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Stephen D. Miller
Editor, Research Progress Report
Western Society of Weed Science;
1996

Jill Schroeder
Research Section Chairperson
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1996

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PROJECT 1

WEEDS OF RANGE AND FOREST

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Silky crazyweed control during various growth stages. K. C. McDaniel, C. R. Hart and J. D. Graham. Silky crazyweed is of major economic importance in northeastern New Mexico because it causes locoism to cattle grazing the plant. Research to compare various herbicides applied during the vegetative, bloom and post flowering growth stages was repeated at three rangeland locations in Colfax Co. between 1992 to 1995. Plots were 30 by 30 ft. with two replications in a randomized complete block. Herbicides were broadcast with a CO_2 pressurized hand-held sprayer (10 ft. swath) delivering 21 gpa at 60 psi. Blue grama was the dominant grass and soil texture was a silty clay loam at all locations. Plant mortality was estimated by two or three observers by visually comparing plant reduction on treated plots to adjacent untreated plots in September 1995.

Picloram applied alone or in combination with 2,4-D or dicamba provided more consistent control of silky crazyweed during all growth stages compared to other herbicides. Metsulfuron, dicamba, clopyralid and higher rates of 2,4-D in general were more efficacious when applied during the bloom stage than during the vegetative or post flower stages. (Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM 88003).

Table. Silky crazyweed control by herbicides during various growth stages. N = 4 trials during each growth stage.

		Silky crazyweed control		
		Early Vegetative	Bloom	Postflower and fruiting
	oz/A		%	
Metsulfuron	.1875	78	93	89
Metsulfuron	.375	74	98	97
Metsulfuron + 2,4-D	.1875 + 1.0	88	99	89
	lb/A			
Picloram	0.25	85	95	91
Picloram	0.375	100	99	91
Picloram + 2,4-D	0.47	95	99	86
Picloram + 2,4-D	0.625	92	98	99
Dicamba	0.5	47	91	77
Dicamba + picloram	0.25 + 0.125	75	85	90
Dicamba + 2,4-D	0.25 + 1.0	57	83	74
Clopyralid	0.125	74	95	96
Clopyralid + 2,4-D	0.125 + 1.0	86	58	-
Clopyralid + triclopyr	0.125 + 0.125	61	96	70
Clopyralid + dicamba	0.125 + 0.125	92	98	-
Triclopyr	0.25	58	86	45
2,4-D	1.0	41	30	16
2,4-D	2.0	25	96	44
2,4-D	4.0	58	90	47

CONTROL OF RIDDELL GROUNDSEL WITH VARIOUS HERBICIDES AT TWO GROWTH STAGES.

James W. Freeburn, Thomas D. Whitson, Larry E. Bennett, University Extension Agent, Professor, Research Associate, University of Wyoming, Laramie, WY 82071

Abstract. Riddell groundsel *(Senecio riddelli)* is a poisonous weed found in rangeland in southeastern Wyoming. Alkaloids present in Riddell groundsel prevent liver cells from replacing themselves, therefore a very thin animal or eventual death is the result of animals consuming it. It commonly grows on very sandy to sandy loam sites.

Two experiments were established near Glendo, Wyoming to evaluate the effects of various herbicide treatments on Riddell groundsel when applied in the vegetative and bloom growth stages. The first experiment was initiated 27 May 1994 when plants were in the vegetative stage and 26 July 1994 when plants were in the bloom stage. Plots were 10 by 27 feet arranged in a randomized complete block design with four replications. Herbicides were broadcast with a CO^{2} pressurized hand-held sprayer delivering 30 gpa at 45 psi. Temperatures on 27 May 1994 were: air 81F, soil surface 86F, 1 inch 84F, 2 inches 76F and 4 inches 74F, with 70% relative humidity and calm winds. Temperatures on 26 July were: air 82F, soil surface 81F, I inch 83F, 2 inches 80F, 4 inches 75F with 43% relative humidity and no wind.

Treatments providing greater than 90% control in the vegetative stage included: clopyralid + 2,4-D at 0.19 + 1.0 lb. and 0.38 + 2.0lb., clopyralid at 0.38 lb.; dicamba + picloram at 0.5 + 0.13 lb. and 0.5 + 0.25 and picloram at 0.25 and 0.5 lb. Treatments providing greater than 90% control in the bloom stage were: clopyralid + 2,4-D at 0.28 + 1.5 and .038 + 2.0 lb., 2,4-D (LVE) at 1.0 lb. and picloram at 0.5 lb/A. Treatments providing greater than 94% control at both growth stages were clopyralid + 2,4-D at 0.38 + 2.0 lb. and picloram at 0.5 lb/A. (Agric. Exp. Sta., Laramie, WY 82071 SR1705).

Table 1. Control of Riddell groundsel with various herbicides.

Treatment	Rate	Control	
		Vegetative stage	Bloom stage
	Lb/A	---- ----------------%-	------------------
Clopyralid + 2,4-D + X-77	1.19 + 0.25% v/v	92	86
Clopyralid + 2,4-D + X-77	1.78 + 0.25% v/v	81	98
Clopyralid + 2,4-D + X-77	2.38 + 0.25% v/v	98	94
Clopyralid + X-77	0.19 + 0.25% v/v	84	78
Clopyralid + X-77	0.38 + 0.25% v/v	100	88
Dicamba + 2,4-D + X-77'	0.5 + 1.0 + 0.25% v/v	58	69
2,4-D LVE	1.0	86	91
2,4-D LVE	2.0	76	78
Dicamba + metsulfuron + X-77	0.5 + 0.4 + 0.25% v/v	68	43
Metsulfuron + X-77	0.4 + 0.25% v/v	86	75
Metsulfuron + X-77	0.8 + 0.25% v/v	49	86
Dicamba + picloram + X-77	0.5 + 0.125 + 0.25% v/v	92	66
Dicamba + picloram + X-77	0.5 + 0.25 + 0.25% v/v	93	82
Dicamba + X-77	0.5 + 0.25% v/v	80	0
Picloram + X-77	0.25 + 0.25% v/v	96	73
Picloram + X-77	0.5 + 0.25% v/v	100	99
Untreated check	----	0	0

Diffuse knapweed control with metsulfuron, metsulfuron tank mixes, picloram, quinclorac, 2,4-D, or dicamba. Sebastian, J.R. 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 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. Metsulfuron alone controlled 26 to 51% of CENDE, while metsulfuron tank mixed with dicamba and 2,4-D controlled approximately 90% of CENDE (Table 2). Dicamba (0.25 lb/ai) and quinclorac (1.0 lb/ai) controlled about 74% of CENDE while picloram (0.25 lb/ai) controlled 97%.

Baseline CENDE density and canopy cover and collective grass canopy cover were taken before the initial application and these data will be collected each successive fall for the duration of the study. Indicated cover and density values are means from five 0.1 m^2 quadrats per replication (20 total quadrats per treatment) taken approximately 90 days after treatment (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			Grass
		Control	Cover	Density	Cover
	(oz ai/a)	---------%---------		----#----	----%----
metsulfuron	0.6	26	42	5	34
metsulfuron	1.2	51	16	2	37
metsulfuron + 2,4-D + dicamba	0.6 16.0 4.0	91	2	0	56
metsulfuron + 2,4-D + dicamba	1.2 16.0 4.0	89	4	1	55
2,4-D	16.0	68	14	1	42
dicamba	4.0	73	7	1	55
picloram	4.0	97	1	0	60
quinclorac	16.0	75	11	2	37
check		0	35	4	25
LSD (0.05)		12	14	2	19

[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.

Salt cedar control by herbicide and mechanical methods. Kirk C. McDaniel,John Taylor and William G. Noffke. In the Middle Rio Grande Valley of New Mexico, salt cedar forms large monotypic stands along the river and adjacent flood plain. This is particularly true on the Bosque Del Apache National Wildlife Refuge (NWR) where large tracts of homogeneous salt cedar vegetation have evolved within the past century from a once diverse mosaic of native riparian vegetation.

The first aerial applications of imazapyr for salt cedar control were made on the Bosque Del Apache NWR in 1987 (130 ac) and 1988 (100 ac). These commercial sprays were highly successful in killing most of the 20 to 30 ft tall trees. The woody debris was removed by burning 1 to 2 years after spraying. However, abundant salt cedar resprouts made it necessary to root plow and rake the sprayed areas before native trees could be planted. Today, the Bosque Del Apache NWR relies mainly on root plowing and raking (piles are burned) to clear large salt cedar stands. Sparse stands of salt cedar are either mechanically grubbed or hand sprayed with imazapyr (1% solution) or a combination of imazapyr + glyphosate (0.5 + 0.5% solution).

Because experience has shown that no single method of control will eliminate salt cedar, a study was initiated to compare multiple combinations of treatments. After collecting pretreatment data to determine saltcedar density and canopy cover, 5 study plots (270 ft by 1000 ft) were aerially sprayed on Aug. 30, 1994 with a fixed wing aircraft. Imazapyr + glyphosate (0.5 + 0.5 lb/ac) were mixed in a 7 gpa solution with 0.25% v/v surfactant and 0.25% v/v Nalcotrol. Spraying was done between 7:00-8:30 am with airtemp. 62-72°F, humidity 92-60%, and wind speed less than 2 mph. On five other study plots mature salt cedar (15 to 25 ft ht) were mechanically cleared between April to May 1995 by root plowing, raking debris into piles, and burning the piles.

Table. Saltcedar density before treatment (August 1994) and the first growing season posttreatment (October 1995). Data was collected from four belt transects (4 x 50 m) placed parallel across each rep.

Treatment	Rep	Salt cedar density		Saltcedar canopy cover	
		Pretrt	Posttrt	Pretrt	Postrt
		---------plants/ha--------		--------------%----------------	
Aerial application of imazapyr + glyphosate	1	6738	10	66	0
	2	6638	0	46	0
	3	4325	0	48	0
	4	4150	0	48	0
	5	7850	0	54	0
Mechanical rootplow + raking	1	8963	7150	72	9.7
	2	6675	3500	46	6.7
	3	5988	300	50	0.1
	4	6463	750	55	2.6
	5	13,388	600	77	0.1

Apparent mortality in spray plots was exceptionally high the first year as only two live plants were counted in treated blocks. Root plowing + raking eliminated the aboveground portion of saltcedar but by October it was evident that resprouting from roots was high. A second raking of mechanical plots was conducted in November 1995 but it will not be known until next summer if saltcedar was further reduced. Followup treatments including planting of trees and grasses are planned over the next 5 years. (Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM 88003).

Fringed sagewort and bigelow sagebrush control with spring and fall herbicide applications. Kirk C. McDaniel. Fringed sagewort (*Artemisia frigida*) and bigelow sagebrush (*Artemisia bigelovii*) are low growing native shrubs which grow in association with principally herbaceous species on blue grama grasslands. Both shrubs are occasionally browsed by livestock and wildlife but they are regarded as low seral species because they increase on disturbed or poorly managed rangelands. Three studies were established in 1994 on the T-O Ranch located 18 miles east of Raton, NM to compare various herbicides applied on two dates in spring and one date in fall. Plots were 30 by 30 ft with two replications in a randomized complete block. Herbicides were broadcast with a CO_2 pressurized sprayer delivering 21 gpa at 60 psi on April 12, 1994 (AT 54°F, ST 48°F @ 6", RH 40%, wind SW 3-8 mph), May 19, 1994 (AT 65°F, ST 60°F @ 6", RH 52%, wind SE 8-15 mph) and October 4, 1994 (AT 61°F, ST 63°F @ 6", RH 65%, wind SW 5-15 mph). Soil was a silty clay loam and was moist to very moist during all applications. Plants were in the vegetative stage when sprayed in spring and were in the late bloom to seed set stage in fall. Mortality was estimated by visually comparing plant reduction in treated plots to adjacent untreated plots on September 12, 1995.

No herbicide provided consistent control of both shrubs across all three spray dates. Picloram alone at 0.375 lb/A provided 95% control in April but a lower percentage of the plants were killed after May and October spraying. Metsulfuron, dicamba, clopyralid and 2,4-D controlled a higher percentage of fringed sagewort when applied in fall compared to spring. The combination of clopyralid + triclopyr at 0.125 + 0.125 lb applied in October provided 90% or higher control of both bigelow sagebrush and fringed sagewort. (Department of Animal and Range Sciences, New Mexico State University, Las Cruces, NM 88003).

Table. Mortality of bigelow sagebrush and fringed sagewort following spring and fall herbicide applications.

		Species and application date					
		Bigelow sagebrush			Fringed sagewort		
		4-12-94	5-19-94	10-4-94	4-12-94	5-19-94	10-4-94
	oz/A	%					
Metsulfuron	.1875	25	20	18	48	58	50
Metsulfuron	.375	0	60	2	0	75	85
Metsulfuron + 2,4-D	.1875 + 1.0	15	7	37	50	40	60
	lb/A						
Picloram	0.25	25	0	75	28	0	95
Picloram	0.375	95	10	23	95	22	73
Picloram + 2,4-D	0.47	35	10	63	35	27	77
Picloram + 2,4-D	0.625	50	3	83	38	30	87
Dicamba	0.5	12	3	17	12	7	35
Dicamba + picloram	0.25 + 0.125	12	3	63	12	7	77
Dicamba + 2,4-D	0.25 + 1.0	40	15	15	48	12	53
Clopyralid	0.125	70	0	80	85	5	90
Clopyralid + 2,4-D	0.125 + 1.0	70	0	-	80	0	-
Clopyralid + triclopyr	0.125 + 0.125	30	0	90	50	0	93
Triclopyr	0.25	-	17	0	23	20	0
2,4-D	1.0	60	45	2	66	77	55
2,4-D	2.0	5	0	15	5	0	67
2,4-D	4.0	30	63	25	30	85	82

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 applied with 2,4-D at 0.4 + 0.6 lb/A 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 brome with occasional wheatgrass. Visual evaluations were based on percent stand reduction as compared to the control.

Glyphosate plus 2,4-D generally provided better long-term leafy spurge control then picloram plus 2,4-D after a single application. Glyphosate plus 2,4-D at 0.4 + 0.6 lb/A averaged 90% leafy spurge control 3 months after treatment (MAT) when applied alone or with the adjuvant X-77 (Table 1). Control with picloram or picloram plus 2,4-D averaged over application rate was 78% at Valley City. Grass injury only averaged 12% with glyphosate plus 2,4-D and was similar whether applied alone or with X-77. Leafy spurge control was similar when picloram was applied with glyphosate plus 2,4-D compared to glyphosate plus 2,4-D applied alone. In general, glyphosate alone provided less leafy spurge control then glyphosate plus 2,4-D.

Leafy spurge control with glyphosate plus 2,4-D still averaged 71% 12 MAT at Valley City and was much better then either picloram plus 2,4-D treatment that only averaged 31% (Table 1). Control was similar with glyphosate whether applied alone or with 2,4-D or picloram but grass injury tended to be higher with glyphosate plus X-77 compared to glyphosate plus 2,4-D. Control gradually declined by 24 MAT. However, treatments that included glyphosate or glyphosate plus 2,4-D averaged 58% control compared to only 6% with picloram or picloram plus 2,4-D.

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, but better long-term control 12 MAT in the first year of a rotational program (Table 2). Grass injury averaged 15% with glyphosate plus 2,4-D at 0.4 + 0.6 lb/A 3 MAT, 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. Control was similar regardless of treatment 15 months after the first treatment (MAFT) (data not shown).

Control was better at Valley City than Jamestown 24 MAFT and averaged 76% and 47%, respectively, over all treatments (Table 2). 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 97% or higher with all treatments at Valley City 27 MAFT but varied at Jamestown. The best treatments at Jamestown were picloram plus 2,4-D or dicamba applied 3 yr in a row or following glyphosate plus 2,4-D plus picloram. Grass injury increased when glyphosate was applied alone or with 2,4-D for the second or third time and averaged 6% and 17% at Jamestown and Valley City, respectively.

A second series of experiments was established to further evaluate glyphosate plus 2,4-D alone at reduced application 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 treatment.

In general, control was less in 1995 than in previous years regardless of treatment (Tables 1,2, and 3). For instance, control with glyphosate plus 2,4-D was 93% 3 MAT in 1993 averaged over all locations (Tables 1 and 2), but only 63% in 1995 (Table 3). Control also was lower for the picloram plus 2,4-D and dicamba treatments which averaged 78% in 1993, but only 49% in 1995. The reason for the reduced control may be due to air temperature at application. The air temperature ranged from 72 to 83 during application in 1995 and quickly warmed to the upper 80s to 90s 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 leav es and stems in the upper portions, but had green stems nearer the surface. New growth emerged from the greem stems approximately 6 weeks after treatment. In the previous experiments the stem tissue had been killed to the soil surface.

Glyphosate plus 2,4-D averaged 77% 3 MAT at Ekre and Fort Ransom which was better than the picloram plus 2,4-D or dicamba treatments which only averaged 56%. However, glyphosate plus 2,4-D averaged only 48% at Jamestown and was similar to picloram plus 2,4-D and dicamba. Glyphosate alone did not control leafy spurge. 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 the grass species most frequently injured and bluegrass was not injured from these treatments at any location.

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 then 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. Glyphosate plus auxin herbicide combinations for leafy spurge control applied in late June 1993 at Valley City, North Dakota.

		3 MAT		12 MAT		15MAT	24 MAT
Treatment	Rate	Control	Grass injury	Control	Grass injury	Control	Control
	lb/A	%					
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	94	17	73	0	65	52
Glyphosate+2,4-D[b]+picloram+X-77	0.3+0.45+0.19+0.5%	89	7	71	0	79	50
Glyphosate+2,4-D[b]+picloram+X-77	0.4+0.6+0.25+0.5%	92	7	70	0	59	51
Glyphosate+picloram+X-77	0.4+0.25+0.5%	79	9	77	0	63	56
Glyphosate+2,4-D[b]	0.4+0.6	88	10	74	0	75	60
Glyphosate+2,4-D[b]	0.3+0.45	89	10	66	0	69	52
Glyphosate+X-77	0.4+0.5%	70	20	83	15	73	67
Glyphosate	0.4	63	11	86	6	77	54
Glyphosate+X-77	0.3+0.5%	64	14	86	8	75	66
Picloram	0.25	63	4	20	0	13	3
Picloram+2,4-D	0.25+1	83	0	33	0	26	11
Picloram+2,4-D	0.5+1	87	3	41	0	31	5
LSD (0.05)		12	6	22	10	27	22

[a] Months after treatment.

[b] Commercial formulation Landmaster BW.

Table 2. Glyphosate plus 2,4-D treatments alternated with auxin herbicides over 3 years applied in late June at two locations in North Dakota.

1993 and 1995		1994		3 MAT[a]		12 MAT[a]		24MAT[a]	27 MAT[a]	
Treatment	Rate	Treatment	Rate	Control	Grass injury	Control	Grass injury	Control	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%	88	18	47	0	48	57	13
Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	90	12	59	0	54	58	3
Gly+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	94	11	68	0	53	55	1
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	60	0	23	0	27	73	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	76	0	22	0	32	79	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%	97	8	65	0	61	86	0
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	97	15	69	0	44	92	11
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	98	11	65	0	53	93	8
LSD (0.05)				13	7	18	...	NS	21	10
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%	94	16	88	0	67	98	16
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Picloram+2,4-D	0.25+1	97	16	94	5	81	97	16
Glyphosate+2,4-D[b]+X-77	0.4+0.6+0.5%	Dicamba+X-77	2+0.5%	97	16	93	0	89	98	18
Picloram+2,4-D	0.25+1	Picloram+2,4-D	0.25+1	89	1	43	0	70	99	0
Dicamba+X-77	2+0.5%	Dicamba+X-77	2+0.5%	80	3	30	0	71	97	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%	98	11	91	0	81	99	19
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Picloram+2,4-D	0.25+1	96	9	80	0	68	99	14
Glyphosate+2,4-D[b]+pic[c]+X-77	0.4+0.6+0.25+0.5%	Dicamba+X-77	2+0.5%	93	12	86	0	84	99	17
LSD (0.05)				8	9	17	3	NS	NS	9

[a] MAT = months after treatment (only received the first treatment by this date); MAFT = months after first treatment (one and two annual retreatments had been applied by 24 and 27 MAFT, respectively.

[b] Glyphosate + 2,4-D was a commercial formulation - Landmaster BW.

[c] Picloram.

Table 3. Leafy spurge control 3 months after treatment with herbicide treatments applied in just three locations in North Dakota.

		Ekre and Ft. Ransom		Jamestown	
Treatment	Rate	Control	Grass injury[a]	Control	Grass injury
	— lb/A –	%			
Glyphosate + 2,4-D[b]	0.4 + 0.6	73	28	50	23
Glyphosate + 2,4-D[b]	0.4 + 0.6	80	26	43	6
Glyphosate + 2,4-D[b]	0.4 + 0.6	77	31	52	11
Picloram + 2,4-D	0.25 + 1	55	0	40	0
Dicamba	2	57	3	42	0
Picloram + 2,4-D	0.5 + 1	52	0	50	0
Glyphosate	0.4	9	11	0	7
Glyphosate	0.4	8	8	5	1
Glyphosate + 2,4-D[b]	0.3 + 0.46	70	19	45	8
Glyphosate + 2,4-D[b]	0.2 + 0.3	66	10	19	4
LSD (0.05)		13	12	27	15[c]

[a] Grass injury from the Ekre location only, no grass injury was observed at Ft. Ransom.

[b] Commercial formulation - Campaign.

[c] LSD is at (0.10).

Leafy spurge control with quinclorac applied with various adjuvants for 3 years. Rodney G. Lym. Quinclorac is an auxin-type herbicide with moderate soil residual. Previous greenhouse research at North Dakota State University has shown that quinclorac will injure leafy spurge and may be more effective when applied with a seed-oil adjuvant rather than alone. The purpose of this research was to evaluate quinclorac applied alone and in combination with picloram or various spray adjuvants as an annual retreatment.

The experiment was established near West Fargo on September 14, 1990, when leafy spurge was in the fall regrowth stage, and 20 to 30 inches tall with 2 to 3 inch long new fall growth on stems. Retreatments were applied on approximately the same date in 1991 and 1992. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 ft in a randomized complete block design with four replications. Evaluations were based on a visual estimate of percent stand reduction as compared to the control and continued for 36 months after the third annual application. Previous research has shown that quinclorac provided the best leafy spurge control when fall-applied.

		Evaluation date						
Treatment[a]	Rate	June 1991	June 1992	June 1993	Sept 1993	Sept 1994	June 1995	Sept 1995
	— lb/A —	% control						
Quinclorac + BAS-090	1+1 qt	90	93	99	92	90	82	66
Quinclorac + Scoil	1+1 qt	74	95	99	94	81	79	71
Quinclorac	1	49	82	89	59	31	14	3
Quinclorac + picloram	1+0.5	85	97	97	94	93	94	82
Quinclorac + picloram + BAS-090	1+0.5+1 qt	91	99	99	97	97	92	83
Picloram + 2,4-D	0.5+1	81	92	94	90	84	86	76
Picloram + 2,4-D + Scoil	0.5+1+1 qt	43	69	92	61	63	60	50
Picloram + 2,4-D + BAS-090	0.5+1+1 qt	57	83	94	73	68	79	58
Picloram + Scoil	0.5+1 qt	71	82	95	60	63	71	45
Picloram	0.5	60	84	96	81	79	82	62
LSD (0.05)		28	14	6	28	22	20	21

[a] Treatments applied annually in September of 1990, 1991, and 1992.

Quinclorac either alone or with Scoil provided better leafy spurge control in June 1992 following a second application compared to June 1991 (Table). Leafy spurge control in June 1993 following a third application averaged 92% or better with all treatments except when quinclorac was applied alone. Quinclorac at 1 lb/A plus BAS-090 or the methylated-seed-oil adjuvant Scoil provided better long-term leafy spurge control than quinclorac applied alone. Control in September 1994, which was 24 months after the third annual treatment averaged 90% with quinclorac plus an adjuvant and/or picloram but only 31% when quinclorac was applied alone.

Control from all treatments gradually declined in June and September 1995. However, even 36 months after the last treatment, quinclorac applied with Scoil or picloram still provided an average of 78% control (Table). Long-term control with quinclorac plus BAS-090 or Scoil was similar to picloram plus 2,4-D at 0.5 plus 1 lb/A, the most commonly used fall-applied treatment. Scoil applied with picloram did not improve leafy spurge control compared to picloram alone, and both Scoil and BAS-090 tended to reduce control when applied with picloram plus 2,4-D.

A seed-oil adjuvant was required to provide acceptable leafy spurge control with quinclorac. Quinclorac plus BAS-090 or Scoil fall-applied provided over 90% leafy spurge control up to 24 months after a 3 year annual application. Quinclorac could be an alternative to picloram plus 2,4-D. There was no grass injury with any treatment.

Comparison of various liquid and powder 2.4-D formulations for leafy spurge control. Rodney G. Lym and Calvin G. Messersmith. The most cost-effective treatment for leafy spurge control is picloram plus 2,4-D. Previous research at North Dakota State University has shown that leafy spurge control is increased 15 to 25% when 2,4-D at 1 lb/A is applied with picloram at 0.5 lb/A or less compared to picloram alone. Control has been similar regardless of the 2,4-D formulation applied with picloram. Several formulations of 2,4-D are no longer available because they were not reregistered with the EPA. Also, several powder formulations of 2,4-D have been formulated to decrease the cost of container shipment and disposal. The purpose of this research was to evaluate several formulations of 2,4-D for leafy spurge control.

The experiment was established June 8, 1992 near Valley City, ND, when leafy spurge was in the yellow bract to flowering growth stage with lush growth and 18 to 24 inches tall. Herbicides were applied using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 by 30 ft in a randomized complete block design with four replicates. The 2,4-D formulations were added to water immediately prior to application and no surfactants were used. All treatments were reapplied to the same plots in June 1993 and 1994, 12 and 24 months after the first treatment (MAFT), respectively.

		Months after first treatment						
Treatment	Rate	1	3	12	15	24	27	36
	lb/A	% control						
2,4-D dimethylamine (Weedar 64)	2	98	20	19	46	21	25	45
2,4-D dimethylamine + diethanolamine (Hi-Dep)	2	98	13	11	56	43	65	73
2,4-D butoxyethyl ester (Weedone LV4)	2	100	18	22	57	30	45	55
2,4-D acid + butoxyethyl ester (Weedone 638)	2	99	18	13	75	38	45	65
2,4-D isooctyl(2-ethylhexyl)ester (Esteron 99)	2	99	18	10	47	30	28	65
2,4-D triisopropanolamine + diethylamine (Formula 40)	2	97	17	6	43	18	40	57
2,4-D dimethylamine 80% WSP (CL-782)	2	68	28	13	53	40	37	55
2,4-D dimethylamine 85% WSP (Savage)	2	99	26	11	47	23	39	55
Picloram	0.5	99	89	65	94	93	97	94
LSD (0.05)		11	27	17	25	22	17	11

The water soluble powder CL-782 provided only 68% topgrowth control 1 MAFT compared to 97% or better for all other 2.4-D formulations (Table 1). Control was similar for all 2,4-D formulations 3 and 12 MAFT, including CL-782, and averaged 20 and 13%, respectively. 2,4-D butoxyethyl ester following a second treatment in June 1993 tended to provide better leafy spurge control 15 MAFT than the other 2,4-D formulations. 2,4-D dimethylamine plus diethanolamine provided 73% control 36 MAFT, or 1 yr after the last application which was better than any other 2,4-D formulation evaluated. The 2,4-D dimethylamine formulation tended to be the least effective formulation evaluated. Picloram applied at 0.5 lb/A for 3 consecutive years provided 97% leafy spurge control and remained at 94% 1 yr after the last application.

In general, leafy spurge control was similar with most 2,4-D formulations. 2,4-D mixed amine tended to provide better control than other formulations evaluated, but only after three annual applications. Previous research at North Dakota State University has shown that leafy spurge control was enhanced when 2,4-D was applied with picloram, regardless of picloram formulation.

Late season yellow starthistle control with postemergence herbicides. Joseph M.DiTomaso and Guy B. Kyser. Late season glyphosate and triclopyr applications on yellow starthistle control were evaluated under field conditions in Yolo County, California. Ten plants in bolting, spiny (no flowers), early flowering (<20% flowers) and mid-flowering (>20% flowers) stages were treated postemergence with either glyphosate (1.0 or 2.0 lbs acid equivalent per acre plus 0.2% of an additional wetting agent [Silwet]) or the ester form of triclopyr (0.75 or 1.5 acid equivalent per acre). The herbicide treatments were applied broadcast with a CO_2 pressurized knapsack sprayer delivering 10 gpa at 40 psi on June 24, 1995. Visual injury was evaluated on July 21, 1995.

Control of yellow starthistle was excellent with glyphosate at either rate, even at the more mature stages. Triclopyr was less effective regardless of the rate or stage of development. In addition, yellow starthistle control with triclopyr progressively decreased in more developed plants. (Department of Vegetable Crops, Robbins Hall, Univ. of California, Davis, CA 95616)

Table. Postemergence control of yellow starthistle at various stages of development.

		Stage of development[1]			
Treatment	Rate	Bolting	Spiny	Early flowering	Mid-flowering
	lb/A	% injury			
Glyphosate	1.0	100	100	100	92
	2.0	100	100	100	100
Triclopyr	0.75	77	46	24	0
	1.5	87	71	54	41
Check	---	0	0	0	0

[1] Treatments applied June 24, 1995 and visually evaluated July 21.

Grass tolerance to preplant soil-applied yellow starthistle herbicide. Lawrence Lass, Robert Callihan, and Dean Gaiser. Yellow starthistle has become one of the dominant species of the Columbia Basin. The objective of this project was to test the tolerance of winter-planted grasses to spring applied picloram and other herbicides. Secondary objectives were to: 1. examine ability of 6 grass species to establish and withstand invasion by yellow starthistle when protected from annual grasses with glyphosate and from yellow starthistle with pyridines, and 2. compare efficacy and longevity of yellow starthistle control by three pyridine herbicides.

The experimental design for the herbicides was a complete randomized plot with three replications. The herbicide strips were 12 by 180 feet. The herbicide treatments applied on June 9, 1994 were clopyralid at 4 and 9 oz ai/A, clopylralid + 2,4-D (Curtail 2 qt/A), and picloram at 8 and 16 oz ai/A. The herbicides were sprayed with an ATV sprayer delivering 17 gal/A water. The air temperature was 80F, soil temperature at 3 inches was 75F and at 6 inches was 72F, and the relative humidity was 45%. The sky was partly cloudy and the wind was from the N a 0 to 5 mph. The yellow starthistle was about 6 inches tall and bolting.

The grasses were planted as two strip blocks across the herbicide treatments on December 22, 1994, with a seven-row single cone seeder with 7-inch spacing. The grasses within each block were Sherman big bluegrass (Poa secunda (Presl.)(P. ampla)); sheep fescue (Festuca ovina L. cv. Covar); crested wheatgrass (Agropyron cristatum (L.) Gaerthn. cv. Hycrest); pubescent wheatgrass (Thinopyrum intermedium spp barbulatum (Schu.) Barkw. cv. Luna); Siberian wheatgrass (Agropyron fragile (Roth) Candargy (A. sibiricum) cv. P-27), and Russian wildrye, (Elymus junceus Fisch. cv. Bozoisky). The air temperature was 46 F, and the soil moisture was 80% ASM in the top 1 inch and the soil was not frozen.

The grass blocks were split with an application of glyphosate at the rate of 16 oz ai/a with R-11 (0.5% v/v), to create a weed free check. The application was made February 9, 1995, before planted grasses germinated. The air temperature was 43F, soil temperature at 3 inches was 40F and at 6 inches was 40F, and the relative humidity was 66%. The sky was clear and the wind was from the north at 0 to 3 mph. Emerged weeds at the time of application included downy brome and redstem filaree.

Visual estimates of yellow starthistle cover and height and other weed cover were recorded on June 12, 1995. On the same date, grass cover and height were estimated in the post-plant treated area because of poor establishment in the untreated area.

The effects of the post-plant treatment with glyphosate were outstanding for the control of the annual weedy grasses (Table 1). The planted grasses were nearly impossible to find in untreated areas because of overtopping by downy brome, tumble mustard and bedstraw. In these areas picloram treatments had more downy brome than the clopyralid treatments, but the clopyralid treatments had more tumble mustard. Periodic detection of sheep fescue and crested wheatgrass was possible in the area not treated with glyphosate while good stands of all planted grasses had established in the area treated with glyphosate.

In the pyridine-treated areas of the glyphosate treatment, grass heights were not different from the check area (Table 2.). Grass cover was not statistically different among treatments because of high variability. Grass cover tended to be higher in the picloram treatments but not in all cases. Both rates of picloram caused the wheatgrass species to appear wind-blown, with a 1/8 to 1/4 twist in some leaves. Wheatgrasses in the clopyralid treatments did not show the "wind-blown twisted leaf" symptom. (University of Idaho, Moscow, ID, 83844-2339 and DowElanco, Spokane, WA, 99037).

Table 1. Effect of Post-plant glyphosate treatments on weed cover when establishing grasses.

No-Post-plant Treatment Herbicide	Rate	Cover Tumble Mustard	 Downy Brome	 Bedstraw
	(oz ai/A)	(%)	(%)	(%)
Check	0	97 b	0 a	0 a
Clopyralid	4	100 b	0 a	0 a
Clopyralid	9	83 b	0 a	17 a
Clopyralid+2,4-D	3.04+16	100 b	0 a	0 a
Picloram	8	0 a	96 b	0 a
Picloram	16	0 a	98 b	0 a
Post-plant Glyphosate Herbicide	Rate			
	(oz ai/A)	(%)	(%)	(%)
Check	0	1 a	0 a	23 a
Clopyralid	4	1 a	0 a	22 a
Clopyralid	9	1 a	0 a	15 a
Clopyralid+2,4-D	3.04+16	0 a	0 a	18 a
Picloram	8	0 a	0 a	0 a
Picloram	16	0 a	0 a	0 a

1Any two means having a common letter are not different at the 5% level of significance, using the LSmeans test.

Table 2. Effect of herbicide treatments on grass establishment.

Grass Herbicide	Rate	Grass Ht.	 Cover	Yellow Starthistle Ht.	 Cover	Other Weed Cover Tumble Mustard	 Downy Brome	 Foxtail Barley	 Bed-straw	 Fiddle Neck
	(oz/A)	(cm)	(%)	(cm)	(%)	(%)	(%)	(%)	(%)	(%)
Bluegrass, sherman										
Check	0	35 b	23	77 b	11 a	0	0	0	27 b	0
Clopyralid	4	26 b	5	51 b	27 b	0	0	0	8 ab	0
Clopyralid	9	39 b	28	54 b	4 a	0	0	0	10 b	0
Clopyralid+2,4-D	3.04+16	38 b	30	69 b	8 ab	0	1	0	20 b	0
Picloram	8	36 b	23	0 a	0 a	0	0	0	0 a	0
Picloram	16	32 b	19	0 a	0 a	0	0	0	0 a	0
Fescue, sheep										
Check	0	11 a	7	63 b	5 a	0	0	0	33 b	0
Clopyralid	4	7 a	3	48 b	17 b	4	0	0	10 b	0
Clopyralid	9	9 a	4	48 b	5 a	1	0	0	14 b	0
Clopyralid+2,4-D	3.04+16	9 a	5	50 b	2 a	0	0	0	20 b	0
Picloram	8	8 a	4	0 a	0 a	0	0	0	0 a	0
Picloram	16	9 a	9	0 a	0 a	0	0	0	0 a	0
Wheatgrass, crested										
Check	0	22 b	2	66 b	5 a	0	0	0	33 b	0
Clopyralid	4	23 b	8	47 b	1 a	0	0	0	14 b	0
Clopyralid	9	34 b	8	39 b	2 a	0	0	0	37 b	3
Clopyralid+2,4-D	3.04+16	29 b	12	58 b	1 a	0	0	0	31 b	0
Picloram	8	23 b	7	0 a	0 a	0	0	0	0 a	0
Picloram	16	24 b	7	0 a	0 a	0	0	0	0 a	0
Wheatgrass, pubescent										
Check	0	38 b	1	71 b	6 a	0	0	0	23 b	0
Clopyralid	4	21 b	10	38 b	4 a	0	0	0	12 b	0
Clopyralid	9	14 ab	4	50 b	8 ab	0	0	0	37 b	3
Clopyralid+2,4-D	3.04+16	28 b	7	53 b	7 a	0	0	0	13 b	0
Picloram	8	30 b	18	0 a	0 a	0	0	0	0 a	0
Picloram	16	30 b	17	0 a	0 a	0	0	0	0 a	0
Wheatgrass, Siberian										
Check	0	29 b	9	64 b	27 b	7	0	0	7 ab	0
Clopyralid	4	17 b	3	43 b	2 a	0	0	0	23 b	3
Clopyralid	9	23 b	4	35 b	4 a	3	0	4	23 b	0
Clopyralid+2,4-D	3.04+16	25 b	8	63 b	6 a	0	0	0	17 b	0
Picloram	8	25 b	8	0 a	0 a	0	0	0	0 a	0
Picloram	16	23 b	5	0 a	0 a	0	0	0	0 a	0
Wildrye, Russian										
Check	0	21 b	5	60 b	14 b	0	0	0	15 ab	0
Clopyralid	4	17 b	4	27 b	4 a	0	0	0	20 a	0
Clopyralid	9	26 b	6	42 b	1 a	1	0	0	13 a	0
Clopyralid+2,4-D	3.04+16	24 b	12	33 b	1 a	0	0	0	7 a	0
Picloram	8	27 b	20	0 a	0 a	0	0	0	0 a	0
Picloram	16	21 b	7	0 a	0 a	0	0	0	0 a	0

1Any two means having a common letter are not different at the 5% level of significance, using LSmeans.

Plumeless thistle (*Carduus acanthoides*) and Canada thistle control in pasture and rangeland. Rodney G. Lym. Plumeless thistle is seldom found in cultivated fields even when there are infestations in nearby roadsides or pastures. Plumeless thistle tends to be shorter than other noxious biennial thistles; it typically is 2 to 4 feet tall but can be 6 feet or more in ideal growing conditions. Canada thistle generally becomes weedy in pasture and rangeland only after the land has been disturbed such as from vehicle traffic or overgrazing. The purpose of these experiments was to evaluate plumeless thistle and Canada thistle control using clopyralid or dicamba alone or with various formulations of 2,4-D.

The Canada thistle experiment was established on a dense stand of thistle on May 23, 1995 when the plants were in the rosette to vegetative growth stage. The plants were generally less than 4 inches tall. The plumeless thistle experiment was established in a moderate infestation on May 31, 1995. Most plants were in the prebud growth stage and 12 to 14 inches tall, but some rosettes with up to 24 inch diam also were present. Treatments for both experiments were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The experiments were in a randomized complete block design with three and four replications for the Canada thistle and plumeless thistle experiments, respectively. The plots were 10 by 30 feet in both experiments. Treatments were visually evaluated for percent control or height reduction compared to the untreated control.

Treatment	Rate	Plumeless thistle control	Canada thistle Height reduction	
		8 WAT[a]	8 WAT[a]	12 WAT[a]
	lb/A	%		
2,4-D[b]	1	97	26	33
2,4-D[b]	2	99	22	25
2,4-D	1	99	38	36
2,4-D	2	100	56	47
Clopyralid	0.2	99	80	50
Dicamba	0.35	98	58	33
2,4-D[b] + clopyralid	0.25 + 0.0625	99	68	50
2,4-D[b] + clopyralid	0.5 + 0.125	100	78	49
2,4-D[b] + clopyralid	1 + 0.25	100	78	76
2,4-D[b] + clopyralid	1 + 0.2	100	72	65
2,4-D + clopyralid	1 + 0.2	100	73	61
Clopyralid + 2,4-D[c]	0.19 + 1	100	85	56
2,4-D[b] + dicamba	0.25 + 0.0625	99	35	32
2,4-D[b] + dicamba	0.5 + 0.125	98	50	38
2,4-D[b] + dicamba	1 + 0.25	100	61	41
2,4-D[b] + dicamba	1 + 0.35	100	53	38
2,4-D + dicamba	1 + 0.35	100	54	27
Dicamba + 2,4-D[d]	0.31 + 0.89	100	57	37
LSD (0.05)		NS	20	23

[a] Weeks after treatment

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

[c] Commercial formulation - Curtail

[d] Commercial formulation - Weedmaster

All plumeless thistle treatments provided rapid topgrowth control and prevented plants from flowering (Table). Most treatments provided near 100% control 8 weeks after treatment (WAT). The most cost-effective treatment was 2,4-D at 1 lb/A applied alone which provided 97% or greater control. Although plumeless thistle has been increasing in North Dakota following several seasons of above or much above average precipitation, it is easily controlled by inexpensive herbicides. Previous research at North Dakota State University has shown that when treatments are not applied until after plumeless thistle has bolted, dicamba at 0.5 lb/A or picloram at 0.25 lb/A were required to prevent flowering.

Canada thistle control was less successful using the same treatments that effectively controlled on plumeless thistle. Only clopyralid plus 2,4-D at 0.19 + 1 lb/A provided 85% or better height reduction 8 WAT (Table). No treatment provided satisfactory control 12 WAT. New stems were emerging following all treatments except those that contained clopyralid. Previous research has shown that clopyralid should be applied at 0.25 to 0.5 lb/A or more to control established Canada thistle in pasture and rangeland.

Yellow toadflax control with picloram or picloram plus 2,4-D applied for 1 to 3 consecutive years. Sebastian, J.R. 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). 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 subplots were 10 by 30 feet.

Baseline LINVU density and cover and collective grass cover were taken before the initial application and these data will be collected each successive fall for the duration of the study. Indicated cover and density values are means from three 0.1 m^2 quadrats per replication (12 total quadrats per treatment) taken approximately 60 days after treatment (DAT).

Visual evaluations compared to non-treated control plots also were taken in October 1995. All initial treatments controlled 25 to 65% of LINVU in October 1995 (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. The 1, 2, or 3 year treatments are classified separately in Table 2 although they are the original first year's application. (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
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.)	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	

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

Herbicide[a]	Rate	Year of treatment	Yellow Toadflax Control	Yellow Toadflax Cover	Yellow Toadflax Density	Grass Cover
	(lb ai/A)		-------%-------	-------%-------	----#----	----%----
picloram	0.25	1	30	53	20	34
		2	25	52	16	38
		3	29	60	20	34
picloram	0.5	1	53	46	19	40
		2	53	62	30	26
		3	56	41	15	39
picloram	0.8	1	55	44	17	23
		2	55	42	14	33
		3	54	55	21	22
picloram	1.0	1	59	31	11	49
		2	59	24	9	51
		3	56	39	11	49
picloram + 2,4-D	0.25 1.0	1	36	48	17	39
		2	40	33	9	46
		3	39	41	16	44
picloram + 2,4-D	0.5 1.0	1	65	19	7	44
		2	65	19	9	45
		3	64	29	11	47
control		1	0	51	20	35
		2	0	54	19	41
		3	0	37	13	35
LSD (0.05)			10	25	12	24

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[a] X-77 surfactant added to all treatments at 0.25% v/v.

PROJECT 2

WEEDS OF HORTICULTURAL CROPS

Chairperson: Carl Bell
University of California Co-op. Ext.
Holtville, CA

Soil-applied herbicide weed control in cantaloupes. Kai Umeda and Chris Fredman. 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 preemergence (PREE). 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 35 feet long. Every other bed was treated and planted to provide an untreated buffer between plots. Before soil herbicide applications on 05 Apr 1995, the field was listed and beds were shaped. All treatments were applied with a hand-held boom with two flat fan nozzles spaced 20-inches apart and delivered in 25 gallons per acre of water pressurized with a CO_2 backpack sprayer at 40 psi. PPI applications in the morning had clear skies with no wind and air temperature at 86°F with dry soil. Incorporation was done with a "sidewinder" power incorporator-bed shaper within 1-hour of the applications. Cantaloupe cv. Gold Mine was planted on every other bed. PREE treatments were applied on the soil surface immediately after planting using the same sprayer. During the afternoon PREE application period, the air temperature was 92°F with a wind at 5 to 10 mph and clear skies. Immediately after PREE applications, the crop was furrow irrigated and beds were thoroughly wetted across the surface to activate the PREE herbicides.

Crop injury at 5 and 14 weeks after treatment (WAT) showed that napropamide and clomazone at the high rate caused the most severe injury and caused some visible stand reduction. Dimethenamid and pendimethalin caused slightly higher injury when applied PREE compared to PPI treatments. On 12 May, at 5 WAT, weed control of pigweeds, Wright's groundcherry, and yellow sweetclover was acceptable (>85%) for most treatments. On 17 Jul, at 14 WAT, bensulide, clomazone, cyanazine, dimethenamid, ethafluralin, metolachlor, pendimethalin, and trifluralin gave marginally acceptable control of most weeds. (University of Arizona Cooperative Extension, Maricopa County, 4341 E. Broadway, Phoenix, AZ 85040.)

Table. Soil-applied herbicide weed control in cantaloupes

					Weed control						
Treatment	Rate	Timing	Injury		AMARA	AMABL	AMAAL	PHYWR		MEUOF	
			12 May	17 Jul	12 May	17 Jul	17 Jul	12 May	17 Jul	12 May	17 Jul
	lb/A		--- % ---		---------------------------- % ----------------------------						
Untreated check			0	0	0	0	0	0	0	0	0
Bensulide	6.00	PPI	10	8	90	83	83	90	73	85	60
Trifluralin	1.00	PPI	13	3	88	88	83	90	71	97	81
Pendimethalin	1.00	PPI	11	10	87	81	79	83	55	99	86
Pendimethalin	1.00	PREE	18	16	97	89	88	90	74	99	85
Napropamide	2.00	PPI	40	23	91	85	79	78	53	99	84
Clomazone	0.50	PPI	25	10	87	85	78	92	79	99	81
Clomazone	1.00	PPI	30	23	92	93	94	95	80	99	91
Metolachlor	1.50	PPI	24	16	90	81	83	90	63	97	74
Metolachlor	1.50	PREE	15	10	87	80	80	79	61	96	79
Dimethenamid	0.75	PPI	9	9	87	76	79	95	61	87	56
Dimethenamid	0.75	PREE	20	16	92	84	84	91	71	90	83
Cyanazine	0.50	PREE	10	6	82	74	71	98	81	99	85
Dithiopyr	0.20	PREE	9	8	91	83	81	86	73	94	35
Thiazopyr	0.10	PREE	16	15	95	89	90	88	61	93	59
Ethafluralin	1.30	PREE	4	8	89	86	88	90	65	99	83
Ethafluralin	1.70	PREE	19	10	93	81	84	99	83	96	66
LSD (0.05)			19	9	16	11	12	10	33	11	30

PPI and PREE treatments applied, cantaloupes planted, and watered on 05 Apr 1995.
AMARA = pigweed species (*Amaranthus* sp.), AMABL = prostrate pigweed (*A. blitoides*),
AMAAL = tumble pigweed (*A. albus*), PHYWR = groundcherry (*Physalis wrightii*),
MEUOF = yellow sweetclover (*Melilotus officinalis*).

Comparison of 2 formulations of microencapsulated clomazone with clomazone 4EC for weed control effectiveness and phytotoxicity in pickling cucumbers and processing squash. McReynolds, R.B., and W. C. Friedkin. Clomazone 4EC has been evaluated in efficacy trials in the Willamette Valley of Oregon for the past 4 years. In 1995, a Section 18 Emergency Use Exemption was approved for its use in cucumbers. The label required mechanical incorporation following application because of the potential for injury to non-target plants. One of the better treatments for weed control in previous years has been the 0.25 lb/A PREE sprinkler irrigation incorporated application. Mechanically-incorporated treatments have generally resulted in poorer weed control at that rate. Microencapsulated formulations which can be incorporated by irrigation hold the promise of obtaining optimum weed control without the problem of off target injury. This research compared 2 formulations of microencapsulated clomazone to clomazone 4EC and other herbicides for their weed control effectiveness and their effect on seedling emergence.

A randomized complete block trial with 4 replications and plot dimensions of 12 by 20 feet was established on a Latourell Loam soil at the North Willamette Research and Extension Center on May 23, 1995. PPI treatments were applied to a dry soil surface and immediately incorporated 2 inches deep with a PTO-driven tiller (CO_2 backpack sprayer, 40 psi, four 8002 nozzles spaced 19 in, 1600 ml/treatment, air temp. 57F, relative humidity 76%, soil temp.-2 inch 60F, wind W at 4 mph, sky clear). The trial was seeded with 'Discover' pickling cucumber and 'Golden Delicious' squash on May 24, 1995 and the PREE treatments were applied (air temp. 57F, relative humidity 72%, soil temp.-2 inch 60F, wind 0 mph). The cucumber between-row spacing was 15 inch. Only a single row of squash was planted. The trial was irrigated 3 hours following the PREE applications with 3/4 to 1 inch of water. Plant stand counts were made on May 31, 1995 to measure treatment effects on emergence. Weed density per plot was measured on June 26, 1995. Pigweed density was higher on one end of the trial than the other. Vetch, dogfennel, groundsel, and shepherdspurse were uniformly distributed throughout the trial area. Yield data was not collected.

Weed density.
The clomazone 4EC, 0.25 lb/A PREE, incorporated by sprinkler irrigation, provided significantly better weed control than the untreated control and the clomazone 087 PPI at the 0.25 lb/A rate. Neither of the microencapsulated clomazone formulations applied PREE significantly improved weed control compared to the clomazone 4EC PPI or the untreated. There were no significant differences among any of the PREE treatments. Though not significant, the microencapsulated formulations performed better when applied PREE than when applied PPI. None of the PPI treatments significantly reduced weed densities compared to the untreated.

Seedling emergence.
Cucumber seedling emergence was significantly reduced only in the clomazone ME-087, 0.25 lb/A PREE treatment. Squash densities were not significantly reduced by any treatments. However, once emerged, stunting of squash seedlings was observed in the naptalam + bensulide PPI treatment. (North Willamette Research and Extension Center, Aurora, OR 97002).

Table. Herbicides applied to 'Discover' pickling cucumber and 'Golden Delicious' winter squash.

Treatment[1]	Rate	Weed density[2]	Stand counts[3]	
			Cucumber	Squash
	lb/a	no/foot^2	3 feet of row	
Clomazone 4 EC PREE	0.25	1.4	14.0	7.5
Ethalfluralin 2 EC PREE	1.25	1.9	12.8	8.8
Bensulide 6 EC PPI +	6.0	2.0	15.3	7.8
Napthalam 3 EC PPI	4.0			
Clomazone ME 014 PREE	0.25	2.0	14.0	7.8
Clomazone ME 014 PREE	0.125	2.4	14.5	7.8
Clomazone ME 087 PREE	0.25	2.6	11.8	7.5
Clomazone ME 087 PREE	0.125	2.6	13.8	8.0
Clomazone 4 EC PPI	0.25	2.9	13.3	8.8
Clomazone 4 EC PREE	0.125	2.9	13.8	8.0
Clomazone ME 014 PPI	0.25	3.5	13.3	8.5
Untreated		3.9	15.3	8.2
Clomazone ME 087 PPI	0.25	4.3	14.0	7.0
LSD		2.2	3.2	1.8

[1] Ppi treatments applied May 23, 1995. Preemergence treatments applied May 24, 1995.
Clomazone ME 014 = clomazone PL 95-014 and clomazone ME 087 = clomazone PL 95-087.

[2] Weed densities were made at random in each plot on June 26, 1995.

[3] Stand counts of emerging seedlings were made on May 31, 1995.

Herbicide treatments on newly planted asparagus. Rick A. Boydston, Steve Eskelsen, and Alan Schreiber. Sulfentrazone, linuron, and isoxaben applied preemergence and pyridate applied postemergence were tested on newly planted asparagus crowns,cv. Jersey Knight, grown under sprinkler irrigation near Prosser, WA. Asparagus crowns were planted on March 21, 1995, and preemergence herbicide applications were made on March 27, 1995. Pyridate was applied postemergence on May 2, 1995 when asparagus was 1 to 2.5 feet tall. Each herbicide was applied at a normal use rate and a double rate to evaluate crop tolerance. The soil was a Warden sandy loam with 1% organic matter. Plots were 10 feet by 30 feet long and contained two rows of asparagus. Each treatment was replicated four times in a randomized complete block design. Herbicide treatments were applied with a CO_2 pressurized ATV sprayer delivering 22 gpa at 30 psi with 8003 VS flat fan nozzles. Visual asparagus injury was estimated on May 12, July 21, and September 21, 1995 and asparagus stand counts were determined on June 2, 1995. Visual weed control ratings were made on May 12, 1995. Common lambsquarters was the main weed present.

Sulfentrazone at 0.5 and 1.0 lb/a did not injure asparagus early in the growing season, but after several sprinkler irrigations, injury symptoms on asparagus began to appear in June and July (Table). Injury consisted of plants becoming necrotic and dying several months after emerging. Isoxaben at 0.5 and 1.0 lb/a and pyridate at 0.9 and 1.8 lb/a did not significantly injure asparagus. None of the herbicides reduced asparagus emergence or stand counts early in the season (Table). Isoxaben applied preemergence and pyridate applied postemergence appear to have adequate selectivity on newly planted asparagus.

Sulfentrazone at 0.5 and 1.0 lb/a and linuron at 0.75 lb/a controlled common lambsquarters well through mid May. Isoxaben only marginally controlled common lambsquarters even at 1 lb/a. In late May, all plots were cultivated and additional soil was thrown onto asparagus rows. Pyridate applied postemergence controlled common lambsquarters well (Table). (USDA-ARS, Irrigated Agriculture Research and Extension Center, Prosser, WA 99350 and Food and Environmental Quality Laboratory, Washington State Univ., Richland, WA 99352)

Table. Herbicide treatments on newly planted asparagus crowns.

Treatment	Timing[1]	Rate	Crop injury 5/12/95	Crop injury 7/21/95	Asparagus stand counts[2]	CHEAL[3] control
		lb/A	--------%--------		no./20 ft row	%
1. Sulfentrazone	pre	0.5	0	43	18	100
2. Sulfentrazone	pre	1.0	0	84	18	100
3. Isoxaben	pre	0.5	0	7	22	55
4. Isoxaben	pre	1.0	0	4	21	74
5. Linuron	pre	0.75	0	1	22	99
6. Pyridate + COC[4]	post	0.9	0	1	21	98
7. Pyridate + COC	post	1.8	0	0	23	99
8. Nontreated check		-----	0	3	23	0
		LSD 0.05	0	13	6	4

[1] Preemergence treatments applied March 27, 1995, and postemergence May 2, 1995.
[2] Asparagus stand counts were determined on June 2, 1995.
[3] Common lambsquarters (CHEAL) control visually evaluated May 12, 1995.
[4] MorAct® crop oil concentrate added at 1% (V/V) spray solution.

Post-emergence weed control in a newly planted asparagus crown nursery. Robert Mullen. A post-emergence weed control trial in a newly planted asparagus crown nursery was established at Speckman Farms west of Stockton, California on May 18, 1995. Three herbicides were evaluated for weed control efficacy and safety to the young asparagus seedlings. The soil type was a Ryde silty clay loam/Egbert much mix and the asparagus variety was UC157$_{F1}$. All treatments were applied over the asparagus crop and weeds with a handheld CO_2 backpack sprayer using 8002 nozzles at 40 psi in a spray volume of 30 gal/a water. At the time of treatment weeds present included 1 1/2 to 3 inch tall redroot pigweed (AMARE), 1 to 2 inch tall lambsquarter (CHEAL), 1 to 3 true leaf common purslane (PORAL), and 4 to 6 true leaf yellow nutsedge (CYPES); the asparagus seedlings were about 2 inches tall. There were four replications of each treatment in a randomized complete block design.

An evaluation of weed control efficacy and crop phytotoxicity took place on May 30, 1995. None of the treatments were effective in controlling yellow nutsedge. Best control of the remaining weed species occurred with the high and medium rates of both metribuzin and linuron, followed by rimsulfuron plus X-77, and the low rate of linuron. Rimsulfuron plus X-77 caused severe crop fern burn, while the high rate of linuron caused some temporary fern chlorosis; all other treatments were quite safe to the asparagus crop. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205.)

Table. Post-emergence weed control in a newly planted asparagus crown nursery.

		Weed Control[1]				
Herbicide	Rate	AMARE	CHEAL	PORAL	CYPES	Asparagus Injury[1]
	oz or lb/A	---------%			---------	%
linuron	0.375 lb	93	89	100	20	9
linuron	0.75 lb	99	97	100	23	13
linuron	1.0 lb	99	97	100	25	25
metribuzin	0.25 lb	99	100	100	18	10
metribuzin	0.5 lb	97	99	100	20	11
rimsulfuron +	0.25 oz +	97	91	91	48	49
X-77	0.25% (V/V)					
Control	------	0	0	0	0	7

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

Evaluation of preemergence herbicide applications to seed carrots. Marvin D. Butler. The objective of this project was to evaluate the herbicides linuron, pendimethalin, and EPTC, applied alone and in combination on seed carrots grown commercially near Madras, Oregon. Treatments of 10 by 20 ft plots were replicated three times in a randomized complete block design. Treatments were applied preemergence on September 8, 1995 with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. The trial area was sprinkler-irrigated with a center pivot three times after planting and prior to application of herbicides, and again 4 hours after herbicide applications. Treatments were evaluated November 2, 1995, for % control of common mallow, prickly lettuce, common lambsquarters, common groundsel, flixweed, and blue mustard. Reduction in stand and crop were rated visually.

Average population of weed species in the untreated plots was 37% common mallow, 22% prickly lettuce, 13% flixweed, 11% common groundsel, 10% blue mustard, and 7% common lambsquarters. Linuron provided 100% control of all six species evaluated. Pendimethalin controlled prickly lettuce, common lambsquarters, flixweed, and blue mustard at 100%, common mallow at 93%, and common groundsel at 50%. EPTC provided inadequate control of all species except common groundsel. There was no reduction in the carrot stand and there was no visible crop injury. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741).

Table. Effect of preemergence herbicide application on seed carrots near Madras, Oregon.

		Weed control[1]					
Treatment[2]	Rate	Common mallow	Prickly lettuce	Common lambsquarters	Common groundsel	Flixweed	Blue mustard
	(lb/A)	(%)					
Linuron	1	100	100	100	100	100	100
EPTC	3.5	0	0	67	80	33	13
EPTC	6.1	0	0	0	90	0	57
Linuron	1						
+ EPTC	3.5	99	100	100	100	100	100
Pendimethalin	0.8	93	100	100	50	100	100
Untreated	---	0	0	0	0	0	0

[1] Visual evaluation was conducted on November 2, 1995

[2] Treatments applied September 8, 1995.

Evaluation of layby herbicide applications to seed carrots. Marvin D. Butler. The objective of this project was to evaluate metribuzin, bromoxynil, oxyfluorfen, and EPTC applied alone, and in combination, to plots in commercial seed carrot fields at three locations (Cloud, S & L, and K & S Farms) near Madras, Oregon. Treatments were replicated three times in a randomized complete block design with 3 row by 20 ft plots. Treatments were applied at layby using a drop nozzle directed at the furrow and base of the plants. The CO_2 pressurized, hand-held, sprayer delivered 20 gpa at 40 psi. Herbicides were applied June 15 at Cloud Farms with very few weeds emerged, June 23 at S & L with weeds 1 to 2 inches high, and June 29 at K & S where weeds were 6 to 18 inches tall. A nonionic surfactant at 0.25% v/v was applied in combination with all treatments. All locations were irrigated within 6 hours following treatment. Plots were furrow irrigated at S & L, and sprinkler irrigated at Cloud and K & S Farms.

Evaluation for herbicide phytotoxicity and% weed control by dominant species was conducted July 21 at S & L, July 24 at K & S, and July 25 at Cloud Farms. Common groundsel was the primary weed present in untreated plots on Cloud Farms at the time of evaluation. In untreated plots at S & L Farms 72% of the weeds were common groundsel; 19% various mustards, 6% hairy nightshade, and 3% redroot pigweed. At K & S Farms 70% of the weeds in untreated plots were redroot pigweed and 30% were hairy nightshade.

There were no visible symptoms of phytotoxicity due to any of the herbicide applications. Metribuzin at 1 lb/A provided the greatest overall control of the major weed species, while EPTC generally did not perform satisfactorily. Metribuzin provided the best control of redroot pigweed, followed by the high rates of bromoxynil and oxyfluorfen. For hairy nightshade bromoxynil and oxyfluorfen performed well, followed by the high rate of metribuzin. The best control of common groundsel was achieved with metribuzin, followed by bromoxynil and oxyfluorfen. Both metribuzin and bromoxynil provided control of kochia, and along with oxyfluorfen performed well on the mustards. The only combination treatment that provided greater control than materials alone was metribuzin plus bromoxynil on redroot pigweed. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741).

Table. Effect of layby herbicide applications on commercial seed carrots at 3 locations near Madras, Oregon.

		Weed control[1]						
		Redroot pigweed			Common groundsel		Hairy nightshade	
Treatment[2]	Rate	Cloud	S & L	K & S	Cloud	S & L	S & L	K & S
	(lb/A)	(%)						
Metribuzin	0.25	100	93	63	100	93	67	63
Metribuzin	0.5	100	100	93	100	97	95	67
Metribuzin	1	100	100	97	100	100	100	100
EPTC	3.5	98	67	10	80	48	63	33
EPTC	6.13	100	100	10	67	27	33	67
Bromoxynil	0.13	100	43	87	83	83	73	100
Bromoxynil	0.25	95	80	90	87	98	100	100
Bromoxynil	0.5	100	95	100	67	100	97	100
Oxyfluorfen	0.2	100	95	87	100	50	100	100
Oxyfluorfen	0.4	100	97	97	100	57	97	100
Oxyfluorfen	0.8	100	93	73	97	75	60	67
Metribuzin	0.25							
+ EPTC	3.5	100	97	92	97	97	93	100
Bromoxynil	0.25							
+ Oxyfluorfen	0.2	67	87	70	95	87	100	100
Bromoxynil	0.25							
+ EPTC	3.5	99	100	93	100	98	97	90
Bromoxynil	0.25							
+ Metribuzin	0.25	100	100	100	92	83	100	100
Untreated	---	0	0	0	0	0	0	0

[1] Visual evaluations were conducted at the three locations July 21, July 24, and July 25.

[2] Treatments were applied to the three locations June 15, June 23, and June 29.

Volunteer potato control in carrots with glyphosate. Rick A. Boydston and Marcus D. Seymour. Volunteer potatoes are difficult to control selectively in carrots with herbicides. Currently, volunteer potatoes are controlled with multiple cultivations and handweeding. This study was conducted to evaluate volunteer potato control in carrots with glyphosate applied in an enclosed spray hood between the carrot beds and glyphosate applied with a ropewick in the carrot rows. The study was conducted on a commercial field planted with carrots, cv. Gold Pride, on May 29, 1995 near Alderdale, WA. Carrots were planted in 26 inch wide beds each containing six rows and beds were spaced 40 inches on center. Glyphosate was applied at 0.75 or 1.5 lb/a between carrot beds in enclosed spray hoods 14 inches wide containing a single 80015 spray nozzle delivering 15 gpa. Glyphosate was applied to potatoes in the carrot rows with a ropewick applicator containing 3% (v/v) Roundup formulation of glyphosate. Glyphosate was applied on July 7, 1995 when carrots were 3 to 5 inches tall in the 3 to 4 leaf stage and volunteer potatoes were 5 to 14 inches tall in the 5 to 8 leaf stage with small tubers present. Volunteer potato control with glyphosate treatments were compared to the grower's standard practice, which consisted of two cultivations on June 30, 1995 and July 19, 1995 and two handweedings on June 30, 1995 and July 24, 1995. Visual potato control was evaluated on July 17, 1995. Carrots were harvested from a 3.3 by 25 foot area in the center of each plot on October 13, 1995 and graded according to commercial standards for slicing carrots. Volunteer potato tubers were dug from a 6.7 by 25 foot area in the center of each plot on October 27, 1995 and counted and weighed.

Glyphosate applied in an enclosed hooded sprayer at 0.75 or 1.5 lb/a controlled 90 to 92% of volunteer potatoes in carrots when rated on July 17, 1995 (Table). Volunteer potatoes that were in the carrot row and that were not taller than carrots survived glyphosate applied with the ropewick and accounted for many of the observed escapes. In late July, potato plant density was reduced by about 60% with the glyphosate treatments and by 90% with cultivation and handweeding compared to nontreated checks (Table). Carrot yield was similar between glyphosate treated plots and plots that were cultivated and handweeded (Table). Volunteer potatoes reduced carrot yield in nontreated checks 27% compared to treated plots. Glyphosate treatments reduced the number of potato tubers produced by about 68% compared to nontreated checks while cultivation and handweeding reduced tuber number by 93%. Potato tuber biomass was reduced by about 80% with glyphosate treatments and by 98% with cultivation and handweeding compared to nontreated checks (Table). (USDA-ARS, Irrigated Agriculture Research and Extension Center, Prosser, WA)

Table. Volunteer potato control in carrot with glyphosate applied in an enclosed hooded sprayer and ropewick.

Treatment	Method	Rate	Potato control[2]	Potato density[3]	#1 grade carrot yield	Potato tuber counts[4]	Potato tuber biomass
		lb/a	---%---	no./m^2	T/A	no./m^2	T/A
Glyphosate	Hooded sprayer and ropewick[1]	0.75	90	1.9	34.0	6.9	0.8
Glyphosate	Hooded sprayer and ropewick	1.5	92	2.0	34.2	5.3	0.6
Conventional	Cultivated twice handweeded twice	-	96	0.5	31.4	1.4	0.1
Nontreated		-	0	4.8	24.2	19.0	3.5
		LSD 0.05	2.8	0.35	4.6	11.2	1.5

[1] Glyphosate applied as 3% (V/V) solution of Roundup® in ropewick in carrot rows.
[2] Visual rating of potato control made on July 17, 1995.
[3] Potato density determined on July 26, 1995.
[4] Potato tuber counts and biomass determined on October 27, 1995.

Pre-emergence weed control in processing tomatoes. Robert Mullen, Janet Caprile, Ted Viss, and Scott Whitely. A post-plant, pre-emergence weed control trial in processing tomatoes was established at Vaquero Farms near Brentwood, California on April 5, 1995. The soil type was a Brentwood clay and the tomato variety was Heinz 9177. All treatments were applied to the surface of the tomato beds and sprinkler incorporated 3 days later. All applications were made with a CO_2 backpack sprayer using 8004 nozzles at 30 psi in 50 gal/a water. Weather at the time of treatment was partly cloudy, 66°F, and a west wind of 2 to 3 mph. There were four replications of each treatment in a randomized complete block design.

An evaluation of weed control efficacy and crop phytotoxicity took place on May 3, 1995, and again on May 19, 1995. Weeds present included a moderately heavy population of black nightshade (SOLNI) and barnyardgrass (ECHCG). Best overall weed control of both weed species present occurred with both rates of dimethenamid, followed by the two highest rates of rimsulfuron. Dimethenamid caused considerable reduction in early crop growth, particularly at the highest rate tested. All the remaining treatments of rimsulfuron and napropamide exhibited excellent crop safety.

The trial was harvested on August 15, 1995 and all treatments, except napropamide, produced significantly greater yields than the untreated control. Interestingly enough, both rates of dimethenamid had the highest level of immature (green) fruit but also the highest yields. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205; and University of California Cooperative Extension, Contra Costa County, Pleasant Hill, CA 94523.)

Table. Pre-emergence weed control in processing tomatoes.

		Weed Control[1]							
		SOLNI		ECHCG		Tomato Injury[1]			Immature
Herbicide	Rate	5/3	5/19	5/3	5/19	5/3	5/19	Yield	(Green) Fruit
	oz or lb/A	----------------------	-%	-----------------	-------	---------%	--------	T/A	%
rimsulfuron	0.125 oz	50	48	65	60	9	8	25.5	5.6
rimsulfuron	0.167 oz	55	50	60	64	8	7	22.4	6.4
rimsulfuron	0.25 oz	58	53	70	68	14	12	30.4	5.8
rimsulfuron	0.375 oz	76	68	84	80	9	8	30.4	6.9
rimsulfuron	0.5 oz	78	70	88	84	7	6	29.4	5.8
dimethenamid	0.75 lb	89	86	99	100	28	20	31.3	13.2
dimethenamid	1.0 lb	93	90	100	100	36	38	33.4	14.1
napropamide	2.0 lb	30	25	53	53	5	6	18.5	6.4
Control	------	0	0	0	5	7	7	17.5	9.3
							LSD @ 5%:	6.2	
							CV =	16.1%	

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

Post-emergence grass and broadleaf control in processing tomatoes. Robert Mullen, Ted Viss, and Scott Whitely. A post-emergence weed control trial in processing tomatoes was established at Bacchetti Farms near Tracy, California on May 18, 1995. The soil type was a Sacramento loam and the tomato variety was Heinz 9175. All treatments were applied over the tomato crop and weeds using a handheld CO_2 backpack sprayer with 8002 nozzles at 40 psi in a spray volume of 30 gal/a water. On the treatment date the tomato crop was at the late first true leaf to second true leaf stage of growth. Weeds present included a heavy infestation of one to two inch tall barnyardgrass (ECHCG), 1 to 2 inch rosette shepherdspurse (CAPBP), cotyledon to early second true leaf hairy and black nightshade (SOLSA and SOLNI), and one inch tall smooth crabgrass (DIGIS). Weather at the time of treatment was clear, 87°F, and a northwest wind 1 to 3 mph. There were four replications of each treatment in a randomized complete block design.

An evaluation of weed control efficacy and crop phytotoxicity took place on April 30, 1995 and again on June 5, 1995. Best overall control of all weeds present was achieved by the highest rate of rimsulfuron plus X-77, and then the lower rate of rimsulfuron plus X-77. Clethodim plus COC at the high rate gave excellent control of barnyardgrass and smooth crabgrass. The rimsulfuron plus X-77 treatments gave a slight slowdown in crop growth, but otherwise all treatments exhibited good crop safety. The trial was harvested on September 1, 1995. All treatments outyielded the control, led by the high rate of rimsulfuron plus X-77 and the high rate of clethodim plus COC. The control also had the highest percentage of immature (green) fruit. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205.)

Table. Post-emergence grass and broadleaf control in processing tomatoes.

		Weed Control[1]											
		ECHCG		DIGIS		CAPBP		SOLNI/SOLSA		Tomato Injury [1]			Immature (green)
Herbicide[2]	Rate	4/30	6/5	4/30	6/5	4/30	6/5	4/30	6/5	4/30	6/5	Yield	Fruit
	oz or lb/A	----------------	----------------	----------------	----%----	----------------	----------------	----------------	----------------			T/A	%
clethodim	0.094 lb	88	86	65	68	8	0	0	0	6	6	36.3	4.9
clethodim	0.125 lb	93	93	80	79	5	0	0	0	7	9	39.4	3.4
sethoxydim	0.188	89	85	60	65	5	0	0	0	7	13	33.9	5.1
rimsulfuron	0.375 oz	94	91	84	83	95	100	79	73	14	17	37.8	2.9
rimsulfuron	0.5 oz	95	93	91	84	95	100	88	83	12	13	40.0	4.4
Control	------	0	0	0	0	0	0	0	0	6	12	25.1	10.2
										LSD @ 5%:		10.5	
											CV =	19.7%	

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

[2] Clethodim and sethoxydim treatments included crop oil concentrate at 1.0% (V/V) and rimsulfuron treatments included X-77 at 0.25% (V/V)

Evaluation of postemergence herbicides for use in non-bearing almonds. David W. Cudney and William H. Krueger. Little mallow (MALPA) and redstem filaree (EROCI) are often difficult to control in almond orchards. Both weeds are tolerant of many of the preemergent herbicides and are also tolerant to the most commonly used foliar herbicide, glyphosate.

Foliar applications of oxyfluorfen have been successfully utilized for control of little mallow and redstem filaree, however oxyfluorfen has been known to "co-distil" particularly from moist surfaces and cause injury to newly developing buds and leaves. The injury is in the form of small necrotic areas on the newly expanding leaves. The necrotic area sloughs out leaving a small "shot hole". This is similar to the injury from the almond disease, shot hole, caused by the fungus *Wilsonomyces carpophilus*. The injury is usually cosmetic, however, concern over possible injury has limited the use of oxyfluorfen to prior to bud break or prior to mid-February. Little mallow and redstem filaree often can become a problem later in the spring, particularly if late spring rains occur.

Lactofen is a herbicide within the same chemical "family" as oxyfluorfen and has foliar activity similar to oxyfluorfen. The purpose of this trial was to compare the use of oxyfluorfen and lactofen on a young almond orchard for their effect on newly expanding almond leaves and the control of little mallow and redstem filaree.

The trial was established on a young almond orchard (in its third year) five miles southeast of Orland, California on March 10, 1995. Each plot was 10 by 26 ft with one tree at the center of the plot. The treatments were arranged in a randomized complete block design with four replications. Treatments were made with a CO_2 backpack sprayer and boom with three 8004 flat fan nozzles and at 30 psi. Two passes were made per plot and the spray volume for all plots was 58 gal/a. Treatments consisted of lactofen applied at 0.25 and 0.5 lb/A with and without glyphosate at 1.0 lb/A. These treatments were compared with oxyfluorfen at 0.5 lb/A with and without glyphosate at 1.0 lb/A and glyphosate alone at 1.0 lb/A. Evaluations of weed control and almond leaf phytotoxicity were made 14 and 32 DAT.

Oxyfluorfen and lactofen controlled both little mallow and redstem filaree similarly when compared at equal rates. Glyphosate did not control little mallow and did not improve efficacy when added to the other herbicides. Lactofen did not significantly effect the newly expanding leaves. Oxyfluorfen did cause necrotic spotting of newly expanding almond leaves 14 DAT, however the overall effect was reduced with the emergence of new leaves at 32 DAT (data not shown). It appears that lactofen might be substituted for oxyfluorfen when sensitive growth is present. (Botany and Plant Sciences Department, University of California, Riverside, CA 92521 and University of California Cooperative Extension, Glenn County, PO Box 697, Orland, CA 95963).

Table. Evaluation of postemergence herbicides in almonds.

Herbicide		Phytotoxicity	Weed control		Weed control	
			EROCI	MALPA	EROCI	MALPA
			14 DAT		32 DAT	
	lbs/A	Rating[1]	%			
Lactofen	0.25	0.0	65	90	63	85
Lactofen	0.5	0.5	85	100	78	88
Lactofen + glyphosate	0.25 + 1.0	0.5	80	95	78	75
Lactofen + glyphosate	0.5 + 1.0	0.3	88	100	83	85
Glyphosate	1.0	0.0	33	35	78	53
Oxyfluorfen	0.5	2.3	78	100	68	85
Oxyfluorfen + glyphosate	0.5 + 1.0	3.0	90	100	88	93
Control		0.0	0	0	0	0
LSD @ 0.05		0.7	10	8	15	9

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[1] Phytotoxicity as necrotic spots and "shot holes" in newly developing almond leaves; 0 = no effect, 10 = complete desiccation of leaves.

Plant-back studies with clomazone 4 EC. McReynolds, R. B., and W. C. Friedkin. Oregon received a Section 18 Emergency Use Exemption for clomazone use on cucumbers in 1995. Grower concern regarding soil-herbicide residual and its effect on crops planted in the subsequent year limited its use. This research was designed to investigate the residual effects of clomazone on selected crops planted 10 months after an application which had been incorporated by either irrigation or mechanically.

A randomized complete block trial with 4 blocks and 3 treatments (untreated, clomazone incorporated mechanically and clomazone irrigation-incorporated, trial dimensions 48 x 144 feet) was established at the North Willamette Research and Extension Center on September 22, 1994. Clomazone 4EC was applied to a weed free soil surface at a rate of 0.25 lb/A (CO_2 tractor mounted sprayer, 40 psi, 4-8002 nozzles spaced 19 inches, 900 ml/plot, air temp 76 F, soil temp-2 inches 68 F, relative humidity 72 F, wind from east 2-mph, sky clear, treated area of a replicate 12 x 48 feet). Following the applications, a tractor mounted tiller was used in the mechanical incorporation plots to incorporate the herbicide to a depth of 3 inches. All plots were sprinkler irrigated with approximately 1 inch of water following the clomazone application to the irrigation-incorporated plots. The following spring, on June 15, 1995, the treatments were split in order to evaluate the impact on the herbicide-residual of the two most commonly used methods in the area for field preparation for planting. One-half of each treatment (24 feet wide) was plowed with a mold-board plow and disked (18 inch disk), the other half was only disked. Both areas were culti-packed for a final seed-bed preparation. On July 17, 1995, fourteen different crops commonly grown in the area were planted in the trial area. A single row 12 feet long of each crop was mechanically seeded in each replicate with a row spacing between the different crops of 15 inches. The trial was irrigated the following day. Seedling stand counts were made from July 31, through August 11, 1995 on 3 feet of row in each plot. The results of the stand counts were analyzed to measure the effect of the carry-over herbicide for the 2 methods of herbicide incorporation from the previous year. Because the soil preparation methods were not applied at random to the trial, the results from the plowed-disked and the disked-only areas were analyzed separately.

Under the plowed-disked field preparation regime, neither the mechanical nor the irrigation incorporated treatments significantly reduced seedling emergence for any of the crops grown compared to the untreated control. Although not significant, a trend towards reduced emergence was observed for broccoli and lettuce. Under the disked-only regime, wheat emergence was significantly reduced in the irrigation-incorporated treatment. The trend toward reduced emergence was observed for lettuce, but was not observed for broccoli.

A special local needs registration for clomazone 4EC is anticipated for 1996. The results from this trial should assist growers in deciding whether or not clomazone will fit in their crop rotation programs. (Oregon State University, North Willamette Research and Extension Center, Aurora, OR 97002.)

Table 1. Seedling emergence of various crops 10 months after application of clomazone 4EC, at a rate of 0.25 lb/A in soil which had been plowed and disked before planting.[1]

		Treatment[2]			
Crop	Variety	Untreated	Rototilled	Irrigated	
		Seedlings/foot			$lsd_{0.05}$
Broccoli	Gem	8.0	7.3	4.5	ns
Carrot	Six Pack	48.8	52.3	47.3	ns
Cauliflower	Snowball Y Imp	22.3	24.0	23.5	ns
Lettuce	Parris Island Cos	41.3	27.8	27.5	ns
Green Onion	Ishikura	36.0	37.3	34.0	ns
Parsnip	Alba	10.8	16.3	11.3	ns
Pea	Little Marvel	2.3	2.3	2.5	ns
Radish	Fuego	29.8	28.8	30.8	ns
Ryegrass	Pennant	35.0	37.8	32.5	ns
Snap Bean	Oregon 91G	22.0	24.0	24.0	ns
Spinach	Melody	13.8	12.5	14.3	ns
Sweet Corn	Golden Jubliee	6.3	7.5	8.3	ns
Table Beet	Detroit Dark Red	72.5	68.0	72.8	ns
Wheat	Stevenson	16.0	14.8	13.5	ns

[1] Field preparation for planting began on June 15, 1995 and was completed on June 27, 1995.
[2] Both mechanical and sprinkler incorporation treatments completed on September 22, 1994.

Table 2. Seedling emergence of various crops 10 months after application of clomazone 4EC, at a rate of 0.25 lb/A in soil which had been only disked before planting.[1]

		Treatment[2]			
Crop	Variety	Untreated	Rototilled	Irrigated	
		Seedlings/foot			$lsd_{0.05}$
Broccoli	Gem	8.5	10.8	11.9	ns
Carrot	Six Pack	62.0	65.0	63.3	ns
Cauliflower	Snowball Y Imp	14.8	9.0	11.3	ns
Lettuce	Parris Island Cos	56.5	40.8	44.3	ns
Green Onion	Ishikura	39.5	35.0	33.5	ns
Parsnip	Alba	25.5	23.0	21.3	ns
Pea	Little Marvel	3.0	0.9	2.3	ns
Radish	Fuego	29 5	33.0	37.0	ns
Ryegrass	Pennant	32.8	28.5	36.3	ns
Snap Bean	Oregon 91G	17.5	17.0	14.5	ns
Spinach	Melody	11.0	11.3	14.0	ns
Sweet Corn	Golden Jubliee	7.3	9.5	7.8	ns
Table Beet	Detroit Dark Red	74.0	60.5	65.0	ns
Wheat	Stevenson	20.0	17.8	14.0	4.3

[1] Field preparation for planting began on June 15, 1995 and was completed on June 27, 1995.
[2] Both mechanical and irrigation incorporation treatments completed on September 22, 1994.

Tolerance of sweet corn cultivars to pyridate formulations. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. Six sweet corn cultivars were evaluated in separate trials for tolerance to wettable powder and emulsifiable concentrate formulations of pyridate at the Hyslop Agronomy Farm near Corvallis, OR. The trial design was a randomized complete block with three replications and 10 by 23 ft plots. The herbicides were applied on June 8, 1995, to 3- to 6-leaf corn. A single-wheel compressed-air sprayer was used to deliver a broadcast spray of 20 gpa at 15 psi. The trial area was cultivated to reduce weed competition. A total of 24 ft of row was harvested from the center two rows in each plot.

Both pyridate formulations caused minor chlorosis in all six sweet corn cultivars (Table 1), but by July 6, no symptoms were present in any treatment. The amount of chlorosis caused by pyridate was slightly more than that caused by bentazon. None of the treatments adversely affected yield (Table 2). (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table 1. Visual evaluations of injury to sweet corn cultivars from pyridate formulations, Hyslop Farm, Corvallis, OR.

		Sweet corn injury[2]					
Treatment[1]	Rate	J	E	GH	SJ	GS	KK
	(lb/A)	(%)					
Pyridate EC	0.47	7	5	5	5	5	5
Pyridate EC	0.94	10	7	7	8	7	8
Pyridate WP	0.47	7	3	2	5	5	2
Pyridate WP	0.94	5	5	2	5	3	5
Bentazon	1	7	0	0	3	0	3
Check	0	0	0	0	0	0	0

[1]Herbicides applied June 8, 1995; EC = 3.75 lb/gal emulsifiable concentrate, WP = 45% wettable powder. Crop oil concentrate added to all treatments @ 1 qt/A.
[2]Evaluated June 15, 1995; J = 'Jubilee', E = 'Elite', GH = 'GH-2690', SJ = 'Supersweet Jubilee', GS = 'GSS-7831', KK = 'Krispy King'

Table 2. Yield of sweet corn cultivars following application of pyridate formulations at Hyslop Farm, Corvallis, OR.

		Sweet corn yield[2]					
Treatment[1]	Rate	J	E	GH	SJ	GS	KK
	(lb/A)	(T/A)					
Pyridate EC	0.47	11.8	15.9	13.5	13.4	11.1	14.2
Pyridate EC	0.94	12.2	16.6	13.4	14.2	11.3	14.8
Pyridate WP	0.47	12.2	16.5	12.8	13.8	11.8	13.0
Pyridate WP	0.94	12.0	15.2	13.5	14.8	13.1	14.2
Bentazon	1	12.2	14.9	14.5	13.1	12.2	13.3
Check	0	12.3	15.8	12.8	13.0	11.8	13.5
	$LSD_{(.05)}$	NS	NS	NS	NS	NS	NS
	CV (%)	5.1	6.7	7.0	9.3	13.2	9.2

[1]Herbicides applied June 8, 1995; EC = 3.75 lb/gal emulsifiable concentrate, WP = 45% wettable powder. Crop oil concentrate added to all treatments @ 1 qt/A.
[2]Harvested September 7, 1995; J = 'Jubilee', E = 'Elite', GH = 'GH-2690', SJ = 'Supersweet Jubilee', GS = 'GSS-7831', KK = 'Krispy King'

Sensitivity of seashore paspalum to commonly used postemergence turf herbicides. David W. Cudney, Victor A. Gibeault, John S. Reints, and Clyde L. Elmore. Seashore paspalum (*Paspalum vaginatum)* is a relatively new turf species in California. Since its introduction into California in the early 1980's, information concerning its culture and management has been developed. However, little is known about its response to the commonly used foliar turf herbicides.

Few of the herbicides that are used in turf are completely selective. When foliar herbicides such as 2,4-D and MSMA, are used, slight stunting and discoloration can occur. These symptoms are seldom noticed and persist for only a few days. The negative effect of the symptoms is far outweighed by the benefits of weed control. Yet occasionally the response of a turf species to an herbicide is severe enough that the herbicide can not be used with that turf species. An example of such a response can be found in the reaction of St Augustine turf to MSMA application.

In order to assess the effects of the commonly used foliar herbicides in seashore paspalum the following trial was established on a healthy four-year-old turf sward at the University of California, Riverside Experiment Station Turf Facility on August 23, 1995. The herbicides tested included: 2,4-D, MCPP, dicamba, MSMA, fenoxaprop, two of the most common commercial three-way herbicide formulations (containing 2,4-D, MCPP, and dicamba), and a commercial formulation of a four-way herbicide combination (2,4-D, MCPP, dicamba and MSMA). Each plot was 5 by 15 ft. All treatments were applied at rates typical of their use with other turf species using a CO_2 plot sprayer at a spray volume of 50 gallons per acre. The plots were arranged in a randomized complete block design with four replications of each treatment. Phytotoxicity evaluations were made 2, 5, 10, and 20 DAT. Mowing was discontinued during the evaluation period and measurements of turf height were made on the 20th day after treatment. Height was taken by measuring the distance from the soil surface to the top of the turf canopy and averaging five measurements for each plot.

MSMA and the combinations containing MSMA were injurious to seashore paspalum turf. Fenoxaprop also injured the turf. The extent of the injury from these herbicides increased with time. It is doubtful that MSMA or fenoxaprop could be used on Seashore Paspalum at normal rates of application. Dicamba, 2,4-D and MCPP alone and in three-way combinations did not cause appreciable injury except for temporary reductions in height from 2,4-D and MCPP. All plots, including the MSMA and fenoxaprop treatments had recovered from treatment effects 50 DAT. (Dept. Botany and Plant Sciences, University of California, Riverside, CA 92521 and Vegetable Crops Department, Weed Science Program, University of California, Davis, CA 95961).

Table. Seashore paspalum post-emergence turf herbicide sensitivity.

						Phytotoxicity				Height
Herbicide	Fenoxaprop	2,4-D	MCPP	Dicamba	MSMA	2 DAT	5 DAT	10 DAT	20 DAT	20 DAT
	lb/A					Rating [1]				cm
Dicamba				0.5		0.3	0.0	0.0	0.0	5.4
MCPP			1.5			0.3	0.0	1.0	1.0	4.0
2,4-D		1.5				0.0	0.0	2.0	2.0	3.6
Fenoxaprop	0.35					0.5	1.8	3.8	4.6	3.0
Combination #1		0.62	0.33	0.06		0.3	0.0	0.0	0.3	4.5
Combination #1		1.24	0.66	0.12		0.0	0.0	1.5	1.3	3.9
Combination #2		0.35	0.63	0.07		0.0	0.0	0.5	0.3	4.8
Combination #2		0.51	0.95	0.11		0.0	0.0	1.3	0.8	4.5
Combination #3		0.50	0.50	0.12	1.9	2.8	3.5	6.3	4.5	3.6
Combination #3		0.83	0.83	0.21	3.0	2.8	4.0	6.3	4.9	3.6
MSMA					2.0	3.3	3.5	5.8	5.8	3.5
Control						0.3	0.0	0.0	0.0	5.3
LSD @ 0.05						1.0	0.5	1.1	1.2	0.7

[1] 0 = no effect, 3 = turf producers would be concerned, 5 = plants with severe symptoms, 10 = all plants dead.

PROJECT 3

WEEDS OF AGRONOMIC CROPS

Chairperson: Phil Stahlman
Kansas State University
Hays, KS

Broadleaf weed control in spring-seeded alfalfa. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 17, 1995 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 1 qt/A. EPTC was applied preplant-incorporated and rototilled to a depth of 2 inches on May 17, 1995. Soil type was a Wall sandy loam with pH 7.8 and <1% organic matter content. 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 gpa at 30 psi. Treatments were applied on June 27, 1995 when alfalfa was in the second trifoliate leaf stage and weeds were small. Black nightshade, redroot pigweed. and prostrate pigweed infestations were heavy throughout the experimental area. Alfalfa stand counts, crop injury, and weed control evaluations were made on July 18, 1995. Alfalfa was harvested August 29, 1995 with a self-propelled Almaco plot harvester.

All treatments had significantly higher plants/ft^2 than EPTC. AC 299,263 and imazethapyr at 0.12 and 0.094 lb ai/A caused significantly more injury (stunting only) than any other treatment. Black nightshade, redroot pigweed, and prostrate pigweed control were excellent (>98%) 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.

		Crop		Weed Control			Crop	
Treatment	Rate	Injury	Plants/ft^2	SOLNI	AMARE	AMABL	Yield	Protein
	lb/A	%	no.		%		T/A	%
AC 299,263	0.024	0	48	100	100	98	2.2	19.7
AC 299,263	0.032	0	49	100	100	99	2.2	20.1
AC 299,263	0.047	2	48	100	100	100	2.2	20.7
AC 299,263	0.063	12	49	100	100	100	2.1	20.4
AC 299,263	0.094	19	48	100	100	100	2.2	20.5
AC 299,263	0.12	22	49	100	100	100	2.0	20.5
Imazethapyr	0.063	1	49	100	100	100	2.2	20.3
Imazethapyr	0.094	12	50	100	100	100	2.1	21.6
EPTC	3.0	10	30	100	100	98	2.3	19.9
Imazethapyr	0.047	0	49	99	99	98	2.2	19.9
Hand-weeded		0	50	100	100	100	2.2	20.2
Check		0	49	0	0	0	2.7	14.9
Weeds/m^2				33	13	18		
LSD 0.05		3	4	1	1	1	0.2	1.5

Purple nutsedge control in alfalfa with norflurazon and EPTC granules. Barry R. Tickes. Research plots were established to evaluate the efficacy of norflurazon 5% granules, applied over a single season, for purple nutsedge control in alfalfa. The test was conducted at the University of Arizona Yuma Mesa Agricultural Center in southwestern Arizona. Plots 16.5 by 125 ft. were established in a 4-year-old alfalfa stand containing a mixture of nondormant alfalfa cultivars. Plots were flood irrigated in a level basin on superstition fine sand soil. The experiment was a randomized complete block with three replications consisting of one or two application of norflurazon 5% granules at 1.0, 2.0, or 3.0 lb/A, four applications of EPTC 20% granules at 3.0 lb/A, and an untreated control. Norflurazon treatments were applied March 31 and June 19, 1995 and EPTC applications were made March 31, May 15, June 19, and July 31, 1995. Applications were made with a Valmar PT 1220 ground-driven granule applicator with a 16.5 ft boom. Purple nutsedge ranged from 0 to 22 plants/ft^2. Purple nutsedge control was estimated visually on August 1, 1995.

Levels of purple nutsedge control were highest for two applications of norflurazon at 2.0 and 3.0 lb/A (62 and 63%, respectively). Both one and two applications of norflurazon at 1.0 lb/A resulted in low levels of purple nutsedge control (25 and 35%, respectively). Four applications of EPTC at 3.0 lb/A provided 45% control of purple nutsedge.

Table. Purple nutsedge control in alfalfa with norflurazon and EPTC granules.

Treatment	Rate	Applications	Purple nutsedge control[1]
	lb/A	no.	%
Norflurazon	1.0	1	25
Norflurazon	1.0	2	35
Norflurazon	2.0	1	50
Norflurazon	2.0	2	62
Norflurazon	3.0	1	57
Norflurazon	3.0	2	63
EPTC	3.0	4	45
Untreated	- -	- -	0

[1] Visual evaluations made August 1, 1995.

Weed control in seedling alfalfa. Carl E. Bell, Mick Canevari, and Ron Vargas. A field study was conducted in the Imperial Valley of California to determine the economic impact of herbicide use and companion planting with oats for weed control in seedling alfalfa. All aspects of alfalfa planting and production were using normal grower practice except for the weed control regimes.

The study utilized a Randomized Complete Block Design with 4 replications. Blocks were arranged in line with the irrigation border to minimize irrigation and planting effects within the plots. Plot size was 10 feet by 15 feet. Preplant incorporated treatments (EPTC and benefin) were applied on Oct 27, 1994 and incorporated with a disk. The disk was double, offset, and set to operate 2-4 inches deep. Oats (cv 'Cayuse') were hand sown after disking and raked lightly into the soil. Germination of the crop was with a flood irrigation on November 2. Postemergence treatments were applied on December 22. The alfalfa was in the 3 trifoliolate stage of growth at this time. Weather was cloudy, about 65°F, and the soil was wet, near field capacity. All herbicide applications were made with a CO_2 pressured sprayer at 20 psi using 8003LP nozzles for a spray volume of 30 GPA. Soil type was a clay loam.

A visual evaluation of weed control and crop injury was made on January 6, 1995. Weeds present were London rocket, littleseed canarygrass, and wild oats. The crop was sampled for yield estimates at the first harvest, on February 22, and at the second harvest on April 7, 1995. Results are shown in the Table below.

Visual weed control evaluations indicated most treatments, with the exception of the EPTC, appeared to control weeds very well. The only significant crop injury was with paraquat, which caused considerable leaf burn, chlorosis, and stand loss. Treatments with 2,4-DB caused typical phenoxy-type injury.

At the first harvest, alfalfa yield, as a component of total forage, was significantly reduced compared to all other treatments except paraquat and the oat nurse crops. Weed yield, in contrast to the visual evaluation, was highest in the Balan and the untreated control plots. The paraquat treatment and the oat nurse crops also had relatively high amounts of weeds at this harvest. Other treatments were similar in yield. Total forage yield was highest for the two oat treatments and the untreated control.

An economic comparison of these weed control methods is presented in Table 2. Net return is directly related to total forage yield. Alfalfa hay prices used for this comparison were taken from market data at the time the crop was harvested. These prices are unusually high, reflecting a shortage of hay for the California dairy market. The weed control method that produced the greatest amount of total forage, regardless of weediness produced the highest net return per acre. This result may have been different during a period of low alfalfa hay demand when the price spread between low and high quality alflafa is greater. (Cooperative Extension, University of California, Holtville, CA, 92250; Stockton, CA 95205, and Madera, CA 93637; respectively.)

Table 1. The efficacy and yield effects of weed control treatments on first year alfalfa in the Imperial Valley of California

Treatment	Rate	Timing[1]	Visual Evaluation		Yield				
			Weed Control	Crop Injury	Feb. 22, 1995				Apr. 7
					Alfalfa	Oats	Weeds	Total	Alfalfa
	lbai/A		%		tons/acre (90% DM)				
Benefin	1.5	PPI	100	<1	0.84a	0	0.30	1.14 c	0.99ab
EPTC	4.0	PPI	50	0	0.82a	0	0.08	0.90 cd	0.98abc
Paraquat	0.25	Post	96	79	0.64 b	0.21	0.23	1.08 cd	0.90 bc
2,4-DB	1.5	Post	85	8	0.81a	0.25	0.06	1.12 cd	0.96abc
Bromoxynil	0.38	Post	98	2	0.72ab	0.17	0.06	0.95 cd	0.94abc
2,4-DB+ sethoxydim	1.5+ 0.38	Post	99	12	0.73ab	0	0.07	0.80 d	0.92abc
Bromoxynil+ sethoxydim	0.38+ 0.38	Post	99	1	0.81a	0	0.06	0.87 cd	0.92abc
Oats	8	PPI	100	0	0.63 b	0.68	0.18	1.50ab	0.89 c
Oats	16	PPI	100	0	0.44 c	1.12	0.19	1.76a	0.74 d
Untreated control			0	0	0.75ab	0.38	0.30	1.43 b	1.00a

[1] PPI = preplant incorporated, by disk to 2-4 inches deep, except oats, which were hand raked into the soil about 1 inch deep. Post = applied at the 3 trifoliolate growth stage of the alfalfa.
Numbers in a column followed by the same letter are not different according to Duncan's Multiple Range Test ($P < 0.05$).

Table 2. An economic comparison of various weed control methods in seedling alfalfa in the Imperial Valley of California.

Treatment	Preharvest Costs[1]	Harvest Costs[2]	Total Costs[3]	Gross Return[4]	Net Return[5]
	$/acre				
Benefin	104.20	54.85	159.05	254.10	95.05
EPTC	103.00	51.25	154.25	239.90	85.65
Paraquat	99.70	52.75	152.45	225.00	72.55
2,4-DB	104.00	54.15	158.15	248.00	89.85
Bromoxynil	101.35	51.45	152.80	226.70	73.90
2,4-DB+sethoxydim	108.70	48.95	157.65	219.60	61.95
Bromoxynil+sethoxydim	106.10	49.95	156.05	228.35	72.30
Oats	100.10	58.65	158.75	265.70	106.95
Oats	100.50	60.25	160.75	272.20	111.45
Untreated control	97.20	59.25	156.45	273.00	116.55

[1] Preharvest costs include all crop establishment and maintenance costs, amortized over 2 harvests of the typical 8 harvests for the low desert.

[2] Harvest costs include cutting, raking, baling, hauling and stacking, adjusted by treatment for actual forage tonage.

[3] Total costs are preharvest plus harvest costs.

[4] Gross return is based upon total forage yield for the first and second harvest, adjusted for hay quality. Market data at the time of harvest was used to calculate crop values.

[5] Net return is gross return minus total costs.

Broadleaf weed control in spring barley. Robert W. Downard and Don W. Morishita. The objective of this study was to examine broadleaf weed control with bromoxynil and MCPA and broadleaf herbicide combinations. Plots were established on the University of Idaho Research and Extension Center Kimberly, Idaho. Weed species evaluated in this study were kochia (KCHSC) and common lambsquarters (CHEAL). Individual plots were 8 by 25 feet with treatments arranged in a randomized complete block and replicated four times. The field was fertilized with 80 and 24 lb/A of nitrogen and sulfur, respectively. Spring barley (var. Crystal) was planted April 18, 1995, at 100 lb/A and sprinkler irrigated. A mid season application of 20 lb/A of nitrogen was applied through the irrigation water to maintain fertility level. Soil type was a silt loam with a pH of 8.3, CEC of 25.5 meq/100 g of soil, and 1.45% organic matter. Herbicides were applied broadcast with a CO_2 pressurized bicycle-wheel sprayer equipped with 11001 flat fan nozzles. The delivery rate was 10 gpa at 36 psi. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken June 6 and 13. Plots were harvested August 8 with a small-plot combine.

Table 1. Application information.

Application date		5/16/95			5/30/95	
Air temperature (F)		68			75	
Soil temperature (F)		64			69	
Relative humidity (%)		35			58	
Wind velocity (mph)		0 to 6			4 to 6	
Soil moisture		moist			dry	
Weed species	KCHSC	CHEAL	SOLSA	KCHSC	CHEAL	SOLSA
Growth stage[1]	cotyl-3 lf	cotyl	cotyl	0.5-2 in	0.5-2 in	2-6 lf
Density (plants/ft^2)	7	2	5	4	3	4

[1] cotyl=cotyledon, lf=leaf, and in=inches.

Crop injury ranging from 8 to 13% was seen with bromoxynil and MCPA plus 2,4-D, dicamba plus thifensulfuron and tribenuron, and 2,4-D alone (Table 2). Kochia and common lambsquarters control was excellent with all herbicide treatments except 2,4-D. Control with 2,4-D dropped off some on June 13, even though it still provided good control. No differences in grain yields were seen with any treatment including the untreated check despite weed densities of 11 to 14 plants/ft^2. This may be attributed to an unseasonably cool and wet spring that favored barley growth over the weeds. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

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

					Weed control[1]				
			Crop injury		KCHSC		CHEAL		
Treatment[2]	Rate	Growth stage	6/6	6/13	6/6	6/13	6/6	6/13	Yield
	lb/A		%						Bu/A
Untreated check			-	-	-	-	-	-	118
Brom & MCPA	0.75	3 leaf	0	0	100	98	100	100	118
Brom & MCPA + thif & trib	0.50 + 0.016	3 leaf	1	0	100	100	100	100	119
Brom & MCPA + tribenuron	0.50 + 0.004	3 leaf	0	0	96	97	100	100	112
Brom & MCPA	0.75	Fully tillered	1	0	99	100	100	100	117
Brom & MCPA gel	0.50	Fully tillered	1	0	97	95	100	96	115
Brom & MCPA	0.50	Fully tillered	1	0	99	99	100	100	119
Brom & MCPA + thif & trib	0.50 + 0.016	Fully tillered	0	0	94	99	100	100	120
Brom & MCPA + tribenuron	0.50 + 0.004	Fully tillered	0	0	94	98	98	100	121
Brom & MCPA + 2,4-D	0.50 + 0.35	Fully tillered	8	4	96	97	99	100	120
Dicamba + thif & trib	0.24 + 0.016	3 leaf	9	5	100	100	100	100	116
2,4-D LV4	0.75	Fully tillered	13	9	94	84	97	85	113
LSD (0.05)			4	3	5	4	NS	8	NS

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

[2] Brom & MCPA is a commercial formulation of bromoxynil and MCPA. Thif & trib is a commercial formulation of thifensulfuron and tribenuron. Surfactant was added to all thif & trib and tribenuron treatments at 0.25% v/v.

Rotational crop response to prosulfuron previously applied to small grains. Daniel A. Ball, Joan Campbell, Darrin L. Walenta, and Donald C. Thill. Two concurrent studies were conducted at the Columbia Basin Agricultural Research Center, Pendleton, OR and at the University of Idaho Plant Science Farm, Moscow, ID to evaluate rotational crop response to prosulfuron soil residues from previous postemergence application for broadleaf weed control in dryland cereal grains. At Pendleton, winter wheat var. 'Stephens' was seeded on October 15, 1993. Prosulfuron was applied postemergence (POST) on April 11, 1994 to wheat in the 7 leaf stage with a tractor mounted, compressed air sprayer delivering 12 gpa at 29 psi (air temperature 64 F, sky clear, wind SW at 1 to 2 mph, relative humidity 56%, soil temp. at 0 inch 89 F, 1 inch 80 F, 2 inch 65 F, 4 inch 51F). Plots were located on a silt loam soil (29.2% sand, 60.4% silt, 10.4% clay, 1.6% organic matter, 6.1 pH, 12.1 Meq/100 g CEC) with 15 by 30 ft main plots and 15 by 10 ft subplots arranged in a split-block design with four replications. All prosulfuron treatments were mixed with R-11 surfactant at 0.25% v/v. The control was not treated with any herbicide treatment at the Pendleton location. Wheat was harvested with a Hege 140 plot combine on July 21, 1994 and grain yield was converted to bu/A based on a 60 lb/bu test weight. Wheat was not injured by any treatment. Weed populations were light and variable throughout the plot area. All prosulfuron rates controlled coast fiddleneck, purple mustard, prickly lettuce, and miners lettuce. Yield and test weight of winter wheat were unaffected by weed control treatment. At Moscow, spring barley var. 'Russell' was seeded April 19, 1994. Postemergence (POST) prosulfuron was applied on May 30, 1994 to 8 to 12 inch, 1 tiller barley with a self propelled sprayer delivering 12 gpa at 40 psi (air temperature 62 F, sky clear, wind E at 0 to 5 mph, relative humidity 51%, soil temp. at 4 inch 63 F). Plots were located on a silt loam soil (22% sand, 62% silt, 16% clay, 2.9% organic matter, 5.8 pH, 18.2 Meq/100 g CEC) with a 30 by 48 ft main plots and 30 by 16 ft subplots arranged in a split block design with four replications. All prosulfuron treatments were mixed with R-11 surfactant at 0.25% v/v. Control plots at Moscow was treated with bromoxynil at 0.43 kg/ha. Barley was harvested with a Hege plot combine on August 18, 1994 and yield was converted to bu/A. Barley was injured by prosulfuron application which adversely affected barley yield and test weight. Common lambsquarters and red root pigweed were the major weeds present. Weed control in barley was good with all treatments.

At Pendleton, wheat stubble was burned on August 17, 1994 and dry fertilizer was applied to plots. The entire plot area was disked once and the fall canola treatment was disked a second time followed by flex tine harrowing. The entire plot area was sprinkler irrigated on August 25 with a total of 6.4 inches of water. Fall canola was seeded on August 31, 1994 and reseeded, due to soil crusting and bird feeding damage, on October 7 with fall canola var. '120-91' at a seeding rate of 10 lb/A. The field was springtooth harrowed prior to re-seeding. Spring crops at Pendleton were treated with a PPI application of trifluralin at 1.0 lb ai/A on March 17, 1995 followed by springtooth and flex tine harrow incorporation. Spring canola var. 'Legend' was seeded on March 17 at 10 lb/A. Spring pea var. 'Columbia' was seeded on March 17 at 220 lb/A, and rolled on March 27. At Moscow, barley stubble was chisel plowed in the fall, cultivated twice in the spring, harrowed twice, and rolled prior to spring seeding. Spring canola at Moscow was treated with a PPI application of trifluralin at 1.0 lb ai/A on May 4, 1995 and incorporated by harrowing. Canola var. 'Helios' was seeded on May 8 at 3 lb/A. Spring pea var. 'Columbia' was seeded on May 1 at 160 lb/A, and rolled on May 4. Lentil var. 'Red Chief' were seeded on May 8 at 60 lb/A. Both peas and lentils received a PRE application of metribuzin at 0.25 lb/A on May 8.

At Pendleton, fall canola was swathed on July 10, 1995 and threshed on July 14, spring pea was harvested dry on July 20, and spring canola was swathed on July 25 and threshed on July 31. At Moscow, lentil and pea were harvested August 2 and canola was harvested September 1. Canola yield at Moscow was reduced by flea beetle and cabbage seed pod weevil infestation. All clean grain samples were converted to lb/A yields. Prosulfuron treatment applied the previous season to small grains had no observable effects on visual growth (data not shown) or pea, canola, or lentil seed yield at either of the two test locations. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801, and Dept. of Plant, Soil, and Entomological Sci., Univ. of Idaho, Moscow, ID 83844-2339).

Table. Rotational crop response to prosulfuron previously applied to small grains. Crop yields at two locations.

		Spring Lentil	Fall Canola	Spring Canola		Spring Pea	
Treatment	Rate	ID	OR	ID	OR	ID	OR
	g/ha	lb/A					
Prosulfuron	10	1560	1140	170	950	2640	2960
Prosulfuron	20	1730	1300	190	850	2800	2880
Prosulfuron	40	1650	1500	180	1030	3030	2920
Control	--	1570	1220	160	910	2620	2760
LSD (0.05)		ns	ns	ns	ns	ns	ns

Spring canola response to imazamethabenz previously applied to small grains. Daniel A. Ball, Terry L. Neider, Darrin L. Walenta, and Donald C. Thill. Two concurrent studies were conducted at the Columbia Basin Agricultural Research Center, Pendleton, OR and on a commercial field near Potlatch, ID to evaluate spring canola response to imazamethabenz soil residues from previous postemergence application for wild oat control in cereal grains. At Pendleton, winter wheat var. 'Stephens' was seeded on October 15, 1993. Postemergence (POST) imazamethabenz applications were made on April 11. 1994 to wheat in the 7 leaf stage with a tractor mounted, compressed air pressurized sprayer delivering 12 gpa at 29 psi (air temperature 64 F, sky clear, wind SW at 1 to 2 mph, relative humidity 56%, soil temp. at 0 inch 89 F, 1 inch 80 F, 2 inch 65 F, 4 inch 51F). Plots were located on a silt loam soil (29.2% sand, 60.4% silt, 10.4% clay, 1.6% organic matter, 6.1 pH, 12.1 Meq/100 g CEC) with 15 by 30 ft main plots and 15 by 10 ft subplots arranged in an split-block design with four replications. All imazamethabenz treatments were mixed with R-11 surfactant at 0.25% v/v. The control did not receive any herbicide treatment at Pendleton. Wheat was harvested on July 21. No visible wheat injury was observed from any treatment, and yield, and test weight of winter wheat were unaffected by weed control treatment (data not shown). At the Potlatch site, spring wheat var. 'Edwall' was seeded on April 20, 1994. Postemergence (POST) imazamethabenz applications were made on May 24, 1994 to 4 leaf, 1 tiller wheat with a hand-held, CO_2 pressurized backpack sprayer delivering 10 gpa at 40 psi (air temperature 92 F, sky clear, wind W at 2 to 4 mph, relative humidity 58%, soil temp. at 0 inch 108 F, 2 inch 102 F, 4 inch 100 F). Plots were located on a silt loam soil (24% sand, 64% silt, 12% clay, 3% organic matter, 4.9 pH, 15.1 meq/100g CEC) with a 20 by 40 ft plot size arranged in an RCB design with 4 replications. All imazamethabenz treatments were mixed with R-11 non-ionic surfactant at 0.25% v/v. The control treatment at Potlatch was treated with a PPI application of triallate at 1.0 lb ai/A. All plots at Potlatch were oversprayed with bromoxynil at 0.25 lb ai/A. Wheat was harvested with a small plot combine on August 12, 1994 and yield converted to bu/A. No visual injury of spring wheat was observed, and yield, and test weight of spring wheat were unaffected by weed control treatment (data not shown).

At Pendleton, wheat stubble was burned on August 17, 1994. The entire plot area was disked twice. Spring canola at Pendleton received a PPI application of trifluralin at 1.0 lb ai/A on March 17, 1995 followed by springtooth and flex tine harrow incorporation. Spring canola var. 'Legend' was seeded on March 17 at 10 lb/A. At Potlatch, the plot area was chisel plowed in fall after wheat harvest. Spring canola at Potlatch was established by field cultivating and harrowing in the spring prior to seeding canola var. 'Reward' on May 16, 1995 at 5 lb/A.

At Pendleton, canola plant stand counts were made on April 12, 1995 by counting all plants in three 1 yd row sections per plot and converting to plants per ft^2. Spring canola was swathed on July 25, 1995 and combined on July 31. All clean grain samples were converted to lb/A yields. At Potlatch, canola plant stand counts were made on June 7, 1995 by counting all plants in two 0.5 yd row sections per plot and converting to plants per ft^2. Spring canola was direct combined on September 5, 1995. All clean grain samples were converted to lb/A yields. Results showed that imazamethabenz doses applied the previous season to small grains had no observable effects on visual growth (data not shown), plant stand or yields of spring seeded canola at either test location. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801, and Dept. of Plant, Soil, and Entomological Sci., Univ. of Idaho, Moscow, ID 83844-2339).

Table. Spring canola plant stand and seed yield response to imazamethabenz previously applied to spring or winter wheat at two locations.

		Canola Stand Density		Canola Seed Yield	
Treatment	Rate	Potlatch, ID	Pendleton, OR	Potlatch, ID	Pendleton, OR
	lb/A	---------- no. plants/ft^2 -----------		----------------- lb/A -----------------	
Imazamethabenz	0.23	9.6	8.5	780	750
Imazamethabenz	0.47	7.6	10.2	780	730
Imazamethabenz	0.94	6.4	11.0	730	970
Control	--	5.3	9.5	720	910
LSD (0.05)		ns	ns	ns	ns

Wild oat control in barley. John O. Evans and R.William Mace. Tralkoxydim was applied to "Rollo" barley alone and in combination with bromoxynil, and 2,4-D to evaluate wild oat control. These were compared to imazamethabenz with similar tank mixes and with diclofop. Plots were established at Utah State University in Logan at the Greenville research farm. The soil type was a Millville silt loam with 7.9 pH and an organic matter content of less than 2%. The barley was planted April 20, 1995. Treatments were established June 20, 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. The barley was 8 inches high with 4 to 5 leaves when treated. A dense stand of wild oats, 6 inches high having 2 to 4 leaves made up about 95% of the weed population. There were a few mustards making up the balance. Visual evaluations for wild oat control and crop injury were recorded June 6th, July 14th and at harvest August 10.

A very wet spring accounted for the late herbicide application window and ideal conditions for diclofop. Diclofop performed exceptionally well, providing 100 percent wild oat control throughout the season. Imazamethabenz performed disappointingly at between 50 and 70 percent. Tralkoxydim mixed with either 2,4-D or bromoxynil plus MCPA provided wild oat control between 65 and 90 percent. The only treatment causing measurable barley injury was the imazamethabenz / 2,4-D combination. Grain yields were significantly different between the control plots, the diclofop, tralkoxydim+ bromoxynil, and tralkoxydim + 2,4-D ester treatments. (Utah Agricultural Experiment Station, Logan, Ut. 84322-4820)

Table. Wild oat control with selected herbicides in barley.

		Weed control	Crop response	
Treatment	Rate	AVEFA	Injury	Yield
	lb/A	%	%	Bu/A
Tralkoxydim[1]	0.27	72	0	52.8
Tralkoxydim[1]	0.27			
bromoxynil+MCPA	0.75	90	0	57.9
Tralkoxydim[1]	0.27			
2,4-D amine	0.75	65	0	49.8
Tralkoxydim[1]	0.27			
2,4-D ester	0.75	80	0	61.2
Imazamethabenz[2]	0.47	67	5	51.3
Imazamethabenz[2]+	0.4			
2,4-D amine	0.75	46	3	33.9
Imazamethabenz[2]+	0.47			
2,4-D ester	0.75	63	13	54.2
Tralkoxydim[2]+	0.18			
imazamethabenz	0.25	65	3	43.8
Diclofop	1	100	0	59.3
Untreated		0	0	32.1
$LSD_{(.05)}$		8.7		23.5

[1] non-ionic surfactant added at .5 % v/v

[2] non-ionic surfactant added at .25 % v/v

<u>Wild oat control in spring barley with tralkoxydim</u>. Robert W. Downard and Don W. Morishita. A field study was established under furrow irrigation near Picabo, Idaho to evaluate wild oat control with tralkoxydim tank mixed with broadleaf herbicides. Individual plots were 8 by 25 feet and treatments were arranged in a randomized complete block and replicated four times. Spring barley (var. Galena) was planted April 25, 1995, at 112 lb/A. Soil type was a silt loam with a pH of 8.5. The herbicides were applied broadcast with a CO_2 pressurized bicycle-wheel sprayer. The delivery rate was 10 gpa at 36 psi using 11001 flat fan nozzles. Herbicides were applied June 1, (air temperature 70 F, soil temperature 66 F, relative humidity 68%, and no wind). Wild oats were at the 1 to 3 leaf stage and averaged 23 plants/ft^2. Visual evaluations for crop injury were taken 15, 29, and 56 days after treatment. Wild oat control evaluations were taken 29, 56 and 84 days after treatment. Plots were harvested September 11, 1995 with a small-plot combine.

No herbicide treatment reduced yields due to crop injury except diclofop plus crop oil concentrate (Table). Crop oil concentrate was inadvertently added to diclofop and subsequently injured the barley. Tralkoxydim at 0.25 lb/A + TF8035 and tralkoxydim at 0.18 lb/A + TF8035 + ammonium SO_4 or 32% UAN controlled wild oat 95% or better on the last evaluation. These treatments also were among the highest yielding treatments in this study (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303).

<u>Table</u>. Crop injury, wild oat control, and barley yield, near Picabo, Idaho.

		Crop injury			Wild oat control			
Treatment[1]	Rate	6/16	6/30	7/27	6/30	7/27	8/24	Yield
	lb/A	%						Bu/A
Untreated check		-	-	-	-	-	-	83
Tralkoxydim + TF8035	0.18 + 0.5% v/v	4	3	1	76	86	85	109
Tralkoxydim + TF8035	0.25 + 0.5% v/v	5	4	3	91	95	95	114
Tralkoxydim + brom & MCPA + TF8035	0.18 + 0.75 + 0.5% v/v	4	1	0	51	70	48	105
Tralkoxydim + bromoxynil + TF8035	0.18 + 0.5 + 0.5% v/v	9	5	3	48	81	68	104
Tralkoxydim + MCPA LV ester + TF8035	0.18 + 0.5 + 0.5% v/v	4	3	0	43	69	53	105
Diclofop + COC	1.0 + 1.0 pt/A	26	21	14	85	84	69	87
Imazamethabenz + nonionic surfactant	0.47 + 0.25% v/v	3	0	0	61	71	74	120
Imazamethabenz + difenzoquat	0 23 + 0.5	5	3	0	51	75	65	106
Tralkoxydim + TF8035 + ammonium SO_4	0.18 + 0.5% v/v + 1.5	9	1	4	92	85	98	110
Tralkoxydim + TF8035 + 32% UAN	0.18 + 0.5% v/v + 2.5% v/v	8	1	0	97	98	96	122
Tralkoxydim + 2,4-D LV ester + TF8035 + ammonium SO_4	0.18 + 0.5 + 0.5% v/v + 1.5	11	9	1	55	91	86	109
Tralkoxydim + 2,4-D LV ester + TF8035	0.18 + 0.5 + 0.5% v/v	10	8	4	43	79	68	95
LSD (0.05)		4	4	4	11	13	13	16

Brom & MCPA is a commercial formulation of bromoxynil and MCPA

Broadleaf weed control in spring barley. Gary A. Lee and Alex G. Ogg, Jr. A study was established near LaCrosse in Whitman County, WA, to evaluate effectiveness of postemergence herbicides for the control of broadleaf weeds in spring barley and to determine subsequent crop tolerance and yield. Spring barley (var. 'Camelot') was planted April 10, 1995, to a depth of 1.5 inches and at a rate of 75 lb/A. Spring barley plants began to emerge April 23, 1995. Soil at the location is a Walla Walla Silt Loam (30% sand, 66% silt, 4% clay, pH 7.6 and 2.02% organic matter) and the surface condition at the time of herbicide application was smooth and soft with moderate crop residue. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 10 by 30 ft. Herbicides were applied postemergence on May 12, 1995 (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 12 gpa at 30 psi. Crop tolerance and weed control were evaluated at 8 (May 20) and 33 (June 16) days after treatment (DAT) and the crop was harvested on August 17,1995. Plots were harvested with a Wintersteiger combine and yields and bushel test weights were calculated on grain samples after deawning and cleaning through a clipper cleaner.

Table 1. Application data

Crop stage	7-10 leaf, 1-2 tillers (principal growth stage: 21-22)
Weed stage	kochia: 10-14 lf. rosettes to plants 2 in. tall with 22 leaves tumble mustard: 12-14 lf. rosettes
Air temp. (F)	65
Relative humidity (%)	43
Wind (mph)	2-4
Sky	100% cloud cover
Soil temp. (F at 4 in.)	59
Soil moisture	dry at surface, good moisture at .5 in.
Rain fall, April to August	4.82inches

First significant rain fall after herbicide application was 0.81 in. occurring June 4, 1995

Russian thistle (SASKR) and Virginia pepperweed (LEPVI) infested the study area, but the populations were too sparse and sporadic to obtain meaningful data. One replication of the study was abandoned because of the influence of residual herbicides applied for perennial weed control the previous growing season. Thus information presented in Table 2 is based on three replications. The kochia (KCHSC) density varied from 0-40 plants/ ft^2, but generally infested the entire study area. Tumble mustard (SSYAL) averaged less than 1 plant/ 9 ft^2.

Several herbicide treatments injured to both kochia and tumble mustard within 8 DAT. 2,4-D LVE at 0.75 lb/A, bromoxynil + 2,4-D LVE at 0.25 ÷ 0.5 lb/A, trifensulfuron + tribenuron + 2,4-D LVE at 0.25 + 0.125 oz + 0.5 lb/A, pyridate + dicamba at 0.47 + 0.094 lb/A, F-8426 + 2,4-D amine DF at 0.031 + 0.25 lb/A and 2,4-D amine + dicamba at 0.5 + 0.094 lb/A controlled both weeds species 94% or more, 33 days after herbicide application. Herbicide treatments containing dicamba injured the barley crop significantly. Internode bowing, prostrate growth and malformed heads were observed.

Barley yields from herbicide treated plots were not significantly higher than yields from the weedy check. However, yield and bushel test weight from plots treated with dicamba at 0.19 lb/A and 2,4-D amine + dicamba at 0.5 ÷ 0.19 lb/A were significantly lower than yields from the nontreated plots. (Plant Science Division, University of Idaho, Moscow ID 83844-2339 and Nonirrigated Weed Science Research Unit, USDA-ARS, Pullman WA 99164-6416)

Table 2. Effect of postemergence applied herbicides on spring barley, crop yield and reduction of kochia and tumble mustard populations.

						Weed Control[4]			
		Crop Injury		Crop Yield[1]		KCHSC		SSYAL	
HERBICIDE TREATMENT	Rate	8 DAT[5]	33 DAT[6]	lb/A	TW	8 DAT[2]	33 DAT[3]	8 DAT[2]	33 DAT[3]
2,4-D LVE *	0.75 lb/A	0	6	1753	46	7	95	6	100
Bromoxynil *	0.375 lb/A	0	2	2165	48	10	56	10	39
Bromoxynil + 2,4-D LVE *	0.25 + 0.5 lb/A	0	8	1727	46	8	94	8	100
Trifensulf. + triben. + 2,4-D LVE *	0.25 + 0.125 oz + 0.5 lb/A	0	2	1557	46	6	94	7	100
Trifensulf. + triben.*	0.25 + 0.125 oz/A	0	2	2104	48	3	48	4	100
Clopyralid + MCPA	0.095 + 0.5 lb/A	0	1	2051	48	6	76	6	100
Pyridate *	0.47 lb/A	0	5	2130	48	3	34	3	24
Pyridate + dicamba *	0.47 + .094 lb/A	0	48	1457	45	3	94	4	100
F-8426 + 2,4-D amine DF *	0.031 + 0.25 lb/A	2	0	2155	48	7	98	8	100
Dicamba *	0.19 lb/A	0	39	1082	44	7	78	7	100
2,4-D amine + dicamba *	0.5 + 0.19 lb/A	0	42	1249	44	6	99	3	100
Weedy check		0	0	1961	47	0	0	0	0
LSD		1	8	510	2	1	29	1	20

*R-11 surfactant added at the rate of .25% V/V

[1] Barley yield and test weight (TW) determined after samples were deawned and cleaned through a clipper cleaner.

[2] Rating scale: 0 = no symptoms; 10 = dead

[3] Percent "reduction incompetitive ability": 0 = no reduction in weed competition and 100 = complete elimination of weed competition

[4] Weed control visually evaluated on May 20 and June16; 8 and 33 days after treatment (DAT), respectively.

[5] Herbicide injury to wheat: 0 = no effect; 2 = slight chlorosis, leaf tip bronzing and/or internode bowing; 5 = moderate chlorosis, leaf tip bronzing and/or internode bowing; 10 = complete kill

[6] Percent herbicide phytotixicity resolting in reduced crop production potential

Trifensulf. =trifensulfuron; triben. = tribenuron

Broadleaf weed control in spring barley with dicamba and pyridate. Don W. Morishita and Robert W. Downard. Dicamba and pyridate tank mixtures were evaluated in a field study for the control of kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), and hairy nightshade (SOLSA) in irrigated spring barley (var. Crystal). This experiment was established at the UI Research and Extension Center, Kimberly, Idaho. Fertilizer was applied at a rate of 80 and 24 lb/A of nitrogen and sulfur, respectively prior to planting. The crop was planted April 18, 1995, at 100 lb/A. Experimental design was a randomized complete block with four replications and plots were 8 by 25 ft. Soil type was a silt loam with a pH of 8.3, CEC of 25.5 meq/100 g soil, and 1.45% organic matter. Herbicides were applied with a CO_2 pressurized bicycle wheel sprayer equipped with 11001 flat fan nozzles calibrated to deliver 10 gpa at 22 psi. All herbicide treatments were applied May 16, with the crop in the 3 leaf stage. At the time of application air temperature was 68 F, soil temperature 64 F, relative humidity 35%, and wind velocity 0 to 6 mph. Average total weed density was 10 plants/ft^2 and kochia was the predominant species. Visual evaluations for crop injury and weed control were taken June 6 and 20. The barley was harvested August 18 with a small-plot combine.

Crop injury was highest, ranging from 9 to 14%, with pyridate + metribuzin and both rates of pyridate alone 3 weeks after treatment (Table). At 5 weeks after treatment, crop injury was about the same as the earlier evaluation. Weed control was equal among all herbicide treatments for all weed species except pyridate at 0.47 lb/A. This was the only treatment that did not effectively control kochia. Control of the other weeds with the lower rate of pyridate was lower than the best performing herbicide treatments, but was still 83% or higher. This lower level of weed control did not affect the barley yield. There was no difference in crop yield among treatments in this study. This may possibly have been due to favorable barley growing conditions early in the season. (Dept. of Plant, Soil, and Entomological Sciences, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and barley yield with pyridate and dicamba, near Kimberly, Idaho.

				Weed control[1]						
		Crop injury		KCHSC		CHEAL		AMARE	SOLSA	Crop
Treatment[2]	Rate	6/6	6/20	6/6	6/20	6/6	6/20	6/6	6/28	yield
	lb/A	%								Bu/A
Check		-	-	-	-	-	-	-	-	123
Pyridate	0.94	9	13	90	89	92	91	99	96	128
Pyridate	0.47	9	11	65	74	83	90	89	93	132
Dicamba + pyridate	0.094 + 0.47	3	6	97	100	100	100	100	100	126
Dicamba + 2,4-D Amine	0.094 + 0.38	4	8	97	98	100	100	100	99	131
Dicamba + pyridate + 2,4-D Amine	0.094 + 0.235 + 0.38	3	9	94	99	100	100	100	100	123
Pyridate + metribuzin	0.47 + 0.125	14	15	99	100	100	99	100	91	127
Dicamba + 2,4-D Amine	0.094 + 0.25	3	5	95	97	100	100	100	100	128
SAN 845H + 2,4-D Amine	0.094 + 0.38	0	1	92	97	100	100	100	100	128
SAN 845H + MCPA	0.094 + 0.38	0	0	94	98	100	100	100	99	131
LSD (0.05)		8	5	11	9	7	8	4	5	NS

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

[2] All herbicide treatment included nonionic surfactant at 0.25% v/v.

Broadleaf weed control in spring barley with F8426. Don W. Morishita and Robert W. Downard. Weed control with F8426 applied alone and in combination with other broadleaf herbicides was evaluated in a study conducted at the UI Research and Extension Center, Kimberly, Idaho. Spring barley (var. Crystal) was planted April 18, 1995, at a seeding rate of 100 lb/A and sprinkler irrigated. The experimental design was a randomized complete block with four replications. Plots were 8 by 25 ft. Soil texture was a silt loam with a pH of 8.3, CEC of 25.5 meq/100 g soil, and 1.45% organic matter. Herbicides were applied with a CO_2 pressurized bicycle-wheel sprayer calibrated to deliver 10 gpa at 35 psi. Environmental conditions at each application is shown in Table 1. Visual evaluations for crop injury and kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), and hairy nightshade (SOLSA) control were taken June 5, 13, and 28. The crop was harvested August 28 with a small-plot combine.

Table 1. Application information.

Application timing		< 4 leaf	Tillering
Application date		5/16/95	5/30/95
Air temperature (F)		68	75
Soil temperature (F)		64	69
Relative humidity (%)		35	58
Wind velocity (mph)		0 to 6	4 to 6
Weed species	Kochia	Common lambsquarters	Hairy nightshade
Weed density (plants/ft^2)	4	4	1

Several herbicide treatments injured the crop (Table 2). Only F8426 in combination with 2,4-D at 0.25 lb/A or dicamba at 0.094 lb/A and thifensulfuron & tribenuron + bromoxynil & MCPA injured the crop less than 10% at the first evaluation date. By the third evaluation date however, the highest injury observed was 5% with F8426 + bromoxynil. Weed control on the third evaluation date for all weed species was 95% or better among all herbicide treatments. Ideal growing conditions for the barley apparently reduced the competitive effect of the weeds in this study. No herbicide treatment had a grain yield higher than the untreated check, but F8426 + 2,4-D at 0.023 + 0.25 lb/A did out-yield five other herbicide treatments. This could partly be attributed to the lower level of early crop injury compared to the others. (Dept of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table 2. Crop injury, weed control, and barley yield with F8426, near Kimberly, Idaho

						Weed control[1]													
		Growth	Crop injury			KCHSC			CHEAL			AMARE			SOLSA				Crop
Treatment[2]	Rate	stage	6/5	6/13	6/20	6/5	6/13	6/28	6/5	6/13	6/28	6/5	6/13	6/28	6/5	6/13	6/28		yield
	lb/A		------	------	------	------	------	------	------	%	------	------	------	------	------	------	------		Bu/A
Check			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		121
F8426	0.023	Tillering	21	6	0	98	100	100	89	99	100	99	100	100	90	100	95		123
F8426	0.031	Tillering	24	9	3	94	100	100	93	100	100	99	100	100	94	100	99		122
F8426 + 2,4-D Amine	0.023 + 0.25	Tillering	4	4	0	86	100	98	85	97	95	93	100	100	94	100	96		132
F8426 + 2,4-D Amine	0.023 + 0.38	Tillering	41	11	1	91	98	100	96	100	100	95	100	100	100	100	96		114
F8426 + 2,4-D Amine	0.031 + 0.25	Tillering	31	11	0	94	100	100	91	100	100	99	98	100	98	99	98		117
F8426 + 2,4-D Amine	0.031 + 0.38	Tillering	31	10	3	94	100	100	93	100	100	100	100	100	96	100	98		122
F8426 + dicamba	0.031 + 0.094	<4 leaf	5	4	3	99	100	100	97	100	100	97	100	99	94	100	100		104
F8426 + MCPA Amine	0.31 + 0.25	<4 leaf	10	6	0	96	100	100	90	98	98	95	100	99	88	98	96		120
F8426 + bromoxynil	0.031 + 0.187	<4 leaf	45	18	5	95	100	98	94	99	96	94	100	99	88	100	95		118
F8426 old[3]	0.031	Tillering	21	5	0	96	100	100	88	99	99	100	100	100	92	98	95		117
Thif & trib[4] brom & MCPA	0.375 0.25	<4 leaf	4	4	0	75	99	96	95	100	100	94	99	100	88	99	98		119
LSD (0.05)			9	4	2	8	2	4	NS	NS	3	NS	NS	NS	7	NS	NS		13

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

[2] All herbicide treatments included nonionic surfactant at 0.25% v/v.

[3] Old formulation of F8426.

[4] Thif & trib is a commercial formulation of thifensulfuron and tribenuron. Brom & MCPA is a commercial formulation of bromoxynil and MCPA.

<u>Dicamba tank mix combinations for broadleaf weed control in spring barley</u>. Don W. Morishita and Robert W. Downard. A field study was established at the UI Research and Extension Center near Kimberly, Idaho to evaluate dicamba tank mixtures with other broadleaf herbicides for crop phytotoxicity and weed control. Spring barley (var. Crystal) was planted April 18, 1995, at 100 lb/A. Prior to planting, the study area was fertilized with 80 and 24 lb/A of nitrogen and sulfur, respectively. The crop was sprinkler irrigated as needed and an additional 20 lb/A UAN was applied midseason through the irrigation system. Plots were 8 by 25 ft and the herbicide treatments were arranged in a randomized complete block design with four replications. Soil texture was a silt loam with a pH of 8.3, CEC of 25.5 meq/100 g soil, and 1.45% organic matter. All herbicide treatments were applied with a CO_2 pressurized bicycle-wheel sprayer equipped with 11001 flat fan nozzles calibrated to deliver 10 gpa at 22 psi. Herbicides were applied May 16 when the crop was in the 3 leaf stage. Environmental conditions at the time of application were as follows: air temperature 66 F, soil temperature 61 F, relative humidity 52%, and wind velocity 4 to 6 mph. Visual evaluations for crop injury and weed control were taken June 6 and 28. Weed species evaluated for control in this study were kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), and hairy nightshade (SOLSA) with a total average density of 10 plants/ft^2. The barley was harvested August 29 with a small-plot combine.

None of the dicamba tank mix combinations injured the crop more than 6% (Table). Weed control was not different among herbicide treatments and ranged from 90 to 100% for all weeds. Due to conditions favorable for barley growth the weeds had no effect on grain yield. (Dept. of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

<u>Table</u>. Crop injury, broadleaf weed control, and barley yield near Kimberly, Idaho.

				Weed control[1]							
		Crop injury		KCHSC		CHEAL		AMARE		SOLSA	Crop
Treatment[2]	Rate	6/6	6/28	6/6	6/28	6/6	6/28	6/6	6/28	6/28	yield
	lb/A	%									Bu/A
Check		-	-	-	-	-	-	-	-	-	114
Dicamba + bromoxynil	0.094 + 0.25	0	0	100	100	99	98	100	100	95	110
Dicamba + bromoxynil + MCPA Amine	0.094 + 0.125 + 0.25	3	3	100	100	100	99	100	100	95	117
Dicamba + bromoxynil + MCPA Amine	0.094 + 0.25 + 0.25	1	6	100	100	100	100	100	100	94	113
Dicamba + bromoxynil + thif & trib[3]	0.094 + 0.125 + 0.125	0	1	98	100	100	100	100	98	93	110
Dicamba + bromoxynil + thif & trib	0.094 + 0.25 + 0.125	1	3	100	98	100	100	100	99	91	121
Bromoxynil + thif & trib	0.125 + 0.125	9	5	100	100	100	100	100	100	94	115
Dicamba + bromoxynil + MCPA Amine + thif & trib	0.094 + 0.125 + 0.25 + 0.125	4	1	100	100	100	100	100	100	96	110
Dicamba + thif & trib + 2,4-D Amine	0.094 + 0.125 + 0.25	1	0	96	98	100	96	100	100	93	116
Dicamba + thif & trib + 2,4-D Amine	0.094 + 0.25 + 0.25	0	0	99	96	99	100	100	100	90	116
Dicamba + bromoxynil + 2,4-D Amine	0.094 + 0.25 + 0.25	1	0	100	98	100	100	100	99	94	114
LSD (0.05)		4	4	NS	NS	NS	NS	NS	NS	NS	NS

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

[2] All herbicide treatments included nonionic surfactant at 0.25% v/v.

[3] Thif & trib is a commercial formulation of thifensulfuron and tribenuron.

Effect of application timing and herbicide rate on broadleaf weed control in spring barley. Mark J. Pavek, Robert W. Downard, Don W. Morishita, David L. Barton, and J. Reed Findlay. Three experiments were conducted in south central Idaho (Kimberly, Jerome, and Murtaugh) to evaluate broadleaf weed control and crop injury in spring barley 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, 2 to 4 leaf, and 4 to 8 leaf. 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 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.

Location	Kimberly			Jerome			Murtaugh		
Applic. date	5/16	5/26	5/31	5/19	5/31	6/11	5/9	5/19	5/31
Applic. time[1]	Cotyl-2 lf	2-4 lf	4-8 lf	Cotyl-2 lf	2-4 lf	4-8 lf	Cotyl-2 lf	2-4 lf	4-8 lf
Air temp.(F)	61	62	79	--	67	60	62	64	64
Soil temp.(F)	54	54	78	--	60	63	50	54	56
RH (%)	84	48	40	--	49	83	--	31	64
Wind (mph)	4	5	3	--	0	4	5	5	3
KCHSC/ft^2	9	9	9	3	3	3	--	19	6
SOLSA/ft^2	4	4	4	1	1	<1	0	0	0
CHEAL/ft^2	<1	<1	<1	<1	<1	<1	0	0	0
AMARE/ft^2	0	0	0	11	15	25	--	12	34
Total weeds/ft^2	13	13	13	15	19	28	0	31	40
Cultivar		Crystal			Baroness			Crystal	

[1] Cotyl = cotyledon, lf = leaf, RH = relative humidity, KCHSC = kochia, SOLSA = hairy nightshade, CHEAL = common lambsquarters, AMARE = redroot pigweed.

Table 2. Weed control and yield with reduced herbicide rates, near Jerome, Idaho.

			Weed control[1]								
			AMARE		KCHSC		SOLSA		CHEAL		
Treatment[2]	Rate	Applic. timing	6/19	7/6	6/19	7/6	6/19	7/6	6/19	7/6	Yield
	lb/A		%								Bu/A
Untreated check			0	0	0	0	0	0	0	0	104
Brom & MCPA + tribenuron	0.083 + 0.002	Coty-2 lf	64	70	65	70	67	76	74	70	104
Brom & MCPA+ tribenuron	0.170 + 0.004	Coty-2 lf	88	78	100	95	95	80	99	95	125
Brom & MCPA + tribenuron	0.250 + 0.006	Coty-2 lf	96	90	100	100	94	88	100	99	110
Brom & MCPA+ tribenuron	0.330 + 0.008	Coty-2 lf	96	91	100	100	94	84	100	100	104
Brom & MCPA + tribenuron	0.420 + 0.010	Coty-2 lf	95	94	100	100	92	91	100	100	109
Brom & MCPA+ tribenuron	0.500 + 0.012	Coty-2 lf	98	99	100	100	99	98	100	100	108
Untreated check			0	0	0	0	0	0	0	0	97
Brom & MCPA + tribenuron	0.083 + 0.002	2-4 leaf	70	73	75	94	89	85	89	98	99
Brom & MCPA+ tribenuron	0.170 + 0.004	2-4 leaf	86	83	89	99	93	91	96	100	111
Brom & MCPA + tribenuron	0.250 + 0.006	2-4 leaf	94	95	95	100	96	97	99	100	100
Brom & MCPA+ tribenuron	0.330 + 0.008	2-4 leaf	92	95	97	100	96	98	100	100	96
Brom & MCPA + tribenuron	0.420 + 0.010	2-4 leaf	96	97	100	100	98	99	100	100	93
Brom & MCPA+ tribenuron	0.500 + 0.012	2-4 leaf	93	97	99	100	99	100	100	100	100
Untreated check			0	0	0	0	0	0	0	0	99
Brom & MCPA + tribenuron	0.083 + 0.002	4-8 leaf	20	70	20	76	33	84	41	79	98
Brom & MCPA+ tribenuron	0.170 + 0.004	4-8 leaf	45	63	38	79	49	87	54	86	105
Brom & MCPA + tribenuron	0.250 + 0.006	4-8 leaf	56	68	51	81	60	89	68	86	115
Brom & MCPA+ tribenuron	0.330 + 0.008	4-8 leaf	51	74	45	93	58	99	58	98	108
Brom & MCPA + tribenuron	0.420 + 0.010	4-8 leaf	49	73	53	94	55	94	54	94	106
Brom & MCPA+ tribenuron	0.500 + 0.012	4-8 leaf	61	79	56	98	65	100	66	95	97
LSD (0.05)			16	8	16	8	18	9	18	7	NS

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

[2] Brom & MCPA is a commercial formulation of bromoxynil and MCPA. Nonionic surfactant added to all treatments at 0.5% v/v.

Table 3 Weed control and yield with reduced herbicide rates, near Kimberly, Idaho.

			Weed control[1]							
		Applic.	KCHSC		SOLSA		CHEAL		AMARE	
Treatment[2]	Rate	timing	6/13	6/28	6/13	6/28	6/13	6/28	6/28	Yiel
	lb/A		%							Bu/A
Untreated check			0	0	0	0	0	0	0	116
Brom & MCPA + tribenuron	0.083 + 0.002	Coty-2 lf	80	60	86	63	94	71	77	120
Brom & MCPA+ tribenuron	0 170 + 0.004	Coty-2 lf	88	74	90	73	96	81	83	119
Brom & MCPA + tribenuron	0.250 + 0.006	Coty-2 lf	92	80	90	83	99	96	94	120
Brom & MCPA+ tribenuron	0.330 + 0.008	Coty-2 lf	92	91	94	91	98	96	98	115
Brom & MCPA + tribenuron	0.420 + 0.010	Coty-2 lf	95	92	96	95	100	100	97	118
Brom & MCPA+ tribenuron	0.500 + 0.012	Coty-2 lf	97	95	94	91	100	98	97	114
Untreated check			0	0	0	0	0	0	0	108
Brom & MCPA + tribenuron	0.083 + 0.002	2-4 leaf	63	68	97	81	100	87	74	119
Brom & MCPA+ tribenuron	0.170 + 0.004	2-4 leaf	89	80	97	85	100	96	90	117
Brom & MCPA + tribenuron	0.250 + 0.006	2-4 leaf	91	85	96	92	100	99	99	115
Brom & MCPA+ tribenuron	0.330 + 0.008	2-4 leaf	95	90	97	92	100	100	100	118
Brom & MCPA + tribenuron	0.420 + 0.010	2-4 leaf	96	94	98	93	100	100	99	112
Brom & MCPA+ tribenuron	0.500 + 0.012	2-4 leaf	96	93	99	97	100	100	98	110
Untreated check			0	0	0	0	0	0	0	116
Brom & MCPA + tribenuron	0.083 + 0.002	4-8 leaf	64	45	76	55	81	60	58	113
Brom & MCPA+ tribenuron	0.170 + 0.004	4-8 leaf	74	60	91	78	94	88	78	122
Brom & MCPA + tribenuron	0.250 + 0.006	4-8 leaf	85	74	90	81	95	95	83	120
Brom & MCPA+ tribenuron	0.330 + 0.008	4-8 leaf	89	85	96	94	97	99	86	120
Brom & MCPA + tribenuron	0.420 + 0.010	4-8 leaf	90	85	95	87	99	100	86	121
Brom & MCPA+ tribenuron	0.500 + 0.012	4-8 leaf	95	98	97	100	99	100	92	118
LSD (0.05)			7	7	5	9	4	10	5	NS

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

[2] Nonionic surfactant added at 0.25% v/v. Brom & MCPA is a commercial formulation of bromoxynil and MCPA.

No crop injury was seen at any of the locations. At Murtaugh, there was no difference in weed control among the three application timings (data not shown). Kochia and common lambsquarters control was similar at all herbicide rates ranging from 91 and 100%, with no differences between the 1/6x rate and the 1x rate (0.500 + 0.012 lb/A). There were no differences in yield. Weed control at Jerome and Kimberly were similar (Table 2 and 3). The two early application timings had better weed control overall than the 4 to 8 leaf application. For all weeds at the two early application timings, weed control at the 1/2x rate at both locations was no different from the 1x rate (0.5 + 0.012 lb/A). At the 4 to 8 leaf application timing, weed control between the 2/3x rate and 1x rate ranged from 85 to 100%. These data indicate that early applications of reduced herbicide rates will effectively control broadleaf weeds. Despite relatively high weed populations, there were no differences in yield among treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

Effect of application timing and imazamethabenz rate on wild oat control in spring barley and spring wheat. Mark J. Pavek, Robert W. Downard, Don W. Morishita, Charles C. Cheyney, and Stuart C. Parkinson. Three experiments were established in southern Idaho to evaluate wild oat control using a standard rate of imazamethabenz (0.41 lb/A) and five reduced rates (0.34, 0.27, 0.21, 0.14, 0.07 lb/A) in irrigated spring barley (Franklin and Twin Falls counties) and spring wheat (Butte county). Each imazamethabenz treatment was applied at three wild oat growth stages: spike to 1 leaf, 1 to 3 leaf, and 3 to 5 leaf. 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 with a bicycle-wheel sprayer equipped with 11001 flat fan nozzles on 16-inch spacing. 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.

Location	----Twin Falls county----			-------Butte county-------			------Franklin county-----		
Appl. date	5/16	5/26	5/31	5/9	5/18	5/27	5/15	5/29	6/01
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)	68	62	77	57	61	55	70	65	62
Wind (mph)	5	7	10	4	5	7	5	2	10
Soil temp.(F)	64	54	78	52	59	55	64	54	58
Rel. humidity(%)	46	48	48	56	49	56		31	54
Wild oat/ft^2	< 1	2	2	72	99	98	29	38	17
Cultivar	barley ('Crystal')			wheat ('Penawawa')			barley ('Colter')		

Wild oat control at Twin Falls county (Table 2) was the same for all imazamethabenz rates above 0.07 lb/A, and ranged from 80 to 93%. There was no difference between the three application times. Barley yield and wild oat seed rain were not different among treatments. Wild oat populations averaged 2 plants/ft^2 and were not very uniform throughout the study area.

Wild oat populations at Franklin and Butte counties averaged 28 and 90 plants/ft^2, respectively. Due to these relatively high wild oat populations, maximum wild oat control at both locations was 75% or less. For both locations wild oat control was not different at rates above 0.21 lb/A and ranged from 66 to 75% (except for the 1 to 3 leaf application at Butte county) (Tables 3 and 4). At Butte county there was a difference in wild oat control and wheat yield between the three application timings. The spike to 1 leaf and 3 to 5 leaf applications controlled wild oat better than the 1 to 3 leaf application. In Franklin county barley yields were not different among treatments higher than 0.07 lb/A (Table 4). There was no difference between the check and 0.07 lb/A. Wild oat seed rain in the untreated check was 808 seeds/ft^2 and was not different from 0.21 lb/A. Wild oat seed rain was not different among rates above 0.21 lb/A. In Butte county, grain yields were not different among treatments higher than 0.14 lb/A, but 0.07 lb/A yielded more wheat than the untreated check (Table 3). Similar to Franklin county, wild oat seed rain in treatments higher than 0.21 lb/A was not different. Thus, with an extremely high wild oat population, maximum grain yield was achieved at 33% (0.14 lb/A) of the full rate. In addition, wild oat seed rain was dramatically reduced at 0.21 lb/A and higher for both Butte and Franklin counties. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

Table 2. Effect of imazamethabenz rate averaged across three application timings on wild oat control and barley yield at Twin Falls county.

Treatment[1]	Rate	Wild oat control	Barley yield
	lb/A	%	Bu/A
Untreated Check		0	102
Imazamethabenz	0.07	37	106
Imazamethabenz	0.14	80	109
Imazamethabenz	0.21	86	107
Imazamethabenz	0.27	89	108
Imazamethabenz	0.34	93	110
Imazamethabenz	0.41	87	108
LSD (0.05)		15	NS

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

Table 3. Effect of imazamethabenz rate and application timing on wild oat control. seed rain. and wheat yield at Butte county.

Treatment[1]	Rate	Application timing	Wild oat control	Wild oat seed rain	Wheat yield
	lb/A	wild oat	%	seed/ft^2	Bu/A
Untreated check			0	1246	28
Imazamethabenz	0.07	Spike to 1 lf	13	1140	37
Imazamethabenz	0.14	Spike to 1 lf	38	1438	48
Imazamethabenz	0.21	Spike to 1 lf	60	728	57
Imazamethabenz	0.27	Spike to 1 lf	68	634	63
Imazamethabenz	0.34	Spike to 1 lf	73	643	60
Imazamethabenz	0.41	Spike to 1 lf	74	573	59
Untreated check			0	1493	26
Imazamethabenz	0.07	1 to 3 lf	0	1158	34
Imazamethabenz	0.14	1 to 3 lf	15	1373	40
Imazamethabenz	0.21	1 to 3 lf	45	984	44
Imazamethabenz	0.27	1 to 3 lf	58	869	49
Imazamethabenz	0.34	1 to 3 lf	66	772	52
Imazamethabenz	0.41	1 to 3 lf	65	598	53
Untreated check			0	1460	37
Imazamethabenz	0.07	3 to 5 lf	35	1028	43
Imazamethabenz	0.14	3 to 5 lf	48	908	59
Imazamethabenz	0.21	3 to 5 lf	61	1049	57
Imazamethabenz	0.27	3 to 5 lf	71	630	55
Imazamethabenz	0.34	3 to 5 lf	76	632	56
Imazamethabenz	0.41	3 to 5 lf	79	532	54
LSD(0.05)			13	265	9

[1] Nonionic surfactant added at 0.25% v/v to all 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	Wild oat seed rain	Barley yield
	lb/A	wild oat	%	seed/ft^2	Bu/A
Untreated check			0	914	42
Imazamethabenz	0.07	Spike to 1 lf	50	662	52
Imazamethabenz	0.14	Spike to 1 lf	66	482	60
Imazamethabenz	0.21	Spike to 1 lf	78	341	71
Imazamethabenz	0.27	Spike to 1 lf	85	218	71
Imazamethabenz	0.34	Spike to 1 lf	85	133	69
Imazamethabenz	0.41	Spike to 1 lf	85	336	67
Untreated check			0	935	47
Imazamethabenz	0.07	1 to 3 lf	15	838	49
Imazamethabenz	0.14	1 to 3 lf	50	724	55
Imazamethabenz	0.21	1 to 3 lf	49	643	51
Imazamethabenz	0.27	1 to 3 lf	61	361	52
Imazamethabenz	0.34	1 to 3 lf	59	419	53
Imazamethabenz	0.41	1 to 3 lf	69	316	52
Untreated check			0	577	46
Imazamethabenz	0.07	3 to 5 lf	5	737	42
Imazamethabenz	0.14	3 to 5 lf	33	703	54
Imazamethabenz	0.21	3 to 5 lf	38	676	55
Imazamethabenz	0.27	3 to 5 lf	53	565	50
Imazamethabenz	0.34	3 to 5 lf	61	357	56
Imazamethabenz	0.41	3 to 5 lf	70	459	53
LSD(0.05)			18	264	8

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

Potential of prosulfuron carryover into sugar beets. Don W. Morishita and Robert W. Downard. Prosulfuron applied at various rates was evaluated for weed control in spring barley and potential carryover to sugar beets planted the year after application. Research plots were established in 1994 at the UI Research and Extension Center, Aberdeen, Idaho. Barley (var. Galena) was planted April 1, 1994, at 100 lb/A. Herbicide treatments were arranged in a randomized complete block design with four replications. Individual plots were 8 by 25 ft. Prosulfuron was applied early postemergence May 11. At the time of application air temperature was 85 F, soil temperature 74 F, relative humidity 38%, and wind speed 0 to 4 mph. Herbicides were applied broadcast with a bicycle-wheel sprayer calibrated to deliver 10 gpa at 28 psi using 11001 flat fan nozzles. Soil texture was a sandy clay loam with a pH of 7.6, CEC of 10.3 meq/100 g soil, and 1.25% organic matter. Visual evaluations for crop injury and common lambsquarters (CHEAL) control were taken May 25 and August 16. The barley was harvested August 16 with a small-plot combine. Sugar beets (var. Beta 8450) were planted April 24, 1995 at a seeding rate of 47,520 seeds/A on 22 inch row spacing. Three postemergence applications of commercially formulated ethofumesate, desmedipham, and phenmedipham were made for weed control. Sugar beet stand count and visual evaluation for crop injury were taken May 26 and June 30, respectively. The crop was harvested by hand September 21.

No prosulfuron rate injured the barley (Table). Common lambsquarters control 2 weeks after treatment was about 75% for all herbicide treatments. By August 16 all prosulfuron rates controlled common lambsquarters 86 to 96%. There were no differences in barley yield among treatments. In 1995, sugar beet stand was not affected and no significant visual injury was observed with any prosulfuron rate. In addition, sugar beet yield was not affected by prosulfuron. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303)

Table. Effect of prosulfuron on weed control and barley and sugar beet yields, near Aberdeen, Idaho.

Treatment[2]	Rate	Crop injury 5/25	 8/16	CHEAL control[1] 5/25	 8/16	Barley Yield	Stand count	Crop injury	Beet yield
	oz/A	-----------%			--------------	Bu/A	plts/100 ft	%	Ton/A
Check		-	-	-	-	95	107	0	21
Prosulfuron	0.143	0	0	73	86	83	105	4	21
Prosulfuron	0.285	0	0	75	96	98	115	1	23
Prosulfuron	0.57	0	0	75	95	103	112	0	21
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS

[1] Weed species evaluated was common lambsquarters (CHEAL).
[2] Nonionic surfactant was added to all prosulfuron treatments at 0.25% v/v.

Prosulfuron and F8426 for broadleaf weed control in spring barley. Janice M. Reed, Terry L. Neider, and Donald C. Thill. A study was established in Latah County, ID to evaluate prosulfuron and F8426 for weed control in barley. Baronesse spring barley was seeded on April 26, 1995. Plot size was 8 by 30 ft and the treatments were arranged in a randomized complete block with four replications. Herbicides were applied postemergence with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 36 psi and 3 mph (Table 1). The primary weed species were common lambsquarters (CHEAL) and mayweed chamomile (ANTCO). Barley injury was evaluated visually 1 week and 6 weeks after treatment and broadleaf weed control was evaluated 6 weeks after treatment. The grain was harvested with a small plot combine from a 4.5 by 27 ft area on August 24, 1995.

Table 1. Application data and soil analysis

Application date	June 9
Barley growth stage	3 lf/1-2 tiller
CHEAL growth stage	1-1 1/2 inches tall
ANTCO growth stage	1/2-1 inch tall
Air temperature (F)	72
Relative humidity (%)	62
Wind speed (mph, direction)	0-2, NW
Cloud cover (%)	75
Soil temperature at 2 inches (F)	60
pH	4.8
OM (%)	3.4
Texture	silt loam

Prosulfuron treatments did not injure barley (Table 2). Common lambsquarters control was lower with prosulfuron alone (85%) than in combination with 2,4-D or bromoxynil (100%). F8426 treatments injured barley initially (10% necrotic tissue), but no injury was visible 5 weeks later. Mayweed chamomile was not controlled with F8426 alone (25%), but was controlled in combination with 2,4-D. Thifensulfuron/tribenuron plus bromoxynil injured barley initially (4% yellowing), but no injury was evident by the second evaluation date. Grain yield ranged from 4478 to 4734 lbs/A and was not different between the treatments. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Spring barley response and weed control with herbicide treatments

				Weed control		
		Barley injury		CHEAL	ANTCO	Grain
Treatment[1]	Rate	6/16/95	7/21/95	7/21/95	7/21/95	yield
	lb/A	------------ %	------------	------------ %	------------	lbs/A
Prosulfuron	0.018	0	0	85	95	4734
Prosulfuron + 2,4-D amine	0.018 + 0.356	0	0	100	100	4732
Prosulfuron + bromoxynil	0.018 + 0.25	0	0	100	100	4724
F8426	0.031	10	0	100	25	4662
F8426 + 2,4-D amine	0.031 + 0.356	10	0	100	92	4659
Thifen/triben + bromoxynil	0.0156 + 0.25	4	0	100	100	4520
Untreated check	-------	--	--	----	----	4478
LSD (0.05)		2	NS	4	10	NS

[1] An 80% nonionic surfactant was applied with all treatments at 0.25% v/v. Thifen/triben = thifensulfuron/tribenuron

Spring barley variety response to increasing wild oat density. Traci A. Brammer and Donald C. Thill. A study was established in the spring, 1995 at the University of Idaho Plant Science Farm near Moscow, Idaho to evaluate the response of different spring barley varieties at variable seeding rates to increasing densities of wild oat . The experiment was arranged as a split block design with main plots as wild oat densities (20 by 96 ft), subplots as spring barley varieties (24 by 20 ft) and sub-subplots as barley densities (8 by 20 ft). Wild oat was planted in rows spaced 3.5 inches apart, 1 inch deep on April 21 with a cone seeder and immediately harrowed twice in perpendicular directions with a spring-tooth harrow. 'Baronesse', 'Steptoe', 'Harrington', and 'Morex' spring barley varieties were planted in rows spaced 7 inches apart, 1.5 inches deep on April 25 with a cone seeder . Wild oat and spring barley densities were determined May 23 by counting plants in a 3 ft^2 area. Wild oat densities were 0, 10, 17, and 26 plants/ft^2 and barley densities were 14, 17, and 19 plants/ft^2. This corresponded to barley seeding rates of 80, 107, and 134 lb/A. Spring barley was harvested with a small plot combine from a 4.5 by 17 ft area form each sub-subplot (8 by 20 ft) on August 23.

Average grain yield for spring barley ranged from 3062 lb/A to 3854 lb/A, with 'Harrington' having the highest average yield (Table 1). Spring barley variety yields were significantly different from each other ('Harrington' was not included in the analysis due to missing values). Increasing wild oat density reduced spring barley yield, within barley varieties (Table 1) and averaged over barley seeding rate and across spring barley variety and density (Table 2). Barley grain yield loss ranged from 50 to 64% at the highest wild oat density. Spring barley density had no effect on grain yield (Table 3). (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83844-2339)

Table 1. Effect of increasing wild oat density on spring barley yield within spring barley variety and averaged across variety.

Spring barley variety[1]	Type of spring barley	Wild oat density	Spring barley yield[2]	Average spring barley yield[3]
		plants/ft^2	lb/A	lb/A
Baronesse	2-row feed	0	6289 a	3821 a
Baronesse		10	3458 b	
Baronesse		17	3030 c	
Baronesse		26	2510 d	
Steptoe	6-row feed	0	5243 a	3062 c
Steptoe		10	2703 b	
Steptoe		17	2394 c	
Steptoe		26	1907 d	
Harrington	2-row malting	0	5774	3854
Harrington		10	3702	
Harrington		17	3226	
Harrington		26	2714	
Morex	6-row malting	0	5202 a	3518 b
Morex		10	3251 b	
Morex		17	3037 c	
Morex		26	2580 d	

[1] Due to missing values, one replication and the variety 'Harrington' were not included in the analysis.
[2] Barley grain yields within a variety with the same letter are not significant at $P < 0.05$, according to a protected LSD test.
[3] Average barley grain yield with the same letter is not significant at $P < 0.05$, according to a protected LSD test.

Table 2. The effect of wild oat density averaged over spring barley variety and density on spring barley yield.

Wild oat density	Spring barley yield[1]
plants/ft^2	lb/A
0	5578 a
10	3137 b
17	2821 c
26	2333 d

[1] Barley grain yield with the same letter are not significant at $P < 0.05$, according to a protected LSD test.

Table 3. The effect of spring barley density averaged over spring barley varieties and wild oat densities on spring barley yield.

Spring barley density	Spring barley yield[1]
plants/ft^2	lb/A
14	3424
17	3387
19	3591

[1] There was no significant treatment effect for barley density ($P=0.20$) and thus, mean comparisons were not attempted.

Postemergence weed control in kidney beans. Mick Canevari and Brooks Bauer. A randomized complete block experiment with three replications was established on August 16, 1995, at Stockton, California to evaluate the effects of postemergence herbicides. Treatments were applied broadcast with a CO_2 backpack sprayer calibrated at 30 gpa at 30 psi. Applications were made to emerged beans and weeds at the following stages:

Kidney beans	Phaseolous vulgaris	2-4 trifoliates	6-10" ht
Redroot pigweed	AMARE	2-8 leaf	1-6" ht
Black mustard	BRSNI	2-4 leaf	3-4" diameter
Hairy nightshade	SOLSA	2-4 leaf	1-1½" ht
Triticum aestivum	Common wheat	3 leaf-2 tillers	2-7" ht

Evaluations were made 12 days after treatment and severe crop injury occurred with both formulations of Pyridate (EC & WP). Imazathapyr showed less than 10% growth supression to beans with good control of broadleaf weeds. Clethodim caused no injury to beans and provided excellent control of volunteer wheat. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205; and Sandoz Agro Inc., Escalon, CA 95320.)

Table. Postemergence weed control in kidney beans.

Treatment	Rate	Kidney bean Injury	Weed Control AMARE	BRSNI	SOLSA	WHEAT
	lb/A	--%--	--%--			
Pyridate WP	0.45	42	66	92	100	0
Pyridate WP	0.9	62	97	100	100	0
Pyridate EC	0.9	65	97	100	100	0
Clethodim + surf	0.1	0	0	0	0	98
Pyridate WP + clethodim + surf	0.9 0.1	80	88	97	100	30
Imazethapyr + surf	0.032	3	82	97	97	22
Imazethapyr + clethodim + surf	0.032 0.1	8	85	95	98	80
Pyridate WP + imazethapyr + surf	0.45 0.032	70	98	100	100	15
Control		0	0	0	0	0

Surfactant: Unifilm 707 1 qt/acre

Broadleaf weed control in pinto beans with dimethenamid as a lay-by treatment. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 17, 1995 at the Agricultural Science Center, Farmington, NM to evaluate the response of pinto beans (var. Bill Z) and annual broadleaf weeds to dimethenamid applied as a lay-by treatment. Soil type was a Wall sandy loam with pH 7.8 and <1% organic matter content. The experimental design was a randomized complete block with four replications. Individual plots were four 34-in rows 30 ft long. Treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Preemergence treatments were applied May 17 and immediately incorporated with 0.75 inches of sprinkler irrigation. Postemergence treatments were applied June 27, when beans were in the fourth trifoliate leaf stage. Weeds were removed by hand in all plots until the postemergence treatments were applied, except for the weedy check. 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 July 26. Dry beans were cut and left in the field one week before thrashing. Dry beans were harvested on August 30 by combining the center two rows of each plot with a John Deere 3300 combine equipped with a load cell.

Ethalfluralin plus metolachlor applied preemergence at 0.75 + 2.0 lb/A followed by dimethenamid applied postemergence at 1.5 lb/A caused the highest injury rating of 5. Broadleaf weed control was good to excellent with all treatments, except the weed-free up to the fourth trifoliate leaf stage and the check. All treatments yielded significantly more dry beans per acre than the weed-free up to the fourth trifoliate leaf stage and the check. Yields were 80 to 2180 lb/A higher in the herbicide treated plots as compared to the checks.

Table. Broadleaf weed control with dimethenamid as a lay-by treatment.

		Crop		Weed Control		Crop
Treatment	Rate	injury	SOLNI	AMARE	AMABL	yield
	lb/A			%		lb/A
Ethalfluralin + metolachlor/dimethenamid[a]	0.75+2.0/1.0	2	100	100	100	2617
Ethalfluralin + metolachlor/dimethenamid[a]	0.75+2.0/1.25	3	100	100	100	2538
Ethalfluralin + metolachlor/dimethenamid[a]	0.75+2.0/1.5	5	100	100	100	2604
Dimethenamid[b]	1.5	4	100	99	99	2505
Ethalfluralin + metolachlor/dimethenamid[a]	0.75+2.0/0.75	0	99	100	98	2657
Dimethenamid[b]	1.25	3	98	99	96	2650
Ethalfluralin + metolachlor[c]	0.75+2.0	0	96	99	93	2624
Dimethenamid[b]	1.0	2	95	99	95	2478
Dimethenamid[b]	0.75	0	92	94	91	2518
Weed-free up to the fourth trifoliate leaf stage		0	0	0	0	557
Hand-weeded check		0	100	100	100	2611
Check		0	0	0	0	477
Weeds/m^2			33	17	17	
LSD 0.05		1	2	1	2	135

[a] First treatment was applied preemergence followed by a postemergence treatment at the fourth trifoliate leaf stage.

[b] Treatments were applied postemergence at the fourth trifoliate leaf stage.

[c] Treatment was applied preemergence.

Broadleaf weed control in pinto beans with early and late postemergence-applied AC 299,263 and imazethapyr. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 17, 1995 at the Agricultural Science Center, Farmington, NM to evaluate the response of pinto beans (var. Bill Z) and annual broadleaf weeds to early and late postemergence-applied AC 299,263 and imazethapyr. Soil was a Wall sandy loam with pH 7.8 and <1% organic matter. The experimental design was a randomized complete block with three replications. Individual treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Early postemergence treatments were applied June 7 when the bean plants were in the first trifoliate leaf stage and weeds were small. Late postemergence treatments were applied June 27 when bean plants were in the fourth trifoliate leaf stage. Weeds were prostrate pigweed, 4- to 6-in rosette, redroot pigweed 3 to 5 in high, and black nightshade 3 to 4 in high. Black nightshade, redroot and prostrate pigweed infestations were heavy throughout the experimental area. An adjuvant mixture of X-77 + 32% nitrogen at 0.25% v/v and 1 qt/A, respectively, were added to each treatment. Early and late postemergence weed control and crop injury were visually estimated July 10 and July 25. Stand counts were made on July 10 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 September 5 by combining the center two rows of each plot with a John Deere 3300 combine equipped with a load cell.

Imazethapyr at 0.047 lb/A injured pinto beans more when applied late postemergence than early postemergence. All treatments provided good to excellent control of redroot and prostrate pigweed. Black nightshade control was good to excellent with all treatments, except the late postemergence treatments of imazethapyr at 0.032 and 0.047 lb/A, AC 299,263 + bentazon at 0.024 + 0.5 lb/A, and AC 299,263 at 0.016 and 0.024 lb/A. The early postemergence treatments yielded more beans per acre than late postemergence treatments. The split application of imazethapyr + bentazon applied at 0.024 + 0.5 lb/A yielded more beans than other treatments and had the best weed control.

Table. Broadleaf weed control in pinto beans with early and late postemergence applied AC 299,263 and imazethapyr.

Treatment	Rate	Crop injury	Stand count	Weed Control			Crop yield
				AMARE	AMABL	SOLNI	
	lb ai/A	%	no.	%			lb/A
AC 299,263[a]	0.024	0	62	100	96	87	1844
Imazethapyr[a]	0.032	0	60	100	99	98	2972
Imazethapyr[a]	0.047	5	60	100	98	98	3074
Imazethapyr + bentazon[a]	0.032 + 0.5	0	62	100	99	100	3125
Imazethapyr + bentazon[b]	0.024 + 0.5	0	62	100	100	98	3177
Imazethapyr + bentazon[c]	0.032 + 0.5	0	60	100	100	90	2562
Imazethapyr[c]	0.032	4	59	99	93	62	1844
Imazethapyr[c]	0.047	7	60	99	98	73	1998
AC 299,263[a]	0.032	0	61	99	99	97	2920
AC 299,263 + bentazon[a]	0.024 + 0.5	0	61	99	99	91	2306
AC 299,263 + bentazon[c]	0.024 + 0.5	0	61	99	99	72	2306
AC 299,263[c]	0.016	0	61	98	96	82	1537
AC 299,263[c]	0.016	0	61	97	92	13	674
AC 299,263	0.024	3	61	97	94	61	1383
Hand-weeded check		0	63	100	100	100	3074
Check		0	61	0	0	0	512
Weeds/m^2				22	32	33	
LSD 0.05		1	ns	2	2	5	208

[a] Treatments applied on June 7 and rated on July 10.

[b] Treatment applied as a split on June 7 and June 27 and rated on July 10.

[c] Treatments applied on June 27 and rated on July 25.

Broadleaf weed control in pinto beans with preemergence, preemergence/postemergence, and postemergence herbicides.

Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 17, 1995 at the Agricultural Science Center, Farmington, NM to evaluate the response of pinto beans (var. Bill Z) to preemergence, preemergence/postemergence and postemergence herbicides. Soil was a Wall sandy loam with pH 7.8 and <1% organic matter. The experimental design was a randomized complete block with three replications. Individual plots were four, 34-in rows 30 ft long. Treatments were applied with a compressed-air backpack sprayer calibrated to deliver 30 gpa at 30 psi. Preemergence treatments were applied May 17 and were immediately incorporated with 0.75 in of sprinkler irrigation. Postemergence treatments were applied June 8, when beans were in the first trifoliate leaf stage and weeds were small. 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 for the single preemergence treatment were made on June 17, and the preemergence/postemergence and postemergence treatments were visually rated on July 10. Stand counts were made June 17 by counting individual plants per 10 ft of the third row of each plot. Dry beans were cut and left in the field one week before thrashing. Dry beans were harvested on August 29 by combining the two center rows of each plot using a John Deere 3300 combine equipped with a load cell.

Dimethenamid applied preemergence at 1.0 lb/A followed by imazethapyr applied postemergence at 0.047 lb/A caused the highest crop injury rating of 5, respectively. All treatments provided good to excellent control of broadleaf weeds, except the postemergence treatments of dimethenamid applied at 1.0 lb/A with or without X-77 and 32% nitrogen solution and the check. Dimethenamid applied postemergence at 1.0 lb/A with or without X-77 and 32% nitrogen solution and the check had significantly lower yields than any other herbicide treatment. Yields were 102 to 2715 lb/A higher in the herbicide treated plots as compared to the check.

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

Treatment[a]	Rate	Crop injury	Stand count	Weed control SOLNI	AMABL	AMARE	Crop yield
	lb/A	%	no.		%		lb/A
Dimethenamid/imazethapyr[b]	1.0/0.032	2	29	100	100	99	2869
Dimethenamid/imazethapyr[b]	1.0/0.047	5	31	100	100	100	3074
Dimethenamid/ imazethapyr + bentazon[b]	1.0/ 0.032 + 0.5	0	31	100	100	100	2920
Imazethapyr[c]	0.047	4	31	100	100	100	2613
Dimethenamid + imazethapyr[c]	1.0 + 0.032	2	30	100	100	97	2818
Dimethenamid + imazethapyr[c]	1.0 + 0.047	5	29	100	100	99	3125
Imazethapyr + bentazon[c]	0.032 + 0.5	0	31	100	100	100	3074
Dimethenamid[d]	1.0	0	31	98	100	98	2664
Dimethenamid/bentazon[b]	1.0/0.5	0	31	97	100	98	2768
Imazethapyr[c]	0.032	2	30	97	99	94	2664
Bentazon[c]	0.5	0	31	92	95	91	1076
Dimethenamid + bentazon[c]	1.0 + 0.5	0	30	91	95	92	1486
Dimethenamid[c]	1.0	0	30	10	10	10	512
Dimethenamid[c,e]	1.0	0	32	10	10	10	563
Hand weeded check		0	30	100	100	100	3033
Check		0	30	0	0	0	410
Weeds/m^2				40	15	16	
LSD 0.05		1	ns	2	1	2	444

[a] All postemergence treatments were applied with X-77 at 0.25% v/v and 1 qt of 32% nitrogen solution.

[b] First treatment was applied preemergence followed by a postemergence treatment.

[c] Treatments were applied postemergence.

[d] Treatment was applied preemergence and was rated on June 17.

[e] X-77 and 32% nitrogen solution was not added.

Dry bean tolerance to preemergence herbicide with or without incorporation and postemergence herbicides applied at the fourth trifoliate leaf stage. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 17, 1995 at the Agricultural Science Center, Farmington, NM to evaluate the response of dry beans (var. Bill Z and Fleetwood) to preemergence applied herbicides with or without incorporation and postemergence herbicides applied at the fourth trifoliate leaf stage. Soil type was a Wall sandy loam with pH of 7.8 and <1% organic matter. The experimental design was a randomized complete block with three replications. Individual plots were four 34-in rows, two for each dry bean, 30 ft long. Treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Preemergence treatments were applied May 17 either with or without light incorporation from a harrow and were immediately incorporated with 0.75 in of sprinkler irrigation. Postemergence treatments were applied June 27, when beans were in the fourth trifoliate leaf stage. Weeds were removed by hand throughout the growing season. Visual evaluations of crop injury and stand count were made on June 17 and July 27 for preemergence and postemergence treatments, respectively. Dry beans were cut and left in the field one week before thrashing. Dry beans were harvested on August 31 by combining two rows of each dry bean type with a John Deere 3300 combine equipped with a load cell.

Dimethenamid applied preemergence at 2.0 lb/A with or without incorporation caused the highest crop injury of both dry bean types. There were no significant differences in yield for either dry bean type.

Table. Dry bean tolerance to preemergence herbicides with or without incorporation and postemergence herbicides applied at the fourth trifoliate leaf stage.

		Crop injury		Stand count		Yield	
Treatment	Rate	Bill Z	Fleetwood	Bill Z	Fleetwood	Bill Z	Fleetwood
	lb/A	%		no.		lb/A	
Dimethenamid[a]	2.0	18	19	30	58	2712	2297
Dimethenamid[b]	2.0	11	18	31	59	2580	2182
Dimethenamid[b]	1.0	5	9	31	60	2836	2730
Alachlor MT[a]	2.0	3	7	31	61	2589	2438
Dimethenamid[a]	1.0	2	5	30	59	2906	2889
Dimethenamid[c]	2.0	2	5	26	58	2686	2474
Metolachlor[a]	3.4	0	0	30	61	2694	2456
Metolachlor[b]	1.7	0	0	29	60	2553	2818
Metolachlor[b]	3.4	0	0	26	60	2535	2447
Alachlor MT[b]	2.0	0	0	29	61	2747	2323
Dimethenamid[c]	1.0	0	0	26	60	2845	2933
Metolachlor[a]	1.7	0	0	30	60	2995	2915
Metolachlor[c]	1.7	0	0	28	60	2871	2738
Metolachlor[c]	3.4	0	0	29	58	2694	2747
Alachlor MT[c]	2.0	0	0	28	59	2800	2438
Weed-free check		0	0	30	59	2951	2868
LSD 0.05		2	2	ns	ns	ns	ns

[a] Treatments applied preemergence with no incorporation.

[b] Treatments applied preemergence with light harrow incorporation.

[c] Treatments applied postemergence at the fourth trifoliate leaf stage.

Redroot pigweed control in pinto beans with AC 299,263 and imazethapyr alone or in combination with bentazon. Richard N. Arnold, Eddie J. Gregory, and A. Berrada. Research plots were established on June 9, 1995 at the Colorado State University Southern Research Center at Yellow Jacket, CO to evaluate the response of pinto beans (var. Bill Z) and redroot pigweed to postemergence applications of AC 299,263 and imazethapyr alone or in combination with bentazon. Soil type was a Wittco loam with pH 7.2 and <1% organic matter content. The experimental design was a randomized complete block with three replications. Individual plots were four 30-in rows 40 ft long. Treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Treatments were applied on June 29, when pinto beans were in the first trifoliate leaf stage and redroot pigweed plants were less than one inch high. Redroot pigweed density was light throughout the experimental area. Visual evaluations of crop injury and weed control were made on July 27. Pinto beans were hand-pulled on September 14 and left in the field for one week. The beans then were thrashed on September 21 with an Almaco plot harvester and weighed.

All herbicide treatments provided excellent control of redroot pigweed compared with the check. No injury was observed from any of the treatments. Yields were 58 to 639 lb/A higher in the treated plots than the check.

Table. Redroot pigweed control in pinto beans with AC 299,263 and imazethapyr alone or in combination with bentazon.

			Pinto beans	
Treatment[a]	Rate	Redroot pigweed control	Injury	Yield
	lb ai/A	%	%	lb/A
Imazethapyr	0.032	100	0	2032
Imazethapyr	0.047	100	0	2265
Imazethapyr + bentazon	0.032 + 0.5	100	0	2265
Imazethapyr + bentazon	0.047 + 0.5	100	0	2206
AC 299,263	0.024	100	0	2032
AC 299,263	0.032	100	0	2265
AC 299,263	0.040	100	0	1858
AC 299,263 + bentazon	0.024 + 0.5	100	0	2206
AC 299,263 + bentazon	0.032 + 0.5	100	0	2206
Imazethapyr + bentazon	0.047 + 1.0	100	0	2206
AC 299,263 + imazethapyr	0.024 + 0.024	100	0	2090
Imazethapyr	0.024	99	0	2090
AC 299,263	0.016	99	0	1974
Bentazon	0.5	98	0	1742
Hand-weeded check		100	0	2090
Check		0	0	1684
Weeds/m^2		4		
LSD 0.05		1	ns	ns

[a] Treatments applied with X-77 and 32% nitrogen solution at 0.25% v/v and 1 qt/A.

Desmedipham/Phenmedipham plus ethofumasate combinations in sugarbeets. Carl E. Bell, Brent Boutwell, and Phil Odom. This project was a comparison of desmedipham/phenmedipham, desmedipham/phenmedipham plus ethofumasate tank mixtures, and co-formulations of desmedipham/phenmedipham with ethofumasate for postemergence weed control and phytotoxicity in sugarbeets. Research was conducted in a cooperative grower's field near Brawley, CA.

Experimental design was a randomized complete block with four replications. Plot size was 2 beds, each 30 inches wide, by 20 feet. The crop was sown in one seedline per bed on October 15, 1994 and irrigated by furrows on the same day. Herbicide treatments were made sequentially, when the crop was in the 2 leaf stage of growth on October 20, 1994 and 6 days later on October 26, or once, when the crop was in the 4 leaf stage on October 26. Applications were made with a CO_2 pressured sprayer at 20 psi, using 8003LP nozzles for a spray volume of 30 gallons/acre. Soil type was a clay loam.

Data collected were: visual estimates of nettleleaf goosefoot and curly dock control and crop phytotoxicity on October 26 and November 1, 1994. Results are shown in the Table below.

According to the visual evaluations, all but the lowest rate herbicide treatments controlled nettleleaf goosefoot and curly dock well at the first evaluation on October 26. Crop injury was evident, but not commercially unacceptable from any treatment. At the second evaluation on November 1, control was nearly 100% for all of the sequential treatments. The treatments made once at the later growth stage did not work as well, even though these two treatments utilized more total herbicide than most of the sequential treatments. (Cooperative Extension, University of California, Holtville, CA 92250 and AgrEvo Chemical Co., Phoenix, AZ 85044.)

Table. Desmedipham/phemmedipham, with and without ethofumasate compared to a co-formulation of desmedipham/phenmedipham with ethofumasate for postemergence weed control in sugarbeet.

Treatment[1]	Applications		Visual evaluations[2]					
			------- October 26 ------			------- November 1 ------		
	Oct. 20	Oct. 26	RUMCR	CHEMU	Phyto	RUMCR	CHEMU	Phyto
	---- lbai/A -----				%			
Des/Phen	0.25	0.33	76	79	1	98	99	2
Des/Phen	0.33	0.33	96	93	5	96	95	1
Des/Phen	0.33	0.4	93	91	4	96	99	2
Des/Phen	0.38	0.5	93	88	4	99	98	10
NA308	0.25	0.33	82	76	5	98	99	5
NA308	0.33	0.33	82	85	4	91	96	7
NA308	0.33	0.4	73	68	7	99	99	10
NA308	0.38	0.5	91	91	5	99	99	10
Des/Phen +	0.17	0.22						
ethofum	0.08	0.11	50	50	1	91	85	1
Des/Phen +	0.22	0.27						
ethofum	0.11	0.13	73	73	2	96	93	1
Des/Phen +	0.25	0.33						
ethofum	0.13	0.17	88	88	4	99	99	2
Des/Phen		0.75	0	0	0	54	79	7
Des/Phen +		0.5						
ethofum		0.25	0	0	0	66	62	4
Untreated control			0	0	0	0	0	0

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[1] Treatment; Des/Phen - desmedipham + phenmedipham, NA308 is a coformulation of desmedipham, phenmedipham, and ethofumasate, ethofum - ethofumasate.

[2] RUMCR - curly dock, CHEMU - nettleleaf goosefoot, Phyto- phytotoxicity.

Comparative performance of triflusulfuron for weed control in sugar beets. Don W. Morishita and Robert W. Downard. A field experiment was conducted to evaluate triflusulfuron applied in combination with registered herbicides for weed control and crop yield in sugar beets (var. WS-91). The experiment was established under sprinkler irrigation at the UI Research and Extension Center, Kimberly, Idaho. The crop was planted April 25, 1995, 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 split plot randomized complete block design with six replications. A broadcast application of nitrogen, phosphorus, and sulfur at 85, 80, and 30 lb/A, respectively was applied prior to planting. A midseason nitrogen and sulfur application at 30 and 0.5 lb/A, respectively was applied through the sprinkler system. Preplant incorporated herbicides were applied broadcast with a bicycle-wheel sprayer calibrated to deliver 20 gpa at 22 psi using 11002 flat fan nozzles. All preemergence and postemergence herbicides were applied in a 10-inch band with a 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 7.9, 1.5% organic matter, and CEC of 18 meq/100 g soil. Application information is listed in Table 1. Crop injury and weed control were evaluated visually June 2, July 27, and September 20. The two center rows from each plot was harvested mechanically September 26.

Table 1. Application information

Application date	4/21	4/28	5/15	5/24	5/31
Application timing	PPI	PRE	Cotyledon	1 to 2 leaf	2 to 4 leaf
Air temperature (F)	42	50	65	52	73
Soil temperature (F)	42	48	60	50	64
Relative humidity (%)	100	-	58	70	50
Wind speed (mph)	4 to 6	0 to 6	0 to 6	6 to 12	0 to 4
Cloud cover (%)	40	-	70	95	30
Weed species	Redroot pigweed	Annual sowthistle	Common lambsquarters	Kochia	Hairy nightshade
Weed density (plants/ft^2)	18	9	8	1	1

Crop injury among the herbicide treatments ranged from 3 to 18% (Table 2). Treatments that included a soil-applied herbicide had the greatest level of injury. No injury was observed at the pre-harvest evaluation (data not shown). At the first evaluation, triflusulfuron improved kochia and redroot pigweed control when tank mixed with desmedipham and phenmedipham compared to desmedipham and phenmedipham alone. Improved kochia control also was observed at the second evaluation date with the addition of triflusulfuron compared to desmedipham and phenmedipham alone. Control of the other weed species was not improved with triflusulfuron + phenmedipham and desmedipham tank mixtures compared to the postemergence treatments that included a soil-applied herbicide. Control of all weed species with triflusulfuron + desmedipham and phenmedipham at 0.024 + 0.33 lb/A was 93% or higher. All weed control treatments except cycloate alone and ethofumesate, desmedipham, and phenmedipham applied postemergence had sugar beet yields higher than the untreated check. All treatments that included triflusulfuron were among the highest yielding treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

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

				Weed control[1]									
		Applic.	Crop	KCHSC		CHEAL		SONOL		AMARE		SOLSA	Crop
Treatment[2]	Rate	timing	injury	6/2	9/20	6/2	9/20	6/2	9/20	6/2	9/20	6/2	yield
	lb/A		------	------	------	------	------	%-	------	------	------	------	Ton/A
Triflusulfuron+	0.016+	Cotyledon	8	89	90	99	95	100	100	95	94	99	30
desm&phen	0.33	Cotyledon											
Triflusulfuron+	0.016+	1-2 leaf											
desm&phen	0.33	1-2 leaf											
Triflusulfuron+	0.024+	Cotyledon	7	99	93	100	98	100	100	100	97	98	33
desm&phen	0.33	Cotyledon											
Triflusulfuron+	0.024+	1-2 leaf											
desm&phen	0.33	1-2 leaf											
Triflusulfuron+	0.016+	Cotyledon	8	92	93	100	96	100	99	99	99	96	34
desm&phen	0.33	Cotyledon											
Triflusulfuron+	0.016+	1-2 leaf											
desm&phen +	0.33 +	1-2 leaf											
clopyralid	0.09	1-2 leaf											
Desm&phen	0.25	Cotyledon	3	86	81	98	97	100	100	96	98	98	32
desm&phen +	0.33 +	1-2 leaf											
clopyralid	0.09	1-2 leaf											
desm&phen +	0.5 +	3-4 leaf											
clopyralid	0.09	3-4 leaf											
Desm&phen	0.33	Cotyledon	3	75	54	93	74	99	94	89	73	97	30
desm&phen	0.33	1-2 leaf											
Cycloate	4.0	PPI	6	44	18	54	20	40	10	73	62	98	16
Cycloate	3.0	PPI	10	93	86	100	92	100	96	95	81	99	31
desm&phen	0.33	Cotyledon											
desm&phen	0.33	1-2 leaf											
Ethofumesate	1.12	PRE	14	100	100	99	100	100	100	99	100	99	33
desm&phen	0.33	Cotyledon											
desm&phen	0.33	1-2 leaf											
EPTC +	1.0 +	PPI	18	97	87	100	94	100	100	99	83	100	31
cycloate	20.5												
desm&phen	0.16	Cotyledon											
desm&phen	0.25	1-2 leaf											
Etho&desm&phen	0.28	Cotyledon	5	65	25	80	60	98	65	83	71	99	20
etho&desm&phen	0.39	1-2 leaf											
Check			-	-	-	-	-	-	-	-	-	-	16
LSD (0.05)			5	12	20	7	16	4	14	9	18	4	6

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

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

Evaluation of dimethenamid for weed control in sugar beets. Don W. Morishita and Robert W. Downard. A field study was conducted at the UI Research and Extension Center, Kimberly, Idaho to investigate crop injury and weed control of dimethenamid in sugar beets (var. WS-91). A preplant fertilizer application consisting of 85, 80, and 30 lb/A of nitrogen, phosphorus, and sulfur was applied broadcast. Sugar beets were planted April 25, 1995, at a rate of 71,280 seeds/A on 22 inch row spacing. 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. The sprayer was calibrated to deliver 20 gpa at 38 psi. Additional application information is shown in Table 1. A midseason application of nitrogen and sulfur at 30 and 0.5 lb/A, respectively was made to fulfill nitrogen requirements and control powdery mildew. A commercial formulation of ethofumesate, desmedipham, and phenmedipham was applied as a split application on all herbicide treatments at the cotyledon, 2 to 3 leaf, and 4 to 5 leaf growth stages. Dimethenamid was applied to individual treatments at 2 to 3 leaf, 4 to 5 leaf, or lay-by. Crop injury and weed control were evaluated visually 1 and 21 days after the lay-by treatment was applied. Weeds evaluated for control were kochia (KCHSC) common lambsquarters (CHEAL), redroot pigweed (AMARE), hairy nightshade (SOLSA), and annual sowthistle (SONOL). The crop was harvested September 25 with a mechanical harvester.

Table 1. Application information.

Application timing[1]	Cotyl	1 to 2 lf	3 to 4 lf	Lay-by
Application date	5/15	5/25	5/31	6/13
Air temperature (F)	65	52	73	69
Soil temperature (F)	60	50	64	60
Relative humidity (%)	56	70	50	40
Wind velocity (mph)	0 to 10	4 to 8	0 to 4	0 to 2
Weed species	kochia	common lambsquarters	redroot pigweed	hairy nightshad
Weed density (plants/ft^2)	1	2	2	1

[1] Cotyl = cotyledon and lf = leaf

Dimethenamid severely injured (>50%) the crop when applied at the 4 to 5 leaf stage (Table 2). No other herbicide treatment injured the crop more than 8%. All of the herbicide treatments controlled all weed species 86 to 100%. There were no differences in weed control among herbicide treatments except for common lambsquarters control at the first evaluation. Dimethenamid applied lay-by was the highest yielding treatment. None of the other treatments had yields significantly higher than the untreated check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

Table 2. Crop injury, weed control, and sugar beet yield with dimethenamid, near Kimberly Idaho.

					Weed control[1]								
Treatment[2]	Rate	Growth stage[3]	Crop injury		KCHSC		CHEAL		AMARE		SOLSA	SONOL	Crop yield
			6/14	7/3	6/14	7/3	6/14	7/3	6/14	7/3	6/14	6/14	
	lb/A		--------	--------	--------	--------	%	--------	--------	--------	--------	--------	Ton/A
Check			-	-	-	-	-	-	-	-	-	-	27
Etho&desm&phen	0.33	3 times	5	1	100	100	99	100	98	100	100	100	32
Etho&desm&phen dimethenamid	0.33 1.17	2 times 3rd applic.	8	3	88	99	86	88	90	100	94	93	30
Etho&desm&phen dimethenamid	0.33 1.17	3 times 3rd applic.	53	54	100	100	98	100	100	100	100	100	26
Etho&desm&phen dimethenamid	0.33 1.17	3 times lay-by	5	5	100	100	96	98	98	100	100	100	35
LSD (0.05)			8	13	ns	ns	8	ns	ns	ns	ns	ns	ns
LSD (0.10)													6

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

[2] Etho&desm&phen is the commercial formulation of ethofumesate, desmedipham, and phenmedipham.

[3] Growth stage at the first, second, and third applications were cotyledon, 2 to 3 leaf, and 4 to 5 leaf, respectively.

Lay-by applications for late season weed control in sugar beets. Robert W. Downard and Don W. Morishita. The objective of this study was to evaluate lay-by treatments for control of late germinating weeds. Plots were located at the University of Idaho Research and Extension Center Kimberly, Idaho. Weeds evaluated were kochia (KCHSC), common lambsquarters (CHEAL), annual sowthistle (SONOL) redroot pigweed (AMARE), and common sunflower (HELAN). Individual plots were 7.33 by 30 feet with treatments arranged in a randomized complete block design and replicated four times. Soil type was a silt loam with a pH of 7.9, CEC of 18 meq/100 g of soil, and 1.5% organic matter. The field was fertilized before planting with 85, 80, and 30 lb/A of nitrogen, phosphorus, and sulfur, respectively. Sugar beets (var. WS-91) were planted on 22 inch rows April 25, 1995, at 71,280 seeds/A and sprinkler irrigated. In late July, 30 lb/A of UAN and 0.5 lb/A sulfur were applied to maintain fertility level and to control powdery mildew. Herbicides were applied in a 10 inch band with a CO_2 pressurized bicycle-wheel sprayer equipped with 8001 even fan nozzles. The delivery rate was 20 gpa at 38 psi. Lay-by treatments were incorporated with 0.5 inch of irrigation water immediately after application. Additional application information is given in Table 1. Weed densities were 1 to 3 plants/ft^2 and annual sowthistle the most prevalent. Crop injury and weed control evaluations were taken June 12 and July 3. Two center rows of each plot were harvested September 25 with a mechanical harvester

Table 1. Application information.

Application timing	cotyledon	7 days later	7 days later	Lay-by
Application date	5/15/95	5/24/95	5/31/95	6/13/95
Air temperature (F)	65	52	73	69
Soil temperature (F)	60	50	64	60
Relative humidity (%)	58	70	50	40
Wind velocity (mph)	0 to 10	4 to 8	0 to 4	0 to 2

Crop injury evaluations before lay-by applications ranged from 10 to 13% with all postemergence treatments (Table 2). Pendimethalin was the only lay-by treatment that increased crop damage. Increased injury with pendimethalin was a result of sugar beet growth stage and herbicide rate. Sugar beets were at the 6 leaf stage. This growth stage is still susceptible to injury from pendimethalin compared to later growth stages. Pendimethalin at 1.5 lb/A instead of 2.0 lb/A also would have reduced the risk of injury. All herbicide treatments controlled all weeds 94 to 100%. Pendimethalin applied lay-by was the only treatment that had a yield equal to the check. Pyrazon applied lay-by was the only treatment that had a higher root and extractable sugar yield than the no lay-by treatment. All other herbicide treatment yields were equal and higher than the check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

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

					Weed control[1]										
		Applic.	Crop injury		KCHSC		CHEAL		SONOL		AMARE		HELAN		Extractable
Treatment	Rate	timing[3]	6/12	7/3	6/12	7/3	6/12	7/3	6/12	7/3	6/12	7/3	7/3	Yield	sugar
	lb/A							%						Tons/A	lb/A
Check			-	-	-	-	-	-	-	-	-	-	-	14	3729
Ethfmst&desm&phen[2]	0.33	3 times	13	0	100	100	100	99	100	100	100	100	100	23	5937
Ethfmst&desm&phen	0.33	3 times	13	0	94	100	99	100	100	100	100	100	100	26	6856
EPTC	3.0	Lay-by													
Ethfmst&desm&phen	0.33	3 times	13	45	100	100	100	100	100	100	100	100	100	14	3446
pendimethalin	2.0	Lay-by													
Ethfmst&desm&phen	0.33	3 times	10	0	100	100	100	100	100	100	100	100	100	28	7301
pyrazon	3.5	Lay-by													
Ethfmst&desm&phen	0.33	3 times	11	0	100	100	99	100	100	100	100	100	99	24	6189
cycloate	3.0	Lay-by													
Ethfmst&desm&phen	0.33	3 times	13	0	93	100	98	100	100	100	94	100	100	25	6131
ethalfluralin	1.5	Lay-by													
Ethfmst&desm&phen	0.33	3 times	11	0	98	100	100	100	100	100	100	100	100	26	6692
trifluralin	0.75	Lay-by													
LSD (0.05)			NS	4	6	NS	NS	NS	NS	NS	NS	NS	NS	4	1039

[1] Weed species evaluated were kochia (KCHSC), common lambsquarters (CHEAL), annual sowthistle (SONOL), redroot pigweed (AMARE), and common sunflower (HELAN).

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

[3] All ethfmst&desm&phen treatments were applied as a split application a total of three times. The first at the cotyledon stage, the second 7 days later, and the third 7 days later.

<u>Preemergence and postemergence application of herbicides on sugar beets</u>. Marvin D. Butler. The objective of this project was to evaluate herbicides applied preemergence and postemergence to sugar beets at three locations near Prineville and Madras, Oregon. Preemergence treatments included ethofumesate alone and in combination with pyrazon. Postemergence applications included phenmedipham and desmedipham, phenmedipham and desmedipham and ethofumesate, clopyralid, ethofumesate, and triflusulfuron, alone and in combination. Sugar beet varieties were 'WS 91' at the Mc Phetridge location, 'Chinook' at the Craig location, and 'Beta 8422' at the Graves location. Dates for preemergence applications were April 19 at the Graves and Mc Phetridge locations, and April 27 at the Craig location. Postemergence treatments at the Mc Phetridge location were made on May 5, May 12, and June 19, with exception of the third triflusulfuron treatment which was applied on May 26. The Craig location received postemergence applications on May 12, May 19, and June 3, while applications at the Graves location were on May 10, May 19, and June 3. Postemergence treatments were applied at the cotyledon stage, followed by a second application a week later at the 2-leaf stage. A third application was made to the non-preemergence treatments when the sugar beets were at about the 6-leaf stage. Herbicides were applied with a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. Treatments were replicated three times in a randomized complete block design with 10 by 25 ft plots. Crop oil concentrate was added to triflusulfuron treatments at 1% of the spray volume. A buffering agent at 4 oz/100 gal was applied in combination with the phenmedipham and desmedipham and ethofumesate treatment.

Visual evaluation of weed control and crop injury were conducted at the Craig and Graves locations June 29, and at the Mc Phetridge location on July 5. A twenty-foot sample was harvested from the center row of each plot at the Craig location on October 16. Plot samples were weighed and sub-sampled for evaluation of % sugar and parts per million nitrate by Holly Sugar.

Plots which received ethofumesate or ethofumesate plus pyrazon applied preemergence had significantly fewer weeds than those receiving only postemergence applications. Only two postemergence applications were necessary following the preemergence treatments. Ethofumesate applied preemergence followed by phenmedipham and desmedipham plus triflusulfuron provided the best weed control. Treatments with phenmedipham and desmedipham provided the greatest control of lambsquarters. Redroot pigweed was best controlled with treatments containing phenmedipham and desmedipham, or ethofumesate. Treatments that contained ethofumesate or clopyralid controlled hairy nightshade. Ethofumesate was the only material which was consistently effective against redstem filaree. The phenmedipham and desmedipham and ethofumesate treatment was not effective against prostrate knotweed, while treatments with ethofumesate and triflusulfuron provided control. Ethofumesate applied preemergence produced slight stunting of the sugar beets only on the sandy soil at the Craig location. When pyrazon was added to the ethofumesate preemergence application, moderate stunting resulted. Some leaf distortion was found following clopyralid applications.

Yield was not reduced following slight stunting from ethofumesate preemergence applications, or moderate stunting following the ethofumesate plus pyrazon preemergence application. The application of triflusulfuron alone did not provide adequate weed control and significantly reduced yield from the 32 to 35 T/A range for other treatments to 21 T/A, while untreated plots yielded 7 T/A. Evaluation of % sugar and nitrate content revealed no significant differences between treatments. Sugar ranged from 18.3 to 19.1% and nitrate ranged from 71 to 133 ppm. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741).

<u>Table</u>. Effect of herbicide application on sugar beets at three locations near Prineville and Madras, Oregon.

	Rate			Weed Control[1]				
Treatments[2]	Pre	Post 1, 2	Post 3	Common lambsquarters	Redroot pigweed	Hairy nightshade	Redstem filaree	Prostrate knotweed
	(lb/A)			(%)				
Ethofumesate triflusulfuron + phenmedipham & desmedipham	1.5	0.03 0.24		99	99	95	99	97
Ethofumesate triflusulfuron + clopyralid	1.5	0.03 0.07		91	97	94	99	100
Ethofumesate + pyrazon phen & desm & etho	1.5 2.7	0.27		98	98	99	100	96
Phen & desm & etho phen & desm & etho + clopyralid		0.27	0.27 0.05	92	95	93	80	39
Triflusulfuron + phenmedipham & desmedipham		0.03 0.24	0.03 0.33	95	96	78	22	95
Triflusulfuron + clopyralid		0.03 0.07	0.03 0.07	43	75	99	74	98
Triflusulfuron + clopyralid + ethofumesate		0.03 0.07 0.13	0.03 0.07 0.25	89	76	100	92	100
Triflusulfuron		0.03	0.03	18	61	51	73	93
Untreated				0	0	0	0	0

[1] Visual evaluations were conducted at the three locations June 29 to July 5.

[2] Postemergence treatments were applied at the three locations to sugar beets in the cotyledon, 2-leaf, and 6-leaf stages. Phen & desm & etho = phenmedipham & desmedipham & ethofumesate commercial formulation.

Sulfonylurea herbicide dose response on sugar beets. Robert W. Downard and Don W. Morishita. This study was conducted in the greenhouse at the University of Idaho Research and Extension Center Kimberly, Idaho. The objective of this study was to determine which sulfonylurea grain herbicide would cause the most injury in sugar beets. The herbicides were thifensulfuron and tribenuron preformulated mixture, thifensulfuron, and tribenuron. Sugar beets were planted in four inch pots and thinned to 4 plants/pot after emergence. The experimental design was a split plot and treatments were replicated four times. The main plot was herbicide and the subplot was rate. Herbicides were applied with a greenhouse track sprayer at 10 gpa. A one liter solution of each treatment at 0.32X rate was made and lower rates were made from dilutions. Crop damage was rated on February 22 and March 1. Sugar beets were harvested on March 22 and air dried.

Sugar beet injury occurred at 0.08X to 0.32X rate of the thifensulfuron and tribenuron premix and tribenuron alone (Table). Thifensulfuron did not significantly increase injury until 0.32X rate. It was only at these highest rates that dry weights were reduced. Tribenuron appeared to cause more damage at lower rates than the other herbicides. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

Table. Crop injury and dry weight of sugar beets.

Treatment	Fraction of label rate[2]	Rate	Injury 2/22	Injury 3/1	Dry weight
		oz/a	------%------		grams
Thifensulfuron & tribenuron	0X		0	0	1.1
Thifensulfuron & tribenuron	0.01X	0.0023	0	0	1.5
Thifensulfuron & tribenuron	0.02X	0.0046	5	0	1.1
Thifensulfuron & tribenuron	0.04X	0.0092	3	5	1.6
Thifensulfuron & tribenuron	0.08X	0.0184	30	21	1.3
Thifensulfuron & tribenuron	0.16X	0.0368	39	50	1.0
Thifensulfuron & tribenuron[1]	0.32X	0.0736	95	100	0.4
Thifensulfuron	0X		0	0	1.6
Thifensulfuron	0.01X	0.0037	1	1	1.5
Thifensulfuron	0.02X	0.0075	6	9	1.3
Thifensulfuron	0.04X	0.015	14	21	1.5
Thifensulfuron	0.08X	0.03	10	6	1.9
Thifensulfuron	0.16X	0.06	1	4	1.6
Thifensulfuron[1]	0.32X	0.12	85	76	0.7
Tribenuron	0X		0	0	1.4
Tribenuron	0.01X	0.0012	6	1	1.2
Tribenuron	0.02X	0.0025	4	0	1.4
Tribenuron	0.04X	0.005	1	0	2.6
Tribenuron	0.08X	0.01	80	79	0.9
Tribenuron	0.16X	0.02	88	71	1.0
Tribenuron[1]	0.32X	0.04	93	99	0.4
LSD (0.05)			23	17	0.7

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[1] Nonionic surfactant was added at 0.25% v/v.

[2] Labeled rate of thifensulfuron and tribenuron, thifensulfuron, and tribenuron was 0.23, 0.125, and 0.375 oz/A, respectively.

Tank mixtures for broadleaf weed control in sugar beets. Robert W. Downard and Don W. Morishita. Tank mixing herbicides commonly is used to increase the weed control spectrum in sugar beets. A field study was established to evaluate weed control of commercially formulated ethofumesate, desmedipham, and phenmedipham tank mixed with clopyralid and/or triflusulfuron. The study was conducted at the University of Idaho Research and Extension Center Kimberly, Idaho. Weeds species evaluated were kochia (KCHSC), common lambsquarters (CHEAL), hairy nightshade (SOLSA), redroot pigweed (AMARE), and annual sowthistle (SONOL). Sugar beets (var. WS-91) were planted on 22 inch rows April 25, 1995, at 71,280 seed/A and sprinkler irrigated. The field was fertilized prior to planting 85, 80, and 30 lb/A of nitrogen, phosphorus, and sulfur, respectively. In late July, 30 lb/A of UAN and 0.5 lb/A of sulfur, were applied through the sprinkler to maintain fertility and control powdery mildew. The soil type was a silt loam with a pH of 7.9, CEC of 18 meq/100 g of soil, and 1.5% organic matter. Herbicides were applied in a 10 in band with a CO_2 pressurized bicycle-wheel sprayer equipped with 8001 even fan nozzles. The delivery rate was 20 gpa at 38 psi. Weed densities at the time of application were 2 to 18 plants/ft^2 and redroot pigweed was the most prevalent. Additional application information is shown in Table 1. Crop injury and weed control evaluations were taken June 12 and July 3. Two center rows from each plot were harvested September 26 with a mechanical harvester.

Table 1. Application information

Application timing	Cotyledon	7 days later	7 days later
Application date	5/16/95	5/24/95	5/31/95
Air temperature (F)	63	52	73
Soil temperature (F)	60	50	64
Relative humidity (%)	46	70	50
Wind velocity (mph)	6 to 12	6 to 12	0 to 4

All herbicide treatments injured the crop 13 to 15% on June 12 evaluation (Table 2). This injury was not observed on July 3, which was 4 weeks later. Weed control was good (85 to 100%) with all treatments indicating that control was not reduced on these species when the combinations were used. All herbicide treatments had higher yields than the untreated check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, Idaho 83303).

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

					Weed control[1]										
Treatment[2]	Rate	Growth stage[3]	Crop injury		KCHSC		CHEAL		SOLSA		AMARE		SONOL		Yield
			6/12	7/3	6/12	7/3	6/12	7/3	6/12	7/3	6/12	7/3	6/12	7/3	
	lb/A		%												Tons/A
Check			-	-	-	-	-	-	-	-	-	-	-	-	12
Desm & phen	0.33	Cotyl	15	0	86	95	100	100	100	97	100	97	99	100	24
desm & phen	0 33	7 d later													
desm & phen	0 33	7 d later													
Desm & phen	0 33	Cotyl	14	0	93	96	100	99	100	97	100	97	100	100	27
desm & phen +	0.33 +	7 d later													
clopyralid	0 094														
desm & phen +	0.33 +	7 d later													
clopyralid	0.94														
Ethfmst&desm&phen	0.33	Cotyl	15	1	91	100	100	100	98	99	100	100	100	100	24
ethfmst&desm&phen	0.33	7 d later													
ethfmst&desm&phen	0.33	7 d later													
Ethfmst&desm&phen	0.33	Cotyl	15	0	93	99	100	100	99	99	100	100	100	100	29
ethfmst&desm&phen +	0.33 +	7 d later													
clopyralid	0.094														
ethfmst&desm&phen +	0.33 +	7 d later													
clopyralid	0.094														
Ethfmst&desm&phen +	0.33 +	Cotyl	13	0	85	92	99	100	100	99	100	98	100	100	24
triflusulfuron	0.0156														
ethfmst&desm&phen +	0.33 +	7 d later													
triflusulruon +	0.0156 +														
clopyralid	0.094														
ethfmst&desm&phen +	0.33 +	7 d later													
triflusulruon +	0.0156 +														
clopyralid	0.094														
LSD (0.05)			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	7

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

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

[3] Abbreviations are 7 d later = 7 days later and cotyl = cotyledon.

Weed control in sugar beets with preplant and preemergence herbicides. Robert W. Downard and Don W. Morishita. Research plots were established at the University of Idaho Research and Extension Center Kimberly, Idaho to evaluate preplant and preemergence sugar beet herbicides for weed control. Weeds species present were kochia (KCHSC), common lambsquarters (CHEAL), redroot pigweed (AMARE), and annual sowthistle (SONOL). Sugar beets (var. WS-91) were planted April 25, 1995, on 22 inch rows at 71,280 seeds/A and sprinkler irrigated. The field was fertilized with 85, 80, and 30 lb/A of nitrogen, phosphorus, and sulfur, respectively. In late July, 30 lb/A of UAN and 0.5 lb/A of sulfur were applied through the sprinkler to maintain fertility and control powdery mildew. The soil type was a silt loam with a pH of 7.9, a CEC of 18 meq/100 g of soil, and 1.5% organic matter. Preplant incorporated (PPI) treatments were applied then incorporated at right angles with a roller harrow. Preemergence (PRE) treatments except for glyphosate were applied then incorporated with 0.8 in of irrigation water. All herbicide treatments were applied with a bicycle-wheel sprayer. All PRE and postemergence (POST) treatments were applied in a 10 inch band, and PPI treatments were applied broadcast. The delivery rate for PPI treatments was 20 gpa at 22 psi using either 11002 flat fan nozzles and 20 gpa at 38 psi with 8001 even fan nozzles for PRE and POST treatments. Weed densities were 1 to 3 plants/ft^2 and annual sowthistle was the most prevalent. Additional application information is shown in Table 1. Crop injury and weed control ratings were taken June 14 and July 3. Two center rows of each plot were harvested September 25 with a mechanical harvester.

Table 1. Application information.

Application timing	PPI	PRE	PRE	POST	POST
Application date	4/21/95	4/28/95	5/13/95	5/24/95	5/31/95
Air temperature (F)	42	50	48	52	73
Soil temperature (F)	42	48	41	50	64
Relative humidity (%)	100	-	50	70	50
Wind velocity (mph)	6 to 8	0 to 6	0	4 to 8	0 to 4

Crop injury on June 14 ranged from 6 to 20% for all herbicide treatments (Table 1). Some of this injury may partly be due to the wet spring that could have moved the herbicide into the root zone. On July 3 both rates of pyrazon plus ethofumesate were the treatments with the highest injury level. Weed control was 90% or better with all herbicide treatments with the exception of pyrazon at 2.34 lb/A applied PRE. All herbicide treatments had higher yields than the untreated check but were not different in comparison to each other. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

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

					Weed control[1]								
			Crop injury		KCHSC		CHEAL		AMARE		SONOL		
Treatment[2]	Rate	Growth stage	6/14	7/3	6/14	7/3	6/14	7/3	6/14	7/3	6/14	7/3	Yield
	lb/A		%										Tons/A
Check			-	-	-	-	-	-	-	-	-	-	19
Pyrazon	1.0	Pre	6	0	90	96	100	100	100	100	100	100	34
ethfmst&desm&phen	0.33	1-2 leaf											
Pyrazon	2.34	Pre	9	0	81	98	100	100	100	100	100	100	32
ethfmst&desm&phen	0.33	1-2 leaf											
Ethofumesate	1.12	Pre	15	4	100	100	100	100	100	100	100	100	32
ethfmst&desm&phen	0.33	1-2 leaf											
Pyrazon +	1.0 +	Pre	11	3	100	100	100	100	100	100	100	100	34
ethofumesate	1.12	Pre											
ethfmst&desm&phen	0.33	1-2 leaf											
Pyrazon +	2.34 +	Pre	16	6	100	100	100	100	100	100	100	100	32
ethofumesate	1.12	Pre											
ethfmst&desm&phen	0.33	1-2 leaf											
Pyrazon +	1.0 +	Pre	18	8	100	100	100	100	100	100	100	100	32
ethofumesate	1.5	Pre											
ethfmst&desm&phen	0.33	1-2 leaf											
Cycloate	3.0	PPI	20	1	100	100	100	100	100	100	100	100	31
ethfmst&desm&phen	0.33	1-2 leaf											
Cycloate w/fert.	3.0	PPI	19	0	100	100	100	100	100	100	100	100	32
ethfmst&desm&phen	0.33	1-2 leaf											
Glyphosate +	0.5 +	Pre to crop	13	1	97	100	100	100	100	100	100	100	36
nonionic surfactant	0.5% v/v												
ethfmst&desm&phen	0.33	1-2 leaf											
LSD (0.05)			7	6	10	NS	NS	NS	NS	NS	NS	NS	5

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

[2] Ethfmst&desm&phen is a commercial formulation of ethofumesate, desmedipham, and phenmedipham. Cycloate w/fert. is cycloate impregnated on fertilizer. All postemergence applications of ethfmst&desm&phen were applied as a split application. The second application 7 days after the 1 to 2 leaf application.

Downy brome control with primisulfuron in established Kentucky bluegrass seed production. Daniel A. Ball and Darrin L. Walenta. A study was established on a commercial Kentucky bluegrass field near LaGrande, OR to evaluate postemergence timings, and split applications of primisulfuron for downy brome control and crop tolerance in established Kentucky bluegrass grown for seed. The experimental area was located in a forth year stand of Kentucky bluegrass var. 'Baron'. EPOST treatments were made on October 5, 1994 (air temp. 55 F, sky cloudy, wind NE at 3 to 6 mph, relative humidity 65%, soil temp. at 0 inch 72 F, 1 inch 67 F, 2 inch 63 F, 4 inch 59 F) to 1 leaf downy brome and bluegrass with 4 inch regrowth. MPOST treatments were made on October 24 (air temp. 40 F, sky clear, wind calm, relative humidity 92%, soil temp. at 0 inch 62 F, 1 inch 58 F, 2 inch 52 F, 4 inch 50 F) to downy brome with 3 to 5 tillers and partially dormant bluegrass. LPOST treatments were made on February 28, 1995 (air temp. 35 F, sky clear, wind N at 3 to 4 mph, relative humidity 65%, soil temp. at 0 inch 49 F, 1 inch 36 F, 2 inch 32 F, 4 inch 34 F) to fully tillered downy brome 3 inch height, and dormant bluegrass. All treatments were made with a hand held CO_2 sprayer delivering 15 gpa at 30 psi. Plots were 10 by 25 ft in size, in an RCB arrangement, with 4 replications. Soil at the site was a loam with 39.4% sand, 41.8% silt, and 18.8% clay, 3% organic matter, 7.3 soil pH, and a CEC of 25.8 meq/100g. Evaluations of visual crop injury and downy brome control were made on October 24, 1994, February 28, 1995 and April 7, 1995. Plots were cut on July 12, 1995 with a small plot swather, and harvested with a plot combine on July 21, 1995. Seed samples were delinted and cleaned prior to yield determination.

Primisulfuron applied at all rates and as split applications provided very good to excellent control of downy brome. Split applications tended to provide slightly better downy brome control, but not at a significantly better level. No crop injury from primisulfuron application was observed. FOE-5043 was ineffective at controlling downy brome when applied at these later downy brome growth stages. The tank-mix combination of oxyfluorfen with primisulfuron appeared to antagonize downy brome control at the February 28th evaluation time. Both treatments with metribuzin caused significant bluegrass injury particularly when observed in the fall after application, however, the standard treatment of oxyfluorfen with metribuzin provided good control of downy brome. Clean seed yield was not significantly different due to herbicide treatment, but there was a substantial difference in field weight due to herbicide treatment. The difference between clean weight and field weight was a reflection of high levels of downy brome seed contamination after harvest. The greater contamination required substantially more cleaning which would increase cleaning expense, thereby reducing profitablility of harvested Kentucky bluegrass seed. (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table 1. Kentucky bluegrass injury, downy brome control, and bluegrass seed yield from postemergence herbicide treatments.

		October 24		February 28		April 7		Yield	
Treatment	Rate	Injury	Control	Injury	Control	Injury	Control	Field	Clean
	lb/A	-------------------------------		%		-------------------------------		------lb/A------	
Primisulfuron + OC	0.018	0	56	0	84	0	86	1036	544
Primisulfuron + OC	0.036	0	56	0	83	0	89	955	520
Primisulfuron + OC/ primisulfuron + OC	0.018/ 0.018	0	55	0	100	0	99	855	571
Primisulfuron + OC/ primisulfuron + OC	0.018/ 0.018	0	64	0	87	2	99	938	553
Oxyfluorfen + primisulfuron + OC	0.25 + 0.018	5	74	0	54	1	79	1318	445
FOE-5043 + R-11	0.25	0	15	0	20	0	34	1637	416
FOE-5043 + R-11	0.33	0	5	1	20	1	19	1655	378
FOE-5043 + metribuzin + R-11	0.25 + 0.375	25	60	4	64	6	69	1817	401
Oxyfluorfen + metribuzin + R-11	0.25 + 0.375	39	66	5	81	9	81	1736	480
Control	--	0	0	0	0	0	0	1700	390
LSD (0.05)		3	15	2	17	4	25	314	NS

OC - Crop oil concentrate applied at 1 qt/A
R-11 non-ionic surfactant applied at 0.25% v/v.

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 and one spring-applied herbicide for control of roughstalk bluegrass in Kentucky bluegrass. The nine herbicides, terbacil, ethofumesate, metribuzin, fenoxaprop, oxyfluorfen, diuron, primisulfuron, dicamba, and imazamethabenz were applied at two rates in a grid pattern to plots in three commercial Kentucky bluegrass fields to evaluate crop injury, and three roughstalk bluegrass fields to determine control of established and seedling plants. Fall applications were made November 3, November 7, and November 22, 1994, at the various locations, and the spring application was made to all plots March 25, 1995. Herbicides were applied to 10 by 10 ft plots at each location using a CO_2 pressurized, hand-held, boom sprayer at 40 psi and 20 gpa. A nonionic surfactant was applied at 0.25% v/v in combination with all herbicides. Evaluation for control of established and seedling roughstalk bluegrass was made March 28, 1995. Evaluation of crop injury to Kentucky bluegrass, based on reduction in plant biomass, was conducted March 29, 1995. Evaluation of the spring-applied fenoxaprop treatments were made May 10, 1995. Pre-harvest evaluations of percent reduction in seed set were conducted on June 9 and 12, 1995.

Seedling roughstalk bluegrass was more easily controlled than established plants. Crop injury to Kentucky bluegrass was 20% for imazamethabenz applied at 0.46 lb/A, and 18% for terbacil at 1 lb/A. Terbacil at 1 lb/A provided 89% control of established roughstalk bluegrass plants, while terbacil plus diuron combinations provided 79 to 83% control. Over 90% of seedling roughstalk bluegrass were controlled with terbacil at 1 lb/A, or with terbacil plus diuron. Application of fenoxaprop reduced seed set in Kentucky bluegrass between 60 and 90%. (Oregon State University, Central Oregon Agricultural Research Center, Madras, OR 97741).

Table. Effect of selected fall-applied herbicide treatments which provided the best overall performance on established and seedling roughstalk bluegrass at 3 locations, and corresponding crop injury to Kentucky bluegrass at three locations 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			
+ terbacil	0.6	94	89	18
Terbacil	0.4			
+ diuron	1.6	92	83	2
Terbacil	0.6			
+ diuron	0.8	92	79	3
Terbacil	0.4			
+ primisulfuron	0.04	85	32	7
Terbacil	0.6			
+ oxyfluorfen	0.13	85	68	5
Terbacil	0.4			
+ metribuzin	0.23	80	50	0
Terbacil	0.6			
+ metribuzin	0.09	80	68	7
Terbacil	0.6			
+ imazamethabenz	0.23	75	68	3

[1] Visual evaluations were conducted March 28 and March 29, 1995.

[2] Treatments were applied November 3, November 7, and November 22, 1994.

Quackgrass control in established Kentucky bluegrass with primisulfuron. Terry L. Neider and Donald C. Thill. A study was established in a Kentucky bluegrass field in Lewis County, ID to evaluate primisulfuron for quackgrass control. The bluegrass field (var. Palouse) was in the 7th year of seed production. The soil was a silt loam with 30% sand, 56% silt, 13% clay, pH 5.4 and 4.6% organic matter. The experimental design was a randomized complete block with four replications and individual plots were 16 by 20 ft. Primisulfuron was applied postemergence at two timings on April 17 and May 18, 1995 (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi. Bluegrass injury and quackgrass control were evaluated visually May 16 and June 1, 1995.

Table 1. Application data.

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

Kentucky bluegrass was not injured by any primisulfuron treatment on May 16, 1995. Split application of primisulfuron with crop oil concentrate injured bluegrass 14% (stunting), while all other primisulfuron treatments injured bluegrass 3 to 8% on June 1, 1995 (Table 2). Quackgrass control was similar between nonionic surfactant or crop oil concentrate treatments. Split application of primisulfuron at 0.018 lb/A plus crop oil concentrate, and primisulfuron at 0.036 lb/A plus nonionic surfactant controlled quackgrass 94%. All other primisulfuron treatments controlled quackgrass 83 to 90%. These plots will be split (8 by 20 ft) in spring 1996 with one half untreated and one half treated with the same series of treatments. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Kentucky bluegrass response and quackgrass control from herbicide treatments, Lewis County, ID.

Treatment[1]	Rate	Timing	Bluegrass injury[2]	Quackgrass control 5/16/95	Quackgrass control 6/1/95
	lb/A		%	%	%
Primisulfuron + nis	0.018	early spring +	8	58	89
primisulfuron + nis	0.018	spring			
Primisulfuron + coc	0.018	early spring +	14	65	94
primisulfuron + coc	0.018	spring			
Primisulfuron + nis	0.027	spring	3	65	88
Primisulfuron + coc	0.027	spring	6	60	83
Primisulfuron + nis	0.036	spring	4	73	94
Primisulfuron + coc	0.036	spring	4	65	90
		LSD (0.05)	5	8	5
		Density (shoots/ft^2)		37	

[1] Nis is a 90% nonionic surfactant applied at 0.25% v/v; coc is a crop oil concentrate applied at 2.5% v/v.

[2] June 1, 1995 evaluation.

Seedling Kentucky bluegrass tolerance to imazamethabenz and difenzoquat. Terry L. Neider and Donald C. Thill. A study was established in seedling Kentucky bluegrass in Lewis County, ID to evaluate seedling bluegrass tolerance to two application timings and different doses of imazamethabenz and difenzoquat. Kentucky bluegrass (var. Palouse) was planted on May 2, 1995 in a silt loam soil (33% sand, 54% silt, 13% clay, pH 5.2 and 6.4% organic matter). 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 on May 18 and June 1, 1995 (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi. Bluegrass injury, and field pennycress, henbit and wild oat control were evaluated visually June 1 and June 26, 1995.

Table 1. Application data.

	May 18, 1995	June 1, 1995
Crop stage	1-2 leaves	2-4 leaves
Weed stage	0.5-1 inch	1-2 inch
Air temp (F)	68	82
Relative humidity (%)	65	46
Wind (mph)	0-3	0-3
Sky	partly cloudy	mostly clear
Soil temp (F)	64	86

Imazamethabenz plus difenzoquat applied at the 1 to 2 leaf stage injured bluegrass 18% (chlorosis) on June 1, 1995 (Table 2), and the same treatment applied at the 3 to 4 leaf stage also injured bluegrass 18% (chlorosis) on June 26, 1995. Difenzoquat applied alone at the 1 to 2 leaf stage injured bluegrass 19 and 15% on June 1, 1995. However, difenzoquat applied alone at the 3 to 4 leaf stage did not injure the bluegrass. Imazamethabenz treatments applied at the 1 to 2 leaf stage controlled field pennycress 98% on June 26, 1995. The same treatments applied at the 3 to 4 leaf stage suppressed field pennycress 60 to 69% on June 26, 1995. Henbit was not controlled adequately by any herbicide treatment and wild oat control was variable ranging from 40 to 80%. This study will be continued and seed yields determined in 1996. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table2. Seedling Kentucky bluegrass response and weed control from herbicide treatments, Lewis county, ID.

					Weed control					
			Bluegrass injury		Field pennycress		Henbit		Wild oat	
Treatment[1]	Rate	Timing	6/1/95	6/26/95	6/1/95	6/26/95	6/1/95	6/26/95	6/1/95	6/26/95
	lb/A		%							
Imazamethabenz	0.23	1-2 lf	0	0	80	98	50	15	35	40
Imazamethabenz	0.47	1-2 lf	0	5	84	98	60	21	40	50
Imazamethabenz + difenzoquat	0.23 + 0.5	1-2 lf	18	5	86	98	66	18	63	58
Difenzoquat	1	1-2 lf	19	5	0	0	0	0	69	80
Difenzoquat	0.5	1-2 lf	15	3	0	0	0	0	53	68
Imazamethabenz	0.23	3-4 lf	---	6	---	60	---	6	---	44
Imazamethabenz	0.47	3-4 lf	---	6	---	69	---	8	---	58
Imazamethabenz + difenzoquat	0.23 + 0.5	3-4 lf	---	18	---	60	---	8	---	65
Difenzoquat	1	3-4 lf	---	0	---	0	---	0	---	63
Difenzoquat	0.5	3-4 lf	---	0	---	0	---	0	---	53
Untreated check			---	---	---	---	---	---	---	---
		LSD (0.05)	5	7	4	7	9	6	10	NS
		Density (plants/ft^2)			4		3		1	

[1]All treatments applied with a 90% nonionic surfactant at 0.25% v/v.

Weed control in seedling Kentucky bluegrass with primisulfuron. Terry L. Neider and Donald C. Thill. A study was established in seedling Kentucky bluegrass in Lewis County, ID to evaluate seedling bluegrass tolerance and weed control with primisulfuron. Kentucky bluegrass (var. Palouse) was planted on May 2, 1995 in a silt loam soil (33% sand, 54% silt, 13% clay, pH 5.2 and 6.4% organic matter). 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 application timings on May 18 and June 1, 1995 (Table 1) with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi. Bluegrass injury, and field pennycress (THLAR), henbit (LAMAM), mayweed chamomile (ANTCO), and wild oat (AVEFA) control were evaluated visually June 26, 1995.

Table 1. Application data.

	May 18, 1995	June 1, 1995
Crop stage	1-2 leaves	1-2 tillers
Weed stage	0.5-1 inch	1-2 inch
Air temp (F)	68	82
Relative humidity (%)	65	46
Wind (mph)	0-3	0-3
Sky	partly cloudy	mostly clear
Soil temp (F)	64	86

Single application of primisulfuron at either 1 to 2 leaf or 1 to 2 tiller stage injured bluegrass 34 to 44% (stunting), and the split application of primisulfuron injured bluegrass 61% (Table 2). Primisulfuron treatments controlled all broadleaf weeds 83% or more and wild oat control was 70 to 88%. This study will be continued and seed yields determined in 1996. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Seedling Kentucky bluegrass response and weed control from herbicide treatments, Lewis County, ID.

			Bluegrass	Weed control			
Treatment[1]	Rate	Timing	injury	THLAR	LAMAM	ANTCO	AVEFA
	lb/A		-----------------------------	-----------------------------	%	-----------------------------	-----------------------------
Primisulfuron	0.018	1-2 leaf	34	98	83	100	70
Primisulfuron	0.036	1-2 leaf	44	100	96	100	83
Primisulfuron	0.018	1-2 tiller	40	95	86	100	86
Primisulfuron	0.036	1-2 tiller	38	96	88	100	88
Primisulfuron	0.018	1-2 leaf+	61	100	99	100	86
primisulfuron	0.018	1-2 tiller					
Bromoxynil	0.5	1-2 tiller	0	98	68	100	0
		LSD (0.05)	8	NS	10	NS	12
		Density (plants/ft^2)		4	3	1	1

[1] All primisulfuron treatments were applied with a crop oil concentrate at 2.5% v/v.

Bioeconomic model for grass weed control in spring-planted canola. Traci A. Brammer, Donald C. Thill, and Ed J. Bechniski. A field experiment was established during the spring of 1995 at the University of Idaho Plant Science Farm near Moscow, Idaho to evaluate the effect of wild oat and volunteer spring barley plant density and sethoxydim rates on wild oat (AVEFA) and volunteer spring barley (HORVX) control in canola, and on canola seed yield and oil content. A bioeconomic model will be constructed for control of wild oat and volunteer spring barley with sethoxydim. Main plots were canola cultivars (32 by 160 ft), subplots were volunteer spring barley or wild oat density (32 by 32 ft), and sub-subplots were sethoxydim dose (8 by 16 ft). The treatments were replicated four times in a randomized split-block design. Wild oat and 'Russell' spring barley were seeded on May 2 in rows spaced 3.5 inches apart. Both species were seeded to attain established plant densities of 0, 1.9. 6.5, 11.1, and 15.8 plants/ft^2. 'Helios' and 'Westar' spring canola were seeded perpendicular to wild oat or volunteer spring barley in rows spaced 7 inches apart to achieve an established plant density of 9.3 plants/ft^2. Both cultivars were seeded on May 4 using practices standard to the area. Sethoxydim was applied at 0, 0.14, 0.19, and 0.28 lb ai/A 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 June 8. Canola seed was direct combine harvested with a small plot combine from a 4.5 by 16 ft area on August 30. A seed sample from each sub-subplot was analyzed for oil content using nuclear magnetic resonance (NMR) spectroscopy.

Table 1. Application data and soil analysis

Application date	May 24		May 26
Growth stage.			
Canola	2 to 4 leaf		2 to 4 leaf
Wild oat	2 to 3 leaf		------
Volunteer spring barley	------		2 to 3 leaf
Air temperature (F)	70		46
Relative humidity (%)	38		69
Wind (mph)	2 to 5		0 to 2
Cloud cover (%)	15		50
Soil temperature at 2 in (F)	62		44
pH		6 2	
OM (%)		2.2	
Texture		silt loam	

All sethoxydim rates controlled volunteer spring barley 90% or better and wild oat 93% or better. Canola seed yield was the same among sethoxydim doses and greater than the untreated control (Table 2). Except for 'Westar' infested with wild oat, volunteer spring barley and wild oat density generally reduced canola seed yields as densities increased (Tables 3 and 4). Total oil content of canola seed was not effected by sethoxydim dose or weed density (wild oat or volunteer spring barley) but was different between canola cultivars (Table 5). (Agriculture Experiment Station, University of Idaho, Moscow, Idaho 83844-2339)

Table 2. The effect of sethoxydim dose on wild oat and volunteer spring barley control and canola seed yield.

		Control		Canola seed yield[1]	
Treatment	Rate	HORVX	AVEFA	HORVX	AVEFA
	lb ai /A	--------- % ---------		---------------lb/A---------------	
Untreated check	--	--	--	742 a	557 a
Sethoxydim	0.14	90	93	974 b	842 b
Sethoxydim	0.19	96	96	973 b	849 b
Sethoxydim	0.28	98	98	968 b	806 b

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

Table 3. The effect of wild oat density on canola seed yield averaged over sethoxydim dose.

	Canola seed yield[1]	
Wild oat density	Helios	Westar
plants/ft^2	-------------------------- lb/A --------------------------	
0.9	741 ad	814 a
4.0	699 abcd	864 a
4.3	769 a	799 a
7.1	642 bcd	836 a
9.3	607 bc	862 a

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

Table 4. The effect of volunteer spring barley density on canola seed yield averaged over cultivar and sethoxydim dose.

Volunteer spring barley density	Canola seed yield[1]	
plants/ft^2	lb/A	% of control
0	1024 a	100
0.6	938 bc	94
2.0	922 bcd	90
3.0	861 cde	84
4.4	807 de	79

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

Table 5. Total canola oil content averaged over weed density and sethoxydim dose.

	Total oil content[1]	
Canola cultivar	HORVX	AVEFA
	----------------------%----------------------	
Westar	35.7 a	34.7 a
Helios	34.6 b	33.2 b

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

Dose response of spring-planted canola to thifensulfuron-tribenuron. Traci A. Brammer, Dan A. Ball, and Donald C. Thill. Experiments were established near Moscow, Idaho and Pendleton, Oregon in spring-planted canola to evaluate canola injury and seed yield to low dose treatments of thifensulfuron-tribenuron. At the Moscow site, plots were 15 by 20 ft arranged in a randomized complete block with four replications. Thifensulfuron-tribenuron was applied to a 8 by 20 ft area on the west side of each plot with a CO_2 pressurized backpack sprayer calibrated to deliver 15 gpa at 37 psi at 3 mph on May 25, 1995 (Table 1). The remaining 7 ft served as a buffer strip between plots. At Pendleton, the treated plot size was 9 by 20 ft arranged in a randomized complete block with four replications. Thifensulfuron-tribenuron was applied with a CO_2 pressurized backpack sprayer calibrated to deliver 13 gpa at 30 psi on May 12, 1995 (Table 1). The doses applied at both locations were percentages of the labeled rate for wheat, which was defined as 17.5 g/ha (0.25 oz/A). Canola plant density was counted within a 3 ft^2 area at Moscow and ranged from 3 to 5 plants/ft^2. At Pendleton, canola plant density was counted within a 2 ft^2 area and ranged from 7 to 10 plants/ft^2. Canola injury was evaluated visually 14 and 21 days after treatment at Moscow and Pendleton, respectively. Canola was direct combine harvested on August 29, 1995 at Moscow and on July 26 and August 4, 1995 at Pendleton.

Table 1. Application data and soil analysis.

Location	Moscow, Idaho	Pendleton, Oregon
Seeding date/ variety	April 4/ 'IMC 02'	March 27/ 'Legend'
Application date	May 25	May 12
Canola growth stage	3 to 5 leaf	pre-bud
Air temperature (F)	46	60
Relative humidity (%)	60	49
Wind speed (mph)	1-3	0-2
Cloud cover (%)	20	0
Soil temperature at 2 in (F)	50	65
Texture	silt loam	silt loam

At Moscow, thifensulfuron-tribenuron at the 2.19 g/ha dose and above injured (chlorosis and stunting) canola 90% or greater, while the 0.55 and 1.09 g/ha dose injured canola 43 and 69%, respectively (Table 2). Canola yields were significantly less than the untreated check when thifensulfuron-tribenuron was applied at 1.09 g/ha or higher and reduced yields by 48 to 97%. At Pendleton, thifensulfuron-tribenuron at the 0.27 g/ha dose and above caused blossom thinning from 35 to 100% and stunting from 7 to 94% (Table 3). Canola yields were significantly less than the untreated check when thifensulfuron-tribenuron was applied at the 0.27 g/ha or higher and reduced yields by 21 to 95%. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83844-2339 and Oregon Agricultural Experiment Station, Columbia Basin Research and Extension Center, Pendleton, Oregon 97801)

Table 2. response of spring-planted canola to decreasing doses of thifensulfuron-tribenuron at Moscow

			Canola		
Treatment[1]	Rate	% of Label rate	Plant counts[2]	Injury[3]	Yield
	g/ha		plants/ft^2	-- % --	lb/A
Untreated check	--	--	5	0	1657
Thifensulfuron-tribenuron	0.04	0.20	4	0	1718
Thifensulfuron-tribenuron	0.07	0.39	3	0	1782
Thifensulfuron-tribenuron	0 14	0.78	4	2	1623
Thifensulfuron-tribenuron	0.27	1.56	4	8	1484
Thifensulfuron-tribenuron	0.55	3.13	4	43	1373
Thifensulfuron-tribenuron	1.09	6.25	4	69	854
Thifensulfuron-tribenuron	2.19	12.50	4	90	634
Thifensulfuron-tribenuron	4.38	25.00	5	92	292
Thifensulfuron-tribenuron	8.75	50.00	5	98	40
Thifensulfuron-tribenuron	17.51	100.00	4	96	55
LSD(0.05)			2	9	303

[1] All treatments applied with R-11, a nonionic surfactant from Wilbur Ellis at 0.25% v/v

[2] Plants counts at the treatment rates of 2.19 and greater included plants that appeared dead.

[3] Injury evaluation at 14 days after treatment.

Table 3. Response of spring-planted canola to decreasing doses of thifensulfuron-tribenuron at Pendleton.

			Canola			
			Injury[2]			
Treatment[1]	Rate	% of Label rate	Yellowing	Stunting	Blossom thinning	Yield
	g/ha		------------- % -------------			lb/A
Untreated check	--	--	0	0	2	1817
Thifensulfuron-tribenuron	0.04	0.20	0	0	0	1822
Thifensulfuron-tribenuron	0.07	0.39	0	2	5	1729
Thifensulfuron-tribenuron	0.14	0.78	0	1	5	1572
Thifensulfuron-tribenuron	0 27	1.56	0	7	35	1427
Thifensulfuron-tribenuron	0.55	3.13	0	31	74	1236
Thifensulfuron-tribenuron	1.09	6.25	2	55	95	902
Thifensulfuron-tribenuron	2.19	12.50	10	72	100	735
Thifensulfuron-tribenuron	4.38	25.00	34	82	100	474
Thifensulfuron-tribenuron	8.75	50.00	50	91	100	258
Thifensulfuron-tribenuron	17.51	100.00	52	94	100	97
LSD(0.05)			5	9	12	258

[1] All treatments applied with R-11, a nonionic surfactant from Wilbur Ellis at 0.25% v/v

[2] Injury evaluation 21 days after treatment.

Control of knotroot setaria in ladino clover. David W. Cudney and Bill Trew. Knotroot setaria (SETGE) also known as knotroot bristlegrass is a serious problem for the production of ladino clover seed crops in the Sacramento Valley of California. It is a perennial bunchgrass which reproduces both from seed and from a crown of shortened rhizomes. It is resistant to all of the cultural and chemical weed control measures that are normally used in legume seed crops including the postemergent herbicides paraquat and sethoxydim. As the density of this grass increases in clover fields, seed yield is reduced and harvesting becomes more difficult. In late summer and early fall after clover seed harvest, knotroot setaria exerts its seed heads above the clover. The flag leaf and spike often extend more than 15 inches above the clover canopy.

Previous tests had shown that knotroot setaria was susceptible to glyphosate treatment. However, spot treatment with glyphosate caused considerable damage to ladino clover stands from overspray. This was particularly serious as the density of the knotroot setaria increased. These conditions seemed ideal for a wick application of glyphosate. The wick applicator would allow application of glyphosate to the flag leaf, peduncle, and spike of the knotroot setaria without glyphosate contact to the underlying ladino clover.

A two-year-old stand of ladino clover which was infested with knotroot setaria was selected. The field was located 5 miles northwest of Hamilton City, California. The soil in the field was a gravely loam soil with one percent organic matter. It was treated on October 20, 1994. The treatments consisted of glyphosate applied as a single wick pass, glyphosate applied in two wick passes (each in opposite directions), and a spot treatment of glyposate. The wick applications were made with a one part glyphosate to two parts water solution utilizing a horizontal, sponge wrapped, 18 inch wooden stake mounted on a vertical handle and operated 5 inches above the clover canopy. This was done to simulate a commercial wick applicator. Spot spray was applied at 4 lb/A glyphosate with a spray volume of 30 gal/a. Plots were 3 by 3 ft in size and were replicated eight times.

Spot treatment and the double wick (applied twice in opposite directions) applications controlled 100% of the knotroot bristlegrass when observed 5 and 7 months after treatment (Table). A single wick application severely stunted knotroot setaria, but failed to kill it. Plants remained severely stunted 7 months after treatment. The results of this study illustrate that it is possible to control knotroot setaria with a wick application, however, two passes were required. (Botany and Plant Sciences, University of California, Riverside, CA 92521)

Table. Comparison of wick vs spot treatment of glyphosate for control of knotroot setaria.

	Knotroot setaria control		
Treatment	13 DAT	145 DAT	220 DAT
	%		
Spot	86	100	100
Single	38	89	86
Double	66	99	100
Control	0	0	0
LSD @ 0.05	11	6	6

Sethoxydim control of green foxtail in resistant and susceptible corn. John O. Evans, Ralph E. Whitesides and R.William Mace. Sethoxydim was applied to a "Poast" resistant variety of corn (DK592SR) and a non-resistant variety (DK592) to control green foxtail. Plots were established at the Greenville farm at Utah State University in Logan. The soil type was a Millville silt loam with 7.9 pH and an organic matter content of less than 2%. The corn was planted on June 16, 1995. Treatments were established on July 13, in a randomized block design, with three replications. Individual treatments were applied to the 10 by 30 foot plots with a bicycle sprayer delivering 16 gpa at 39 psi using 8001 flatfan nozzles. The corn ranged in height from 2 to 6 inches with 4 to 6 leaves when treated and there was a heavy stand of green foxtail 4 to 10 inches in height and 20% with seedheads. A visual evaluation for green foxtail control and corn injury was completed on September 11.

Sethoxydim applied at a rate of 1.5 pt/A controlled 87 percent of the green foxtail and at a rate of 3 pt/A controlled 92 percent. The variety DK592SR was not injured by either of the sethoxydim rates but the standard variety, DK592 exhibited injury symptoms of 87 and 95 percent respectively. (Utah Agricultural Experiment Station, Logan, Ut. 84322-4820)

Table. Green foxtail control and corn injury with sethoxydim.

		Weed control	Crop injury	
Treatment	Rate	SETVI	DK592SR	DK592
	Lb/A	%	--------%-------	
Sethoxydim[1]	1.5	87	0	87
Sethoxydim[1]	3.0	92	0	95
Untreated		0	0	0
LSD$_{(.05)}$		9	0	8.0

[1] non-ionic surfactant added at .5 % v/v

Canada thistle control in imidazolinone-resistant corn with imazethapyr, dicamba and AC 513,995. Katheryn M. Christianson, Rodney G. Lym, and Calvin G. Messersmith. Canada thistle is a difficult perennial weed to control in corn. Dicamba and clopyralid are the primary herbicides registered for Canada thistle control in corn. Imazethapyr and AC 513,995 are imidazolinone herbicides for broadspectrum weed control and are injurious to corn. The objective of this experiment was to compare a tank-mix of imazethapyr and dicamba to other herbicide treatments in imidazalinone-resistant corn for Canada thistle control.

The experiment was established at Fargo, ND, in a dense Canada thistle stand. Fertilizer was added according to soil test for the site and incorporated 18 May 1995. 'Pioneer IR-231R' corn was seeded on 22 May 1995. Herbicides were applied 9 June 1995 when Canada thistle plants were in the 8- to 10-leaf rosette stage using a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. The plots were 10 by 30 ft, and the experiment was in a randomized complete block design with four replications. Canada thistle control evaluations were based on a visual estimate of percent stand height reduction as compared to the untreated control.

		Height reduction		
		June	July	Aug
Treatment	Rate	14DAT[a]	28DAT[a]	56DAT[a]
	oz/A	%		
Imazethapyr + dicamba[b] + X-77 + 28% N	0.8 + 3.2 + 0.25% + 1 qt	55	79	29
Imazethapyr + dicamba[b] + primisulfuron + X-77 + 28% N	0.8 + 3.2 + 0.29 + 0.25% + 1 qt	80	87	34
Imazethapyr + dicamba[b] + clopyralid + X-77 + 28% N	0.8 + 3.2 + 2 + 0.25% + 1 qt	76	90	66
Bromoxynil + primisulfuron + nicosulfuron + X-77 + 28% N	6 + 0.29 + 0.25 + 0.25% + 1 qt	86	63	46
AC 513,995 + X-77 + 28% N	3.9 + 0.25% + 1 qt	68	72	40
Clopyralid	4	79	93	96
LSD (0.05)		16	27	30

[a] Days after treatment

[b] Commercial formulation - Resolve

All treatments averaged greater than 75% topgrowth reduction except imazethapyr and dicamba alone which averaged only 55% 14 days after treatment (DAT) (Table). Plant height reduction 28 DAT averaged 84% with all treatments, except bromoxynil plus primisulfuron plus nicosulfuron, at 63%. The Canada thistle plants were actively growing by 56 DAT, and control had declined for all treatments except those containing clopyralid. Clopyralid alone at 4 oz/A provided the best season-long Canada thistle control.

Velvetleaf control in silage corn. Mick Canevari and Rod Vargo. Research plots were established under furrow irrigation at Farmington, California on May 29, 1995. Plots were 2 rows by 25' with 4 replications and a randomized complete block design. The herbicide applications were applied broadcast with a CO_2 backpack sprayer, 30 gpa volume at 30 psi. Three timings of applications were made that included preplant incorporated made with a Johnston Power Incorporator at a depth of 3" to dry soil. The preemergence treatments were applied broadcast following corn planting and furrow irrigation. Postemergence treatments made at corn 8" height and sprayed broadcast over the top. The soil was a Stockton adobe clay series.

The herbicide thiafluamide + metribuzin (axiom DF) provided moderate control of velvetleaf (ABUTH) when applied preplant incorporated, excellent control at postemergence timing and poor control when applied preemergence. Dimethenamid and metoachlor gave poor control of velvetleaf at preplant incorporated and preemergence applications.

Harvest was completed on September 21, 1995 of corn silage with significant differences of yields. Separation of corn and velvetleaf was made at harvest and calculated on a lb/acre biomass yield. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205; and Bayer Corporation, Sacramento, CA.)

Table. Velvetleaf control in silage corn.

			---Weed control----		----Silage corn----		
Treatment	Rate	Application Timing	ABUTH	Weed yield	Injury	Yield	
	lb/A		%	lb/A	%	lb/A	
Control	—	—	0	19,750	0	14,530	b
Thiafluamide + metribuzin	0.81	PPI	68	9,587	0	25,270	ab
Thiafluamide + metribuzin	0.89	PPI	73	9,877	0	25,560	ab
Thiafluamide + metribuzin	0.81	PRE	35	17,720	0	19,460	b
Thiafluamide + metribuzin	0.89	PRE	18	18,010	0	17,430	b
Metolachlor	2.5	PPI	30	13,070	0	21,790	b
Metolachlor	2.5	PRE	10	15,400	0	21,790	b
Thiafluamide + metribuzin	0.89	POST	88	4,212	0	34,860	a
Dimethenamid	1.0	PPI	35	18,300	0	18,880	b
Dimethenamid	1.0	PRE	43	18,010	0	18,010	b
Thiafluamide + metribuzin	0.81	POST	87	5,229	0	34,280	a
Thiafluamide + metribuzin	0.89	POST	91	3,777	0	36,020	a
			LSD	7,515	LSD	10,550	
			Alpha	.050			

Annual grass and broadleaf weed control in field corn with postemergence herbicides. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 2, 1995 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525) and annual broadleaf weeds to postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were four 34-in rows 30 ft long. Treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Treatments were applied postemergence on May 25, when corn was in the 3- to 4-leaf stage and weeds were small. Black nightshade infestations were heavy and redroot pigweed and prostrate pigweed, barnyardgrass, and green foxtail infestations were moderate throughout the experimental area. Visual evaluations of crop injury and weed control were made June 28. Hand-weeded controls were hoed starting on May 26, about every two weeks until August 8. Stand counts were made on June 25 by counting individual plants per 10 ft of the third row of each plot. Field corn was harvested on November 16 by combining the center two rows of each plot with a John Deere 3300 combine equipped with a load cell.

All treatments, except the check, provided good to excellent control of broadleaf weeds. Pyridate at 0.47 and 0.7 lb/A, pyridate plus metribuzin at 0.47 plus 0.06 lb/A, metribuzin at 0.09 lb/A and dicamba at 0.25 lb/A provided poor control of annual grass. No injury was observed in any of the treatments. Pyridate plus metribuzin at 0.47 plus 0.06 lb/A and pyridate plus metribuzin plus dicamba at 0.47 plus 0.06 plus 0.25 lb/A had the highest yields of 189 bu/A. Yields were 32 to 148 bu/A higher in the herbicide treated plots as compared to the nonweeded check.

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

		Stand	Weed Control					
Treatment[1]	Rate	counts	AMARE	AMABL	SOLNI	ECHCG	SETVI	Yield
	lb/A	no.			%			bu/A
Pyridate + metribuzin[2]	0.47 + 0.06	18	100	100	98	94	94	168
Pyridate + metribuzin	0.47 + 0.09	18	100	98	99	95	95	149
Pyridate + metribuzin[2]	0.47 + 0.09	19	100	98	100	97	99	175
Pyridate + dicamba + atrazine (pm)	0.47 + 0.8	18	100	100	100	98	99	170
Pyridate + atrazine[2]	0.47 + 0.5	19	100	100	100	99	99	184
Pyridate + metribuzin + dicamba[3]	0.47 + 0.06 + 0.25	19	100	100	100	94	95	189
Dicamba + atrazine (pm)	0.8	19	100	100	100	84	86	178
Dicamba[3] + metribuzin	0.25 + 0.09	19	100	100	99	95	95	178
Dicamba[3] + metribuzin	0.25 + 0.06	19	99	99	98	86	82	162
Pyridate + metribuzin	0.47 + 0.06	19	99	99	95	75	77	189
Metribuzin	0.09	18	99	97	88	80	77	174
Dicamba[3] + N	0.25	18	98	96	95	10	10	164
Pyridate[2]	0.7	19	90	97	96	10	10	146
Pyridate[2]	0.47	18	88	97	93	10	10	105
Hand-weeded check		19	100	100	100	100	100	183
Check		19	0	0	0	0	0	73
Weeds/m^2			18	20	29	18	15	
LSD 0.05		ns	2	3	2	5	4	17

[1] pm = packaged mix; N = 32% nitrogen solution applied at 1 gal/A.

[2] Treatments applied with a crop oil concentrate at 1 qt/A.

[3] Diglycolamine salt of dicamba.

Annual grass and broadleaf weed control in field corn with preemergence and postemergence herbicides. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established on May 3, 1995 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 3525) and annual grass and broadleaf weeds to preemergence and postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with three replications. Individual plots were four 34-in rows 30 ft long. Treatments were applied with a compressed-air, backpack sprayer calibrated to deliver 30 gpa at 30 psi. Preemergence treatments were applied May 3 and immediately incorporated with 0.75 inches of sprinkler-applied water. Postemergence treatments were applied May 30 when corn was in the three to four leaf stage and weeds were small. Black nightshade infestations were heavy, redroot pigweed and prostrate pigweed, barnyardgrass, and green foxtail infestations were moderate throughout the experimental area. Preemergence and postemergence treatments were rated visually for crop injury and weed control on June 5 and June 25. Stand counts were made on June 5 by counting individual plants per 10 ft of the third row of each plot. Field corn was harvested on November 16 by combining the center two rows of each plot with a John Deere 3300 combine equipped with a load cell.

No injury was observed in any of the treatments. All treatments gave excellent control of broadleaf weeds. postemergence treatments of flumetsulam plus clopyralid plus 2,4-D at 0.21 lb/A and dicamba at 0.25 lb/A gave poor control of annual grasses. Acetochlor plus atrazine at 2.5 lb/A had the highest yield of 197 bu/A. Yields were 52 to 162 bu/A higher in the herbicide treated plots as compared to the weedy check.

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

		Stand	Weed Control					
Treatment[1]	Rate	counts	AMARE	AMABL	SOLNI	ECHCG	SETVI	Yield
	lb/A	no.			%			bu/A
Flumetsulam + metolachlor (pm)	1.44	19	100	100	100	100	100	177
Flumetsulam + metolachlor (pm)	1.68	18	100	100	100	100	100	171
Flumetsulam + metolachlor (pm)	1.92	17	100	100	100	100	100	179
Flumetsulam + metolachlor	0.17 + 1.5	18	100	100	100	100	100	175
Flumetsulam + metolachlor	0.21 + 1.5	18	100	100	100	100	100	170
Atrazine + metolachor (pm)	3.6	17	100	100	100	100	100	179
Metolachlor + halosulfuron	1.5 + 0.078	18	100	100	100	100	100	180
Acetochlor	1.6	18	100	100	100	100	100	178
Acetochlor + atrazine (pm)	2.5	18	100	100	100	100	100	197
Dimethenamid	0.9	18	100	100	100	100	100	179
Dimethenamid + atrazine (pm)	2.5	18	100	100	100	100	100	182
Flumetsulam + clopyralid + 2,4-D[2] (pm)	0.21	18	100	100	100	62	68	139
Dicamba + atrazine[2] (pm)	1.0	18	100	100	100	99	100	183
Dicamba[2]	0.25	18	100	96	100	10	10	136
Hand-weeded check		18	100	100	100	100	100	191
Check		18	0	0	0	0	0	84
Weeds/m^2			17	20	30	14	12	
LSD 0.05		ns	1	1	1	3	1	21

[1] pm = package mix.

[2] Treatments applied postemergence with X-77 and 32% nitrogen solution at 0.25% v/v and 2 qt/A and rated June 25.

Broadleaf weed control in lentil with imazethapyr combinations. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate broadleaf weed control in lentil with imazethapyr combinations. Triallate was applied at 1.25 lb/A (grower equipment) to the entire plot area and incorporated with a tillage operation prior to applying preplant imazethapyr treatments on May 1, 1995. Preplant treatments were incorporated immediately after application with a field cultivator, and lentil (var. Brewer) was seeded on May 2, 1995 in a silt loam soil (28% sand, 59% silt, 13% clay, pH 5.1 and 3.3% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. All herbicide treatments were applied with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi and application data are shown in Table 1. Lentil and broadleaf weed densities were determined on June 6, 1995. Lentil injury was evaluated visually June 7, June 16, and July 7, 1995. Common lambsquarters (CHEAL), mayweed chamomile (ANTCO), and field pennycress (THLAR) control were evaluated visually July 7, 1995. Lentil was harvested at maturity with a small plot combine on August 23, 1995.

Table 1. Application data.

	May 1, 1995	May 8, 1995	June 9, 1995
Timing	preplant (PPI)	preemergence (PRE)	postemergence (POST)
Crop stage	---	---	4 in
Weed stage	---	---	1.5 in
Air temp (F)	62	64	64
Relative humidity (%)	50	58	72
Wind (mph)	2-4	0-4	0-2
Sky	mostly cloudy	mostly clear	partly cloudy
Soil temp (F)	48	58	74

There was no visible injury to the lentil on June 7, 1995. Lentil stand ranged from 6 to 7 plants/ft of row on June 7, 1995 in preplant or preemergence herbicide treated plots and were not different from the untreated check (data not shown). Broadleaf weed density was variable, and preplant or preemergence herbicide treated plots tended to have fewer broadleaf weeds (Table 2). Metribuzin applied postemergence alone or with Bivert injured lentil 9 to 10% (chlorosis), and pyridate injured lentil 13 and 14% (chlorosis) on June 16, 1995. However, injury was not visible at the later evaluation date on July 7, 1995. Imazethapyr plus metribuzin at 0.023 plus 0.14 lb/A controlled mayweed chamomile 86% and field pennycress 91%, while common lambsquarters control was only 71%. All other imazethapyr plus metribuzin combinations controlled all weed species 83 to 99%. Common lambsquarters and field pennycress control was similar between postemergence applications of metribuzin alone or in combination with Bivert. However, mayweed chamomile control was significantly less with metribuzin plus Bivert. Pyridate at 0.9 lb/A controlled all weed species 80 to 90%. Lentil yields from all herbicide treated plots were not different from the untreated check and ranged from 1099 to 1531 lb/A. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table 2. Lentil response and broadleaf weed control from herbicide treatments, Latah County, ID.

			Lentil		Weed	Weed control		
Treatment	Rate	Timing	Injury[1]	Yield	Density	CHEAL	ANTCO	THLAR
	lb/a		%	lb/A	plants/ft^2		%	
Imazethapyr + metribuzin	0.023 + 0.14	PPI	0	1173	0.1	71	86	91
Imazethapyr + metribuzin	0.023 + 0.19	PPI	0	1204	0.0	83	88	93
Imazethapyr + metribuzin	0.031 + 0.19	PPI	0	1531	0.1	89	88	95
Imazethapyr	0.031	PPI +	0	1333	0.3	90	90	99
metribuzin	0.19	PRE						
Imazethapyr	0.047	PPI	0	1384	0.5	84	89	96
Metribuzin	0.14	POST	9	1099	1.3	88	86	98
Metribuzin	0.19	POST	9	1435	1.6	89	89	99
Metribuzin[2]	0.14	POST	9	1102	1.1	83	79	93
Metribuzin[2]	0.19	POST	10	1203	2.0	86	78	90
Pyridate	0.675	POST	13	1227	1.6	89	74	83
Pyridate	0.9	POST	14	1201	3.5	84	80	90
Untreated check			---	1284	3.0	---	---	---
		LSD (0.05)	2.5	NS	2	8	7	5

[1] June 16, 1995 evaluation.

[2] Applied with 2 oz product of Bivert (Manufactured by Wilbur Ellis Company) per lb product of metribuzin; Bivert was added to entire spray volume after metribuzin was in suspension.

Weed control in blackeye peas using various application timings and placement of herbicides. Mick Canevari, Brooks Bauer, and Don Colbert. A field experiment was established to evaluate hairy nightshade (SOLSA), purslane (POROL), and barnyardgrass (ECHCG) control in Blackeye peas using various timings of applications and two types of herbicide incorporation (cultivation and furrow irrigation). A randomized complete block design experiment was used and the trial conducted at Stockton, California, with treatment dates of June 27, 1995, July 13, 1995 and July 26, 1995. Applications were made with a CO_2 backpack sprayer at a volume of 30 gpa at 30 psi.

Visual evaluations on weed control and crop injury was recorded on July 26 and August 15, 1995. Preplant incorporated treatments were made to preformed beds on 30" centers and pre-irrigated 7 days before application. Rolling cultivator was used 2 times for preplant incorporation. The second application timing treatments was a directed spray to bed and furrow followed by a furrow irrigation 2 days later. The third timing treatments were also applied directed spray to newly formed furrows following a cultivation. Furrow irrigation was applied 2 days after treatment for incorporation. A fourth timing treatment was made with postemergence herbicides on August 2, 1995 and applied as a broadcast spray over the top of crop and weeds.

No crop injury was recorded from treatments of pendimethalin, dimethenamid or ethalfluralin applied preplant incorporated or layby. Some injury occurred from metolachlor alone and combination with metolachlor used preplant incorporated. Injury symptoms included stunting and leaf crinkling with a slight chlorosis. Postemergence herbicide imazethapyr caused crop injury of 5%. Weed control ranged from (45 to 100%) on hairy nightshade and (27 to 100%) for common purslane. Barnyardgrass control ranged between 50 and 100%. (University of California Cooperative Extension, San Joaquin County, 420 S. Wilson Way, Stockton, CA 95205; Sandoz Agro Inc., Escalon, CA 95320; and American Cyanamid, Lodi, CA 95242.)

Table 1. Weed control in blackeye peas.

Treatment	Rate	Timing of Application			
		6/27/95 PPI	7/13/95 PRE	7/26/95 LAYBY	8/2/95 POST
	lb/A				
Control	—	—	—	—	—
Dimethenamid	1.0	X			
Dimethenamid + ethalfluralin	1.0 1.0	X X			
Dimethenamid + dimethenamid	0.75 0.5	X	X		
Dimethenamid + ethalfluralin + dimethenamid	0.75 1.0 0.5	X X	X		
Metolachlor + pyridate WP	2.5 0.45	X			X
Metolachlor + pyridate	2.5 0.9	X			X
Dimethenamid + pyridate WP	1.0 0.45		X		X
Dimethenamid + pyridate WP	0.5 0.9		X		X
Pendimethalin + pyridate + imazethapyr	1.5 0.45 0.032	X			X X over the top
Pendimethalin + pyridate + imazethapyr	1.5 0.45 0.032	X			X X directed spray
Pendimethalin + imazethapyr	1.5 0.032	X			X over the top
Pendimethalin + imazethapyr	1.5 0.032	X		X	
Metolachlor + ethalfluralin	2.5 1.0	X X			
Ethalfluralin + dimethenamid + metolachlor	1.0 0.75 1.25	X X X			
Imazethapyr	0.047		X		

Table 2. Weed control in blackeye peas.

Treatment	Blackeye pea Injury		Weed Control					
			SOLSA		POROL		ECHCG	
	7/26	8/15	7/26	8/15	7/26	8/15	7/26	8/15
	%		%					
Control	0	0	0	0	0	0	0	0
Dimethenamid	0	0	100	83	100	27	100	100
Dimethenamid + ethalfluralin	0	0	100	100	100	100	100	100
Dimethenamid + dimethenamid	10	0	100	93	100	77	100	100
Dimethenamid + ethalfluralin + dimethenamid	15	0	100	100	100	100	100	100
Metolachlor + pyridate WP	10	0	100	99	100	70	100	100
Metolachlor + pyridate	10	0	100	93	100	73	100	100
Dimethenamid + pyridate WP	—	0	—	79	—	50	—	67
Dimethenamid + pyridate WP	—	0	—	80	—	47	—	50
Pendimethalin + pyridate + imazethapyr	0	0	45	70	78	100	100	97
Pendimethalin + pyridate + imazethapyr	0	0	60	63	57	100	97	97
Pendimethalin + imazethapyr	0	0	57	53	67	93	100	90
Pendimethalin + imazethapyr	0	0	100	100	100	100	100	100
Metolachlor + ethalfluralin	15	10	100	97	100	100	100	100
Ethalfluralin + dimethenamid + metolachlor	13	5	100	97	100	100	100	100
Imazethapyr	0	5	100	83	100	37	0	50

Reduced herbicide rates in a winter wheat-spring pea rotation. Joan M. Campbell and Donald C. Thill. Two experiments, one each in wheat and pea, will determine the effects of continuous reduced herbicide rate over four years in a winter wheat-spring pea rotation. Reduced herbicide rates were applied for the third year. In wheat, weed seedlings were counted in two, 1 yd^2 areas per plot before herbicide application. Bromoxynil and tribenuron/thifensuluron were applied at 0.25 + 0.019 (1x), 0.17 + 0.012 (2/3x), and 0.08 + 0.006 (1/3x) lb/acre. R-11 nonionic surfactant was added at 0.25% v/v. Treatments were applied with a self-propelled sprayer calibrated to deliver 13 gpa at 40 psi. An untreated check was included for comparison. Weeds were sampled, recounted, and weighed from the same areas 4 weeks later. In pea, weeds were counted 6 weeks after the pre-emergence treatment of ethalfluralin + triallate at 0.75 + 1.5 (1x), 0.5 + 0.83 (2/3 x), and 0.25 + 0.42 (1/3x) lb/acre.

Table 1. Environmental data.

Crop	Pea	Wheat
Application date	May 4, 1995	May 5, 1995
Air temperature	65 F	70 F
Soil temperature	52 F at 4 inches	60 F at 4 inches
Relative humidity	50%	43%
Cloud cover	overcast	mostly sunny
Wind speed	1 to 3 mph	0 to 3 mph

Fewer weeds tended to emerge in winter wheat after 2 years of reduced herbicide rates in the previous pea and wheat crops compared to the untreated control (Table 2). There were fewer weeds in the treated plots after herbicide application (Table 2 and 3). Wheat test weight was 8% lower and grain yield was 48% lower in the check compared to the treated plots. The trend for lower wheat yield and quality with reduced rates was not statistically significant. Herbicides were applied in the pea experiment before weeds emerged so the effect of carryover from reduced herbicide applications in the previous wheat crop was indeterminable. However, total weed emergence after the pre-emergence treatments were 2.5, 3.2, 9.5 and 77.5 for the 1x, 2/3x, 1/3x and check, respectively; the same trend as the wheat experiment (Table 4). Seven weed species were present in the pea experiment, but data is shown only for three selected species and the total (Table 4). Weed density tended to be greater in the 1/3x treated plots than in the 1x and 2/3x treated plots. In both pea and wheat, the trend is for reduced weed numbers and biomass as the amount of herbicide increases, but this was not statistically different due to variation in weed populations. The final year of application may emphasize these differences.

Table 2. Weed control and wheat yield after 3 years of reduced herbicide input.

Rate	Total weeds[1] pre-application	Total weeds[2] post application Density	Biomass	Wheat test weight	Wheat grain yield
	no/yd^2	no/yd^2	oz/yd^2	lb/bu	bu/A
1 x	421 a[3]	3 a	0.04 a	58.6 a	98 a
2/3 x	422 a	16 a	0.18 a	58.5 a	97 a
1/3 x	498 a	73 a	1.48 a	58.3 a	96 a
Check	618 a	369 b	9.98 b	54.1 b	51 b

[1] Field pennycress, mayweed chamomile, prickly lettuce, henbit, shepherd's-purse, and mouseear chickweed.

[2] Field pennycress, mayweed chamomile, prickly lettuce, henbit, shepherd's-purse, wild oat, common lambsquarters, catchweed bedstraw, and downy brome.

[3] Means within a column followed by the same letter are not significantly different at the 5% level of probability according to LSD mean separation.

Table 3. Density and biomass of primary weed species in wheat after 3 years.

	Shepherd's purse		Mayweed chamomile		Field pennycress		Prickly lettuce		Wild oat	
Rate	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass
	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2
1 x	0 a[1]	0.0 a	0.5 a	0.004 a	0.0 a	0.00 a	2 a	0.04 a	0 a	0.00 a
2/3 x	0 a	0.0 a	1.5 a	0.006 a	0.0 a	0.00 a	11 a	0.07 a	3 a	0.07 a
1/3 x	0 a	0.0 a	0.2 a	0.004 a	0.0 a	0.00 a	70 a	1.43 a	1 a	0.04 a
Check	34 b	0.3 b	74.5 b	0.914 b	3.5 b	0.05 b	241 b	8.18 b	13 b	0.29 b

[1] Means within a column followed by the same letter are not significantly different at the 5% level of probability according to LSD mean separation.

Table 4. Weed control and pea yield after 3 years of reduced herbicide input.

	Common lambsquarters		Hairy nightshade		Wild oat		Total weeds[1]		Pea
Rate	Density	Biomass	Density	Biomass	Density	Biomass	Density	Biomass	yield
	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	no/yd^2	oz/yd^2	lb/A
1 x	0.2 a[2]	0.04 a	0.2 a	0.003 a	0.0 a	0.00 a	2.5 a	0.1 a	3183 a
2/3 x	0.5 a	0.02 a	1.0 a	0.006 a	0.0 a	0.00 a	3.2 a	0.1 a	3257 a
1/3 x	6.8 a	0.07 a	1.5 a	0.022 a	0.5 a	0.02 a	9.5 a	0.1 a	3198 a
Check	69.5 b	1.78 b	1.2 a	0.007 a	5.0 b	0.33 b	77.5 b	2.1 b	2704 b

[1] Includes field pennycress, mayweed chamomile, henbit, and shepherd's-purse

[2] Means within a column followed by the same letter are not significantly different at the 5% level of probability according to LSD mean separation.

Broadleaf weed control in a new planting of peppermint with pyridate combinations. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. A trial was conducted in central Oregon to evaluate pyridate applied alone and in combination with low rates of other herbicides for the control of broadleaf weeds in newly planted peppermint. The trial design was a randomized complete block with three replications and 8 by 20 ft plots. The herbicide treatments were applied with a single-wheel compressed-air plot sprayer that delivered 20 gpa at 15 psi. Most of the weeds were at the 2- to 4-leaf stage when treated, and the mint was emerging to 2 inches tall.

Two weeks after herbicide application, control of wild buckwheat (POLCO), common lambsquarters (CHEAL), and kochia (KOCSC) was greater than 90 percent in all treatments (Table). After 5 weeks, control of wild buckwheat was less in treatments that contained only foliar-active herbicides. This reduction in control was due to recovery of injured plants and emergence of new ones. None of the treatments caused visible injury to the peppermint. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table. Visual evaluations of percent weed control and peppermint injury following applications of pyridate and pyridate combinations, Prineville, OR.

		Weed control and crop injury[2]							
		POLCO		CHEAL		KOCSC		Peppermint	
Treatment[1]	Rate	5/17	6/7	5/17	6/7	5/17	6/7	5/17	6/7
	lb/A	(%)							
Pyridate	0.47	93	80	100	97	100	97	0	0
Pyridate	0.94	93	78	100	100	100	97	0	0
Pyridate + terbacil	0.47 + 0.4	100	100	100	100	100	100	0	0
Pyridate + bentazon	0.47 + 0.5	96	86	100	100	100	100	0	0
Pyridate + bromoxynil	0.47 + 0.062	99	93	100	98	100	100	0	0
Pyridate + clopyralid	0.47 + 0.062	100	100	100	100	100	100	0	0
Check	0	0	0	0	0	0	0	0	0

[1] Applied May 3, 1995; a non-ionic surfactant was added to all treatments at 0.25% v/v.
[2] Evaluated May 17 and June 7, 1995

Redroot pigweed control in peppermint with dormant-season herbicide treatments. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. Two trials were conducted in Jefferson County, OR to evaluate the control of redroot pigweed with herbicides applied during the dormant season. One trial was located near Metolius and the other near Culver. The trial design was a randomized complete block with three replications and 8 by 20 ft plots. The herbicide treatments were applied with a single-wheel compressed-air plot sprayer which delivered a broadcast spray of 20 gpa at 15 psi. The herbicides were applied to dormant peppermint on January 31, 1995.

All of the herbicide treatments slowed peppermint regrowth in the spring, but by early June no effect on the mint from any treatment was visible. Oxyfluorfen and sulfentrazone provided superior control of redroot pigweed into late June. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table. Average percent peppermint injury and redroot pigweed control ratings at two sites, Jefferson County, OR, 1995.

		Crop injury and weed control[2]			
		Peppermint		Pigweed	
Treatment[1]	Rate	March/April	June 7	June 7	June 26
	(lb/A)	(%)			
Oxyfluorfen	0.4	15	0	96	98
Clomazone	0.5	20	0	68	75
Sulfentrazone	0.25	15	0	96	97
Check	0	0	0	0	0

[1] Treatments applied January 31, 1995.

[2] First visual evaluation of peppermint injury conducted at the Metolius site on March 28, 1995 and at the Culver site on April 18, 1995.

Broadleaf weed control in field potatoes. Richard N. Arnold, Eddie J. Gregory, and Daniel Smeal. Research plots were established in April 20, 1995 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of potatoes (var. Wischip) 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 gpa at 30 psi. Treatments were applied after drag-off on May 16, and were immediately incorporated with 0.75 inches of sprinkler-applied water. Black nightshade, redroot pigweed, and prostrate pigweed infestations were heavy throughout the experimental area. Visual evaluations of crop injury and weed control were made June 12. Potatoes were harvested on September 26 by harvesting two rows 5 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 inches and 3 inches and bigger. Culls such as diseased or less than 1-7/8 inches were not included.

Dimethenamid plus metribuzin at 1.25 + 0.3 lb/A caused the highest injury rating of 5. Redroot pigweed control was excellent with all treatments except the check. Metolachlor II at all three rates provided poor control of prostrate pigweed. Black nightshade control was good to excellent with all treatments except metolachlor II at 0.975 lb/A, metribuzin at 0.3 lb/A, and the nontreated check. All treatments yielded significantly more total cwt/A and more 1-7/8 to 3 inch potatoes than the check.

Table. Broadleaf weed control in field potatoes.

Treatment[1]	Rate	Crop injury	Weed Control AMARE	Weed Control AMABL	Weed Control SOLNI	Total yield	1-7/8 to 3 in	>3 in
	lb/A	no.	%			cwt/A		
Dimethenamid	1.0	0	100	88	98	648	494	138
Metolachlor	1.95	0	100	79	93	580	428	115
Dimethenamid + metribuzin	0.75 + 0.3	0	100	100	96	577	390	149
Dimethenamid + metribuzin	1.0 + 0.3	3	100	99	100	641	448	172
Dimethenamid + metribuzin	1.25 + 0.3	5	100	100	100	564	441	70
Metolachlor + metribuzin	1.46 + 0.3	1	100	100	100	559	410	92
Metolachlor + metribuzin	1.95 + 0.3	0	100	100	100	610	438	115
Dimethenamid	1.25	0	99	94	100	587	436	99
Metribuzin	0.6	0	99	96	91	585	422	121
Dimethenamid	0.75	0	97	82	94	607	407	162
Metolachlor + metribuzin	0.975 + 0.3	0	96	100	85	577	436	81
Metolachlor	1.46	0	95	50	99	553	424	73
Metribuzin	0.3	0	95	79	83	585	447	99
Metolachlor	0.975	0	91	17	80	573	433	95
Hand-weeded check		0	100	100	100	599	451	112
Check		0	0	0	0	275	238	7
Weeds/m^2			17	24	29			
LSD 0.05		1	2	6	3	81	75	78

[1] The herbicide used was metolachlor II.

[2] Treatments applied postemergence with X-77 and 32% nitrogen solution at 0.25% v/v and 2 qt/A and rated June 25.

Potato tolerance to dimethenamid and metolachlor, Aberdeen. Dennis J. Tonks, Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate potato tolerance to dimethenamid and metolachlor applied pre- (PRE) and early postemergence (EPOST). 'Russet Burbank' potatoes were seeded at 11-inch intervals in 36-inch wide rows on April 28, 1994 in a Declo silt loam soil with 1.4% organic matter and pH 8.2 near Aberdeen, Idaho. Aldicarb at 3.0 lb/a was applied at planting for insect control. The experimental area received a broadcast application of 120 lb/a N before planting and an additional 111 lb/a N was injected through the irrigation system during the growing season. Chlorothalonil at 1 lb/a and copper hydroxide at 3.2 pts pr/a were applied on August 3 and 9 for early blight control. Permethrin was applied at 0.94 lb/a on August 3, 1994 for insect control. The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. All herbicides were applied with a CO_2 -powered backpack sprayer delivering 17.5 gpa. Preemergence treatments were applied on May 24, 1994 after hilling and were incorporated immediately with 0.6 inches of irrigation water. Early postemergence treatments were applied on May 30, 1994 and were incorporated with 0.5 inches of water. Control plots were maintained weed free with a preemergence treatment of metribuzin (0.5 lb/a) + pendimethalin (0.75 lb/a) supplemented by hand weeding. Potato vines were desiccated with diquat + X77 at 0.25 lb/a + 0.25% v/v on September 1, 1993. Plots were harvested October 3, 1994.

Visual injury was greater for EPOST treatments than for PRE treatments. Leaf cupping and malformation were evident for EPOST treatments but were slight for PRE treatments. Potatoes rapidly outgrew these symptoms. Injury did not affect tuber production. (University of Idaho Aberdeen Research and Extension Center, Aberdeen, ID 83210)

Table. Potato tolerance to dimethenamid and metolachlor, Aberdeen.

				Potato Injury			Potato Yield								
	Treatment	Rate	Application Timing	6 /7	6/22	7/6	<4 oz	4-6 oz	6-12 oz	>12 oz	US #2	Culls	Total US #1	Total Yield	Specific Gravity
		lb/a		---------%--------			-----------------------------------cwt/a---								%
1	Dimethenamid	1.0	PRE	2	1	0	59.8	83.9	162.1	57.1	36.1	45.6	303.0	444.5	1.078
2	Dimethenamid	1.25	PRE	4	2	0	57.8	88.3	175.8	58.3	28.8	51.9	322.4	460.8	1 077
3	Dimethenamid	1.5	PRE	15	6	3	48.0	66.0	158.1	59.8	43.2	69.9	283.9	445.1	1.077
4	Dimethenamid	1.75	PRE	8	5	3	42.1	62.7	146.2	58.6	49.1	74.0	267.5	432.8	1.074
5	Dimethenamid	3.0	PRE	10	5	3	51.7	63.5	159.4	64.0	34.3	71.4	289.9	444.3	1.077
6	Dimethenamid	1.0	EPOST	25	8	4	47.3	57.0	144.2	97.5	29.8	61.1	289.8	436.9	1.075
7	Dimethenamid	1.25	EPOST	28	9	5	39.8	54.2	150 2	73.6	33.6	69.0	278.3	420.8	1.076
8	Dimethenamid	1.5	EPOST	28	10	6	48 3	70.1	172.3	65.3	27.7	52.9	307.7	436.4	1 074
9	Dimethenamid	1.75	EPOST	32	14	7	44.4	75.6	156 3	60.6	36.6	58.9	292.5	423.0	1.075
10	Dimethenamid	3.0	EPOST	38	17	9	42.1	60.5	173.0	51.9	27.9	66.6	285.5	422.1	1.076
11	Metolachlor	2.0	PRE	3	1	3	48.3	70 6	177.5	69.1	31.9	58.5	317.2	455.8	1.074
12	Metolachlor	3.0	PRE	7	7	4	54.6	67.2	139.7	64.3	43.8	53.7	271.2	423 3	1.076
13	Metolachlor	4.0	PRE	9	7	5	50.9	67.8	138.7	46.6	35.2	65.4	253.1	404.5	1.075
14	Metolachlor	2.0	EPOST	18	9	5	50.0	67.7	149 8	53.7	32 8	56.2	271.2	410.2	1.076
15	Metolachlor	3.0	EPOST	34	15	7	58.0	70.9	143.2	58 3	23.1	73.2	272.3	426.6	1.075
16	Metolachlor	4.0	EPOST	38	17	9	48.0	62.8	143.0	54.0	38.4	76.6	259.8	422.8	1.076
17	Control			0	0	0	49.9	69.2	129.5	62.7	33.3	64 2	261.3	408.6	1.074
	LSD (0 05)			7	4	3	N.S.	N.S.	N.S.	N.S.	N S.	N.S.	N.S.	N.S.	N.S.

Potato tolerance to dimethenamid and metolachlor, Burley. Dennis J. Tonks, Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate potato tolerance to dimethenamid and metolachlor applied preemergence (PRE) and early postemergence (EPOST). 'Russet Burbank' potatoes were seeded at 11-inch intervals in 36-inch wide rows on May 4, 1994 in a clay loam soil with 2.3% organic matter and pH 7.7 in a production field near Burley, Idaho. The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. All herbicides were applied with a CO_2 -powered backpack sprayer delivering 17.5 gpa. PRE treatments were applied after hilling in May 23, 1994 and EPOST treatments were applied on May 26, 1994; all treatments were incorporated with 0.75 inches of irrigation water on May 28, 1994. Control plots were maintained weed free with a preemergence treatment of metribuzin (0.5 lb/a) + pendimethalin (0.75 lb/a) supplemented by hand weeding. Potato vines were mechanically rolled two weeks before harvest. Plots were harvested on September 26, 1994.

Visual injury was greater for EPOST treatments than for PRE treatments. Leaf cupping and malformation were evident for EPOST treatments but were much less evident for PRE treatments. Potatoes quickly outgrew these symptoms. Injury did not affect tuber yield or quality. (University of Idaho Aberdeen Research and Extension Center, Aberdeen, ID 83210)

Table. Potato tolerance to dimethenamid and metolachlor, Burley.

				Potato Injury		Potato Yield								
	Treatment	Rate	Application Timing	6/8	6/30	<4 oz	4-6 oz	6-12 oz	>12 oz	US #2	Culls	Total US #1	Total Yield	Specific Gravity
		lb/a		------%-----		----------cwt/a----------								%
1	Dimethenamid	1.0	PRE	0	0	36.2	48.0	120.8	35.2	24.6	56.1	204.0	320.9	1.075
2	Dimethenamid	1.25	PRE	1	0	30.1	46.2	115.9	40 8	35.5	79.5	202.9	347.8	1 077
3	Dimethenamid	1.5	PRE	1	0	27.9	39.2	101.3	40.0	32.9	88.7	180.5	330.0	1.076
4	Dimethenamid	1.75	PRE	3	0	27.0	45.0	109.3	65.8	33.7	54.6	220.1	335.4	1.076
5	Dimethenamid	3.0	PRE	12	0	22.4	35 6	115.3	36.2	25.9	79.0	187.1	314.4	1.076
6	Dimethenamid	1.0	EPOST	7	0	28.7	38.2	117.3	58.4	26.5	67.7	213.9	336.8	1.079
7	Dimethenamid	1.25	EPOST	5	0	27.3	38.8	117.8	52.0	20.2	65.8	208.6	321.9	1.077
8	Dimethenamid	1.5	EPOST	8	0	31.9	36.1	108.3	42.4	35.7	79.6	186.8	334.0	1 074
9	Dimethenamid	1.75	EPOST	13	0	34.0	37.2	101 2	64.5	27.1	83.1	202.9	347.1	1.075
10	Dimethenamid	3.0	EPOST	37	0	30.5	37.0	119.2	61.9	27.5	69.5	218.4	345.9	1.076
11	Metolachlor	2.0	PRE	7	0	34 5	45.5	119.3	31.8	32.2	69.4	196.6	332.7	1.076
12	Metolachlor	3.0	PRE	5	0	27.8	35.6	111.9	49.4	42.4	52.9	196.9	320.0	1.077
13	Metolachlor	4.0	PRE	8	0	27.2	40.6	110.1	40.5	48.0	59.7	191.2	326.1	1.075
14	Metolachlor	2.0	EPOST	13	0	26.9	38.8	126.6	43.1	33.8	59.6	208.0	328.8	1.077
15	Metolachlor	3.0	EPOST	43	0	40.6	42.7	100.0	42.5	31.8	65.4	185 2	323.0	1.078
16	Metolachlor	4.0	EPOST	47	0	30 0	33 4	107.2	43.9	33.0	77.3	184.5	324.8	1.076
17	Control			0	0	26 8	44.3	135.1	37.3	34.0	59.6	216.7	337.1	1.075
	LSD (0.05)			7	0	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Potato tolerance to dimethenamid and metolachlor, Idaho Falls. Dennis J. Tonks, Charlotte V. Eberlein, Mary J. Guttieri, and Felix. E. Fletcher. The objective of this experiment was to evaluate potato tolerance to dimethenamid and metolachlor applied pre- (PRE) and early postemergence (EPOST). 'Russet Burbank' potatoes were seeded at 11-inch intervals in 36-inch wide rows on May 15, 1994 in a Pancheri silt loam soil with 1.6% organic matter and pH 8.2 in a production field near Idaho Falls, Idaho. The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. All herbicides were applied with a CO_2 -powered backpack sprayer delivering 17.5 gpa. Preemergence herbicides were applied on May 28, 1994 after hilling and were incorporated with 0.5 inches of irrigation water. Early postemergence treatments were applied on June 6, 1994 and were incorporated with 0.5 inches of water. Irrigation water was applied within 24 hours after herbicide application. Control plots were maintained weed free with a preemergence treatment of metribuzin (0.5 lb/a) + pendimethalin (0.75 lb/a) supplemented by hand weeding. Potato vines were mechanically rolled two weeks prior to harvest. Plots were harvested September 12, 1994.

Injury was greater for EPOST treatments than for PRE treatments. Leaf cupping and malformation were evident for EPOST treatments but much less evident for PRE treatments. Potatoes quickly outgrew these symptoms. Tuber production and quality were not affected by herbicide treatments. (University of Idaho Aberdeen Research and Extension Center, Aberdeen, Idaho, 83210)

Table. Potato tolerance to dimethenamid and metolachlor, Idaho Falls.

				Potato Injury		Potato Yield								
	Treatment	Rate	Application Timing	6/13	7/5	<4 oz	4-6 oz	6-12 oz	>12 oz	US #2	Culls	US #1	Total Yield	Specific Gravity
		lb/a		----%-----		---------------------------------cwt/a---------------------------------								%
1	Dimethenamid	1.0	PRE	0	0	46.9	64.8	116.9	34.0	19.9	27.1	215.7	309.5	1.082
2	Dimethenamid	1.25	PRE	0	0	40.8	69.6	124.5	26.6	22.2	28.1	220.7	311.9	1.079
3	Dimethenamid	1.5	PRE	2	0	38.6	62.7	106.2	26.8	31.3	29.7	195.8	295.3	1.078
4	Dimethenamid	1.75	PRE	7	0	40.8	62.6	105.3	25.5	33.5	23.9	193.5	291.6	1.078
5	Dimethenamid	3.0	PRE	8	0	45.6	52.7	103.9	30.2	26.1	16.0	186.8	274.5	1.077
6	Dimethenamid	1.0	EPOST	10	0	35.3	57.5	97.8	18.4	42.3	38.6	173.5	290.4	1.078
7	Dimethenamid	1.25	EPOST	27	0	50.5	60.6	113.4	23.6	16.2	15.9	198.5	277.6	1.077
8	Dimethenamid	1.5	EPOST	27	0	39.1	62.3	116.7	31.8	32.1	28.3	210.8	310.3	1.081
9	Dimethenamid	1.75	EPOST	28	0	45.9	57.3	102.7	54.7	22.8	26.2	214.7	309.6	1.080
10	Dimethenamid	3.0	EPOST	40	0	53.3	60.3	138.6	18.2	27.3	29.8	217.1	327.4	1.077
11	Metolachlor	2.0	PRE	3	0	51.9	51.9	101.1	30.3	21.2	22.4	183.3	278.8	1.077
12	Metolachlor	3.0	PRE	7	0	49.4	59.4	111.3	29.7	21.0	24.4	200.4	295.2	1.080
13	Metolachlor	4.0	PRE	12	0	36.4	47.3	98.2	25.6	17.6	20.8	171.2	245.9	1.077
14	Metolachlor	2.0	EPOST	27	0	47.8	62.7	116.9	23.2	21.2	22.5	202.8	294.3	1.078
15	Metolachlor	3.0	EPOST	33	0	47.2	53.1	112.5	32.5	14.7	22.8	198.1	282.7	1.078
16	Metolachlor	4.0	EPOST	40	0	40.1	54.3	98.4	23.9	24.9	29.3	176.6	270.9	1.077
17	Control			0	0	50.6	62.4	120.8	24.6	17.3	23.4	207.7	299.1	1.078
	LSD (0.05)			7	0	10.4	N.S.	N.S.	N.S.	13.6	N.S.	N.S.	N.S.	N.S.

Weed control in potatoes with preemergence treatments of dimethenamid, Aberdeen. Dennis J. Tonks, Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate dimethenamid applied preemergence alone and in herbicide mixtures for weed control in potatoes. 'Russet Burbank' potatoes were seeded at 11-inch intervals in 36-inch wide rows on May 11, 1994 in a Declo silt loam soil with 1.17% organic matter and pH 8.1 near Aberdeen, Idaho. Aldicarb at 3.0 lb/a was applied at planting for insect control. The experimental area received a broadcast application of 90, 200, 100, 10, 4, 1.5, and 89 lb/a N, P, K, Zn, Mn, B, and S, respectively, before planting and an additional 89 and 53 lb/a N and S were injected through the irrigation system during the growing season. Chlorothalonil at 1 lb/a and copper hydroxide at 3.2 pts pr/a were applied on August 3 and 9 for early blight control. Permethrin was applied at 0.94 lb/a on August 3, 1994 for insect control. The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. All herbicides were applied with a CO_2 -powered backpack sprayer delivering 17.5 gpa. Treatments were applied after hilling on May 26 and were incorporated immediately with 0.6 inches of irrigation water. Weed populations in the weedy control at row closure were 22 green foxtail (SETVI), 1 redroot pigweed (AMARE), 1 common lambsquarters (CHEAL), and 1 hairy nightshade (SOLSA)/ft^2. Potato vines were desiccated with diquat + X77 at 0.25 lb/a + 0.25% v/v on August 26, 1994. Plots were harvested September 19, 1994.

Late season green foxtail control was greater than 90% for all treatments except dimethenamid at 1.0 and 1.25 lb/a, dimethenamid + rimsulfuron at 1.0 + 0.023 lb/a, metribuzin at 0.5 lb/a, rimsulfuron at 0.023 lb/a, EPTC + metribuzin at 3.0 + 0.5 lb/a, and EPTC at 3.0 lb/a. Late season control of redroot pigweed and common lambsquarters was greater than or equal to 90% for all treatments except pendimethalin at 0.75 lb/a and EPTC at 3.0 lb/a. Late season hairy nightshade control was greater than or equal to 90% except for metribuzin at 0.5 lb/a, rimsulfuron at 0.023 lb/a, pendimethalin at 0.75 lb/a, and EPTC at 3.0 lb/a. Early season injury ratings ranged from 0 to 11%. All treatments except pendimethalin at 0.75 lb/a had higher US #1 yields than the weedy check. All treatments had a higher total yield than the weedy check, but overall yields were unusually low due to a severe infestation of verticillium wilt that caused premature vine death. (University of Idaho Aberdeen Research and Extension Center, Aberdeen, ID 83211)

Table 1. Preemergence treatments for weed control in potatoes, Aberdeen.

						Weed Control											
			Potato Injury			SETVI			AMARE			CHEAL			SOLSA		
	Treatment	Rate	6/10	6/22	6/29	6/29	7/15	8/25	6/29	7/15	8/25	6/29	7/15	8/25	6/29	7/15	8/25
		lb/a	%														
1	Dimethenamid	1.0	2	0	0	95	89	83	98	96	90	100	96	93	98	94	91
2	Dimethenamid	1.25	5	1	1	98	94	88	100	98	95	100	98	96	100	97	94
3	Dimethenamid	1.5	10	6	4	100	99	93	100	100	95	100	100	96	100	99	96
4	Dimethenamid + Metribuzin	1.0 + 0.5	4	2	2	98	98	94	100	100	99	100	100	99	100	99	97
5	Dimethenamid + Metribuzin	1.25 + 0.5	5	3	3	100	99	96	100	100	99	100	100	99	100	100	99
6	Dimethenamid + Metribuzin	1.5 + 0.5	11	4	5	100	99	98	100	100	99	100	100	97	100	100	99
7	Dimethenamid + Rimsulfuron	1.0 + 0.023	3	2	5	99	97	87	100	100	99	100	100	99	99	100	98
8	Dimethenamid + Rimsulfuron	1.25 + 0.023	11	7	4	100	99	91	100	100	99	100	100	99	100	100	98
9	Dimethenamid + Rimsulfuron	1.5 + 0.023	5	3	5	100	99	96	100	100	99	100	100	99	100	100	99
10	Metribuzin	0.5	3	4	1	96	91	87	100	100	98	100	100	96	94	88	85
11	Rimsulfuron	0.023	2	0	1	94	85	81	100	100	99	98	100	94	95	90	89
12	Pendimethalin + Metribuzin	0.75 + 0.5	4	5	4	100	100	99	100	100	98	100	100	99	99	98	97
13	Metolachlor + Metribuzin	2.0 + 0.5	5	4	3	99	97	95	100	100	98	100	100	97	100	96	97
14	EPTC + Metribuzin	3.0 + 0.5	5	3	3	98	94	88	100	100	98	100	100	98	99	94	93
15	Pendimethalin	0.75	4	2	0	100	99	98	82	82	75	88	82	86	75	74	68
16	Metolachlor	2.0	4	3	2	100	99	97	99	98	96	98	98	90	99	95	90
17	EPTC	3.0	2	1	1	97	87	80	93	91	80	96	91	88	96	84	78
18	Weedy Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	LSD (0.05)		5	4	2	2	6	6	3	4	5	3	4	4	4	5	5

Table 2. Potato yield and specific gravity with preemergence weed control treatments, Aberdeen.

			---------Potato Yield---------							
	Treatment	Rate	< 4 oz	4-12 oz	>12 oz	US #2	Culls	Total US #1	Total Yield	Specific Gravity
		lb/a	----------	----------	----------	cwt/a	----------	----------	----------	%
1	Dimethenamid	1.0	69.7	77.8	4 8	29.6	15.5	86.5	197.4	1.073
2	Dimethenamid	1.25	74.2	119.3	7.7	41.6	24 0	127.0	266 8	1.073
3	Dimethenamid	1.5	71.3	81 8	10.7	39.2	25.6	110.2	228.6	1.078
4	Dimethenamid + Metribuzin	1.0 + 0.5	50.0	122.6	7.4	54.5	32.5	130.0	267.1	1.077
5	Dimethenamid + Metribuzin	1.25 + 0.5	58.4	119 5	13.2	34.4	32.0	132.7	257.5	1.079
6	Dimethenamid + Metribuzin	1.5 + 0.5	64.4	118.9	7.6	30.9	35.7	126.5	257.5	1.079
7	Dimethenamid + Rimsulfuron	1.0 + 0.023	58.9	89.6	4.8	35.7	36.1	93.9	215.1	1.076
8	Dimethenamid + Rimsulfuron	1.25 +0.023	72.3	125.6	2.5	35.6	17.5	128.1	253.5	1.078
9	Dimethenamid + Rimsulfuron	1.5 + 0.023	60 1	111.1	4.1	39.8	31.3	115.2	246.5	1.077
10	Metribuzin	0.5	61.3	91.4	2.7	35.4	43.1	94.2	233.9	1.078
11	Rimsulfuron	0.023	63.3	89.4	4.4	38.6	24.4	93.8	220.0	1.076
12	Pendimethalin + Metribuzin	0.75 + 0.5	62.5	135.4	3.0	31.9	31.9	138 4	264.8	1.078
13	Metolachlor + Metribuzin	2.0 + 0.5	58.8	103.4	6.3	39.3	28.0	109.7	235.8	1.076
14	EPTC + Metribuzin	3.0 + 0.5	58.8	129.1	8.0	27.4	29.1	137.2	262.4	1.078
15	Pendimethalin	0.75	76.2	74.8	3.7	26.3	26.0	78.5	207.0	1.076
16	Metolachlor	2.0	67.0	103.3	5 8	28.5	34.7	109.0	239.2	1.073
17	EPTC	3.0	79.7	108.3	3.2	34.2	30.3	111.4	255.7	1.073
18	Weedy Check		76.9	43.2	0.8	13.0	6.9	44.0	140.7	1.072
	LSD (0.05)		20 0	36.7	8.0	16.3	16.1	39.5	53.4	0.005

Weed control in potatoes with preemergence treatments of dimethenamid, Idaho Falls. Dennis J. Tonks, Charlotte V. Eberlein, Mary J. Guttieri, and Felix E. Fletcher. The objective of this experiment was to evaluate dimethenamid applied preemergence alone and in herbicide mixtures for weed control in potatoes. 'Russet Burbank' potatoes were seeded at 11-inch intervals in 36-inch wide rows on May 15, 1994 in a Pancheri silt loam soil with 1.6% organic matter and pH 8.2 in a production field near Idaho Falls, Idaho. The experimental design was a randomized complete block with three replications. Plot size was 12 by 30 feet. All herbicides were applied with a CO_2 -powered backpack sprayer delivering 17.5 gpa. Herbicides were applied preemergence after hilling on May 28, 1994 and were incorporated with 0.5 inches of irrigation water. Weed populations in the weedy control at row closure were 1 common lambsquarters (CHEAL)/ft^2. Potato vines were killed by rolling two weeks prior to harvest. Plots were harvested September 19, 1994.

Late season weed control was 90% or greater for all treatments except pendimethalin at 0.75 lb/a. No visual injury was observed. Yield of US #1 tubers for most treatments was not significantly different from the weedy control; however, a trend for higher yield was noted for a number of treatments. (University of Idaho Aberdeen Research and Extension Center, Aberdeen, ID 83210)

Table 1. Preemergence treatments for weed control in potatoes, Idaho Falls.

			Potato Injury	CHEAL Control		
	Treatment	Rate	7/4	6/29	7/15	8/25
		lb/a	%			
1	Dimethenamid	1.0	0	100	96	93
2	Dimethenamid	1.25	0	100	98	96
3	Dimethenamid	1.5	0	100	100	96
4	Dimethenamid + Metribuzin	1.0 + 0.5	0	100	100	99
5	Dimethenamid + Metribuzin	1.25 + 0.5	0	100	100	99
6	Dimethenamid + Metribuzin	1.5 + 0.5	0	100	100	97
7	Dimethenamid + Rimsulfuron	1.0 + 0.023	0	100	100	99
8	Dimethenamid + Rimsulfuron	1.25 + 0.023	0	100	100	99
9	Dimethenamid + Rimsulfuron	1.5 + 0.023	0	100	100	99
10	Metribuzin	0.5	0	100	100	96
11	Rimsulfuron	0.023	0	98	100	94
12	Pendimethalin + Metribuzin	0.75 + 0.5	0	100	100	99
13	Metolachlor + Metribuzin	2.0 + 0.5	0	100	100	97
14	Pendimethalin	0.75	0	88	82	86
15	Metolachlor	2.0	0	98	98	90
16	Metolachlor + Pendimethalin	1.5 + 0.75	0	100	100	99
17	Weedy Check		0	0	0	0
	LSD (0.05)		N.S.	3	4	4

Table 2. Potato yield and specific gravity with preemergence weed control treatments, Idaho Falls.

			Potato Yield							
	Treatment	Rate	< 4 oz	4-12 oz	>12 oz	US #2	Culls	Total US #1	Total Yield	Specific Gravity
		lb/a	cwt/a							%
1	Dimethenamid	1.0	33.8	74.1	14.0	87.6	65.5	88.0	274.7	1.075
2	Dimethenamid	1.25	27.9	105.9	29.6	70.6	51.0	135.5	285.0	1.075
3	Dimethenamid	1.5	30.6	90.1	22.7	82.4	56.2	112.8	282.0	1.079
4	Dimethenamid + Metribuzin	1.0 + 0.5	41.2	125.6	32.9	72.3	48.3	158.5	320.2	1.077
5	Dimethenamid + Metribuzin	1.25 + 0.5	37.8	100.9	31.7	85.6	53.4	143.9	299.0	1.077
6	Dimethenamid + Metribuzin	1.5 + 0.5	37.5	105.4	21.0	96.4	53.6	125.8	289.7	1.079
7	Dimethenamid + Rimsulfuron	1.0 + 0 023	33.7	128 8	17.4	66.8	37.4	143.1	271.0	1.078
8	Dimethenamid + Rimsulfuron	1.25 + 0.023	30.7	83.2	19.3	93.3	64.1	102.6	290.7	1.076
9	Dimethenamid + Rimsulfuron	1.5 + 0.023	39.6	132.9	28.3	87.8	50.5	161.2	339.1	1.079
10	Metribuzin	0.5	30.0	94.5	33.8	70.8	83.3	128.4	312.4	1.080
11	Rimsulfuron	0.023	34.5	110.1	30.9	100.1	44 6	144.5	306.5	1.078
12	Pendimethalin + Metribuzin	0.75 + 0.5	26.7	105.0	36.6	81.6	59.8	141.5	309.6	1.076
13	Metolachlor + Metribuzin	2.0 + 0.5	43.3	155.9	21.0	80.7	42.1	176.9	343.1	1.076
14	Pendimethalin	0.75	28.7	120.5	22.3	72.8	45.0	142.8	289.2	1.077
15	Metolachlor	2.0	40.1	129.1	18.7	84.5	40.8	147.8	313.2	1.080
16	Weedy Check		34.1	97.3	18.0	59.8	54.9	111.8	253.7	1.078
	LSD (0.05)		N.S.	43.8	N.S.	N.S.	N.S.	49.2	N.S.	N.S.

Broadleaf weed control in spring wheat with dicamba and pyridate. Gary A. Lee and Alex G. Ogg, Jr. An experimental trial was established near Endicott in Whitman County, WA to evaluate postemergence herbicide treatments for the control of kochia in a soft white spring wheat crop. Herbicide efficacy, crop tolerance and crop yield were evaluated. Spring wheat (var. 'Centennial') was planted April 7, 1995, at a depth of 1 inch and at a rate of 90 lb/A. Triallate (granules) at 1.25 lb/A was applied April 4, 1995, and was harrow incorporated to a depth of approximately 1 inch. Spring wheat plants began to emerge April 23, 1995. Soil at the location is an Onyx Silt Loam (23% sand, 72% silt, 5% clay, pH 6.1 and 2.04% organic matter) and the surface condition at the time of herbicide application was smooth, small clods (< 1.0 inch) and light crop residue. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 10 by 30 ft. Herbicides were applied postemergence on May 14, 1995, (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 12 gpa at 30 psi. Crop tolerance and weed control were evaluated at 7 (May 21) and 29 (June 12) days after treatment (DAT) and the crop was harvested on August 27,1995. Plots were harvested with a Wintersteiger combine and yields and bushel test weights were calculated on grain samples cleaned with a clipper cleaner.

Table 1 Application data

Crop stage	5 leaf, 2 tillers (principal growth stage. 22G)
Weed stage	kochia: 6-8 lf. rosettes to plants 2 in. tall with 22 leaves
Air temp (F)	71
Relative humidity (%)	33
Wind (mph)	0
Sky	clear
Soil temp. (F at 4 in.)	72
Soil moisture	dry at surface, good moisture at 1 in.
Rain fall, April to August	4.82 inches

First significant rain fall after herbicide application was 0.81 inch occurring on June 4, 1995

All herbicide treatments included R-11 nonionic surfactants at 0.25% V/V. Pyridate + dicamba at 0.235 + 0.094 lb/A and pyridate + metribuzin at 0.47 + 0.125 lb/A resulted in severe phytotoxicity to 74 to 84% of the kochia plants within 7 (May 21) days after treatment (DAT). By 29 DAT, only herbicide treatments containing dicamba alone or in combination with pyridate and/or 2,4-D amine killed 95% or more of the kochia population. None of the treatments in this study effectively controlled mayweed chamomile. In plots where kochia populations were nearly eliminated, mayweed chamomile plants were released to become the dominant weed species, forming a dense vegetative canopy. All herbicide treatments except pyridate at 0.235 and 0.47 lb/A caused slight to moderate phytotoxic symptoms on wheat plants. Treatments which included dicamba induced internode bowing and prostrate growth of wheat. Metribuzin and pyridate induced slight chlorosis and moderate leaf bronzing symptoms. Wheat plants recovered, for the most part, but some stunting was visible in some herbicide treated plots throughout the growing season.

Although six herbicide treatments provided 95% or better control of kochia, the surviving plants grew to form a dense canopy which prevented mechanical harvesting most of the wheat crop. All four replications could be mechanically harvested in only those plots treated with pyridate + dicamba + 2,4-D amine at 0.235 + 0.094 + 0.25 lb/A; therefore, yield data could not be analyzed statistically. Only 2 or 3 replications could be harvested in plots treated with pyridate + dicamba + 2.4-D amine at 0.47 + 0.094 + 0.25 lb/A, pyridate + dicamba at 0.235 + 0.094 and 0.47 + 0.094 lb/A, 2,4-D + dicamba at 0.25 + 0.094 lb/A, and dicamba at 0.094 lb/A. All other plots could not be harvested and were considered crop failures. A 25 ft^2 area was hand harvested in each of the weedy check plots. These yielded 24 bu/A and had a bushel test weight of 51 lb/bu. Kochia air dried biomass produced in the weedy check plots averaged 16400 lb/A. (Plant Science Division, University of Idaho, Moscow ID 83844-2339 and Nonirrigated Weed Science Research Unit, USDA-ARS, Pullman WA 99164-6416)

Table. Response of kochia, mayweed chamomile and 'Centennial' spring wheat to herbicides applied postemergence.

		Spring Wheat				Weed Control			
		Injury		Yield	TW	KCHSC		ANTCO	
Treatment	Rate lb/A	7DAT[1]	29DAT[2]	bu/A	lb/bu	7DAT[3]	29DAT[4]	7DAT[3]	29DAT[4]
Pyridate*	0.235	0	0	**		0	14	0	0
Pyridate*	0.47	0	0	**		31	35	4	8
Pyridate*	0.94	2	0	**		0	29	4	5
Pyridate + dicamba*	0.235 + 0.094	2	8	41[6]	58	74	98	3	30
Pyridate + dicamba*	0.47 + 0.094	2	18	38[7]	55	75	96	0	28
2,4-D amine + dicamba*	0.25 + 0.094	2	21	39[6]	59	0	98	6	75
Pyridate + dicamba + 2,4-D*	0.235 + 0.094 + 0.25	2	18	43	59	31	98	6	61
Pyridate + dicamba + 2,4-D*	0.47 + 0.094 + 0.25	2	10	38[7]	57	68	95	7	58
Pyridate + metribuzin*	0.235 + 0.125	4	14	**		18	31	2	11
Pyridate + metribuzin*	0.47 +0.125	4	16	**		84	34	4	8
dicamba*	0.094	2	8	37[6]	56	62	96	0	14
2,4-D *	0.25	2	10	**		0	40	4	26
Metribuzin*	0.125	4	10	**		0	8	2	0
Weedy check		0	0	24[5]	51	0	0	0	0
LSD(0.05)		1	7			7	21	1	10

[1] Herbicide injury to wheat: 0 = no effect; 2 = slight chlorosis, leaf tip bronzing and/or internode bowing; 5 = moderate chlorosis, leaf tip bronzing and /or intrenode bowing; 10 = complete kill

[2] Percent herbicide phytotoxicity resulting in reduced crop production potential

[3] Percent control based on visual evaluations: 0 = no detectable control; 100 = complete control

[4] Percent "reduction in competitive ability": 0 = no reduction in weed competition; 100 = complete elimination of weed competition

[5] Hand harvested 25 ft^2 in each of 4 weedy check plots

[6] Mean of 2 reps. mechanically harvested

[7] Mean of 3 reps. mechanically harvested

**Plots for this herbicide treatment not harvested

*R-11 nonionic surfactant added at the rate of 0.25% V/V

Broadleaf weed control in spring wheat with phenoxy herbicide combinations. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate broadleaf weed control in winter wheat with different phenoxy herbicide combinations. Spring wheat (var. Westbred Vanna) was seeded on in a silt loam soil (23% sand, 64% silt, 13% clay, pH 5.6 and 3.1% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence June 14, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 4 leaf wheat with 2 tillers and 1.5 inch weeds. Environmental conditions at application were as follows: air temp 64 F, relative humidity 80%, wind 3 mph, cloudy sky, and soil temp 64 F. Spring wheat injury was evaluated visually on June 21 and July 17, 1995. Mayweed chamomile (ANTCO), common lambsquarters (CHEAL), and field pennycress (THLAR) control were evaluated visually on July 17, 1995. Spring wheat was harvested at maturity with a small plot combine on August 15, 1995.

Spring wheat was injured 3% or less on June 21, 1995 (data not shown), and injury was not visible at the later evaluation on July 17, 1995. All herbicide treatments controlled common lambsquarters and field pennycress 95% or more. MCPA ester alone or in combination with bromoxynil controlled mayweed chamomile 85 and 83%, while all other herbicide treatments controlled mayweed chamomile 90% or more. Grain test weights for all treatments were not different and averaged 59.8 lb/bu. Wheat grain yield from herbicide treated plots ranged from 61 to 73 bu/A and were not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

		Weed control			Wheat
Treatment[1]	Rate	ANTCO	CHEAL	THLAR	yield
	lb/A	-------------	%	------------	bu/A
2,4-D ester	0.5	90	95	98	70
2,4-D amine	1	93	95	98	61
MCPA ester	0.5	85	95	95	61
MCPA amine	1	93	95	100	73
Dicmamba	0.094	91	98	100	70
Bromoxynil	0.5	91	95	98	58
Thifen/triben	0.0234	93	95	98	71
2,4-D ester + dicamba	0.25 +0.047	90	95	98	66
2,4-D ester + bromoxynil	0.25 + 0.25	95	98	98	67
2,4-D ester + dicamba + thifen/triben	0.25 + 0.047 + 0.0156	98	100	100	66
2,4-D ester + bromoxynil + thifen/triben	0.25 + 0.25 + 0.0156	95	100	100	61
MCPA ester + dicamba	0.25 + 0.047	95	100	100	65
MCPA ester + bromoxynil	0.25 + 0.25	83	95	95	63
MCPA ester + dicamba + thifen/triben	0.25 + 0.047 + 0.0156	98	100	100	61
MCPA ester + bromoxynil + thifen/triben	0.25 + 0.25 + 0.0156	98	100	100	69
MCPA amine + dicamba	0.5 + 0.047	95	98	100	67
MCPA amine + bromoxynil	0.5 + 0.25	95	93	100	66
MCPA amine + dicamba + thifen/triben	0.5 + 0.047 + 0.0156	95	98	98	64
MCPA amine + bromoxynil + thifen/triben	0.5 + 0.25 + 0.0156	93	98	98	69
Untreated check		---	---	---	65
	LSD (0.05)	8	NS	NS	NS
	Density (plants/ft^2)	6	4	1	

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[1] 2,4-D ester is a 5 lb/gal EC, 2,4-D amine is a 79.8% dry soluble (DS), MCPA ester is a 5.2 lb/gal EC and MCPA amine is a 77.6% DS marketed by United Agri Products; thifen/triben was applied as a commercial formulation of thifensulfuron plus tribenuron; all thifensulfuron/tribenuron treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

Bromoxynil combinations for broadleaf weed control in spring wheat. John O. Evans, R.William Mace and Marlin Winger. Research plots were established May 31, 1995 to evaluate the response of broadleaf weeds to two rates of bromoxynil combined with triasulfuron in the presence of either MCPA or 2,4-D. These treatments were compared to tank mixes of metsulfuron, 2,4-D and dicamba. The experimental design was a randomized complete block 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. The wheat was 8 inches high with 3 to 4 leaves at the time of application. The weed population was made up of 60% shepherds purse, 15% redroot pigweed, 15% lambsquarter, 5% mustards and 5% buckwheat. Treatments were visually evaluated for wheat injury and broadleaf weed control. The wheat was also sampled for yield August 21, 1995.

All herbicide treatments were effective in controlling the broadleaf weed population. Treatments including dicamba did cause some crop injury which also resulted in a trend towards slightly reduced wheat yields. Compared to other treatments, the dicamba treatment yield was not significantly different but was lower than untreated plots. (Utah Agricultural Experiment Station, Logan. 84322-4820)

Table. Broadleaf weed control in wheat with bromoxynil.

		Weed control	Wheat response	
Treatment	Rate	Broadleaf[2]	Injury	Yield
	Lb/A	%	%	bu/Ha.
Bromoxynil+MCPA+	0.25			
triasulfuron[1]	0.007	98	0	107.5
Bromoxynil+MCPA+	0.25			
triasulfuron[1]	0.009	94	0	116.2
Bromoxynil+MCPA+	0.31			
triasulfuron[1]	0.007	100	0	137.8
Bromoxynil+MCPA+	0.31			
triasulfuron[1]	0.009	97	0	
116.4Bromoxynil+MCPA+	0.38			
triasulfuron[1]	0.009	95	0	121.4
Bromoxynil+2,4-D+	0.125+0.25			
triasulfuron[1]	0.007	92	0	112.8
Bromoxynil+2,4-D+	0.125+0.25			
triasulfuron[1]	0.009	99	0	125.4
Bromoxynil+2,4-D+	0.187+0.25			
triasulfuron[1]	0.007	100	0	124.3
Bromoxynil+2,4-D+	0.187+0.25			
triasulfuron[1]	0.009	98	0	122.5
Metsulfuron+	0.0038			
2,4-D ester	0.25	99	0	111.6
Dicamba+	0.125			
MCPA	0.5	100	0	98.6
Metsulfuron+	0.0038			
2,4-D ester	0.25	99	20	85.3
dicamba	0.125			
Untreated		0	0	101.2
LSD$_{(.05)}$		6		42

[1] non-ionic surfactant added at .5 % v/v

[2] Visual evaluation July 10,1995

Effect of application timing and herbicide rate on broadleaf weed control in spring wheat. Mark J. Pavek, Robert W. Downard, Don W. Morishita, Roger Ashley, and Steven N. Harrison. Two field trials were conducted in southeast Idaho (Swan Valley and Soda Springs) to evaluate broadleaf weed control and crop injury using a tank mixture of bromoxynil & MCPA + tribenuron. The mixture was applied at six rates: 1x, 5/6x, 2/3x, 1/2x, 1/3x, and 1/6x (where 1x = bromoxynil and MCPA at 0.500 lb/A + tribenuron at 0.012 lb/A). An untreated check also was included. Each rate was applied at three weed growth stages: cotyledon to 2 leaf, 2 to 4 leaf, and 4 to 8 leaf. 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. Herbicides were applied with a bicycle-wheel sprayer calibrated to deliver 10 gpa at 24 to 26 psi, using 11001 and 8001 flat fan nozzles. Additional application information is presented in Table 1. Weed control and crop injury were evaluated visually two times.

Table 1. Application information.

Location	----------Swan Valley----------			----------Soda Springs----------		
Application dates	6/5	6/13	6/26	6/12	6/20	6/30
Application timing[1]	cotyl-2 lf	2-4 lf	4-8 lf	cotyl-2 lf	2-4 lf	4-8 lf
Air temperature (F)	66	80	79	73	60	73
Soil temperature (F)	66	80	76	58	66	61
Relative humidity (%)	56	32	41	45	77	27
Wind velocity (mph)	7	7	4	5	4	5
Weed density (plants/ft^2)	1	1	1	12	16	16
Cultivar		Amidon			751	

[1] Cotyl = cotyledon, lf = leaf

Crop injury at Swan Valley ranged from 1 to 14% with the most injury at the four highest herbicide rates applied at the first application (Table 2). Injury was attributed to freezing conditions within 24 h after application. Wheat yield was not affected by the herbicide injury. Weed control was highest at the first two applications. There was no difference in weed control between the 1/3x to 1x (0.500 + 0.012 lb/A) rates, except redroot pigweed at the 2 to 4 leaf stage, on the first two applications. There was no difference in field pennycress control, which ranged from 95 and 100%, between the 1/6x and 1x rates at the first two applications. There were no yield differences among treatments including the untreated check. At Soda Springs, redroot pigweed and field pennycress populations averaged 16 plants/ft^2 (Table 1). Maximum redroot pigweed control at the cotyledon to 2 leaf application was 82%, while control was as high as 95% at the 2 to 4 leaf application (Table 3). Redroot pigweed control at the cotyledon to 2 leaf timing was not different from 1/3x to 1x rates and ranged from 79 to 82% at the late evaluation. Redroot pigweed control was highest with the 2 to 4 leaf applications, averaging 76 to 95% at the late evaluation, with no differences between the 2/3x and 1x rates. Field pennycress control was similar between the two early applications, ranging from 84 to 100%, but decreased at the 4 to 8 leaf application. At the 2 to 4 leaf application, there was no difference in field pennycress control between the 1/6x and 1x rates. This is similar to the Swan Valley location. Despite the heavy weed populations at Soda Springs, there were no yield differences among treatments. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303).

Table 2. Weed control, and yield with reduced herbicide rates, near Swan Valley, Idaho.

				Weed control						
				Cutleaf nightshade		Field pennycress		Redroot pigweed		
Treatment[1]	Rate	Applic. timing	Crop injury	7/5	7/25	7/5	7/25	7/5	7/25	Yield
	lb/A		%							Bu/A
Untreated check			0	0	0	0	0	0	0	34
Brom & MCPA + tribenuron	0.083 + 0.002	Cotyl-2 lf	4	95	90	95	100	97	88	42
Brom & MCPA+ tribenuron	0.170 + 0.004	Cotyl-2 lf	7	97	99	99	100	97	97	43
Brom & MCPA + tribenuron	0.250 + 0.006	Cotyl-2 lf	13	100	100	100	100	98	100	41
Brom & MCPA+ tribenuron	0.330 + 0.008	Cotyl-2 lf	13	95	99	100	100	100	100	34
Brom & MCPA + tribenuron	0.420 + 0.010	Cotyl-2 lf	13	100	96	100	100	100	98	35
Brom & MCPA+ tribenuron	0.500 + 0.012	Cotyl-2 lf	12	98	100	100	100	96	98	39
Untreated check			0	0	0	0	0	0	0	39
Brom & MCPA + tribenuron	0.083 + 0.002	2-4 lf	2	91	96	96	100	79	76	39
Brom & MCPA+ tribenuron	0.170 + 0.004	2-4 lf	1	100	97	100	100	84	89	45
Brom & MCPA + tribenuron	0.250 + 0.006	2-4 lf	1	100	99	100	100	91	95	41
Brom & MCPA+ tribenuron	0.330 + 0.008	2-4 lf	1	100	100	99	100	88	91	41
Brom & MCPA + tribenuron	0.420 + 0.010	2-4 lf	2	100	100	100	100	97	92	47
Brom & MCPA+ tribenuron	0.500 + 0.012	2-4 lf	2	100	99	100	100	97	93	39
Untreated check			0	0	0	0	0	0	0	42
Brom & MCPA + tribenuron	0.083 + 0.002	4-8 lf	1	65	81	70	100	66	71	41
Brom & MCPA+ tribenuron	0.170 + 0.004	4-8 lf	3	80	89	80	100	70	79	42
Brom & MCPA + tribenuron	0.250 + 0.006	4-8 lf	3	82	92	84	100	79	86	44
Brom & MCPA+ tribenuron	0.330 + 0.008	4-8 lf	4	92	100	94	100	91	84	41
Brom & MCPA + tribenuron	0.420 + 0.010	4-8 lf	6	94	100	93	100	89	90	41
Brom & MCPA+ tribenuron	0.500 + 0.012	4-8 lf	6	89	98	86	100	90	89	43
LSD (0.05)			4	8	5	10	9	8	5	NS

[1] Nonionic surfactant added at 0.25% v/v. Brom & MCPA is a commercial formulation of bromoxynil and MCPA.

Table 3. Weed control and yield with reduced herbicide rates near Soda Springs, Idaho.

			Weed control				
		Application	Redroot pigweed		Field pennycress		
Treatment[1]	Rate	timing	7/17	8/1	7/17	8/1	Yield
	lb/A		---	--- % ---		---	Bu/A
Untreated check			0	0	0	0	77
Brom & MCPA[2] + tribenuron	0.083 + 0.002	Cotyl-2 lf	53	67	99	97	76
Brom & MCPA+ tribenuron	0.170 + 0.004	Cotyl-2 lf	60	79	96	99	74
Brom & MCPA + tribenuron	0.250 + 0.006	Cotyl-2 lf	62	77	100	98	76
Brom & MCPA+ tribenuron	0.330 + 0.008	Cotyl-2 lf	64	82	95	97	78
Brom & MCPA + tribenuron	0.420 + 0.010	Cotyl-2 lf	63	78	97	99	75
Brom & MCPA+ tribenuron	0.500 + 0.012	Cotyl-2 lf	63	80	99	99	84
Untreated check			0	0	0	0	64
Brom & MCPA + tribenuron	0.083 + 0.002	2-4 lf	65	76	84	88	77
Brom & MCPA+ tribenuron	0.170 + 0.004	2-4 lf	69	79	91	96	81
Brom & MCPA + tribenuron	0.250 + 0.006	2-4 lf	74	85	96	96	64
Brom & MCPA+ tribenuron	0.330 + 0.008	2-4 lf	85	91	99	100	77
Brom & MCPA + tribenuron	0.420 + 0.010	2-4 lf	90	95	99	100	77
Brom & MCPA+ tribenuron	0.500 + 0.012	2-4 lf	91	93	100	100	77
Untreated check			0	0	0	0	66
Brom & MCPA + tribenuron	0.083 + 0.002	4-8 lf	49	49	45	53	67
Brom & MCPA+ tribenuron	0.170 + 0.004	4-8 lf	68	74	70	82	78
Brom & MCPA + tribenuron	0.250 + 0.006	4-8 lf	73	78	73	94	63
Brom & MCPA+ tribenuron	0.330 + 0.008	4-8 lf	76	79	76	92	70
Brom & MCPA + tribenuron	0.420 + 0.010	4-8 lf	81	90	80	97	65
Brom & MCPA+ tribenuron	0.500 + 0.012	4-8 lf	81	87	86	100	74
LSD (0.05)			9	8	10	12	NS

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

[2] Brom & MCPA = bromoxynil plus MCPA preformulated mixture.

Kochia control in spring wheat with varoius herbicides and herbicide combinations. Gary A. Lee and Alex G. Ogg, Jr. A study was established in Whitman County, WA to evaluate effectiveness of postemergence herbicides for the control of kochia (KCHSC) in spring wheat and subsequent crop tolerance and yield. Soft white spring wheat (var. 'Centennial') was seeded April 7, 1995, at a depth of 1 inch and at a rate of 90 lb/A. Triallate (granules) at 1.25 lb/A was applied April 4, 1995, and was harrow incorporated to a depth of approximately 1 inch. Spring wheat plants began to emerge April 23, 1995. Soil at the location is an Onyx Silt Loam (25% sand, 68% silt, 7% clay, pH 7.9 and 1.96% organic matter) and the surface condition at the time of herbicide application was smooth, with small clods (< 1.0 inch) and light crop residue. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 10 by 35 ft. Herbicides were applied postemergence on May 14, 1995 (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 12 gpa at 30 psi. Crop tolerance and weed control were evaluated at 7 (May 21) and 29 (June 12) days after treatment (DAT) and the crop was harvested on August 28,1995. Plots were harvested with a Wintersteiger combine and yields and bushel test weights were calculated on grain samples cleaned with a clipper cleaner.

Table 1. Application data

Crop stage	5 leaf, 2 tillers (principal growth stage: 22G)
Weed stage	kochia: 6-8 lf. rosettes to plants 2 in. tall with 22 leaves
Air temp. (F)	81
Relative humidity (%)	48
Wind (mph)	2-8
Sky	clear
Soil temp. (F at 4 in.)	59
Soil moisture	dry at surface, good moisture at 1 in.
Rain fall April to August	4.82 inches
First significant rain fall after herbicide application was 0.81 in. occurring June 4, 1995	

Herbicide treatments including F-8426 killed 100% of existing kochia plants within 7 DAT (Table 2). Clopryalid + 2,4-D at 0.095 + 0.5 lb/A, bromoxynil + 2,4-D at 0.25 + 0.5 lb/A, pyridate + dicamba at 0.47 + 0.094 lb/A, prosulfuron at 0.027 lb/A and MCPA + dicamba at 0.25 + 0.19 lb/A controlled kochia 92% or more 7 DAT. Kochia seedlings continued to emerge after the initial herbicide applications resulting in decreased control of the kochia infestation between the 7 DAT and 29 DAT evaluations. Percent reduction in competitive ability for several treatments increased between the first and second evaluation dates. Generally, the herbicide treatments containing dicamba or F-8426 sustained effective kochia control (96% or better) through the growing season. The kochia population at this site appears to be moderately resistant to the sulfylurea herbicides.

F-8426 alone and in combination with 2,4-D amine DF and pyridate + dicamba induced slight to moderate chlorosis and leaf tip bronzing of wheat plants. New leaves produced after herbicide applications appeared normal. Herbicide treatments which included dicamba initially caused slight to moderate internode bowing and /or prostrate growth, but plants recovered to near normal growth habit prior to heading. Bromoxynil + dicamba at both rates, MCPA + dicamba at 0.25 + 0.19 lb/A and 2,4-D amine + dicamba at 0.5 + 0.19 lb/A reduced wheat vigor 11 to 18%. However, wheat yields from plots receiving these treatments were significantly higher than yields from the weedy check plots and equivalent to the yields from the hand weeded plots. Crop yields were obtained from 9 of the 24 herbicide treatments. Although several other herbicide treatments provided some control of the kochia population, remaining plants grew to form a dense canopy which inhibited the mechanical harvest of the wheat crop. Under commercial conditions, such dense kochia growth would result in near total crop failure. (Plant Science Division, University of Idaho, Moscow ID 83844-2339 and Nonirrigated Weed Science Research Unit, USDA-ARS, Pullman WA 99164-6416)

Table 2. Effect of postemergence herbicide applications on wheat vigor, crop yield and the kochia infestation.

Treatment	Rate	Spring Wheat				KCHSC Control	
		Injury		Yield	TW		
		8 DAT	30 DAT[2]	bu/A	lb/bu	8 DAT[3]	30 DAT[4]
2,4-D LVE *	0.75 lb/A	0	6	52	59	0	82
2,4-D LVE ***	0.75 lb/A	3	2	50	60	0	77
Bromoxynil	0.19 lb.A	2	1	**		0	38
Bromoxynil	0.25 lb/A	2	0	**		0	58
Bromoxynil + dicamba	0.25 + 0.125 lb/A	3	11	63	61	75	96
Bromoxynil + dicamba	0.25 + 0.19 lb/A	2	12	64	61	40	96
Bromoxynil + 2, 4-D LVE	0.25 + 0.5 lb/A	2	6	**		79	71
Chlorsulf. + metsulf.	0.158 + 0.032 oz/A	0	0	**		0	30
Chlorsulf.+ metsulf. + bromoxynil	0.158 + 0.032 oz + 0.19 lb/A	0	2	**		0	50
Metsulfuron	0.06 oz/A	0	0	**		0	9
Tribenuron *	0.19 oz/A	2	2	**		0	26
Trifensulf. + triben. + 2,4-D	0.167 + 0.083 oz + 0.38 lb/A	0	0	**		0	32
Trifensulf. + triben. + bromoxynil	0.167 + 0.083 oz + 0.19 lb/A	2	1	**		34	71
Clopyralid + MCPA	0.095 +0.5 lb/A	2	1	**		94	64
F-8426 *	0.031 lb/A	4	5	69	60	100	98
Bromoxynil + 2,4-D	0.25 +0.25 lb/A	3	0	**		91	73
F-8426 +2,4-D amine DF*	0.031 + 0.25 lb/A	3	2	70	61	100	98
Pyridate + dicamba	0.47 + 0.094 lb/A	3	5	71	61	93	96
Prosulfuron*	0.018 lb/A	0	0	**		0	20
Prosulfuron*	0.027 lb/A	3	0	**		94	21
Triasulfuron	0.21 oz/A	0	0	**		0	18
Triasulfuron + bromoxynil	0.21 oz + 0.25 lb/A	2	0	**		42	77
MCPA +dicamba*	0.25 + 0.19 lb/A	0	15	72	61	92	99
2,4-D amine + dicamba *	0.5 + 0.19 lb/A	2	18	70	61	0	99
Weedy check		0	0	24[6]	51	0	0
Hand weeded check				70	60		
LSD (.05)		1	4	17[5]	NS	5	20

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[1] Herbicide injury to wheat: 0 = no effect; 2 = slight chlorosis or internode bowing; 5 = moderate chlorosis or prostrate growth; 10 = complete kill

[2] Percent herbicide phytotoxicity resulting in reduced crop production potential

[3] Herbicide phytotoxicity: 0 = no effect and 100 = complete kill

[4] Percent "reduction in competitive ability": 0 = no reduction in weed competition and 100 = complete elimination of weed competition

[5] Statistical significant differences at the .0755 level

[6] Hand harvested 25ft^2 in each of 4 weedy check plot

*R-11 surfactant added at the rate of 0.25% V/V

***Sylgard organosilicone surfactant added at the rate of 0.125% V/V

**Unable to mechanically harvest plot area due to density of kochia biomass

Chlorsulf. = chlorsulfuron; metsulf. = metsulfuron; trifensulf. = trifensulfuron; triben. = tribenuron

Postemergence kochia control in spring wheat with F-8426 and standard herbicides. Gary A. Lee and Alex G. Ogg, Jr. An experimental trial was established near Endicott in Whitman County, WA, to evaluate effectiveness of postemergence herbicides for the reduction in competitive ability of kochia (KCHSC) in spring wheat. Additional parameters evaluated included crop tolerance and yield. Soft white spring wheat (var. 'Centennial') was planted April 7, 1995, at a depth of 1 inch and at a rate of 90 lb/A. Granular triallate at 1.25 lb/A was applied and harrow incorporated to a depth of 1 inch on April 4, 1995. The crop began to emerge April 23, 1995. Soil at the location is an Onyx Silt Loam (25% sand, 68% silt, 7% clay, pH 7.9 and 1.96% organic matter) and the surface condition at the time of herbicide application was smooth, with small clods (< 1.0 inch) and light crop residue. The herbicide treatments were arranged in a randomized complete block design with four replications and individual plots were 10 by 35 ft. Herbicides were applied postemergence on May 14, 1995, (Table 1) with a CO_2 pressurized backpack sprayer calibrated to deliver 12 gpa at 30 psi. Crop tolerance and weed control were evaluated at 7 (May 21) and 29 (June 12) days after treatment (DAT) and the crop was harvested on August 28,1995. Plots were harvested with a Wintersteiger combine and yields and bushel test weights were calculated on grain samples cleaned with a clipper cleaner.

Table 1. Application data

Crop stage	5 leaf, 2 tillers (principal growth stage: 22G)
Weed stage	kochia: 6-8 lf. rosettes to plants 2 in. tall with 22 leaves
Air temp. (F)	81
Relative humidity (%)	32
Wind (mph)	0-2
Sky	clear
Soil temp. (F at 4 in.)	71
Soil moisture	dry at surface, good moisture at 1 in.
Rain fall, April to August	4.82 inches
First significant rain fall after herbicide application was 0.81 in. occurring June 4, 1995	

All herbicide treatments in the trial included R-11 nonionic surfactant at 0.25% V/V. F-8426 at 0.023 and 0.031 lb/A and F-8426 + 2,4-D amine DF killed kochia rapidly resulting in 92% control within 7 days after treatment (Table 2). All four treatments maintained 96% or more control throughout the evaluation period. The sulfonylurea herbicide treatments did not control kochia adequately indicating that moderate resistance exists in the kochia population. 2,4-D amine DF at 0.25 lb/A controlled approximately one-third of the kochia infestation and surviving plants outgrew early symptoms.

Herbicide treatments containing F-8426 caused initial chlorosis and leaf tip burning of the wheat plants, but new growth following herbicide treatment was normal. By the last evaluation date, only slight phytotoxic effects were visually detectable. Kochia plants treated with sulfonylurea herbicides grew to 6-7 ft. in height and formed a dense canopy making mechanical harvest impossible. Glyphosate at 0.75 lb ae/A was applied by air 3 weeks before harvest. However, only isolated ,individual kochia plants were killed and dried sufficiently to allow mechanical harvest.

F-8426 at 0.023 and 0.031 lb/A and F-8426 + 2,4-D amine DF at 0.023 + 0.25 and 0.031 + 0.25 lb/A were the only herbicide treatments which provided adequate kochia control throughout the growing season to allow mechanical harvest of the spring wheat crop. Wheat yields and bushel test weights were significantly higher from the F-8426 treated plots than from the weedy check plots. (Plant Science Division, University of Idaho, Moscow ID 83844-2339 and Nonirrigated Weed Science Research Unit, USDA-ARS, Pullman WA 99164-6416)

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

Treatment	Rate	Spring Wheat					KCHSC Control		
		Injury			Yield				
		7DAT[1]	16DAT[2]	29DAT[2]	bu/A	lb/bu	7DAT[3]	16DAT[3]	29DAT[4]
F-8426*	0.023	2	8	0	51	60	97	99	97
F-8426*	0.031	2	11	3	52	60	99	99	99
F-8426 + 2,4-D amine DF*	0.023 + 0.25	2	10	0	48	60	92	99	97
F-8426 + 2,4-D amine DF*	0.031 + 0.25	2	11	1	46	60	97	98	96
Trifensulf. + triben. + 2,4-D DF*	0.225 +0.112 oz + 0.25	0	8	0	*		12	74	79
Chlorsulf. + metsulf. + 2,4-D DF*	0.19 oz + 0.25	0	4	0	*		22	45	71
Triasulfuron + 2,4-D DF*	0.21 oz + 0.25	0	5	0	*		24	41	44
2,4-D amine DF*	0.25	0	3	0	*		18	25	31
Weedy check		0	0	0	24[5]	51	0	0	0
LSD (.05)		1	6	NS	7	2	7	13	14

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[1] Herbicide injury to wheat: 0 = no effect; 2 = slight chlorosis or leaf tip bronzing; 5 – moderate chlorosis or leaf tip bronzing; 10 = complete kill

[2] Percent herbicide phytotoxicity resulting in reduced crop production potential

[3] Percent control based on visual evaluations: 0 = no detectable control; 100 = complete kill

[4] Percent "reduction in competitive ability": 0 = no reduction in weed competition; 100 = complete elimination of weed competition

[5] Hand harvested 25 ft^2 in each of 4 weedy check plots

* R-11 nonionic surfactant added at the rate of 0.25% V/V

Trifensulf. = trifensulfuron; triben. = tirbenuron; chlorsulf. = chlorsulfuron; metsulf. = metsulfuron

Wild oat control in spring wheat with tralkoxydim. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate wild oat control in spring wheat with tralkoxydim. Spring wheat (var. Penawawa) was seeded April 19, 1995 in a silt loam soil (30% sand, 57% silt, 13% clay, pH 5.6 and 4.4% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence June 9, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 4 leaf wheat with 2 tillers, 2 inch broadleaf weeds, and 4 leaf wild oat with 1 tiller. Environmental conditions at application were as follows: air temp 58 F, relative humidity 90%, wind 2 mph, partly cloudy sky, and soil temp 50 F. Spring wheat injury was evaluated visually on June 21 and July 17, 1995. Wild oat (AVEFA), mayweed chamomile (ANTCO), catchweed bedstraw (GALAP), common lambsquarters (CHEAL), and field pennycress (THLAR) control were evaluated visually on July 17, 1995. Spring wheat was harvested at maturity with a small plot combine on August 15, 1995.

Tralkoxydim treatments injured wheat 8% or less on June 21, 1995, but injury was not visible at the later evaluation on July 17, 1995. Tralkoxydim plus 2,4-D suppressed wild oat 73%, but wild oat control was 90% when ammonium sulfate was add to the same treatment. All other tralkoxydim treatments controlled wild oat 80 to 89%, and were comparable to diclofop and imazamethabenz treatments. Tralkoxydim treatments containing a broadleaf herbicide controlled common lambsquarters and field pennycress 95 to 100%. Tralkoxydim treatments containing bromoxynil or bromoxynil/MCPA controlled mayweed chamomile 75%, while tralkoxydim treatments with 2,4-D or MCPA only suppressed mayweed chamomile and catchweed bedstraw 30% or less. Grain test weights for all treatments ranged from 63 to 65 lb/bu. Wheat grain yield from herbicide treated plots ranged from 56 to 66 bu/A and were not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

		Spring wheat		Weed control				
Treatment[1]	Rate	Injury[2]	Yield	AVEFA	ANTCO	GALAP	CHEAL	THALR
	lb/A	%	bu/A			%		
Tralkoxydim	0.18	0	56	80	0	0	0	0
Tralkoxydim + bromoxynil/MCPA	0.18 + 0 75	1	59	88	75	30	95	98
Tralkoxydim + bromoxynil	0.18 + 0.5	0	65	88	75	30	95	100
Tralkoxydim + MCPA	0.18 + 0.5	0	56	85	13	3	95	98
Diclofop	1	10	65	89	0	0	0	0
Imazamethabenz	0.47	0	63	80	0	80	0	95
Imazamethabenz + difenzoquat	0.235 + 0.5	4	63	91	0	83	48	98
Tralkoxydim	0.18	0	58	89	0	0	0	0
Tralkoxydim + 2,4-D	0.18 + 0.5	4	66	73	30	3	98	98
Tralkoxydim + 2,4-D[3]	0.18 + 0.5	8	56	90	20	0	98	95
Untreated check		---	52	---	---	---	---	---
	LSD (0.05)	2	NS	11	10	11	25	5
	Density (plants/ft^2)			6	2	1	15	1

[1] 2,4-D and MCPA are ester formulations; bromoxynil/MCPA was applied as a commercial formulation of bromoxynil plus MCPA; all tralkoxydim treatments were applied with TF8035 (mineral oil and nonionic surfactant blend) at 0.5% v/v; all imazamethabenz treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] June 21, 1995 evaluation.

[3] Applied with a 3.5 lb/gal ammonium sulfate formulation at 1.5 lb/A.

Broadleaf weed control in winter wheat with bentazon and prosulfuron. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate broadleaf weed control in winter wheat with bentazon and prosulfuron herbicides. Winter wheat (var. Cashup) was seeded on October 10, 1994 in a silt loam soil (27% sand, 62% silt, 11% clay, pH 5.4 and 4.3% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence May 9, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 5 leaf wheat with 3 tillers and 1.5 inch weeds. Environmental conditions at application were as follows: air temp 64 F, relative humidity 80%, wind 0 to 4 mph, mostly clear sky, and soil temp 62 F. Winter wheat injury was evaluated visually on May 24 and June 12, 1995. Mayweed chamomile (ANTCO), catchweed bedstraw (GALAP), field pennycress (THLAR), common lambsquarters (CHEAL), and henbit (LAMAM) control were evaluated visually on June 12, 1995. Winter wheat was harvested at maturity with a small plot combine on August 15, 1995.

Prosulfuron plus 2,4-D injured wheat 5% (chlorosis) on May 24, 1995, but injury was not visible by the later evaluation on June 12, 1995. Bentazon alone or in combination with bromoxynil controlled mayweed chamomile 94 to 100%. However, bentazon at 0.5 lb/A alone or in combination with bromoxynil at 0.19 lb/A controlled all other weed species 50% or less. Bentazon plus bromoxynil at 0.75 plus 0.19 lb/A controlled field pennycress 94% and common lambsquarters 90%, but catchweed bedstraw and henbit control was 70% or less. Bentazon plus bromoxynil at 0.5 plus 0.25 lb/A controlled catchweed bedstraw 78%, and controlled all other weed species 83% or more. Prosulfuron alone did not adequately control the weed species present. Prosulfuron in combination with 2,4-D or bromoxynil controlled field pennycress 95 and 96%, and common lambsquarters 93 and 95%, respectively. However, these combinations controlled all other weed species 78% or less. Grain test weights from all treatments were not different and averaged 60.6 lb/bu. Wheat grain yield from all herbicide treated plots were not different from the untreated check and ranged from 65 to 82 bu/A. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

		Winter wheat		Weed control				
Treatment[1]	Rate	Injury[2]	Yield	GALAP	THLAR	ANTCO	CHEAL	LAMAM
	lb/A	%	bu/A			%		
Bentazon[3]	0.5	0	79	8	35	94	35	30
Bentazon + bromoxynil	0.5 + 0.19	0	82	35	45	94	48	50
Bentazon + bromoxynil	0.5 + 0.25	0	76	78	98	100	98	83
Bentazon + bromoxynil	0.75 + 0.19	0	65	65	94	98	90	70
Prosulfuron	0.018	0	70	38	78	58	53	53
Prosulfuron + 2,4-D	0 018 + 0.5	5	66	65	95	58	93	60
Prosulfuron + bromoxynil	0.018 + 0.25	0	68	75	96	73	95	78
Thifen/triben + bromoxynil	0.0156 + 0.25	0	77	83	88	78	100	75
Untreated check		---	70	---	---	---	---	---
	LSD (0 05)	2	NS	13	10	7	24	8
	Density (plants/ft^2)			3	2	3	3	4

[1] 2,4-D is an ester formulation; thifen/triben was applied as a commercial formulation of thifensulfuron plus tribenuron; all prosulfuron and thifensulfuron/tribenuron treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] May 24, 1995 evaluation.

[3] Crop oil concentrate was added at 2.5% v/v.

Broadleaf weed control in winter wheat with bromoxynil combinations. Terry L. Neider and Donald C. Thill. A study was established in Nez Perce County, ID to evaluate broadleaf weed control in winter wheat with different bromoxynil combinations. Winter wheat (var. Stevens) was seeded on October 10, 1994 in a silt loam soil (28% sand, 58% silt, 14% clay, pH 5.1 and 4.2% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 25 ft. Herbicide treatments were applied postemergence April 24, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 4 leaf wheat with 2 tillers and 1.5 inch weeds. Environmental conditions at application were as follows: air temp 66 F, relative humidity 74%, wind 0 to 1 mph, mostly clear sky, and soil temp 70 F. Winter wheat injury, and mayweed chamomile (ANTCO), catchweed bedstraw (GALAP), field pennycress (THALR) and henbit (LAMAM) control were evaluated visually on May 9 and June 1, 1995. Winter wheat was harvested at maturity with a small plot combine on August 1, 1995.

Winter wheat was not injured by any herbicide treatment. Weed control was not different between herbicide treatments on May 9, 1995, and all herbicide treatments controlled mayweed chamomile 71 to 85%, catchweed bedstraw 48 to 68%, field pennycress 71 to 86% and henbit 50 to 68% (data not shown). All herbicide treatments controlled field pennycress 88 to 96% and henbit 73 to 85% on June 1, 1995. Bromoxynil/MCPA alone or in combination with metribuzin suppressed mayweed chamomile 35 and 58%, and catchweed bedstraw 35 and 25%, respectively, on June 1, 1995. Bromoxynil or MCPA in combination with thifensulfuron/tribenuron controlled mayweed chamomile 73 to 88% and catchweed bedstraw 60 to 65% on June 1, 1995. Bromoxynil in combination with tribenuron at 0.0078 lb/A and 0.0156 lb/A controlled mayweed chamomile 65 and 83%, respectively, on June 1, 1995. Grain test weights from all treatments were not different and averaged 57.9 lb/bu. Grain yields were not different between herbicide treated plots, and herbicide treated plots yielded 9 to 18 bu/A more than the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

		Weed control[2]				Wheat
Treatment[1]	Rate	ANTCO	GALAP	THLAR	LAMAM	yield
	lb/A	%				bu/A
Bromoxynil/MCPA	0.75	35	35	88	73	79
Bromoxynil + thifen/triben	0.25 + 0.0156	73	65	95	80	79
Bromoxynil + thifen/triben	0.1875 + 0.0156	88	65	90	83	78
MCPA + thifen/triben	0.25 + 0.0156	83	63	96	80	77
MCPA + thifen/triben	0.25 + 0.0234	80	60	93	78	78
Bromoxynil + tribenuron	0.25 + 0.0078	65	75	91	85	73
Bromoxynil + tribenuron	0.25 + 0.0156	83	80	95	75	82
Bromoxynil/MCPA + metribuzin	0.25 + 0.14	58	25	91	83	74
Untreated check		---	---	---	---	64
	LSD (0.05)	15	22	NS	NS	9
	Density (plants/ft^2)	12	4	14	11	

[1] Bromoxynil is a gel formulation; MCPA is an ester formulation; bromoxynil/MCPA was applied as a commercial gel formulation of bromoxynil plus MCPA; thifen/triben was applied as a commercial formulation of thifensulfuron plus tribenuron; all herbicide treatments containing thifensulfuron/tribenuron or tribenuron were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] June 1, 1995 evaluation.

Broadleaf weed control in winter wheat with dicamba and bromoxynil combinations. Terry L. Neider and Donald C. Thill. A study was established in Latah county, ID to evaluate broadleaf weed control in winter wheat with different dicamba and bromoxynil combinations. Winter wheat (var. Madsen) was seeded on October 14, 1994 in a silt loam soil (28% sand, 60% silt, 12% clay, pH 6.0 and 3.9% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence May 9, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 4 leaf wheat with 5 tillers and 1.5 inch weeds. Environmental conditions at application were as follows: air temp 68 F, relative humidity 80%, wind 2 mph, mostly clear sky, and soil temp 64 F. Winter wheat injury was evaluated visually on May 24 and June 12, 1995. Field pennycress (THLAR), and a mixture of mayweed chamomile and pineapple-weed (ANTCO) control were evaluated visually on June 12, 1995. Winter wheat was harvested at maturity with a small plot combine on August 21, 1995.

Dicamba combinations containing 2,4-D and bromoxynil injured wheat 4 to 5% (laying-over) on May 24, 1995, but injury was not visible by the later evaluation on June 12, 1995. Thifensulfuron/tribenuron was required in the herbicide mixture to achieve 65 to 89% control of the mayweed chamomile and pineapple-weed. All herbicide treatments controlled field pennycress 100%. Grain test weights for all treatments were not different and averaged 59.8 lb/bu. Wheat grain yield from herbicide treated plots ranged from 100 to 111 bu/A and were not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

		Winter wheat		Weed control	
Treatment[1]	Rate	Injury[2]	Yield	ANTCO[3]	THLAR
	lb/A	%	bu/A	-------- % --------	
Dicamba + bromoxynil	0.094 + 0.25	0	107	35	100
Bromoxynil	0.25	0	109	38	100
Dicamba + bromoxynil + 2,4-D	0.094 + 0.125 + 0.25	4	104	45	100
Dicamba + bromoxynil + 2,4-D	0.094 + 0.25 + 0.25	5	105	50	100
Bromoxynil + 2,4-D	0.125 + 0.25	0	111	49	100
Bromoxynil + 2,4-D	0.25 + 0.25	0	111	53	100
Dicamba + bromoxynil + thifen/triben	0.094 + 0.125 + 0.0078	0	109	71	100
Dicamba + bromoxynil + thifen/triben	0.094 + 0.25 + 0.0078	1	108	65	100
Bromoxynil + thifen/triben	0.125 + 0.0078	0	109	75	100
Bromoxynil + thifen/triben	0.25 + 0.0078	0	104	80	100
Dicamba + 2,4-D + thifen/triben	0.094 + 0.25 + 0.0078	1	103	81	100
Bromoxynil + 2,4-D + thifen/triben	0.25 + 0.25 + 0.0078	0	104	83	100
Dicamba + bromoxynil + 2,4-D + thifen/triben	0.094 + 0.125 + 0.25 + 0.0078	4	104	89	100
Untreated check		---	100	---	---
	LSD (0.05)	2	NS	10	NS
	Density (plants/ft^2)			11	4

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[1] 2,4-D is an ester formulation; thifen/triben was applied as a commercial formulation of thifensulfuron plus tribenuron; all herbicide treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] May 24, 1995 evaluation.

[3] A mixture of mayweed chamomile and pineapple-weed.

Broadleaf weed control in winter wheat with dicamba combinations. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate broadleaf weed control in winter wheat with different dicamba combinations. Winter wheat (var. Madsen) was seeded on October 18, 1994 in a silt loam soil (25% sand, 64% silt, 11% clay, pH 5.0 and 3.9% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence May 9, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 4 leaf wheat with 5 tillers and 1.5 inch weeds. Environmental conditions at application were as follows: air temp 58 F, relative humidity 80%, wind 2 mph, mostly clear sky, and soil temp 50 F. Winter wheat injury was evaluated visually on May 24 and June 12, 1995. Henbit (LAMAM), mayweed chamomile (ANTCO), prickly lettuce (LACSE), and shepherd's-purse (CAPBP) control were evaluated visually on June 12, 1995. Winter wheat was harvested at maturity with a small plot combine on August 15, 1995.

Dicamba plus 2,4-D plus pyridate treatments injured wheat 4% (laying-over) on May 24, 1995, but injury was not visible at the later evaluation on June 12, 1995. Dicamba treatments containing 2,4-D and pyridate suppressed mayweed chamomile 60 and 71%, and shepherd's-purse 74 and 79%. The treatment with pyridate at 0.235 lb/A suppressed henbit 65%, and 0.47 lb/A of pyridate controlled henbit 88%. The treatment with thifensulfuron/tribenuron at 0.0078 lb/A controlled all weed species 79 to 85%, and 0.0156 lb/A of thifensulfuron/tribenuron controlled all weed species 91% or more. Dicamba plus 2,4-D plus bromoxynil controlled all weed species 89 to 94%. SAN 845H plus the wettable powder formulation of 2,4-D controlled all weed species 83 to 88%, which was comparable to dicamba plus 2,4-D. However, SAN 854H plus the liquid formulation of 2,4-D only suppressed mayweed chamomile 63% and shepherd's-purse 54%. Grain test weights for all treatments were not different and averaged 57.1 lb/bu. Wheat grain yield from herbicide treated plots ranged from 91 to 99 bu/A and were not different from the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

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

Treatment[1]	Rate	Winter wheat		Weed Control			
		Injury[2]	Yield	LAMAM	ANTCO	LACSE	CAPBP
	lb/A	%	bu/A	%			
Dicamba + 2,4-D + thifen/triben	0.094 + 0.25 + 0.0078	0	99	83	79	85	85
Dicamba + 2,4-D + thifen/triben	0.094 + 0.25 +0.0156	0	97	91	91	95	91
Dicamba + 2,4-D + pyridate	0.094 + 0.25 + 0.235	4	96	65	60	85	74
Dicamba + 2,4-D + pyridate	0.094 + 0.25 + 0.47	4	94	88	71	88	79
Dicamba + 2,4-D + bromoxynil	0.094 + 0.25 + 0.25	0	92	89	90	94	93
Dicamba + 2,4-D	0.094 + 0.375	0	93	83	83	88	88
SAN 845H + 2,4-D	0.094 + 0.375	0	93	85	63	83	54
SAN 845H + 2,4-D[3]	0.094 + 0.375	0	91	83	83	88	88
Untreated check		---	93	---	---	---	---
	LSD (0.05)	2	NS	NS	8	7	7
	Density (plants/ft^2)			1	2	1	5

[1] 2,4-D is an amine formulation; thifen/triben was applied as a commercial formulation of thifensulfuron plus tribenuron; all herbicide treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] May 24, 1995 evaluation.

[3] 2,4-D is a wettable powder formulation.

Comparison of imazamethabenz formulations for wild oat control in winter wheat. Terry L. Neider and Donald C Thill. A study was established in Boundary County, ID to compare imazamethabenz formulations for wild oat control in winter wheat. Winter wheat (var. Hill 81) was seeded October 1, 1994 in a loam soil (33% sand, 48% silt, 19% clay, pH 7.8 and 3.7% organic matter). The experimental design was a randomized complete block with four replications and individual plots were 8 by 30 ft. Herbicide treatments were applied postemergence May 15, 1995 with a CO_2 pressurized backpack sprayer delivering 10 gpa at 32 psi to 5 leaf wheat with 3 tillers and 2 to 4 leaf wild oat. Environmental conditions at application were as follows: air temp 78 F, relative humidity 50%, wind 3 mph, partly cloudy sky, and soil temp 68 F. Winter wheat injury was evaluated visually on May 26 and July 18, 1995. Wild oat control was evaluated visually on July 18, 1995. Winter wheat was harvested at maturity with a small plot combine on August 25, 1995.

Winter wheat injury was 5% or less on May 26, 1995, and injury was not visible at the later evaluation on July 18, 1995. Wild oat control varied between imazamethabenz treatments, but wild oat control was 73% or less. This likely was related to the non-competitive winter wheat stand, which established poorly during drought conditions in fall 1994. Tralkoxydim and fenoxaprop/2,4-D/MCPA controlled wild oat 89 and 84%, respectively, while diclofop only suppressed wild oat 48%. Grain test weights for all treatments were not different and averaged 58 lb/bu. Winter wheat yields reflected wild oat control, and grain yields from plots treated with imazamethabenz in combination with bromoxynil/MCPA or thifensulfuron/tribenuron were not different from the untreated check. Wheat grain yields from all other herbicide treated plots were 10 to 20 bu/A more than the untreated check. (Plant Science Division, University of Idaho, Moscow, ID 83844-2339)

Table. Winter wheat response and wild oat control from herbicide treatments, Boundary County, ID.

Treatment[1]	Rate	Winter wheat Injury[2]	Winter wheat Yield	Wild oat control
	lb/A	%	bu/A	%
Imazamethabenz	0.47	0	51	69
Imazamethabenz[3]	0.47	0	50	58
Imazamethabenz + difenzoquat	0.235 + 0.5	4	49	71
Imazamethabenz[3] + difenzoquat	0.235 + 0.5	5	50	73
Imazamethabenz[3] + difenzoquat[3]	0.235 + 0.5	5	44	58
Imazamethabenz[3] + MCPA	0.47 + 0.5	1	54	71
Imazamethabenz[3] + bromoxynil/MCPA	0.47 + 0.5	1	40	56
Imazamethabenz[3] + 2,4-D	0.47 + 0.5	1	49	59
Imazamethabenz[3] + thifen/triben	0.47 + 0.0234	0	43	54
Imazamethabenz[3] + MCPA + thifen/triben	0.47 + 0.25 + 0.0234	1	50	69
Imazamethabenz[3] + bromoxynil/MCPA + thifen/triben	0.47 + 0.5 + 0.0234	3	52	66
Tralkoxydim	0.18	0	54	89
Diclofop	1	5	48	48
Fenox/2,4-D/MCPA	0.59	1	50	84
Untreated check		---	34	---
	LSD (0.10)	2	10	13
	Density (plants/ft^2)			23

[1] 2,4-D and MCPA are ester formulations; bromoxynil/MCPA was applied as a commercial formulation of bromoxynil plus MCPA; tralkoxydim treatment was applied with TF8035 (mineral oil and nonionic surfactant blend) at 0.5% v/v; all imazamethabenz treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] May 26, 1995 evaluation.

[3] Imazamethabenz is a 67% soluble granular (SG) formulation; difenzoquat is a 64% SG formulation.

Control of catchweed bedstraw in winter wheat. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. Two trials were conducted in winter wheat fields in western Oregon to evaluate herbicide effectiveness on catchweed bedstraw. The trial design was a randomized complete block with four replications and 8 by 25 ft plots. A single-wheel compressed-air plot sprayer was used to deliver a broadcast spray of 20 gpa at 15 psi. The Dyksterhuis site was south of Corvallis in Benton County, and the Chambers site was west of Talbot in Marion County. The winter wheat cultivar 'Gene' was seeded at both sites. (Application dates, growth stages, and evaluation dates are listed in Table 1.)

Pyridate and dicamba plus thifensulfuron-tribenuron injured the wheat slightly at the Chambers site (Table 2). All treatments except prosulfuron provided at least 95% catchweed bedstraw control at both sites. Carfentrazone provided 100% control of bedstraw at both sites (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table 1. Application dates, growth stages, and evaluation dates for herbicide treatments at two locations in western Oregon.

	Dyksterhuis	Chambers
Application date	2/20/95	2/3/95
Wheat growth stage	6 to 8 inches, 1 to 2 tillers	4 to 6 inches, 2 to 3 tillers
Bedstraw growth stage	2 to 6 inch diameter	1 whorl to 4 inch diameter
Evaluation date	3/27/95	3/7/95

Table 2. Visual evaluations of wheat injury and catchweed bedstraw control with herbicide treatments at two locations in western Oregon.

		Wheat injury and bedstraw control			
		Dyksterhuis		Chambers	
Treatment[1]	Rate	Wheat	Bedstraw	Wheat	Bedstraw
	(lb/A)	(%)			
Carfentrazone-ethyl	0.03	0	100	0	100
Prosulfuron	0.018	0	81	0	90
Pyridate	0.9	0	100	10	99
Dicamba + thi-tri	0.125 + 0.023	0	95	18	97
Check	0	0	0	0	0

[1] Non-ionic surfactant added to prosulfuron and dicamba + thifensulfuron-tribenuron (thi-tri) treatments @ 0.25% v/v.

Control of Italian ryegrass in winter wheat. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. Three trials were conducted in western Oregon to evaluate FOE 5043 for the control of Italian ryegrass in winter wheat. The trial 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. Preemergence-incorporated (PEI) treatments were applied and hand-raked in two directions on the same day that the preemergence-surface (PES) treatments were applied. Dates of herbicide applications for the three locations are listed in Table 1.

All treatments provided at least 90% control of Italian ryegrass (Table 2). There was no difference in ryegrass control between the two timings of FOE 5043 + metribuzin. The preemergence-surface treatment caused considerable crop injury at the Sheridan site (Table 3). The 1-leaf-stage application caused only minor stunting and produced consistently high yields at the 3 locations. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table 1. Application dates for herbicide treatments at three locations in western Oregon.

	Application dates		
Application timing	Lafayette	Sheridan	Perrydale
PEI & PES	10/12/94	10/25/94	10/25/94
1 leaf	11/7/94	11/18/94	11/18/94
2 leaf	12/9/94	1/10/95	1/10/95

Table 2. Visual evaluations of Italian ryegrass control with herbicide treatments in winter wheat at three locations in western Oregon.

		Application	Italian ryegrass control[2]		
Treatment[1]	Rate	timing	Lafayette	Sheridan	Perrydale
	(lb/A)			(%)	
Triallate/ metribuzin + chlr-met	1.25 0.14 + 0.019	PEI 2 leaf	94	99	90
FOE 5043 + metribuzin	0.25 0.125	PES	100	98	97
FOE 5043 + metribuzin	0.375 0.125	1 leaf	100	99	97
Check	0		0	0	0

[1]Non-ionic surfactant added to metribuzin + chlorsulfuron-metsulfuron (chlr-met) treatment at 0.25% v/v.
[2]Evaluated February 3, 1995.

Table 3. Wheat grain yields and visual evaluations of crop injury from herbicide treatments at three locations in western Oregon.

			Viual evaluation and wheat yield[2]					
		Application	Lafayette		Sheridan		Perrydale	
Treatment[1]	Rate	timing	Injury	Yield	Injury	Yield	Injury	Yield
	(lb/A)		(%)	(bu/A)	(%)	(bu/A)	(%)	(bu/A)
Triallate/ metribuzin + chlr-met	1.25 0.14 + 0.019	PEI 2 leaf	0	90	14	90	0	40
FOE 5043 + metribuzin	0.25 0.125	PES	0	106	24	71	14	48
FOE 5034 + metribuzin	0.375 0.125	1 leaf	5	105	13	86	11	56
Check	0	---	0	26	0	26	20	14
		$LSD_{(.05)}$ CV (%)		16.6 12.7		20.7 19.1		6.1 10.6

[1]Non-ionic surfactant added to metribuzin + chlorsulfuron-metsulfuron (chlr-met) treatment at 0.25% v/v.
[2]Evaluated February 3, 1995.

Enhancing winter wheat tolerance to downy brome. R. L. Anderson. Downy brome remains a difficult-to-control weed for Great Plains winter wheat producers. Producers plant tall wheat varieties to minimize downy brome injury, however, grain yields are usually lower than the semi-dwarf varieties normally grown. This study examined the effect of time of nitrogen application and seeding rate on improving grain yield of winter wheat varieties when infested with downy brome.

A semi-dwarf variety, TAM 107, and a tall variety, Lamar, were planted at 40 and 65 lb/A on September 23, 1994. Nitrogen fertilizer (ammonium nitrate) at 60 lb N/A was applied in either April, 5 months before planting, or August. Downy brome from the indigenous soil seed bank emerged within 2 weeks of wheat emergence. Average downy brome density was 60 plants/m^2. The experimental design was a 3-way factorial, with four replications. Plot size was 6 by 10 m.

Within each plot, three subplots (1 m^2) were established: two sub-plots with downy brome present, and one subplot maintained weed-free by hand weeding. Downy brome was harvested from infested-subplots in late June for biomass (dry weight) and seed production. Winter wheat from each subplot was harvested at maturity, and biomass and grain yield determined. Downy brome biomass in each treatment was compared to the treatment representing the conventional practice of producers in this area: TAM 107 planted at 40 lb/A, with N applied in August. Also, downy brome component of the plant community was determined. Winter wheat grain yield from the infested-subplots was expressed as percent yield loss compared to the weed-free control for each treatment.

Downy brome response. Downy brome growth was decreased most by Lamar. Compared to the conventional practice, growing Lamar reduced downy brome biomass 43%, when averaged over seeding rate and N treatments (see Table). Only when N was applied in April and seeding rate increased to 65 lb/A did TAM 107 reduce downy brome biomass production. Downy brome comprised 56% of the plant community with TAM 107, but only 31% with Lamar, again showing that Lamar was more competitive. Downy brome also produced less seed in the Lamar canopy, as seed production/m^2 was reduced 41% when Lamar was planted at 65 lb/A and N applied in April compared to the conventional practice (data not shown). For all treatments, the percent reduction in downy brome seed produced was similar to the biomass reduction.

Winter wheat response. In weed-free conditions, Lamar produced 44 bu/A, while TAM 107 yielded only 29 bu/A when averaged across seeding rate and N treatments. The growing season was cooler than normal, and received 168% of normal precipitation (19.3 vs. 11.5 in). These conditions resulted in TAM 107 yields being lower than normal. Lamar yield loss due to downy brome interference was 26%, averaged over all treatments, while TAM 107 yield loss was 43%. Seeding rate and N treatments did not influence Lamar response to downy brome interference or its weed-free yields. With TAM 107, however, applying N in August increased wee-free yields with both seeding rates compared to the April application of N when TAM 107 was planted at 40 lb/A.

Producers will no only reduce their yield loss due to downy brome interference by growing taller varieties, but also reduce downy brome seed production. This reduced seed input into the soil seed bank may lessen downy brome densities in future wheat crops (USDA-ARS, P. O. Box 400, Akron, CO 80720).

Table. Effect of cultural practices on downy brome interference in winter wheat.

Variety	Nitrogen application	Seeding rate	Dobr biomass reduction[1]	Dobr % of community[2]	Wheat yield loss[3]	Wheat yield[4]
		lb/ac		%		bu/A
TAM 107	April	40	7	58	36	22
	April	65	28	46	40	30
	August	40	0	64	45	32
	August	65	6	56	49	32
		LSD (0.05)	23	12	NS	8
Lamar	April	40	44	30	23	43
	April	65	45	28	25	42
	August	40	41	32	25	43
	August	65	40	33	30	48
		LSD (0.05)	NS	NS	NS	NS
	Variety means, averaged over all treatments					
	TAM 107		10	56	43	29
	Lamar		43	31	26	44

[1] Biomass (dry weight) of downy brome (Dobr) in treatmetn compared to Dobr biomass (550 g/m^2) in the conventional practice of TAM 107, seeded at 40 lb/A, with N applied in August.

[2] Dobr biomass divided by Dobr biomass + winter wheat biomass.

[3] Grain yield of weed-free subplot minus grain yield of Dobr-infested subplot, divided by weed-free grain yield.

[4] Grain yield from weed-free subplots.

F8426 combinations with wild oat herbicides in winter wheat. Terry L. Neider and Donald C. Thill. A study was established in Latah County, ID to evaluate F8426 efficacy in combination with wild oat herbicides. Winter whe Madsen) was seeded October 5, 1995 in a silt loam soil (25% sand, 68% silt, 7% clay, pH 6.7 and 2.9% organic The experimental design was a randomized complete block with four replications and individual plots were 8 b Herbicide treatments were applied postemergence May 13, 1995 with a CO_2 pressurized backpack sprayer de gpa at 32 psi to 4 leaf wheat with 2 tillers, 1 inch broadleaf weeds, and 2 to 3 leaf grass weeds. Environmer conditions at application were as follows: air temp 64 F, relative humidity 58%, wind 3 mph, clear sky, an F. Winter wheat injury was evaluated visually on May 19, May 30, and July 7, 1995. Wild buckwheat (P ladysthumb (POLPE), mayweed chamomile (ANTCO), field pennycress (THLAR), and volunteer lentil evaluated visually on May 19 and May 30, 1995. Wild oat (AVEFA), Italian ryegrass (LOLMU), and windgrass (APEIN) control were evaluated visually on July 7, 1995. Winter wheat was harvested at small plot combine on August 25, 1995.

F8426 treatments injured (chlorosis and/or necrotic tissue) winter wheat by the early evaluation wheat injury was not visible by the later evaluation on July 7, 1995. F8426 treatments controlle pennycress, ladysthumb and volunteer lentil 73 to 100%, while mayweed chamomile was only F8426 treatments containing a wild oat herbicide controlled wild oat 90 to 93%. F8426 trea suppressed Italian ryegrass 59 and 62%, and F8426 treatments containing imazamethabenz windgrass 66 and 73%. Wild oat control was enhanced when F8426 was applied in comb imazamethabenz. Grain test weights for all treatments were not different and averaged 5 were variable and yields from herbicide treated plots were not different from the untreated c Division, University of Idaho, Moscow, ID 83844-2339)

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

		Winter wheat										
		Injury		Grain	Weed control							
Treatment[1]	Rate	5/19/95	5/30/95	yield	POLCO	POLPE	ANTCO	THLAR	LENCU	AVEFA	LOLMU	APEIN
	lb/A	------ % ------		bu/A	%							
F8426	0.023	5	0	71	89	73	43	97	83	0	0	0
F8426	0.031	5	0	67	95	80	53	100	75	0	0	0
F8426[2]	0.023	14	4	74	85	75	53	98	80	0	0	0
F8426[2]	0.031	13	3	60	93	73	50	97	83	0	0	0
F8426 + diclofop	0.023 + 1	13	3	69	96	75	56	100	80	91	59	0
F8426 + diclofop	0.031 + 1	15	3	74	100	75	48	100	83	92	62	0
F8426 + Imazamethabenz	0.023 + 0.47	9	3	82	95	90	53	100	76	93	0	66
F8426 + Imazamethabenz	0.031 + 0.47	11	4	65	96	95	63	100	85	90	0	73
Diclofop	1	1	0	59	0	0	0	0	0	87	57	0
Imazamethabenz	0.47	0	0	59	35	15	0	53	0	83	0	60
Thifen/triben + diclofop	0.0234 + 1	0	0	61	80	78	73	77	78	90	62	0
Thifen/triben + imazamethabenz	0.0234 + 0.47	0	0	76	88	86	65	90	73	89	0	64
Untreated check		---	---	59	---	---	---	---	---	---	---	---
LSD (0.05)		3	2	NS	9	17	12	9	11	4	7	4
Density (plants/ft^2)					8	10	6	5	4	11	3	3

[1] All imazamethabenz and thifensulfuron/tribenuron treatments were applied with a 90% nonionic surfactant at 0.25% v/v.

[2] Applied with a 90% nonionic surfactant at 0.25% v/v.

Reduced herbicide rates applied with an air-shear sprayer in winter wheat. Joan M. Campbell and Donald C. Thill Two experiments in winter wheat compared an air-shear spray application against conventional spray application for broadleaf weed control with postemergence herbicides. Thifensulfuron/tribenuron+bromoxynil/MCPA were applied at 1x (0.019+0.5 lb/a, respectively), 3/4x, 1/2x, 1/4x, and 0 with each application method at Lewiston and Potlatch, Idaho (Table 1). Sprayers were tractor mounted with 15 ft booms. The conventional treatments were applied at 10 gal/A, 40 psi, and 3 mph. The air-shear treatments were applied at 5 gal/A, 11 psi liquid pressure, 21 inches air over water air pressure, and 4.6 mph. The experimental design was a complete block with four replications. Plots were 15 by 40 ft. Weeds were sampled in each plot from two 2.25 ft^2 areas within one week of grain harvest to enable maximum weed seed recovery. Plants were counted, dried, and weighed and seed was threshed and weighed. Wheat grain was harvested at maturity.

Table 1. Environmental data.

Experiment location	Lewiston	Potlatch
Application date	April 26, 1995	May 15, 1995
Air temperature	65 F	74 F
Soil temperature	52 F @ 4 inch	60 F @ 4 inch
Relative humidity	55%	62%
Cloud cover	10%	overcast
Wind speed	0 to 2.5 mph	0 to 5 mph

Weed seed production tended to increase with a reduction in herbicide rates applied with either spray system at both locations (Tables 2 and 3). Total weed density was higher with the conventional sprayer (50 plants/yd^2) than the air-shear sprayer (20 plants/yd^2) at Lewiston (Table 2). However, the conventional spray system resulted in fewer weeds, lower weed biomass, and lower weed seed weight than the air-shear system at Potlatch (Table 3). There was no rate by sprayer type interaction at either location. Crop yield was reduced only in the untreated control at both locations. (Plant Science Division, University of Idaho, Moscow Idaho 83844-2339)

Table 2. Weed control in winter wheat with reduced herbicides applied through an air-shear sprayer at Lewiston.

	Weed[1] density		Weed biomass		Weed seed weight		Wheat test weight		Wheat grain yield	
Rate	Air	Conv.	Air	Conv.	Air	Conv.	Air	Conv.	Air	Conv.
	-- plants/yd^2 --		--- g/yd^2 ---		--- g/yd^2 ---		--- lb/bu ---		--- bu/A ---	
Check	68		152		3.9		57.7		81	
1/4 x	50	67	53	20	1.93	0.98	57.6	57.6	112	107
1/2 x	13	84	1	18	0.31	0.84	58.2	57.8	115	110
3/4 x	6	37	1	2	0.20	0.26	58.3	57.9	121	109
1 x	11	14	1	3	0.06	0.66	58.1	58.4	109	114
Mean	20	50	14	11	0.63	0.69	58.0	57.9	114	110

[1] Catchweed bedstraw, prickly lettuce, wild buckwheat, shepherd's-purse, field pennycress, mayweed chamomile, wild mustard, yellow starthistle

Table 3. Weed control in winter wheat with reduced herbicides applied through an air-shear sprayer at Potlatch.

	Weed[1] density		Weed biomass		Weed seed weight		Wheat test weight		Wheat grain yield	
Rate	Air	Conv	Air	Conv	Air	Conv	Air	Conv	Air	Conv
	-- plants/yd^2 --		--- g/yd^2 ---		--- g/yd^2 ---		--- lb/bu ---		--- bu/A ---	
Check	182		83		0.72		54.0		56	
1/4 x	150	42	20	5	1.01	0.15	54.9	54.4	67	66
1/2 x	42	48	5	5	0.26	0.12	54.8	54.9	61	58
3/4 x	14	8	1	0.3	0.03	0.00	55.0	55.0	61	69
1 x	27	4	14	1	0.15	0.07	55.1	55.1	68	65
Mean	59	26	10	3	0.36	0.08	55.0	54.9	64	64

[1] Prickly lettuce, panicle willoweed, wild buckwheat, red clover, erect knotweed, field pennycress, shepherd's-purse

Jointed goatgrass interference in southern Idaho winter wheat. Don W. Morishita and Robert W. Downard. A field experiment was conducted near Twin Falls, Idaho to determine the competitiveness of jointed goatgrass in dryland winter wheat (var. Stephens). The crop and jointed goatgrass were planted October 13, 1994. Winter wheat seeding rate was 60 lb/A in a 12-inch row spacing. Jointed goatgrass was seeded to obtain uniform densities of 5, 10, 25, and 50 plants/yd^2. Plots were thinned to desired jointed goatgrass densities in the early spring. The experimental design was a randomized complete block with four replications. A postemergence application of bromoxynil and MCPA was applied at 1.0 lb/A for broadleaf weed control May 3. Jointed goatgrass and wheat were harvested by hand August 1. Jointed goatgrass seed number and yield and wheat yield were determined from each plot and averaged.

As jointed goatgrass populations increased, seed number and yield increased (Table). However, jointed goatgrass seed yields decreased from 196 seeds/plant at a density of 5 plants/yd^2 to 106 seeds/plant at 50 plants/yd^2. Wheat yields decreased as jointed goatgrass plant density increased. There was no wheat yield reduction at jointed goatgrass populations of 5 and 10 plants/yd^2 compared to the weed-free check. (Department of Plant, Soil, and Entomological Sciences, University of Idaho, Twin Falls, ID 83303)

Table. Jointed goatgrass and wheat seed yield, near Twin Falls, Idaho.

Jointed goatgrass density	Jointed goatgrass seed/acre	Jointed goatgrass seed weight	Wheat yield
plants/yd^2	seed x 10^6	lb/A	Bu/A
0	0	0	57
5	4.7	415	48
10	7.1	602	50
24	13.9	1111	40
47	25.7	2059	36
LSD (0.05)	4.8	405	11

Triallate an seed protectant interaction effect on wheat stand establishment and yield. Daniel A. Ball, Darrin L. Walenta, Richard W. Smiley, and Lisa-Marie J. Patterson. A study was established at the Columbia Basin Agricultural Research Center near Pendleton, OR to evaluate possible interactions between triallate and two commercially available wheat seed protectants on winter wheat stand establishment and yield. Speculation on the possible safening effects of seed protectants against triallate injury on wheat prompted this trial. Seed protectants evaluated in this study were difenoconazole, formulated as Dividend, and carboxin+thiram, formulated as RTU Vitavax Thiram. Winter wheat var. 'Madsen' from a single seed lot was treated with commercially recommended seed protectant rates of 0.5 oz/cwt Dividend, or 6.0 oz/cwt RTU Vitavax Thiram. The study was arranged as a split-plot design with main treatments consisting of seed protectants and an untreated seed control. Main treatments were split into sub-plots consisting of preplant incorporated (PPI) triallate applied at 1.5 lb/A, 3.0 lb/A, and an untreated control. Main treatments were 10 by 90 ft in size, and sub-plots were 10 by 30 ft, with 3 replications. Soil at the site was a Walla Walla silt loam (25.6% sand, 59.2% silt, 15.2% clay. 1.6% organic matter. 5.6 pH, and 16.2 Meq/100 g CEC). PPI granular triallate sub-treatments were applied on September 28, 1994 with a drop spreader (air temp. 87 F, sky partly cloudy, wind NW at 4 mph, relative humidity 34%, soil temp. at 0 inch 115 F,1 inch 103 F, 2 inch 96 F, 4 inch 80 F), and incorporated twice at right angles with a flex-tine harrow set to a 2 inch depth. Percent germination of treated seed was evaluated in the laboratory in two separate tests on September 28 and October 13, 1994 by placing 4 replications of 200 seeds from each treatment in moistened rolled paper towels and placing in a laboratory seed germinator at 20C with no illumination. Germinated seed were counted periodically over a 14 day period. Treated winter wheat was planted in field plots on October 4, 1994 at a 2 inch depth into moist soil with a Great Plains double disk drill. Evaluations of early wheat emergence in the field were made 14 and 16 days after planting by counting two 0.5 m sections of row per plot. Final wheat stand estimates were made on November 8, 1994 and March 24, 1995 by counting all wheat plants in two 1.0 m sections of row per plot. Plants from one 0.5 m of row per plot were collected on April 19, 1995, roots washed free of soil and visually evaluated for *Rhizoctonia* root rot, take-all, and dryland root rot diseases. On June 22, 1995 wheat heads from two 1.0 m sections of row per plot were counted, and wheat plant heights obtained. Grain was harvested on July 24, 1995 with a Hege plot combine, and yields converted to bu/A based on a 60 lb/bu test weight.

Laboratory germination counts for wheat treated with seed protectants were not significantly different and averaged difenoconazole, 98.3%; carboxin+thiram, 95.3%; and untreated seed, 97.5%. No significant differences in early wheat seedling field emergence due to seed protectant or triallate were observed (Table 1), partly due to a high level of viablility in overall emergence data. Stand counts of untreated wheat seed plots were reduced on November 8th compared to either seed protectant when averaged over all triallate sub-treatments (Table 1). On March 24th, stand count was less for untreated compared to treated seed averaged over all triallate treatments (Table 1). Triallate at 3.0 lb/A reduced wheat stand where wheat seed was untreated. Negligible differences in plant root or crown disease from any seed treatment or herbicide were observed from plants sampled and rated on April 19 (data not shown). These data indicate that both seed treatments improved wheat stand counts in triallate treated field soil, however, wheat plant height, head count. grain yield, nor test weight were affected by seed protectant or triallate in this trial (Table 2). (Columbia Basin Ag. Res. Ctr., Oregon State Univ., Pendleton, OR 97801).

Table 1. Triallate/seed treatment influence on wheat emergence and final stand.

			Wheat Emergence		Wheat Stand	
Seed Treatment	Herbicide	Rate	October 18	October 20	November 8	March 24
		lb /A	---------------- no. plants/m of row			----------------
Difenoconazole	triallate	1.5	5.0	23.4	32.7	26.5
	triallate	3.0	9.6	9.4	32.0	23.2
	control	---	17.0	17.4	35.5	27.2
Carboxin+thiram	triallate	1.5	13.0	22.0	38.0	27.2
	triallate	3.0	10.3	21.0	34.3	26.3
	control	---	3.6	14.4	37.8	30.2
Control	trillate	1.5	5.4	20.4	29.2	22.3
	triallate	3.0	5.0	17.6	31.7	17.7
	control	---	9.2	25.6	30.2	27.3
LSD (0.05)	seed treatment		ns	ns	4.4	4.1
	herbicide		ns	ns	ns	4.1
	seed treatment * herbicide		ns	ns	ns	ns

Table 2. Triallate/seed treatment influence on wheat plant height, head count, grain yield, and test weight

			Winter wheat			
Seed Treatment	Herbicide	Rate	Height	Heads	Yield	Test weight
		lb /A	cm	plants/m	bu/A	lb/bu
Difenoconazole	triallate	1.5	95	110	113	62.0
	triallate	3.0	95	105	110	61.9
	control	---	97	119	116	62.1
Carboxin-thiram	triallate	1.5	97	116	113	62.0
	triallate	3.0	97	115	115	60.5
	control	---	92	106	111	62.4
Control	trillate	1.5	94	104	114	62.0
	triallate	3.0	93	97	109	62.0
	control	---	97	112	116	61.8
LSD (0.05)	seed treatment		ns	ns	ns	ns
	herbicide		ns	ns	ns	ns
	seed treatment * herbicide		ns	ns	ns	ns

Wild oat and Italian ryegrass control in winter wheat. Carol Mallory-Smith, Bill D. Brewster, and Dennis M. Gamroth. Two trials were conducted to evaluate wild oat control in winter wheat with postemergence herbicides. One of the sites was also infested with Italian ryegrass. 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 a broadcast spray of 20 gpa at 15 psi. One trial site was near Perrydale in Polk County, OR, and the other was near Woodburn in Marion County, OR. Application dates and growth stages are listed in Table 1.

All treatments provided greater than 90% control of wild oats (Table 2). Tralkoxydim was slightly more effective than diclofop-methyl on wild oats at both locations. Imazamethabenz was somewhat better than diclofop-methyl on wild oats at the Polk County site, but failed to control Italian ryegrass at the Marion County site. Diclofop-methyl provided complete control of Italian ryegrass. (Dept. of Crop and Soil Science, Oregon State Univ., Corvallis, OR 97331-3002.)

Table 1. Herbicide application information for two trials in western Oregon.

	Polk County	Marion County
Application date	2/3/95	2/22/95
Wheat growth stage	4 leaf, 1 to 2 tillers	3 leaf
Wild oat stage	4 leaf, 0 to 2 tillers	3 to 4 leaf
Ryegrass stage	-----	4 leaf, 1 to 2 tillers
Evaluation date	6/21/95	6/22/95
Harvest date	8/9/95	8/9/95

Table 2. Wheat grain yields and visual evaluations of wild oat and Italian ryegrass control from herbicide treatments, Polk and Marion Counties, OR.

		Wheat yield and weed control				
		Polk County		Marion County		
Treatment[1]	Rate	Wheat	Wild oats	Wheat	Wild oats	Italian ryegrass
	(lb/A)	(bu/A)	(%)	(bu/A)	-------- (%)	--------
Tralkoxydim	0.18	109	100	76	94	91
Tralkoxydim	0.25	109	100	81	97	94
Imazamethabenz	0.47	106	95	34	99	0
Diclofop-methyl	1	104	97	81	91	100
Check	0	44	0	15	0	0
	$LSD_{(.05)}$	15.7		14.5		
	CV (%)	10.8		16.4		

[1] A mineral oil and non-ionic surfactant blend was added to tralkoxydim treatments at 0.5% v/v. A non-ionic surfactant was added to imazamethabenz treatments at 0.25% v/v.

PROJECT 4

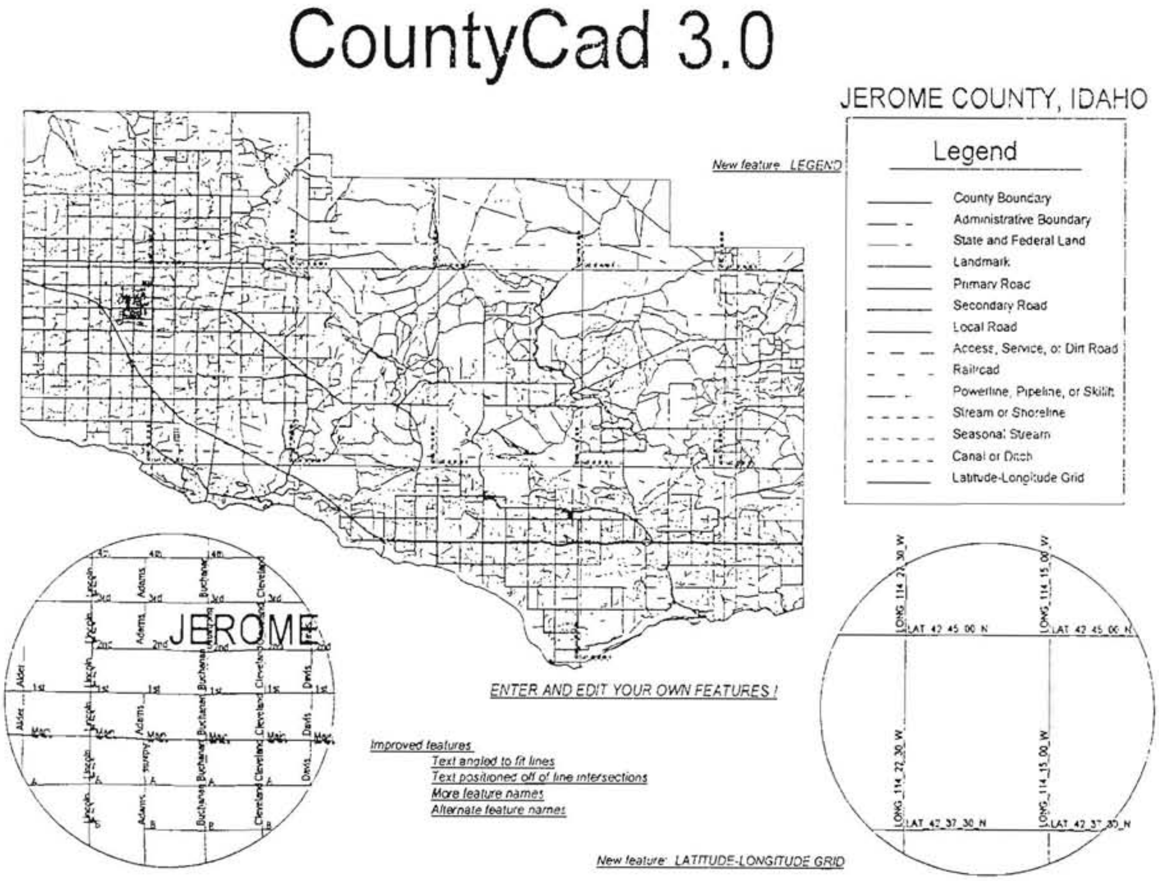
EXTENSION EDUCATION AND REGULATORY

Chairperson: Beverly Durgan
University of Minnesota
St. Paul, MN

A simple method for computer mapping of weed infestations and other features in DOS or Windows. Lawrence W. Lass, Hubert W. Carson and Robert H. Callihan. COUNTYCAD 3.0 and REGIONCAD 3.0 for DOS, Windows and Windows 95 are simple, but useful systems for the computer mapping of geographically-distributed data. Each enables non-cartographers to draw and display data in map form without the expense of a full Geographic Information System (GIS) and highly-trained support personnel.

COUNTYCAD and REGIONCAD are data sets which are used with the EasyCAD software program. Data is added or edited as layers, much as transparencies are overlaid on an overhead projector. Positions or boundaries of weed populations and other features are easily entered with a mouse or from global positioning system data. COUNTYCAD and REGIONCAD display roads, streams, water bodies, towns, political boundaries and a latitude and longitude grid. COUNTYCAD includes both primary and secondary names for map features.

COUNTYCAD and REGIONCAD are fully compatible with EasyCAD for Windows and EasyCAD for DOS. EasyCAD for Windows utilizes the Windows Clipboard feature and has full printer support including color and FAX capabilities. EasyCAD for Windows offers many different feature styles, lines of variable width, printable coordinates for map features, increased selection of text fonts, new menu with zoom buttons on the side, easy alignment of grid to map features, and comes with an improved COUNTYCAD manual. Data may be exchanged with most GIS packages. The program runs on any IBM or compatible computer running Windows or DOS with a hard disk, mouse and printer. This low-cost mapping software allows for simple record-keeping of pest locations and management planning. (Plant Science Division, University of Idaho, Moscow, ID, 83844-2339)



Newly reported weed species; potential weed problems in Idaho. Timothy W. Miller, Robert H. Callihan and Sherri L. Carson. 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 1995. Two species were found to be new records for Idaho in 1995. Extensions of the ranges of several species that have been present in Idaho for several years were also recorded. Twenty species were found to be new records for individual counties in 1995. 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 December 1, 1994 to November 30, 1995. 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. *Anthriscus sylvestris* (L.) Hoffman (ANRSY) chervil, wild; Apiaceae.
   County: Latah.
2. *Centaurea macrocephala* Puschk. (CENMC) knapweed, bighead; Asteraceae.
   County: Idaho.

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

1. *Acroptilon repens* (L.) D.C. (CENRE) knapweed, Russian; Asteraceae.
   County: Lewis.
2. *Adonis aestivalis* L. (*) pheasant-eye; Ranunculaceae.
   County: Power.
3. *Alyssum alyssoides* (L.) L. (AYSAL) alyssum, yellow; Brassicaceae.
   County: Fremont.
4. *Alyssum desertorum* Stapf (AYSDE) alyssum, dwarf; Brassicaceae.
   County: Clark.
5. *Anchusa arvensis* (L.) Bieb. (LYCAR) bugloss, small; Boraginaceae.
   County: Benewah.
6. *Datura stramonium* L. (DATST) jimsonweed; Solanaceae.
   County: Kootenai, Bonner.
7. *Digitaria sanguinalis* (L.) Scop. (DIGSA) crabgrass, large; Poaceae.
   County: Twin Falls.
8. *Hesperis matronalis* L. (HEVMA) damesrocket; Brassicaceae.
   County: Twin Falls.
9. *Leonurus cardiaca* L. (LECCA) motherwort; Lamiaceae.
   County: Oneida.
10. *Mollugo verticillata* L. (MOLVE) carpetweed; Aizoaceae.
    County: Ada.
11. *Myosotis scorpioides* L. (MYOPA) forget-me-not, true; Boraginaceae.
    County: Shoshone.
12. *Navarretia squarrosa* (Esch.) H. & A. (*) skunkweed; Polemoniaceae.
    County: Kootenai.
13. *Onobrychis viciaefolia* Scop. (*) sainfoin; Fabaceae.
    County: Power.
14. *Oxalis stricta* L. (OXAST) woodsorrel, yellow; Oxalidaceae.
    County: Latah.
15. *Panicum miliaceum* L. (PANMI) millet, wild-proso; Poaceae.
    County: Clearwater.
16. *Polypogon monspeliensis* (L.) Desf. (POHMO) polypogon, rabbitfoot; Poaceae.
    County: Clark, Washington.
17. *Ranunculus arvensis* L. (RANAR) buttercup, corn; Ranunculaceae.
    County: Latah.
18. *Sisymbrium loeselii* L. (SSYLO) mustard, tall hedge; Brassicaceae.
    County: Clark.
19. *Sorghum halepense* (L.) Pers. (SORHA) Johnsongrass; Poaceae.
    County: Payette.
20. *Spergularia rubra* (L.)Presl. (SPBRU) sandspurry, red; Caryophyllaceae.
    County: Gem, Ada.

*) No Bayer Code listed in WSSA Composite List of Weeds.

1995 weed identifications for county extension and weed control programs in Idaho. Timothy W. Miller, Robert H. Callihan and Sherri L. Carson. 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 294 plants were submitted for identification or verification in the reporting period December 1, 1994 to November 30, 1995. Two hundred and eighty-four of these were from the state of Idaho, with ten submitted from other states. One hundred and ninety-seven 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; ninety-seven 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 rubrum, Aceraceae	Ada	November 06, 1995
Acroptilon repens, Asteraceae	Lewis	June 08, 1995
Adonis aestivalis, Ranunculaceae	Idaho	May 25, 1995
Adonis aestivalis, Ranunculaceae	Power	August 10, 1995
Agoseris grandiflora, Asteraceae	Kootenai	July 14, 1995
Alopecurus pratensis, Poaceae	Idaho	August 22, 1995
Alyssum alyssoides, Brassicaceae	Fremont	June 28, 1995
Alyssum desertorum, Brassicaceae	Clark	April 26, 1995
Ambrosia acanthicarpa, Asteraceae	Gem	October 23, 1995
Ambrosia acanthicarpa, Asteraceae	Minidoka	August 28, 1995
Amelanchier alnifolia, Rosaceae	Ada	August 02, 1995
Amsinckia retrorsa, Boraginaceae	Benewah	May 31, 1995
Anchusa arvensis, Boraginaceae	Benewah	May 31, 1995
Anthriscus sylvestris, Apiaceae	Latah	May 19, 1995
Arabis holboellii pinetorum, Brassicaceae	Fremont	June 01, 1995
Arnica cordifolia cordifolia, Asteraceae	Idaho	June 12, 1995
Artemisia ludoviciana, Asteraceae	Ada	July 14, 1995
Artemisia ludoviciana, Asteraceae	Butte	October 02, 1995
Asclepias speciosa, Asclepiadaceae	Lewis	August 29, 1995
Asperugo procumbens, Boraginaceae	Minidoka	June 01, 1995
Astragalus filipes, Fabaceae	Washington	June 21, 1995
Atriplex rosea, Chenopodiaceae	Bingham	October 09, 1995
Atriplex rosea, Chenopodiaceae	Lincoln	October 30, 1995
Azolla mexicana, Salviniaceae	Ada	November 03, 1995
Bidens cernua, Asteraceae	Clark	July 19, 1995
Bidens frondosa, Asteraceae	Bonner	September 05, 1995
Brassica kaber, Brassicaceae	Kootenai	August 08, 1995
Brassica napus, Brassicaceae	Washington	October 23, 1995
Brassica rapa, Brassicaceae	Jerome	September 25, 1995
Bromus tectorum, Poaceae	Ada	May 02, 1995
Bryonia alba, Cucurbitaceae	Franklin	August 15, 1995
Bryonia alba, Cucurbitaceae	Fremont	June 28, 1995
Bryonia alba, Cucurbitaceae	Latah	July 26, 1995
Camelina microcarpa, Brassicaceae	Gem	July 10, 1995
Campanula rapunculoides, Campanulaceae	Twin Falls	April 28, 1995
Carduus acanthoides, Asteraceae	Lewis	July 17, 1995
Carex vesicaria vesicaria, Cyperaceae	Nez Perce	June 20, 1995
Castilleja angustifolia, Scrophulariaceae	Twin Falls	June 22, 1995
Centaurea macrocephala, Asteraceae	Idaho	July 21, 1995
Chenopodium foliosum, Chenopodiaceae	Idaho	September 19, 1995
Chondrilla juncea, Asteraceae	Bonner	September 25, 1995
Chondrilla juncea, Asteraceae	Twin Falls	June 09, 1995
Cirsium arvense, Asteraceae	Lewis	June 30, 1995
Cirsium arvense, Asteraceae	Caribou	September 25, 1995
Clarkia amoena, Onagraceae	Gem	July 18, 1995
Cleome lutea, Capparidaceae	Twin Falls	June 09, 1995
Collomia grandiflora, Polemoniaceae	Latah	June 27, 1995
Collomia linearis, Polemoniaceae	Fremont	June 28, 1995
Crambe abyssinica, Brassicaceae	Bingham	August 17, 1995
Crepis acuminata, Asteraceae	Twin Falls	June 09, 1995
Crepis occidentalis occidentalis, Asteraceae	Custer	June 22, 1995
Crepis occidentalis occidentalis, Asteraceae	Washington	June 01, 1995
Cuscuta pentagona calycina, Convolvulaceae	Gem	September 11, 1995
Cuscuta pentagona calycina, Convolvulaceae	Kootenai	August 29, 1995
Cytisus nigricans, Fabaceae	Ada	November 03, 1995
Dactylis glomerata, Poaceae	Kootenai	May 17, 1995
Datura stramonium, Solanaceae	Bonner	September 14, 1995
Datura stramonium, Solanaceae	Kootenai	June 15, 1995
Daucus carota, Apiaceae	Idaho	August 21, 1995
Deschampsia elongata, Poaceae	Kootenai	September 27, 1995
Descurainia sophia, Brassicaceae	Kootenai	May 30, 1995
Dianthus latifolius, Caryophyllaceae	Twin Falls	May 30, 1995
Digitaria ischaemum, Poaceae	Kootenai	August 21, 1995
Digitaria sanguinalis, Poaceae	Twin Falls	August 25, 1995
Eleocharis ovata, Cyperaceae	Kootenai	September 19, 1995
Epilobium glaberrimum, Onagraceae	Twin Falls	July 11, 1995
Epilobium paniculatum, Onagraceae	Lewis	April 28, 1995
Epilobium watsonii, Onagraceae	Ada	May 05, 1995
Equisetum arvense, Equisetaceae	Benewah	May 25, 1995
Equisetum fluviatile, Equisetaceae	Benewah	May 25, 1995

Eragrostis cilianensis, Poaceae	Franklin	October 23, 1995
Erigeron annuus, Asteraceae	Ada	June 19, 1995
Eriophyllum lanatum lanatum, Asteraceae	Benewah	June 09, 1995
Euphorbia marginata, Euphorbiaceae	Twin Falls	September 14, 1995
Exochorda racemosa, Rosaceae	Ada	July 12, 1995
Festuca arundinacea, Poaceae	Ada	September 22, 1995
Festuca rubra, Poaceae	Ada	April 03, 1995
Festuca rubra, Poaceae	Canyon	July 18, 1995
Frasera fastigiata, Gentianaceae	Kootenai	June 02, 1995
Frasera fastigiata, Gentianaceae	Kootenai	May 17, 1995
Funaria hygrometrica, Funariaceae	Oneida	June 30, 1995
Galium aparine, Rubiaceae	Kootenai	July 05, 1995
Geum macrophyllum, Rosaceae	Benewah	May 04, 1995
Gilia aggregata aggregata, Polemoniaceae	Benewah	June 27, 1995
Glycyrrhiza lepidota, Fabaceae	Boundary	October 20, 1995
Gnaphalium chilense, Asteraceae	Kootenai	July 24, 1995
Grindelia squarosa, Asteraceae	Clark	July 19, 1995
Gypsophila elegans, Caryophyllaceae	Minidoka	July 05, 1995
Hesperis matronalis, Brassicaceae	Twin Falls	May 22, 1995
Iva axillaris, Asteraceae	Blaine	August 02, 1995
Juncus bufonius, Juncaceae	Kootenai	August 01, 1995
Juniperus communis, Cupressaceae	Gem	April 17, 1995
Juniperus communis, Cupressaceae	Washington	January 26, 1995
Juniperus squamata, Cupressaceae	Kootenai	November 07, 1995
Knautia arvensis, Dipsacaceae	Custer	July 10, 1995
Lactuca pulchella, Asteraceae	Kootenai	July 06, 1995
Leonurus cardiaca, Lamiaceae	Oneida	July 21, 1995
Leonurus cardiaca, Lamiaceae	Oneida	June 27, 1995
Lepidium campestre, Brassicaceae	Twin Falls	June 22, 1995
Lesquerella occidentalis cusickii, Brassicaceae	Clark	May 30, 1995
Ligusticum verticillatum, Apiaceae	Idaho	June 14, 1995
Lithophragma parviflora, Saxifragaceae	Idaho	June 12, 1995
Lithophragma tenella tenella, Saxifragaceae	Elmore	February 27, 1995
Lolium multiflorum, Poaceae	Ada	March 20, 1995
Lolium multiflorum, Poaceae	Ada	March 16, 1995
Lolium perenne, Poaceae	Canyon	July 17, 1995
Lolium perenne, Poaceae	Kootenai	October 04, 1995
Lolium perenne, Poaceae	Ada	June 27, 1995
Lomatium dissectum dissectum, Apiaceae	Idaho	June 28, 1995
Lamatium foeniculaceum, Apiaceae	Minidoka	April 07, 1995
Lonicera utahensis, Caprifoliaceae	Bonneville	September 15, 1995
Lunaria rediviva, Brassicaceae	Ada	April 17, 1995
Lunaria rediviva, Brassicaceae	Kootenai	April 26, 1995
Lygodesmia juncea, Asteraceae	Power	September 29, 1995
Lythrum salicaria, Lythraceae	Boundary	March 03, 1995
Lythrum salicaria, Lythraceae	Gem	August 31, 1995
Madia glomerata, Asteraceae	Blaine	August 10, 1995
Madia glomerata, Asteraceae	Kootenai	July 06, 1995
Madia glomerata, Asteraceae	Kootenai	July 24, 1995
Marrubium vulgare, Lamiaceae	Twin Falls	June 23, 1995
Matricaria perforata, Asteraceae	Kootenai	July 06, 1995
Mentzelia laevicaulis laevicaulis, Loasaceae	Lemhi	July 19, 1995
Mentzelia laevicaulis laevicaulis, Loasaceae	Gem	August 11, 1995
Mentzelia laevicaulis laevicaulis, Loasaceae	Kootenai	July 21, 1995
Microsteris gracilis, Polemoniaceae	Kootenai	July 05, 1995
Mollugo verticillata, Aizoaceae	Ada	August 17, 1995
Myosotis scorpioides, Boraginaceae	Kootenai	July 27, 1995
Navarretia intertexta, Polemoniaceae	Latah	October 16, 1995
Navarretia intertexta, Polemoniaceae	Kootenai	July 24, 1995
Navarretia squarrosa, Polemoniaceae	Kootenai	September 27, 1995
Nemophila breviflora, Hydrophyllaceae	Fremont	June 22, 1995
Oenothera biennis, Onagraceae	Twin Falls	May 25, 1995
Oenothera biennis, Onagraceae	Gem	July 21, 1995
Oenothera biennis, Onagraceae	Custer	August 10, 1995
Oenothera hookeri ornata, Onagraceae	Latah	July 11, 1995
Onobrychis viciaefolia, Fabaceae	Power	August 10, 1995
Ornithogalum umbellatum, Liliaceae	Ada	April 26, 1995
Osmorhiza occidentalis, Apiaceae	Idaho	June 12, 1995
Oxalis stricta, Oxalidaceae	Latah	June 15, 1995
Pochistima myrsinites, Celastraceae	Benewah	May 25, 1995
Panicum miliaceum, Poaceae	Clearwater	July 13, 1995
Penstemon nitidus, Scrophulariaceae	Minidoka	May 04, 1995
Pensteman nitidus, Scrophulariaceae	Twin Falls	May 04, 1995
Phacelia hastata leucophylla, Hydrophyllaceae	Benewah	June 09, 1995
Poa annua, Poaceae	Canyon	May 05, 1995
Poa annua, Poaceae	Kootenai	September 28, 1995
Poa compressa, Poaceae	Kootenai	October 04, 1995
Polygonum coccineum, Polygonaceae	Canyon	September 12, 1995
Polyganum cuspidatum, Polygonaceae	Washington	June 01, 1995
Polyganum douglasii douglasii, Polygonaceae	Power	September 28, 1995
Polygonum douglasii douglasii, Polygonaceae	Bonner	September 25, 1995
Polygonum persicaria, Polygonaceae	Kootenai	August 08, 1995
Polypogon monspeliensis, Poaceae	Washington	June 23, 1995

Polypogon monspeliensis, Poaceae	Clark	July 19, 1995
Populus angustifolia, Salicaceae	Ada	August 08, 1995
Potentilla argentea, Rosaceae	Boundary	June 22, 1995
Potentilla norvegica, Rosaceae	Ada	June 02, 1995
Prunus mahaleb, Rosaceae	Kootenai	August 10, 1995
Prunus tomentosa, Rosaceae	Canyon	March 27, 1995
Ranunculus testiculatus, Ranunculaceae	Lewis	May 04, 1995
Ranunculus testiculatus, Ranunculaceae	Clark	April 26, 1995
Rhinanthus minor, Scrophulariaceae	Bonner	June 22, 1995
Nasturtium officinale, Brassicaceae	Twin Falls	June 19, 1995
Rumex acetosella, Polygonaceae	Idaho	May 04, 1995
Rumex crispus, Polygonaceae	Fremont	July 10, 1995
Sambucus cerulea, Caprifoliaceae	Bonneville	November 13, 1995
Sanguisorba minor, Rosaceae	Canyon	April 12, 1995
Scirpus pallidus, Cyperaceae	Payette	July 05, 1995
Senecio integerrimus vaseyi, Asteraceae	Kootenai	May 04, 1995
Senecio serra, Asteraceae	Caribou	July 21, 1995
Senecio vulgaris, Asteraceae	Twin Falls	September 01, 1995
Silene conoidea, Caryophyllaceae	Latah	June 09, 1995
Sisymbrium loeselii, Brassicaceae	Clark	July 19, 1995
Solanum carolinense, Solanaceae	Payette	September 18, 1995
Solanum dulcamara, Solanaceae	Kootenai	September 07, 1995
Sorbaria arborea, Rosaceae	Ada	September 20, 1995
Sorghum halepense, Poaceae	Payette	August 25, 1995
Spergularia rubra, Caryophyllaceae	Ada	March 12, 1995
Spergularia rubra, Caryophyllaceae	Gem	July 26, 1995
Spergularia rubra, Caryophyllaceae	Kootenai	August 21, 1995
Sphaeralcea munroana, Malvaceae	Clark	July 19, 1995
Taeniatherum caput-medusae, Poaceae	Ada	July 17, 1995
Tanacetum vulgare, Asteraceae	Latah	July 26, 1995
Thlaspi arvense, Brassicaceae	Clark	May 30, 1995
Trifolium repens, Fabaceae	Canyon	September 12, 1995
Trifolium repens, Fabaceae	Kootenai	March 23, 1995
Trifolium repens, Fabaceae	Kootenai	March 29, 1995
Urtica dioica, Urticaceae	Butte	October 02, 1995
Verbascum blattaria, Scrophulariaceae	Lewis	September 18, 1995
Verbena bracteata, Verbenaceae	Twin Falls	September 01, 1995
Veronica americana, Scrophulariaceae	Kootenai	July 27, 1995
Veronica anagallis-aquatica, Scrophulariaceae	Clark	July 19, 1995
Veronica peregrina xalapensis, Scrophulariaceae	Gem	June 19, 1995
Veronica peregrina xalapensis, Scrophulariaceae	Nez Perce	April 20, 1995
Veronica serpyllifolia humifusa, Scrophulariaceae	Teton	June 19, 1995

Sixteen specimens identified only to genus and forty specimens which were not identified due to the condition of the plant are not included in this list.

PROJECT 5

WEEDS OF AQUATIC, INDUSTRIAL AND NONCROP AREAS

Chairperson: Robert Callahan
University of Idaho
Moscow, ID

Turf suppression and broadleaf weed control with AC 263,222 combinations. John O. Evans and R.William Mace. Research plots were established April 7, 1995 at the Logan-Cache Airport near Utah State University, to evaluate turf suppression and broadleaf weed response using AC 263,222 at four rates with and without dicamba. The soil type was a Parlo silt loam with 7.9 pH and an organic matter content of less than 3%. The experimental design was a randomized complete block 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. The grasses at the site were 85% crested wheatgrass, 10% downy brome and 5% bulbous bluegrass. The broadleaf weed population consisted of prickly lettuce, corn gromwell and clasping pepperweed. They made up only 5 to 10% of the plant community. Visual evaluations were completed on several dates throughout the summer for grass response and broadleaf weed control. The grasses were evaluated for reduction in color, height, and seed heads. Yields were taken August 21, 1995.

AC 263,222 alone did not provide weed control at any rate tested but when dicamba was added broadleaf weed control was greater than 87 percent. Though not significant there were some interesting trends in the results. Dicamba appeared to contribute some synergism to AC 263,222 in reducing the height, seed heads and yield of the crested wheatgrass. There was also less color reduction in the wheatgrass in plots containing dicamba. Increasing rates of AC 263,222 revealed a greater trend for height, seed head and yield reduction. AC 263,222 appears to suppress forage grasses. This provides a management alternative to mechanical mowing without causing permanent grass damage or shortening stand life. (Utah Agricultural Experiment Station, Logan, Ut. 84322-4820)

Table. Broadleaf weed control and turf suppression with AC 263,222.

		Weed control	Grass response			
Treatment	Rate	Boadleaf	Height red.	Head sup.	Color red.	Yield
	Lb/A	%		------------%-----------		kg/Ha.
AC 263,222[1]	0.094	0	38	65	7	1681
AC 263,222[1]	0.125	0	49	78	22	1409
AC 263,222[1]	0.156	0	52	70	28	615
AC 263,222[1]	0.188	0	58	83	30	786
AC 263,222[1] + dicamba	0.094+.38	91	41	84	7	828
AC 263,222[1] + dicamba	0.125+.38	90	58	85	12	623
AC 263,222[1] + dicamba	0.156+.38	95	52	90	13	506
AC 263,222[1] + dicamba	0.188+.38	93	61	92	10	749
AC 263,222[2]	0.156+.38	91	57	91	9	702
AC 263,222[2] + dicamba	0.156+.38	87	56	88	13	828
Untreated		0	0	0	19.7	2843
LSD$_{(.05)}$		4.3	5.8	9.7	17	764

[1] non-ionic surfactant added at .5 % v/v

[2] Sun-it II added at .75 qt/A

Comparison of imazapyr and glyphosate for saltcedar control. Keith W. Duncan. Saltcedar is an introduced phreatophyte which dominates millions of acres of riparian areas throughout the western United States. Saltcedar is an aggressive competitor and often grows in near monoculture stands.

Previous research at New Mexico State University has shown that saltcedar may be controlled with ground applications of imazapyr applied alone or in combination with glyphosate. Also, one previous trial suggested that saltcedar could be controlled with aerial applications of imazapyr. Much of the saltcedar in the Pecos River Valley of eastern New Mexico is inaccessible to ground based application of herbicides. Therefore, trials were established in September, 1992 and in August, 1993 and 1994 to evaluate the efficiency of aerial applications of imazapyr and/or glyphosate for control of saltcedar.

In the 1992 trial, herbicides were applied with a helicopter in a total volume of 7 gpa with 0.25% v/v surfactant. Swath width was 30 ft. In the 1993 and 1994 trials, herbicides were applied with a fixed-wing aircraft. Total spray solution was 7 gpa or 3 gpa with 0.25% v/v surfactant and 0.25% v/v Nalcotrol. Swath width was 45 ft.

Table. Saltcedar mortality 34, 23 or 12 months after helicopter or fixed-wing application of imazapyr and/or glyphosate near Artesia, New Mexico.

Treatment	Rate	Mortality Helicopter	Mortality Fixed-wing	Mortality Fixed-wing
		1992	1993	1994
	--lb/a--			
imazapyr + glyphosate	0.5 + 3.0	70		
imazapyr + glyphosate	0.5 + 0.75	72		
imazapyr + glyphosate	0.5 + 0.5	81		
imazapyr	1.0	90		
imazapyr + glyphosate	0.5 + 0.5		80	99
imazapyr + glyphosate	0.375 + 0.375		65	93
imazapyr + glyphosate	0.375 + 0.5		66	79
imazapyr + glyphosate	0.25 + 0.5		37	86
imazapyr	0.75		72	80
imazapyr + glyphosate[1]	0.5 + 0.5		69	54
imazapyr[1]	0.75		80	64

[1] 3 gpa total solution

Treatments applied by helicopter in 1992 resulted in fair control of saltcedar 34 months after application. Application streaks were evident throughout the 1992 plots and evaluations were made only in the sprayed portions of each plot. In the fixed-wing applications of saltcedar mortality tended to be higher where imazapyr was applied at 0.5 lb/a or greater. Saltcedar mortality was generally higher in treatments where the herbicides were applied in 7 gpa total volume as compared to 3 gpa total volume.

Mortality was determined by stem counts in July, 1995. Additional mortality stem counts will be conducted in summer, 1996 (Cooperative Extension Service, New Mexico State University, Artesia, New Mexico 88210).

PROJECT 6

BASIC SCIENCES, ECOLOGY, BIOLOGY, PHYSIOLOGY, GENETICS, AND CHEMISTRY

Chairperson: Pat Fuerst
Washington State University
Pullman, WA

PROJECT 7

ALTERNATIVE METHODS OF WEED CONTROL

Chairperson: Kossim Al Khatib
Washington State University
Mt. Vernon, WA

Effect of soil solarization, metham, and metham plus solarization on weed seed survival and diseases of cherry rootstocks. R. Ed Peachey, Larry W. Moore, Aida Raio, Jack Pinkerton, and Marilyn Canfield. The effect of weed seed survival in response to soil solarization and soil incorporated metham was determined in an interdisciplinary experiment on disease incidence and severity during the early establishment phase of cherries. Field experiments were conducted at the OSU Botany and Plant Pathology Experimental Farm near Corvallis, OR at three sites with two different soil types and 4 replications for each treatment. Plots were mechanically rototilled to a fine texture and irrigated to field capacity. Twenty four hours later, the soil was inoculated with a suspension of A. tumefaciens and annual bluegrass seeds. The soil was irrigated to field capacity and a 1 mm plastic tarp was placed over the plots. Soil was covered with plastic tarp from July 15 until September 30. In the metham plots, the soil was rototilled to 15 cm within 10 minutes of applying metham, and the plots rolled with a water-filled lawn roller to seal the surface. In September of 1994, one soil core 5 cm in diameter by 15 cm deep was taken from each plot. The core was cut in segments of 0-2.5, 2.5-5, 5-10, 10-15 cm, bagged separately and air dried. Two hundred grams of soil from each sample was pulverized and placed on top of greenhouse soil in 10 by 10 by 10 cm pots. Annual bluegrass emergence in the field was evaluated on December 15.

Soil solarization reduced annual bluegrass seed survival by 89 percent in the top layer of soil and by approximately 50 percent up to the 5-10 cm depth. In the solarization plus metham study the trends were similar. Annual bluegrass germination was eliminated from the top one inch of soil by solarization. Metham at the high rate (100 gpa) totally controlled weeds at the lower levels but a few survived near the surface, possibly due to metham volatility losses even though the soil was sealed mechanically after application. The low rate of metham (25 gpa) plus solarization significantly improved weed control at all soil depths compared to metham without solarization, although some of the effect was probably due to tarping rather than solarization alone. Soil temperatures at the 5 cm depth averaged as high as 40 C in the sandy loam soil.

Populations of A.tumefaciens declined from 10^6 colony forming units per gram of soil to undetectable levels in solarized silty loam soil. The number of A.tumefaciens strains in silty clay soil declined but was still detectable after 8 weeks in solarized soil. In both greenhouse and field studies, none of the cherry trees planted into solarized soil formed tumors. In unsolarized soil in the greenhouse and in field plots, tumor incidence on cherry trees was 13 and 2 percent respectively. (Horticulture Dept., Oregon State University, Corvallis, OR 97331).

Table 1. Number of weed seedlings emerged from solarized and unsolarized soil in controlled environment germination study.

	Annual bluegrass		Total weeds	
Soil depth	Solarized	Check	Solarized	Check
-cm-				
0-2.5	0.1	1.1	0.5	8.2
2.5-5.0	0.3	1.7	0.9	7.3
5.0-10	0.9	1.5	3.3	7.3
10.0-15.0	1.5	0.8	5.4	6.5

Table 2. Effect of metham and soil solarization on annual bluegrass seed survival at four depths, and field emergence of annual bluegrass two months after removing plastic tarp.

Soil depth	Annual bluegrass seedling emergence from 200 g of collected soil				
(cm)	Check	Solarized	Solar+metham (25 gal/ac)	Metham (25 gal/ac)	Metham (100 gal/ac)
0-2.5	4.5	0	0	1.2	1.0
2.5-5.0	5.6	2.0	0	0.6	0
5.0-10	5.3	8.0	0	0.3	0
10.0-15.0	6.0	11.3	0.3	0	0
	Annual bluegrass emergence in field plots (no./m^2)				
Field plots	827	17	0	248	116

AUTHOR INDEX

(alphabetically by last name)

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HERBACEOUS WEED INDEX

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WOODY PLANT INDEX

(alphabetically by common name)

WOODY PLANT INDEX

(alphabetically by scientific name)

CROP INDEX

HERBICIDE INDEX

(by common name or code designation)

This table was compiled from nomenclature approved by the Weed Science Society of America Terminology Committee (Published in each issue of Weed Science) and the Herbicide Handbook of the WSSA (6th edition). "Page" refers to the page where a report about the herbicide begins; actual mention may be on a following page.

clopyralid	3,6-dichloro-2-pyridinecarboxylic acid	2,3,6,11,13,38,56, 60,62,72,79,93
cyanazine	2-[[4-chloro-6-(ethylamino)-1,3,5-triazin -2-yl]amino] -2-methylpropanenitrile desmedifam ethyl[3-1[[phenylamino) carbonyl]oxy]phenyl]carbamate	16
cycloate	*S*-ethyl cyclohexylethylcarbamothioate	56,59,63
desmedipham	ethyl [3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate	55,56,58,59,60,62,63
dicamba	3,6-dichloro-2-methoxybenzoic acid	2,3,4,6,7,13,28,33,38, 39,40,44,65,72,74,75,87, 88,89,93,99,100,102,117
diclofop	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy] propanoic acid	36,37,96,100,105,109
difenzoquat	1,2-dimethyl-3,5-diphenyl-1*H*-pyrazolium	37,67,96,101
dimethenamid	2-chloro-N-[(1-methyl-2-methoxy)ethyl]-*N*-(2,4-dimethyl-thien-3-yl)acetamide	16,23,50,52,53,58,73,75, 77,80,81,82,83,84,85
dithiopyr	S,S-dimethyl 2-(difluoromethyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3,5-pyridinedicarbothioate	16
diuron	*N'*-3,4-dichlorophenyl)-*N,N*-dimethylurea	65
EPTC	*S*-ethyl dipropyl carbamothioate	20,21,30,31,56,59,84,85
ethalfluralin	*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)benzenamine	16,17,50,59,77,78
ethofumasate	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate	55,56,58,59,60,62,63,65
F-8426	ethyl 2-chloro-3-[2-chloro-4-fluoro-5-(4-difluoromethyl-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl) phenyl]propanoate	38,40,47,93,95,102,105
fenoxaprop	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy] propanoic acid	28,65,101
flumetsulam	*N*-(2,6-difluorophenyl)-5-methyl[1,2,4] triazolo[1,5-*a*]pyrimidine-2-sulfonamide	75
FOE 5043	*N*-(4-fluorophenyl)-*N*-(1-methylethyl)-2-[[(5-trifluoromethyl)-1,3,4-thiadiazol-2-yl]-oxy]acetamide	64,103

glyphosate	N-(phosophonomethyl)glycine	5,7,11,22,25,63,71,118
halosulfuron	methyl 5-[[(4,6dimethoxy-2-pyrimidinyl)amino]carbonylamino sulfonyl]-3-chloro-1-methyl-1-*H*-pyrazole-4-carboxylate	75
imazamethabenz	(±) -2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-4(and 5)-methylbenzoic acid (3:2)	35,36,37,44,65 67,96,101,105,109
imazapyr	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H* imidazol-2-yl]-3-pyridinecarboxylic acid	5,118
imazethapyr	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridine-carboxylic acid	30,49,51,52,54,72,76,77
isoxaben	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl] -2,6-dimethoxybenzamide	18
lactofen	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro -4-(trifluoromethyl)phenoxy]-2-nitrobenzoate	25
linuron	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea	18,19,20
MCPA	(4-chloro-2-methylphenoxy)acetic acid	33,36,37,38,39,40, 41,42,88,90,93,96,98,101,106
mecroprop	(±)-2-(4-chloro-2-methylphenoxy)propanoic acid	28
metham	methylcarbamodithioic acid	121
metolachlor	2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide	16,50,53,73,75,77,80, 81,82,83,84,85
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4*H*)-one	19,21,39,64,65,73,74,76,80, 84,85,87,98,102,103
metsulfuron	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid	2,3,4,6,89,93,95,103
MSMA	monosodium methanearsonate	28
napropamide	N,N-diethyl-2-(1-napthalenyloxy)propanamide	16,23
napthalam	2-[(1-napthalenylamino)carbonyl]benzoic acid	17
nicosulfuron	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino] carbonyl]amino]sulfonyl]-*N,N*-dimethyl-3-pyridinecarboxamide	72

norflurazon	4-chloro-5-(methylamino)-2-(-trifluoromethyl) phenyl)-3(2*H*)-pyridazinone	31
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	21,25,64,65,80
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion	32
pendimethalin	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitro benzenamine	16,20,59,77,84,85
phenmedipham	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl) carbamate	55,56,58,59,60,62,63
picloram	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	2,3,4,6,7,9,10,11,14
primisulfuron	2-[[[[4,6-bis(difluoromethoxy)-2-pyrimidinyl]amino] carbonyl]amino]sulfonyl]benzoic acid	64,65,66,68,72
prosulfuron	1-(4-methoxy-6-methyl-triazin-2-yl)-3-[2-(3,3,3-trifluoropropyl)-phenylsulfonyl]-urea	34,46,47,93,97,102
pyrazon	5-amino-4-chloro-2-phenyl-3(2*H)*-pyridazinone	59,60,63
pyridate	O-(6-chloro-3-phenyl-4-pyridazinyl) *S*-octyl carbonothioate	18,27,38,39,49,74,76, 77,79, 87,93,100
quinclorac	3,7-dichloro-8-quinolinecarboxylic acid	4,9
rimsulfuron	N-[[4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl] -3-(ethylsulfonyl)-2-pyridinesulfonamide	19,23,24,84,55
SAN 845H	3,6-dichloro-2-methoxy benzoic acid	39,100
sethoxydim	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	24,32,69,72
sulfentrazone	N-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl] phenyl]methanesulfonamide	18,80
terbacil	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4-(1*H*,3*H*)-pyrimidinedione	65,79
thiafluamide	*N*-(4-flurophenyl)-*N*-(1-methylethyl)-2-[5-trifluoromethyl)-1,3,4-thiadiazol-2-yl)]acetamide	73

thiazopyr	methyl 2-(difluoromethyl)-5-(4,5-dihydro-2-thiazolyl)-4-(2-methylpropyl)-6-(trifluoromethyl)-3-pyridinecarboxylate	16
thifensulfuron	3-[[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid	33,38,40,41,47, 61,70,78,88,93,95,97,98, 99,100,101,102,105,106
tralkoxydim	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-(2,4,6-trimethylphenyl)-2-cyclohexen-1-one	36,37,96,101,109
triallate	*S*-(2,3,3-trichloro-2-propenyl)bis(1-methylethyl)carbamothioate	78,103,108
triasulfuron	2-(2-chloroethoxy)-*N*-[[(4-methoxy-6-methyl-1,3-5-triazin-2-yl]amino]carbonyl]benzene sulfonamide	89,93,95
tribenuron	methyl 2-[[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl)methylamino]carbonyl]amino]sulfonyl] benzoate acid	33,38,40,41,42,47,61,70 78,88,90,93,95,97,98,99 100,101,102,105,106
triclopyr	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	2,6,11
trifluralin	2,6-dinitro-*N*,*N*-dipropyl-4-(trifluoromethyl) benzenamine	16,59
triflusulfuron	methyl 2-[[[[[4-dimethylamino-6-(2,2,2-trifluoroethoxy)-1,3,5-triazin-2-yl]amino] carbonyl]amino]sulfonyl]-3-methylbenzoate	56,60,62
2,4-D	(2,4-dichlorophenoxy)acetic acid	2,3,4,6,7,9,10,11,13,14, 28,33,36,37,38,39,40,41 47,87,88,89,93,95,96,97 99,100,101
2,4-DB	(2,4-dichlorophenoxy)butanic acid	32

ABBREVIATIONS

&	and
$	dollar
@	at
+	plus
>	greater than
%	percent
#	number
A, a, or ac	acre
ae	acid equivalent
AEGCY	jointed goatgrass
Ag. or Agric	Agriculture
AGRSM	Agropyron smithii
ai or a.i.	active ingredient
ai/a	active ingredient per acre
AMAAL	tumble pigweed
AMABL	prostrate pigweed
AMARE	redroot pigweed
AMMN	ammonium nitrate
ANCVR	spurred anoda
ANOVA	analysis of variance
ANTCO	mayweed chamomile
APEIN	interrupted windgrass
APHDE	toothed spurge
Appl.	application
Apr	April
ARLU	Alnus rubra
AT	air temperature
ATV	all terrain vehicle
Aug.	August
AVEFA	wild oat
AVESA	oats
AZ	Arizona
Bare G	bare ground
BETVU	sugar beet
BOUGER	Bouteloua gracilis
BRANI	black mustard
BROMUS	brumus species
BROTC	Bromus tectorum
BROTE	downy brome
bu/A	bushel(s) per acre
C	degree Celsius
CA	California
CAPBP	sherpherd's purse
CARFI	Carex filifolia
CEC	cation exchange capacity
CENCY	cornflower
CENTRE	Centaurea repens

CHEAL	common lambsquarters
CHEMU	nettleleaf goosefoot
Chl or Chlorsulf	chlorsulfuron
CIRAR	Cirsium arvense
cm	centimeter(s)
CO	Colorado
CO2 or CO_2	carbon dixoide
COC	crop oil concentrate
Conv.	conventional
Cotyl or coty	cotyledon
CRP	Conservation Reserve Program
CRUAC	Carduus acanthoids
cv	cultivar
CV	coefficient of variation
cwt/A	one hundred weight per acre
cwt	one hundred weight
CYWOF	Cynoglossum officinale
DAT	days after treatment
DBP	days before planting
Dep or Dept	Department
DESSO	flixweed
Dev	deviation
DF	dry flowable
DM	dry matter
DS	dry soluble formulation
E	east
E post or EPOST	early postemergence
EB	early bloom
EC	emulsifiable concentrate
ECHO	junglerice
ECHCG	barnyardgrass
Ent.	Entomology
EPHES	Euphorbia esula
EROCI	redstem filaree
Exp	Experiment
Ext	Extension
F	value of statistical test
F	degress Fahrenheit
F_1	in plant breeding, the first filial generation
ft	foot or feet
Ft.	Fort
ft^2	square feet
g	gram(s)
g ha^{-1} or g/ha	gram(s) per hectare
G	granule
G/A, GPA, gpa	gallon(s) per acre
GALAP	catchweed bedstraw
Gly	glyphosate
gpa, gal/a	gallons per acre
ha	hectare

HALGL	Galogeton glomeratus
HORVU	barley
hr	hour(s)
ID	Idaho
in or “	inch(es)
IR	imidazolionone resistant
IT	imidazolionone tolerant
Jun	June
K	potassium
KCHSC or KOCSC	kochia
kg/m	kilogram per meter
kg/ha	kilogram per hectare
kg	kilogram
km/h	kilometers per hour
kPa	kilopascal
L	liquid
L	liter(s)
L/ha^{-1} or L/ha	liter(s) per hectare
LACSE	prickly lettuce
LAMAM	henbit
lb/A or lbs/A	pound(s) per acre
lb	pounds
lb or lbs	pound(s)
lb ai/gal	pound(s) acid equivalent per gallon
lb ai/A	pound(s) active ingredient per acre
LC	liquid concentrate
LENCU	lentil
LEPVI	Virginia pepperweed
lf	leaf or leaves
LOLMU	Italian ryegrass
LP	low pressure
LPOST	late postemergence
LSD	Least Significant Difference
LVE	low volative ester
m	meter(s)
m^2	square meters
MAFT	months after first treatment
MALPA	little mallow
MAT or mat	months after treatment
meq	milliequivalent
met or metsulf	metsulfuron
MIF	modified in furrow
misc	miscellaneous
MONLI	narrowleaf montia
mph	miles per hour
MPOST	periodic contact type postemergence treatment
MSO	methylated seed oil
N	nitrogen or north
ND	North Dakota
NIS	nonionic surfactant

NM	New Mexico
NMSU	New Mexico State University
NS or ns	non-significant
NW	northwest
Oct	October
OM or o.m.	organic matter
OPUPO	Opuntia polycantha
OR	Oregon
oz/yd^2	ounce per square yard
oz/cwt	ounce per hundred weight
oz/A	ounces per acre
oz	ounce
P	probability
P	phosphorous
PANMI	wild-proso millet
PDIR	post-directed
PEI	preemergence incorporated
pH	(-) log hydrogen ion concentration
pic	picloram
plts/ft^2 or plants/ft^2	plants per square foot
PM or pm	package mix
PNW	Pacific Northwest
POLCO	wild buckwheat
POPES	postplant preemergence surface
POPI	postplant incorporated
POST, Post, post or POE	postemergence
PPI or ppi	preplant incorporated
PRE, pree, or pre	preemergence
psi	pounds per square inch
PSME	Pseudotsuga menziesil
pt/A	pint(s) per acre
PTO	power take-off
qt/A	quarts per acre
RCB	randomized complete block design
RES	Research
RH	relative humidity
S	south
SASKR	Russian thistle
Sci	Science
SE	southeast
SECCE	rye
SENVU	common groundsel
SEP	September
SETVI	green foxtail
SG	soluble granule
SGF	soluble granule formulation
SOLNI	black nightshade
SOLSA	hairy nightshade
SOLTR	cutleaf nightshade
SONAS	spiny sowthistle

SONOL	annual sowthistle
SSYAL	tumble mustard
SSYIR	London rocket
ST	soil temperature
Sta	Station
STEME	common chickweed
STICO	Stipa comata
SW	southwest
T/A, tpa or t/A	ton(s) per acre
Temp	temperature
Thif, thifen, thi, or thifensulf.	thifensulfuron
THLAR	field pennycress
TRIAE	wheat
Trib, triben, or tri	tribenuron
UAN	urea-ammonium nitrate
UI	University of Idaho
Univ	University
USA	United States of America
UT	Utah
v/v	volume per volume
var	variety or varieties
var	variation
vars	varieties
vs.	versus
w/w	weight per weight
W	west
WA	Washington
WAT	weeks after treatment
WG	water dispersable granule
wks	weeks
WP	wettable powder
wsp	water soluble powder
WY	Wyoming
X or x	times
yd	yard
yd^2	square yard
Zn	zinc