, 1996	May 2, 1996	Apr 29, 1996
	lb/A		----------------	bu/A	----------------	---%---	----------plants/ft^2	------------
Mon 37500	0.016	Fall	94.7	85.7	117.5	75	2	1
Mon 37500	0.032	Fall	103.6	90.8	115.7	83	2	0.7
Mon 37500	0.064	Fall	95.4	85.5	114.6	94	1	3
Triasulfuron	0.016	Fall	93.6	91.5	113.9	53	4	0
Mon 37500	0.016	Spring	97.5	89.4	113.4	65	2	2
Mon 37500	0.032	Spring	101.7	83.8	112.7	68	2	1
Mon 37500	0.064	Spring	96.1	83.9	111.8	84	2	2
Triasulfuron	0.016	Spring	98.1	87.8	110.8	30	5	3
Untreated check	--	--	94.2	80.6	109.6	0	4	3
LSD (0.50)	--	--	10.8	10.7	11.3	29	5	2

[1] All treatments were applied with a non-ionic surfactant (R11) at 0.5% v/v with the Mon 37500, and 0.25% v/v with triasulfuron.

Downy brome control in winter wheat with Mon 37500. Sandra L. Shinn and Donald C. Thill. A study was established near Endicott Washington to evaluate downy brome control in winter wheat with MON 37500. 'Madsen' winter wheat was planted on September 15, 1995 in a silt loam soil with a pH of 5.7, 27.2% sand, 4.8% clay, 68% silt and 2.75% organic matter. The experimental design was a randomized complete block with four replications and individual plots were 20 by 64 ft. Herbicide treatments were applied postemergence at two application times, November 1, 1995 and March 19, 1996, with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 32 psi (Table 1). Winter wheat and downy brome (BROTE) plants were counted and evaluated visually on February 15 and 22, and on May 2, 1996. Jointed goatgrass (AEGCY) and downy brome plants were counted and harvested from a 5.3 ft^2 area, dried for 48, hours and weighed. Winter wheat was harvested at maturity on July 25, 1995 with a small plot combine from a 4.1 by 61.5 ft area.

Table 1. Application data

	Endicott	
	Nov 1, 1995	Mar 19, 1996
Timing	Fall	Spring
Crop stage	3 to 4 leaf / 1 to 2 tiller	8 to 9 tillers / jointed
Weed stage	1 to 2 leaf	15 to 36 leaf
Density plants/ft^2	15 wheat / 27 brome	19 brome
Air temperature (F)	28	50
Relative humidity (%)	76	76
Wind (mph)	0	5
Cloud cover (%)	0	100
Soil temperature at 2 in. (F)	30	40

In February, fall applied Mon 37500 had controlled downy brome 88 to 98% and had reduced downy brome to 0.7 to 3 plants/ft^2 compared to the untreated check which had 13 plants/ft^2 Table 2). On May 30, 1996, the Mon 37500 fall and spring treatments had 4 to 11 and 14 to 36 plants/ft^2 of downy brome respectively, compared to the untreated check which had 51 plants/ft^2. Jointed goatgrass densities ranged from 2 to 10 plants/ft^2 in Mon 37500 treatments at both application timings, compared to the untreated check which had 16 plants/ft^2. Jointed goatgrass was not present in replications three and four, so average plant counts are from replications one and two. Wheat grain yield from herbicide treated plots ranged from 104 to 111 bu/A and was not different from the untreated check (Table 3). This study will be repeated in 1997. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Winter wheat, downy brome, and jointed goatgrass plant densities and control after herbicide treatment.

			Plant densities				Weed control	
			Feb 15, 1996		May 30, 1996		Feb 22, 1996	May 2, 1996
Treatment[1]	Rate	Timing	BROTE	Wheat	BROTE	AEGCY	BROTE	
			plants/ft^2				(%)	
Mon 37500	0.016	Fall	3	7	11	7	88	91
Mon 37500	0.032	Fall	2	6	5	6	93	93
Mon 37500	0.064	Fall	0.7	6	4	3	98	93
Triasulfuron	0.016	Fall	6	5	18	10	54	64
Mon 37500	0.016	Spring	--	5	36	10	--	40
Mon 37500	0.032	Spring	--	5	14	6	--	45
Mon 37500	0.064	Spring	--	5	32	2	--	45
Triasulfuron	0.016	Spring	--	5	49	9	--	8
Untreated check	--	--	13	5	51	16	0	0
LSD (0.50)	--	--	3	1	22	9	6	16

[1] All treatments were applied with a non-ionic surfactant (R11) at 0.50% v/v with the Mon 37500 and 0.25% v/v with the triasulfuron.

Table 3. Downy brome and jointed goatgrass dry weight and winter wheat yield.

			May 30, 1996		July 16, 1996
			BROTE	AEGCY	Wheat
Treatment[1]	Rate	Timing	biomass		yield
			oz/ft^2		bu/A
Mon 37500	0.016	Fall	0.06	0.05	107.1
Mon 37500	0.032	Fall	0.01	0.03	111.1
Mon 37500	0.064	Fall	0.01	0.02	106.5
Triasulfuron	0.016	Fall	0.14	0.06	100.9
Mon 37500	0.016	Spring	0.11	0.02	105.5
Mon 37500	0.032	Spring	0.12	0.03	106.6
Mon 37500	0.064	Spring	0.07	0.02	109.3
Triasulfuron	0.016	Spring	0.29	0.04	104.3
Untreated check	--	--	0.26	0.11	105.8
LSD (0.50)	--	--	0.12	0.07	16.5

Winter annual grass weed control in winter wheat with Mon 37500 and UI 96101. Sandra L. Shinn, Terry L. Neider, and Donald C. Thill. A study was established near Tammany, Idaho in winter wheat to evaluate different rates of UI 96101 and Mon 37500 at two crop stages for annual brome (BROTE) and wild oat (AVEFA) control. 'Promontory' winter wheat was seeded on November 18, 1995 in a silt loam soil (32% sand, 52% silt, 16% clay, 5.2 organic matter, and pH of 5.1). The experimental design was a randomized complete block with four replications, and individual plots were 8 by 30 ft. The treatments were applied with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (Table 1). Plant densities were ten wheat, two annual brome, and three wild oat plants/ft^2. Wheat injury was evaluated on March 20, May 30, and June 21,1996, and annual brome and wild oat control were evaluated on June 21, 1996. Winter wheat was harvested at maturity with a small plot combine from a 4.1 by 27 ft area on August 6, 1996.

Table 1. Application data.

	December 20, 1995	April 24, 1996
Wheat growth stage	1 to 2 leaf	4 to 5 leaf / 2 to 3 tiller
Brome growth stage	1 to 2 leaf	2 to 3 leaf
Wild oat growth stage	--	1 to 2 leaf
Air temperature (F)	33	62
Relative humidity (%)	93	66
Wind (mph)	0 to 1	2 to 6
Cloud cover (%)	100	100
Soil temperature at 2 in. (F)	30	46

No herbicide treatment injured winter wheat. Mon 37500 applied in December controlled annual brome 73 to 80%. However, control was 48 to 58% when it was applied in the spring. (Table 2). UI 96101 controlled the annual brome 60 to 78% at both application times. Wild oat was suppressed 3 to 40% with Mon 37500 and 0 to 60% with UI96101. Wheat yield from the herbicide treated plots ranged from 62 to 74 bu/A compared to the untreated check which was 64 bu/A. Wheat yield was not different among any treatment. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Wild oat and annual brome control and winter wheat yield with UI96101 and Mon 37500.

Treatment[1]	Rate	Application date	Weed control Brome[2]	Weed control AVEFA	Wheat yield
	lb/A		----------%----------		lb/A
Mon 37500	0.023	December	73	3	70
Mon 37500	0.031	December	80	3	68
UI 96101	0.027	December	60	0	72
UI 96101	0.040	December	65	18	70
Mon 37500	0.023	April	48	35	67
Mon 37500	0.031	April	58	40	69
UI 96101	0.027	April	74	53	73
UI 96101	0.040	April	78	60	74
Metribuzin	0.250	April	34	8	62
Untreated check	--	--	0	0	64
LSD (0.05)	--	--	11	27	14

[1] All Mon 37500 and UI 96101 treatments were applied with a 90% nonionic surfactant at 0.25% v/v.
[2] Mixture of poverty and downy brome.

Broadleaf weed control in winter wheat with sulfonylurea herbicide combinations. Michael J. Wille and Donald C. Thill. A study was established in Latah County, Idaho to compare the efficacy of different sulfonylurea herbicides alone and in combination for broadleaf weed control in winter wheat. 'Stevens' winter wheat was seeded on October 16, 1995 into a Palouse silt loam (24% sand, 60.% silt, 15% clay, pH 5.7, 4.0% organic matter). Volunteer lentil (LENCU), mayweed chamomile (ANTCO), field pennycress (THLAR), henbit (LAMAM), shepherd's-purse (CAPBP), and prickly lettuce (LACSE) were the primary weed species present. The experiment was designed as a randomized complete block with four replications. Each plot was 2.4 by 9.1 meters. Herbicide treatments were applied postemergence on April 25, 1996 with a CO_2 backpack sprayer delivering 93.5 l/ha at 213 kPa. Winter wheat was at the 6 leaf stage with 4 to 5 tillers, volunteer lentil was less than 3.8 cm tall, field pennycress and henbit were less that 7.6 cm tall, and mayweed chamomile and prickly lettuce rosettes were less than 7.6 cm in diameter at the time of application. Environmental conditions at application were as follows: air temperature 10 C, relative humidity 66% with dew present, wind 8.1 km/h, no cloud cover, soil temperature at 5 cm was 13 F. Winter wheat injury was evaluated visually at 7, 14, and 28 days after treatment (DAT). Above ground weed biomass was collected for each weed species from a 0.25 m^2 area of each plot at winter wheat heading on June 21, 1996. Winter wheat was harvested at maturity on August 16, 1996.

Metsulfuron at 0.0084 kg/ha injured wheat 10% 7 DAT, while both metsulfuron treatments injured winter wheat 6 and 15%, for the lower and higher rates, respectively, 14 DAT (data not shown). This delayed response likely was due to a week of very cool weather immediately following application. Wheat treated with the lower metsulfuron rate recovered by 28 DAT. Wheat injury with the higher rate was 9% 28 DAT. No other treatments injured winter wheat. At winter wheat heading, above ground biomass of volunteer lentil was significantly reduced by all herbicide treatments compared to the control, but herbicide treatments did not differ from each other (Table). All treatments reduced mayweed chamomile biomass compared to the control. Mayweed chamomile biomass was reduced 72% by thifensulfuron/tribenuron + dicamba (0.0078 + 0.1043 kg/ha) and greater than 88% by all other treatments. Herbicide treatments reduced shepherd's-purse biomass 74 to 100% compared to the control and these treatments did not differ from each other. Henbit biomass was equal to or greater than the control. The population of prickly lettuce was negligible at sampling time. Grain yields for all treatments ranged from 7999 to 8912 kg/ha and did not differ from the control, except for the prosulfuron + bromoxynil treatment. Grain yield was greatest for this treatment. The group means of prosulfuron alone or in combination did not differ from that of thifensulfuron/tribenuron alone or in combination with respect to injury, weed biomass, or grain yield. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Winter wheat response and weed biomass from herbicide treatments, Latah county, ID.

		Weed biomass at winter wheat heading				Grain
Treatment[1]	Rate	LENCU	ANTCO	LAMAM	CAPBP	yield
	kg/ha	g/m²				kg/ha
Metsulfuron	0.0043	1.2320	1.3440	0.4472	0.1392	8172
Metsulfuron	0.0084	1.2700	0.4732	0.4152	0.0000	7623
Thifen/triben	0.0211	1.6740	4.4012	2.4380	0.9540	7689
Tribenuron	0.0175	1.6632	6.8100	3.3492	1.2592	8405
Prosulfuron	0.0211	1.4620	0.2640	0.0980	0.1892	8423
Thifen/triben +	0.0211	0.5692	0.5592	0.5260	0.0000	8349
bromoxynil	0.2803					
Thifen/triben +	0.0078	0.2360	22.1452	1.2292	2.3920	8159
dicamba +	0.1043					
Thifen/triben +	0.1569	0.2340	9.0392	2.4372	1.2760	8270
dicamba	0.1043					
Prosulfuron +	0.0211	0.8160	0.0000	0.4432	0.0160	8912
bromoxynil	0.2803					
Prosulfuron +	0.0078	0.5712	8.7492	1.0432	3.6760	8054
dicamba	1.0425					
Prosulfuron +	0.2018	0.1220	0.1400	1.1132	0.3540	8463
dicamba	0.1043					
Thifen/triben +	0.0078	0.4252	0.3960	1.3108	0.3068	8071
dicamba +	0.1043					
bromoxynil	0.1401					
Thifen/triben +	0.0078	0.3340	2.2920	0.2692	0.3712	8381
dicamba +	0.1043					
bromoxynil	0.2803					
Prosulfuron +	0.0101	0.1800	0.4792	0.4632	0.8560	8545
dicamba +	0.1043					
bromoxynil	0.1401					
Prosulfuron +	0.0101	0.5400	0.1752	0.0232	0.1020	8411
dicamba +	0.1043					
bromoxynil	0.2803					
Control		12.2860	80.7080	0.5440	14.6772	7999
LSD (0.05)		1.8512	13.2264	2.6248	4.1132	697

[1] All treatments applied with a 90% non-ionic surfactant, 0.25% v/v.
Thifen/triben = commercial formulation of thifensulfuron + tribenuron.

Broadleaf weed control in spring wheat with sulfonylurea herbicide combinations. Michael J. Wille and Donald C. Thill. A study was established in Whitman County near Colfax, Washington to compare the efficacy of different sulfonylurea herbicides alone and in combination for broadleaf weed control in spring wheat. The experiment was designed as a randomized complete block with four replications. Each plot was 2.4 by 9.1 meters. Catchweed bedstraw (GALAP), wild buckwheat (POLCO), henbit (LAMAM), common lambsquarters (CHEAL), pinnate tansymustard (DEPSI), and solanum species (a mixture of black nightshade, hairy nightshade, and cutleaf nightshade) were the major weed species present. Herbicide treatments were applied postemergence to spring wheat (var. Hard Red 926) on May 20, 1996 with a CO_2 backpack sprayer delivering 93.5 l/ha at 213 kPa. Wheat had 3 to 4 leaves with 1 tiller, and weeds were in the cotyledon to 1 leaf stage. Environmental conditions at application were as follows: air temperature 8 C, relative humidity 90%, wind 5 km/h, 30% cloud cover, and soil temperature at 5 cm, 12 C. Spring wheat injury was evaluated visually at 7, 14 and 28 days after treatment (DAT), and catchweed bedstraw, henbit, common lambsquarters, and solanum species control was evaluated visually 28 DAT on June 17, 1996. Above ground biomass was collected for each species from a 0.25 m^2 area of each plot at wheat heading on June 21, 1996. Spring wheat was harvested at maturity on August 13, 1996.

Prosulfuron, alone or in combination with bromoxynil did not injure spring wheat (Table 1). Thifensulfuron/tribenuron injured wheat 24% and 13% at 7 and 14 DAT, respectively. Tribenuron injured wheat 26% 7 DAT, and 15% at 14 DAT. Metsulfuron at 0.0043 and 0.0084 kg/ha injured wheat 23 and 28% at 7 DAT, and 23 and 43% at 14 DAT, respectively. Only the wheat treated with metsulfuron continued to exhibit stunting 28 DAT. Wheat treated with metsulfuron at 0.0043 kg/ha recovered thereafter, but wheat treated with metsulfuron at 0.0084 kg/ha remained stunted throughout the growing season. Prosulfuron alone or in combination injured wheat significantly less than thifensulfuron alone or in combination with other herbicides at 7 and 14 DAT but did not differ at 28 DAT.

Prosulfuron alone, and both rates of metsulfuron controlled catchweed bedstraw less than 46% (Table 2). Thifensulfuron/tribenuron and tribenuron controlled catchweed bedstraw 73 to 80%. Thifensulfuron/tribenuron or prosulfuron in combination with bromoxynil controlled catchweed bedstraw greater than 90%. All herbicide treatments controlled henbit 74 to 95% and did not differ from each other. All treatments controlled Solanum ssp. greater than 90% except prosulfuron alone and metsulfuron at 0.0043 kg/ha which controlled Solanum ssp. 46 and 69%, respectively. All treatments controlled common lambsquarters greater than 83% except metsulfuron at 0.0043 kg/ha which controlled common lambsquarters 64%. Wild buckwheat and pinnate tansymustard were not present in sufficient number to evaluate 28 DAT. All herbicide treatments reduced biomass of Solanum ssp. by greater than 90% except prosulfuron which reduced biomass by 54% (Table 3). Biomass of henbit and common lambsquarters did not differ from the control. Catchweed biomass was reduced most by thifensulfuron/tribenuron alone, thifensulfuron/tribenuron plus bromoxynil, and prosulfuron plus bromoxynil. However, no statistical differences could be demonstrated between the control and the other treatments because catchweed bedstraw plant density throughout the study site was highly variable. Grain yield was greatest in plots treated with thifensulfuron/tribenuron or prosulfuron in combination with bromoxynil (Table 2).

Table 1. Winter wheat injury from herbicide treatments, Whitman County, WA

Treatment[1]	Rate	Crop injury[2]		
		7 DAT[3]	14 DAT	28 DAT
	kg/ha	-------	%	-------
Metsulfuron	0.0043	23	23	13
Metsulfuron	0.0084	28	43	8
Tribenuron	0.0175	26	15	0
Thifen/triben	0.0211	24	13	0
Prosulfuron	0.0211	5	0	0
Thifen/triben + bromoxynil	0.0211 0.28	18	5	0
Prosulfuron + bromoxynil	0.0211 0.28	5	0	0
Control	0.0000	--	--	--
LSD (0.05)		8	7	8

[1] All treatments applied with a 90% non-ionic surfactant, 0.25% v/v.
Thifen/triben = commercial formulation of thifensulfuron + tribenuron.
[2] Crop injury: stunting and chlorosis
[3] DAT = Days after treatment

Table 2. Weed control from herbicide treatments, Whitman, County, WA.

Treatment[1]	Rate	Weed control 28 DAT				Grain yield
		GALAP	LAMAM	CHEAL	Solanum[2]	
	kg/ha	------	%	------	------	kg/ha
Metsulfuron	0.0043	38	74	64	69	4585
Metsulfuron	0.0084	33	95	94	92	4597
Tribenuron	0.0175	73	80	95	96	5159
Thifen/triben	0.0211	80	80	84	94	5961
Prosulfuron	0.0211	45	85	85	46	6166
Thifen/triben + bromoxynil	0.0211 0.2803	95	95	93	97	6620
Prosulfuron + bromoxynil	0.0211 0.2803	90	92	95	97	6534
Control	0.0000	–	–	–	–	5006
LSD (0.05)		17	NS	NS	28	1255

[1] All treatments applied with a 90% non-ionic surfactant, 0.25% v/v.
Thifen/triben = commercial formulation of thifensulfuron + tribenuron.
[2] Solanum spp.= SOLNI, SOLSA, SOLTR.

Table 3. Weed biomass from herbicide treatments, Whitman County, WA.

Treatment[1]	Rate	Weed biomass at heading			
		GALAP	LAMAM	CHEAL	Solanum[2]
	kg/ha	------	g/m^2	------	------
Metsulfuron	0.0043	146.20	0.00	0.96	11.04
Metsulfuron	0.0084	274.30	0.05	0.00	0.86
Tribenuron	0.0175	59.76	1.06	0.00	0.06
Thifen/triben	0.0211	31.45	1.75	0.00	6.30
Prosulfuron	0.0211	159.79	1.80	0.36	53.91
Thifen/triben + bromoxynil	0.0211 0.2803	6.88	2.26	0.00	0.05
Prosulfuron + bromoxynil	0.0211 0.2803	23.78	0.94	0.00	0.08
Control	0.0000	273.10	1.81	5.25	117.28
LSD (0.05)		NS	NS	NS	76.02

[1] All treatments applied with a 90% non-ionic surfactant, 0.25% v/v.
Thifen/triben = commercial formulation of thifensulfuron + tribenuron.
[2] Solanum spp.= SOLNI, SOLSA, SOLTR.

Comparison of several adjuvants with BAS 589 03H for field bindweed control in fallow. Terry L. Neider and Donald C. Thill. A study was established near Lewiston, ID to evaluate field bindweed control in fallow with several different BAS 589 03H-adjuvant combinations. The experimental design was a randomized complete block with four replications, and individual plots were 8 by 23 ft. Herbicide treatments were applied postemergence on June 5, 1996 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 30 psi (air temperature 65 F, relative humidity 58%, wind 0 to 2 mph, clear sky, and soil temperature 62 F) to 8 inch standing wheat stubble and field bindweed with 6 to 8 inch runners. The soil was a silt loam (24% sand, 62% silt, 14% clay, pH 5.6 and 2.3% organic matter). Field bindweed control was evaluated visually July 10, and August 28, 1996.

Field bindweed control was similar between BAS 589 03H treatments for the duration of the study, and ranged from 88 to 93% on July 10 and 71 to 81% on August 28, 1996 (Table). (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Field bindweed control with BAS 589 03H and adjuvant combinations near Lewiston, ID.

Treatment[1]	Rate	Field bindweed control	
		7/10/96	8/28/96
	lb/A	------ %	------
BAS 589 03H + BCH 880 01S	1.25 + 0.94	90	81
BAS 589 03H + BCH 904 70S	1.25 + 0.63	85	71
BAS 589 03H + BCH 064 00S	1.25 + 1.25	89	73
BAS 589 03H + BCH 904 07S	1.25 + 1.0	90	75
BAS 589 03H + BCH 904 08S	1.25 + 1.0	93	73
BAS 589 03H + BCH 904 09S	1.25	91	74
Glyphosate/2,4-D	1.0	88	68
ANOVA (0.05)	.	NS	NS
Density ($plants/ft^2$)		8	

[1] BCH numbered compounds are adjuvants and were applied as %v/v. Glyphosate/2,4-D was applied with ammonium sulfate at 17 lb/100 gal of carrier.

PRE and POST treatments in sunflower. Richard K. Zollinger. An experiment was conducted to evaluate sunflower response and weed control from several non-labeled herbicides applied PRE, PRE followed by POST and POST treatments in sunflower. 'Interstate 3311' sunflower was seeded May 29 and PRE treatments were applied May 29, 1996 at 2:00 pm with 83 F air, 60 F soil at 4 inches, 40% RH, 5% clouds, and 5 to 9 mph wind. Imazamethabenz and clethodim were applied June 29, 1996 at 12:00 noon with 85 F air, 94 F soil at soil surface, 80% RH, 80% clouds and 3 to 7 mph wind to 6 to 10 leaf and 2 to 7 inch sunflower, 2 to 5 inch green and yellow foxtail and 4 to 10 inch tall rosette to bolt wild mustard.

Treatments were applied to an 8 ft wide area the length of 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 four replicates per treatment.

Table. PRE and POST treatments in sunflower, 1996.

		July 3					July 22				
Treatment[a]	Rate	Snfl	SETLU	SINAR	AMARE	CHEAL	Snfl	SETLU	SINAR	AMARE	CHEAL
	lb ai/A	% inj	---------- % control ----------				% inj	----------- % control ------------			
PRE											
Pendimethalin	1.5	0	81	59	78	79	0	45	50	30	20
Dimethenamid	1.5	0	81	38	79	63	0	48	55	28	28
Acetochlor	2.9	2	90	55	86	68	0	50	79	55	45
Sulfentrazone	0.25	2	66	45	79	76	0	30	40	68	59
Sulfentrazone	0.375	1	83	48	91	88	0	48	99	70	61
Dimeth + pend	1.25 + 1.5	0	89	56	81	82	0	50	38	40	33
Acet + pend	2.9 + 1.5	5	90	53	89	80	0	59	81	74	69
Sulf + pend	0.25 + 1.5	0	84	50	83	78	0	43	62	43	36
PRE fb POST											
Sulf/Clet + PO	0.25/0.094	3	96	25	91	86	0	99	0	58	53
Sulf/Clet + PO	0.25/0.125	1	96	25	82	77	5	99	45	53	43
POST											
Clet + Imaz	0.094 + 0.25	26	92	99	10	6	18	99	99	38	28
Untreated		0	0	0	0	0	0	0	0	0	0
LSD (0.05)		4	9	18	13	18	7	17	21	18	18
C.V.		31	8	28	13	18	17	21	32	32	38

[a]Dimeth = dimethenamid, pend = pendimethalin, acet = acetochlor (microencapsulated formulation), sulf = sulfentrazone, clet = clethodim, imaz = imazamethabenz, PO = petroleum oil. Herbimax was used as petroleum oil (PO) at 1% v/v, Snfl = sunflower.

The study had a high infestation ofredroot pigweed, green and yellow foxtail and a medium infestation of common lambsquarters and wild mustard. Less than 1 inch of precipitation occurred during the first 3 weeks after application which explains, in part, more limited control of foxtail, redroot pigweed and common lambsquarters than would expected with PRE herbicides activated through precipitation. Excellent sunflower safety was observed with all treatments except the treatment containing Assert. Assert was applied during very hot and humid conditions which contributed to stunting and yellowing observed at evaluation. Department of Plant Sciences, North Dakota State University, Fargo, ND 58105-5051.

PROJECT 4

TEACHING AND TECHNOLOGY TRANSFER

RICHARD LEE, CHAIR

1996 weed identifications for county extension and weed control programs in Idaho. Timothy W. Miller, Robert H. Callihan, and Don W. Morishita. The extension weed identification program at the University of Idaho provides a service to those desiring authoritative identifications on plant specimens. The reasons people submit specimens vary from mild curiosity to a bona fide need by a property manager to control a species that is unknown. The data generated in this program are useful in determining educational needs as well as documenting changes in the Idaho weed flora. Information obtained in this program enable: (1) compiling of weed species present in Idaho, (2) determining distribution of weeds, (3) recording weed dispersal into new areas, (4) detecting new alien species (5) recognizing the season(s) that particular weed identification problems arise, (6) identifying education deficiencies to assist in planning programs for extension and regulatory personnel on weed identification, and (7) compiling of an available historical data base. This report serves the important function of advising research, extension, and regulatory personnel in Idaho, as well as other states, of weed distributions in Idaho that may significantly affect those states.

A total of 200 plants were submitted for identification or verification in the reporting period November 1, 1995 to October 31, 1996. One hundred ninety-three of these were from the state of Idaho, with seven submitted from other states. One hundred sixty-five of these data (listed below) are from identification requests submitted to weed identification personnel by county extension agents and county weed superintendents in the state of Idaho; thirty-five were from other sources. This list indicates species of interest that warrant development of educational material and instruction. In addition, many samples are submitted because of unusual circumstances (novelty, growth stage, specimen condition or specimen inadequacy) that call for specialist capabilities. Many of these are native species, some are crops, and some are ornamentals submitted by homeowners for curiosity rather than weed concerns. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho, 83844).

Identification	County	Date
Acer negundo , Aceraceae	Kootenai	June 21, 1996
Achillea millefolium , Asteraceae	Minidoka	April 01, 1996
Agropyron intermedium , Poaceae	Latah	August 22, 1996
Agropyron spicatum spicatum, Poaceae	Bingham	June 17, 1996
Agrostis stolonifera , Poaceae	Latah	July 22, 1996
Agrostis tenuis , Poaceae	Canyon	May 22, 1996
Agrostis tenuis , Poaceae	Kootenai	September 26, 1996
Alopecurus pratensis , Poaceae	Lewis	May 22, 1996
Alyssum desertorum , Brassicaceae	Bingham	May 13, 1996
Ambrosia trifida , Asteraceae	Kootenai	August 27, 1996
Anchusa officinalis , Boraginaceae	Bonner	July 09, 1996
Anthriscus caucalis , Apiaceae	Idaho	September 13, 1996
Apera interrupta , Poaceae	Lewis	July 15, 1996
Arrhenatherum elatius , Poaceae	Benewah	October 17, 1996
Astragalus lentiginosus , Fabaceae	Cassia	June 10, 1996
Astragalus purshii , Fabaceae	Twin Falls	May 02, 1996
Berteroa incana , Brassicaceae	Fremont	July 18, 1996
Bidens frondosa , Asteraceae	Twin Falls	August 27, 1996
Brodiaea hyacinthina , Liliaceae	Latah	July 09, 1996
Bromus commutatus , Poaceae	Lewis	July 15, 1996
Bromus tectorum , Poaceae	Lewis	May 28, 1996
Campanula glomerata , Campanulaceae	Kootenai	June 27, 1996
Cardamine pensylvanica , Brassicaceae	Boundary	October 17, 1996
Carduus nutans , Asteraceae	Idaho	June 17, 1996
Carthammus tinctorius , Asteraceae	Lewis	August 12, 1996
Centaurea nigra , Asteraceae	Bonner	July 08, 1996
Centaurea solstitialis , Asteraceae	Twin Falls	September 06, 1996
Cerastium vulgatum , Caryophyllaceae	Caribou	June 03, 1996
Cerastium vulgatum , Caryophyllaceae	Kootenai	May 08, 1996
Ceratophyllum demersum , Ceratophyllaceae	Kootenai	May 29, 1996
Chaenactis douglasii achilleaefolia, Asteraceae	Ada	June 06, 1996
Chenopodium rubrum , Chenopodiaceae	Twin Falls	September 26, 1996
Chorispora tenella , Brassicaceae	Twin Falls	April 23, 1996
Chrysothamnus viscidiflorus , Asteraceae	Twin Falls	August 12, 1996
Cicuta douglasii , Apiaceae	Bonneville	August 02, 1996
Cirsium neoexicanum utahense, Asteraceae	Gem	May 13, 1996
Cirsium vulgare , Asteraceae	Kootenai	July 23, 1996
Cleome serrulata , Capparidaceae	Minidoka	September 05, 1996
Collomia grandiflora , Polemoniaceae	Kootenai	July 18, 1996
Conyza canadensis , Asteraceae	Gooding	October 08, 1996
Crepis acuminata , Asteraceae	Bonneville	July 11, 1996
Crepis capillaris , Asteraceae	Latah	July 22, 1996
Crepis runcinata runcinata, Asteraceae	Kootenai	July 09, 1996
Danthonia unispicata , Poaceae	Idaho	June 21, 1996
Datura stramonium , Solanaceae	Jerome	September 13, 1996
Delphinium divaricatum , Ranunculaceae	Canyon	June 24, 1996
Deschampsia elongata , Poaceae	Idaho	July 08, 1996
Dianthus armeria , Caryophyllaceae	Kootenai	July 19, 1996
Disporum trachycarpum , Liliaceae	Kootenai	September 06, 1996
Draba verna verna, Brassicaceae	Idaho	April 18, 1996
Elaeagnus angustifolia , Elaeagnaceae	Minidoka	August 12, 1996
Elytrigia repens , Poaceae	Nez Perce	July 01, 1996
Epilobium minutum , Onagraceae	Idaho	April 18, 1996
Epilobium paniculatum paniculatum, Onagraceae	Kootenai	May 30, 1996
Eragrostis cilianensis , Poaceae	Twin Falls	July 18, 1996
Erigeron compositus compositus, Asteraceae	Nez Perce	May 02, 1996
Eriophyllum lanatum integrifolium, Asteraceae	Idaho	June 21, 1996
Erysimum asperum , Brassicaceae	Idaho	June 21, 1996

Euonymus fortunei , Celastraceae	Ada	April 15, 1996
Euphorbia glyptosperma , Euphorbiaceae	Twin Falls	September 09, 1996
Euphorbia peplus , Euphorbiaceae	Latah	October 08, 1996
Euphorbia serpyllifolia , Euphorbiaceae	Jerome	August 14, 1996
Fagopyrum esculentum , Polygonaceae	Payette	August 29, 1996
Galeopsis tetrahit , Lamiaceae	Benewah	August 19, 1996
Galium aparine , Rubiaceae	Washington	June 05, 1996
Glechoma hederaceae , Lamiaceae	Butte	September 13, 1996
Hesperis matronalis , Brassicaceae	Payette	May 17, 1996
Hibiscus trionum , Malvaceae	Gem	September 09, 1996
Hibiscus trionum , Malvaceae	Twin Falls	September 05, 1996
Howellia aquatilis , Campanulaceae	Kootenai	May 29, 1996
Knautia arvensis , Dipsacaceae	Custer	July 08, 1996
Knautia arvensis , Dipsacaceae	Lemhi	August 05, 1996
Lamium purpureum , Lamiaceae	Washington	April 17, 1996
Leonurus cardiaca , Lamiaceae	Oneida	July 26, 1996
Lithospermum ruderale , Boraginaceae	Idaho	July 08, 1996
Lolium multiflorum , Poaceae	Nez Perce	July 01, 1996
Lolium multiflorum , Poaceae	Bingham	August 12, 1996
Lycium halimifolium , Solanaceae	Ada	April 02, 1996
Lycium halmifolium , Solanaceae	Elmore	June 18, 1996
Lythrum salicaria , Lythraceae	Gem	July 12, 1996
Matricaria perforata , Asteraceae	Payette	June 10, 1996
Mentzelia albicaulis , Loasaceae	Custer	June 25, 1996
Mentzelia laevicaulis laevicaulis, Loasaceae	Jerome	September 23, 1996
Montia perfoliata , Portulacaceae	Minidoka	April 22, 1996
Myosotis arvensis , Boraginaceae	Gem	June 12, 1996
Myosotis micrantha , Boraginaceae	Idaho	April 18, 1996
Navarretia intertexta , Polemoniaceae	Kootenai	December 27, 95
Navarretia intertexta intertexta, Polemoniaceae	Bonner	August 29, 1996
Navarretia intertexta intertexta, Polemoniaceae	Lewis	August 27, 1996
Oenothera biennis , Onagraceae	Butte	August 20, 1996
Ornithogalum umbellatum , Liliaceae	Nez Perce	May 23, 1996
Oxalis corniculata , Oxalidaceae	Canyon	July 09, 1996
Pedicularis groenlandica , Scrophulariaceae	Bonneville	July 11, 1996
Physocarpus malvaceus , Rosaceae	Kootenai	August 14, 1996
Poa annua , Poaceae	Idaho	April 24, 1996
Poa annua , Poaceae	Bonneville	July 29, 1996
Poa pratensis , Poaceae	Canyon	February 21, 1996
Poa pratensis , Poaceae	Idaho	June 13, 1996
Polygonum cuspidatum , Polygonaceae	Payette	May 08, 1996
Populus trichocarpa , Salicaceae	Kootenai	October 08, 1996
Potentilla pensylvanica , Rosaceae	Minidoka	June 11, 1996
Prunus cerasifera , Rosaceae	Ada	April 08, 1996
Ranunculus macounii macounii, Ranunculaceae	Owyhee	May 13, 1996
Ranunculus repens , Ranunculaceae	Boundary	October 29, 1996
Ranunculus subrigidus , Ranunculaceae	Bonner	July 11, 1996
Rhamnus purshiana , Rhamnaceae	Kootenai	August 14, 1996
Salvia officinalis , Lamiaceae	Latah	September 16, 1996
Senecio hydrophilus , Asteraceae	Lewis	May 17, 1996
Senecio integerrimus ochroleucus, Asteraceae	Kootenai	May 22, 1996
Setaria glauca , Poaceae	Twin Falls	August 27, 1996
Solanum dulcamara , Solanaceae	Kootenai	June 21, 1996
Solanum dulcamara , Solanaceae	Fremont	June 26, 1996
Solidago canadensis salebrosa, Asteraceae	Bonneville	July 11, 1996
Sonchus arvensis , Asteraceae	Twin Falls	October 08, 1996
Sparganium emersum emersum, Sparganiaceae	Kootenai	October 01, 1996
Streptopus amplexifolius chalazatus, Liliaceae	Kootenai	September 06, 1996
Tamarix ramosissima , Tamaricaceae	Twin Falls	September 26, 1996
Tanacetum vulgare , Asteraceae	Clearwater	May 22, 1996
Thermopsis rhombifolia , Fabaceae	Custer	June 12, 1996
Tragopogon dubius , Asteraceae	Nez Perce	October 10, 1996
Trifolium dubium , Fabaceae	Kootenai	August 19, 1996
Ventenata dubia , Poaceae	Idaho	April 18, 1996
Verbena bracteata , Verbenaceae	Canyon	July 22, 1996
Veronica anagallis-aquatica , Scrophulariaceae	Twin Falls	June 12, 1996
Veronica anagallis-aquatica , Scrophulariaceae	Clark	August 02, 1996
Veronica arvensis , Scrophulariacea	Gem	May 22, 1996
Veronica officinalis , Scrophulariaceae	Kootenai	May 09, 1996
Veronica officinalis , Scrophulariaceae	Benewah	June 05, 1996
Vibrunum farreri , Caprifoliaceae	Ada	January 16, 1996

Twenty-three specimens identified only to genus or not identified due to condition of the plant are not included in this list.

Newly reported weed species; potential weed problems in Idaho. Timothy W. Miller, Robert H. Callihan, 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. No species were found to be new to the Pacific Northwest (Idaho, Oregon and Washington) in 1996. Two species were found to be new records for Idaho in 1996. Extensions of the ranges of several species that have been present in Idaho for several years were also recorded. Twenty-eight species were found to be new records for individual counties in 1996. 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, 1995 to October 31, 1996. 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)

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).

None reported.

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. *Centaurea nigra* L. (CENNI) knapweed, black; Asteraceae.
   County: Bonner.

2. *Myosotis arvensis* (L.) Hill (MYOAR) forget-me-not, field; Boraginaceae.
   County: Gem.

GROUP III: New county records: species not previously reported in the county listed, although previously reported in one or more counties in Idaho.

1. *Alyssum desertorum* Stapf. (AYSDE) alyssum, dwarf; Brassicaceae.
   County: Bingham.

2. *Ambrosia trifida* L. (AMBTR) ragweed, giant; Asteraceae.
   County: Kootenai.

3. *Anchusa officinalis* L. (ANCOF) bugloss, common; Boraginaceae.
   County: Bonner.

4. *Campanula glomerata* L. (CMPGL) bellflower, clustered; Campanulaceae.
   County: Kootenai.

5. *Cardamine pensylvanica* Muhl ex. Willd. (CARPE) bittercress, Pennsylvania; Brassicaceae.
   County: Boundary.

6. *Carduus nutans* L. (CRUNU) thistle, musk; Asteraceae.
   County: Idaho.

7. *Centaurea solstitialis* L. (CENSO) starthistle, yellow; Asteraceae.
   County: Twin Falls.

8. *Cerastium vulgatum* L. (CERVU) chickweed, mouseear; Caryophyllaceae.
   County: Caribou.

9. *Chorispora tenella* (Pall.) DC. (COBTE) mustard, blue; Brassicaceae.
County: Twin Falls.

10. *Crepis capillaris* (L.) Wallr. (CVPCA) hawksbeard, smooth; Asteraceae.
County: Latah.

11. *Datura stramonium* L. (DATST) jimsonweed; Solanaceae.
County: Jerome.

12. *Eragrostis cilianensis* (All.) Mosher (ERACN) stinkgrass; Poaceae.
County: Twin Falls.

13. *Euphorbia peplus* L. (EPHPE) spurge, petty; Euphorbiaceae.
County: Latah.

14. *Glechoma hederaceae* L. (GLEHE) ivy, ground; Lamiaceae.
County: Butte.

15. *Hesperis matronalis* L. (HEVMA) damesrocket; Brassicaceae.
County: Payette.

16. *Hibiscus trionum* L. (HIBTR) mallow, Venice; Malvaceae.
County: Twin Falls, Gem.

17. *Hyocyamus niger* L. (HSYNI) henbane, black; Solanaceae.
County: Nez Perce.

18. *Knautia arvensis* (L.) T.Coult. (KNAAR) bluebuttons; Dipsacaceae.
County: Lemhi.

19. *Lamium purpureum* L. (LAMPU) deadnettle, purple; Lamiaceae.
County: Washington.

20. *Lolium multiflorum* Lam. (LOLMU) ryegrass, Italian; Poaceae.
County: Bingham.

21. *Lycium halmifolium* Mill. (LYUHA) matrimonyvine; Solanaceae.
County: Elmore.

22. *Matricaria perforata* Merat (MATIN) chamomile, scentless; Asteraceae.
County: Payette.

23. *Polygonum cuspidatum* Sieb. & Zucc. (POLCU) knotweed, Japanese; Polygonaceae.
County: Payette.

24. *Ranunculus aquatilis capillaceus* (Thuill.) DC. (RANTR) waterbuttercup, white; Ranunculaceae.
County: Latah.

25. *Ranunculus repens* L. (RANRE) buttercup, creeping; Ranunculaceae.
County: Boundary.

26. *Sparganium emersum emersum* Rehmann (SPGEM) burreed, narrow-leaf; Sparganiaceae.
County: Kootenai.

27. *Tamarix ramosissima* Ledeb. (TAARA) saltcedar; Tamaricaceae.
County: Twin Falls. (NOTE: Canyon, Gooding, Power, and Owyhee counties also reported new *Tamarix* populations; specimens identified to genus).

28. *Tanacetum vulgare* L. (CHYVU) tansy, common; Asteraceae.
County: Clearwater.

PROJECT 5

WEEDS OF AQUATIC, INDUSTRIAL, AND NON-CROP AREAS

NELROY JACKSON, CHAIR

Imazapyr and glyphosate for control of saltcedar. Carl E. Bell and Brent E. Boutwell. Two field experiments were conducted in the Imperial Valley of southeastern California to compare foliar applications of glyphosate and imazapyr for control of mature saltcedar in natural areas. The first experiment, near Heber, CA, was started in the fall before the saltcedar went dormant, the second experiment, near Imperial, CA, began in early summer on actively growing plants.

Experimental design for both experiments was a randomized complete block with four replications. Replicates were groups of saltcedar plants, and plots consisted of four to six individual plants. All treatments were based upon percentage of herbicide concentration in the spray mix rather than a fixed rate per area. Treatments at the Heber site were imazapyr at 1%, glyphosate at 2%, and imazapyr plus glyphosate, each at 0.5%. Herbicide applications were made with a CO_2 pressured sprayer at 32 psi, using a hand held wand with a 30 inch wide boom with two 26x cone nozzles on November 15, 1994. Plants were sprayed to wet, but not runoff. At the Imperial site, treatments were imazapyr at 1%, glyphosate at 4%, and two combination treatments of imazapyr plus glyphosate, one at 0.5% each, the other at 1% each. Treatments for this site were applied on June 7, 1995. Applications of herbicide were made with a CO_2 pressured sprayer at 20 psi, using a hand held wand with one 8004E nozzle. Plants were sprayed to wet, but not runoff. All treatments in both experiments included non-ionic surfactant at 0.25% (v/v). Untreated controls were included in each experiment for comparison.

Data collected were: visual evaluations of weed control at the Heber site on April 16, 1995 and March 26, 1996 and at the Imperial site on July 17, 1995 and March 26, 1996. Results are shown in the Tables below.

At the Heber site, saltcedar control with imazapyr and the combination treatment was apparent, but not satisfactory, at the evaluation on April 19, 1995, about 5 MAT, but was very good the following year (16 MAT). Results at the Imperial site were not as good, no treatment killed saltcedar. (Cooperative Extension, University of California, Holtville, CA 92250.)

Table 1. Saltcedar control with imazapyr and glyphosate at Heber, CA.

Treatment[1]	Concentration	Saltcedar Control April 19, 1995	 March 26, 1996
	%	%	
Imazapyr	1	73	91
Imazapyr + glyphosate	0.5 (each)	73	96
Glyphosate	2	35	10
Untreated control		0	0

[1] Treatments applied on November 15, 1994.

Table 2. Saltcedar control with imazapyr and glyphosate at Imperial, CA.

Treatment[1]	Concentration	Saltcedar Control July 17, 1995	 March 26, 1996
	%	%	
Imazapyr	1	66	45
Imazapyr + glyphosate	0.5 (each)	24	15
Imazapyr + glyphosate	1 (each)	62	35
Glyphosate	4	21	0
Untreated control		0	0

[1] Treatments applied on June 7, 1995.

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.

		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.

All treatments provided greater than 90% Canada thistle control 9 months after treatment (MAT) except clopyralid plus 2,4-D at 4 + 24 oz/A and both dicamba + 2,4-D treatments (Table). 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 + 11.5 oz/A which averaged 71% control. 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 + 16 oz/A and metsulfuron plus 2,4-D at 0.6 + 16 oz/A averaged 45% bareground. No other treatment provided even short-term total vegetation control. 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 sustaining the best Canada thistle control. (Plant Sciences Dept., North Dakota State Univ., Fargo, 58105)

AC 263,222 for growth suppression of unimproved turfgrass. John O. Evans and R.William Mace. Treatments were applied to intermediate wheatgrass to evaluate the effect of AC 263,222 and 2,4-D combinations for grass growth suppression and weed control. Plots were established near North Logan, Utah at the farm of Roland Hancey. The soil was a Green Canyon gravely loam with a pH of 8 and an organic matter content of less than 2%. This pasture was nearly a monoculture of intermediate wheatgrass with a few scattered alfalfa plants and no broadleaved weeds. The stand was estimated to be 10 to 15 years old.

Treatments were applied in a randomized block design, with three replications on June 7, 1996. 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 25, July 9, August 6 and September 4, 1996 for decreases in color, seed heads, stand and plant height.

AC 263,222 suppressed plant height about 25%, color was decreased approximately 30% at the higher treatment rates, and seed heads decreased by 47% without decreasing plant stand. No treatment differences existed among the AC 263,222 and AC 263,222 plus 2,4-D plots except for plant color. All treatments were measureably different from untreated plots at the end of the growth season. (Utah Agricultural Experiment Station, Logan, UT. 84322-4820)

Table. Evaluation of AC 263,222 for grass suppression on unimproved turfgrass. Logan, Ut. 1996.

		Intermediate wheatgrass response												
		Color				Seed heads			Stand			Plant height		
Treatment[1]	Rate	6/25	7/9	8/6	9/4	7/9	8/6	9/4	7/9	8/6	9/4	7/9	8/6	9/4
	lb/A	% decrease												
AC 263,222	0.063	2	23	10	13	47	47	50	0	0	0	25	30	32
AC 263,222	0.094	8	30	23	22	48	48	48	0	0	0	25	29	30
AC 263,222	0.125	18	37	23	28	48	48	48	0	0	0	24	19	35
AC 263,222+ 2,4-D ester	0.063 +1.0	10	32	10	10	43	43	40	0	0	0	25	19	26
AC 263,222+ 2,4-D ester	0.094 +1.0	3	20	13	12	47	47	47	0	0	0	26	23	29
AC 263,222+ 2,4-D ester	0.125 +1.0	5	32	20	22	48	48	48	0	0	0	28	23	33
2,4-D ester	1.0	2	0	0	0	0	0	0	0	0	0	0	0	9
Check		0	0	0	0	0	0	0	0	0	0	0	0	0
LSD(0.05)		6	6	13	7	7	7	6	0	0	0	7	12	10

[1] Non-ionic surfactant added a .25 % v/v.

PROJECT 6

BASIC SCIENCES

MARY GUTTIERI, CHAIR

Diclofop-resistant wild oat biotypes can be cross-resistant to tralkoxydim. Steven S. Seefeldt and Alex G. Ogg, Jr. Plants of three wild oat biotypes from the Willamette Valley of Oregon were grown in the greenhouse. The greenhouse was maintained at 20 C and the plants were grown in 4 by 6 by 3 inch pots filled with a commercial potting mix. Seed were soaked for 24 hours in a solution of 1.4 mM giberellic acid and 4 mM KCl to enhance germination. Twelve seeds were sown into each pot resulting in 8 to 12 plants per pot. Plants were watered as needed with 0.5 g/L of a commercial fertilizer. One of the biotypes (C) was resistant to all herbicides in the aryloxyphenoxypropionate family, but not to sethoxydim or clethodim in the cyclohexanedione family. A second biotype (H) was resistant to diclofop, fluazifop, and fenoxaprop in the aryloxyphenoxypropionate family and to sethoxydim and clethodim in the cyclohexanedione family. The third biotype (S) was susceptible to all herbicides in the aryloxyphenoxypropionate and the cyclohexanedione family.

Tralkoxydim was applied in a spray chamber with a moving boom to plants in the 2 to 3 leaf stage. The spray nozzle was an even flat-fan 8002E and delivered 20 GPA at 30 psi. Plants were sprayed with 0, 0.018, 0.054, 0.18, 0.54, and 1.8 lb/A of tralkoxydim (Achieve 80W) with 0.5 % v/v of the surfactant Supercharge, representing a 0, 0.1, 0.3, 1, 3, and 10x concentration of the recommended label rate respectively. Two weeks after treatment, plant survival was rated (Table) and then all above ground plant material in a pot was cut and placed in a bag and dried for 48 h at 60 C. Dry weights were obtained on an average plant per pot basis. Each treatment was replicated three times and pots were completely randomized both on the spray table and on the greenhouse bench. All dose-response results were normalized in each experiment by expressing the dry weights as a percentage of the dry weight of control plants. Data were analyzed using the GLM procedure which determined that there were differences between the biotypes' response to the herbicide. Nonlinear regression using the log-logistic model and the nonlinear regression procedure of SAS determined the dose required to inhibit growth of each biotype 50 % (I_{50}) and to predict the plant response to a range of herbicide doses (Figure).

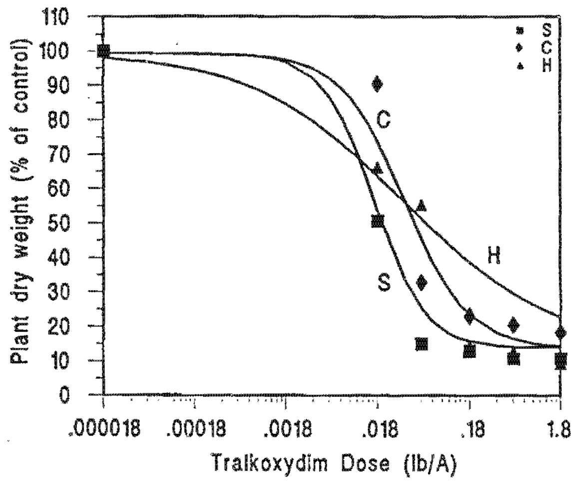
At 0.018 lb tralkoxydim/A, almost 25 % of the S biotype plants were killed, whereas the H and S biotypes were unaffected (Table). At 0.054 lb/A all the S and 94 % of the C biotype plants were killed, whereas the 80 % of the H biotype plants were still alive. At the full field use rate (0.18 lb/A), only one H biotype plant survived. From the survival data, it is obvious that the C and H biotypes are more resistant to tralkoxydim than is the S biotype and that the H biotype is more resistant to tralkoxydim than is the C biotype. In the greenhouse, conditions are optimal for herbicide efficacy. In the field, there are many conditions which will reduce the efficacy of a herbicide. Based on the data in the table, there is concern that many more than 3 % of the H biotype plants would survive a field application of tralkoxydim.

The nonlinear dose-response which describes plant response as a function of dose is plotted along with means of plant dry weights obtained in the experiment (Figure). The S biotype was the most sensitive to tralkoxydim with an I_{50} of 0.09 lb/A and the C and H biotypes had I_{50}'s of 0.2 and 0.19 respectively.

Table. Plant survival to different doses of tralkoxydim.

Dose	Biotype C	Biotype H	Biotype S
lb/A	%	%	%
0	100	100	100
0.018	100	100	76
0.054	6	81	0
0.18	0	3	0
0.54	0	0	0
1.8	0	0	0

Figure. Dose-response of C, H, and S wild oat biotypes to tralkoxydim.



PROJECT 7

ALTERNATIVE METHODS OF WEED CONTROL

ED PEACHY, CHAIR

The effect of a fungal pathogen, *Pythium ultimum*, on winter wheat and jointed goatgrass. Brady F. Kappler and Gary Y. Yuen. This experiment was designed to evaluate the response of winter wheat and jointed goatgrass above and below ground biomass to *Pythium ultimum*. An initial pilot study was conducted at the University of Nebraska-Lincoln in the spring of 1995 to determine if *P. ultimum* would indeed affect jointed goatgrass . Soil was inoculated with 0, 25, 50, and 100 propagules per gram of *P. ultimum*. After inoculation winter wheat and jointed goatgrass were planted into 12" x 18" flats with equal numbers of winter wheat and jointed goatgrass seeds. The highest rate of pythium (100 propagules per gram) had the largest influence on jointed goatgrass. The *P. ultimum* also had a strong effect on winter wheat.

In the spring of 1996 a detailed experiment was conducted. The experiment was conducted in growth chambers with a Alliance silt loam, *Aridic Argiustolls* soil. The asexual P167 strain of *P. ultimum* that had been cultured on a potato carrot broth medium was mixed with the soil to produce levels of 0, 50, and 100 propagules per gram (ppg). Conditions in the growth chamber were maintained at 25C for 12 hour days and 14C for night temperatures. The experiment was a completely randomized design (CRD) design with 4 replications. Arapahoe winter wheat and jointed goatgrass were planted in 10" x 14" flats. Five rows of wheat with 10 seeds per row and 5 rows of jointed goatgrass with 5 spikelets per row were planted in all flats. Plants were watered to field capacity by sub irrigation at the time of planting, 7 and 12 days after planting. After 12 days the flats were only watered lightly to prevent desiccation. After 3 weeks percent germination, below ground biomass (root) and above ground biomass (shoot) were recorded. Ungerminated seeds were assayed to determine pythium infection.

Winter wheat and jointed goatgrass germination was not effected by the presence of *P. ultimum* in the soil. Winter wheat root and shoot weights were not affected by *P. ultimum* presence. However, jointed goatgrass root and shoot weights were decreased when the soil was inoculated with *P. ultimum* at the 50 and 100 propagules per gram inoculation level. No differences were found between the 50 and 100 propagules per gram treatments. Data is presented in the table below. (Dept. of Agronomy, University of Nebraska, Lincoln, NE 68583-0915).

Table. Effect of *Pythium ultimum* on the root and shoot weights of winter wheat (WW) and jointed goatgrass (JGG)

Treatment	WW root wt.	WW shoot wt.	JGG root wt.	JGG shoot wt.
ppg	g			
0	0.21	0.77	0.55	0.46
50	0.18	0.33	0.34	0.29
100	0.24	0.68	0.38	0.33
Contrast	P > F			
0 vs 50	NS[1]	NS	***[2]	**
0 vs 100	NS	NS	**	*
50 vs 100	NS	NS	NS	NS

[1] NS, indicates not significant (P > .10).
[2] *, **, *** indicates significance at P ≤ .10, P ≤ .05, and P ≤ .01 , respectively.

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2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl) nicotinic acid
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F-8426 [carfentrazone-ethyl] proposed (Affinity)
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. . . . . 20, 21, 28, 39, 64, 65, 66, 78, 80, 85, 90, 91, 92, 101, 104, 109
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