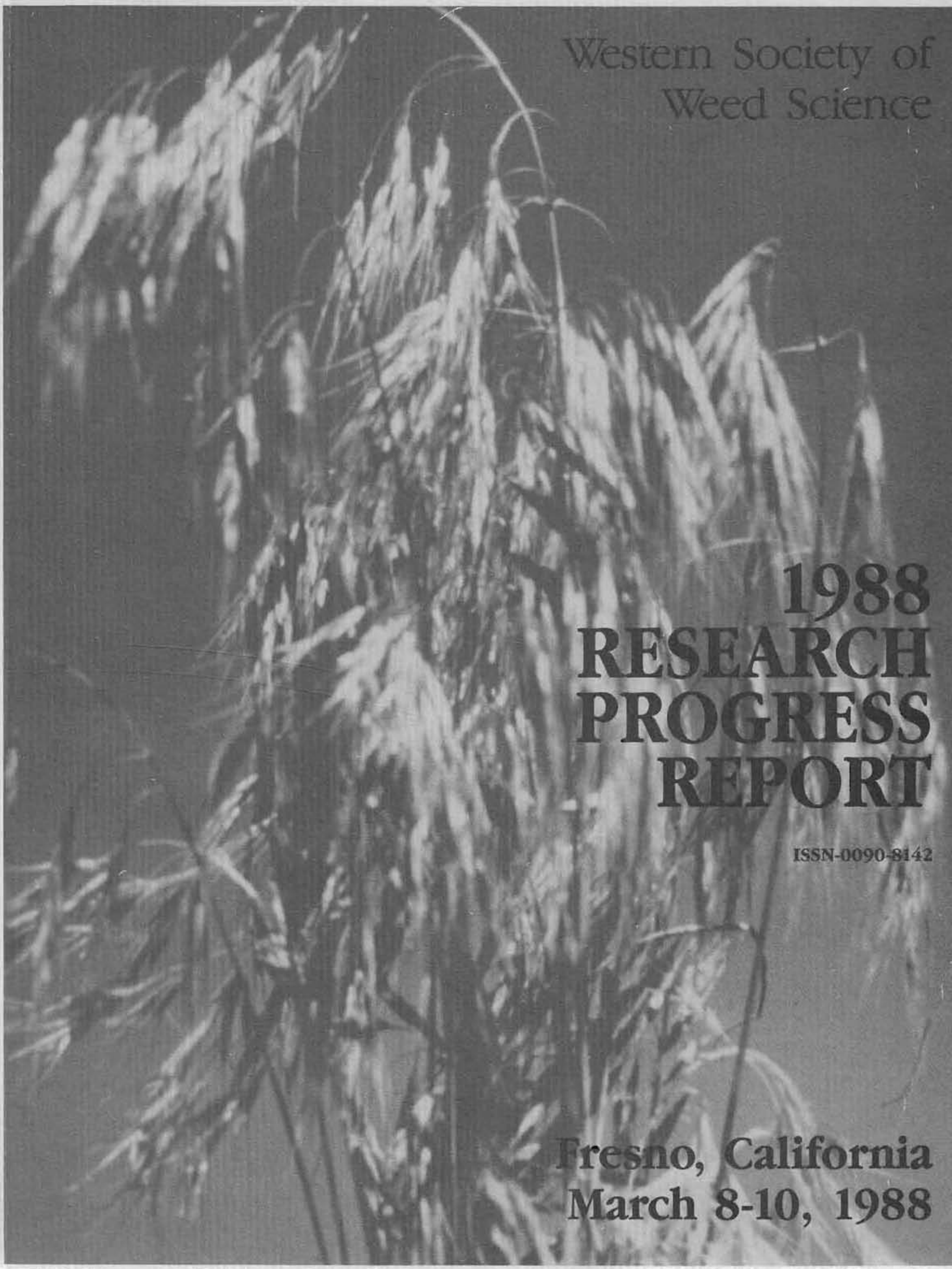


Western Society of Weed Science

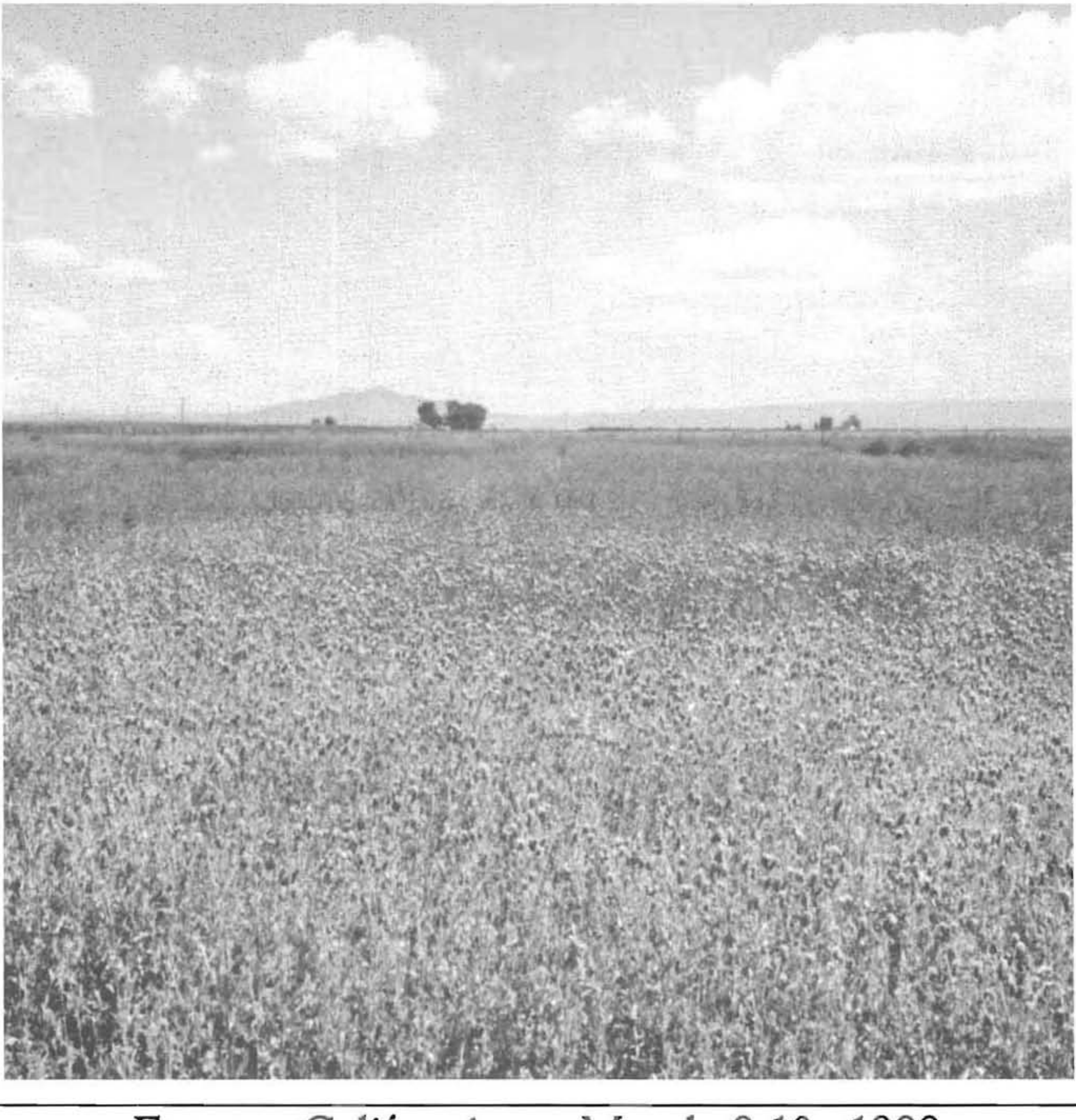
1988 RESEARCH PROGRESS REPORT

ISSN-0090-8142

Fresno, California
March 8-10, 1988

Western Society
of Weed Science

1988
Research Progress Report



Fresno, California March 8-10, 1988

FOREWORD

The Western Society of Weed Science (WSWS) 1988 Research Progress Report is a compilation of brief reports and recent investigations by weed scientists in the Western United States. The primary function of this volume is to facilitate interchange of information within the weed science community: it is not meant to serve as a means of presenting conclusions, endorsements or recommendations to the general public or anyone else. In this report, information contained herein is meant to be considered in a preliminary sense, and NOT FOR PUBLICATION. This represents an effort by the WSWS to make available effective research, improve communication among scientists having common interests, minimize duplication of effort and to promote a sharing of ideas.

This 1988 Western Society of Weed Science Research Progress Report is prepared by photoreproduction of reports as submitted by the authors, without retyping or significant editorial changes. Content, format, and style of each paper or report are the sole responsibility of the author(s). In the interest of information exchange, reports were accepted for printing, except for profound deviations from WSWS editorial rules.

The accumulation of the project reports and some index work was the responsibility of the seven (7) project chairmen. Final responsibility for compiling the report and developing the indices belongs to the research section chairman.

Recognition and credit must go to the members of the Western Society of Weed Science whose efforts are reflected in the reports contained herein.

Stephen D. Miller
Chairman, Research Section
Western Society of Weed Science
1988

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

TABLE OF CONTENTS (Cont'd.)

PROJECT 1.

PERENNIAL HERBACEOUS WEEDS

Phil Westra - Project Chairman

Fallow bindweed control with picloram combinations. Westra, P. and T. D'Amato. Three experiments were initiated in the fall of 1986 for field bindweed (CONAR) control with picloram combinations. Sites 2 and 3 were sprayed on 8-21-86 and 8-22-86 respectively; site 1 was sprayed on 9-20-86. Plots 20 by 40 ft in size were laid out in a RCB design with 3 replications. Applications were made in 18 gpa of water from a CO_2 backpack sprayer equipped with 11002LP SS nozzles. Field bindweed runners were 6 - 18 in long in each study. Site 3 had 7 winter wheat varieties planted on 10-6-86; these were harvested in July 1987.

Picloram at 0.125 lb ai/a either with 2,4-D or dicamba, was less effective for long term control than picloram at 0.25 lb ai/a. The addition of atrazine did not affect bindweed control, but did provide excellent fallow control of annual weeds, including volunteer wheat. At all 3 sites, dicamba + 2,4-D was the least effective, most inconsistent treatment for long term control. It appears that 0.25 lb ai/a of picloram is the minimum amount needed for reasonable long term bindweed suppression.

Vona, Carson, Tam 107, Newton, Scout, Sandy, and Baca winter wheat varieties were planted into site 3 45 days after herbicide applications. Although this plantback interval is shorter than desired (60 to 90 days would be a normal plantback restriction at these picloram rates), we wanted to gather an additional year of varietal plantback response to picloram. Averaged across all varieties and compared to the untreated check, dicamba + 2,4-D increased wheat yields 31%, 0.125 lb ai/a picloram + 2,4-D increased yields 15 %, and 0.25 lb ai/a picloram + 2,4-D caused a 22% yield reduction. Carson, Sandy, and Baca were least affected by picloram, while Newton and Scout were somewhat sensitive to the higher picloram rate. In 1987 we are evaluating 60 and 90 day plantback intervals. A label for use of picloram to control bindweed in fallow should have a minimum of 60 days for plantback restriction. In Colorado, such use should be made after wheat harvest, when bindweed runners have attained 8-16 in length, about 10 months prior to wheat planting the following year. (Weed Science Laboratory, Colorado State University, Ft. Collins, CO 80523)

Fallow bindweed control with picloram combinations.

Herbicide	Rate (lb ai/a)	% Bindweed control								
		SITE 1			SITE 2			SITE 3		
		5-28 1987	8-18 1987	10-10 1987	5-29 1987	7-2 1987	7-30 1987	9-27 1986	6-10 1987	7-20 1987
untreated check		0 d	0 d	0 d	0 c	0 c	0 c	0 b	0 b	0 c
picloram 2,4-D LVE	.125 1.0	96 a	82 b	72 b	96 a	67 b	55 b	100 a	100 a	96 a
picloram 2,4-D	.25 1.0	97 a	90 a	85 a	100 a	94 a	89 a	100 a	100 a	99 a
dicamba 2,4-D	.50 1.0	80 c	58 c	33 c	89 b	55 b	51 b	100 a	98 a	92 b
picloram dicamba	.125 .50	90 b	83 b	71 b	99 a	65 b	58 b	-	-	-
picloram 2,4-D atrazine	.25 .50 1.0	96 a	92 a	85 a	100 a	93 a	86 a	-	-	-

Means in a column followed by the same letters are not significantly different based on DMRT at .05.

Canada thistle control in a non-grazed Colorado Pasture. Beck, K.G. An experiment was established in a non-grazed pasture at Platteville, CO to evaluate Canada thistle (CIRAR) control longevity with single season spring and fall herbicide applications. The design was a randomized complete block with four replications. Spring applications included picloram, clopyralid, dicamba, chlorsulfuron, and 2,4-D (Table 1). Applications of 2,4-D in the spring were followed by fall treatments of dicamba and chlorsulfuron. All treatments were applied with a CO_2 pressurized bicycle sprayer using 11003 flat fan nozzles calibrated to deliver 23 gpa at 30 psi. Other application data are presented in Table 1. Plot size was 10 by 30 ft.

Visual evaluations were taken on July 23 and October 8, 1986, approximately six weeks and four months after spring applications, respectively. The October 8 evaluation was three weeks after fall applicatons. Picloram (0.75 lb ai/A) provided the greatest control six weeks after spring treatments and chlorsulfuron (0.047 lb ai/A) the lowest (Table 2). At the fall evaluation, spring applications of picloram (0.75 lb ai/A) provided the greatest control of Canada thistle and spring applications of dicamba (1.0 lb ai/A) the lowest. Phytoxicity to grasses was not evident at either evaluation date (data not shown).

Visual evaluations were taken again on June 25, 1987. Picloram at all rates, 2,4-D applied in spring followed by dicamba or chlorsulfuron in fall provided the best control one year after application (Table 2). Clopyralid at 0.125 and 0.25 lb ai/a, dicamba at all rates applied in spring, and chlorsulfuron applied in spring gave poor control.

Herbicide treatments will be evaluated again in 1988 for control longevity of single season applications. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Table 1. Application data for Canada thistle control in a non-grazed Colorado pasture.

Environmental data		
Application dates	Jun 13, 1986	Sep 19, 1986
Application time	12:00 p	1:30 p
Air temperature, F	75	72
Cloud cover, %	95	10
Relative humidity, %	64	62
Wind speed/direction, mph	2/NE	4/S
Soil temperature (2 in), F	61	46

Weed data

Application date	Species	Growth Stage	Height (in)	Density (plt/ft^2)
Jun 13	CIRAR	bolting	10 to 15	12 to 15
Sep 19	CIRAR	rosette	2 to 7	12 to 15

Table 2. Canada thistle control with spring and fall herbicide applications.

Herbicide	Rate	Timing	CIRAR		
	(lb ai/A)		7-23-86	10-8-86	6-25-87
			-------(% Control)-------		
picloram	0.50	spring	97	99	85
picloram	0.75	spring	96	100	96
clopyralid	0.125	spring	69	69	30
clopyralid	0.25	spring	84	88	30
clopyralid	0.50	spring	91	89	63
dicamba	1.0	spring	79	29	0
dicamba	2.0	spring	86	66	25
chlorsulfuron	0.047	spring	74	79	29
2,4-D amine	2.0	spring	84		
+ dicamba	2.0	fall		99	80
2,4-D amine	2.0	spring	84		
+ chlorsulfuron	0.023	fall		75	70
2,4-D amine	2.0	spring	90		
+ chlorsulfuron	0.047	fall		81	99
LSD (0.05)			22	23	31

Canada thistle control with chlorflurenol, dicamba, and clopyralid in a Colorado pasture. Beck, K.G. and J.R. Sebastian. An experiment was established to evaluate control of Canada thistle (CIRAR) with chlorflurenol (a morphactin), dicamba, or clopyralid applied alone or chlorflurenol in combination with dicamba or clopyralid at several rates (Table 2). The design was a randomized complete block with four replications. Applications were made in spring when Canada thistle was in the rosette stage and two treatments were repeated in fall. All treatments were applied with a CO_2 pressurized backpack sprayer through 11003LP nozzles calibrated to deliver 24 gpa at 15 psi. Other application information is presented in Table 1. Plot size was 10 by 30 feet.

Visual evaluations were taken August 25 and November 2, 1987 approximately 12 weeks and 5 months after spring applications, respectively. The November 2 evaluation was 7 weeks after fall applications. Chlorflurenol at 0.125 lb ai/a in combination with clopyralid at both rates provided the best Canada thistle control on August 25 whereas chlorflurenol alone gave poor control (Table 2). Chlorflurenol plus clopyralid at all rates applied in spring followed by chlorflurenol plus dicamba in fall provided the best control on November 2 whereas dicamba at 0.125 lb ai/a and both rates of chlorflurenol applied alone gave poor control. Chlorflurenol at 0.125 lb ai/a in combination with clopyralid at 0.125 lb ai/a provided 25 and 24% greater control on August 25 and November 2, respectively, than clopyralid alone at 0.125 lb ai/a.

Treatments will be re-evaluated in 1988. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Table 1. Application data for Canada thistle control with chlorflurenol, dicamba, and clopyralid.

Environmental data		
Application date	Jun 2, 1987	Sep 14, 1987
Application time	7:00 A	3:00 P
Air temperature, C	4	24
Cloud cover, %	0	30
Relative humidity, %	-	40
Wind speed/direction, mph	4-7/N	3-5/W
Soil temperature (2 in), C	2	14

Weed data

Application date	Species	Growth Stage	Height (in)	Density (plt/ft^2)
Jun 2, 1987	CIRAR	pre-bud to bud	10-17	2-4
Sep 14, 1987	CIRAR	late flower + fall rosette	4-6	2-4

Table 2. Canada thistle control with chlorflurenol, dicamba, and clopyralid in a Colorado pasture.

Herbicide	Rate	Timing	CIRAR	
	(lb ai/a)		8-25-87	11-2-87
			-----(% Control)-----	
chlorflurenol	0.125	spring	31	25
chlorflurenol	0.25	spring	14	8
clopyralid	0.125	spring	56	54
clopyralid	0.25	spring	79	78
dicamba	0.125	spring	36	28
dicamba	0.25	spring	50	46
dicamba	1.00	spring	60	56
dicamba	2.00	spring	68	66
chlorflurenol	0.125	spring	81	76
+ clopyralid	0.125			
chlorflurenol	0.125	spring	84	87
+ clopyralid	0.25			
chlorflurenol	0.25	spring	69	69
+ clopyralid	0.25			
chlorflurenol	0.125	spring	49	43
+ dicamba	0.125			
chlorflurenol	0.125	spring	51	46
+ dicamba	0.25			
chlorflurenol	0.25	spring	54	54
+ dicamba	0.25			
chlorflurenol	0.125	spring	74	
+ clopyralid	0.125	spring		
+ chlorflurenol	0.125	fall		89
+ dicamba	0.125	fall		
chlorflurenol	0.25	spring	74	
+ clopyralid	0.25	spring		
+ chlorflurenol	0.25	fall		94
+ dicamba	0.25	fall		
LSD (0.05)			22	22

Testing clopyralid for Canada thistle (*Cirsium arvense* L.) control. Fay, P.K. and E.S. Davis. Clopyralid has shown excellent promise for Canada thistle control. This experiment was established to measure the residual control following application of 7 rates of the herbicide. Clopyralid was applied at the rates shown (Table) on 6-17-87 to Canada thistle plants on the Post Research Farm, Bozeman, MT, in the early bud stage of growth. Applications were made with a CO_2-pressured backpack sprayer in 19 gpa to 11 by 23 foot plots. There were 3 replications. Plots were mowed, and the rear half of each plot rototilled 5 to 6 cm deep on 8-18-87. The number of Canada thistle plants per m^2 was counted in 2 locations per subplot on 10-1-87.

Control of Canada thistle regrowth was excellent following rates of 0.19 lb/A and above 4 months after application. Little or no residual control was evident at lower rates, including .09 lb/A, the current labeled rate of Curtail® herbicide in small grains. (Montana Agric. Exp. Sta., Bozeman, MT 59717.)

Effect of 7 rates of clopyralid on the regrowth of Canada thistle.

Clopyralid rate	Canada Thistle Plants (m^2)	
	Mowed plots	Rototilled plots
lb/A	No.	
.02	25	38
.05	37	40
.09	21	21
.19	1	1
.28	2	1
.75	0	0
1.50	0	0
Control	35	32
LSD .05	10	25

Canada thistle control prior to planting winter wheat. Westra, P. and T. D'Amato. On 9-4-86, several herbicide combinations were applied to a dense, uniform stand of Canada thistle (CIRAR) with 21 plants/yd^2. Plots were 20 X 40 ft in a RCB design with 3 replications. Applications were made in 27 gpa of water with a CO_2 backpack sprayer using 11002LP SS nozzles. Canada thistle plants were 4-10 in tall at time of application. All plots were seeded to winter wheat on 10-6-86. Visual evaluations of Canada thistle control were made on 5-29 and 7-20 in 1987. The area was also infested with volunteer rye (SECCE), which was rated for control on 5-29-87. Wheat harvest occurred in July, 1987.

Most of the herbicide combinations provided excellent Canada thistle control (in excess of 90% almost 11 months after treatment). Dicamba, glyphosate, chlorsulfuron, picloram, and clopyralid in various combinations were particularly effective for long term control. 2,4-D, Landmaster II, metsulfuron, and DPX-R9674 were of limited benefit in this fall applied study. Clopyralid at 0.063 lb ai/a gave unacceptable control, but at rates above 0.25 lb ai/a gave excellent control (98-99%). Picloram + dicamba gave excellent Canada thistle control, but caused noticeable wheat injury. Of the herbicides tested, clopyralid at higher rates was striking in the high degree of Canada thistle control, lack of wheat injury, and potential for long term control. Because of the dense, uniform Canada thistle stand, this was an excellent test of these herbicide combinations.

As an additional observation from this study, it was noted that picloram gave 93-97% control of volunteer rye, chlorsulfuron gave 68-83% control, and dicamba had very slight effect on volunteer rye. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Canada thistle control prior to planting winter wheat

Herbicide	Rate (lb ai/a)	CIRAR 5/29/87	SECCE 5/29/87	CIRAR 7/20/87	YIELD
		(% control)			bu/a
untreated check		0	0	0	9 f
dicamba glyphosate	.50 .59	91 a	10 d	82 cd	20 abc
dicamba picloram	.25 .125	98 a	97 a	96 ab	17 a-e
dicamba picloram	.50 .125	100 a	93 a	98 a	15 b-f
dicamba chlorsulfuron + surf.	.50 .024	99 a	68 c	94 abc	21 ab
dicamba 2,4-D	.50 .75	52 b	13 d	45 f	15 b-f
clopyralid	.063	37 c	0 e	25 g	14 c-f
clopyralid	.25	100 a	0 e	98 a	19 a-d
clopyralid	.40	100 a	0 e	99 a	18 a-d
clopyralid chlorsulfuron + surf.	.063 .023	96 a	83 b	77 d	16 b-e
clopyralid 2,4-D	.125 .50	87 a	0 e	85 bcd	19 a-d
glyphosate	1.50	94 a	0 e	93 abc	18 a-d
Fallowmaster (dicamba + glyphosate premix)	1.62	91 a	10 d	82 cd	23 a
Landmaster II (2,4-D + glyphosate premix)	1.89	58 b	0 e	58 e	14 c-f
chlorsulfuron + surf.	.023	94 a	80 b	80 d	14 c-f
metsulfuron	.006	0 e	o e	0 h	13 def
dicamba DPX-R9674	.25 .024	18 d	3 e	11 h	10 ef

Means in a column followed by the same letters are not significantly different based on DMRT at .05.

Response of yellow hawkweed to sulfonylurea and pyridine herbicides. Miller, T.W., R.H. Callihan, and D.C. Thill. The purpose of this experiment was to determine the effects of six herbicides at three rates on established yellow hawkweed (Hieracium pratense Tausch. HIECA) in pasture. The experiment was initiated on June 19, 1986 at Fernwood, Idaho. Plots measured 10 by 25 ft, with four replications in a randomized complete block design. Treatments consisted of single applications of chlorsulfuron, sulfometuron-methyl, metsulfuron-methyl, DPX-L5300 (each at 0, 0.5, 1, and 2 oz ai/a), picloram (0, 0.1, 0.4, and 0.6 lb ae/a) and clopyralid (0, 0.25, 0.5, and 1 lb ae/a). Treatments were applied in 23 gal/a water carrier with flat-fan 8002 nozzles at 40 psi, from a CO_2-pressurized backpack sprayer operated at 3 mph. The air temperature at the time of treatment was 66F and the relative humidity was 55%. The soil type is a Helmer silt loam, the soil temperature at 6 inches was 59F. There was 50% cloud cover and dew was present. Herbicide treatments were treated with split-plot applications of ammonium nitrate solution (50 lbs N/a) on March 17, 1987 during a rain.

Plots were evaluated for first-year results by estimating percent chlorosis of treated yellow hawkweed on July 17, 1986. Picloram at 0.4 and 0.6 lb ae/a (93 to 100%) and clopyralid at all rates (80 to 100%) caused extensive chlorosis (Table 1). Metsulfuron caused moderate chlorosis at 1 and 2 oz ai/a (71 to 66%). Chlorsulfuron, sulfometuron, and DPX-L5300 caused chlorosis, but the effect was erratic and not pronounced. Results may have been significantly affected by an unusually dry summer.

Plots were evaluated July 13-15, 1987 for second-year results by sampling the vegetation within randomly placed 22-cm diameter hoops. Vegetation was clipped at ground level, and separated into one of five catagories: 1. grasses (species were Bromus inermis Leys., Poa pratensis L., and Phleum pratense L.); 2. meadow hawkweed; 3. clovers (species were Trifolium pratense L. and Trifolium hybridum L.); 4. oxeye daisy (Chrysanthemum leucanthemum L. CHYLE); or 5. other forbs (species were Taraxacum officinale Weber. TAROF, Rumex acetosella L. RUMAA, and Potentilla spp. L.). Samples were then dried for at least 48 hours at 100F and weighed. Percents of check values were calculated prior to statistical analysis.

Yellow hawkweed dry weights ranged from 28 to 0% of the check in the picloram plots and 11 to 0% in the clopyralid plots (Table 2). Metsulfuron at 2 oz ai/a reduced yellow hawkweed to 29% of the check. Yellow hawkweed was not affected by nitrogen application (Table 3).

Grass populations were increased by clopyralid at all rates (241 to 346% increase), by metsulfuron at 2 oz ai/a (268% increase) and by chlorsulfuron at 0.5 and 2 oz ai/a (296 and 380% increase, respectively) (Table 2). Because of an extremely low grass population in the check plot for the chlorsulfuron treatment in replication #2, increases attributed to chlorsulfuron were more likely due to sampling error rather than herbicidal influence. Nitrogen application did not increase grass dry weights, although the residual soil nitrate level was low (< 0.1 ug/ml of soil) (Table 3). Possibly those herbicide treatments not controlling yellow hawkweed allowed it to utilize the added nitrogen to a greater extent than the grass species.

Clover percentages were reduced by chlorsulfuron at 0.5 and 2.0 oz ai/a and sulfometuron at 0.5 oz ai/a (50% reduction in all cases) (Table 2). Clover stands were also reduced from 79% to 69% of the check by nitrogen application (Table 3). Oxeye daisy populations were reduced by all herbicide treatments except chlorsulfuron at all rates (63 to 65% of the check) and sulfometuron at 0.5 oz ai/a (66%) (Table 2). The oxeye daisy response to nitrogen was not significant (Table 3). The other forbs catagory was reduced by chlorsulfuron at 1.0 oz ai/a (29% of the check) and sulfometuron at 2.0 oz ai/a (25%) (Table 2). Clopyralid at 0.25 lb ae/a increased dry weight of other forbs (197% of the check). Other forbs did not respond to nitrogen application (Table 3). (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Yellow hawkweed response to sulfonylurea and pyridine herbicides 28 days after application.

Herbicide	Rate (ai or ae/a)	Chlorosis[1] (%)
chlorsulfuron	0.0 oz	0.0 f[2]
	0.5 oz	7.5 f
	1.0 oz	32.5 cde
	2.0 oz	20.0 def
sulfometuron	0.0 oz	0.0 f
	0.5 oz	7.5 f
	1.0 oz	10.0 f
	2.0 oz	13.75 ef
picloram	0.0 lb	0.0 f
	0.1 lb	42.5 c
	0.4 lb	92.5 a
	0.6 lb	100.0 a
clopyralid	0.0 lb	0.0 f
	0.25 lb	80.0 ab
	0.5 lb	80.0 ab
	1.0 lb	100.0 a
metsulfuron	0.0 oz	0.0 f
	0.5 oz	40.0 cd
	1.0 oz	71.25 b
	2.0 oz	66.25 b
DPX-L5300	0.0 oz	0.0 f
	0.5 oz	15.0 ef
	1.0 oz	15.0 ef
	2.0 oz	17.5 ef

[1] Estimated percent chlorosis as compared to controls (no effect = 0%).

[2] Means having a common letter are not different at the 5% level of significance (LSD = 21; r^2 = 0.89, C.V. = 43%).

Table 2. Response of pasture vegetation to sulfonylurea and pyridine herbicides 13 months after application.

Herbicide	Rate		Dry Weight				
			Grass	Hawkweed	Clover	Daisy	Forbs
	(ai or ae/a)		(% of check)				
chlorsulfuron	0.0	oz	100 ef[1]	100 b-e	100 a	100 a	100 bc
	0.5	oz	296 a-c	115 a-d	50 b	65 ab	43 c-e
	1.0	oz	235 a-f	92 b-e	59 ab	63 ab	29 de
	2.0	oz	380 a	73 c-f	50 b	63 ab	37 c-e
sulfometuron	0.0	oz	100 ef	100 b-e	100 a	100 a	100 bc
	0.5	oz	103 d-f	120 a-c	50 b	66 ab	35 c-e
	1.0	oz	70 f	161 a	50 b	41 b	40 c-e
	2.0	oz	93 ef	124 ab	50 b	38 b	25 e
picloram	0.0	lb	100 ef	100 b-e	100 a	100 a	100 bc
	0.1	lb	189 b-f	28 f-h	88 ab	33 b	119 b
	0.4	lb	233 a-f	0 h	88 ab	25 b	55 b-e
	0.6	lb	234 a-f	0 h	88 ab	25 b	50 c-e
clopyralid	0.0	lb	100 ef	100 b-e	100 a	100 a	100 bc
	0.25	lb	241 a-e	11 gh	63 ab	36 b	197 a
	0.5	lb	322 a-c	0 h	63 ab	25 b	94 b-d
	1.0	lb	346 ab	0 h	63 ab	25 b	59 b-e
metsulfuron	0.0	oz	100 ef	100 b-e	100 a	100 a	100 bc
	0.5	oz	155 c-f	106 b-e	75 ab	25 b	38 c-e
	1.0	oz	168 c-f	66 d-f	75 ab	25 b	58 b-e
	2.0	oz	268 a-d	29 f-h	75 ab	25 b	38 c-e
DPX-L5300	0.0	oz	100 ef	100 b-e	100 a	100 a	100 bc
	0.5	oz	156 c-f	67 d-f	63 ab	39 b	38 c-e
	1.0	oz	191 b-f	86 b-e	63 ab	38 b	38 c-e
	2.0	oz	207 b-f	59 e-g	63 ab	38 b	38 c-e
LSD	-		167	49	45	46	68
r^2	-		0.70	0.80	0.82	0.83	0.68
C.V.	-		94%	66%	41%	63%	109%

[1]Means having a common letter are not different at the 5% level of significance.

Table 3. Response of pasture vegetation to nitrogen 4 months after application.

Nitrogen Rate	Dry Weight				
	Grass	Hawkweed	Clover	Daisy	Forbs
(lbs/a)	(% of check)				
0	173.5a[1]	72.5a	78.9a	54.9a	64.2a
50	200.2a	72.2a	68.8b	52.9a	71.4a
LSD	50	14	9	10	21
r^2	0.70	0.80	0.82	0.83	0.68
C.V.	94%	66%	41%	63%	109%

[1]Means having a common letter are not different at the 5% level of significance.

Leafy Spurge control in pasture. Lass, L., R.H. Callihan, and T.W. Miller. The purpose of this experiment was to determine the effects of three rates of six herbicides on established leafy spurge (Euphorbia esula L.) (EPHES) in pasture.

The experiment was established in dense leafy spurge in a non-grazed pasture east of Rathdrum, Idaho on June 9, 1986. The soil type was Avonvulle gravely silt loam. Plots measured 10 by 20 ft, with four replications in a randomized complete block design. The treatments consisted of single applications of DPX-L5300 (0.0, 0.5, 1.0, 2.0 oz ai /a), clopyralid (0.0, 0.25, 0.5, 1.0 lb ai/a), sulfometuron (0.0 0.5, 1.0, 2.0 oz ai/a), picloram (0.0, 0.5, 1.0, 2.0 lb ai/a), fosamine-ammonium (0.0, 0.5, 1.0, 2.0 lb ai/a) and combinations of metsulfuron and chlorsulfuron (0.0 + 0.0, 0.3 + 0.3, 0.5 + 0.5, and 1.0 + 1.0 oz ai/a).

Treatments were applied in 23 gal/a water carrier, with TeeJet 8002 nozzles at 43 psi., from a backpack sprayer operated at 3 MPH. The air temperature at the time of the first treatment was 59 F, soil surface temperature was 42 F, and the relative humidity 46%. The sky was 80% cloudy and no dew was present.

Leafy spurge growth was significantly reduced by all rates of picloram (77 to 98%; p=.0001) after 5 weeks. Picloram was the only herbicide providing more than 50% control at this time. Some regrowth (5 to 10 plants) occurred in picloram plots 4 months after application. In the spring, 10 months after application, picloram continued to significantly reduce regrowth of leafy spurge by 98 to 100 %.

Fosamine-ammonium at rates of 0.5 to 2.0 lb ai/a significantly slowed and delayed regrowth (90%) of leafy spurge in the spring. Fosamine-ammonium had suppressed leafy spurge 19 to 49% by late summer of the second year. Regrowth of leafy spurge was reduced by rates of 0.5, 1.0, and 2.0 of picloram, 14 months after application, although lower rates were not as effective as higher rates. The summer control by picloram ranged from 48 to 84% for rates ranging from 0.5 to 2.0 lb ai./a.

Sulfometuron at 2.0 oz ai/a appeared to suppress first summer's growth, but this was not statistically verifiable. The next year's spring growth was reduced significantly (99%). The summer growth, 14 months after spraying 2.0 oz ai/a, was suppressed 39%.

A high negative correlation was found between the first summer's biomass and the rates of sulfometuron (r=-.73) and picloram (r=-.77). This trend continued the second year, and suggests a linear response to increasing rate. Grasses were not supressed by picloram but were supressed by the other treatments that were effective on leafy spurge.

Since leafy spurge is a rhizomatous perennial, these current-seasons results should not be considered definitive criteria; the subsequent seasons' data will be more meaningful. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Leafy Spurge Control in a North Idaho Pasture.

		Biomass[1]			
		Leafy Spurge			Grasses
Herbicide	Rate	Summer 7/17/86	Spring 4/28/87	Summer 8/8/87	Spring 4/28/87
	(ai./A)	(%)			
metsulfuron + chlorsulfuron	0.0 oz	100 a[2]	100 a	100 a	100 a
	.3+.3 oz	98 a	100 a	100 a	100 a
	.5+.5 oz	98 a	100 a	100 a	100 a
	1+1 oz	98 a	100 a	100 a	87 ab
	(r)	-0.21	-	-	-0.77
DPX-L5300	0.0 oz	100 a	100 a	100 a	100 a
	0.5 oz	100 a	100 a	100 a	100 a
	1.0 oz	105 a	100 a	100 a	100 a
	2.0 oz	92 a	90 a	100 a	100 a
	(r)	-0.38	-0.39	-0.11	-0.39
fosamine-ammonium	0.0 lb	100 a	100 a	100 a	100 a
	0.5 lb	83 a	11 b	72 bcd	62 ab
	1.0 lb	80 a	11 b	81 abc	87 ab
	2.0 lb	95 a	5 bc	51 d	67 b
	(r)	-0.05	-0.65	-0.39	-0.42
clopyralid	0.0 lb	100 a	100 a	100 a	100 a
	0.3 lb	100 a	100 a	100 a	100 a
	0.5 lb	99 a	100 a	100 a	90 ab
	1.0 lb	96 a	100 a	100 a	100 a
	(r)	-0.39	-	-	-
sulfometuron	0.0 oz	100 a	100 a	100 a	100 a
	0.5 oz	91 a	100 a	87 ab	100 a
	1.0 oz	87 a	100 a	100 a	80 ab
	2.0 oz	67 a	1 bc	61 cd	15 c
	(r)	-0.73	-0.99	-0.67	-0.82
picloram	0.0 lb	100 a	100 a	100 a	100 a
	0.5 lb	23 b	2.5 bc	52 d	100 a
	1.0 lb	6 b	1 c	56 d	100 a
	2.0 lb	2 b	0 c	16 e	100 a
	(r)	-0.77	-0.69	-0.83	-

1. Estimated biomass, expressed as a percent of the untreated control.
2. Any two means having a common letter are not significantly different at the 5% level of significance, using Protected Duncan's Test.

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

The experiment was established at three locations in North Dakota and began on 25 August 1981 at Dickinson, 1 September 1981 at Sheldon, and on 11 June 1982 at Valley City. The soil at Dickinson was a loamy fine sand with pH 6.6 and 3.6% organic matter, at Sheldon was a fine sandy loam with pH 7.7 and 2.1% organic matter, and at Valley City was a loam with pH 6.7 and 9.4% organic matter. Dickinson, located in western North Dakota, generally receives much less precipitation than the other two sites located in eastern North Dakota. All treatments were applied annually except 2,4-D alone which was applied biannually (both spring and fall). Picloram treatments were applied in late August 1981 and in June of 1982 through 1986. The Sheldon location was discontinued following the fall evaluations in 1985. Thus, the Dickinson site has received seven picloram and picloram plus 2,4-D treatments and 13 2,4-D treatments, while the Valley City site has received six and 12 treatments, respectively. The plots were 10 by 30 ft and each treatment was replicated four times in a randomized complete block design at all sites. Evaluations were based on percent stand reduction as compared to the control.

Picloram at 0.25, 0.38 and 0.5 lb/A provided 49, 69 and 77% leafy spurge control, respectively, 60 months after treatment (Table). Control had declined by approximately 9% compared to the previous year. 2,4-D alone provided an average of 47% control of leafy spurge after biannual applications for 6 years.

Leafy spurge control 60 months after treatment increased by an average of 26, 16, and 13% when 2,4-D at 1 to 2 lb/A was applied with picloram at 0.25, 0.38, or 0.5 lb/A respectively, when compared to the same picloram rate applied alone. Picloram at 0.5 lb/A plus 2,4-D provided an average of 90% leafy spurge control but had declined slightly compared to the previous year. The greatest enhancement with 2,4-D plus picloram seems to be with 2,4-D at 1.5 lb/A or less and picloram at 0.375 lb/A or less. In general, leafy spurge control has been similar at all sites and does not seem to be influenced by soil types, pH, or organic matter. However, leafy spurge control at Dickinson had declined in 1986 and 1987 compared to 1985 which probably was due to above average precipitation and excellent growing conditions in 1986 following several years of below average precipitation.

Picloram at 0.5 lb/A alone and all picloram at 0.38 or 0.5 lb/A plus 2,4-D treatments are near or have reached the target of 90% or better leafy spurge control. Some type of treatment will need to be continued to maintain control, but perhaps more economical treatments will sustain the target control level. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table. Leafy spurge control from annual picloram or picloram plus 2,4-D treatments and biannual 2,4-D treatments at two locations in North Dakota (Lym and Messersmith).

		Site and 1987 evaluation date								
		Dickinson		Valley City		Months after treatment				
Herbicide	Rate	June	Sept	May	Aug	12[a]	24	36	48	60
	(lb/A)	(% control)								
Picloram	0.25	51	30	48	61	39	48	48	58	49
Picloram	0.38	65	51	74	79	65	62	52	77	69
Picloram	0.5	76	63	77	78	65	71	81	86	77
2,4-D bian	1	55	30	24	25	22	30	38	50	39
2,4-D bian	1.5	48	27	48	42	22	24	26	45	49
2,4-D bian	2	54	24	55	27	19	30	26	54	54
Pic+2,4-D	0.25+1	79	79	67	94	52	66	63	85	73
Pic+2,4-D	0.25+1.5	81	84	74	85	58	66	70	85	77
Pic+2,4-D	0.25+2	75	62	76	90	57	62	66	83	76
Pic+2,4-D	0.38+1	79	73	90	91	69	72	70	90	84
Pic+2,4-D	0.38+1.5	85	81	84	92	68	74	76	93	84
Pic+2,4-D	0.38+2	82	85	90	95	68	59	76	91	86
Pic+2,4-D	0.5+1	82	81	92	99	71	75	84	94	87
Pic+2,4-D	0.5+1.5	86	89	97	96	64	73	80	97	91
Pic+2,4-D	0.5+2	86	87	96	98	76	75	81	95	91
LSD (0.05)		20	19	20	19	18	14	19	14	14

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

Leafy spurge control under trees and along waterways. Lym, Rodney G. and Calvin G. Messersmith. Leafy spurge is difficult to control with herbicides near trees or open water such as ponds, ditches, and rivers because of potential damage to desirable vegetation or water contamination. However, these areas provide a constant source of seed for infestation of nearby and downstream areas if no control measures are initiated. The purpose of these experiments was to evaluate several herbicides for both leafy spurge control and potential to damage desirable vegetation.

Three experiments for leafy spurge control under trees were established in a shelter belt located in a waterfowl rest area near Valley City, ND. The plots were located in a dense stand of leafy spurge growing under mature ash and elm trees that had been planted five ft apart in 12-ft rows. The herbicides were applied either with a hand-held single-nozzle sprayer delivering 40 gpa or with the controlled droplet applicator (CDA) which applied approximately 4 gpa. The hand-held sprayer treatments were applied as a premeasured amount of herbicide:water per plot to assure the correct rate and three passes were made across each plot to assure adequate coverage. The CDA treatments covered each plot only once. The experiment starting dates and leafy spurge stage at treatment were: June 26, 1986, flowering and beginning seed set; September 3, 1986, post-seed set and chlorotic leaves; and June 16, 1987, yellow bract to flowering growth stage. There were four replications per treatment in a randomized complete block design and the plots were 12 by 24 ft. Evaluations were based on percent stand reduction as compared to the control.

Initial leafy spurge control was poor when glyphosate was applied alone, regardless of rate or treatment date (Table 1). Control improved to over 90% 12 months after treatment (MAT) following a June but not September application. Grass injury was nearly 100% with all glyphosate treatments.

Sulfometuron alone did not control leafy spurge satisfactorily (Table 1). However, control at 12 MAT increased by an average of 10 and 35% when applied with glyphosate in the spring and fall, respectively, compared to glyphosate alone. Leafy spurge control averaged 97% with sulfometuron + 2,4-D at 1 or 2 + 17 oz/A but grass injury was over 50%. Picloram, applied with the CDA at a picloram:water concentration of 1:7, provided nearly 100% leafy spurge control with no grass injury. Several ash trees had some leaf curling but no visible permanent damage from this treatment.

The experiment to evaluate leafy spurge control with herbicides that can be used near water was established on June 27, 1986 along a ditchbank in Fargo. The experimental design and application methods were similar to the tree experiment. All plots were treated with 2,4-D at 1 lb/A in June 1987 to control leafy spurge seedlings.

Amitrole at 4 lb/A provided 91 and 95% leafy spurge control 12 and 15 MAT, respectively, but there was 64% grass injury (Table 2). Increasing the application rate to 8 lb/A increased grass injury but not leafy spurge control. Unfortunately, amitrole is no longer cleared for use near water. Fosamine provided 90% leafy spurge control 12 MAT but also 57% grass injury. No other fosamine treatment provided satisfactory control and evaluations varied considerably from plot to plot indicating this herbicide may provide inconsistent control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Leafy spurge control under trees (Lym and Messersmith).

Application date and treatment	Rate	Evaluation date: Aug 86 Control	May 87 Control	May 87 Grass injury	Aug 87 Control	Aug 87 Grass injury
	(oz/A)	(% control)				
June 26, 1986						
Glyphosate	8.5	9	92	88	79	..
Glyphosate	17	41	96	98	94	..
Sulfometuron	0.5	15	0	0	29	..
Sulfometuron	1	9	0	0	19	..
Sulfometuron	2	9	28	15	19	..
Sulfometuron +glyphosate	0.5 + 8.5	13	98	98	90	..
Sulfometuron +glyphosate	1 + 8.5	13	96	99	95	..
Sulfometuron +glyphosate	2 + 8.5	24	99	96	85	..
Picloram (CDA)	1:7[a]	99	95	0	85	..
LSD (0.05)		19	8	14	23	
September 3, 1986						
Glyphosate	17	..	65	99	54	..
Sulfometuron +glyphosate	2 + 17	..	99	99	89	..
Sulfometuron +2,4-D	2 + 17	..	69	66	51	..
Picloram (CDA)	1:7[a]	..	86	9	66	..
LSD (0.05)			26	17	31	
June 16, 1987						
Glyphosate	8.5	..	..	..	13	98
Glyphosate	17	..	..	..	30	98
Sulfometuron +glyphosate	0.5 + 8.5	..	..	..	9	83
Sulfometuron +glyphosate	1 + 8.5	..	..	..	12	86
Sulfometuron +glyphosate	2 + 8.5	..	..	..	36	76
Sulfometuron + 2,4-D	1 + 17	..	..	..	95	48
Sulfometuron + 2,4-D	2 + 17	..	..	..	99	63
Picloram (CDA)	1:7[a]	..	..	..	96	0
LSD (0.05)					12	25

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

Table 2. Leafy spurge control along ditchbanks (Lym and Messersmith).

		Control			
		Aug 86	May 87		Aug 87
Treatment	Rate	Control	Control	Grass injury	Control
	(lb/A)	(%)			
Amitrole	2	99	69	23	80
Amitrole	4	100	91	64	95
Amitrole	8	100	87	81	96
Fosamine	2	5	14	3	59
Fosamine	4	19	58	10	55
Fosamine	8	40	90	57	82
LSD (0.05)		19	17	42	28

Evaluation of sulfometuron and other sulfonylurea herbicides for leafy spurge control. Lym, Rodney G. and Calvin G. Messersmith. Previous research at North Dakota State University has shown that sulfometuron delays, and sometimes stops, bud growth on leafy spurge roots. A herbicide that prevents or delays bud regrowth should improve long-term control since leafy spurge reestablishes by growth from the root buds following top growth control. The purpose of these experiments was to evaluate sulfometuron alone and in combination with auxin herbicides applied throughout the growing season for leafy spurge control. Also, DPX-L5300, chlorsulfuron, and fosamine were evaluated for leafy spurge control.

All herbicides were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 x 30 ft in a randomized complete block design. The sulfometuron experiment establishment dates in 1986 and leafy spurge growth stages were: June 5 near Hunter, ND, at the true flower stage; July 22 and August 27 near Chaffee, ND, at the mature seed and fall regrowth stages, respectively; September 3 near Valley City, ND, well branched and in the fall regrowth stage; and September 15 near Dickinson, ND, in the fall regrowth stage with most leaves chlorotic or bright red. As leafy spurge control declined, a retreatment of picloram at 4 oz/A was applied 12 months after the original treatment as a split-block treatment to the back one-third of each plot at Hunter and Chaffee. Evaluations were based on percent stand reduction as compared to the control.

No treatment applied in June near Hunter provided satisfactory leafy spurge control 2 months after treatment (MAT) (Table 1). There was 10% or less grass injury with all treatments. These plots were cultivated by the landowner and were not evaluated further. Similar sulfometuron plus auxin herbicide treatments applied in July near Chaffee provided 82 to 100% top growth control 1 MAT. Sulfometuron alone did not provide satisfactory leafy spurge control. When evaluated in May 1987, grass injury tended to increase as the sulfometuron rate increased and was higher when sulfometuron was applied with picloram or dicamba compared to sulfometuron alone. When evaluated in August 1987, control was similar when sulfometuron was applied either alone or with an auxin herbicide prior to the picloram retreatment (62%) compared to no prior treatment (48%), although there was a trend for improved control when a treatment preceded picloram application.

Leafy spurge control tended to be better when sulfometuron plus an auxin herbicide was applied in August or September (Table 2) compared to June or July (Table 1). However, grass injury also was higher. Long-term leafy spurge control tended to be higher as the sulfometuron rate increased up to 2 oz/A but the dicamba, 2,4-D, and picloram rate had little effect on control over the ranges evaluated. Sulfometuron + picloram at 2 + 8 to 16 oz/A provided the best long-term leafy spurge control 12 MAT (averaged 93% over the Valley City and Dickinson locations). However, grass injury averaged 42 and 77% 12 MAT at the two locations, respectively (Table 2).

DPX-L5300 alone or applied with 2,4-D or dicamba did not provide long-term leafy spurge control (Table 3). DPX-L5300 + picloram at 1 + 8 oz/A provided 77 and 21% leafy spurge control 3 and 12 MAT, respectively, averaged over locations and was similar to sulfometuron + picloram at 1 + 8 oz/A. However, no DPX-L5300 treatment injured grass. Chlorsulfuron applied with an auxin herbicide did not provide satisfactory leafy spurge control. Sulfometuron applied with amitrole, fluroxypyr, and picloram all resulted in similar leafy spurge control. Fosamine provided inconsistent leafy spurge control even when applied at 96 oz/A. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table 1. Leafy spurge control by sulfometuron with auxin herbicides applied in June at Hunter or July at Chaffee (Lym and Messersmith).

		Location and evaluation date						
		Hunter		Chaffee				
		Aug 86		Aug 86	May 87		Aug 87	
Treatment	Rate	Control	Grass injury	Control	Control	Grass injury	Control	Retreatment[a]
	(oz/A)	(%)						
Sulfometuron + picloram	0.25 + 4	19	10	..	..	..	..	..
Sulfometuron + dicamba	0.25 + 8	0	10	..	..	..	..	..
Sulfometuron + 2,4-D	0.5 + 8	5	0	..	..	..	..	..
Sulfometuron + picloram	0.5 + 8	41	0	100	40	11	15	52
Sulfometuron + dicamba	0.5 + 16	1	10	83	5	0	7	54
Sulfometuron + 2,4-D	1 + 8	0	10	97	18	3	8	53
Sulfometuron + picloram	1 + 8	40	10	99	60	20	16	54
Sulfometuron + picloram	1 + 16	9	0	..	..	..	..	..
Sulfometuron + dicamba	1 + 16	..	..	82	47	11	14	76
Sulfometuron + picloram	2 + 32	..	..	99	97	30	60	66
Sulfometuron + dicamba	2 + 128	..	..	100	96	49	59	69
Sulfometuron + picloram + 2,4-D	0.5 + 4 + 16	18	10	..	..	..	..	..
Sulfometuron	1	..	..	31	18	10	7	66
Sulfometuron	2	..	..	13	16	15	8	72
Control	0	0	0	0	0	0	0	48
LSD(0.05)		27	NS	15	32	21	22	NS

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

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

		Location and evaluation date									
		Chaffee			Valley City			Dickinson			
		May 87		Aug 87	May 87		Aug 87	June 87		Sept 87	
Treatment	Rate	Control	Grass injury	Control	Control	Grass injury	Control	Control	Grass injury	Control	Grass injury
	(oz/A)	(%)									
Sulfometuron + 2,4-D	0.5 + 16	..	..	..	41	0	11	..	..	..	..
Sulfometuron + 2,4-D	0.5 + 32	..	..	..	57	0	9	55	61	23	33
Sulfometuron + picloram	0.5 + 8	89	35	15	96	7	39	..	..	..	..
Sulfometuron + picloram	0.5 + 12	..	..	..	98	3	68	97	71	67	26
Sulfometuron + picloram	0.5 + 16	..	..	..	99	4	81	..	..	..	..
Sulfometuron + dicamba	0.5 + 16	68	8	16	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	1 + 8	35	83	1	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	1 + 16	..	..	..	90	5	26	..	..	..	..
Sulfometuron + 2,4-D	1 + 32	..	..	..	93	6	41	..	..	..	..
Sulfometuron + picloram	1 + 8	95	46	32	99	8	85	..	..	..	..
Sulfometuron + picloram	1 + 12	..	..	..	99	6	88	..	..	..	..
Sulfometuron + picloram	1 + 16	..	..	..	99	8	86	..	..	..	..
Sulfometuron + dicamba	1 + 16	81	36	17	..	..	..	..	..	..	..
Sulfometuron + 2,4-D	2 + 16	..	..	..	97	34	68	75	73	26	33
Sulfometuron + 2,4-D	2 + 32	..	..	..	99	29	73	78	70	29	33
Sulfometuron + picloram	2 + 8	..	..	..	99	49	97	95	89	83	60
Sulfometuron + picloram	2 + 12	..	..	..	99	41	95	99	94	90	80
Sulfometuron + picloram	2 + 16	..	..	..	99	37	98	99	98	93	91
Sulfometuron + picloram	2 + 32	94	56	70	..	..	..	..	..	..	..
Sulfometuron + dicamba	2 + 128	95	53	56	..	..	..	..	..	..	..
Picloram	16	..	..	..	99	0	63	..	..	..	..
Fosamine	64	43	15	9	..	..	..	..	..	..	..
Fosamine	96	56	13	20	..	..	..	..	..	..	..
LSD (0.05)		29	19	28	12	21	22	20	29	22	24

Table 3. DPX-L5300 and chlorsulfuron with auxin herbicides for leafy spurge control (Lym and Messersmith).

		Location and evaluation date						
		Chaffee				Dickinson		
		Aug 86		May 87	Aug 87	Sept 86	June 87	Aug 87
Treatment	Rate	Leafy spurge	Grass injury	Leafy spurge	Leafy spurge	Leafy spurge	Leafy spurge	Leafy spurge
	(oz/A)	(% control)						
DPX-L5300	1	0	0	0	0	21	0	0
DPX-L5300	2	0	0	0	0	8	0	0
DPX-L5300 + 2,4-D	1 + 16	3	0	0	0	42	3	0
DPX-L5300 + picloram	1 + 8	67	0	36	20	87	5	15
DPX-L5300 + dicamba	1 + 16	3	0	8	3	42	0	0
Chlorsulfuron + 2,4-D	0.5 + 16	0	0	0	0	57	0	0
Chlorsulfuron + picloram	0.5 + 8	42	10	9	0	63	3	10
Chlorsulfuron + dicamba	0.5 + 16	3	10	3	0	37	0	0
Sulfometuron + amitrole	1 + 32	11	20	6	0	27	6	6
Sulfometuron + fluroxypyr	1 + 16	49	40	30	12	97	15	0
Sulfometuron + picloram	1 + 8	59	30	40	13	..	..	..
Fosamine + X-77 surf.	32 + 0.5%	..	..	..	..	62	14	8
Fosamine + X-77 surf.	64 + 0.5%	..	..	..	..	10	11	0
Fosamine + X-77 surf.	96 + 0.5%	..	..	..	..	68	52	10
LSD (0.05)		18	18	21	11	40	12	NS

Sulfometuron applied alone and with auxin herbicides for leafy spurge control. Lym, Rodney G. and Calvin G. Messersmith. Sulfometuron is an analog of chlorsulfuron but with slightly less soil residual and a different weed control spectrum. Sulfometuron currently is used for grass suppression along roadsides and also has controlled some broadleaf weeds including leafy spurge. The purpose of this experiment was to evaluate sulfometuron alone and in combination with auxin herbicides for leafy spurge control.

The experiment was established in cropland severely infested with leafy spurge near Hunter, ND. Spring and fall treatments were applied on June 27 and September 4, 1985, respectively. Leafy spurge was 26 to 36 inches tall and beginning seed set in June while fall regrowth following a summer dormancy had begun when treatments were applied in September. The herbicides were applied with a tractor-mounted sprayer delivering 8.5 gpa at 35 psi. All plots were 10 by 30 ft in a randomized complete block design with four replications. As leafy spurge control declined, a retreatment of picloram at 0.25 lb/A was applied on August 26, 1986, as a split-block treatment to the back one-third of each plot to evaluate sulfometuron as a pretreatment to picloram. Evaluations were based on percent stand reduction as compared to the control.

Leafy spurge growth stopped following application of sulfometuron alone, regardless of application date. Plants treated with sulfometuron alone in June were not controlled visibly but had chlorotic leaves when evaluated in August and root bud elongation was inhibited. Leafy spurge top growth was killed when treated with sulfometuron plus an auxin herbicide and root bud growth was inhibited. Leafy spurge root buds were white and short on plants treated with sulfometuron, compared to the pink elongated buds on untreated plants. Sulfometuron plus an auxin herbicide provided better leafy spurge control than sulfometuron alone, and long-term control was better when sulfometuron was mixed with picloram than with 2,4-D or dicamba (Table). Leafy spurge control declined rapidly between the June and August 1986 evaulations.

Leafy spurge control increased to a maximum of 100% following retreatment with picloram at 0.25 lb/A (Table). Control averaged 81 and 67% in August 1987, when picloram was applied to plants originally treated with sulfometuron in the spring and fall, respectively. Control increased following the picloram retreatment as the sulfometuron rate increased following spring but not fall treatments. The best long-term control was sulfometuron spring-applied with either picloram or metsulfuron followed by the picloram retreatment which averaged 94 and 93%, respectively. The optimum herbicide application rates and date and the effectiveness of various retreatments must be evaluated further to determine if sulfometuron plus an auxin herbicide can provide cost-effective leafy spurge control. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table. Leafy spurge control with sulfometuron applied either alone or with various auxin herbicides (Lym and Messersmith).

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

[a] Picloram at 0.25 lb/A applied as a split-block to the back one-third of each plot on August 26, 1986.

Fluroxypyr for leafy spurge control. Lym, Rodney G., and Calvin G. Messersmith. Fluroxypyr is a picolinic acid herbicide similar to picloram but with less soil residual and a different weed control spectrum. The purpose of this experiment was to evaluate fluroxypyr for leafy spurge control as a single application treatment, applied with auxin herbicides, and in a repetitive treatment program.

The experiment was established on a dense stand of leafy spurge near Dickinson, ND, on July 14, 1986. Previous research had indicated the optimum application time for leafy spurge control with fluroxypyr was post seed-set. The herbicides were applied using a tractor-mounted sprayer delivery 8.5 gpa at 35 psi. The retreatments were applied as a split-block treatment. The original whole plots were 15 x 56 ft and the retreatment subplots were 10 x 15 ft with three replications. Evaluations were based on percent stand reduction as compared to the control.

Fluroxypyr at 0.5 and 1 lb/A provided an average of 90 and 41% leafy spurge control 2 and 11 months after treatment (MAT), respectively (Table). Control was similar when fluroxypyr at 0.25 or 0.5 lb/A was applied alone or with dicamba, picloram, or 2,4-D. Picloram at 1 lb/A provided 73% leafy spurge control 11 MAT which was the expected level of control from this treatment based on long-term evaluations at North Dakota State University. No single treatment provided satisfactory control 14 MAT.

Leafy spurge control, when averaged over retreatments, increased to an average of 73% regardless of the original fluroxypyr treatment and was similar to the picloram treatments (Table). The best retreatments were picloram alone at 0.5 lb/A, picloram + fluroxypyr at 0.25 + 0.25 lb/A, and + picloram + 2,4-D at 0.25 + 1 lb/A which averaged 94, 89, and 86% control, respectively. In comparsion, fluroxypyr at 0.5 lb/A applied as a retreatment averaged only 69% control.

In general, fluroxypyr alone and applied with dicamba, picloram, and 2,4-D provided similar control to picloram + 2,4-D at 0.25 + 1 lb/A both in the year of treatment and following various retreatments (Table). For example, fluroxypyr at 0.5 lb/A applied twice provided 83% leafy spurge control compared to 89% with picloram + 2,4-D at 0.25 + 1 lb/A applied twice. The picloram + 2,4-D treatment was the most cost-effective treatment in a long-term leafy spurge research program conducted in North Dakota. Thus fluroxypyr applied once provided less leafy spurge control than picloram at similar rates, but fluroxypyr may be useful in a retreatment program especially in areas where picloram cannot be used. (Published with approval of the Agric. Exp. Stn., North Dakota State Univ., Fargo 58105).

Table. Leafy spurge control with fluroxypyr alone and in combination with auxin herbicides (Lym and Messersmith).

Treatment	Rate	Evaluation date		Retreatment/rate (lb/A)/evaluated Sept 87							
		Sept 86	June 87	Fluro. 0.5	Pic. 0.25	Pic. 0.5	Fluro. + Pic. 0.25+0.25	Fluro. + Pic. 0.5+0.25	Pic.+ 2,4-D 0.25+1	Con- trol	Mean
	(lb/A)	(% control)									
Fluroxypyr	0.5	88	34	83	78	98	96	85	89	0	75
Fluroxypyr	1	92	47	70	88	89	87	78	86	13	73
Fluroxypyr+picloram	0.25+0.25	95	27	64	84	96	91	78	93	10	74
Fluroxypyr+picloram	0.5+0.25	98	40	63	71	98	93	87	94	16	74
Fluroxypyr+2,4-D	0.5+1	94	27	72	72	93	80	77	84	5	69
Fluroxypyr+dicamba	0.25+0.25	96	13	64	88	94	86	88	70	8	71
Picloram+2,4-D	0.25+1	99	25	79	91	97	85	77	89	3	75
Picloram	1	81	73	74	76	87	89	60	81	17	69
Control		0	0	51	68	96	90	56	86	0	64
Mean				69	80	94	89	76	86	8	
LSD (0.05)		13	28	whole plot = NS; subplots = 8; whole plot x subplot = 32							

Common Tansy control in pasture. Lass, L., R.H. Callihan, T. Miller, and D.C. Thill. The effects of four different herbicides on established common tansy (Tanacetum vulgare L.) in pasture were examined. The treatments consisted of single applications of metsulfuron (0.0, 0.5, 1.0, 2.0 oz ai/a), DPX-L5300 (0.0, 0.5, 1.0, 2.0 oz ai/a), clopyralid (0.0, 0.5, 1.0 lb ai/a and 1.0 + glyphosate at 0.5 lbs ai/a), and picloram (0.0, 0.5, 1.0, 2.0 lbs/a).

Treatments were applied in 23 gal/a water to 10 by 20 ft plots, replicated four times in a split plot design at Farragut State Park in northern Idaho. The date of application was June 9, 1986. The air temperature was 59 F, soil surface temperature was 55 F, and the RH 42%. The sky was 80% cloudy; no dew was present. Visual estimates of tansy biomass were recorded July 17, 1986, October 22, 1986, April 28, 1987, and August 8, 1987.

Only metsulfuron significantly reduced the total biomass (88 to 92%) of common tansy one month after application ($p = 0.0001$ Table 1).

Four months after application, new seedling growth and regrowth from rhizomes were significantly reduced by all metsulfuron treatments (96 to 100%; $p = 0.001$). Both picloram (2 lb/a) and clopyralid (1 lb/a) reduced fall regrowth of seedlings and rhizomes.

In the spring (10 months after application) metsulfuron continued to reduce biomass (90 to 98%) and Picloram reduced biomass (72 to 100%). Clopyralid suppressed spring growth and where applied with glyphosate, the biomass was reduced 93%, although the effect did not continue through the summer. In the summer of 1987 (14 months after application) biomass continued to be significantly reduced (90 to 100%) by metsulfuron at all rates applied, and by the highest rate of picloram.

High negative correlations were found between summer 1986 tansy biomass and rates of metsulfuron ($r = -0.71$) and picloram ($r = -0.79$)(Table 1). High negative correlations also were found between fall 1986 tansy biomass and rates of metsulfuron ($r = -0.70$), clopyralid ($r = -0.79$) and picloram ($r = -0.75$). Spring correlations with rate remained high with metsulfuron, clopyralid, and picloram. The correlation between DPX-L5300 rates and tansy control was lower than in 1986 because of tansy regrowth. In the summer of 1987, the correlation of tansy biomass to rate was highest (-0.97) in the picloram treatment.

Reduction of common tansy by metsulfuron in the first and second year was significant and striking. Early season application of metsulfuron at 0.5 to 1.0 oz./a or 2.0 lb/a picloram provided adequate second season control, and better control than 1.0 lb/a clopyralid or DPX-L5300. Although, DPX-L5300 resulted in growth suppression, the rate response was not as consistent as in the case of the other herbicides in the study. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Common Tansy control in pasture.

Herbicide	Rate	Biomass [1] Summer 7/17/86	Fall 10/22/86	Spring 4/28/87	Summer 8/8/87
	(ai/A)	(%)	(%)	(%)	(%)
Metsulfuron	0.0 oz	100 a	100 a	100 a	100 a
	0.5 oz	12 d	4 b	10 cd	10 d
	1.0 oz	6 d	0 b	2 d	0 d
	2.0 oz	6 d	0 b	1 d	2 d
Correlation to rate (r)		-0.71	-0.70	-0.71	-0.71
DPX-L5300	0.0 oz	100 a	100 a	100 a	100 a
	0.5 oz	70 b	18 b	72 ab	81 ab
	1.0 oz	65 b	9 b	97 a	100 a
	2.0 oz	55 bc	23 b	75 ab	82 ab
Correlation to rate (r)		-0.58	-0.61	-0.19	-0.21
Clopyralid	0.0 lb	100 a	100 a	100 a	100 a
	0.5 lb	60 b	30 b	70 ab	100 a
	1.0 lb	57 b	7.5 b	42 bc	90 a
Clopyralid+ Glyphosate	1.0 lb + 0.5 lb	60 b	1 b	7 d	66 b
Correlation to rate (r)		-0.51	-0.46	-0.69	-0.62
Picloram	0.0 lb	100 a	100 a	100 a	100 a
	0.5 lb	60 b	20 b	27 cd	87 a
	1.0 lb	52 bc	12 b	5 d	45 c
	2.0 lbs	40 c	0 b	0 d	0 d
Correlation to rate (r)		-0.79	-0.75	-0.79	-0.97

[1]Estimated biomass, expressed as percent of control.
The fall evaluation 1986 was new growth or regrowth from perennial rhizomes.
[2]Any two means having a common letter are not significantly different at the 5% level of significance using Protected Duncan's Test.

PROJECT 2.

HERBACEOUS WEEDS OF RANGE AND FOREST

Tom Whitson - Project Chairman

Control of foxtail barley (Hordeum jubatum L.) in perennial grass pastures. Ferrell M. A. and T. D. Whitson. Foxtail barley is a highly competitive, short-lived perennial living on wet, alkaline meadows. Palatable in early growth stages but stiff awns prevent livestock utilization upon maturity. An experiment was established June 17, 1986 to compare various herbicides for control of this perennial grass. The experiment was located on a mountain meadow at a 7200 ft elevation. Plots were 9 by 60 ft with two replications arranged in a randomized complete block. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. Weather information: air temperature 69F, soil surface 85F, 1 inch 71F, 2 inch 64F and 4 inch 61F, relative humidity was 35%, winds 0 to 1 mph SSW. The soil was a sandy clay loam (66% sand, 13% silt and 21% clay) with a 7.5 pH and a 0.9% organic matter. Perennial grasses included: Garrison creeping foxtail, smooth bromegrass and foxtail barley. Foxtail barley was four inches tall and actively growing during the herbicide applications.

Quizalofop applied at 0.5 lb ai/a was the most effective control for foxtail barley. Perennial grasses were suppressed by 25 and 20% the first and second growing seasons, respectively. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Control of foxtail barley in native mountain meadows

		% control		% desirable perennial grass suppression	
Herbicide	lbs ai/a	1986	1987	1986	1987
glyphosate	1.0	0	0	40	0
fluazifop-P	0.5+1%	0	0	50	0
quizalofop + C.O.C.	0.5	90	87	25	20
metribuzin	0.75	0	25	25	0
haloxyfop + C.O.C.	0.5+1%	80	20	0	0
sethoxydim + C.O.C.	0.5+1%	0	0	60	0
check	-	0	0	0	0

Foxtail barley (Hordeum jubatum L.) control in perennial grass meadows. Whitson, T. D. and Gerald Langbehn. Foxtail barley, a short-lived perennial, is common on poorly drained alkali soils in Wyoming. Awns of this species can cause injury to grazing animals once grasses have matured. A series of herbicides were applied to a wetland pasture infested with foxtail barley on April 14, 1987 to determine control of foxtail barley and the effects on other desirable perennial grasses. This study was located near Thermopolis, Wyoming. Plots were 10 by 27 ft, arranged in a randomized complete block design with four replications. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. The soil was a sandy clay loam (65% sand, 13% silt, 22% clay) with a 7.6 pH and 2.9% organic matter. Soil moisture and crop conditions were good during application. Weather information: air temperature 70F, soil surface 70F, 1 inch 68F, 2 inches 65F, 4 inches 60F with a relative humidity of 40% and wind speeds 3 to 5 mph N. Foxtail barley was actively growing and fully tillered. Quizalofop at 0.25 and 0.5 lb ai/a and paraquat applied at 0.5 lb ai/a provided excellent control with little suppression of other perennial grasses. Terbacil applications of 2.0 lb ai/a provided excellent control of foxtail barley but caused a considerable amount of suppression of desirable perennial grass species. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Control of foxtail barley in perennial grass meadows

Herbicide	lbs ai/a	% control foxtail barley	% suppression perennial grasses
metribuzin	0.25	0	0
metribuzin	0.5	10	0
metribuzin	0.9	61	0
sethoxydim + crop oil conc.	0.25+1%	10	0
sethoxydim + crop oil conc.	0.5+1%	12	0
fusilade + crop oil conc.	0.25+1%	52	20
fusilade + crop oil conc.	0.5+1%	72	20
quizalofop + crop oil conc.	0.25+1%	95	0
quizalofop + crop oil conc.	0.5+1%	95	0
ethyl metribuzin	0.5	0	0
ethyl metribuzin	1.0	0	0
pronamide	0.5	5	0
terbacil	1.0	83	20
terbacil	2.0	98	75
paraquat + X-77	0.5+0.25%	93	0
check	-	0	0

Downy brome (Bromus tectorum (L.)) control in rangeland with various herbicides. Whitson, T. D., D. A. Reynolds and Arthur Lauer. Downy brome is utilized as an early spring forage by livestock but is generally considered as an agressive rangeland invader by most rangeland managers. A series of herbicides were applied April 17, 1987 to downy brome infested rangeland to determine control of downy brome and effects on perennial rangeland grasses. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. Plots were 10 by 27 ft arranged in a randomized complete block design with four replications. The soil, a loamy sand, containing 84% sand, 8% silt and 8% clay with 1.0% organic matter and a 6.9 pH. Soil moisture and crop conditions were good during application. Weather information: air temperature 70F, soils, 70F surface, 64F 1 inch, 58F 2 inches, 54F 4 inches, winds calm, relative humidity 28%. Perennial grasses (needleandthread and western wheatgrass) were starting early spring growth and downy brome was in the fully tillered growth stage at the time of herbicide application. Fluazifop-P and quizalofop applied at 0.25 and 0.5 lb ai/a controlled 100% of the downy brome in the study, both herbicides caused perennial grasses to have suppressed seed head production. Terbacil applied at 1.0 and 2.0 ai/a controlled downy brome but caused considerable damage to the perennial grasses. Other herbicides failed to adequately control downy brome. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Control of downy brome on rangeland with various herbicides

Herbicide	lbs ai/a	% downy brome control	% perennial grass damage
atrazine	0.25	0	0
atrazine	0.5	3	0
atrazine	1.0	17	0
atrazine	2.0	83	38
metribuzin	0.25	6	0
metribuzin	0.5	27	0
sethoxydim +	0.25+		
crop oil conc.	1%	0	3
sethoxydim +	0.5+		
crop oil conc.	1%	10	7
fluazifop-P +	0.25+		
crop oil conc.	1%	100	suppressed seed heads
fluazifop-P +	0.5+		
crop oil conc.	1%	100	suppressed seed heads
ethyl metribuzin	0.5	3	0
ethyl metribuzin	1.0	7	0
quizalofop	0.25	100	suppressed seed heads
quizalofop	0.5	100	suppressed seed heads
terbacil	0.5	17	33
terbacil	1.0	90	83
terbacil	2.0	98	95
check	-	0	0

Evaluation of curlycup gumweed control with spring vs fall herbicide applications. Ferrell, M.A. and T.D. Whitson. Curlycup gumweed is a warm season, biennial native forb found in waste places, along roadways, and depleted rangelands. It is an invader and has no forage value. This experiment was established to evaluate the effectiveness of late summer herbicide applications compared with spring herbicide applications for the control of curlycup gumweed.

The study was established August 8, 1985, when curlycup gumweed was in full flower and 4 to 6 inches in height. The experiment was replicated June 18, 1986, when curlycup gumweed was in the prebud stage. Liquid formulations were applied with a 6-nozzle knapsack spray unit delivering 40 gpa water (August 8, 1985 weather data: air temp. 60 F, relative humidity 58%, soil temp. - 0 inch 82 F, 1 inch 85 F, 2 inch 80 F, 4 inch 70 F, wind N at 5 mph, sky clear. June 18, 1986 weather data: air temp. 74 F, relative humidity 33%, soil temp. - 0 inch 110 F, 1 inch 91 F, 2 inch 81 F, 4 inch 66 F, wind calm, sky clear). Plots were 9 by 30 ft arranged in a randomized complete block design with four replications. The soil was a sandy loam (73% sand, 10% silt and 17% clay) with 1.2% organic matter and a 7.1 pH.

Visual estimates of curlycup gumweed control were made August 21, 1986 and August 6, 1987. Except for clopyralid at 0.5 lb ai/A, fluroxypyr, metsulfuron, metsulfuron + dicamba, and metsulfuron + 2,4-D LVE all treatments applied on June 18, 1986 provided greater control of curlycup gumweed, over treatments applied on August 14, 1985. However, clopyralid at 0.5 lb ai/A, metsulfuron, picloram, metsulfuron + dicamba, and metsulfuron + 2,4-D LVE maintained good control at both application dates. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1516.)

Curlycup gumweed control

Treatment	Rate lb ai/A	Percent control[1] Date applied 8/14/85 Year evaluated '86	'87	6/18/86 '86	'87
		% control			
clopyralid	0.25	76	83	60	100
clopyralid	0.50	70	99	89	100
fluroxypyr	0.25	0	0	0	0
fluroxypyr	1.00	0	0	0	0
metsulfuron	0.0109	76	91	90	88
dicamba	0.50	71	87	86	98
2,4-D LVE	1.50	71	91	93	99
MCPA amine	3.0	68	71	90	94
2,4-D amine	3.0	79	74	96	99
triclopyr	0.75	40	20	55	80
picloram	0.25	66	91	81	100
dicamba + 2,4-D amine	0.50 + 1.50	78	83	96	98
triclopyr + 2,4-D LVE	0.25 + 0.50	65	56	88	97
metsulfuron + bromoxynil	0.0109 + 0.50	79	56	92	83
metsulfuron + dicamba	0.0109 + 0.50	84	100	97	98
metsulfuron + 2,4-D LVE	0.0109 + 0.50	81	99	95	94
LSD (0.05) =		16	21	10	7
CV =		18	22	9	6

[1] Visual control evaluations August 21, 1986 and August 6, 1987

Showy milkweed (Asclepias speciosa Torr.) control with various herbicides. Whitson, T. D. and M. L. Schwope. Showy milkweed, a perennial invading pastures and hay meadows has increased in several fields in Wyoming. A trial was established on an irrigated grass pasture near Lovell, Wyoming on June 11, 1986 to determine what the effect of various herbicides were on showy milkweed and perennial grasses. Plots were 9 by 30 ft, arranged in a randomized complete block design with four replications. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. The soil was a clay loam (44% sand, 28% silt and 28% clay) with 2.5% organic matter and 7.5 pH. Soil moisture and crop conditions were good during application. Weather information: air temperature 85F, soil surface 95F, 1 inch 92F, 2 inch 90F, 4 inch 85F with relative humidity 36% and wind speeds 3 to 5 mph N. Showy milkweed was growing and in the bud stage during application. Evaluations were made one year following applications on May 20, 1987.

Perennial grasses were not damaged in any treatment area except the sulfometuron at 2.0 oz ai/a which had a 20% suppression in growth. Treatments providing control greater than 93% included dicamba at 8.01 lb ai/acre and picloram at 1.0 and 2.0 lb ai/acre. Sulfometuron and fluroxypyr provided 80 and 84% control, respectively when applied at 0.0625 and 1.0 lb ai/a. Other treatments were inconsistent and provided limited control. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Showy milkweed control with various herbicides

Herbicide	Rate lb ai/a	% showy milkweed control
Dicamba	4.0	70
Dicamba	8.0	93
2,4-D (LVE)[1]	4.0	46
2,4-D (LVE)	8.0	61
Triclopyr	1.0	69
Triclopyr	4.0	74
Clopyralid	1.0	63
Clopyralid	2.0	50
Fluroxypyr	0.5	61
Fluroxypyr	1.0	80
Picloram 2 EC[2]	1.0	97
Picloram 2 EC	2.0	100
Sulfometuron	0.0625	69
Sulfometuron	0.125	84
Fosamine ammonium	1.0	70
Check	-	0

[1] LVE = Low Volitile Ester
[2] EC = Emulsifiable concentrate

Quackgrass (Agropyron repens (L.) Beauv. control with various water carriers and herbicides. Fink, G. E. and T. D. Whitson. Quackgrass is a persistent perennial invading many hay meadows in Wyoming. This experiment on quackgrass control was established to determine the effects of water quality on glyphosate and to compare application rates of sethoxydim and quizalofop.

Plots were established June 25, 1987, near Kaycee, Wyoming, on rapidly growing quackgrass. The quackgrass was 3 to 12 inches tall with slight seed head emergence. Glyphosate was applied with water high in calcium salts and with softened water. Herbicides were applied with a 6-nozzle knapsack spray unit delivering 10 and 30 gallons per acre. Weather conditions were as follows: air temperature 85F, winds were calm. The soil was a silty clay loam containing 10% sand, 60% silt and 30% clay with 2.5% organic matter and a 7.7 pH. Plots were 10 by 108 ft arranged as single, unreplicated blocks with 10 ft buffer strips left untreated between treatments. Plots were evaluated August 5, 1987.

When glyphosate was applied at 0.75 lb ai/a and hard and soft water carriers were compared at 30 gallons per acre, the glyphosate applied in a soft water carrier controlled 25 percent more quackgrass than glyphosate applied in hard water. When carrier gallonages were reduced to 10 gallons per acre and glyphosate was applied at 0.75 lb ai/a both the soft and hard water carriers performed equally controlling 99% of the quackgrass. Increased applications of glyphosate to 1.5 lb ai/a controlled 100% of the quackgrass in 10 gallon carrier applications with hard and soft water. Quizalofop applied at 0.5 and 0.75 lb ai/a in 10 gallons of hard water per acre controlled 90 and 95 percent of the quackgrass, respectively. Sethoxydim provided poor quackgrass control when applied at 0.5 and 0.75 lb ai/a in a 10 gallon per acre hard water carrier. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Quackgrass control with various herbicides and water carriers

		Water carrier		
Herbicide	lbs. ai/a	type	gal/acre	% quackgrass control
glyphosate	0.75	hard	30	60
glyphosate	0.75	soft	30	85
glyphosate	0.75	hard	10	99
glyphosate	0.75	soft	10	99
glyphosate	1.5	hard	10	100
glyphosate	1.5	soft	10	100
quizalofop	0.5	hard	10	90
quizalofop	0.75	hard	10	95
sethoxydim	0.5	hard	10	0
sethoxydim	0.75	hard	10	10
check	-	-	-	0

Control of gray rabbitbrush and Douglas rabbitbrush with various herbicides. Whitson, T. D. and M. A. Ferrell. Douglas rabbitbrush (*Chrysothamnus viscidiflorus* (Hook.) Nutt. and gray rabbitbrush (*Chrysothamnus nauseosus* (Pall. ex Pursh) Britt. are woody rangeland species that are very difficult to control by burning or herbicides because of their resprouting ability. Several herbicides were applied on August 14, 1985 and June 17, 1986 to rabbitbrush spp. to determine efficacy on rabbitbrush and effects of the herbicides on perennial rangeland grasses. Herbicides were applied when rabbitbrush spp. were actively growing with a six-nozzle knapsack spray unit delivering 40 gpa at 45 psi. Plots were 9 by 30 ft arranged in a randomized complete block design with four replications. The soil was a sandy loam (70% sand, 17% silt and 13% clay) with 2.2% organic matter and 7.4 pH. Soil moisture was good with the spring application and depleted during the August treatments. Perennial grass species included western wheatgrass and prairie junegrass. Weather information: (Aug. 14, 1985) air temperature 60F, soil surface 90F, 1 inch 82F, 2 inches 70F, 4 inches 62F, a relative humidity of 58% and a wind speed of 3 mph NW; (June 17, 1986) Air 69F, soil surface 69F, 1 inch 73F, 2 inches 76F, 4 inches 76F and a relative humidity of 35% with a wind speed of 5 to 10 mph NW.

None of the tested herbicides provided any long-term control of either gray rabbitbrush or Douglas rabbitbrush at the rates listed. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Control of rabbitbrush spp. with various herbicides

		Application date	
		Aug. 14, 1985	June 17, 1986
Herbicide	lb/ai/a	% control	% control
Triclopyr + 2,4-D (LVE)	1.0 + 2.0	0	0
Triclopyr + 2,4-D (LVE)	1.5 + 3.0	0	0
Triclopyr	1.0	0	0
Triclopyr	2.0	0	0
Picloram + clopralid	0.125 + 0.125	0	0
Picloram + clopralid	0.25 + 0.25	0	0
Picloram	0.25	0	0
Picloram	0.5	0	0
Fluroxypyr	1.0	0	0
2,4-D (LVE)	2.0	0	0
Check	-	0	0

Herbicide evaluations for control of big sagebrush (*Artemisia tridentata* Nutt.). Whitson T. D., M. A. Ferrell and R. D. Cunningham. Big sagebrush is a highly competitive woody shrub occupying over 34 million acres of Wyoming rangeland. With control of sagebrush yields of perennial grasses have tripled. Two herbicides have been commonly used for this purpose, 2,4-D LVE and tebuthiuron 20p. 2,4-D must be applied in very early spring when sagebrush has broken dormancy to be effective, usually within about a two week period. Tebuthiuron 20p must be applied with granular applicators but can be applied at any time except on frozen soil. This study was conducted to determine the efficacy of other herbicides for sagebrush control. The experiment was applied June 3, 1986. Plots were 22 by 400 ft arranged as blocks with 10 ft buffers between treatments. Herbicides were broadcast with a truck mounted sprayer delivering 40 gpa at 35 psi. Weather information: air temperature 80F, soil surface 80F, 1 inch 80F, 2 inches 85F, 4 inches 86F. Relative humidity was 42% with wind speeds 2 to 4 mph, NW. The soil was a sandy loam (70% sand, 22% silt and 8% clay) with an organic matter of 0.8% and a 6.5 pH.

All applications except fluroxypyr applied at 0.17 lb ai/a and 2,4-D (Amine) applied at 2.0 lb ai/a provided over 96% control of big sagebrush. As a follow up to this initial study, three replicated studies were established in 1987 to compare application rates and dates of fluroxypyr to 2,4-D LVE. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Herbicide evaluations for big sagebrush control

Herbicide	Rate lbs ai/a	Big sagebrush % control
2,4-D (LVE)	2.0	100
2,4-D + triclopyr	1.0+1.5	100
Triclopyr	1.0	98
Fluroxypyr	0.7	98
Fluroxypyr	0.17	61
2,4-D (Amine)	2.0	50
2,4-D (Amine)	4.0	96

Control of big sagebrush (Artemisia tridentata Nutt.) with wettable powder formulations of tebuthiuron. Whitson, T. D. and M. A. Ferrell. Several rates of tebuthiuron 80% wettable powder were applied September 1, 1985 to dormant rangeland to determine effects of the herbicide on big sagebrush and perennial grasses. The experiment was located at a 6800 ft elevation site receiving an average precipitation of 11 inches. Plots were 8 by 136 ft arranged as single unreplicated blocks. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. Weather information: air temperature 72F, soil surface 80F, 1 inch 76F, 2 inch 72F, 4 inch 70F, relative humidity was 28%, wind was 1 to 2 mph NW. The soil was a Boyle sandy loam (60.6% sand, 24.2% silt and 15.8% clay) with 1.7% organic matter and a 6.9 pH.

Tebuthiuron 80 WP applied at 0.5 lb ai/a controlled 95% of the big sagebrush but caused a 30% reduction in the density of perennial grasses. The grass damage would not be expected with the same rate of pelleted tebuthiuron formulation but application of the wettable powder can be done more uniformly and with less application expense. More studies should be conducted to determine effects of dormant spring applications. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Control of big sagebrush with tebuthiuron wettable powder

Herbicide	Rate lb ai/a	Percent big sagebrush control	Percent perennial grass injury
Tebuthiuron	0.25	50	10
Tebuthiuron	0.4	80	20
Tebuthiuron	0.5	95	30
Tebuthiuron	0.6	94	40
Tebuthiuron	0.75	97	50
Tebuthiuron	1.0	98	80

Tebuthiuron effects on live canopy cover of big sagebrush (*Artemisia tridentata* Nutt.) and associated species seven years after application. Whitson, T. D. and M. A. Ferrell. Tebuthiuron 10 and 20% pelleted formulations were applied in the spring and fall to evaluate their efficacy for big sagebrush control in rangeland. The experiment was established near Kaycee, Wyoming on May 29, 1980 and September 16, 1980, on a Boyle sandy loam soil (60.6% sand, 24.2% silt and 15.8% clay) with a 1.7% organic matter and 6.9 pH. Spring and fall weather information, respectively: air temperature 72, 76F, soil surface 77, 104F, 1 inch 74, 104F, 2 inch 72, 102F, 4 inch 71, 94F; the relative humidity was 38 and 44% with wind speeds 0 to 4 mph NW and 0 to 1 mph SW. Treatment areas 98 m^2 were arranged in a randomized complete block design with three replications. The study was fenced to prevent grazing. Herbicides were applied with a centrifugal granular applicator. Live canopy cover was determined using Levy and Maddens' point method of pasture analysis technique. One hundred pinpoint plant identifications were taken at equidistant points along a permanently located 11 m transect line within each treatment replication. Only the first pinpoint was recorded as live canopy cover. Individual species counts within treatment areas were utilized for percent live canopy cover. When a statistical analysis was completed, no differences were found between application dates, therefore, those data were combined allowing six replications to be used for statistical computations. With the application of 0.25 lbs ai/a granular tebuthiuron big sagebrush control was 89% with the 10 and 20% formulations. No significant differences in live canopy of either annual or perennial grasses were found between formulations. Downy brome increased four fold in live canopy cover compared to the untreated check. The 0.5 lb ai/a application rate of 10 and 20% tebuthiuron provided 100 and 98% control of big sagebrush. Control released downy brome rather than western wheatgrass, therefore because of downy brome the treatment showed no increase in desirable perennial grasses. The 0.75 and 1.0 lb ai/a tebuthiuron applications provided 100% control of big sagebrush but released downy brome. When downy brome is in the beginning understory of a big sagebrush rangeland community, sagebrush control could likely result in a rangeland species shift to downy brome. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Table 1. The effects of tebuthiuron 10 and 20% pelleted formulations on live canopy of big sagebrush and associated species.

		Application rate lbs ai/a				
Species	Form %	0.25	0.5	0.75	1.0	Check
Big Sagebrush	10	6b[a]	0b	0b	0b	54a
	20	6b	1b	0b	0b	54a
Prairie Junegrass	10	0a	0a	0a	0a	2a
	20	0a	0a	0a	0a	2a
Green Needlegrass	10	0a	0a	0a	0a	0a
	20	1a	0a	0a	0a	0a
Blue Grama	10	0a	0.2a	0a	0a	1a
	20	0.2a	0a	0a	0.2a	1a
Western Wheatgrass	10	15a	12ab	6b	7b	7b
	20	12a	11ab	10abc	8bc	7c
Downy Brome	10	67b	77ab	84a	81a	18c
	20	71b	77ab	81ab	85a	18c
Other Species	10	1a	2a	2a	1a	2a
	20	2a	1a	1a	1a	2a
Bare Ground	10	12a	10a	8a	11a	17a
	20	9a	10a	9a	6a	17a

[a] Plant species means with the same letter(s) within the same row are not significantly different among treatments at the 5% level according to Duncan's multiple range test.

Table 2. Percent control and perennial grass species production 7 years after a tebuthiuron application.

			lbs production/acre		
Herbicide	lbs ai/a	% Sagebrush control	Western wheatgrass	Prairie junegrass	Total
Tebuthiuron	0.25	85c[a]	418b	122ab	538b
Tebuthiuron	0.5	96b	717a	146a	862a
Tebuthiuron	0.75	97ab	499b	98bc	597b
Tebuthiuron	1.0	99a	479b	85c	564b
Check	-	0d	157c	53d	210c

[a] Plant species means with the same letter(s) within the same column are not significantly different among treatments at the 5% level according to Duncan's multiple range test.

Big sagebrush control and perennial grass production five years following herbicide treatments. Whitson, T.D. and M.A. Ferrell. This experiment was established June 10, 1982 to compare new herbicides to 2,4-D for sagebrush control and resulting perennial grass production. The study is located in Fremont County, WY, on a sandy loam soil (70% sand, 22% silt, 8% clay) with 0.8% organic matter and a 6.5 pH. The plots are 9 by 30 ft with three replications in a randomized complete block design. Liquid herbicide formulations were applied broadcast with a six-nozzle knapsack unit delivering 40 gpa carrier at 40 psi and granular formulations applied with a granular applicator. Weather information: air temp. 60 F, relative humidity 56%, wind NW at 2 to 3 mph, sky clear, soil temp. - 0 inch 76 F, 1 inch, 68 F, 2 inch, 56 F, and 4 inch, 55 F. At the time of herbicide application soil moisture levels were low, grasses ranged in height from 2 to 4 inches and sagebrush height ranged from 8 to 16 inches and was actively growing.

The treatments were clipped by grass species September 1, 1987, five years after herbicides were applied. Treatments were selected for clipping based on previous years percent sagebrush control, production and availability of herbicides in the marketplace.

Treatments controlling over 95% of the big sagebrush included metsulfuron at 0.5 lb ai/A, PPG 1259 at 1.0, 2.0 and 4.0 lb ai/A, 2,4-D LVE and 2,4,5-T ester each applied at 2.0 lb ai/A, tebuthiuron at 0.5, 0.75 and 1.0 lb ai/A, and UC 77179 at 0.5, 1.0, 2.0, 4.0 and 6.0 lb ai/A. All vegetation was controlled in areas treated with UC 77179.

Yield of *Stipa comata* was increased significantly in areas receiving 2,4-D (LVE) at 2.0 lb ai/A and triclopyr at 0.5 and 1.0 lb ai/A, while *Agropyron smithii* yields were increased in areas treated with tebuthiuron at 0.25, 0.5, 0.75 and 1.0 lb ai/A. When the yield of the two perennial grass weights were combined, significant increases were found with applications of 2,4-D (LVE) at 1.0 and 2.0 lb ai/A, tebuthiuron at 0.5 and 0.75 ai/A and triclopyr applied at 0.5 and 1.0 lb ai/A.

Big sagebrush control and resulting forage production

Herbicide treatment[1]	lb ai/A	Percent control[2]	Air dry forage, lb/A[3] STICO[4]	AGRSM[4]	TOTAL
metsulfuron 70DF	0.031	33	------	------	-------
metsulfuron 70DF	0.062	78	------	------	-------
metsulfuron 70DF	0.125	89	------	------	-------
metsulfuron 70DF	0.5	95	------	------	-------
DPXT 6206 70DF	0.031	77	------	------	-------
DPXT 6206 70DF	0.062	63	------	------	-------
DPXT 6206 70DF	0.125	85	------	------	-------
DPXT 6206 70DF	0.5	95	------	------	-------
PPG 1259 FL	1.0	100	------	------	-------
PPG 1259 FL	2.0	99	------	------	-------
PPG 1259 FL	4.0	99	------	------	-------
Dicamba 4DMA	1.0	9	------	------	-------
Dicamba 4DMA	2.0	17	------	------	-------
2,4-D (LVE)	1.0	61	334 bc	89 d	424 bcd
2,4-D (LVE)	2.0	97	577 a	153 cd	730 a
2,4,5-T ester	1.0	91	------	------	-------
2,4,5-T ester	2.0	96	------	------	-------
tebuthiuron 20P	0.125	62	------	------	-------
tebuthiuron 20P	0.25	91	148 cd	280 bc	429 bcd
tebuthiuron 20P	0.5	95	315 c	341 ab	512 bc
tebuthiuron 20P	0.75	99	66 d	512 a	578 abc
tebuthiuron 20P	1.0	100	34 d	358 ab	392 cd
UC 77179	0.5	95	------	------	-------
UC 77179	1.0	100	------	------	-------
UC 77179	2.0	100	------	------	-------
UC 77179	4.0	100	------	------	-------
UC 77179	6.0	100	------	------	-------
triclopyr 4E	0.25	23	------	------	-------
triclopyr 4E	0.5	92	566 ab	42 d	608 ab
triclopyr 4E	1.0	94	553 ab	55 d	609 ab
triclopyr 4E/2,4-D	0.5 + 1.0	89	------	------	-------
clopyralid	0.25	7	------	------	-------
clopyralid	0.5	11	------	------	-------
clopyralid	1.0	15	------	------	-------
check	---	0	149 cd	87 d	236 d
LSD (P = 0.05)			234	181	212

[1]Herbicide treatments applied June 10, 1982; X-77 applied at 0.5% v/v
[2]Visual control evaluations September 1, 1987; data from previous years can be found in WSWS 1987 Research Progress Report p. 68
[3]Production measurements September 1, 1987
[4]STICO = *Stipa comata*; AGRSM = *Agropyron smithii*; means followed by the same letter within a column are not significantly different according to the least significant difference test (P = 0.05)

Live canopy cover and production changes in big sagebrush (Artemisia tridentata Nutt.) infested rangeland 7 years after the application of tebuthiuron. Whitson, T. D. and M. A. Ferrell. Big Sagebrush infested rangeland in Wyoming produces only 1/3 the available forage for livestock compared to areas without big sagebrush. A big sagebrush infested rangeland area near Bosler, Wyoming was treated with 10 and 20% pelleted tebuthiuron on May 29 and September 16, 1980, on a Boyle sandy loam soil (60.6% sand, 24.2% silt and 15.8% clay) with 1.7% organic matter and 6.9% pH. Respective spring and fall experiments weather information: air temperature 72, 76F, soil surface 80, 104F, 1 inch 78, 104F, 2 inches 77, 102F, 4 inches 75, 94F; relative humidity 28 and 44%, wind speeds 0 to 4 mph SW. Treatment areas 18 by 30 ft were arranged in a randomized complete block design with three replications. The study was fenced to prevent grazing. Herbicides were applied with a centrifugal granular applicator. A vegetative inventory using Levy and Madden's point method of pasture analysis technique was used to determine live canopy cover. One hundred pinpoint identifications were taken at equidistant points along a permanently located 11 m transect line within each treatment replication (Table 1). Perennial grass yields were determined by clipping individual species from five, one meter quadrats per treatment in 1987. No statistical differences were found in date of application or the 10 or 20 percent product formulations therefore these data were combined and 12 replications were used to determine statistical application rate differences. As sagebrush control levels increased both live canopy cover and yields of perennial grasses increased. Live canopy cover differences in western wheatgrass were not found with areas treated with tebuthiuron at 0.25, 0.5, 0.75 or 1.0 lb ai/a. Differences were not found in production with any tebuthiuron applications for western wheatgrass or total production except at the 0.5 lb ai/a application rate which was significantly higher than any of the other application rates. The 0.25 lb ai/a application rate controlled only 85% of the sagebrush and the 0.75 and 1.0 lb ai/a applications caused damage to the perennial grasses, as a result lower perennial grass production was found on those areas. The 0.5 lb ai/a application rate controlled 96% of the sagebrush and caused no perennial grass damage, therefore it would be the preferred rate for sagebrush control. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Live canopy cover of rangeland treated in 1980 with applications of 10 and 20% pelleted tebuthiuron.

Species	Form. %	0.25	0.5	0.75	1.0	0.0
		Tebuthiuron application rate lbs ai/a				
		% live canopy cover				
Big sagebrush	10	3b[a]	1b	0b	0b	40a
	20	6b	1c	1c	0c	40a
Douglas rabbitbrush	10	6a	7a	4a	4a	5a
	20	5a	5a	5a	2a	5a
Hoods phlox	10	1a	0a	1a	0a	1a
	20	1a	0.3ab	0b	0.3ab	1ab
Prairie Junegrass	10	7a	10a	2b	3b	8a
	20	12a	8a	7a	6a	8a
Western wheatgrass	10	53a	58a	66a	56a	15b
	20	45a	56a	55a	56a	15b
Other spp.	10	1a	1a	1a	0a	1a
	20	1a	1a	0a	1a	1a
Bare ground	10	29ab	24b	27b	39a	30ab
	20	28a	28a	32a	35a	30a

[a] Plant species means with the same letter(s) within the same row are not significantly different among treatments at the 5% level according to Duncan's multiple range test.

Broom snakeweed (Gutierrezia sarothrae) control with various herbicides. Whitson, T. D. and M. A. Ferrell. Broom snakeweed is reported to cause losses due to abortion in cattle and sheep. It is especially toxic when grazed in early growth stages when it is growing on sandy soils when other feed is scarce. Two studies were established near McFadden, Wyoming to control broom snakeweed in pasture. The perennial grass understory was Fairway crested wheatgrass (Agropyron cristatum). Plots were 9 by 30 ft in size with four replications. Respective herbicide applications were August 1, 1985 and June 17, 1986 when broom snakeweed was in early bloom and in early vegetative growth stages 4 to 6 inches in height. Herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. The soil was a sandy loam (75% sand, 18% silt and 7% clay) with 2.4% organic matter and 7.8 pH. Weather factors on the August 1, 1985 experiment were: air 78F, soil surface 89F, 1 inch 86F, 2 inch 76F and 4 inch 72F, relative humidity 80% and wind speed 3 mph, NW. Weather factors on the June 17, 1986 experiment were: air 78F, soil surface 109F, 1 inch 106F, 2 inch 90F and 4 inch 78F, relative humidity 55% and wind speed 0 to 5 mph, NW.

Excellent control was obtained with applications of triclopyr + 2,4-D, picloram + clopyralid, picloram and triclopyr at the 2.0 lb ai/a application rate. Timing of applications did not appear to be a factor when herbicide treatments provided control. 2,4-D LVE was considerably more effective when applied in spring rather than mid-summer. Three studies were established in 1987 to better determine the lowest possible application rates required for effective control. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Broom snakeweed control with various herbicices

Herbicide	Rate lbs ai/a	Application date Aug. 1, 1985 % control	June 17, 1986 % control
triclopyr + 2,4-D (LVE)[1]	1.0 + 2.0	99	100
triclopyr + 2,4-D (LVE)	1.5 + 3.0	99	100
triclopyr	1.0	68	53
triclopyr	2.0	96	99
picloram + clopyralid	0.125 + 0.125	96	100
picloram + clopyralid	0.25 + 0.25	100	100
picloram	0.25	96	100
picloram	0.5	98	100
fluroxypyr	1.0	89	80
2,4-D (LVE)	2.0	15	82
Check	-	0	0

[1] LVE = Low Volitile Ester

Leafy spurge control with fluroxypyr and picloram at different application timings in a Colorado pasture. Beck, K.G. and J.R. Sebastian. An experiment was conducted near Laporte, CO to evaluate leafy spurge (EPHES) control with fluroxypyr and picloram. The design was a randomized complete block with four replications. Fluroxypyr was applied at five rates in July and September and picloram at two rates in June and September (Table 1). All treatments were applied with a CO_2 pressurized backpack sprayer using 11003LP flat fan nozzles calibrated to deliver 24 gpa at 15 psi. Other environmental data are presented in Table 2. Plot size was 10 by 30 ft.

Visual evaluations were taken on November 2, 1987 approximately 19, 16, and 9 weeks after June, July and September applications, respectively. Greater fall regrowth occurred in many plots treated with fluroxypyr in July compared to checks. Fluroxypyr at all rates and picloram at 1.0 lb ai/a in spring and both rates in fall provided greatest leafy spurge control at evaluation; fluroxypyr at 0.20, 0.40, 0.60, and 1.00 lb ai/a caused least control (Table 1).

Herbicide treatments will be evaluated again in June, 1988 then retreated in a split-plot design with low rates of fluroxypyr. Treatments will be evaluated again in 1989. (Weed Research Laboratory, Colorado State University, Ft. Collins 80523).

Table 1. Leafy spurge control with fluroxypyr and picloram at different application timings.

Herbicide	Rate (lb ai/a)	Timing	EPHES Nov 2, 1987 (% Control)
fluroxypyr	0.20	July	0
fluroxypyr	0.40	July	0
fluroxypyr	0.60	July	0
fluroxypyr	0.80	July	26
fluroxypyr	1.00	July	16
fluroxypyr	0.20	Sep	99
fluroxypyr	0.40	Sep	96
fluroxypyr	0.60	Sep	98
fluroxypyr	0.80	Sep	99
fluroxypyr	1.00	Sep	98
picloram	0.50	June	95
picloram	1.00	June	100
picloram	0.50	Sep	100
picloram	1.00	Sep	100
LSD (0.05)			17

Table 2. Application data for leafy spurge control with fluroxypyr and picloram at different timings.

Environmental data			
Application dates	6-25-87	7-15-87	9-4-87
Application times	11:00 A	6:30 A	10:00 A
Air temperature, C	28	24	20
Cloud cover, %	0	0	20
Wind Speed/direction, mph	2-5/SW	NONE	0-2/SW
Soil temperature (2 in), C	22	24	17

Weed data

Application date	Species	Growth Stage	Height (in)	Density ($shoot/ft^2$)
6-25-87	EPHES	flowering	18-24	8-10
7-15-87	EPHES	flowering	18-24	8-10
9-4-87	EPHES	seed set/ senescence	-	-

Testing granular formulations of picloram for leafy spurge (*Euphorbia esula* L.) control. Fay, P.K. and E.S. Davis. The Dow Chemical Company has ceased production of Tordon 2K, a dry pellet formulation of picloram. The loss of Tordon 2K will impact Montana since it was especially useful for spot treatment of pioneer patches of leafy spurge. Many ranchers and weed district personnel have used small amounts of Tordon 2K for many years effectively controlling the noxious rangeland weed. These experiments were established in an attempt to find substitute dry formulations of picloram. Complete fertilizer (14-14-14), ammonium sulphate fertilizer, "Tidy Kat," "Hagen," and a locally-made organic cat litter were placed on a plastic sheet and sprayed with Tordon 22K using an atomizer. The herbicide was applied in numerous sprays and thoroughly mixed between applications. The final concentration for each material is shown in the table. Oat (*Avena sativa* L.) kernels were autoclaved and soaked in known amounts of Tordon 22K for 24 hours, removed from the solution, and air dried. They imbibed 1% (w/w) picloram as Tordon 22K. The dried materials and Tordon 2K granules were hand applied to 7 by 25 foot plots at Bozeman and Whitehall, MT on May 14, 1986. Tordon 22K was applied using a CO_2-pressurized backpack sprayer in 15 gpa. There were 3 replications arranged in a randomized complete block design at both locations. Leafy spurge control was visually rated in June of 1986 and 1987 at both locations (Table).

Tordon 22K, the liquid formulation of picloram was ineffective at both rates tested at both locations. Tordon 2K, the extruded pellet formulation, provided effective control 13 months after application. The impregnated fertilizer treatments were very effective at the highest rate tested. The impregnated cat litter formulations were also effective at both locations when applied at the rate of 1 lb a.i./A. Dead oat kernels imbibed with Tordon 22K were erratic at Bozeman but provided complete control at Whitehall. It appears that picloram can be impregnated on many types of substrates and maintain good activity on leafy spurge. (Montana Agric. Exp. Sta., Bozeman, MT 59717.)

The effect of picloram impregnated on several substrates for leafy spurge control in Bozeman and Whitehall, MT.

Picloram Formulation Type	Formulation Active Ingredient	Picloram Rate	Leafy Spurge Control			
			Bozeman		Whitehall	
			6-12-86	6-15-87	6-26-86	6-15-87
		lb/A	%			
Tordon 22K	2 E.C.	0.5	84	31	0	28
Tordon 2K	2%	0.5	48	73	43	92
14-14-14 fertilizer	0.43%	0.5	35	46	13	59
NH_4SO_4	0.43%	0.5	37	45	35	99
"Tidy Kat" cat litter	2%	0.5	27	40	53	99
"Hagen" cat litter	2%	0.5	40	59	48	100
Organic cat litter	1%	0.5	45	64	32	60
Dead oat kernels	1%	0.5	43	50	30	97
Tordon 22K	2 E.C.	1.0	98	55	13	48
Tordon 2K	2%	1.0	65	87	82	99
14-14-14 fertilizer	0.43%	1.0	58	100	53	100
NH_4SO_4 fertilizer	0.43%	1.0	67	94	92	100
"Tidy Kat" cat litter	2%	1.0	94	99	87	100
"Hagen" cat litter	2%	1.0	71	98	35	100
Organic cat litter	1%	1.0	75	96	43	100
Dead oat kernels	1%	1.0	37	83	62	100
Control	---		0	0	0	0
LSD .05			31	31	21	14

Leafy spurge control with fall applications of sulfometuron. Ferrell, M.A. and T.D. Whitson. Leafy spurge is a major broadleaf, perennial weed problem in rangeland. This research was conducted in Crook County, WY, to compare the efficacy of fall applications of sulfometuron on leafy spurge.

Plots were established September 16, 1986 to a dense stand of leafy spurge in a rangeland setting. Leafy spurge was mature and had shed most of its seed. Perennial grasses 1 to 2 feet tall were present as an understory. Herbicides were applied with a 6-nozzle knapsack spray unit with a carrier volume of 40 gpa delivered at 40 psi pressure through 8004 flat fan nozzles. Weather conditions were as follows: air temp. 53 F, relative humidity 80%, wind S at 5 mph, sky cloudy, soil temp. - 0 inch 55 F, 1 inch 57 F, 2 inch 57 F, 4 inch 57 F. Soil was a silt loam (22% sand, 58% silt and 20% clay) with 1.8% organic matter and 6.3 pH. Plots were 9 by 30 ft and arranged in a randomized complete block design with four replications.

Percent leafy spurge control, suppression, and grass suppression were evaluated visually on July 8, 1987. No treatment provided satisfactory control when evaluated 10 months after application. Picloram applied at 2.0 lb ai/A normally provides 90% control or better one year after application, however, in this particular study control was variable, ranging from 50 to 90% control in individual plots. All treatments containing sulfometuron resulted in suppression of leafy spurge, with sulfometuron + glyphosate resulting in the highest suppression, at 81%. All treatments containing sulfometuron at the 0.0468 lb ai/A rate and higher also resulted in grass suppression. Sulfometuron + glyphosate resulted in the highest percentage of grass suppression at 89%. Due to the suppressive nature of sulfometuron, its use as a setup treatment needs to be studied. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1518).

Leafy spurge shoot control

Treatment[1]	Rate lb ai/A	Percent control[2] 1987	Percent suppression[2] 1987	Percent grass suppression[2] 1987
sulfometuron	.0313	0	10	0
sulfometuron	.0468	3	30	20
sulfometuron	.0938	13	35	28
sulfometuron + 2,4-D LVE	.0313 + 1.0	10	38	0
sulfometuron + 2,4-D LVE	.0625 + 1.0	24	54	20
sulfometuron + picloram	.0313 + .125	13	33	10
sulfometuron + picloram	.0625 + .125	60	75	23
sulfometuron + glyphosate	.0625 + .75	49	81	89
fosamine	1.0	0	0	0
fosamine	2.0	0	0	0
sulfometuron + fosamine	.0938 + 1.0	13	51	11
picloram	.125	0	0	0
picloram	2.0	70	0	0
LSD (0.05) =		16	18	18
CV =		61	88	42

[1] Treatments applied September 16, 1986; surfactant, X-77, added to all treatments at 0.5% v/v
[2] Visual evaluations July 8, 1987

Dicamba combinations for leafy spurge shoot control. Ferrell, M.A. and T.D. Whitson. Leafy spurge is a major broadleaf, perennial weed problem in rangeland. This research was conducted in Crook County, WY, to compare the efficacy of dicamba combinations, with picloram and 2,4-D LVE, on leafy spurge.

Plots were established May 14, 1986 to a dense stand of leafy spurge in a rangeland setting. The leafy spurge was in the prebud stage-of-growth. Perennial grasses 4 to 6 inches tall were present as an understory. Herbicides were applied with a 6-nozzle knapsack spray unit with a carrier volume of 40 gpa delivered at 40 psi pressure through 8004 flat fan nozzles. Weather conditions were as follows: air temp. 45 F, relative humidity 60%, wind SW at 5 mph, sky cloudy, and a soil temp. - 0 inch 60 F, 1 inch 54 F, 2 inch 50 F, 4 inch 50 F. Soil was silt loam (22% sand, 58% silt and 20% clay) with 1.8% organic matter and 6.3 pH. Plots were 9 by 30 ft and arranged in a randomized complete block design with four replications.

Visual evaluations were made May 14, 1987. Picloram at 2.0 lb ai/A was the only effective treatment. Combinations of dicamba with picloram and 2,4-D LVE were not effective in controlling leafy spurge. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1517.)

Leafy spurge shoot control

Treatment[1]	Rate lb ai/A	Percent control[2]
dicamba	0.5	0
dicamba	1.0	0
dicamba	2.0	0
dicamba	4.0	53
dicamba + picloram	0.5 + 0.125	0
dicamba + picloram	1.0 + 0.25	18
picloram	0.5	42
picloram	1.0	65
picloram	2.0	96
dicamba + 2,4-D LVE	1.0 + 1.0	47
dicamba + 2,4-D LVE	1.0 + 3.0	45
LSD (0.05) =		19
CV =		36

[1]Treatments applied May 14, 1986; surfactant, X-77, added to all treatments at 0.5 v/v

[2]Visual evaluations July 7, 1987

Initial control of leafy spurge with various formulations of 2,4-D. Ferrell, M.A. and T.D. Whitson. Leafy spurge is a major broadleaf, perennial weed problem in rangeland. This research was conducted in Crook County, WY, to compare the efficacy of various formulations of 2,4-D on leafy spurge.

Plots were established May 28, 1987 on a dense stand of leafy spurge in a rangeland setting. The leafy spurge was in full bloom. Perennial grasses 6 to 8 inches tall were present as an understory. Herbicides were applied with a 6-nozzle knapsack spray unit with a carrier volume of 30 gpa delivered at 45 psi pressure through 8004 flat fan nozzles. Weather conditions were as follows: air temp. 63 F, relative humidity 74%, wind W at 5 mph, sky cloudy, soil temp. 0 inch 75 F, 1 inch 70 F, 2 inch 70 F, 4 inch 65 F. Soil was a silt loam (22% sand, 58% silt and 20% clay) with 1.8% organic matter and 6.3 pH. Plots were 10 by 27 ft and arranged in a randomized complete block design with four replications.

Visual evaluations were made July 7, 1987, 40 days after treatment application. The 2,4-D butoxyethyl ester + 2,4-D amine formulation provided better initial control especially at the 1.0 lb ai/A rate than did the other 2,4-D formulations. As rates increased, however, there was less difference between the 2,4-D formulations. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1520 .)

Leafy spurge control

Treatment[1]	Rate lb ai/A	Percent initial control[2] 1987
2,4-D alkanolamine	1.0	54
2,4-D isoctyl ester	1.0	74
2,4-D amine + 2,4-D butoxyethyl ester	1.0	80
2,4-D alkanolamine	1.5	69
2,4-D isooctyl ester	1.5	78
2,4-D amine + 2,4-D butoxyethyl ester	1.5	81
2,4-D alkanolamine	2.0	80
2,4-D isooctyl ester	2.0	81
2,4-D amine + 2,4-D butoxyethyl ester	2.0	85
picloram	2.0	73
LSD (0.05) =		17
CV =		14

[1]Treatments applied May 28, 1987
[2]Visual evaluations July 7, 1987

Leafy spurge control with spring applications of sulfometuron. Ferrell, M.A. and T.D. Whitson. Leafy spurge is a major broadleaf, perennial weed problem in rangeland. This research was conducted in Crook County, WY, to compare the efficacy of spring applications of sulfometuron on leafy spurge.

Plots were established May 14, 1986 to a dense stand of leafy spurge in a rangeland setting. The leafy spurge was in the prebud stage. Perennial grasses 4 to 6 inches tall were present as an understory. Herbicides were applied with a 6-nozzle knapsack spray unit with a carrier volume of 40 gpa delivered at 40 psi pressure through 8004 flat fan nozzles. Weather conditions were as follows: air temp. 45 F, relative humidity 60%, wind SW at 5 mph, sky cloudy, soil temp. - 0 inch 60 F, 1 inch 54 F, 2 inch 50 F, 4 inch 50 F. Soil was a silt loam (22% sand, 58% silt and 20% clay) with 1.8% organic matter and 6.3 pH. Plots were 9 by 30 ft and arranged in a randomized complete block design with four replications.

Percent leafy spurge control and grass suppression were evaluated visually on August 13, 1986 and July 7, 1987. With the exception of metsulfuron, all treatments exhibited varying degrees of control three months after application, with sulfometuron + 2,4-D LVE and picloram providing good control (see table). Evaluations were taken 14 months after herbicide applications and it was found that sulfometuron + 2,4-D LVE provided poor weed control while picloram provided fair weed control. However, treatments containing sulfometuron did exhibit some suppression of leafy spurge wtih no grass suppression 14 months after treatment application. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1519.)

Leafy spurge shoot control

Treatment[1]	Rate lb ai/A	Percent control[2]		Percent grass suppression[2]	
		1986	1987	1986	1987
sulfometuron	.0468	53	0	83	0
sulfometuron	.0938	55	0	91	0
metsulfuron	.0188	0	0	0	0
metsulfuron	.0375	0	0	0	0
sulfometuron + metsulfuron	.0468 + .0188	58	0	85	0
sulfometuron + metsulfuron	.0468 + .0375	59	0	90	0
sulfometuron + metsulfuron	.0625 + .0188	55	0	90	0
sulfometuron + metsulfuron	.0625 + .0375	60	0	90	0
sulfometuron + glyphosate	.0625 + .75	53	0	98	8
fosamine	1.0	3	0	0	0
fosamine	2.0	5	0	0	0
sulfometuron + fosamine	.0938 + 1.0	59	0	85	0
sulfometuron + 2,4-D LVE	4.0	87	34	69	0
picloram	2.0	87	60	0	0
LSD (0.05) =		8	3	11	ns
CV =		14	33	15	599

[1] Treatments applied May 14, 1986; surfactant, X-77, added to all treatments at 0.5% v/v

[2] Visual evaluations August 13, 1986 and July 7, 1987

Control of leafy spurge with fluroxypyr. Whitson, T. D. and M. A. Ferrell. Two experiments were established in 1985 to compare times of application and sequential herbicide treatments following fluroxypyr. Applications of fluroxypyr at 0.5 lb ai/a applied in two study areas on July 24, and August 26, 1985, 1986. One year following initial applications of fluroxypyr retreatments were applied with fluroxypyr, dicamba, 2,4-D(LVE) and picloram at 0.5, 2.0, 2.0 and 0.5 lb ai/a, respectively. Dates of each of the series of retreatments in the studies were June 2, 1986 and July 28, 1986.

Herbicides were applied with a CO_2 pressurized knapsack unit delivering 40 gpa at 45 psi. Weather information: (July 24, 1985) air temperature 70F, soil surface 70F, 1 inch 65F, 2 inch 60F, 4 inch 60F, relative humididy 70%, wind 0 mph. (August 26, 1985) air temperature 70F, soil surface 90F, 1 inch 90F, 2 inch 90F, 4 inch 84F, relative humidity 20%, wind 0 mph. (July 2, 1986) air 75F, soil surface 75F, 1 inch 78F, 2 inch 78F, 4 inch 70F, relative humidity 35%, wind 0 mph. (August 28, 1986) air temperature 84F, soil surface 112F, 1 inch 96F, 2 inch 88F, 4 inch 80F, relative humidity 22%, wind 5 to 10 mph SE. The soil was a sandy loam (73% sand, 15% silt and 12% clay) with 1.3% organic matter and pH of 7.6. The studies were irrigated but watering was not uniform.

Evaluations were taken, two years following initial treatments, on May 18, 1987. No differences were found between the initial treatments of fluroxypyr applied in July and August 1987 (tables 1, 2). Both of the initial treatment times provided similar control when followed by retreatments applied the same day. All retreatments applied on July 28, 1986 controlled considerably higher percentages of leafy spurge than the same treatments applied on June 2, 1986 (Table 1, 2).

Fluroxypyr set-up treatments followed by 0.5 lb aia/a of picloram in late July provided 97% control of leafy spurge, retreatments of picloram averaged 60% control when applied in early June. Timing of both the fluroxypyr as set-up treatments and retreatments is important. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Table 1. Fluroxypyr July treatments followed by June retreatments.

	Herbicide	lbs ai/a	Date of initial application	% Control retreatments June 2, 1986	% Control retreatments July 28, 1986
1.	fluroxypyr + fluroxypyr	0.5 0.5	7/24/85	48	65
2.	fluroxypyr + dicamba	0.5 2.0	7/24/85	46	87
3.	fluroxypyr + 2,4-D (LVE)	0.5 2.0	7/24/85	29	59
4.	fluroxypyr + picloram	0.5 0.5	7/24/86	69	97
5.	fluroxypyr	0.5	7/24/86	11	11
6.	check	-	-	0	0

Table 2. Fluroxypyr August treatments followed by June retreatments.

	Herbicide	lbs ai/a	Date of initial application	% control retreatments June 2, 1986	July 28, 1986
1.	fluroxypyr	0.5	8/26/85	34	73
	+ fluroxypyr	0.5			
2.	fluroxypyr	0.5	8/26/85	35	86
	+ dicamba	2.0			
3.	fluroxypyr	0.5	8/26/85	36	63
	+ 2,4-D (LVE)	2.0			
4.	fluroxypyr	0.5	8/26/85	50	97
	+ picloram	0.5			
5.	fluroxypyr	0.5	8/26/85	5	5
6.	check	-	-	0	0

Leafy spurge control with late summer applied herbicides. Wichman, D.M. This research was conducted to evaluate the efficacy of eleven herbicide treatments applied in late summer. The research site is in the Judith River bottom near Ross Fork, MT. Primary species were western wheatgrass, Kentucky bluegrass, leafy spurge, and mature cottonwood trees.

The experiment was a randomized complete block design with three replications. Plots were 10.0 ft wide by 45 ft long. Treatments were applied with a tractor mounted CO_2 sprayer, operated at 30 psi, delivering 7.7 gal/a water carrier through 8002 nozzles. Fosamine-ammonium treatments were applied in two passes (15.4 gal/a). Treatments were applied August 22, 1986 to leafy spurge, which had been clipped to a 2 inch height July 1, in the pre-bud to flowering stage. Visual evaluations were conducted 9-16-1986, 5-25-1987, and 9-1-1987.

Picloram at 32 oz ai/a and sulfometuron methyl + 2,4-D ester at 1.0 + 16 and 1.5 + 16 oz ai/a provided the greatest burn down of the leafy spurge. Leafy spurge control was similar for all treatments nine months and one year after application. However, sulfometuron methyl killed most of the grass present. The Fosamine-ammonium control was greater than expected. The performance of Fosamine-ammonium may have been due to time of application, micro-climate or a combination of timing and micro-climate. (Central Ag. Research Center, Montana State University, Moccasin, Montana 59462).

Leafy spurge control with late summer applied herbicides

Herbicide	Rate	Leafy spurge control %			Grass cover %	
	oz ai/a	Sept 1986	May 1987	Sept 1987	May 1987	Sept 1987
picloram	8.0	50	100	88	96	99
sulfometuron methyl+surf.1/	1.5+.25%v/v	47	99	82	2	5
sulfometuron methyl+surf.	2.0+.25%v/v	57	97	86	1	7
sulfometuron+2,4-D ester	1.0+16	80	98	82	3	30
sulfometuron+2,4-D ester	1.5+16	87	100	96	1	11
fosamine-ammonium	64	20	98	92	100	99
fosamine-ammonium	128	40	98	92	100	99
fosamine-ammonium	192	40	97	94	100	97
sulfometuron methyl+surf.	1.0+.25%v/v	50	97	64	5	25
check untreated		0	0		50	40
picloram	32	90	100	99	83	94
sulfometuron methyl+picloram	1.0+4.0	47	98	84	8	17
LSD (0.05)		18	ns	10	8	15

1/ surf. = surfactant

Yellow starthistle presence in 29 month-old stands of eight grasses. Northam, F.E. and R.H. Callihan. A grass adaptation study evaluated the ability of eight grass species to withstand yellow starthistle (Centaurea solstitialis L. CENSO) invasion. The grasses were Alkar tall wheatgrass (Thinopyrum ponticum), Luna pubescent wheatgrass (Thinopyrum intermedium ssp barbulatum), Nezpar Indian ricegrass (Oryzopsis hymenoides (R. & S.)Ricker), Nordan crested wheatgrass (Agropyron desertorum), Oahe intermediate wheatgrass (Thinopyrum intermedium), Paiute orchardgrass (Dactylis glomerata L.), P-27 Siberian wheatgrass (Agropyron fragile) and Secar bluebunch wheatgrass (Pseudoroegneria spicata). For the nomenclature authority of the wheatgrass, see Table 1. Each replication also included a control strip without an established grass variety.

The site is a well-drained, alluvium near the Snake River in Lewiston, Idaho. The soil type is a Tammany Creek variant with a fine sandy loam surface texture. Annual precipitation averages 13 inches, most of which occurs from November through April.

In Nov. 1984 the plot area was disked six in. deep to bury approximately two in. of plant litter and to control winter annuals. On March 9, 1985, a preplant application of 1.0 lb ai/a glyphosate was applied. The grasses were planted on 12 Mar. 1985 with a seven-row plot drill. Twenty seeds per foot of row were planted with a seven in. row spacing resulting in 34 pure live seeds per square foot (sqft) for each species (Table 1). The grass plots in each replication were drilled strips 152 by 4.5 ft for each species. The entire plot area was mowed to a height of six in. to remove top growth of broadleaf weeds on June 12, 1985. At this time the grasses were 2 to 4 in. tall. The site was mowed to six in. again in late Aug. On 29 Mar. 1986 0.5 lb ai/a of 2,4-D was applied and on 21 Apr. 1986 another 1.0 lb ai/a of 2,4-D was applied to control yellow starthistle, yellow sweetclover (Melilotus officinalis (L.) Lam. MELOF) and hairy vetch (Vicia villosa Roth VICVI) seedlings. No maintenance treatments were applied during the 1987 growing season.

Yellow starthistle densities (number/sqft) were recorded in Aug 1987 (29 months after seeding). Herbage yields (g/sqft) were sampled at this time. These data were analyzed as a randomized complete block design with six samples from each of four replications.

The average yellow starthistle density for all plots was 1.2 plants/sqft; the density averages ranged from 0.13 plants/sqft in the intermediate wheatgrass plots to 3.3 plants/sqft in the crested wheatgrass plots (Table 2). The plots from the control strips averaged 1.51 yellow starthistle/sqft. The averages of yellow starthistle plants in the plots of crested wheatgrass (3.3/sqft), orchardgrass (1.75/sqft), Siberian wheatgrass (1.47/sqft) and the control strip (1.51/sqft) were significantly greater (LSD=1.24; $P<0.05$) than the intermediate wheatgrass average (0.13/sqft).

The average weight of yellow starthistle for all plots was 1.6 g/sqft with the average weights ranging from 0.17 g/sqft in the pubescent wheatgrass plots to 4.05 g/sqft in the orchardgrass plots (Table 2). The plots from the control strip averaged 2.14 g/sqft. Average yellow starthistle weights in the plots of orchardgrass (4.05 g/sqft) and the Siberian wheatgrass (3.23 g/sqft) were significantly higher (LSD=2.84; $P<0.05$) than the averages from the plots of pubescent wheatgrass (0.17 g/sqft) and intermediate wheatgrass (0.19 g/sqft). Also, the average from the bluebunch wheatgrass plots (0.70 g/sqft) was significantly less than the orchardgrass average.

The relationships of grass density and biomass to yellow starthistle density and biomass is summarized in Table 2. Grass density correlated fairly well with yellow starthistle biomass ($r=-.879$). The higher the density of grass the lower the yellow starthistle biomass except in the case of bluebunch wheatgrass, which had both low grass density and low yellow starthistle biomass. The grasses with biomass over 10.0 g/sqft (intermediate wheatgrass, pubescent wheatgrass and tall wheatgrass) had the lowest yellow starthistle density, but no consistent relationship between grass weight and yellow starthistle density was evident with the grasses producing less than 7.0 g/sqft. The results from these data are outlined below (Table 3).

Table 3. Summary of grass performance in a yellow starthistle infestation.

Grass species	Grass and yellow starthistle performance
Siberian wheatgrass Orchardgrass	lowest grass densities; lowest grass biomass; highest yellow starthistle biomass
Indian ricegrass	good grass density, but low grass biomass; moderate yellow starthistle density and biomass
Crested wheatgrass	good grass density; fair grass biomass; highest yellow starthistle density
Tall wheatgrass	low yellow starthistle density; high grass biomass; high yellow starthistle biomass
Intermediate wheatgrass Pubescent wheatgrass	highest grass densities; low yellow starthistle densities; lowest yellow starthistle biomass

After 29 months, Oahe intermediate wheatgrass was the best grass for reducing yellow starthistle populations and producing the most forage. Luna pubescent wheatgrass and Alkar tall wheatgrass also were good at maintaining low yellow starthistle stands and producing forage. Even though Nordan crested wheatgrass density was good, yellow starthistle was not adversely affected. The remaining grasses were considered unacceptable for this site because they either did not survive or had low forage production. (Idaho Agricultural Experiment Station, Moscow, Id. 83843)

Table 1. Seeding rates for the grasses planted in a yellow starthistle infested site.

Grass	# seeds per lb	lbs pure live seed per acre
Alkar tall wheatgrass Thinopyrum ponticum** (Agropyron elongatum)	79,000	18.7*
Durar hard fescue Festuca ovina var. duriuscula	565,000	2.6
Luna pubescent wheatgrass Thinopyrum intermedium ssp. barbulatum** (Agropyron trichophorum)	91,000	16.3
Nezpar Indian ricegrass Oryzopsis hymenoides	235,000	6.3
Nordan crested wheatgrass Agropyron desertorum	175,000	8.5
Oahe intermediate wheatgrass Thinopyrum intermedium ssp. intermedium** (Agropyron intermedium)	100,000	14.8
Paiute orchardgrass Dactylis glomerata	540,000	2.7
P-27 Siberian wheatgrass Agropyron fragile** (A. sibiricum)	250,000	5.9
Reubens Canada bluegrass Poa compressa	2,500,000	0.6
Secar bluebunch wheatgrass Pseudoroegneria spicata** (Agropyron spicatum)	140,000	10.6
Sherman big bluegrass Poa secunda*** (P. ampla)	917,000	1.6

* these seeding rates equal 34 pure live seed per square foot.
** sensu Barkworth and Dewey. 1985. Amer. J. Bot. 72:767-776.
*** Sensu Kellog. 1985. J. Arnold Arboretum. 66:201-242.

Table 2. Density and biomass of grasses and yellow starthistle in the grass control plots of a grass herbicide tolerance trial.

Grass Variety	Density*		Biomass*	
	Grass	CENSO	Grass	CENSO
	#/sqft		g/sqft	
Oahe intermediate wheatgrass	1.56**	0.13	12.62	0.19
Luna pubescent wheatgrass	1.53	0.55	10.14	0.17
Alkar tall wheatgrass	0.99	0.48	10.43	1.39
Nordan crested wheatgrass	0.99	3.30	6.03	1.38
Nezpar Indian ricegrass	0.91	1.07	2.90	1.44
Secar bluebunch wheatgrass	0.79	0.80	4.32	0.70
Paiute orchardgrass	0.38	1.75	3.03	4.05
P-27 Siberian wheatgrass	0.01	1.47	0.09	3.23
Control	--	1.51	--	2.14
LSD (0.05)	0.31	1.24	2.69	2.84

* These date were collected 29 months after an early spring grass seeding on an urban site in Lewiston, Id.

** Each value is the mean of four replications; six quadrats were sampled in each replication. An 8 sqft quadrat was used to sample density and a 4 sqft quadrat was used to sample biomass.

Adaptation of selected grasses to a semi-arid yellow starthistle infested site. Northam, F.E. and R.H. Callihan. Eleven grasses were evaluated for adaptation to a semi-arid northern Idaho site infested with yellow starthistle (Centaurea solstitialis L. CENSO). The site is a well-drained, alluvium near the Snake River in Lewiston, Idaho. The soil type is a Tammany Creek variant with a fine sandy loam surface texture. Annual precipitation averages 13 inches, most of which occurs from November through April.

In Nov 1984 the plot area was disked six in. deep to bury approximately two in. of plant litter and to control winter annuals. On 9 Mar 1985, a 1.0 lb ai/a preplant application of glyphosate was applied. The grasses were planted on 12 Mar 1985 with a seven-row plot drill. Twenty seeds per foot of row were planted with a seven in. row spacing resulting in 34 pure live seeds per square foot (sqft) for each species (Table 1). The grass plots in each replication were drilled strips 152 by 4.5 ft for each species. The entire plot area was mowed to a height of six in. to remove top growth of broadleaf weeds on June 12, 1985. At this time the grasses were 2 to 4 in. tall. The site was mowed to six in. again in late Aug. On 29 Mar 1986 0.5 lb ai/ac of 2,4-D was applied and on 21 Apr 1986 another 1.0 lb ai/a of 2,4-D was applied to control yellow starthistle, yellow sweetclover (Melilotus officinalis (L.) Lam. MELOF) and hairy vetch (Vicia villosa Roth. VICVI) seedlings. No maintenance treatments were applied during the 1987 growing season.

Cultivars of eight grasses established adequate stands for evaluating survival and growth. The grasses were Alkar tall wheatgrass (Thinopyrum ponticum), Luna pubescent wheatgrass (Thinopyrum intermedium ssp barbulatum), Nezpar Indian ricegrass (Oryzopsis hymenoides (R. & S.) Ricker), Nordan crested wheatgrass (Agropyron desertorum), Oahe intermediate wheatgrass (Thinopyrum intermedium), Paiute orchardgrass (Dactylis glomerata L.), P-27 Siberian wheatgrass (Agropyron fragile) and Secar bluebunch wheatgrass (Pseudoroegneria spicata). For the nomenclature authority of the wheatgrasses, see Table 1. Sherman big bluegrass (Poa secunda Presl) and Durar hard fescue (Festuca ovina var duriuscula L.) produced poor stands while Canada bluegrass (Poa compressa L.) did not establish; therefore, these species were not evaluated.

Plant densities (number/sqft) were recorded in July 1985 (4 months after seeding), June 1986 (15 months after seeding) and Aug 1987 (29 months after seeding). Herbage yield (g/sqft) were also recorded in June 1986 and Aug 1987.

The first objective in this experiment was to assess species adaptability to the site. Grass performance was used as an adaptability indicator by comparing the stand counts and yields (Table 2). Grass density ranged from 6.57 plants/sqft (tall wheatgrass) to 3.18 plants/sqft (bluebunch wheatgrass) in July 1985. By Aug. 1987, grass density in the same plots ranged from 1.56 plants/sqft (intermediate wheatgrass) to 0.01 plants/sqft (P-27). The density in the intermediate and pubescent wheatgrass plots were essentially identical in 1987 (1.56 and 1.53 plants/sqft, respectively), and were significantly higher than the densities in the other species' plots (LSD 0.05 = .31). Densities ranged from 0.79 to 0.99 plants/sqft in 1987 and were significantly higher than orchardgrass (0.38 plants/sqft) and Siberian wheatgrass (0.01 plants/sqft).

The 1987 herbage yields (Table 2) for three grasses were significantly higher than the others. Intermediate wheatgrass yielded highest with 12.6 g/sqft, tall wheatgrass was second with 10.4 g/sqft and pubescent wheatgrass was third with 10.1 g/sqft (LSD at 0.05 = 2.69). On a lb/a basis, intermediate wheatgrass yielded 1210 lbs, tall wheatgrass yielded 999 lbs and pubescent wheatgrass yielded 970 lbs. Other species yielded less than 6.1 g/sqft (585 lbs/a).

The results from this spring seeding indicated that Durar hard fescue, Reubens Canada bluegrass and Sherman big bluegrass did not establish well at this site. Even though P-27 Siberian wheatgrass and Paiute orchardgrass established adequate stands in 1985, their populations declined to less than 11% of their initial level after two years. The Nordan crested wheatgrass, Nezpar Indian ricegrass and Secar bluebunch wheatgrass control plots maintained almost 1 plant/sqft in 1987, but their forage production was 40% to 80% below that of Alkar tall wheatgrass, Luna pubescent wheatgrass and Oahe intermediate wheatgrass. Both stand counts and forage production indicated that Oahe performed best at the site. Luna was a close second and Alkar performed well, but not as well as Oahe and Luna. (Idaho Agricultural Experiment Station, Moscow, Id 83843)

Table 1. Seeding rates for the grasses planted in a yellow starthistle infested site.

Grass	# seeds per lb	lbs pure live seed per acre
Alkar tall wheatgrass Thinopyrum ponticum** (Agropyron elongatum)	79,000	18.7*
Durar hard fescue Festuca ovina var. duriuscula	565,000	2.6
Luna pubescent wheatgrass Thinopyrum intermedium ssp. barbulatum** (Agropyron trichophorum)	91,000	16.3
Nezpar Indian ricegrass Oryzopsis hymenoides	235,000	6.3
Nordan crested wheatgrass Agropyron desertorum	175,000	8.5
Oahe intermediate wheatgrass Thinopyrum intermedium ** (Agropyron intermedium)	100,000	14.8
Paiute orchardgrass Dactylis glomerata	540,000	2.7
P-27 Siberian wheatgrass Agropyron fragile** (A. sibiricum)	250,000	5.9
Reubens Canada bluegrass Poa compressa	2,500,000	0.6
Secar bluebunch wheatgrass Pseudoroegneria spicata** (Agropyron spicatum)	140,000	10.6
Sherman big bluegrass Poa secunda*** (P. ampla)	917,000	1.6

* these seeding rates equal 34 pure live seed per square foot.
** sensu Barkworth and Dewey. 1985. Amer. J. Bot. 72:767-776.
*** sensu Kellog. 1985. J. Arnold Arboretum. 66:201-242.

Table 2. Performance of grasses in a semi-arid yellow starthistle infested site.

Grass	Density (# plants/sqft)			Yield (g/sqft)	
	1985	1986	1987	1986	1987
Alkar tall wheatgrass	6.57*	1.37	0.98 B**	4.25	10.43 A
P-27 Siberian wheatgrass	6.17	0.19	0.01 D	0.44	0.09 D
Nordan crested wheatgrass	---	1.59	0.99 B	6.23	6.03 B
Oahe intermediate wheatgrass	5.19	1.90	1.56 A	12.97	12.62 A
Luna pubescent wheatgrass	4.76	1.83	1.53 A	9.09	10.14 A
Nezpar Indian ricegrass	3.87	1.42	0.91 B	2.54	2.90 C
Paiute orchardgrass	3.57	0.87	0.38 C	2.44	3.03 C
Secar bluebunch wheatgrass	3.18	1.00	0.79 B	1.56	4.32 BC
LSD at 0.05	1.10	0.53	0.31	3.33	2.69

* Each value is a mean of four replications with six control plots in each rep.

** Means within a single column with the same letter are not significantly different at the 5% level.

Revegetating yellow starthistle infested land with intermediate wheatgrass. Prather, T. S., R. H. Callihan, and D. C. Thill. The purpose of this study was to evaluate procedures for establishing a perennial grass in yellow starthistle (*Centaurea solstitialis* L.) (CENSO) infested areas by reducing the number of yellow starthistle plants in these areas. The experiment was established in March, 1982 as a split plot randomized complete block. Main plot treatments were 0.25 lb ai/a picloram, 50 lb/a nitrogen (NH_3NO_2), and 0.25 lb ai/a picloram plus 50 lb/a nitrogen (NH_3NO_2). Subplot treatments were either seeded (15 lb/a) or not seeded with intermediate wheatgrass (*Thinopyrum intermedium* ssp. *barbulatum* (Schur) Barkw. and D. R. Dewey) (THIIN). The site was initially tilled with a tandem disc to prepare a seedbed. Next subplots were seeded and harrowed, followed by herbicide and fertilizer application.

Yield (above ground biomass) was sampled in July, 1987 after yellow starthistle and intermediate wheatgrass had initiated flowering. Data were collected for yellow starthistle, intermediated wheatgrass, annual grasses, and forbes. Annual grass yields were the combined yields of medusahead wildrye (*Taieniatherum caput-medusae* (L.) Nevski), downy brome (*Bromus tectorum* L.), and Ventenata (*Ventenata dubia* (Leers) Coss. et. Dur.). Forb yield was the combined biomass of field bindweed (*Convolvulus arvense* L.), hairy vetch (*Vicia villosa* Roth), and Gray's lomatium (*Lomatium grayi* Coult. and Rose).

The effects of main plot treatments have changed when comparing 1986 results with 1987 results. In 1986, picloram treated, seeded subplots still yielded more intermediate wheatgrass (1319 lb/a) than the untreated, seeded plots (838 lb/a; $LSD_{0.05}$=349): picloram plus fertilizer treated, seeded subplots yielded significantly less yellow starthistle (286 lb/a) than the untreated, seeded subplots (1389 lb/a; $LSD_{0.05}$=1077). The 1987 harvest indicated that the 1986 effects of main plot treatments no longer exist (Table 1). Yellow starthistle yield in subplots not seeded to intermediate wheatgrass was twice as high (3421 lb/a) as in subplots seeded with intermediate wheatgrass (1605 lb/a) (Table 2). Plots seeded with intermediate wheatgrass had higher intermediate wheatgrass yields than those not seeded (1148 vs. 67 lb/a, respectively). There were no significant differences in annual grass or forb yields in the seeded vs. not seeded subplots.

The chemically treated plots have declined to the level of the control plots, indicating the need for a maintenance type chemical treatment. Even though seeding intermediate wheatgrass has reduced yellow starthistle by one half, interference from intermediate wheatgrass alone is not sufficient to prevent recursion of yellow starthistle dominated communities. However, intermediate wheatgrass seeding combined with initial and subsequent maintenance chemical treatments will most likely maintain yellow starthistle at acceptably low levels. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Yield of yellow starthistle, intermediate wheatgrass, annual grasses, and forbs, five years after herbicide and fertilizer application.

Treatment	Rate	Yield			
		CENSO	THIIN	Annual grass	Forb
	(lb ai or lb/ac)	(lb/a)			
picloram	0.25	2455	679	940	299
nitrogen	50	2487	520	979	332
picloram + nitrogen	0.25 + 50	2720	586	920	184
check	----	2617	512	942	314
$LSD_{0.05}$		1072	1250	718	953

Table 2. Yield of yellow starthistle, intermediate wheatgrass, annual grasses, and forbs, five years after seeding intermediate wheatgrass.

Treatment	Rate	Yield			
		CENSO	THIIN	Annual grass	Forb
	(lb/a)	(lb/a)			
Seeded	15	1605	1148	1081	189
Not seeded	0	3421	67	826	365
$LSD_{0.05}$		759	885	510	675

Musk thistle control with spring and fall applied herbicides in Colorado rangeland. Beck, K.G. and J.R. Sebastian. An experiment was established near Wetmore, CO to evaluate musk thistle (CRUNU) control with several herbicides applied in fall and/or spring. The design was a randomized complete block with four replications. Picloram, dicamba, and 2,4-D LVE were applied at two rates on Oct 21, 1986 and May 25, 1987 and chlorsulfuron at three rates on Oct 21, 1986 (Table 1). All treatments were applied with a CO_2 pressurized backpack sprayer with 11003 flat fan nozzles calibrated to deliver 23 gpa at 30 psi. Other application information is presented in Table 2. Plot size was 10 by 30 ft.

Visual evaluations were taken on Nov 20, 1986 and Jul 28, 1987. On Jul 28, musk thistle plants were divided into mature and seedling categories to determine control. On Nov 20, picloram at both rates, dicamba at 1.0 lb ai/a, and 2,4-D LVE at 3.0 lb ai/a provided greatest musk thistle control while 2,4-D LVE at 1.5 lb ai/a and all chlorsulfuron rates the lowest (Table 1). On the Jul 28 evaluation, mature musk thistle was best controlled by picloram, dicamba, and 2,4-D LVE at all rates and both timings and chlorsulfuron at 0.047 and 0.094 lb ai/a provided the least control. Seedling musk thistle was best controlled by picloram at both rates and timings, dicamba at 0.50 lb ai/a spring applied and 1.0 lb ai/a both timings, and 2,4-D LVE at both rates spring timing; dicamba at 0.50 lb ai/a fall applied, 2,4-D LVE both rates fall applied, and chlorsulfuron at 0.047 and 0.094 lb ai/a provided the least control.

Herbicide treatments will be evaluated again in 1988. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Table 1. Musk thistle control with spring and fall applied herbicides in Colorado rangeland.

Herbicide	Rate (lb ai/a)	Timing	CRUNU Nov 86 Rosette	CRUNU Jul 87 Mature	CRUNU Jul 87 Seedl
			-------(%	Control)	------
picloram	0.25	Oct	78	100	100
picloram	0.50	Oct	80	100	100
picloram	0.25	May	0	100	100
picloram	0.50	May	0	100	100
dicamba	0.50	Oct	71	90	58
dicamba	1.00	Oct	75	99	83
dicamba	0.50	May	0	100	100
dicamba	1.00	May	0	100	100
2,4-D LVE	1.50	Oct	40	86	53
2,4-D LVE	3.00	Oct	79	96	60
2,4-D LVE	1.50	May	0	100	100
2,4-D LVE	3.00	May	0	100	100
chlorsulfuron	0.047	Oct	43	54	29
chlorsulfuron	0.094	Oct	48	70	29
chlorsulfuron	0.141	Oct	58	96	70
LSD (0.05)			7	21	26

Table 2. Application data for musk thistle control with fall and spring applied herbicides in Colorado rangeland.

Environmental data		
Application date	Oct 21, 1986	May 25, 1987
Application time	11:00 A	2:00 P
Air temperature, C	9	12
Cloud cover, %	25	0
Relative humidity, %	65	72
Wind speed/direction, mph	0	4-8/W
Soil temperature (2 in), C	-2	8

Weed data

Application date	Species	Growth Stage	Diameter	Density
Oct 21, 1986	CRUNU	rosette	-	17/plot
May 25, 1987	CRUNU	seedling/ rosette	-	-

Herbicide control evaluations on Dalmatian toadflax. Ferrell, M.A. and T.D. Whitson. Dalmatian toadflax is native to Europe and was introduced into the U.S. as an ornamental. It has since escaped the flower garden and has become a serious problem along roadsides and rangelands. It is difficult to control due to its extensive and deep root system. This experiment was established to evaluate various herbicides on the control of Dalmatian toadflax. Plots were established June 17, 1985 to a stand of Dalmatian toadflax in rangeland. The toadflax was 6 to 18 inches tall and in the bud to full bloom stage. Perennial grasses 4 to 6 inches tall were present as an understory. Liquid formulations were applied with a 6-nozzle knapsack spray unit delivering 40 gpa water. Weather conditions were as follows: air temp. 68 F, relative humidity 42%, wind NW at 2 mph, sky partly cloudy, soil temp. - 0 inch 89 F, 1 inch 88 F, 2 inch 75 F, 4 inch 69 F. Soil was a clay loam (52% sand, 17% silt and 31% clay) with 4.5% organic matter and 6.8 pH. Plots were 9 by 30 ft and arranged in a randomized complete block design with three replications.

Visual evaluations made two years after treatment application show picloram to be maintaining excellent control on Dalmatian toadflax. Combinations of picloram and fluroxypyr are also maintaining effective control, however, fluroxypyr alone resulted in no control. (Wyoming Agric. Exp. Sta., Laramie, WY 82071, SR 1521.)

Dalmatian toadflax shoot control

Treatment[1]	Rate lb ai/A	Percent control[2] 1986	1987
triclopyr + 2,4-D amine	1.0 + 2.0	0	0
triclopyr + 2,4-D amine	1.5 + 3.0	0	0
triclopyr	2.0	0	0
triclopyr	3.0	0	0
fluroxypyr	2.0	0	0
fluroxypyr	3.0	0	0
triclopyr + fluroxypyr	1.0 + 1.0	0	0
triclopyr + fluroxypyr	1.5 + 1.5	0	0
picloram + fluroxypyr	1.0 + 1.0	96	97
picloram + fluroxypyr	1.5 + 1.5	99	99
picloram	2.0	99	99
LSD (0.05) =		3	2
CV =		7	4

[1]Treatments applied June 17, 1985
[2]Visual evaluations June 29, 1986

Yellow toadflax control with fluroyxpyr and picloram in Colorado rangeland. Beck, K.G. and J.R. Sebastian. A rangeland experiment was was established near Meeker, CO to evaluate yellow toadflax (LINVU) control with fluroxypyr, picloram, and tank mixes of fluroxypyr and picloram (Table 2). The design was a randomized complete block with four replications. All treatments were applied on July 2, 1987 with a CO_2 pressurized backpack sprayer using 11003LP flat fan nozzles calibrated to deliver 24 gpa at 15 psi. Other application information is presented in Table 2. Plot size was 10 by 30 ft.

Visual evaluations were taken on October 7, 1987, approximately three months after treatments were applied. Picloram (2.0 lb ai/a) and fluroxypyr + picloram (0.50 + 1.0 lb ai/a) provided greatest control and fluroxypyr + picloram (0.25 + 0.25 lb ai/a) the lowest at evaluation. Phytotoxicity to grasses was not evident (data not shown).

Herbicide treatments will be evaluated again in 1988 and 1989 for control longevity. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Table 1. Application information for yellow toadflax control with fluroxypyr and picloram in Colorado rangeland.

Environmental data	
Application date	Jul 2, 1987
Application time	12:30 P
Air temperature, C	22
Cloud cover, %	0
Relative humidity, %	not taken
Wind speed/direction, mph	0-3/W
Soil temperature (2 in), C	18

Weed data

Application date	Species	Growth Stage	Height (in)	Density (plt/ft^2)
Jul 2, 1987	LINVU	vegetative	3-8	2-4

Table 2. Yellow toadflax control with fluroxypyr and picloram in Colorado rangeland.

Herbicide	Rate (lb ai/a)	LINVU Oct 7, 1987 (% Control)
fluroxypyr	1.00	45
picloram	1.00	48
picloram	2.00	93
fluroxypyr + picloram	0.25 0.25	44
fluroxypyr + picloram	0.25 0.50	79
fluroxypyr + picloram	0.25 1.00	79
fluroxypyr + picloram	0.50 0.25	66
fluroxypyr + picloram	0.50 0.50	88
fluroxypyr + picloram	0.50 1.00	91
fluroxypyr + picloram	1.00 0.25	65
fluroxypyr + picloram	1.00 0.50	80
fluroxypyr + picloram	1.00 1.00	70
LSD (0.05)		12

Great plains yucca control in Colorado rangeland. Beck, K.G. An experiment was established near Akron, CO to evaluate the control of Great Plains yucca (UCCGC) on rangeland. The design was a randomized complete block with four replications. Herbicides were applied on Jul 8, Aug 14, and Oct 28, 1986. The Jul 8 treatments included dicamba, picloram, dicamba plus 2,4-D LVE, and dicamba plus picloram. Each herbicide treatment was applied with one of two surfactants, Herbimax (Loveland Industries, Loveland, CO) or Cidekick II (JLB International Chemical Inc., Vero Beach, Fl) at 0.05% v/v (Table 2). On Jul 8, one dicamba and one picloram treatment did not include surfactant. On Aug 14 and Oct 28, only picloram and dicamba were applied with and without Herbimax surfactant. All treatments were applied with a CO_2 pressurized backpack sprayer using 11003 flat fan nozzles calibrated to deliver 29 gpa at 30 psi. Other application data are presented in Table 1. Plot size was 15 by 50 feet.

Visual evaluations of control were taken on Aug 28 and Nov 17, 1986 and Aug 26, 1987. No control of yucca (Table 2) or damage to rangeland grasses (data not shown) was observed at any date. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523).

Table 1. Application information for Yucca control in Colorado rangeland with different herbicide and surfactant combinations.

Environmental data			
Application dates	Jul 8	Aug 14	Oct 28
Application time	2:00 p	2:00 p	4:00 p
Air temperature, F	81	81	55
Cloud cover, %	10	0	0
Relative humidity, %	60	60	60
Wind speed/direction, mph	0	-	0
Soil temperature (2 in), F	68	68	39

Weed data

Application Date	Species	Growth Stage	Height (ft)	Density (plt/yd^2)
Jul 8	UCCGC	pods present	2 to 3	0.5 to 1
Aug 14	UCCGC	vegetative	2 to 3	0.5 to 1
Oct 28	UCCGC	vegetative	2 to 3	0.5 to 1

Table 2. Yucca control in Colorado rangeland with different herbicide and surfactant combinations.

Herbicide	Rate	Surfactant	Timing	UCCGC		
	(lb ai/a)			Aug 86	Nov 86	Aug 87
				---(% Control)----		
dicamba	1.0	Herbimax[1]	Jul 8	0	0	0
dicamba	2.0	Herbimax	Jul 8	0	0	0
dicamba	1.0	Cidekick II	Jul 8	0	0	0
dicamba	2.0	Cidekick II	Jul 8	0	0	0
dicamba	2.0	none	Jul 8	0	0	0
dicamba + 2,4-D LVE	1.0 +3.0	Herbimax	Jul 8	0	0	0
dicamba + 2,4-D LVE	1.0 +3.0	Cidekick II	Jul 8	0	0	0
dicamba + picloram	0.5 +0.25	Herbimax	Jul 8	0	0	0
dicamba + picloram	0.5 +0.5	Herbimax	Jul 8	0	0	0
dicamba + picloram	0.5 +0.25	Cidekick II	Jul 8	0	0	0
dicamba + picloram	0.5 +0.5	Cidekick II	Jul 8	0	0	0
picloram	0.5	Herbimax	Jul 8	0	0	0
picloram	0.5	Cidekick II	Jul 8	0	0	0
picloram	1.0	Herbimax	Jul 8	0	0	0
picloram	1.0	Cidekick II	Jul 8	0	0	0
picloram	1.0	none	Jul 8	0	0	0
dicamba	2.0	none	Aug 14	0	0	0
dicamba	2.0	Herbimax	Aug 14	0	0	0
picloram	1.0	none	Aug 14	0	0	0
picloram	1.0	Herbimax	Aug 14	0	0	0
dicamba	2.0	none	Oct 28	-	0	0
dicamba	2.0	Herbimax	Oct 28	-	0	0
picloram	1.0	none	Oct 28	-	0	0
picloram	1.0	Herbimax	Oct 28	-	0	0

[1]Surfactants applied at 0.5% v/v.

Perennial grass response with control of mat forbs in rangeland. Whitson, T. D. and M. A. Ferrell. A series of herbicides were applied April 7, 1986 to a mat forb rangeland community to determine the effects various treatments would have on a mat forb community and on forage production. The experiment was located on rangeland at a 7500 foot elevation. Plots were 9 by 30 ft with three replications arranged in a randomized complete block. The herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack unit delivering 40 gpa at 45 psi. Weather information: air temperature 50F, soil surface 45F, 1 inch 46F, 2 inch 46F, and 4 inch 45F; relative humidity was 70%, wind speeds 2 to 3 mph NW. The soil was a sandy loam (75% sand, 18% silt and 7% clay) with 2.4% organic matter and a 7.8 pH.

The rangeland mat forb community consisted of tufted cryptantha (Crypthantha caespitosa) CRYCA, northern crypthantha (Crypthanta celosiodes) CRYCE, stemless goldenweed (Haplopappus acaulis) HAPAC, broom snakeweed (Gutierrezia sarothrae) GUESA, fringed sagewort (Artemisia frigida) ARTFR, cushion wild buckwheat (Eriogonum ovolofolium) ERIOV, hooker sandwort (Arenaria hookerii) AREHO, spoonleaf milkvetch (Astragalus spatulatus) ASTSP, Douglas rabbitbrush (Chrysothamnus viscidiflorus) CYTVI, nuttail goldenweed (Haplopappus nuttalli) HAPNU, Hoods phlox (Phlox hoodii) PHLHO. Perennial grass species consisted of needle-and-thread (Stipa comata) STDCO and Griffiths wheatgrass (Agropyron griffithsi) AGGRI. Control evaluations were made by species August 26, 1986 (reported pp 50, 51 Western Society Weed Science 1987) and September 8, 1987. The 1987 evaluations consisted of reading live canopy cover with a point frame, 100 points per plot and clipping (2) one meter circular quadrats per plot.

All treatments provided 70% control or greater control of the forb community and increased total perennial grass yields from 354 to 549 lbs/acre compared to 168 lbs/acre for the untreated check. Control of the mat forb community was 91% or greater with Picloram applied at 0.25, 0.5 or 1.0 lb ai/acre and dicamba + 2,4-D at 0.5 + 1.5 lb ai/acre. Highest total perennial grass yields were obtained in plots treated with 2,4-D + triclopyr at 0.5 + 0.25 lb ai/acre and picloram applied at 0.25 and 0.5 lb ai/acre. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

Perennial grass production resulting from mat forb control on rangeland

			Pounds Production/Acre		
Herbicide	Rate lbs/ai/a	% Control[1]	Needleand-thread[2]	Griffiths Wheatgrass[3]	Total[4]
dicamba	1.0	84	145	312	457
2,4-D(LVE)[5]	2.0	75	124	289	413
triclopyr	1.0	84	174	221	395
metsulfuron	0.019	71	132	334	466
metsulfuron	0.38	77	174	311	485
picloram	0.25	91	205	306	511
picloram	0.5	97	286	222	508
picloram	1.0	100	184	170	354
2,4-D(LVE) + triclopyr	0.5+ 0.25	81	141	408	549
dicamba + 2,4-D(A)[6]	0.5+ 1.5	91	137	325	462
Check	-	0	42	126	168

1. LSD 0.5% = 12%, CV = 9.4%.
2. LSD 0.5% = 77 lb/a, CV = 28.3%.
3. LSD 0.5% = N.S., CV = 32.7%.
4. LSD 0.5% = 138 lb/a, CV = 18.3%.
5. LVE = Low Volitile Ester.
6. A = Amine.

Effects of several herbicides on newly seeded grasses. Whitson, T. D. and J. G. Lauer. Grass seed growers and ranchers establishing new grass seedings have problems determining which herbicides to apply that will provide maximum weed control with minimum damage to newly emerging grass seedlings. This study was established to determine grass species tolerance to herbicides when applications were made at various growth stages. Several herbicides were applied preplant, preemergence and postemergence to these grass species: Regar meadow brome, Critana thickspike wheatgrass, Rosana western wheatgrass, Bozoiski russian wildrye, Magnar basin wildrye, Bromar mountain brome, Hycrest crested wheatgrass, PI 432403 slender wheatgrass, Synthetic A russian wildrye and Sodar streambank wheatgrass. Herbicides were applied with a four-nozzle knapsack spray unit delivering 40 gpa at 45 psi. Herbicide plots were 7 by 55 ft arranged in a randomized complete block design with three replications. The soil was a sandy clay loam (47% sand, 27% silt and 26% clay) with 1.6% organic matter and a 7.9 pH. April 15 weather information: relative humidity 20%, wind 5 to 10 mph NE, air temperature 70F, soil surface 60F, 1 inch 55F, 2 inches 50F, 4 inches 50F. June 15 weather information: relative humidity 70%, wind 2 to 3 mph NW, air 72F, soil surface 70F, 1 inch 65F, 2 inches 62F, 4 inches 60F. Grass varieties were seeded in three 22 inch rows with herbicides applied across rows. Grass seeding was done April 15, 1987. Herbicides were applied preplant and preemergence on April 15, 1987 and postemergence on June 15, 1987. Grasses did not show selective tolerance for any herbicides applied. Propazine and simazine applied preplant provided weed control but seeded grasses were not tolerant. An application of picloram at 0.5 lb ai/a applied preemergence caused 53% crop injury to seeded grasses. No other herbicides provided annual grass control. Bromoxynil applied postemergence at 0.5 lb ai/a and picloram applied postemergence at 0.0625 lb ai/a provided 65 and 72% broadleaf weed control, respectively. (Department of Plant, Soil and Insect Sciences, University of Wyoming, Laramie, WY 82071)

			% control annual weeds	
Herbicide	lbs ai/a	% crop stand	grasses[1]	broadleaf[2]
propazine (preplant)	1.0	0	43	77
simazine (preplant)	1.0	0	90	87
picloram (preemergence)	0.5	53	43	80
clopralid (preemergence)	0.25	100	0	03
fluroxypyr (preemergence)	0.5	100	0	07
fluroxypyr (postemergence)	0.25	100	0	0
clopralid (postemergence)	0.25	100	0	7
MCPA(Amine) (postemergence)	0.25	100	0	10
bromoxynil (postemergence)	0.5	100	0	65
picloram (postemergence)	0.0625	93	10	72
Check	-	100	-	-

[1] grasses included: green foxtail and barnyardgrass
[2] broadleaf weeds included: wild buckwheat and redroot pigweed

New weed species and potential weed problems in Idaho. Old, R. R., F. E. Northam, R. H. Callihan and D. C. Thill. Several species of plants not previously reported in Idaho were observed during 1987 and possess the potential to become weed problems. Also recorded were extensions of the ranges of several species that have been present in Idaho for several years. The following list separates the plants into three groups: (1) those not previously reported for Pacific Northwest; (2) those not previously documented for Idaho, although present in the Pacific Northwest (Hitchcock and Cronquist, Flora of the Pacific Northwest, 1973); (3) those previously reported in Idaho, wherein the known range of the species has been expanded due to 1987 field observations. The following lists cite the scientific name, Weed Science Society of America code (if available), common names, family names and locations.

Group I: Species not previously reported for Idaho, nor listed in Flora of the Pacific Northwest.

1. Abutilon theophrasti Medik. (ABUTH) velvetleaf; Malvaceae; garden in Kooskia, Idaho Co., and Plant Science Farm, Moscow, Latah Co.

2. Andropogon saccharoides (Sw.) Rydb. (ANOSA) silver beardgrass; Gramineae; roadshoulders along Salmon River, Idaho Co. (= Bothriochloa saccharoides)

3. Argemone albiflora Hornem. (ARGAL) bluestem pricklepoppy; Papaveraceae; near Middleton, Canyon Co. A previously unreported specimen was collected in Canyon Co. in 1956.

4. Galium pedamontanum All. Rubiaceae; near Potlatch, Latah Co., and Selway River, Idaho Co. Reported as Galium sp. in 1985 WSWS Progress Report First record in western U.S.

5. Milium vernale Bieb. (MILSC) early millet; Gramineae; winter wheat fields near Grangeville, Idaho Co. First record for N. America. Common name from Great Britain.

6. Oxytropis riparia Litv. Leguminosae; hay meadows, Fort Hall Indian Reservation, Bingham Co. First record in western U.S.

Group II: Species not previously documented for Idaho, although currently listed in Flora of the Pacific Northwest.

1. Centaurea pratensis Thuill. meadow knapweed; Compositae; Latah Co. Roadside on west side of University of Idaho campus.

2. Euphorbia supina Raf. ex Boiss. (EPHMA) spotted spurge; Euphorbiaceae; in a lawn, Ada Co.

3. Senecio jacobaea L. (SENJA) tansy ragwort; Compositae; railroad siding at a lumber mill, Benewah Co.

Group III: Species previously reported in Idaho; new county records.

1. Anthemis tinctoria L. (ANTTI) yellow chamomile; Compositae; Valley Co., southern most sighting in Idaho.

2. Aira caryophyllea L. (AIRCA) silver hairgrass; Gramineae; along Selway River, Idaho Co.†

3. Bryonia alba L. (BYOAL) white bryony; Cucurbitaceae; urban situation, Boise, Ada Co.*

4. Chaenorrhinum minus (L.) Lange (CHNMI) dwarf snapdragon; Scrophulariaceae; at Cottonwood, Idaho Co.*,†

5. Cynodon dactylon (L.) Pers. (CYNDA) Bermudagrass; Gramineae; waste areas in Mountain Home, Elmore Co.†

6. Cynosurus echinatus L. (CYXEC) hedgehog dogtailgrass; Gramineae; along Selway River, Idaho Co.*

7. Galiopsis tetrahit L. (GAETE) common hemp nettle; Labiatae; oat fields, Shoshone, Co.

8. Hieracium aurantiacum L. (HIEAU) orange hawkweed; Compositae; Cascade Co., southern most sighting in Idaho and first south Idaho record.*

9. Hypochoeris radicata L. (HRYRA) spotted catsear; Compositae; Cascade, Co., southern most sighting in Idaho and first south Idaho record.*

10. Nemophila breviflora Gray Great Basin nemophila; Hydrophyllaceae; winter grain field, Latah Co.

11. Panicum dichotmiflorum Michx. (PANDI) fall panicum; Gramineae; wasteland and cultivated fields, Boise and Emmett Co.

12. Panicum miliaceum L. (PANMI) proso millet; Gramineae; collected from three locations in Moscow, Latah Co.

13. Sorghum halepense (L.) Pers. (SORHA) Johnsongrass; Gramineae; clover field near Southwick, Nez Perce Co. Another sighting of this weed was recorded near this area last year.†

14. Torilis arvensis (Hubs.) Link (TOAIR) hedgeparsley; Umbelliferae; Clearwater River area, Idaho Co.*

15. Viola arvensis Murr. (VIOAR) field violet; Violaceae; Valley Co., southern most sighting in Idaho and first south Idaho record. This species is becoming an increasingly common crop problem in north Idaho, records from Bonner Co., Latah Co., Nez Perce Co. and Idaho Co.

(Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

* WSWS 1985 Progress Report
† WSWS 1986 Progress Report

Survey of noxious weeds along roads in the Boise National Forest. Callihan, R.H., R.R. Old, D.S. Pavek, and E.A. Steele. A reconnaissance survey (Figure 1) of roadside noxious weed species was conducted by the University of Idaho for the Boise National Forest between 1 June 1987 and 3 August 1987. The survey was conducted by observation from a pickup truck operating at approximately 20mph along Forest Service access roads within each district (Figure 2). During the survey, fourteen noxious weed species were found with some noxious weed species in every ranger district (Figure 3). LORAN-C navigation equipment generated the latitude/longitude positions of weeds observed, and data were recorded on tape through a microcomputer. From these computer-recorded positions, noxious weed distributions were mapped for the forest's roadsides. The data were sent to the National Agriculture Pest Information System database. Each district received a list and a map showing roads surveyed by University of Idaho and Forest Service personnel. Collections were made of each species; these were pressed, dried, and deposited with the Boise National Forest for distribution to each of the six ranger districts. One species, *Hyoscyamus niger* L., was not on the Boise Forest Integrated Weed Management Priorities list. Five species, *Carduus nutans* L., *Linaria vulgaris* Hill., *Centaurea diffusa* Lam., *Convolvulus arvensis* L., and *Aegilops cylindrica* Host., originally listed as "potential new invaders" also were found. Eight noxious weed species, *Cardaria draba* (L.) Desv., *Euphorbia esula* L., *Conium maculatum* L., *Linaria dalmatica* (L.) Mill., *Centaurea maculosa* Lam., *Chondrilla juncea* L., *Cirsium arvense* (L.) Scop., and *Onopordum acanthium* L., that were on the list as "new invaders" were found. Some of these species, such as *C. juncea* (Figure 4) had become widespread within this national forest. Some species, such as *L. dalmatica* (Figure 5) and *C. maculosa* (Figure 6) had become well established in a few areas with nuclear infestations some distance from the main infestations. It is considered that most of these species are in the process of continual dispersion and increase in this national forest. These data are to be used by the Boise National Forest in evaluation and updating of their noxious weed environmental analysis and in their noxious weed management program. Idaho Agricultural Experiment Station, Moscow, ID, 83843.

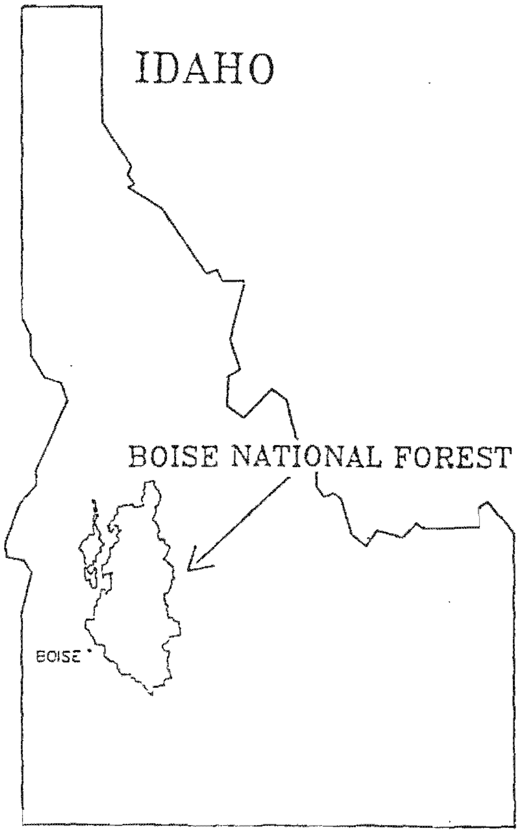


Figure 1. Location of the Boise National Forest

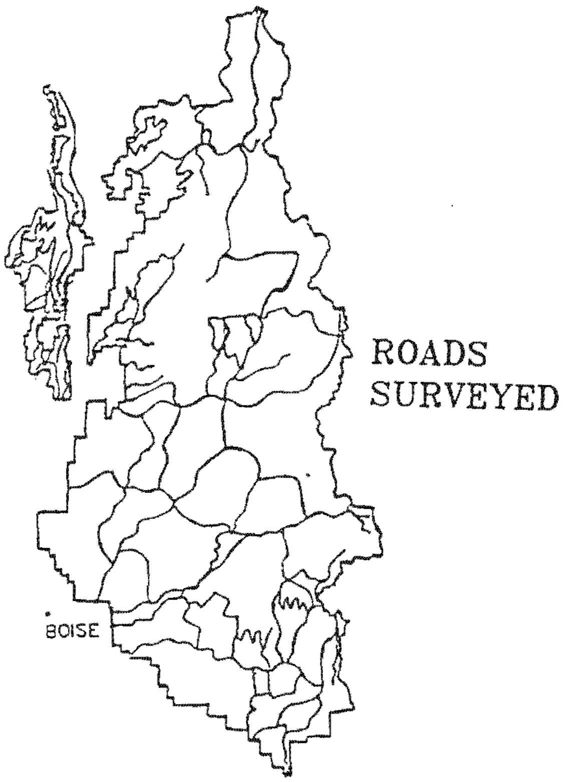


Figure 2. Roads surveyed in the Biose National Forest

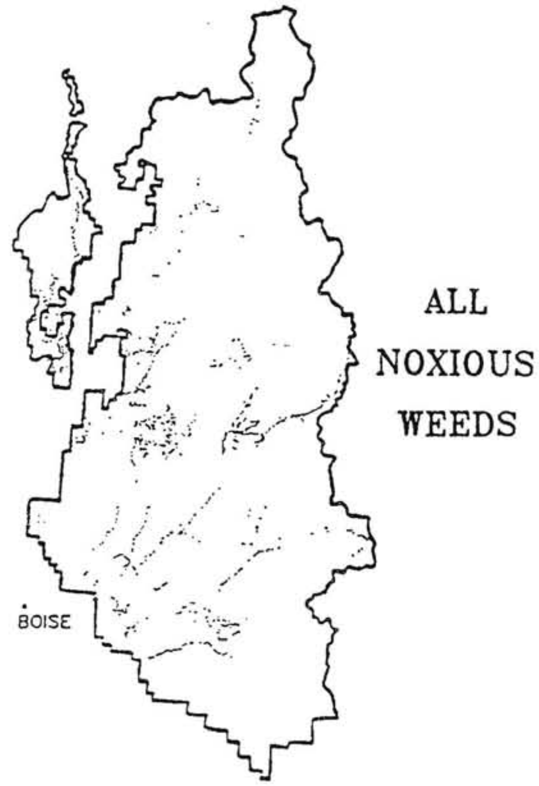


Figure 3. Locations of noxious weed species in the Boise National Forest

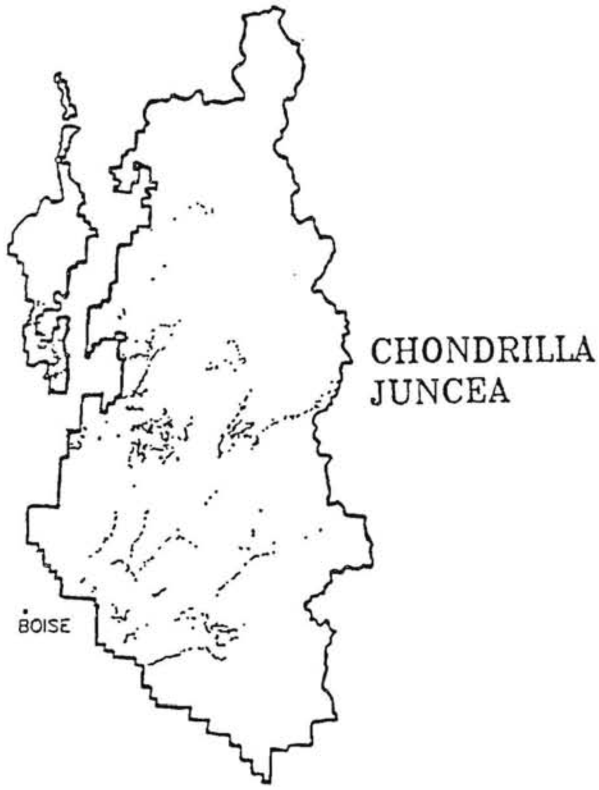


Figure 4. Distribution of *Chondrilla juncea* L. in the Boise National Forest

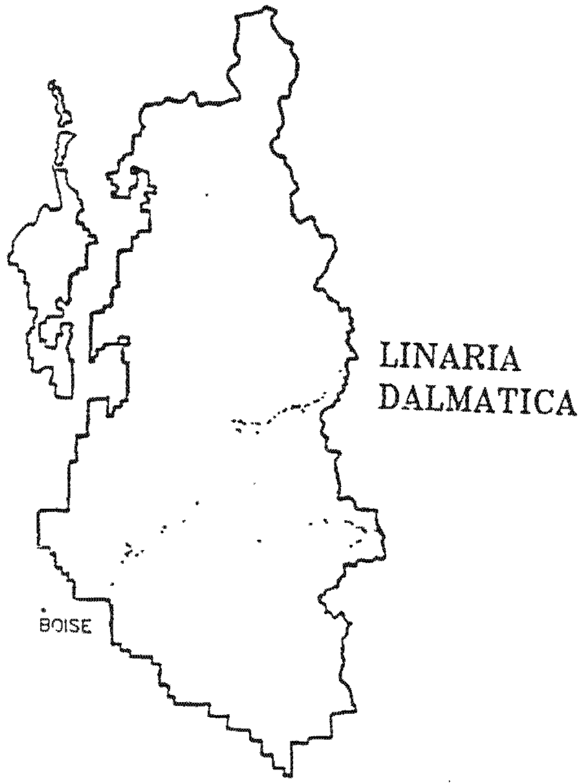


Figure 5. Distribution of *Linaria dalmatica* (L.) Mill. in the Boise National Forest

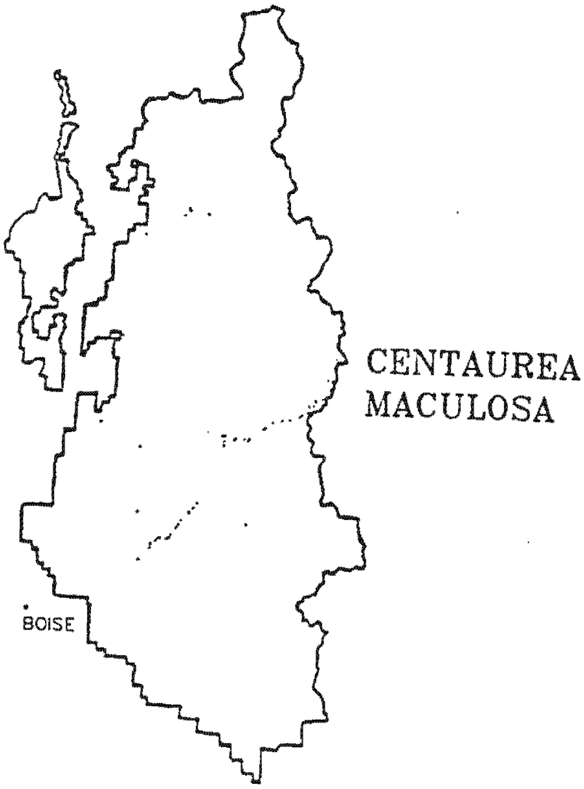


Figure 6. Distribution of *Centaurea maculosa* Lam. in the Boise National Forest .

PROJECT 3.

UNDESIRABLE WOODY PLANTS

Vanelle Carrithers - Project Chairman

Evaluation of herbicides for herbaceous weed control in young conifer plantations in coastal Oregon. Cole, E.C., and M. Newton. Herbaceous weeds commonly invade young conifer plantations in coastal Oregon and can increase competitive stress on young Douglas-fir. Several herbicide treatments were tested for early season conifer release on a two-year-old Douglas-fir plantation. Site preparation occurred in 1984 and consisted of a "brown and burn" operation. Glyphosate and triclopyr lester had been applied as preburn herbicides. 2-0 bare root Douglas-fir were planted in 1985. After site preparation, the area was dominated primarily by herbaceous weeds, including velvet grass and Australian fireweed. Sword fern and salmonberry were also present.

Each herbicide and combination of herbicide were tested in a completely randomized factorial experiment with three replications (one replication is equivalent to one plot). Three untreated control plots were also included. Each treatment was applied using a nitrogen pressurized hand-held plot sprayer. The sprayer consisted of 7 nozzles (8015 nozzles) on a boom for an effective swath width of 3.2 m. Plots were 3.2 by 11 m and sprayed at the rate of 120 l/ha on March 23, 1987.

Plots were evaluated in summer, 1987 by estimating percent cover for each species present. For analysis, cover for each species was combined in different vegetation types -- grass, forlo fern, and shrub.

No significant differences were found among treatments for shrubs and ferns (Table 1). In these cases, the amounts of ferns and shrubs present on all plots were minimal, even on the control plots.

With forb cover, all treatments were significantly different from the control plots (29 percent cover) (Table 2). Treatments with clopyralid, sulfometuron and 2,4-D ester had less than 4 percent forb cover. The other treatments had forb cover ranging from 6 to 15 percent.

Grass cover (Table 2) was significantly reduced with all but the 2,4-D ester and clopyralid treatments which had 70 to 78 percent grass cover compared to 63 percent cover for the control plots. The rest of the treatments had less than 14 percent grass cover and were not significantly different from each other.

Due to the large amount of grass remaining in the plots, the 2,4-D ester and clopyralid treatments were not significantly different from the control plots for total cover (Table 2). The remaining treatments were not significantly different from each other, but all were significantly different from the control. Total cover ranged from two to 23 percent for these treatments.

Most of the Douglas-fir in these plots exhibited no injury from the herbicide treatments. Less than four percent of the seedlings had minor injury to foliage, including stunting and chlorosis. Injury appears to be associated with 2,4-D.

Table 1. Percent cover for fern and shrub vegetation types

Treatment[2]	Rate/ha	% Cover[1] Fern	Shrub
2,4-D ester	2.2 kg ai	3 a	0.3 a
Atrazine + dalapon	3.3 + 3.3 kg ai	3 a	1 a
Clopyralid + atrazine + dalapon	0.14+3.3+3.3 kg ai	3 a	1 a
	0.3+3.3+3.3 kg ai	2 a	1 a
	0.6+3.3+3.3 kg ai	1 a	0.3 a
Clopyralid + hexazinone	0.3 + 1.1 kg ai	1 a	1 a
Clopyralid	0.3 kg ai	18 a	0.3 a
	0.6 kg ai	4 a	1 a
Clopyralid + sulfometuron	0.3 + 0.14 kg ai	2 a	1 a
	0.6 + 0.14 kg ai	1 a	0 a
Glyphosate + atrazine	0.8 kg ae + 3.3 kg ai	1 a	0 a
Hexazinone	1.1 kg ai	1 a	1 a
Sulfometuron + 2,4-D ester	0.14 + 2.2 kg ai	1 a	0.3 a
Sulfometuron	0.14 kg ai	11 a	0 a
Control	0	1 a	0.3 a

[1] Means in the same column followed by the same letter are not significantly different at alpha=0.05 using Tukey's.

[2] Surfactant Activar 90 added at 0.5% to all treatments.

Table 2 Percent cover for grass, forb, and total cover vegetation types

Treatment[2]	Rate/ha	% Cover[1] Grass	Forb	Total
2,4-D ester	2.2 kg ai	77 a	3 cd	84 a
Atrazine + dalapon	3.3 + 3.3 kg ai	6 b	13 b	23 b
Clopyralid + atrazine + dalapon	0.14+3.3+3.3 kg ai	7 b	4 bcd	15 b
	0.3+3.3+3.3 kg ai	5 b	2 cd	10 b
	0.6+3.3+3.3 kg ai	4 b	2 cd	8 b
Clopyralid + hexazinone	0.3 + 1.1 kg ai	14 b	2 cd	17 b
Clopyralid	0.3 kg ai	70 a	4 cd	93 a
	0.6 kg ai	78 a	2 cd	86 a
Clopyralid + sulfometuron	0.3 + 0.14 kg ai	1 b	0 d	4 b
	0.6 + 0.14 kg ai	7 b	1 d	9 b
Glyphosate + atrazine	0.8 kg ae + 3.3 kg ai	5 b	6 bcd	13 b
Hexazinone	1.1 kg ai	6 b	10 bc	18 b
Sulfometuron + 2,4-D ester	0.14 + 2.2 kg ai	1 b	1 d	3 b
Sulfometuron	0.14 kg ai	1 b	1 d	13 b
Control	0	63 a	29 a	94 a

1 Means in the same column followed by the same letter are not significantly different at alpha=0.05 using Tukey's.

2 Surfactant Activar 90 added at 0.5% v/v in all treatments.

Evaluation of herbicides for forest site preparation in coastal Oregon. Cole, E.C. and M. Newton. Different herbicides and combinations of herbicides were tested on a site in coastal Oregon to determine efficacy for site preparation. The site is part of a unit clearcut four years ago. Dominant vegetation included red alder 150 to 300 cm tall, salmonberry 60 to 90 cm tall, hazel 150 to 200 cm tall, and vine maple 60 to 150 cm tall. Alder and salmonberry were primarily from seed origin, while vine maple and hazel were predominantly sprouts.

Each herbicide and herbicide combination were replicated three times, with one replication equivalent to one plot. Three untreated control plots were included. Because the dominant species were not present in all plots, plots were stratified by species. Treatments were then randomly assigned based on the stratification. Plots were 4.6 by 8.8 m (0.01a) and were sprayed June 23 and 24, 1986 with a backpack sprayer with a single adjustable Chapin® nozzle using the "waving wand" technique. Spray volume was 93.5 l/ha. Before application, up to ten shrubs of each species were tagged for later evaluation. Plots were evaluated approximately one year after treatment, and percent crown and stem reduction were rated ocularly.

Results indicated that most treatments were highly effective during the late June application (Tables 1 and 2). For red alder, only the metsulfuron treatment was not significantly different from the control. All other treatments, except for triclopyr amine and glyphosate at .8 kg ae/ha, resulted in greater than 90 percent crown reduction and 62 to 100 stem reduction.

With salmonberry, the least effective treatments were the 2,4-D and triclopyr treatments. These treatments generally resulted in greater stem reduction than crown reduction due to resprouting of shrubs after treatment.

Most treatments gave excellent control on hazel. Imazapyr produced the most consistent results with almost 100 percent mortality.

Control of vine maple was less effective. Sample sizes were low, so that results were not as conclusive. Several of the glyphosate treatments caused 100 percent mortality. The least effective treatments were the 2,4-D, triclopyr, and metsulfuron treatments. (Department of Forest Science, Oregon State University, Corvallis, OR 97331)

Table 1 Percent crown and stem reduction for red alder and salmonberry

Treatment[1]	Rate/ha	Red Alder[2] %Crown Reduction	Red Alder[2] %Stem Reduction	Salmonberry[2] %Crown Reduction	Salmonberry[2] %Stem Reduction
2,4-D ester	2.2 kg ai	98 ab	97 a	19 d	44 c
Triclopyr amine	1.7 kg ai	84 c	73 bc	25 d	58 bc
Triclopyr amine+XRM-4823[3]	1.7 kg ai	91 abc	84 ab	35 cd	96 a
Triclopyr ester	1.7 kg ai	100 a	99 a	79 ab	91 a
Metsulfuron	35 g ai	1 d	0 d	100 a	100 a
Metsulfuron + 2,4-D ester	35 g ai + 2.2 kg ai	99 a	99 a	100 a	100 a
Metsulfuron + triclopyr ester	35 g ai + 1.7 kg ai	93 abc	89 ab	98 a	100 a
Imazapyr	0.6 kg ai	94 abc	62 c	98 a	99 a
Imazapyr + metsulfuron	0.6 kg ai + 35 g ai	97 ab	73 bc	100 a	100 a
Imazapyr + glyphosate (No added surfactant)	0.6 kg ai + 0.8 kg ae	99 a	99 a	100 a	100 a
Imazapyr + glyphosate	0.6 kg ai + 0.8 kg ae	95 abc	83 ab	94 a	99 a
Glyphosate (No added surfactant)	0.8 kg ae	87 bc	70 bc	81 ab	69 abc
	1.7 kg ae	98 ab	94 a	100 a	100 a
	2.5 kg ae	100 a	100 a	100 a	100 a
Glyphosate	0.8 kg ae	92 abc	88 ab	86 ab	80 ab
	1.7 kg ae	100 a	100 a	91 a	100 a
	2.5 kg ae	99 a	99 a	91 a	86 ab
Glyphosate + metsulfuron	0.8 kg ae + 35 g ai	100 a	100 a	100 a	100 a
	1.7 kg ae + 35 g ai	98 ab	96 a	---	---
	2.5 kg ae + 35 g ai	100 a	100 a	100 a	100 a
Glyphosate + triclopyr ester	0.8 kg ai 1.7 kg ai	99 a	100 a	58 bc	85 ab
Control	0	6 d	6 d	0 d	0 d

[1] Unless otherwise specified, surfactant was added to all treatments at 0.25% v/v. Surfactant was Activar 90.

[2] Means in the same column followed by the same letter are not significantly different at alpha=0.05 using Tukey's.

[3] XRM-4823 is an experimental surfactant.

Table 2. Percent crown and stem reduction for vine maple and hazel

Treatment[1]	Rate/ha	Vine Maple[2] %Crown Reduction	Vine Maple[2] %Stem Reduction	Hazel[2] %Crown Reduction	Hazel[2] %Stem Reduction
2,4-D ester	2.2 kg ai	10 e	9 ef	92 ab	94 a
Triclopyr amine	1.7 kg ai	30 cde	14 def	83 abc	83 abc
Triclopyr amine + XRM-4823[3]	1.7 kg ai	35 cde	13 def	80 abc	79 abc
Triclopyr ester	1.7 kg ai	--	--	93 ab	93 a
Metsulfuron	35 g ai	14 de	10 ef	98 a	97 a
Metsulfuron + 2,4-D ester	35 g ai + 2.2 kg ai	56 abcd	46 bcdef	97 a	96 a
Metsulfuron + triclopyr ester	35 g ai + 1.7 kg ai	62 abc	52 abcde	78 abc	77 abc
Imazapyr	0.6 kg ai	86 a	40 cdef	100 a	100 a
Imazapyr + metsulfuron	0.6 kg ai + 35 g ai	91 a	64 abc	100 a	100 a
Imazapyr + glyphosate (No added surfactant)	0.6 kg ai + 0.8 kg ae	86 a	71 abc	100 a	100 a
Imazapyr + glyphosate	0.6 kg ai + 0.8 kg ae	100 a	90 ab	93 ab	93 a
Glyphosate (No added surfactant)	0.8 kg ae	38 bcde	35 cdef	89 abc	85 ab
	1.7 kg ae	100 a	100 a	100 a	100 a
	2.5 kg ae	99 a	93 ab	72 bc	60 bc
Glyphosate	0.8 kg ae	86 a	52 abcde	92 ab	85 ab
	1.7 kg ae	70 abc	60 abcd	100 a	100 a
	2.5 kg ae	100 a	100 a	98 a	99 a
Glyphosate + metsulfuron	0.8 kg ae + 35 g ai	90 a	30 cdef	100 a	100 a
	1.7 kg ae + 35 g ai	--	--	92 ab	88 ab
	2.5 kg ae + 35 g ai	100 a	100 a	100 a	100 a
Glyphosate + triclopyr ester	0.8 kg ae + 1.7 kg ai	81 ab	67 abc	91 ab	85 ab
Control	0	0 e	0 f	8 d	4 d

[1] Unless otherwise specified, surfactant was added to all treatments at 0.25% v/v. Surfactant was Activar 90.

[2] Means in the same column followed by the same letter are not significantly different at alpha=0.05 using Tukey's.

[3] XRM-4823 is an experimental surfactant.

Control of tan oak and madrone resprouts with glyphosate plus an experimental additive. Jackson, Nelroy E. and Martin D. Lemon. Resprouts of tan oak (*Lithocarpus densiflorus*) and madrone (*Arbutus menziestii* are a serious problem in Northern California forestry. Two trials were conducted with two formulations of ipa-glyphosate - Roundup herbicide which has surfactant and Accord herbicide which has no surfactant - with the experimental additive MON-8161, with and without additional nonionic surfactant.

Treatments were applied to clumps of resprouts (1 to 2 meters tall) by backpack sprayer in early September 1986. Roundup plus (+) R11 + MON-8161 at rates of 2% + 0.5% + 0.25% Volume/Volume (V/V) respectively, gave 100% control of both tan oak and madrone resprouts with no regrowth or resprouting, 292 days after treatment. Roundup + MON-8161 without additional surfactant at rates of 2% + 0.25% V/V gave only 40% control of both tan oak and madrone resprouts at Weaverville (see Table 1). Accord + R11 or No Foam A + MON-8161 at rates of 2% + 0.5% + 0.25% V/V respectively, gave 100% and 91% control respectively of tan oak resprouts with some regrowth from the No Foam A treatment only. Accord + No Foam A at rates of 2% + 0.5% V/V gave only 43% control of tan oak resprouts 292 days after treatment at Feather Falls (see Table 2).

The MON-8161 additive in combination with additional nonionic surfactact improved control of both tan oak and madrone resprouts with glyphosate possibly by increasing penetration and absorption of glyphosate into the leaves of both species. MON-8161 is being evaluated again in 1987. (Monsanto Agricultural Company, 24551 Raymond Way, Suite 285, El Toro, CA 92630)

R11 is a registered trademark of Wilbur Ellis Company
No Foam A is a registered trademark of Monterey Chemical Company
Roundup is a registered trademark of Monsanto Company
Accord is a trademark of Monsanto Company

Table 1. Control of tan oak and madrone resprouts, Weaverville, CA

Treatment	Rate %V/V	% Control of resprouts: Tan Oak 68 DAT	Tan Oak 292 DAT	Madrone 68 DAT	Madrone 292 DAT
Roundup + R11 + MON-8161	2 0.5 0.25	87	100	13	100
Roundup + MON-8161	2 0.25	8	40	7	40

Table 2. Control of tan oak resprouts, Feather Falls, CA

Treatment	Rate %V/V	% Control of tan oak resprouts 71 DAT	292 DAT
Accord + R11 + MON-8161	2 0.5 0.25	89	100
Accord + No Foam A + MON-8161	2 0.5 0.25	61	91
Accord + No Foam A	2 0.5	10	43

Successional changes in conifer communities following three methods of site preparation and three levels of secondary herbicide release. Lanini W.T. and S.R. Radosevich. Shrub competition is one of the leading causes for poor conifer establishment and growth. A better understanding of how various management practices affect shrub growth and species composition is necessary to increase the efficiency of these management operations. A study was established in 1978 to compare the influence of brushraking, rotary mastication, or a controlled fire on subsequent shrub invasion and growth. Additionally, each of these treatments was subdivided into 0, 1, or 2 herbicide treatments to suppress shrub growth. Plots were evaluated in terms of both shrub species composition and shrub volume by species.

Shrub volume had increased by 1980, two years after shrub removal (Table 1) on all plots except those receiving two herbicide applications. The plots receiving a single herbicide application had just been treated when these measurements were made and therefore had not had sufficient time to decrease shrub volume. Both levels of herbicide application had reduced shrub volume by 1982 (Table 1). Also at this time, it was evident that brushraking was superior to rotary mastication or fire at reducing shrub regrowth in the absence of herbicide application. This same trend was again observed in 1986. Shrub volumes on the fire plots with no herbicide applications was approximately equal to shrub volumes outside the study area.

These treatments also affected species composition, most notably the abundance of greenleaf manzanita (*Arctostaphylos patula* Greene). A general trend was observed toward increased percentages in the stand of greenleaf manzanita when two herbicide applications were made. This species appeared more tolerant of the herbicide treatments (2,4-D amine in 1979 and glyphosate in 1980) than did the other species which included mountain whitethorn (*Ceanothus cordulatus* Kell.), bittercherry [*Prunus emarginata* (Dougl) Walp.], black oak (*Quercus kelloggii* Newb.) and deerbrush [*Ceanothus integerrimus* N. & A. (*C. andersonii* Parry)]. Although this is a species capable of sprouting after top removal, the rotary masticator plots generally had the lowest volume of greenleaf manzanita. This may indicate a slower regrowth potential from sprouts in this species as compared to other shrubs on this site. (University of Californa, Davis 95616 and Oregon State University, Corvallis 97331).

Table 1.

Total shrub volume (m^3/ha) relative to site preparation method and subsequent herbicide treatment.

Treatment	No. of herbicide applications	1980	Year* 1982	1986
Brushrake	0	940 ab	1,900 c	10,700 c
	1	1,510 b	530 ab	14,870 b
	2	490 a	170 a	2,390 a
Fire	0	2,970 c	5,490 d	58,290 e
	1	3,410 c	700 ab	13,780 b
	2	610 a	410 a	2,590 a
Hydroax (Rotary Masticator)	0	3,160 c	6,940 e	45,420 d
	1	3,340 c	1,430 bc	16,170 b
	2	260 a	340 a	2,740 a

*Values followed by the same letter are not statistically different as determined by an LSD test at the 5% level.

Table 2.

Greenleaf manzanita density (% of stand) based on numbers of shrubs per unit area, all shrubs equal 100% relative to site preparation method and subsequent herbicide treatment

Treatment	No. of herbicide applications	1980	Year* 1982	1986
Brushrake	0	17 b	34 d	43 d
	1	13 b	25 cd	33 cd
	2	46 d	57 e	76 f
Fire	0	18 b	20 bc	27 abc
	1	27 c	24 bcd	44 d
	2	26 c	34 d	61 e
Hydroax	0	7 a	14 a	15 a
	1	9 a	18 ab	26 ab
	2	17 b	20 bc	28 bc

* Values followed by the same letter are not statistically different as determined by an LSD test at the 5% level.

Basal sprays for brush control in central Arizona. Brock, J.H. Brush is a major factor reducing the quality of rangeland habitats on many of the natural resource regions of Arizona. Of particular concern are small leguminous trees or shrubs including velvet mesquite, catclaw acacia and white thorn acacia. This research was conducted in central Arizona to compare efficacy of herbicides and application technique.

The experiments were applied to stands of brush near Apache Junction and Winkelman, Arizona. Each treatment was applied to 10 tagged plants and with 3 replicates giving a total of 30 plants per treatment. The experiment is a randomized complete block design. Herbicides were applied in early July 1987. The basal treatments included: 2% conventional application consisting of 2% herbicide ai by volume in diesel with stems wet to runoff; 25% low volume application consisted of 25% herbicide ai, stem wet, but not to runoff; 25% streamline consisted of a solution of 25% herbicide ai, 65% diesel and 10% surfactant on a volume basis, application was in a stream of about 4 ml volume to the sides of the stem; basal spot application was 4 ml of formulated herbicide per 2.5 cm of stem diameter applied to the soil near the canopy dripline; a diesel only and untreated plants served as controls. At both locations conventional basal spray applications provided best canopy reduction although not statistically different from 25% low volume applications. Streamline applications were less effective, especially on the more mature trees that had well developed bark. Evaluations in coming years will center on plant mortality providing information for root kill.
(Division of Agriculture, Arizona State University, Tempe, AZ 85287)

Initial effects of basal spray treatments containing various herbicides on velvet mesquite of the Quarter Circle U Ranch near Apache Junction, Arizona, treatments applied July 7, 1987

Average Defoliation Rating (0-10)*			
Herbicide	Application	7-31-87	9-12-87
diesel	conventional	2.4 defg	3.7 ef
clopyralid	2% conventional	6.6 abc	7.2 abcd
triclopyr	2% conventional	8.3 a	9.6 a
clopyralid/triclopyr	2% conventional	8.4 a	8.9 ab
triclopyr/picloram	2% conventional	7.3 ab	8.9 ab
fluroxypyr	2% conventional	4.5 bcde	6.6 bcde
clopyralid	25% low volume	6.1 abc	6.3 bcde
triclopyr	25% low volume	6.7 abc	7.6 abc
triclopyr/picloram	25% low volume	5.2 abcd	6.3 bcde
clopyralid	25% streamline	1.6 efg	2.3 f
triclopyr	25% streamline	2.3 defg	2.7 f
triclopyr/picloram	25% streamline	3.6 cdef	5.0 cdef
hexazinone	basal spot	0.5 fg	4.4 edf
control	none	0.0 g	0.0 g

* Defoliation rating: 0 = no effect, 10 = complete defoliation, means followed by the same letter are not statistically different at P = 0.05% using SNK mean separation

Initial effects of basal spray treatments containing various herbicides on mixed brush species (catclaw acacia, velvet mesquite and white thorn) at the Victory Cross Ranch near Winkelman, Arizona, treatments applied July 8 and 9, 1987

		Average Defoliation Rating (0-10)*	
Herbicide	Application	8-11-87	10-16-87
diesel	conventional	4.0 d	8.4 abc
clopyralid	2% conventional	8.7 a	9.7 a
triclopyr	2% conventional	8.1 a	9.3 ab
clopyralid/triclopyr	2% conventional	8.8 a	9.4 ab
triclopyr/picloram	2% conventional	9.3 a	10.0 a
fluroxypr	2% conventional	7.1 ab	8.8 abc
clopyralid	25% low volume	8.0 a	9.5 ab
triclopyr	25% low volume	8.2 a	9.2 ab
triclopyr/picloram	25% low volume	7.2 ab	9.0 ab
clopyralid	25% streamline	6.4 abc	8.4 abc
triclopyr	25% streamline	4.5 cd	6.8 c
triclopyr/picloram	25% streamline	4.9 bcd	6.7 c
hexazinone	basal spot	7.5 a	7.4 bc
control	none	0.5 e	0.9 d

* Defoliation rating: 0 = no effect, 10 = complete defoliation, means followed by the same letter are not significantly different, at P = 0.05% using SNK mean separation

Banana poka control in Hawaii Volcanoes National Park. Santos, G.L., L.W. Cuddihy, and C.P. Stone. Banana poka (*Passiflora mollissima* (HBK) Bailey), a woody vine from South America, has become a serious problem in the montane wet and mesic forests of Hawaii. Originally introduced as an ornamental, banana poka currently infests more than 4,000 ha of the wet forests in Hawaii Volcanoes National park. This research was conducted to evaluate the efficacy of one mechanical (cut-only) and 6 herbicidal treatments.

Ten vines were selected for each treatment. The cut-stem technique was used on all vines. Herbicides were applied immediately after cutting to the entire cut surface of the stump as well as the cut vine. One-meter radius plots were established around each stump to detect adverse effects on native plant species. Treatments were applied on August 3 to 6, 1987. Visual evaluations were conducted on November 10, 1987.

All treatments provided complete resprout inhibition (see table). The 3 triclopyr, the undiluted glyphosate, and the cut-only treatments resulted in 100% cambium mortality; the remaining glyphosate treatments also resulted in excellent cambium mortality. Adventitious rooting of the cut vine was observed on 5 of the cut-only, 2 of the 50% glyphosate, and 1 each of the 5% glyphosate and 50% triclopyr treatments. This rooting could cause the reestablishment of the vine despite the death of the cut stump. None of the treatments caused severe injury to native species except individuals abutting the cut stem, which apparently received herbicidal treatment. Monitoring will continue until one year post treatment. (Hawaii Field Research Center, Hawaii Volcanoes National Park, P.O. Box 52, Hawaii National Park, HI 96718)

Banana poka control in Hawaii Volcanoes National Park

Treatment	Dilution	No resprouts (%)	Dead cambium (%)	Cut vine rooting (%)
triclopyr, triethyl-amine salt, 3 lb ae/gal	5% v/v in water	100	100	0
	50% v/v in water	100	100	10
	undiluted	100	100	0
glyphosate, isopropyl-amine salt, 3 lb ae/gal	5% v/v in water	100	90	10
	50% v/v in water	100	90	20
	Undiluted	100	100	0
Cut only		100	100	50

Firetree control in Hawaii Volcanoes National Park. Santos, G.L., L.W. Cuddihy, and C.P. Stone. Firetree (Myrica faya Ait.), a tree introduced to Hawaii from the Azores, has become a serious threat to the integrity of the wet, mesic, and open dry forests of the submontane and montane regions of Hawaii Volcanoes National Park. In the past 22 years firetree has increased from a single recorded individual to an infestation of over 16,600 ha in and near the Park. Firetree, because it is a nitrogen fixer, may encourage the establishment of other alien plant species which would otherwise be less able to compete with native species in the nitrogen-poor volcanic substrates of the Park. Research to evaluate the effectiveness of 5 herbicide treatments on firetree was conducted in 2 sites in Hawaii Volcanoes National Park: a closed-canopy wet 'ohi'a (Metrosideros polymorpha (Gaud.)) forest (Site A) and an open-canopy dry 'ohi'a forest (Site B). The experiment included cut-stump applications at both sites, with an additional test of continuous-frill applications at Site A. Two size classes, based on basal diameter, were used for the tests: small (3 to 9 cm) and large ($\geq$9.5 cm). Ten trees per size class were chosen at each site, for a total of 40 trees per treatment in the cut-stump test. Twenty "large" trees per treatment were chosen for the continuous frill test. Herbicides were applied to cover the entire surface of the cut stump, while a thin stream of herbicide was introduced into the frill cut around the entire diameter of each tree in the frill test. A 1-m radius plot was established around each tree to detect possible effects of herbicides on native plant species. Cut-stump treatments were applied on June 16 to 19, 1987, at Site B, and on June 23 to 26 and July 2, 1987, at Site A. Frill applications were applied on July 7 through 13, 1987. Visual evaluations of the cambium, presence of resprouts, and vigor of firetree canopy (frill treatment only) were conducted at 4 months after treatment.

In the Site A cut-stump treatments, all herbicides provided excellent to complete inhibition of resprouting, with metsulfuron-methyl and imazapyr in water producing the greatest cambium mortality (see table). Cambium mortality with triclopyr and imazapyr in oil were comparable, while glyphosate was not effective. Metsulfuron-methyl and imazapyr in water provided complete resprout inhibition, excellent canopy defoliation, and the highest cambium mortality. Triclopyr also gave excellent results. Glyphosate and the 2 imazapyr treatments were slightly less effective. None of the treatments caused visible injury to native plant species within the study plots. Monitoring will continue until 1 year post treatment. (Hawaii Field Research Center, Hawaii Volcanoes National Park, P.O. Box 52, Hawaii National Park, HI 96718)

Herbicide treatments on firetree in Hawaii Volcanoes National Park

Herbicide	Dilution	Technique	Site**	% stumps without resprouting	% stumps with dead cambium***
glyphosate, iso-		Cut stump	A	95	0
propylamine salt,		Cut stump	B	30	15
3 lb ae/gal	Undiluted	Frill*	A	90	25
imazapyr, iso-		Cut stump	A	100	40
propylamine salt,	9% v/v in	Cut stump	B	95	40
0.2 lb ae/gal	water	Frill*	A	95	15
imazapyr, iso-		Cut stump	A	100	15
propylamine salt,	9% v/v in	Cut stump	B	45	15
2 lb ae/gal	citrus oil	Frill*	A	95	10
triclopyr,		Cut stump	A	95	15
ethylamine salt,	10% v/v in	Cut stump	B	80	15
3 lb ae/gal	water	Frill*	A	100	35
metsulfuron-	28 gm/l	Cut stump	A	100	40
methyl	water	Cut stump	B	90	65
60% dry flowable	w/v	Frill*	A	100	45
Water control		Cut stump	A	50	0
		Cut stump	B	0	0
		Frill*	A	30	0
Citrus oil control		Cut stump	A	50	5
		Cut stump	B	5	5
		Frill*	A	15	0

*Canopy defoliation heavy (>50%): glyphosate - 80%; imazapyr (0.2 lb ae/gal) - 70%; imazapyr (2 lb ae/gal) - 60%; trichlopyr - 90%; metsulfuron-methyl - 95%; controls - 0% each

**A = closed canopy wet 'ohi'a,
B = open canopy dry 'ohi'a

***Checked at ground level

Cut-stump treatments for the control of glorybush in Hawaii. Santos, G.L., L.W. Cuddihy, and C.P. Stone. Glorybush (*Tibouchina urvilleana* (DC.) Cogn. in DC.), originally brought to Hawaii as an ornamental, is currently found in the Kilauea area of Hawaii Volcanoes National Park. It can form dense monotypic stands which exclude native species. This research was conducted on 4 discrete populations of glorybush in the Park to compare the effectiveness of 4 herbicide treatments. Twenty-five cut stems were chosen within each of the 4 populations for monitoring treatment effectiveness. The selection of which of the 4 treatments would be applied to each of the 4 populations was randomly determined; each population of 25 stems received a different herbicide treatment. (Other stems in each of the 4 areas were necessarily treated also, but the results reported here are only for the 25 selected stems in each area.) Herbicides were immediately applied to the entire cut surface of each stump. Due to the ability of the cut slash to produce adventitious roots if left on the forest floor, it was necessary to consolidate the slash and apply triclopyr ester at 0.45 kg ae/ha with camer volume of 171 l/ha at 20 psi using 8002E nozzles. Herbicides were applied on November 24, 1986, and visual evaluations were conducted nearly 9 months later (August 13, 1987).

The undiluted triclopyr ester caused very good resprout inhibition and cambium mortality (see table). The undiluted triclopyr amine and the 50% triclopyr ester (50% triclopyr amine) treatments provided less effective control. (Hawaii Field Research Center, Hawaii Volcanoes National Park, P.O. Box 52, Hawaii National Park, HI 96718)

Cut-stump treatments on glorybush in Hawaii Volcanoes National Park

Herbicide	Dilution	No resprouts (%)	Dead cambium (%)
triclopyr, triethyl-amine salt, 3 lb ae/gal	Undiluted	84	52
	50% v/v in water	76	44
triclopyr, butoxyethyl ester, 4 lb ae/gal	Undiluted	88	80
	50% v/v in water	72	68

PROJECT 4.

WEEDS IN HORTICULTURE CROPS

Rick Boydston - Project Chairman

Vegetable crop tolerance to metolachlor soil residues. King, W. O. and G. D. Crabtree. Vegetable tolerance to winter-applied metolachlor was investigated in a trial at Corvallis, OR, with rates of 1.5, 3.0, 6.0, and 8.0 lb ai/a applied January 15 and March 26, 1987. Plots 15 by 25 ft in a randomized complete block design with four replications were planted to beans, beets, broccoli, cauliflower, carrots, onions, and oats on May 26 and sprinkle irrigated as needed. Vegetables were evaluated visually for injury and heights of oats measured on June 28. Yields were measured as weights of the whole vegetable plants in 10 ft of row. Beans and broccoli were harvested August 5, beets and cauliflower September 4, onions September 30, and carrots October 1.

Oat shoot height data (table) show stunting from metolachlor, especially the March application, and greater activity with higher rates. Visual estimates of onion, carrot, cauliflower, and broccoli damage follow the same pattern. Beets were less affected, with only the late applications of 6 and 8 lb rates causing significant damage. Beans were unaffected.

Yields did not follow the same pattern as visual damage estimates except for onions which were the most sensitive of the vegetables. Bean, beet, and cauliflower yields generally increased with herbicide treatment, probably reflecting decreased weed competition. Plots were hand weeded in early July, apparently not soon enough to prevent competition in plots where little herbicide remained in the soil. Broccoli yields were reduced by both 8.0 lb rates and the late 6.0 lb rate. The late-applied 8.0 lb rate reduced carrot yield 35%, but the number of carrot plants in that treatment was reduced 60%. The large reductions in onion yields also corresponded to reductions of numbers of onion plants. Average individual onion weights were similar between treatments except in the late-applied 6.0 and 8.0 lb rates where average weights were both 21 g compared to 50 g from the control treatment. (Horticulture Department, Oregon State University, Corvallis, OR 97331)

Response of vegetable crops and oats to winter applied metolachlor.

Crop	Metolachlor rate (lb ai/a)								
		- -Applied 1/15/87- -				- -Applied 3/26/87- -			
	0.0	1.5	3.0	6.0	8.0	1.5	3.0	6.0	8.0
	- - - - - - - -(shoot height, cm, June 28) - - - - - - -								
oats	32	32	31	22	14	30	17	9	8
	- - - - - (% injury, visual rating, June 28) - - - - -								
beans	0	5	3	0	4	0	0	9	4
beets	0	0	10	0	6	4	3	31	23
broccoli	0	0	0	16	44	0	15	71	73
cauliflower	3	5	16	20	46	10	33	55	69
carrots	8	6	15	26	50	9	23	69	79
onions	5	5	20	35	69	13	53	78	85
	- - - - - - - - -(yield, kg/10 ft of row) - - - - - - - -								
beans	6.3	7.0	6.0	7.0	7.1	6.6	7.8	7.9	7.6
beets	6.1	6.2	5.6	7.0	9.6	5.4	7.9	7.9	8.7
broccoli	3.5	4.5	3.6	4.0	1.8	4.1	4.5	1.3	0.9
cauliflower	3.2	4.2	3.3	5.7	5.5	4.1	5.1	5.5	3.2
carrots	10.2	11.0	10.5	12.1	11.2	11.3	14.8	10.3	6.6
onions	2.40	2.13	1.86	1.61	0.75	2.55	1.46	0.15	0.10

Controlling wild proso millet (Panicum miliaceum L.) in snapbeans. McGrath, D.M., P.Diener, W.S.Braunworth, Jr., and G. Crabtree. Wild proso millet now infests several thousand acres of farmland in the Willamette Valley of Oregon. It has become a major pest in sweet corn fields and this year became a serious problem in 200 acres of snapbeans. An emergency exemption (FIFRA Sec.18) for the use of the selective grass herbicide sethoxydim on snapbeans was granted. Research was conducted in 1987 to evaluate currently registered snapbean herbicides for control of wild proso millet, and to evaluate snapbean injury due to sethoxydim application. Snapbean yields were significantly higher when the herbicide combinations EPTC-trifluralin-dinoseb-sethoxydim, EPTC-trifluralin-chloramben-sethoxydim, or EPTC-trifluralin-chloramben were used rather than a standard weed control program for the Willamette valley, EPTC-trifluralin-dinoseb or sethoxydim alone. There was slight crop injury associated with the use of chloramben. Where the only weed controls applied were post emergence applications of sethoxydim, yields were reduced. This appeared to be related to weed pressure prior to application rather than herbicide phytotoxicity. (Marion County OSU Extension, Oregon State University, Corvallis, OR 97331).

Wild proso millet control and snapbean response to herbicide application at Stayton, Oregon 1987.

Treat.no. and Herbicide	Rate lb.ai/A	Appli- cation {1}	Wild Millet % control 7/21	Wild Millet % control 8/20	Snapbean Injury (%) 7/21	Snapbean Injury (%) 8/20	Snapbean Yield (Tons/A) {3}	Snapbean Grade (%1-4) {2}
1) EPTC	3.5	PPI	95	70	0	10	5.0	69
Trifluralin	0.75	PPI						
Dinoseb	4.5	PRE						
2) EPTC	3.5	PPI	95	95	0	0	7.7 a	57
Trifluralin	0.75	PPI						
Dinoseb	4.5	PRE						
Sethoxydim	0.092	POST						
3) EPTC	3.5	PPI	99	95	5	10	6.4 a	57
Trifluralin	0.75	PPI						
Chloramben	2.5	PRE						
4) EPTC	3.5	PPI	100	99	0	5	6.5 a	70
Trifluralin	0.75	PPI						
Chloramben	2.5	PRE						
Sethoxydim	0.092	POST						
5) Sethoxydim	0.092	POST	0	85	0	10	4.0 b	72
6) Sethoxydim	0.184	POST	0	95	0	5	4.5 b	59
7) Check			0	0	0	50	0.5 c	64

{1} PPI, preplant incorporated, applied on 6/24/87; PRE, preemerge applied on 6/24/87; POST, Post emergence, applied on 7/21/87 when millet was in the 2-4 leaf stage.

{2} Percent of beans passing through standard snapbean sieve sizes 1-4.

{3} Treatments followed by the same letter do not differ significantly at the 5% level according to the Duncans Mulltiple Range test.

Annual grass control in spring planted carrots. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 to evaluate the efficacy of several new herbicides for control of barnyardgrass and green foxtail in spring planted carrots (var. Imperator 58). Soil type was a Kinnear very fine sandy loam with a pH of 7.9 and an organic matter content of less than 1%. Individual plots were 6 by 30 ft in size with four replications arranged in a randomized complete block design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 30 gal/a at 25 psi. Preplant incorporated treatments were applied April 16 and immediately disc and spike-tooth harrowed to a depth of 2 to 4 in. Preemergence surface applied treatments were applied April 24, 1987. Postemergence treatments were applied May 26 with 1 qt COC per acre. Six rows of carrots were planted 12 in apart on 72 in beds. Rows of barnyard-grass and green foxtail were planted between each carrot row at 1.0 lb/a using a cone seeder.

Visual evaluations of crop injury and weed control were made July 17, 1987. All treatments provided excellent control of barnyard-grass. Green foxtail control was excellent (100%) with all treatments except haloxyfop-methyl and fluazifop-P-butyl at 0.13 lb ai/a. All treatments resulted in substantial yield increases compared to the untreated check. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Annual grass evaluations in spring planted carrots, 1987

Treatment	Timing[1]	Rate lb ai/a	Crop Injury[2]	Weed Control[2] ECHCG	Weed Control[2] SETVI	Marketable Yield[3]
				-------%-------		----T/A-----
fluorochloridone	PES	0.50	0	100	100	11.7
fluorochloridone	PES	1.00	0	100	100	11.0
sethoxydim	POST	0.14	0	100	100	11.9
sethoxydim	POST	0.28	0	100	100	12.1
haloxyfop-methyl	POST	0.13	0	100	91	12.5
haloxyfop-methyl	POST	0.25	0	100	100	11.9
fluazifop-P-butyl	POST	0.13	0	100	92	12.1
fluazifop-P-butyl	POST	0.25	0	100	100	11.9
trifluralin	PPI	1.00	9	100	100	10.5
linuron	PES	1.00	9	100	100	9.2
check			0	0	0	8.0
handweeded check			0	0	0	11.9

[1]PES = preemergence surface: PPI = preplant incorporated: POST = postemergence.

[2]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[3]T/A = tons per acre.

Broadleaf weed control in spring planted carrots. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 to evaluate the efficacy of individual and/or herbicide combinations applied preplant incorporated and preemergence surface in spring planted carrots (var. Imperator 58). Soil type was a Kinnear very fine sandy loam with a pH of 7.9 and an organic matter content of less than 1%. Individual plots were 6 by 30 ft in size with four replications arranged in a randomized complete block design. Treatments were applied with a CO_2 backpack sprayer calibrated to deliver 30 gal/a at 25 psi. Preplant incorporated treatments were applied April 16 and immediately disc and spike-tooth harrowed to a depth of 2 to 4 in. Preemergence surface applied treatments were applied April 24, 1987. Six rows of carrots were planted 12 in apart on 72 in beds. Rows of Russian thistle, kochia and prostrate pigweed were planted between each carrot row at 1.0 lb/a using a cone seeder.

Visual evaluations of crop injury and weed control were made July 3, 1987. All treatments provided good to excellent control of prostrate pigweed. Kochia and Russian thistle control was good to excellent with all treatments except trifluralin and linuron at 0.5 lb ai/a. Carrot stand was reduced over 10% by linuron alone or in combination with fluorochloridone and by trifluralin at 1.5 lb ai/a. However, all treatments resulted in substantial yield increases compared to the untreated check. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Broadleaf evaluations in spring planted carrots, 1987

Treatment	Timing[1]	Rate lb ai/A	Crop Injury[2]	----Weed Control[2]----- AMABL	KCHSC	SASKR	Marketable Yield
				----------%------------			----T/A----
fluorochloridone	PES	0.50	0	100	100	97	10.2
fluorochloridone	PES	0.75	0	100	100	100	10.7
linuron	PES	1.00	56	100	90.6	77	2.8
trifluralin	PPI	1.5	20	100	92	90	5.0
linuron + fluorochloridone	PES	0.5 + 0.5	25	100	100	95	7.1
linuron + fluorochloridone	PES	1.0 + 0.5	51	100	100	96	2.0
trifluralin + fluorochloridone	PPI	1.0 + 0.5	10	100	100	97	9.0
fluorochloridone	PES	0.25	0	96	100	92	10.1
trifluralin	PPI	0.5	0	93	20	18	2.2
linuron	PES	0.5	13	86	60	35	4.6
check			0	0	0	0	1.6
handweeded check			0	100	100	100	10.3

[1]PES = preemergence surface: PPI = preplant incorporated.

[2]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[3]T/A = Tons per acre.

Effectiveness of thiameturon in sweet corn. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Thiameturon was applied to (Jubilee) sweet corn to evaluate crop tolerance and weed control. The trial was a randomized complete block with five replications and 2.5 m by 8 m plots. Spray volume was 234 L/ha delivered at 143 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. The thiameturon was applied on May 26, 1987 to 4-leaf corn; the weeds had two true leaves. One thiameturon treatment was applied with surfactant.

All thiameturon treatments controlled the Powell amaranth, but only the high rate and the treatment containing surfactant controlled the prostrate knotweed (see table). Crop injury in the form of chlorosis and stunting was observed at the higher rates. The greatest crop injury occurred in the plots treated with thiameturon plus surfactant. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Effect of thiameturon on sweet corn, Powell amaranth, and prostrate knotweed

Thiameturon rate	Corn injury	Powell amaranth control	Prostrate knotweed control
(g/ha)		(%)	
8.7	0	100	14
17.5	10	100	53
34.8	12	100	91
17.5 + surfactant	17	100	100
0	0	0	0

surfactant = X-77 at 0.25% v/v

Preemergent and early postemergent weed control on garlic. Penhallegon, R.H. and R.D. William. In February 1986, preemergent and postemergent applications of chloroxuron, pendimethalin, bromoxynil, sethoxydim and fluazifop-p-butyl were applied to elephant garlic planted November 1985 and silver garlic planted January 1986 in Grants Pass, Oregon to evaluate weed control and possible crop injury.

Of the four replications of the herbicide treatments shown in Table 1, the first rep was with silver garlic planted on January 5, 1986 in a sandy loam soil with high organic matter in raised boxes. The other three reps were with elephant garlic planted in November 1985, in sandy soil on raised beds. Treatments were applied on February 5, 1986 which were preemergent to weeds and the silver garlic but postemergent to elephant garlic.

Weed control in silver and elephant garlic with chloroxuron and pendimethalin applications resulted in 78 to 86% weed control. Bromoxynil was applied after weeds were too large resulting in poor weed control. Sethoxydim and fluazifop-p-butyl did not control broadleaf weeds. Phytotoxicity from chloroxuron, bromoxynil and pendimethalin were high for silver garlic in the raised boxes filled with sandy loam and high organic matter. The elephant garlic planted on raised beds demonstrated little or no reduction in growth from phytotoxicity. (Oregon State University Extension Service, OR 97331).

Table 1. Garlic tolerance to preemergence and early postemergence herbicides

Treat. no.	Herbicide	Formulation	Rate (lb ai/a)	Crop phytotoxicity 1/ Variety Silver	Elephant	General % 2/ weed control
1	check	-	-	0	0	0
2	chloroxuron	WP50	3	25	0	86
3	chloroxuron	WP50	6	40	1.7	78
4	pendimethalin	L4	1.5	7	1.7	83
5	pendimethalin	L4	2.0	40	1.7	83
6	bromoxynil	L2	0.2	20	0	26
7	bromoxynil	L2	0.5	5	0	16
8	sethoxydim 3/	L1.53	0.2	5	3.3	4
9	fluazifop-p-butyl 3/	L1	0.2	2	0	13

1/ Visual ratings of crop phytotoxicity 0 = no injury; 100 = complete kill
2/ The average % weed control for both garlic varieties
3/ 1% crop oil volume of H_2O for sethoxydim and fluazifop-p-butyl

Table 2. Weed control ratings for several broad leaf and grassy weeds in Elephant and Silver Garlic, 1986.

Trt #	Herbicide	Formulation	Rate (lb/ ai/A)	% WEED CONTROL [1/] WEED SPECIES Sh.-purse	Bitter-cress	Pink	Chick-weed	Blue-grass	Rye Grass	Fen-nel	Knot-weed	Clo-ver	Hen-bit	F. bind-weed	Mus-tards	Plan-tain	Average
1	check			0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	chloroxuron	WP50	3	100	98	99	99	76	25	97	85	95	-[2/]	-	98	-	86
3	chloroxuron	WP50	6	99	98	100	98	94	0	100	93	88	-	-	75	0	78
4	pendimethalin	L4	1.5	96	100	57	96	82	25	99	88	97	-	70	90	98	83
5	pendimethalin	L4	2	95	100	80	96	79	23	65	100	99	-	-	91	100	83
6	bromoxynil	L2	0.25	33	-	33	33	17	17	36	17	-	-	-	17	33	26
7	bromoxynil	L2	0.5	16	-	33	22	13	0	24	17	20	-	-	11	8	16
8	sethoxydim	L1.5	0.25	0	0	0	0	23	23	0	0	0	0	0	0	0	4
9	fluazifop-p-butyl	L1	0.25	33	0	13	10	20	0	0	48	45	0	0	0	0	13

[1] % weed control: 0-no control, 100- complete control; herbicide application was February 5, 1986; control ratings were made in April 1986.

[2] Weed species not present

Annual grass control in spring planted onions. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 at the Agricultural Science Center to evaluate efficacy of individual herbicides for annual grass control in spring planted onions (var. Brown Beauty). Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. Individual plots were 6 by 30 ft in size with four replications arranged in a randomized complete block design. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 30 gal/a at 25 psi. The preemergence surface applied treatment was applied on April 24, 1987 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied on May 26, 1987 when onions were in the first true leaf stage. All postemergence treatments were applied with a COC at 1 qt per acre. Weed species were planted on April 21, 1987 at 1.0 lb/a in separate rows 20 in apart, using a tractor driven cone seeder.

Visual weed control and crop injury evaluations were assessed on July 2, 1987. All treatments provided good to excellent control of both weed species. No visible onion injury was observed in any of the treatments. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Annual grass control in spring planted onions, 1987

Treatment	Timing[1]	Rate lb ai/a	Crop[2] Injury	Weed Control[2] ECHCG	SETVI	Marketable Yield
				-------%-------		50 lb sacks/a
sethoxydim	POST	0.28	0	100	100	1425
haloxyfop	POST	0.25	0	100	100	1431
haloxyfop	POST	0.19	0	100	100	1416
fluazifop	POST	0.25	0	100	100	1422
fluazifop	POST	0.19	0	100	100	1412
DCPA	PES	10.00	0	100	98	1410
sethoxydim	POST	0.19	0	100	96	1435
fluazifop	POST	0.13	0	100	93	1417
haloxyfop	POST	0.13	0	100	91	1428
sethoxydim	POST	0.14	0	100	87	1395
check			0	0	0	397
handweeded check			0	100	100	1416

[1]PES = preemergence surface and POST = postemergence.

[2]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

Broadleaf weed control in spring planted onions. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 at the Agricultural Science Center to evaluate efficacy of individual and/or herbicide combinations for broadleaf weed control in spring onions (var. Brown Beauty). Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. Individual plots were 6 by 30 ft in size with four replications arranged in a randomized complete block design. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 30 gal/a at 25 psi. Preemergence surface applied treatments were applied April 24, 1987 and immediately incorporated with 0.75 in of sprinkler applied water. Postemergence treatments were applied May 26, 1987 when onions were in the first true leaf stage. Weed species were planted on April 21, 1987 at 1.0 lb/a in separate rows 20 in apart, using a tractor driven cone seeder.

Visual weed control and crop injury evaluations were assessed on July 2, 1987. All treatments provided excellent control of prostrate pigweed. Kochia and Russian thistle control were good to excellent with all treatments except DCPA at 10.0 lb ai/a. Oxyfluorfen applied preemergence surface at 0.4 lb ai/a and pendimethalin applied preemergence surface at 2.0 lb ai/a alone or as a split application with bromoxynil caused over 60% crop injury. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Broadleaf weed evaluations in spring planted onions, 1987

Treatment	Timing[1]	Rate lb ai/a	Crop[2] Injury	Weed Control[2] AMABL	KCHSC	SASKR	Marketable Yield
				----------%----------			50 lb sacks/a
oxyfluorfen	PES	0.4	80	100	94	97	260
metolachlor + bromoxynil	POST	1.0 + 0.5	0	100	100	100	1350
oxyfluorofen + bromoxynil	POST	0.5 + 1.0	0	100	100	100	1410
pendimethalin	PES	2.0	60	100	92	90	350
pendimethalin + bromoxynil	PES + POST	2.0 + 1.0	65	100	100	100	300
DCPA	PES	10.0		100	24	18	450
check			0	0	0	0	150
handweeded check			0	100	100	100	1390

[1]PES = premergence surface and POST = postemergence.

[2]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

Weed control in onions with fertilizer solutions - 1987. Cudney, D. W. and S. Orloff. Sulfuric acid had been the standard contact herbicide used for the control of broadleaf weeds in onions. This herbicide treatment has been proven to be injurious to the onions, difficult to apply, and costly. Commercial applicators are no longer available to apply sulfuric acid. A field trial was initiated to investigate the weed control properties of two fertilizer solutions, urea-sulfuric acid solution (N-Tac) and ammonium thiosulfate (Thio-sul). The solutions were tested at three application rates: 93, 186, and 280 l/ha. The plots were treated using a constant pressure CO_2 backpack sprayer at a spray volume of 560 l/ha. Plot size was 1 meter by 9 meters. Each treatment was replicated four times. Onions were in the one-true leaf stage at the time of treatment (May 9). Weeds present in the trial area were Jim Hill mustard and Russian thistle which were 5 to 10 cm and 2 to 10 cm in diameter, respectively. Weed control was evaluated two weeks after treatment on May 23.

Onion injury was greatest with the urea-sulfuric acid solution at the higher application rates. The highest application rate (280 l/ha) resulted in a 19 percent reduction in onion stand. Ammonium thiosulfate did not injure the onions as severely.

Jim Hill mustard was controlled with both fertilizer solutions, particularly at the higher application rates. Urea-sulfuric was superior to ammonium thiosulfate for the control of Russian thistle. These data indicate that it was not possible to adequately control Russian thistle with a single application of either fertilizer solutions without severe onion injury. (University of California Cooperative Extension, Riverside, CA 92521)

Weed control in onions with fertilizer solutions

Treatment	Rate l/ha	Onion[1] Injury	Jim Hill[2] Mustard Control	Russian[2] Thistle Control	Percent[3] Stand
N-Tac	93	1.0	7.8	3.0	99
	187	2.6	9.8	7.8	93
	280	4.3	10.0	8.8	81
Thio-sul	93	1.0	5.4	1.8	92
	187	1.3	8.8	2.8	90
	280	1.4	9.3	3.8	91
check	-----	0.4	0.0	0.3	100
LSD		0.9	1.2	1.5	15

1/ 0 = no injury, 10 = all plants dead

2/ 0 = no control, 10 = all weeds dead

3/ Percent stand relative to untreated control plots

Grass control in onions with postemergence grass herbicides. Westra, P. and T. D'Amato. Seven herbicides were evaluated for grassy weed control and phytotoxicity in onions in 1986 and 1987. The studies consisted of 3 replications of a RCB design with 6.7 by 30 ft plots. Applications were made with a CO_2 backpack sprayer using 11002LP SS tips spraying at 20 psi boom pressure delivering 20 gpa. Treatments were applied postemergence to seeded onions. All treatments included crop oil concentrate at 1 qt/a. Percent control was based on visual evaluations (scale of 0-100).

The herbicides all showed good to excellent grass control with no onion injury. Wild proso millet (PANMI) density was high, making control difficult at some lower herbicide rates in 1987. Best control is obtained when application is made to small grasses. (Weed Research Laboratory, Colorado State University, Ft. Collins, CO 80523)

Grass control in onions with postemergence grass herbicides.

Herbicide	Rate (lb/a)	ECHCG 9-16-86 (% control)	Yield 1986 (cwt/a)	PANMI 7-27-87 (% control)	Yield 1987 (cwt/a)
untreated check		0 d	154 cd	0 e	111 b
fluazifop-butyl	.188	93 c	102 d	67 b	286 a
fluazifop-butyl	.250	98 ab	180 cd	89 a	267 a
fluazifop-butyl	.375	--	--	93 a	218 a
sethoxydim	.200	94 bc	269 bc	--	--
sethoxydim	.250	--	--	91 a	230 a
sethoxydim	.300	99 a	220 bcd	--	--
DPX-Y6202	.050	--	--	88 a	261 a
DPX-Y6202	.100	100 a	316 b	--	--
DPX-Y6202	.200	100 a	272 bc	--	--
fenoxaprop-ethyl	.100	93 c	440 a	--	--
fenoxaprop-ethyl	.150	99 a	222 bcd	--	--
fenoxaprop-ethyl	.250	--	--	97 a	266 a
BAS-517	.100	98 a	118 d	--	--
BAS-517	.150	--	--	98 a	305 a
BAS-517	.200	100 a	152 cd	--	--
haloxyfop methyl	.125	98 ab	192 cd	--	--
haloxyfop methyl	.150	--	--	96 a	281 a
haloxyfop methyl	.250	100 a	163 cd	--	--
clethodim	.030	--	--	38 d	252 a
clethodim	.045	--	--	57 c	274 a
clethodim	.060	--	--	73 b	291 a
clethodim	.075	--	--	87 a	244 a

Evaluation of several preemergence herbicides for direct seeded bell peppers. Agamalian, Harry. Preemergence herbicides were sprayed following the seeding of direct seeded bell peppers. Herbicides included were diethatyl, napropamide and diphenamid, as well as combinations of the above herbicides.

The primary objective of this experiment was to assess the efficacy of diethatyl for the control of hairy nightshade. A secondary objective was to assess crop tolerance of diethatyl, napropamide and diphenamid combinations.

This experiment was conducted on a clay loam soil with 45% clay, 30% silt and 25% sand. The organic matter content was .8%.

Following application of the herbicides, sprinkler irrigation was used to leach the herbicide into the soil. Approximately 1 inch of water was used for the initial irrigation. The weed control results from this experiment indicated 90% or better nightshade control with diethatyl at the 4 lb ai/a rate. This held true whether diethatyl was applied as a single treatment or in combination with napropamide, diphenamid or all three herbicides. When diethatyl was reduced to the 2 lb ai/a rate, the hairy nightshade control was less effective.

Efficacy of all herbicide treatments provided at least 80% pigweed control at this site.

Seedling phytotoxicity evaluations indicated no significant differences from any of the herbicide treatments. No yield data was obtained from this experiment as the crop was destroyed prior to harvest. (University of California, Cooperative Extension, Salinas, CA 93901).

Efficacy of preemergence herbicides on bell peppers

Treatment	lb ai/a	% Weed Control SOLSA	AMARE	Phyto	Crop Destroyed Prior to Harvest
diethatyl	2	78	85	0	
diethatyl	4	92	98	0	
diethatyl	8	100	100	0.5	
diethatyl + napropamide	4 + 2	97	98	0	
diethatyl + diphenamid	4 + 4	95	95	0.2	
diethatyl + napropamide + diphenamid	2+2+2	75	82	0.2	
diethatyl + napropamide + diphenamid	4+2+4	90	100	0.7	
napropamide	2	0	80	0	
diphenamid	4	0	90	0	
Control	0	0	0	0	

Selective weed control in transplanted bell peppers. Agamalian, Harry. Following the transplanting of bell peppers, preemergence applications of pronamide were applied as a topical application. Sprinkler irrigation was used to leach the herbicide into the soil, using approximately 1 inch of water. Pronamide was applied at the rate of 1 lb and 2 lb active ingredient.

A non-treated control was included in the replicated experiment. The experiment was conducted on a Chualar sandy loam soil with 35% clay, 30% silt and 35% sand. The organic matter contained was .5%.

The major weeds observed in this experiment were hairy nightshade, redroot pigweed, and purslane

Efficacy data obtained on this experiment resulted in 90% or better hairy nightshade and purslane control. Pigweed control was only 35% to 45%, considered to be not commercial.

Vigor evaluations made approximately 30 days after treatment indicated 85% vigor at the 1 lb ai/a pronamide rate but only 55% vigor at the 2 lb ai/a rate. These results indicated some suppression from the 2 lb ai/a application.

Yield data obtained from fresh bell peppers indicated no significant difference from the 1 lb and 2 lb ai/a herbicide rates when compared to the hand-weeded control.

These studies indicated that the herbicide pronamide shows some potential for transplanted bell peppers, although early crop injury was observed at the 2 lb ai/a rate. (University of California Cooperative Extension, Salinas, CA 93901)

Efficacy of pronamide post transplant on bell peppers

		% Weed Control			Pepper Evaluations	
Treatment	lb ai/a	SOLSA	AMARE	POROL	% Vigor	lb/a
pronamide	1	90	35	98	8.5	7744
pronamide	2	98	45	100	5.5	9196
Control	0	0	0	0	9.5	9292

Evaluation of preplant incorporated herbicides for direct seeded chili peppers. Agamalian, Harry. The application of several preplant incorporated herbicides were made to a Greenfield sandy loam soil with 55% sand, 25% clay and 20% silt. The organic matter was 0.6%. The herbicides were incorporated to a depth of 2 to 2 1/2 inches.

Following seeding of the peppers, sprinkler irrigation was used to germinate the crop. Approximately 1 inch of water was applied.

Herbicides included in this experiment were diethatyl, napropamide, and diphenamid. These herbicides were applied in single and combination dosage rates.

The principle objective of this study was to assess diethatyl for hairy nightshade control. Efficacies resulting from this experiment indicated effective nightshade control (80% or better) was obtained with diethatyl when 4 lb ai/a was applied either in single or in combination treatments. Other weeds evaluated in this experiment included redroot pigweed and black mustard. Effective pigweed control was obtained with all treatments except the 2 lb ai/a diethatyl. Black mustard was effectively controlled with diphenamid and combinations of diphenamid with diethatyl and napropamide.

Chili pepper tolerances were evaluated by vigor and stand counts. Both evaluations indicated excellent crop tolerance to the three herbicides at the dosage rates used in this experiment.

Red mature chili peppers were harvested for yield data. The results on the enclosed table indicate no significant differences between any of the respective treatments nor was there any significant difference in the color or maturity from the herbicides. (University of California Cooperative Extension, Salinas, California).

Efficacy of preplant incorporated herbicides on chili peppers

Treatment	lb ai/a	% Weed Control SOLSA	AMARE	BRSNI	Pepper Vigor	Pepper Stand Count	% Red	T/a Fresh w/w
diethatyl	2	65	75	70	10.0	43.2	75.5	26.7
diethatyl	4	90	96	70	10.0	46.5	76.7	23.4
diethatyl	8	98	98	72	9.5	46.0	75.2	25.4
diethatyl + napropamide	4+2	93	100	70	9.8	44.7	87.0	23.7
diethatyl + diphenamid	4+4	94	98	90	10.0	42.0	68.5	24.1
diethatyl + napropamide + diphenamid	2+2+2	78	95	87	9.5	44.0	77.7	27.2
diethatyl + napropamide + diphenamid	4+2+4	96	100	98	10.0	46.5	78.5	25.8
napropamide	2	0	96	68	10.0	45.5	70.2	25.6
diphenamid	4	60	98	80	10.0	45.7	70.0	24.4
Control	0	12	0	0	10.0	43.5	66.0	25.8
						ns	ns	ns
							cv 14.5	cv 13.6

Postplant preemergent herbicide evaluations on chili peppers. Agamalian, Harry. Several preemergence herbicides were applied to direct seeded chili peppers. This experiment was conducted on a Greenfield sandy loam soil with 55% sand, 25% clay and 20% silt. The organic matter was 0.6%.

Immediately following herbicide applications, sprinkler irrigation was used to germinate the crop with approximately 1 inch of water.

The herbicides in this experiment included diethatyl, napropamide and diphenamid. These herbicides were applied in single and combination dosage rates.

The primary objective of this experiment was to evaluate diethatyl for hairy nightshade weed control. The major weeds at this site include hairy nightshade, redroot pigweed and black mustard.

Approximately 30 days after treatment, weed and pepper evaluations were obtained. Hairy nightshade weed control from this experiment resulted in 85% or better from all herbicide treatments. Effective redroot pigweed control was obtained with diethatyl at 4 lb ai/a. Single rates of napropamide and diphenamid did not provide commercial control. Black mustard was efficiently controlled with combinations of diethatyl plus napropamide, diethatyl plus diphenamid and single applications of diphenamid.

Evaluations of chili pepper vigor and stand count indicated no significant differences from any of the respective herbicides when compared with the hand-weeded control.

Yield data taken when the chili peppers were at least 60% red color resulted in no significant differences from the respective herbicides. Percent red color likewise showed no significant differences from the respective herbicide treatments.

Hairy nightshade control was improved with the lower rate of Antor applied under preemergence conditions when compared to preplant incorporated. These differences illustrate the dilution effect of mixing the herbicide into the soil profile at marginal dosages of weed effectiveness. (University of California Cooperative Extension, Salinas, CA 93901).

Efficacy of preemergence herbicides on chili peppers

		% Weed Control			Pepper	Pepper Stand	%	T/a
Treatment	lb ai/a	SOLSA	AMARE	BRSNI	Vigor	Count	Red	Fresh w/w
diethatyl	2	85	71	45	10.0	45.7	64.2	25.6
diethatyl	4	91	84	77	10.0	43.0	64.5	24.7
diethatyl	8	92	94	70	10.0	47.2	71.5	24.3
diethatyl + napropamide	4+2	87	90	85	9.2	47.5	88.5	24.7
diethatyl + diphenamid	4+4	90	94	92	9.8	47.2	81.5	24.1
diethatyl + napropamide + diphenamid	2+2+2	84	86	92	9.8	47.0	75.2	25.9
diethatyl + napropamide + diphenamid	4+2+4	91	88	88	9.8	48.2	69.7	24.3
napropamide	2	0	30	0	9.8	44.5	75.0	24.8
diphenamid	4	15	55	80	10.0	43.2	65.5	24.2
Control	0	12	0	0	10.0	42.7	70.2	20.3
						ns	ns	ns
							cv 14.9	cv 14.6

Layby weed control in established chili peppers. Agamalian, Harry. Preemergence herbicides were applied to established chili pepper plants following thinning when they were 4 to 5 inches tall. Herbicides included in this study were pronamide, DCPA and chloramben. The experiment was established on the Variety UF - 15 processing-type long green chili pepper used for dehydration. The soil texture was a Greenfield sandy loam with 55% sand, 25% clay and 20% loam. The organic matter was 0.6%.

Following application of the herbicides, sprinkler irrigation was used at a rate of 1 inch of water. Application rates for the herbicides were pronamide (1 lb ai/a and 2 lb ai/a; DCPA (10 lb ai/a); and chloramben (4 lb ai/a).

Major weeds at this site were redroot pigweed and hairy nightshade. Commercial efficacy for pigweed was only obtained with chloramben, resulting in 90% control. For hairy nightshade, 85% or better control was obtained with all herbicides.

Yield data was obtained on the mature red peppers. The following table indicates no significant yield data from any of the respective herbicide treatments when compared with the handweeded control. (University of California Cooperative Extension, Salinas, CA 93901).

Efficacy of preemergence herbicides applied post thinning

	% Weed Control			Pepper Evaluations		
Treatment	lb ai/a	AMARE	SOLSA	% Vigor	Yield T/A	% Red
pronamide	1	30	90	98	26.8	73.7
pronamide	2	60	100	100	27.7	60.0
DCPA	10	70	85	100	26.9	60.0
chloramben	4	90	95	98	28.9	72.7
Control	0	0	0	100	25.6	66.6
					ns	ns

A pre-plant, pre-emergence weed control trial in processing tomatoes comparing different rates of metam-sodium applied as bladed treatments. Orr, J.P., R.J. Mullen, G. Miyao, and P. Verdegaal. A pre-plant, pre-emergence weed control trial, evaluating four different rates of metam-sodium applied with subsurface spray blades, was established at Barandas Farms (Manuel and Tom Barandas) west of Sacramento, California, on April 13, 1987. Soil moisture was intermediate at the time of treatment and the soil condition was somewhat cloddy. Application of the metam-sodium was done with a CO_2 sprayer mounted to a tractor with the fumigant fed by plastic spray hose into two subsurface spray blades mounted o a tool bar. This allowed for two six-inch bands of metam-sodium to be applied on beds that were to be twin row planted with processing tomatoes. Due to a delay in the grower's planting schedule, the field was not planted until mid-May and first irrigated on May 19, 1987. This may have had some effect on the performance of the various metam-sodium treatments. Weed control ratings were made on June 9, 1987, and weeds present included black nightshade, mustard, and lambsquarter. Crop phytoxicity ratings were not taken on this date as the crop was still emerging and the stand was somewhat erratic in all treatments. Best overall weed control was achieved with the highest rate of metam-sodium, but even this treatment gave only partial control of lambsquarter. The second best treatment was the 100 gallon per acre rate of metam-sodium and its performance may have been better had not the spray tank become partially plugged due to foreign matter for a portion of two replications. The other two rates of metam-sodium gave generally poor weed control activity on all weed species, except mustard. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

A pre-plant, pre-emergence weed control trial in processing tomatoes comparing different rates of metam-sodium applied as bladed treatments

June 9, 1987

		WEED CONTROL[1]		
TREATMENT	**RATE gal/a**	**BLACK NIGHTSHADE**	**LAMBSQUARTER**	**BLACK MUSTARD**
metam-sodium	150.0	8.9	6.5	8.3
metam-sodium	100.0	7.8	5.0	7.5
metam-sodium	75.0	6.5	4.8	7.5
metam-sodium	37.5	3.0	2.3	6.5
Control	-----	0.0	0.0	0.0

1 Average of four replications: 0 = no weed control
10 = complete weed control

A pre-plant, pre-emergence nightshade control trial in processing tomatoes comparing two methods of application of metam-sodium. Mullen, R.J., J.P. Orr, R. Smith, D. Kontaxis, and A. Carlisle. A pre-plant, pre-emergence weed control trial in processing tomatoes was established at Vaquero Farms (Lou Sousa, Alan Carlisle) on April 6, 1987. Three rates of metam-sodium (Vapam) were applied with a handheld CO_2 backpack sprayer and immediately incorporated with a power tiller to a depth of two inches. Two other comparable rates of metam-sodium were applied as a drench treatment in 2,000 gallons water per acre spray volume. The width of the waterband drench of metam-sodium was 1.5 feet. Soil moisture, on a Brentwood clay soil, at time of treatment was intermediate. All treatments were left unplanted for a period of two weeks. Weed control and crop phytotoxicity ratings were made on May 18, 1987, and again on May 26, 1987. Best control of black nightshade occurred with a 100 gallon per acre rate of metam-sodium applied as a drench treatment, followed by the 50 gallon per acre rate of metam-sodium as a drench treatment. None of the pre-plant, soil power incorporated treatments of metam-sodium gave commercial control of black nightshade, but the 100 gallon per acre rate gave the best partial control of black nightshade of the three rates evaluated under this application method. Regardless of treatment rate or application method, no observed tomato crop phytotoxicity occurred. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

A pre-plant, pre-emergence nightshade control trial in processing tomatoes comparing two methods of application of metam-sodium

		WEED CONTROL[1] BLACK NIGHTSHADE		TOMATO[1] PHYTOTOXICITY RATING	
TREATMENT	RATE gal/a	5/18	5/26	5/18	5/26
PRE-PLANT INCORPORATED					
metam-sodium	25	2.5	2.5	0.5	0.7
metam-sodium	50	5.5	4.5	0.5	0.5
metam-sodium	100	6.9	6.4	0.6	0.5
PRE-PLANT WATERBAND DRENCH					
metam-sodium	50	7.8	7.6	0.5	0.6
metam-sodium	100	8.9	8.5	0.4	0.5
CONTROL	---	0.0	0.0	0.5	0.5

[1] Average of four replications: 0 = no weed control, no crop damage
10 = complete weed control, crop dead

TREATMENT	RATE gal/a	SPRAY VOLUME gal/a	YIELD tons/a	SIG. DIF. AT 5%
PRE-PLANT INCORPORATED				
metam-sodium	25	50	31.3	A
metam-sodium	50	100	33.3	A
metam-sodium	100	200	34.0	A
PRE-PLANT WATERBAND DRENCH				
metam-sodium	50	2,000	26.9	A
metam-sodium	100	2,000	27.7	A
CONTROL	---	-----	28.9	A

A post-emergence trial for weed control in processing tomatoes. Mullen R.J., R. Smith, and J.P. Orr. A post-emergence weed control trial in processing tomatoes was established on April 28, 1987, at Bacchetti Farms (Bert and Mark Bacchetti) northwest of Tracy, California. All treatments were applied with a CO_2 backpack sprayer and with 50 gallons per acre spray volume. The soil type was a Sacramento clay loam and the field was furrow irrigated throughout the season. The crop was in the fourth to fifth true-leaf stage at time of treatment and weeds present included one to four true-leaf hairy and black nightshade, one to three inch tall barnyardgrass, one to two inch rosette shepherd'spurse, two to three inch tall redroot pigweed, and one to three true-leaf stinging nettle. Weed pressure was very heavy. The trial was rated for weed control efficacy and crop phytotoxicity on May 8, 1987. Best overall weed control was achieved by the combination treatment of acifluorfen (Tackle) + LAB-191 + BAS-090 surfactant oil, however this treatment also resulted in considerable crop leaf burn. The second best treatment overall was a combination of metribuzin (Sencor) + cloproxydim (Select) + Agridex. This treatment was weak on black nightshade, but gave no crop phytotoxicity. Acifluorfen alone gave excellent control of black nightshade and stinging nettle, but was somewhat weak on hairy nightshade and the other weed species present. Metribuzin alone was effective on stinging nettle, hairy nightshade, and shepherd'spurse, but weak on black nightshade and barnyardgrass in combinations with herbicides with a broadleaf post-emergence spectrum primarily. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

A post-emergence trial for weed control in processing tomatoes

TREATMENT	RATE LB/A	WEED CONTROL[1] BARNYARD GRASS	BLACK NIGHTSHADE	HAIRY NIGHTSHADE	SHEPHERD'S PURSE	REDROOT PIGWEED	STINGING NETTLE	TOMATO[1] PHYTOTOXICITY RATING
acifluorfen	.25	2.8	8.8	6.8	7.0	4.3	8.5	1.6
pyridate	.25	2.0	6.8	7.3	2.8	3.0	3.5	1.3
metribuzin DF	.33	3.0	4.8	8.3	8.1	7.5	8.6	0.7
metribuzin DF +	.33							
cloproxydim +	0.1							
acridex	1/2%	9.5	5.8	8.5	9.1	9.3	9.1	0.8
acifluorfen +	.125							
LAB-191 + BAS-090	0.1+1/2%	9.3	9.4	9.0	9.1	8.1	9.5	4.1
Control	----	0.0	0.0	0.0	0.0	0.0	0.0	0.6

1 Average of four replications: 0 = no weed control, no crop damage
10 = complete weed control, crop dead

A layby-incorporated weed control trial in processing tomatoes. Mullen R.J., J. P. Orr, and P. Verdegaal. A layby weed control trial in processing tomatoes was established on June 1, 1987, at Augusta-Bixler Farms (Bill Salmon and Floyd Leveroni), northwest of Tracy, California. The objective of the trial was to evaluate six herbicides and one combination treatment applied as directed sprays to the base of the crop plants and evaluate their potential for weed control effectiveness and crop phytotoxicity. Treatments were applied post-emergence to the weeds with a CO_2 backpack sprayer in 50 gallons per acre spray volume when the crop was in the four to six true-leaf stage of growth. After treatment, all sprays were then incorporated into the top two to three inches of soil with the grower's power tiller. The soil type was a Barns clay loam and furrow irrigation followed six days after treatment. Weed control and crop phytotoxicity ratings were made on June 15, 1987, and again on June 21, 1987. EPTC (Eptam) gave the best overall weed control of all species within the trial, followed by the combination of chloramben (Amiben) + pebulate (Tillam), diethatyl-ethyl (Antor) alone, and acifluorfen (Tackle) alone. Acifluorfen gave the best nightshade control, but was weak on yellow nutsedge. Oxadiazon (Ronstar) caused considerable crop injury, particularly at the high rate, and some crop damage occurred with the use of chloramben DS alone or in combination with pebulate. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

A layby-incorporated weed control trial in processing tomatoes

		WEED CONTROL[1]						TOMATO[1]	
		BLACK NIGHTSHADE		PURSLANE		YELLOW NUTSEDGE		PHYTOTOXICITY RATING	
TREATMENT	RATE lb/a	6/15	6/21	6/15	6/21	6/15	6/21	6/15	6/21
CIPC	4	8.0	8.5	7.0	6.3	5.1	4.0	1.5	1.4
EPTC	3	7.6	8.3	7.6	8.0	7.8	8.6	1.2	1.2
oxadiazon	1	6.1	7.1	5.8	7.3	6.1	6.4	3.1	2.1
oxadiazon	2	6.6	7.4	6.9	7.0	5.8	5.8	5.6	3.7
acifluorfen	1	7.6	9.2	7.1	8.0	6.8	6.4	1.5	1.5
diethatyl-ethyl	4	8.0	8.3	6.3	7.3	6.6	7.5	1.6	1.3
chloramben DS	6	7.0	7.8	6.6	6.8	6.0	6.5	2.4	2.1
chloramben DS +	6								
pebulate	6	8.0	8.1	7.6	7.5	8.4	7.9	2.8	2.5
Control	---	1.0	1.8	0.8	1.3	1.2	2.3	0.7	0.9

[1] Average of four replications: 0 = no weed control, no crop damage
10 = complete weed control, crop dead

Layby herbicides in processing tomatoes. Orr, J.P., Stucki, L.F., and Mullen, R.J. On July 10, 1987, 6203 processing tomatoes were planted at Cosumnes River College Research Farm in a clay loam soil. Upon reaching the five-leaf stage and at a height of six inches, layby herbicides were applied to the tomato plants. Granular application was applied by using a ACME Spred-Rite granular spreader. Liquid applications were applied at 30 PSI and 30 gal./A by a CO_2 backpack sprayer. All treatments were replicated four times in a randomized plot design. Treatments were sprinkler incorporated. No weeds were present in the trial. Fresh weights were taken on September 17, 1987. The tomato plants were cut at ground level and weighed for each treatment involved in the trial.

Oxadiazon 2%G showed excellent yield overall with little vigor reduction and no phytotoxicity. Diethatyl when applied over the top caused vigor reduction and phytotoxicity it was much lower when directed. Oxadiazon 2E caused unacceptable damage along with pronamide and chloramben at the higher rates and acifluorfen at the 1.5lbs/A rate. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

Layby herbicides in processing tomatoes

CHEMICAL & FORMULATION	RATE lb ai/a	APPLI-CATION	FRESH WT. YIELD T/a	SIG. DIF. AT 5%	STAND[1] REDUCTION	VIGOR[1] REDUCTION	PHYTO-[1] TOXICITY
oxadiazon 2%G	2.0	Overtop	79.38	A	0.0	0.0	0.0
diethatyl 4E	4.0	Overtop	73.76	AB	0.0	3.8	3.3
oxadiazon 2%G	3.0	Overtop	73.65	AB	0.0	1.0	0.0
diethatyl 4E	4.0	Directed	71.76	AB	0.0	1.0	0.0
oxadiazon 2%G	4.0	Overtop	70.67	AB	0.0	1.0	0.0
diethatyl 4E	2.0	Overtop	70.24	AB	0.8	3.0	2.5
acifluorfen 2E	0.5	Directed	65.55	ABC	0.5	0.8	0.0
diethatyl 4E	2.0	Directed	56.01	ABCD	0.0	2.0	0.5
pronamide + X77 50W	.5%+.5%	Overtop	50.57	BCDE	0.0	5.8	5.5
oxadiazon 2E	2.0	Directed	49.04	BCDE	1.8	5.3	5.0
oxadiazon 2E	4.0	Directed	41.92	CDE	4.8	8.0	8.0
acifluorfen 2E	1.0	Directed	40.55	CDE	0.0	3.8	0.0
chloramben 10%G	2.0	Overtop	40.51	CDE	0.5	2.0	0.5
chloramben 10%G	4.0	Overtop	40.33	CDE	0.0	5.8	3.3
acifluorfen 2E	1.5	Directed	37.06	DE	0.5	4.5	2.3
chloramben 10%G	6.0	Overtop	28.09	E	0.8	5.5	5.0
pronamide + X77 50W	1.0% 0.5%	Overtop	25.91	E	0.0	7.3	8.0
Control ---	---	------	78.66	A	0.0	0.0	0.0

1 0 = no crop damage
10 = crop dead

CV = 30.0257
LSD = 10.9612

Control of purple nutsedge in bermuda swards. Cudney, D. W., Clyde Elmore, and John Vandam. Purple nutsedge is a serious weed pest in warm season turf in the lower desert valleys of southern California. This perennial weed's growth cycle is perfectly matched to the growth cycle of warm season turf species such as bermuda. The commonly used post emergence herbicides which give some control of yellow nutsedge do not give adequate control of purple nutsedge. Two trials were established on golf courses infested with purple nutsedge southeast of Palm Springs in the La Quinta area. Both trials were located on bermudagrass fairways. The postemergence herbicides were applied with a constant pressure CO_2 backpack sprayer. A spray volume of 485 liters per hectare was used and all treatments were replicated three times in both trials. The first trial at PGA west was first sprayed on March 20th. The second application was made on March 31st and the plots were last evaluated two months after the first treatment. The second trial located at Cathedral Canyon was first treated on July 10th. Difficulty with the irrigation system in the plot area in August and September did not allow the second set of treatments to be made. The postemergence herbicides tested were: MSMA (2.2 kg ai/ha), bentazon (1.7 kg ai/ha), imazaquine (.28 and .43 kg ai/ha), and imazaquine plus MSMA (.43 + 2.2 kg ai/ha). All treatments except imazaquine at the lower rate were intended to be compared as single treatments and as sequential applications where a second application followed the first ten days later.

Phytotoxicity ratings were highest in the Cathedral Canyon site (table 1.). This was as might be expected due to the fact that the Cathedral Canyon plots were applied later in the summer when temperatures were higher and plant stress was greater. However phytotoxicity was not high enough to cause concern and the bermudagrass soon recovered. MSMA and MSMA combinations with imazaquine had the highest phytotoxicity ratings.

The short term of the Cathedral Canyon trial did not allow full expression of the imazaquine plots due to the slow action of this herbicide and the necessity of early termination of the trial. MSMA and MSMA plus imazaquine had the best purple nutsedge control ratings in the Cathedral Canyon trial.

The control of purple nutsedge in the PGA West trial table 2.) was marginal even with the best treatments. The combination of MSMA plus imazaquine applied twice ten days apart was the best overall treatment. This treatment shows promise but needs further study. (U.C. Coop. Ext., Riverside, CA 92521)

Table 1. Purple nutsedge control, Cathedral Canyon (La Quinta)

Treatment	Rate Kg/ha	Phytotoxicity[1] 8/7/87	Nutsedge Control 8/7/87
MSMA	2.2	2.5	7.2
MSMA	2.2	2.2	7.6
bentazon	1.7	0.1	3.0
bentazon	1.7	0.5	5.0
imazaquine	0.28	1.1	2.5
imazaquine	0.43	0.7	4.0
imazaquine	0.43	1.1	2.5
imazaquine+MSMA	0.43 + 2.2	2.5	6.7
imazaquine+MSMA	0.43 + 2.2	2.7	7.3
check		.3	0.0
LSD .05		1.0	1.8

Table 2. Purple nutsedge control, PGA West (La Quinta)

Treatment	Rate Kg/ha	Phyto.[1] 3/31/87	Nutsedge[2] Control 3/31/87	Phyto.[1] 4/24/87	Nutsedge[2] Control 4/24/87
MSMA	2.2	0.3	1.0	0.0	3.6
MSMA *	2.2	0.0	3.6	1.0	4.6
bentazon	1.7	0.0	4.6	0.0	3.0
bentazon *	1.7	0.0	4.3	0.3	4.6
imazaquine	.28	0.0	0.3	0.0	1.6
imazaquine	.43	0.0	0.3	0.0	2.6
imazaquine *	.43	1.0	0.6	0.7	4.0
imazaquine+MSMA	.43 + 2.2	1.3	0.6	0.7	5.3
imazaquine+MSMA *	.43 + 2.2	0.3	2.3	1.3	7.3
check		0.0	0.3	0.0	0.3
LSD .05		0.5	1.5	0.8	1.6

1/ 0 = no injury, 10 = all bermudagrass dead
2/ 0 = no control, 10 = all weeds dead

* Repeated application first on 3/20/87 + second application on 3/31/87

<u>Tolerance of zoysia to selected preemergence herbicides.</u> Cudney,D.W., Clyde Elmore,Victor Gibeault and Stephen Cockerham. A new, superior variety of zoysia has been released by the University of California. Zoysia has not been commonly grown in Southern California. Therefore it is important to evaluate the tolerance of the new zoysia variety to the commonly used preemergence turf herbicides.

Preemergence herbicides were applied on August 4th to a sward of zoysia which had been harvested five weeks previously for sod. The preemergence herbicides were applied using a CO_2 constant pressure backpack sprayer with a spray volume of 280 liters per hectare. The preemergence herbicides included: benefin (3.4 and 6.7 kg ai/ha), bensulide (11.2 and 22.4 kg ai/ha), pendimethalin (2.2 and 4.5 kg ai/ha), prodiamine (2.2 and 4.5 kg ai/ha), oxadiazon (2.2 and 4.5 kg ai/ha), atrazine (1.1 and 2.2 kg ai/ha), benefin plus trifluralin (1.5 plus .75 kg ai/ha), benefin plus oryzalin (1.1 and 1.1 kg ai/ha) and benefin plus oxadiazon (1.1 and 2.2 kg ai/ha). All treatments were replicated four times.

The plots were evaluated on August 12th and August 26th for color (phytotoxicity) and on September 1st root length measurements were made to evaluate the effect of the preemergence herbicides on zoysia root development.

There were no differences among treatments for color ratings for either evaluation date except for the atrazine treatments which showed a significant reduction in color (yellowing) for both evaluation dates. Root growth one month after treatment averaged two centimeters at the fourth node from the shoot apexes in the untreated plots. Oxadiazon and atrazine treatment did not significantly reduce root length. Benefin at the lower rate of application (3.4 kg) resulted in a slight reduction in root length. The high rate of benefin and both rates of bensulide, pendimethalin and prodiamine reduced root length. The combination treatments of benefin plus trifluralin, benefin plus oryzalin, and benefin plus oxadiazon all reduced root length. This study indicates the need to be aware of possible below ground effects of the use of preemergence herbicides which could slow regrowth of sod swards between harvests. (University of California Cooperative Extension, Riverside, CA 92521)

Zoysia preemergence tolerance

Treatment	Rate Kg/ha	Color 8/12/87 1/	Color 8/26/8 1/	Avg. Root 2/ Length (cm) 9/1/87
benefin	3.4	8.0	8.0	1.3
benefin	6.7	8.0	8.0	0.7
bensulide	11.2	8.0	8.0	0.4
bensulide	22.4	8.0	8.0	0.1
pendimethalin	2.2	8.0	8.0	0.2
pendimethalin	4.5	8.0	8.0	0.2
prodiamine	2.2	8.0	8.0	0.2
prodiamine	4.5	7.7	8.0	0.1
oxadiazon	2.2	8.0	8.0	1.8
oxadiazon	4.5	8.0	8.0	1.8
atrazine	1.1	7.0	7.7	1.6
atrazine	2.2	5.2	6.5	1.7
Team[a]	1.5 + .75	8.0	8.0	0.8
XL[b]	1.1 + 1.1	8.0	8.0	0.2
Regalstar[c]	1.1 + 2.2	8.0	8.0	0.8
check		8.0	8.0	2.0
LSD .05		0.5	0.3	0.4

1/ Color of zoysia in the plot as determined by the following scale: 1 = yellow, 9 = dark green.

2/ Avg. length of roots (cm) emerging from the fourth node from the apex of ten randomly selected stolens per plot.

a benefin + trifluralin
b benefin + oryzalin
c benefin + oxadiazon

Tolerance of zoysia to selected postemergence herbicides. Cudney,D.W., Clyde Elmore,Victor Gibeault and Stephen Cockerham. A new, superior variety of zoysia (El Torro) has been released by the University of California. Zoysia has not been commonly grown in Southern California. Therefore it is important to evaluate the tolerance of the new zoysia variety to the commonly used postemergence turf herbicides.

Postemergence herbicides were applied on August 4th to a sward of zoysia which had been established for approximately one year. The postemergence herbicides were applied using a CO_2 constant pressure backpack sprayer with a spray volume of 465 liters per hectare. The postemergence herbicides compared included: 2,4-D (1.1 and 2.2 kg ai/ha), dicamba (1.1 and 2.2 kg ai/ha), MSMA (2.2 and 4.5 kg ai/ha), 2,4-d plus MCPP plus dicamba (1.5 + .73 + .12 and 3.0 + 1.5 + .24 kg ai/ha), triclopyr (.56 and 1.12 kg ai/ha), bromoxynil (1.12 and 2.24 kg ai/ha), bentazon (1.12 and 2.24 kg ai/ha), triclopyr plus 2,4-d (.56 plus 1.12 and 1.12 plus 2.24 kg ai/ha), chlorflurenol plus dicamba (.56 plus .56 kg ai/ha), chlorflurenol plus triclopyr (.56 plus .56 kg ai/ha) and imazaquine (.43 kg ai/ha). All treatments were replicated four times.

The treatments were applied on August 28th and evaluated for zoysia phytotoxicity on September 1st and September 10th. The plots were left unmowed for two weeks after treatment so that regrowth measurements (height) could be made (September 10th). Color evaluation was made September 14th. The plots were mowed on September 15th and then left unmowed for four weeks so that an estimate of seedhead suppression could be made. Some zoysia cultivars produce an extensive array of seedheads if left unmowed for more that two weeks during the growing season. It had been noted that some postemergence herbicides could suppress this seed head production. On October 14th seed head counts were made by randomly placing ten centimeter rings within the plots and counting the number of seed heads within each ring. Averages of three counts per plot were taken.

Zoysia phytotoxicity ratings taken four days after treatment showed that the high rates of dicamba, bromoxynil and triclopyr plus 2,4-D were causing significant phytotoxicity. Two weeks after treatment the second pytotoxicity evaluation showed that recovery had taken place and only plots which had received the high rate of MSMA were showing discoloration. No phytotoxicity symptoms were evident in the zoysia three weeks after treatment.

Regrowth measurements taken two weeks after treatment showed that all herbicides and herbicide combinations with the exception of bromoxynil and bentazon tended to produce a temporary reduction in growth. This was particularly evident at the higher rate of application.

There was no significant difference in color 16 days after application. Seed head counts were reduced by some herbicide applications. The 2,4-D, 2,4-D plus MCPP plus dicamba, and triclopyr plus 2,4-D treatments had the lowest seed head counts. Although some significant seed head suppression was evident, it was not enough to be aesthetically effective by preventing seed head formation. (University of California Cooperative Extension, Riverside, CA 92521)

Zoysia postemergence tolerance, U.C. Riverside

Treatment	Rate Kg/ha	Phyto.[5] 9/1/87	Phyto.[5] 9/10/87	Height(cm) 9/10/87	Color 9/14/87	Seed Head Count 10/14/87
2,4-D	1.12	0.5	0.0	3.3	2.5	15.0
2,4-D	2.24	1.2	.2	2.6	2.2	16.0
Dicamba	1.12	1.2	1.2	2.8	2.7	15.5
Dicamba	2.24	3.2	.2	3.3	3.0	20.5
MSMA	2.24	0.6	1.5	2.7	2.0	24.7
MSMA	4.48	2.1	2.0	3.0	2.7	31.5
[1]	1.46 +.73+.12	1.2	.2	3.0	2.7	13.2
[2]	2.92 +1.46+.24	2.2	.3	2.8	2.5	14.5
Triclopyr	0.56	1.0	.7	3.2	2.7	20.2
Triclopyr	1.12	1.3	1.2	3.0	3.7	21.7
Bromoxynil	1.12	2.5	0.0	4.0	3.0	20.0
Bromoxynil	2.24	4.6	0.0	3.7	3.2	21.7
Bentazon	1.12	0.1	0.0	4.1	3.2	25.5
Bentazon	2.24	0.3	0.0	4.0	3.0	22.7
Triclopyr +2,4-D	0.56+1.12	1.2	.6	3.6	3.5	16.2
Triclopyr +2,4-D	1.12+2.24	4.1	1.7	2.8	4.0	14.5
[3]	0.56+0.56	1.3	0.0	3.8	2.0	20.0
[4]	0.56+0.56	1.0	0.0	3.6	2.7	28.5
Imazaquine	0.38	1.0	1.0	3.0	3.0	34.0
Check		0	0	4.0	2.7	32.0
LSD (.05)		0.3	0.6	0.6	ns	12.2

[1] Chlorflurenol + Dicamba
[2] Chlorflurenol + Triclopyr
[3] 2,4-D + MCPP + Dicamba
[4] 2,4-D + MCPP + Dicamba
[5] Phytotoxicity where 0 = No effect and 10 = all zoysia dead

Evaluation of several herbicides for postemergence control of broadleaf weeds in turf. Elmore, C.E. and J.A. Roncoroni. A study was conducted on a Kentucky bluegrass, ryegrass, and creeping bentgrass turf at the Haggin Oaks Country Club in Sacramento, California. Several herbicides were tested for their effectiveness in the control of broadleaf plantain (*Plantago major*), white clover (*Trifolium repens*) and dandelion (*Taraxacum officiale*). The herbicides 2,4-D oil soluble amine (Weedar Emulsamine E-3), chlorflurenol (Breakthru), triclopyr ester (Turflon), triclopyr amine, 2,4-D + MCPP + dicamba (Trimec), dicamba (Banvel), quinclorac (BAS 5140H), and clopyralid (Lontrel) were used alone and in combination.

Herbicides were applied on June 3, 1987, using a CO2 pressurized backpack sprayer, with three 8004 flat fan nozzles delivering 50 gpa of water at 30 psi. Plots 10 ft. by 10 ft. were replicated 4 times in a randomized complete block design. Soil was moist and irrigation was withheld for approximately 40 hours.

Two weed control evaluations were taken, the first on June 19, and the second on July 31, 1987. Phytotoxicity evaluations were taken on June 19. The herbicide treatments showed no significant effect on the turf, with the exception of triclopyr (amine or ester) injurying creeping bentgrass. Dandelion control was evaluated June 19; this weed was not widely distributed within the plot and no conclusive results can be made from this evaluation, but it appears that this weed was not controlled with quinclorac or 0.5 lb/A of chlorflurenol.

The study site was heavily populated with white clover and broadleaf plantain. Early control of white clover was apparent with the combination of triclopyr ester + chlorflurenol, triclopyr ester + clopyralid and chlorflurenol + dicamba. July 31 evaluations showed 90% or better control of white clover by all treatments except, 2,4-D and triclopyr (both amine and ester) alone.

Broadleaf plantain control (greater than 65%) was achieved with 2,4-D + MCPP + dicamba, triclopyr ester + chlorflurenol, triclopyr ester + clopryalid, and to a lesser extend by triclopyr and clopyralid separately on June 19. Better than 85% control of the broadleaf plantain was observed from chlorflurenol plus triclopyr ester, triclopyr ester + clopyralid 0.5 lbs + 0.5 lbs, triclopyr ester + dicamba + chlorflurenol, 2,4-D + mecoprop + dicamba and triclopyr alone on July 31. (University of California, Davis, CA 95616)

BROADLEAF WEEDS

Herbicide	Rate/A (lb)	Ratings 6/19/87				Ratings 7/31/87	
			Weed Control			Weed Control	
		phytotoxicity	White clover	Broadleaf plantain	Dandelion	White clover	Broadleaf plantain
1. 2,4-D oil soluble amine (Weedar Emulsamine E-3)	1.0	1.0	3.2	6.2	9.2	5.7	9.3
2. chlorflurenol (Breakthru)	0.5	1.5	3.0	2.5	2.0	9.0	3.0
3. chlorflurenol	1.0	1.25	4.8	3.3	10.0	9.2	5.5
4. triclopyr ester (Turflon)	0.5	3.8	7.0	6.8	10.0	7.5	8.8
5. triclopyr amine (Garlon)	0.5	3.5	6.2	7.0	10.0	4.3	8.5
6. 2,4-D, MCPP, dicamba (Trimec)	1.01 + 0.54 + 0.1	2.0	6.0	8.5	10.0	9.8	10.0
7. triclopyr ester + chlorflurenol	0.5 + 0.5	3.2	8.8	7.8	10.0	9.8	8.7
8. triclopyr ester + dicamba + chlorflurenol	0.25 + 0.25 + 0.5	2.8	6.8	5.0	10.0	10.0	9.0
9. dicamba (Banvel)	0.25	1.2	7.0	4.5	10.0	9.0	4.6
10. quinclorac (BAS-5140H)	1.5	1.0	7.2	4.0	6.0	10.0	3.8
11. quinclorac	1.0	1.8	4.0	2.0	-	10.0	3.2
12. quinclorac + chlorflurenol	0.5 + 0.5	2.2	6.0	5.0	9.3	10.0	5.0
13. triclopyr ester + clopyralid	0.25 + 0.25	2.2	8.0	4.5	10.0	10.0	6.2
14. triclopyr ester + clopyralid	00.5 + 0.5	2.2	8.8	9.0	10.0	10.0	9.8
15. clopyralid (Lontrel)	0.5	1.2	7.5	6.8	10.0	10.0	7.2
16. chlorflurenol + dicamba	0.25 + 0.25	1.2	8.5	6.2	9.8	10.0	7.6
17. chlorflurenol + triclopyr	0.25 + 0.25	2.5	5.5	4.8	9.5	10.0	8.5
18. control		1.0	1.0	1.0	1.0	2.0	2.8

All ratings averages of 4 replications
Phytotoxicity: 1 = no effect, 10 dead plant.
Weed Control: 1 = no control, 10 = complete control.

Testing chlorsulfuron for prostrate knotweed (*Polygonum aviculare* L.) control along sidewalk edges. Fay, P.K. and E.S. Davis. Prostrate knotweed (POLAV) is an unsightly weed found growing in compacted ground. It is especially troublesome for groundskeepers since it emerges over a long period of time so applications of nonresidual herbicides are ineffective. Chlorsulfuron was applied in late fall to 0.5 by 20 m plots with a single nozzle sprayer in 14 gpa at 40 psi on October 30, 1986. The plots were located in Kentucky blue-grass (*Poa pratensis* L.) sod along sidewalk edges in an area heavily trampled by pedestrians. There were 3 replications per treatment.

Chlorsulfuron provided excellent residual control of prostrate knotweed 9 months after application. There was no injury to Kentucky blue-grass. This treatment will provide residual control of prostrate knotweed and can be applied during a convenient time of the year. (Montana Agric. Exp. Sta., Bozeman, MT 59717.)

Prostrate knotweed control with chlorsulfuron

Chlorsulfuron Rate	Prostrate knotweed control on July 30, 1987[1]	
	Seedlings	Mature Plants
oz ai/A	(%)	
.063	96	83
.125	99	97
.25	100	100

[1] Average of three replications.

Postemergence control of creeping woodsorrel (Oxalis corniculata) in bermudagrass turf. Michelle LeStrange[1] and C.L. Elmore[2]. Creeping woodsorrel (*Oxalis corniculata* L.) is a common perennial broadleaf weed in turfgrass. It spreads rapidly from seed and stems that root at the nodes. It is found growing in turf with a high or low level of maintenance. An established bermudagrass (*Cynodon dactylon*) turf site that was infested with mature creeping woodsorrel at the Tulare Golf Course was selected to evaluate post emergence broadleaf herbicides.

The ester formulation of the herbicide triclopyr was compared to the amine formulation. Triclopyr ester was also evaluated in combination with chlorflurenol or clopyralid. A combination of herbicides, 2,4-D, mecoprop, dicamba and MSMA (Quadmec), and the herbicide quinclorac plus nonphytotoxic oil was also evaluated. The herbicides were applied in 50 gpa water at 30 psi April 21, 1987 to plots arranged in a randomized block design with four replications. Watering was withheld for 48 hours to maximize herbicide uptake.

Weed control was visually evaluated May 22, June 15, August 7 and October 24, 1987, however, since the control was consistent from date to date only May and October are shown. No phytotoxicity was observed.

OXALIS CONTROL IN BERMUDAGRASS TURF

		Creeping woodsorrel control[1]	
Treatments	Rate (lb/A)	5/22/87	10/24/87
triclopyr ester	0.5	9.3	9.0
triclopyr amine	0.5	6.8	8.9
triclopyr amine	0.75	8.6	9.4
triclopyr ester + chlorflurenol	0.25 + 0.25	9.8	10.0
triclopyr ester + chlorflurenol	0.5 + 0.5	9.8	9.8
triclopyr ester + clopyralid	0.25 + 0.25	6.3	7.5
triclopyr ester + clopyralid	0.5 + 0.5	9.9	9.9
2,4-D + mecorop + dicamba + MSMA	0.8 + 0.8 + 0.2 + 3.0	8.9	9.6
quinclorac + BAS 090	2.0 + 0.25%	2.0	5.3
untreated		2.8	5.4

[1] Weed control: 1 = no control; 10 = complete control

LSD .05 treatments		1.2	2.1

(continued)

The triclopyr amine formulation was not as effective at an equivalent rate (0.5 lb/A) as the ester formulation. Triclopyr ester plus chlorflurenol combinations (0.25 + 0.25) or (0.5 + 0.5) gave greater than 95 percent control of creeping woodsorrel. When triclopyr ester was used in combination with clopyralid (0.25 + 0.25) control was inadequate, however at the 0.5 + 0.5 lb/A rates there was almost complete control.

The mixture of 2,4-D, mecoprop, dicamba and MSMA gave excellent control in this study. The combination without MSMA in previous work had not given control, thus it was not included in this study. Quinclorac at 2 lb/A plus nonphytotoxic oil at 0.25% v/v did not give effective creeping woodsorrel control. (University of California, Visalia, CA 93291[1] and University of California, Davis, CA 95616[2])

PROJECT 5.

WEEDS IN AGRONOMIC CROPS

Doug Ryerson - Project Chairman

Evaluation of herbicide treatments in dormant alfalfa. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on December 17, 1986 to evaluate the efficacy of herbicide treatments for weed control in dormant alfalfa (var. Lanhonton). Soil type was a Persayo-Farb silty clay loam with a pH of 7.6 and an organic matter content of less than 1%. Individual plots were 12 by 30 ft in size with four replications arranged in a randomized complete block design. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 30 gal/A at 25 psi.

Visual weed control and crop injury evaluations were made on May 7 and plots harvested for yield June 1, 1987. Downy brome and tansy mustard infestations were heavy throughout the experimental area. Downy brome control was good to excellent with all treatments except norflurazon at 2.0 and 1.0 lb ai/A; tansy mustard control was excellent with all treatments except norflurazon at 1.0 lb ai/A. All treatments resulted in a higher protein content than the untreated check. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Herbicide evaluations in dormant alfalfa, 1987

Treatment	Rate lb ai/A	Crop Injury	-Weed Control[1]-- Dobr	Tamu	Yield[2]	Protein
			--------%--	---------		---%----
hexazinone	0.25	0	100	100	2050	20.9
hexazinone	0.50	0	100	100	2308	20.0
hexazinone	0.75	0	100	100	2235	20.1
metribuzin	0.38	0	100	100	2148	20.7
metribuzin	0.50	0	100	100	2219	20.8
terbacil	0.50	0	100	100	2202	19.8
terbacil	0.75	0	100	100	2130	20.7
terbacil	1.00	0	100	100	1981	21.3
diuron	3.00	0	99	100	2005	20.5
norflurazon	4.00	0	97	100	2172	20.3
metribuzin	0.25	0	95	95	2015	19.7
diuron	2.00	0	93	100	2324	20.9
norflurazon	2.00	0	75	98	2430	15.7
norflurazon	1.00	0	60	80	2258	14.8
check			0	0	2289	12.1

[1]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

[2]Forage yields are expressed on a 20% moisture basis.

Rhizome johnsongrass control in established alfalfa - 1987. Cudney, D. W. and S. Orloff. Rhizome johnsongrass is highly competitive in established alfalfa. Johnsongrass can limit quality, reduce alfalfa stand through competition, and be a serious problem in succeeding rotational crops. A trial was established in the high desert region of southern California to evaluate the effects of selective postemergence grass herbicides (sethoxydim, BAS 517, fluazifop-butyl, and clethodim) for the control of this perennial weed. Treatments were made using a CO_2 constant pressure backpack sprayer. A spray volume of 235 l/ha using TJet 8003 XR flat fan nozzles was used. Plots measured 4.5 by 5 meters and the treatments were replicated four times. The herbicides were applied on July 2nd, following third cutting when the johnsongrass regrowth was 12 to 30 cm in height. All herbicides were applied at .28 kg/ha except for sethoxydim which was applied at .56 kg/ha. A second application was made to all plots on August 15th when the johnsongrass regrowth was 7 to 20 cm in height. It was made at the same rate as the first and at half that rate. Johnsongrass control ratings were made on August 14th (prior to the second application) and on August 27th.

Fluazifop-butyl was rated as the most effective herbicide after the first application. The control improved with all the herbicides after the second application. A reduced rate at the second application tended to reduce control except for sethoxydim, where the control was similar for both application rates. Fluazifop-butyl at the higher use rate was the only herbicide which controlled all the johnsongrass present. It was hoped that acceptable control could still be achieved by reducing the rate of the second application but this was not supported by these data. (University of California Cooperative Extension, Riverside, CA 92521)

Rhizome Johnsongrass control in established alfalfa

Treatment*	Rate	Rating[1/] 8/14	8/27
sethoxydim	.56 + .28	4.8	7.5
	.56 + .56		7.8
BAS 517	.28 + .14	5.5	7.3
	.28 + .28		8.3
fluazifop-butyl	.28 + .14	8.3	8.9
(enantiomer)	.28 + .28		10.0
clethodim	.28 + .14	7.1	6.8
	.28 + .28	0.0	8.6
check	------	0.0	0.0
L.S.D. .05		0.8	1.3

*Surfel added to all treatments at 2.3 l/ha

1/ 0 = No injury, 10 = All weeds dead

Testing herbicides for spotted knapweed (Centaurea maculosa Lam.) control in alfalfa. Fay, P.K. and E.S. Davis. Alfalfa seed growers in several states are having difficulty with spotted knapweed seed contamination of alfalfa seed. Eight herbicides were tested to determine their effectiveness on the weed. The herbicides were applied at the rates shown (Table) on September 29, 1986 in 15 gpa to 7 by 25 foot plots in Gallatin Gateway, MT. Application was made with a CO_2-pressured backback sprayer to a dormant, heavy infestation of spotted knapweed. The plots were visually rates on 5-28, 7-18, and 10-20-87.

Only hexazinone provided significant control of spotted knapweed. The current labeled recommendations for hexazinone on alfalfa permit an application rate as high as 3 lb a.i./A. Further testing of higher rates of hexazinone should be conducted. (Montana Agric. Exp. Sta., Bozeman, MT 59717.)

Effect of 8 herbicides on spotted knapweed control the season after a fall-dormant application.

Herbicide	Rate	5-28-87	7-18-87	10-20-87
	lb/A		%	
metribuzin	0.5	10	13	7
metribuzin	0.75	10	12	7
metribuzin	1.0	18	20	12
hexazinone	0.5	38	35	45
hexazinone	2.0	57	77	62
terbacil	0.5	0	7	0
terbacil	1.0	0	5	0
diuron	1.6	0	7	0
diuron	3.2	0	3	0
atrazine	0.75	0	3	0
simazine	1.0	0	8	0
ethylmetribuzin	1.0	0	10	0
cyanazine	2.5	3	3	0
control	---	0	0	0
LSD .05		0	23	4

Established alfalfa weed control by pyridate. Lass, L., R.H. Callihan. The purpose of this experiment was to evaluate the effects of three rates of pyridate on established alfalfa.

The experiment was established in 7 year-old-alfalfa on April 22, 1987. The soil texture was silt loam. Plots size was 10 by 20 ft, with four replications in a randomized complete block design. The treatment consisted of a single application of pyridate WP (0.0, 0.9, 1.35, 1.8 lb ai/a).

Treatments were applied in 23 gal/a water carrier, with TeeJet 8002 nozzles at 43 psi., from a backpack sprayer operated at 3 MPH. The air temperature was 71 F, soil temperature was 65-55-50 F at depths of 0-3-6 inches respectively, and the RH was 66%. The sky was 50% cloudy and no dew present. Alfalfa was harvested from a 3 by 17 ft area within each plot on May 22, 1987 at 5% bloom which was 30 days after treatment.

Chickweed (Stellaria media (L.) Cyrill, (STEME)) control with pyridate was not visible 8 days after spraying, but was controlled 22 days after application by pyridate (85 to 99 % p=0.0001). Shepherd's purse (Capsella bursa-pastoris (L.) Medic., (CAPBP)) was significantly reduced by pyridate (45 to 76 % p = 0.0056).

The alfalfa showed some symptoms of herbicide stress in all of the pyridate treatments. Leaves present that were present at application had chlorotic tips 8 days after application; the symptom remained until cutting. The height of the alfalfa was reduced by 12% in all of the pyridate treatments. Fresh weight and dry weight of pyridate-treated alfalfa was 35% lower than the check at all pyridate rates. The yield reduction was probably a result of control of chickweed and shepherd's purse. Alfalfa moisture content in the pyridate-treated plots was not significantly different from the check.

In summary, alfalfa treated with pyridate controlled chickweed and reduced shepherd's purse populations. The pyridate treatments caused some chlorosis of alfalfa leaves present at application. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Effect of pyridate on established aflalfa.

Parameter		Rate lb ai/a			
		0	0.9	1.35	1.8
1. Weeds					
a. Shepherd Purse (%)[1]					
4/30/1987	(P) = 0.0056	100 a	55 b	42 b	34 b
5/14/1987	(P) = 0.0003	100 a	25 b	34 b	24 b
b. Chickweed (%)[1]					
4/30/1987	(P) = 1.0000	100 a	100 a	100 a	100 a
5/14/1987	(P) = 0.0001	100 a	15 b	2.5 c	0.25 c
2. Alfalfa					
a. Chlorosis (%)[2]					
4/30/1987	(P) = 0.0001	0 a	58 b	62 b	63 b
b. Height (cm)					
5/14/1987	(P) = 0.0221	65.1 a	56.9 b	57.5 b	57.5 b
c. Fresh wt. Tons/A					
5/22/1987	(P) = 0.1121	9.16 a	5.95 ab	5.84 ab	5.28 b
d. Dry wt. Tons/A					
	(P) = 0.0218	2.68 a	1.87 b	1.83 b	1.71 b
e. Moisture (%)					
	(P) = 0.9366	0.31 a	0.317 a	0.32 a	0.33 a

[1]Weed response is reflected as estimated biomass, expressed as a percent of check.
[2]Chlorosis is shown as the estimated percent of leaves showing chlorosis greater than 25% of leaf tip.
[3]Any two means within columns having a common letter are not significantly different at the 5% level of significance, using LSD.

Evaluation of postemergence applications of AC-263,499 in seedling alfalfa. Miller, S.D. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate weed control and alfalfa tolerance with postemergence applications of AC-263,499 alone or in combination with herbicides for grassy weed control. Plots were established under sprinkler irrigation and were 9 by 45 ft in size with three replications arranged in a randomized complete block. Alfalfa (var. Pioneer 526) was planted in a sandy loam soil (73% sand, 18% silt and 9% clay) with 1.6% organic matter and a 7.4 pH May 8, 1987. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi June 16 (air temp 80 F, relative humidity 59%, wind calm, sky partly cloudy and soil temp - 0 inch 78 F, 2 inch 69 F and 4 inch 69 F) to 2 to 4 inch alfalfa and 1 to 4 inch weeds or June 25, 1987 (air temp 82 F, relative humidity 44%, wind NW 2 mph, sky clear and soil temp - 0 inch 84 F, 2 inch 79 F and 4 inch 72 F) to 4 to 6 inch alfalfa and 4 to 8 inch weeds. Visual weed control and crop damage evaluations were made July 14 and plots harvested for yield July 31, 1987. Weed infestations were heavy and uniform throughout the experimental area.

Slight alfalfa injury (less than 5%) was observed with bromoxynil; however, alfalfa stand was not reduced. All herbicide treatments increased alfalfa yield compared to the weedy check and were highest in plots treated with AC-263,499. Weed size at the time of treatment did not greatly influence weed control. Green foxtail (SETVI) control was 90% or greater with all treatments except AC-263,499 at 0.032 lb/A without oil concentrate, bromoxynil and 2,4-DB. Redroot pigweed (AMARE) control was 90% or greater with all treatments except bromoxynil. Common lambsquarters (CHEAL) control was not adequate with any treatment except bromoxynil or 2,4-DB. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1507.)

Postemergence applications of AC-263,499 in seedling alfalfa

Treatment[1]	Rate lb ai/A	Alfalfa[2] injury %	stand red %	yield lb/A	Control[3] AMARE %	CHEAL %	SETVI %
1 to 4 inch weeds							
AC-263,499	0.032	0	0	3228	96	13	84
AC-263,499	0.063	0	0	3515	96	17	93
AC-263,499	0.094	0	0	3402	100	27	92
AC-263,499 + oc	0.032	0	0	3311	98	38	97
AC-263,499 + sethoxydim + oc	0.032 + 0.2	0	0	3383	100	27	93
AC-263,499 + fluazifop + oc	0.032 + 0.3	0	0	3436	100	27	100
AC-263,499 + quizalofop + oc	0.032 + 0.1	0	0	3466	100	43	100
AC-263,499 + haloxyfop + oc	0.032 + 0.1	0	0	3435	100	30	100
AC-263,499 + fenoxaprop + oc	0.032 + 0.2	0	0	3421	100	37	100
bromoxynil	0.25	2	0	2612	63	91	0
2,4-DB	1.0	0	0	3054	90	93	0
4 to 8 inch weeds							
AC-263,499	0.032	0	0	3175	99	10	80
AC-263,499	0.063	0	0	3239	100	0	92
AC-263,499	0.094	0	0	3368	99	33	96
AC-263,499 + oc	0.032	0	0	3183	100	30	93
AC-263,499 + sethoxydim + oc	0.032 + 0.2	0	0	3367	100	23	96
AC-263,499 + fluaziflop + oc	0.032 + 0.3	0	0	3345	100	35	100
AC-263,499 + fluizalofop + oc	0.032 + 0.1	0	0	3285	100	37	99
AC-263,499 + haloxyfop + oc	0.032 + 0.1	0	0	3270	97	23	100
AC-263,499 + fenoxaprop + oc	0.032 + 0.2	0	0	3277	100	25	100
bromoxynil	0.25	3	0	2434	23	99	0
2,4-DB	1.0	0	0	3058	99	100	0
weedy check	---	0	0	2264	0	0	0

[1] Treatments applied June 16 and June 25, 1987; oc = At Plus 411 F at 1 qt/A
[2] Alfalfa injury and stand reduction (red) visually evaluated July 14 and plots harvested July 31, 1987
[3] Weed control visually evaluated July 14, 1987

Wild proso millet and broadleaf weed control in seedling alfalfa. Miller, S.D. A series of postemergence herbicide treatments were applied at Wheatland, WY, to evaluate their efficacy for weed control in newly seeded alfalfa (var. Apollo II). The alfalfa was seeded May 15 and postemergence treatments applied July 2, 1987 (air temp 83 F, relative humidity 34%, wind calm, sky partly cloudy and soil temp - 0 inch 83 F, 2 inch 90 F and 4 inch 85 F) to 6 to 9 inch alfalfa and 12 to 14 inch weeds. Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. The herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi. The soil was classified as loam (54% sand, 30% silt and 16% clay) with 2.1% organic matter and a 7.7 pH. Visual weed control ratings were made July 23 and August 24 and visual crop damage evaluations July 23, 1987. Wild proso millet (PANMI) and common sunflower (HELAN) infestations were heavy and buffalobur (SOLCU) infestations moderate throughout the experimental area.

No crop injury or stand reduction was observed with any treatment. Wild proso millet control was 90% or greater with all treatments except AC-263,499, fenoxaprop and quizalofop alone or in combination and broadleaf weed control 90% or greater with all treatments containing AC-263,499 when evaluated seven weeks after herbicide application. Wild proso millet control with quizalofop and fenoxaprop was 10 to 17% lower and broadleaf weed control with AC-263,499 6 to 18% higher at the seven than three week evaluation. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1506.)

Weed control in seedling alfalfa

Treatment[1]	Rate	Alfalfa[2]		Weed Control[3]					
				3 wk			7 wk		
		injury	stand red	PANMI	HELAN	SOLCU	PANMI	HELAN	SOLCU
	lb ai/A	%	%	%	%	%	%	%	%
sethoxydim + oc	0.2	0	0	90	0	0	92	0	0
sethoxydim + oc	0.3	0	0	94	0	0	93	0	0
BAS-517 + oc	0.15	0	0	98	0	0	94	0	0
quizalofop + oc	0.15	0	0	94	0	0	82	0	0
fenoxaprop + oc	0.3	0	0	94	0	0	77	0	0
AC-263,499 + oc	0.094	0	0	55	85	75	53	93	92
sethoxydim + AC-263,499 + oc	0.3 + 0.094	0	0	94	87	75	93	93	93
BAS-517 + AC-263,499 + oc	0.15 + 0.094	0	0	99	87	78	100	96	92
quizalofop + AC-263,499 + oc	0.15 + 0.094	0	0	82	87	77	70	93	92
fenoxaprop + AC-263,499 + oc	0.3 + 0.094	0	0	80	87	77	70	93	92
weedy check	-----------	0	0	0	0	0	0	0	0

[1] Treatments applied July 2, 1987; oc = At Plus 411 F at 1 qt/A
[2] Alfalfa injury and stand reduction (red) visually evaluated July 23, 1987
[3] Weed control visually evaluated July 23 and August 24, 1987

Evaluation of postemergence herbicide treatments in seedling alfalfa. Miller, S.D. A series of postemergence herbicide treatments were applied at the Torrington Research and Extension Center, Torrington, WY, to evaluate their efficacy for weed control in newly seeded alfalfa (var. Pioneer 526). The alfalfa was seeded May 8 and postemergence treatments applied June 10, 1987 (air temp 82 F, relative humidity 30%, wind W at 7 mph, sky partly cloudy and soil temp - 0 inch 80 F, 2 inch 70 F and 4 inch 70 F) to 2 inch alfalfa and 1 to 3 inch weeds. Plots were 9 by 45 ft with three replications arranged in a randomized complete block. The herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi. The soil was classified as a sandy loam (73% sand, 18% silt and 9% clay) with 1.6% organic matter and a 7.4 pH. Plots were sprinkler irrigated. Visual weed control and crop damage evaluations were made June 24 and plots harvested for yield July 30, 1987. Weed infestations were heavy and uniform throughout the experimental area.

Alfalfa was injured 8 to 18% and stand reduced 3 to 8 % with treatments containing bromoxynil. Alfalfa yields reflected weed control and/or crop injury and were highest in plots treated with AC-263,499. Green foxtail (SETVI) control was 90% or greater with all rates of sethoxydim, BAS-517 and AC-263,499. Common lambsquarters (CHEAL) control was 90% or greater with all rates of bromoxynil and 2,4-DB alone or in combination and with AC-263,499 at rates of 0.063 lb/A or higher. Redroot pigweed (AMARE) control was 90% or greater with all rates of AC-263,499 and 2,4-DB alone or in combination with bromoxynil. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1497.)

Postemergence herbicide evaluation new seeding alfalfa

Treatment[1]	Rate lb ai/A	Alfalfa[2] injury %	Alfalfa[2] stand red %	Alfalfa[2] yield lb/A	Control[3] CHEAL %	Control[3] AMARE %	Control[3] SETVI %
AC-263,499	0.032	0	0	3301	81	100	90
AC-263,499	0.063	0	0	3421	90	100	91
AC-263,499	0.094	0	0	3522	92	100	93
AC-263,499	0.125	5	0	3241	99	100	96
AC-263,499 + oc	0.032	2	0	3259	90	99	91
sethoxydim + oc	0.2	0	0	2347	0	0	97
sethoxydim + oc	0.3	0	0	2346	0	0	99
bromoxynil	0.25	10	3	2821	100	75	0
bromoxynil	0.38	14	5	2771	100	81	0
bromoxynil (ME 4)	0.38	8	5	2835	100	81	0
bromoxynil + 2,4-DB	0.25 + 0.5	12	7	3020	100	99	0
bromoxynil + oc	0.38	18	8	2886	100	95	0
bromoxynil + sethoxydim + oc	0.25 + 0.2	17	5	3006	100	85	94
bromoxynil + sethoxydim + oc	0.38 + 0.2	14	8	3010	100	96	93
BAS-517 + oc	0.05	0	0	2466	0	0	99
BAS-517 + oc	0.1	0	0	2470	0	0	100
BAS-517 + oc	0.15	0	0	2420	0	0	100
2,4-DB	0.5	4	3	3075	97	95	0
weedy check	----	0	0	2319	0	0	0

[1]Treatments applied June 10, 1987; oc = AT Plus 411 F at 1 qt/A
[2]Alfalfa injury and stand reduction (red) visually evaluated June 24 and plots harvested July 30, 1987
[3]Weed control visually evaluated June 24, 1987

Weed control in seedling alfalfa with bromoxynil and pyridate. Morishita, D. W. and M. L. Diamond. A study was established at the Southwest Kansas Branch Experiment Station to evaluate herbicides for weed control in irrigated seedling alfalfa. Alfalfa ('Riley') was planted April 17, 1987, and sprinkler irrigated as needed until emergence. Bromoxynil and pyridate applied alone and in tank mixture with sethoxydim + crop oil were applied May 18 at the 3 to 5 trifoliate stage of alfalfa growth (Table 1). Sequential applications of sethoxydim to selected pyridate treatments were made May 29. The experiment was a randomized complete block design with four replications. Plot size was 10 by 25 ft. Weed control and crop injury evaluations were made June 23 and the alfalfa was harvested June 24.

No herbicide treatment caused significant crop injury (Table 2). All bromoxynil treatments controlled redroot pigweed (AMARE) and punturevine (TRBTE) 86% or better. The tank mixture of bromoxynil + sethoxydim + crop oil effectively controlled barnyard grass (ECHCG). When pyridate was tank mixed with sethoxydim and crop oil, it controlled all three weed species. The highest alfalfa yields were sethoxydim + crop oil applied sequentially to pyridate and the pyridate + sethoxydim + crop oil tank mixture. The weed yield in the untreated check was greater than 6000 lb/A. (Southwest Kansas Branch, Kansas Agric. Exp. Sta., Garden City, Kansas 67846).

Table 1. Application and weather data

Date of application	5/18/87	5/29/87
Alfalfa growth stage	3 to 5 trifoliate	5 to 7 trifoliate
Air temperature (F)	87	56
Soil temperature (F) @ 2 in	80	65
Relative humidity (%)	44	100
Cloud cover (%)	0	0
Wind speed (mph)	4	4

Table 2. Weed control, crop yield, and weed yield in seedling alfalfa 68 days after planting near Garden City, Kansas

Treatment	Rate	Appl date	Crop injury	Weed control[a] AMARE	ECHCG	TRBTE	Crop yield	Weed yield
	(lb/A)		(%)				(lb/A)	
Check	-	-	-	-	-	-	145	6170
Bromoxynil	0.38	5/18[b]	0	89	0	86	1127	1067
Bromoxynil + crop oil	0.38 + 1 qt/A	5/18	0	96	0	90	1448	598
Bromoxynil + sethoxydim + crop oil	0.38 0.20 + 1 qt/A	5/18	4	91	98	88	2155	130
Pyridate	0.90	5/18	0	89	18	48	1715	786
Pyridate + sethoxydim + crop oil	0.68 + 0.20 + 1 qt/A	5/18	1	94	93	69	2411	265
Pyridate + sethoxydim + crop oil	0.90 + 0.20 + 1 qt/A	5/18	0	96	89	85	2325	109
Pyridate / sethoxydim + crop oil	0.45 / 0.20 + 1 qt/A	5/18 5/29[c]	0	90	98	18	2523	747
Pyridate / sethoxydim + crop oil	0.68 / 0.20 + 1 qt/A	5/18 5/29	0	94	98	55	1809	250
Pyridate / sethoxydim + crop oil	0.90 / 0.20 + 1 qt/A	5/18 5/29	0	94	98	53	2153	263
LSD (0.05)			ns	8	18	35	853	1420

[a]Abbreviations are WSSA code numbers from Composite List of Weeds, Weed Sci. 32, Suppl. 2.
[b]5/18=application made at the 2 to 6 trifoliate growth stage.
[c]5/29=sequential sethoxydim application applied on this date.

Weed control in spring-planted alfalfa with postemergence herbicides - 1987. Orloff, S. B. and D. Cudney. Spring-planted alfalfa in the high desert can often become infested with a broad spectrum of both winter and summer annual weeds. The temperature at this time of year can be quite warm (32 degrees C). Little is known regarding the efficacy and crop safety of postemergence herbicides when applied under these conditions in the high desert. A trial was conducted to evaluate the efficacy of several herbicides for the control of lambsquarters, Russian thistle, volunteer wheat, barnyardgrass, and Jim Hill mustard. The plots were treated when the alfalfa reached the 3 to 5 trifoliate leaf stage (April 26). The growth stage of the weeds was as follows: lambsquarters 5 cm tall; Russian thistle 5 to 10 cm tall; volunteer wheat 22 cm tall; barnyardgrass 2 to 4 leaves; and Jim Hill mustard 10 cm in diameter. The plots were treated using a constant pressure CO_2 backpack sprayer at a spray volume of 280 l/ha. The plots were 2 by 7 meters in size with four replicates of each treatment. Weed control evaluations were made at one month intervals (May 6, June 1, and July 2).

Both DPX-M6316 and bromoxynil injured the alfalfa. The alfalfa soon outgrew the injury from bomoxynil. The stunting caused from DPX-M6316 was prolonged. None of the other herbicides caused significant injury. Both the ester and amine formulations of 2,4-DB and combinations including 2,4-DB controlled lambquarters. Bromoxynil at both rates, alone and in combinations, also controlled lambsquarters. Although imazethyapyr severly stunted the lambsquarters, it did not provide complete control. DPX-M6316 did not control lambquarters except when it was combined with sethoxydim and a crop oil concentrate.

Bromoxynil, imazethyapyr, and the combination of DPXM 6316 with sethoxydim and oil were the most effective for the control of Russian thistle. All of the herbicides and herbicide combinations controlled Jim Hill mustard except when sethoxydim was applied alone.

All treatments containing sethoxydim and imazethyapyr controlled volunteer wheat and barnyardgrass. It appeared that the combination of DPX-M6316 plus sethoxydim was inferior to sethoxydim alone or in other combinations for the control of wheat. This suggests a possible antagonistic relationship between sethoxydim and DPX-M6316. Barnyardgrass ratings were complicated by the competitive pressure from other weed species. This is evidenced by the high control rating (6.5) in the untreated check plots. When competitive broadleaf species were controlled in the bromoxynil treated-plots, barnyardgrass control ratings were much lower (0.8).

The most effective herbicide treatment for the broad spectrum of weeds encountered in this trial was the combination of bromoxynil plus sethoxydim. (University of California Cooperative Extension, Riverside, CA 92521)

Weed control in spring planted alfalfa

Treatment	Rate Kg/ha	Crop Injury[1] 5/06	Crop Injury[1] 6/1	Crop Injury[1] 7/02	Lambsquarters[2] 5/06	Lambsquarters[2] 6/1	Lambsquarters[2] 7/02	Russian[2] Thistle 5/06	Russian[2] Thistle 6/1	Jim Hill[2] Mustard 6/1	Volunteer Wheat 6/1	Barnyard-grass 7/02
sethoxydim*	0.34	0.0	0.0	2.0	0.0	0.0	0.3	0.0	0.0	0.0	9.8	10.0
2,4-DB ester	0.56	1.7	0.3	0.0	5.0	10.0	10.0	4.3	5.8	9.8	0.0	1.0
2,4-DB ester	0.84	1.3	0.3	0.0	5.5	10.0	10.0	5.3	8.3	10.0	0.0	0.5
2,4-DB amine	0.84	0.8	0.0	0.0	3.8	9.8	9.8	1.3	3.0	9.8	0.0	3.3
imazethyapyr	1.10	0.6	0.0	0.0	4.8	10.0	10.0	2.5	4.8	10.0	0.0	2.5
bromoxynil	0.11	0.5	0.0	0.5	3.8	7.0	7.8	6.0	8.8	10.0	8.0	10.0
DPXM-6316	0.22	1.3	0.0	0.5	5.0	9.5	8.3	6.3	9.8	10.0	9.5	10.0
	0.56	2.9	0.0	0.5	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.8
	1.10	3.5	0.5	0.3	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.8
	0.018	3.6	1.9	4.0	2.3	3.3	1.3	4.0	4.0	10.0	0.0	5.3
	0.035	4.4	2.3	3.3	3.0	5.8	2.5	5.6	6.8	10.0	0.5	7.0
2,4-DB ester +sethoxydim	.56+.34	2.0	0.5	0.0	4.6	10.0	10.0	5.0	8.3	10.0	10.0	10.0
2,4-DB amine +sethoxydim	.84+.34	2.0	0.3	0.3	5.3	10.0	10.0	4.8	5.9	10.0	9.5	10.0
bromoxynil +sethoxydim	.56+.34	3.3	0.0	0.3	10.0	9.8	9.0	10.0	10.0	10.0	9.5	10.0
DPXM-6316 +sethoxydim	.018+.34	4.8	1.8	0.0	4.0	9.8	9.9	6.3	10.0	10.0	6.6	9.8
check		0.0	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	6.5
LSD .05		0.8	0.9	1.5	0.9	1.0	1.6	1.0	2.5	0.2	1.8	3.1

1/ 0 = no injury, 10 = all plants dead
2/ 0 = no control, 10 = all weeds dead

*Surfel added at 2 pts/A
**X-77 added at .25%

<u>Weed control in fall-planted seedling alfalfa - 1987.</u> Orloff, S. B. and D. Cudney. A trial was established in the high desert region of southern California to evaluate postemergence herbicides (2,4-DB amine and ester, bromoxynil, DPXM 6316, imazethyapyr, imazethyapyr plus 2,4-DB ester combinations and paraquat) in seedling alfalfa. All treatments except paraquat were applied on November 20th to alfalfa at the three trifoliate leaf stage of growth. Paraquat was applied at .28 kg/ha to alfalfa in the five to seven trifloiate leaf stage on December 22nd and .56 kg/ha to alfalfa with 9 trifoliate leaves on February 21st. Herbicide treatments were applied using a constant pressure CO_2 backpack sprayer at a spray volume of 280 l/ha. The plots measured two by seven meters. Weeds were in the seedling stage averaging 8 to 12 cm in size. Treatments were replicated four times.

Crop injury ratings were made on December 16 and January 9. Initial injury was greatest with the 1.1 kg/ha rate of bromoxynil.

2,4-DB ester was superior to twice the rate of the amine formulation for the control of filaree. Other herbicides that were found to be effective for the control of filaree were imazethyapyr at all rates and combinations with 2,4-DB ester, and DPXM 6316 at the higher rate (.07 kg/ha). Filaree was found to be tolerant to bromoxynil applications.

Tansy mustard control was achieved with 2,4-DB, bromoxynil, imazethyapyr, and imazethyapyr plus 2,4-DB combinations. DPXM 6316 and paraquat did not control tansy mustard. A similar trend was observed with Jim Hill mustard and shepherd's purse. Imazethyapyr was slightly less effective on shepherd's purse than the other mustard species. DPXM 6316 controlled 100 percent of the fiddleneck at all three rates tested. 2,4-DB ester, bromoxynil, and the higher rates of imazethyapyr also controlled fiddleneck.

Volunteer barley was not controlled but was severly stunted with imazethyapyr applications. The best volunteer barley control was achieved when paraquat was applied at the 6 trifoliate leaf stage of the alfalfa.

The most effective herbicide treatments for the weed spectrum encountered in this trial were 2,4-DB ester, the higher rates of imazethyapyr, and the combination treatments of 2,4-DB plus imazethyapyr. DPXM 6316 was most effective for fiddleneck control. (University of California Cooperative Extension, Riverside, CA 92521)

Weed control in fall planted seedling alfalfa

Treatment	Rate[1]/ Kg/ha	Crop Injury 12/16	Crop Injury 1/09	Filaree[2]/ 12/16	Filaree 1/09	Filaree 3/19	Tansy[2]/ Mustard 12/16	Tansy Mustard 1/09	Tansy Mustard 3/19	Jim Hill[2]/ Mustard 12/16	Jim Hill Mustard 1/09	Fiddleneck[2]/ 12/16	Fiddleneck 1/09	Fiddleneck 3/19	Shepherds-purse[2]/ 12/16	Shepherds-purse 1/09	Volunteer Barley[2]/ 1/09	Volunteer Barley 3/19
2,4-DB amine	1.10	0.0	0.0	3.8	4.5	8.6	2.5	4.9	4.4	4.8	7.7	0.0	0.0	4.5	4.0	4.0	0.0	0.5
2,4-DB ester	0.56	1.0	0.0	4.3	6.8	10.0	4.5	6.3	9.5	5.0	9.6	2.0	2.0	8.5	4.5	5.0	0.0	0.0
2,4-DB ester	0.84	1.8	0.9	5.5	6.9	10.0	5.3	7.0	10.0	7.8	9.8	1.0	3.0	9.0	4.0	6.0	0.75	1.0
bromoxynil	.56	1.8	.5	3.8	1.5	0.0	9.5	9.3	9.4	9.8	10.0	9.5	10.0	9.8	10.0	10.0	0.0	0.0
bromoxynil	1.1	3.5	1.0	2.3	6.8	0.0	9.9	9.5	9.8	10.0	10.0	10.0	10.0	9.5	10.0	10.0	0.0	0.0
DPXM-6316	.018	0.25	0.0	6.8	6.8	4.3	6.0	4.8	1.8	6.9	5.8	4.0	8.5	10.0	5.0	5.5	0.5	0.0
DPXM-6316	.035	0.25	.25	7.8	7.8	7.5	6.3	5.8	1.8	8.0	7.8	3.5	9.5	10.0	6.0	7.3	0.0	0.0
DPXM-6316	.070	1.4	0.0	7.5	7.9	9.8	7.8	7.3	5.5	8.5	8.1	4.5	9.3	10.0	5.5	8.5	0.0	0.0
imazethyapyr	.07	.25	0.0	7.5	8.6	9.3	8.5	9.8	10.0	7.3	9.5	4.0	8.5	6.5	5.0	7.5	3.5	5.5
imazethyapyr	.14	1.4	.75	8.0	9.0	10.0	9.0	10.3	10.0	8.5	9.3	4.3	9.0	9.0	5.5	8.0	6.0	7.1
imazethyapyr	.28	1.8	2.0	8.8	8.8	10.0	8.9	9.5	10.0	8.8	8.5	4.5	9.3	10.0	6.8	8.0	7.5	8.4
imazethyapyr	.07+.56	1.8	.25	8.5	9.6	10.0	9.0	10.0	10.0	9.3	10.0	4.5	8.8	7.0	6.0	9.0	2.5	4.3
imazethyapyr	.14+.28	1.3	1.0	8.8	9.5	10.0	9.5	9.8	10.0	9.3	10.0	3.5	4.0	10.0	6.2	7.5	3.5	6.6
paraquat 2	.28	---	4.3	---	7.0	6.8	---	6.8	3.3	---	5.8	---	3.5	.5	---	9.0	7.9	9.4
paraquat 2	.56	---	---	---	---	5.5	---	---	8.9	---	---	---	---	2.8	---	---	---	6.5
check	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LSD .05		0.6	0.8	1.8	1.2	1.1	0.8	1.8	2.0	1.3	1.3	1.0	1.9	2.9	2.6	2.2	1.1	1.2

1/ 0 = no injury, 10 = all plants dead
2/ 0 = no control, 10 = all weeds dead

Water-run versus granular trifluralin for the control of dodder in alfalfa - 1987. Orloff, S. B. and D. Cudney. Dodder (*Cuscuta* spp.) is the most serious weed pest in high-desert alfalfa fields. Recent research results have demonstrated that trifluralin granules control dodder. Application costs and the cost of the product could be reduced if the liquid (emulsifiable) formulation of trifluralin could be applied through sprinkler irrigation.

A study was initiated to compare a granular application with sprinkler application of liquid trifluralin. The treatments were made on February 28th. The granules were applied using a Valmar airflow granular applicator. The liquid trifluralin was injected into a center pivot irrigation system. Two rates of application were compared for both application methods (2.2 and 4.4 kg/ha). Three replications of each treatment were made. The number of dodder colonies per plot were determined and the percent control calculated on June 6th, July 17th, and August 18th.

Dodder control throughout the growing season was superior with the granular applications. The length of dodder control was also extended with the granular formulation. The high rate of the granular application (4.4 kg/ha) was the most effective, providing 86 percent control through mid-August. (University of California Cooperative Extension, Riverside, CA 92521)

Water-run vs granular trifluralin for control of dodder in alfalfa

Treatment	Rate Kg/ha	Percent Control 6/05	7/17	8/18
Water-run	2.2	34	42	-0-
Granule	2.2	74	56	52
Water-run	4.5	30	22	15
Granule	4.5	97	92	86
L.S.D. .05		19	24	19

Sequential herbicide treatments for grass and broadleaf weed control in seedling alfalfa - 1987. Orloff, S. B. and D. Cudney. Weed control in seedling alfalfa in the high desert region of southern California often involves the sequential application of two herbicides (pronamide and 2,4-DB) to control both grass and broadleaf species. The necessity of two herbicides increases the cost of seedling alfalfa weed control. A trial was established in a seedling alfalfa field in Barstow to: 1) determine the most effective hebicide(s) for the control of the weeds present, (2) determine if a late application of paraquat could adequately control the broadleaf or grassy weeds missed by an earlier pronamide or 2,4-DB application, and (3) determine if a tank mix of imazethyapyr and pronamide, rather than the standard sequential treatment, would control both grassy and broadleaf weeds.

The trial was established November 22nd in a seedling alfalfa field which was in the three to five trifoliate leaf stage. Shepherd's purse was five to twelve centimeters in diameter at stand density which exceeded 200 plants per square meter. Seven to ten centimeter rescue grass with three to five leaves was also present at a density of greater than 200 plants per square meter. Sowthistle and London rocket were also present but at lower population levels. They were both seven to ten centimeters in diameter.

Treatments were made using a CO_2 constant pressure backpack sprayer. A spray volume of 280 l/ha was applied using TJet 8003 XR flat fan nozzles. Plots were two by six meters in size and the treatments were replicated four times. Pronamide, imazethyapyr, 2,4-DB, and paraquat were applied alone and as sequential treatments. Single applications of DPX-M6316 were also tested. Pronamide and a combination of pronamide plus imazethyapyr were applied on November 22. The plots were then sprinkler irrigated with one-half inch of water. DPX-M6316, 2,4-DB and imazethyapyr alone were applied on December 2nd. Paraquat was applied on February 27th. Alfalfa injury and weed control evaluations were made on December 30th and March 24th.

The 2,4-DB controlled mustard species but did not control rescue grass. Pronamide partially controlled rescue grass but did not control the broadleaf weeds. DPX-M6316 did not control rescue grass and partially controlled the broadleaf species. Imazethyapyr was slow acting, as evident by contrasting the initial and final evaluations. Imazethyapyr at .14 kg/ha did not control rescue grass, but the higher rate (.28 kg/ha) increased control. Shepherd's purse was controlled with both rates of imazethyapyr. Paraquat alone or when used in combination with other herbicides controlled rescue grass. Paraquat alone did not completely control shepherd's purse.

Combination or sequential herbicide treatments were necessary for control of both broadleaf and grassy weeds. The tank mix of pronamide and imazethyapyr, the sequential applications of pronamide plus paraquat, 2,4-DB plus paraquat, and imazethyapyr plus paraquat controlled all weed species. The tank mix of imazethyapyr and pronamide has the advantage of complete weed control in a single application, thus reducing application costs. (University of California Cooperative Extension, Riverside, CA 92521)

Sequential herbicide treatments for grass and broadleaf control in seedling alfalfa

Treatment	Rate Kg/ha	Crop Injury[1] 12/30	Crop Injury[1] 3/24	Rescue Grass[2] 12/30	Rescue Grass[2] 3/24	London[2] Rocket 12/30	Shepherds [2] purse 12/30	Shepherds [2] purse 3/24
pronamide	.84	0.0	0.0	3.8	7.5	.5	.3	0
paraquat	.56	0.0	2.8	0.0	10.0	0	0	8.0
2,4-DB	.84	1.0	0.0	1.0	0.0	6.3	4.3	9.5
imazethyapyr	.14	1.3	1.0	4.9	3.5	7.8	5.8	10.0
imazethyapyr	.28	2.3	1.6	6.0	7.5	8.0	6.5	10.0
pronamide + paraquat	.84+.84	1.5	0.3	4.8	6.3	6.8	4.5	9.5
pronamide + 2,4-DB	.84+.56	0.0	2.0	3.0	10.0	.3	0	9.5
pronamide + imazethyapyr	.84+.14	2.5	1.3	7.8	9.5	9.3	8.5	10.0
2,4-DB + paraquat	.84+.56	1.0	2.3	0.5	10.0	6.3	4.5	9.9
imazethyapyr + paraquat	.14+.56	1.6	2.5	4.0	9.8	7.6	5.9	9.8
DPX-M6316	0.018	2.0	0.0	1.8	1.8	7.0	6.0	6.4
DPX-M6316	0.035	.8	0.0	2.8	1.8	7.3	6.0	6.0
check		0.3	0.0	0.0	0.0	0.0	0.0	0.0
LSD .05		1.2	1.4	1.8	3.3	1.2	1.4	2.7

1/ 0 = no injury, 10 = all plants dead
2/ 0 = no control, 10 = all weeds dead

<u>Dinoseb substitutions for the control of attached dodder - 1987.</u> Orloff, S. B. and D. Cudney. The treatment of isolated dodder patches with dinoseb compounds was the primary method of controlling dodder once it had become attached. The use of this herbicide has been suspended by the Environmental Protection Agency. An alternative method commonly used to control attached dodder is to burn the dodder infested area using a propane-fueled burner. Research has shown that this method is both slower and is more injurious to the alfalfa. A series of trials were conducted during the 1987 growing season to find a contact herbicide that could substitute for dinoseb compounds. A total of four trials were conducted in the high-desert valleys of southern California. The results of these trials were compiled and are presented in the following table.

Treatments were made using a constnat pressure CO_2 backpack sprayer. Treatments were made within 10 days after cutting when the alfalfa had 10 to 18 cm of regrowth in all studies. The areas selected for treatment were heavily infested with dodder.

In the first study (Table 1.) dinoseb controlled 100 percent of the dodder in all four replications. Urea sulfuric acid solution at the highest rate of application (373 l/ha) gave marginal control. All other treatments (paraquat, diquat, ammonium thiosulfate, and bisulfate of soda) failed to control dodder.

In the second study (Table 2.) diesel, paraquat, paraquat plus diesel, and paraquat plus diuron were compared. Only diesel plus paraquat had any significant effect on dodder but this treatment was still unacceptable.

In the third study (Table 3.) dinoseb, paraquat, diquat, oxyfluorfen, urea sulfuric acid, and ammonium thiosulfate solutions were compared. Only dinseb and the higher rates of urea sulfuric acid solution controlled the attached dodder.

In the fourth study (Table 4.) endothall, weed oil, glufosinate-ammonium and dinoseb were compared. Only dinoseb and the higher rate of glufosinate-ammonium controlled dodder.

None of the contact herbicides tested equalled the effectiveness of dinoseb. Glufosinate-ammonium and urea sulfuric acid showed the most promise for replacing dinoseb. (University of California Cooperative Extension, Riverside, CA 92521)

Table 1. Control of attached dodder in alfalfa - Newberry Spgs.

Treatment	Rate/ha[3/]	Dodder Control 6/05
Paraquat[1/]	.56 kg	5.5
Diquat[1/]	.56 kg	6.3
Dinoseb	2.8 kg	10.0
Urea sulfuric acid[2/]	187 l	5.3
	280 l	6.5
	373 l	8.4
Thio-sul[2/]	187 l	3.3
	280 l	4.0
	373 l	6.0
Bisulfate of Soda[2/]	224 kg	3.3
	448 kg	5.3
Check	--	1.5
L.S.D. .05		3.2

1/ .5% X-77 added
2/ 1.0% Surfel added
3/ Spray volume of 560 l/ha

Table 2. Control of attached dodder in alfalfa - Lancaster, CA

Treatment	Rate/ha[1/]	Dodder Control 6/24
Diesel	933 l	5.0
Diesel + Paraquat	933 l + .56 kg	7.3
Paraquat	.56 kg	1.7
Paraquat + Diuron	.56 + .56 kg	1.3
	.56 + 1.1 kg	2.3

1/ Spray volume of 933 l/ha

Table 3. Control of attached dodder in alfalfa - Newberry Spgs.

Treatment[1/]	Rate/ha[2/]	Dodder Control[3/] 6/14	6/23
Dinoseb	2.8 kg	10.0	9.4
Paraquat	.84 kg	2.0	3.0
	1.1 kg	3.8	6.5
	1.7 kg	3.8	4.5
Diquat	1.1 kg	2.8	5.9
Oxyfluorfen	.28 kg	2.5	3.5
	.56 kg	2.5	2.5
	1.1 kg	1.8	2.8
Urea sulfuric acid	280 l 560 l vol	8.1	6.5
	560 l 560	8.9	7.0
	560 l 1120	9.6	9.0
Ammonium thiosulfate	280 l 560	3.8	2.8
	560 l 560	4.0	3.5
	560 l 1120	6.1	4.8
Check		0	.5
L.S.D. .05		2.0	3.0

1/ All treatments except dinoseb received .25% Ag98
2/ Spray volume of 933 l/ha unless otherwise noted
3/ Dodder Control 10 = 100% Control 0 = No Control

Table 4. Control of attached dodder in alfalfa - Lancaster, CA

Treatment	Rate kg ai/ha[3/]	Dodder Control 9/04	9/15
Endothall[1/]	1.1	3.5	3.1
	2.2	6.6	5.8
Weed Oil[2/]	280	2.0	1.0
	560	7.0	5.3
Glufosinate-ammonium	1.1	4.5	3.9
	2.2	8.9	9.3
Dinoseb	2.8	9.8	9.9
L.S.D. .05		1.7	1.5

1/ Surfel added 8.6 l/ha
2/ Ag98 added at 8.6 l/ha
3/ Spray volume of 933 l/ha

Control of volunteer barley in seedling alfalfa - 1987. Orloff, S. B. and D. Cudney. Cereal grains are a common rotational crop in alfalfa production areas. Volunteer cereal plants frequently compete during the year of stand establishment. Propham had been the standard herbicide used for the control of volunteer cereals in seedling alfalfa. However, propham was recently removed from commercial use. Five selective postemergence grass herbicides (DPX-Y6202, fluazifop-butyl, sethoxydim, clethodim, and haloxyfop methyl) were evaluated for control of volunteer barley in fall-planted alfalfa in the high desert of southern California. The alfalfa had 4 to 5 trifoliate leaves at the time of application. The volunteer barley had 3 to 4 tillers and varied from 10 to 20 cm in height. The plots were treated using a constant pressure CO_2 backpack sprayer with a spray volume of 280 l/ha. The plots were evaluated on January 9 and March 19.

The herbicides were slow-acting as is apparent in the first evaluation taken 35 days after application. At that time, none of the herbicides had controlled the barley. However, by March 19 (105 days after application) all of the herbicide treatments except sethoxydim at the low rate (.28 kg/ha) controlled the barley. (University of California Cooperative Extension, Riverside, CA 92521)

Control of volunteer barley in seedling alfalfa

Treatment	Rate Kg/ha	Rating[1/] 1/09	3/19
assure	.14	6.0	10.0
	.28	6.0	10.0
fluazifop-butyl	.14	4.5	10.0
(enantiomer)	.28	4.5	10.0
sethoxydim	.28	4.1	6.3
	.56	6.5	10.0
clethodim	.14	5.3	9.8
	.28	6.1	10.0
haloxyfop-methyl	.14	5.6	10.0
	.28	6.5	10.0
check	-----	1.3	-0-
L.S.D. .05		1.4	0.5

1/ 0 = no control, 10 = all weeds dead

Control of barnyardgrass in seedling alfalfa with postemergence herbicides - 1987. Orloff, S. B. and D. Cudney. Barnyardgrass (Echinochloa crusgali) is a common problem in spring-planted alfalfa. Barnyardgrass that emerges with the alfalfa can compete with it for the entire season. It reduces hay quality and diminishes alfalfa plant population. A trial was established to compare the efficacy of several postemergence grass herbicides and a broad-spectrum herbicide (imazethyapyr) for the control of barnyardgrass. Each of the five herbicides were tested at two rates. Each treatment was replicated four times. Herbicides were applied using a constant pressure CO_2 backpack sprayer with a spray volume of 280 l/ha. The plots were two by seven meters in size. The barnyardgrass was in the four to six leaf growth stage and 5 to 12 cm in height at the time of application (May 8). The alfalfa was in the six to eight trifoliate leaf stage.

The first evaluation was made on May 27th (prior to first cutting). A second evaluation was made on August 27th when the number of seedheads per plot was determined. No injury to the alfalfa was observed with any of the herbicide treatments. All herbicides controlled barnyardgrass at the first rating (5/27) except for the low rate of imazethyapyr. Some of the grasses had recovered by late-season when seedhead counts were made. The greatest recovery occurred in the plots receiving the low rate of imazethyapyr (.11 kg/ha). (University of California Cooperative Extension, Riverside, CA 92521)

Postemergence grass control in seedling alfalfa

Treatment	Kg/ha	Rating[1] 5/27	Seed Heads[2] 8/27
assure*	.11	10.0	0.5
	.22	10.0	1.0
sethoxydim*	.22	10.0	5.5
	.34	10.0	0.0
clethodim*	.11	10.0	0.5
	.22	10.0	1.0
imazethyapyr**	.11	8.3	17.0
	.22	10.0	1.5
fluazifop-butyl*	.11	10.0	1.0
(enantiomer)	.22	10.0	0.0
check	-----	-0-	134.0
L.S.D. .05		0.4	14.6

* Surfel added at 2.3 l/ha
**X-77 added at 25%

1/ 0 = no control, 10 = all weeds dead

2/ seed heads per plot

Post-emergence weed control in seedling alfalfa. Orr, J.P. On February 6, 1987, at Grand Island, Walnut Grove, California, herbicides were applied post-emergence to alfalfa at two to three inches in height, four to five trifoliate. The weed species and stage of growth were: Annual bluegrass seedlings to 5-leaf stage; volunteer wheat, 12-14 inches in height, five-leaf stage; black mustard three to four inches and six to eight inches in diameter; and swinecress, five-leaf stage, two inches in diameter.

The alfalfa was grown on a Columbia loam and flood irrigated. Treatments were applied by a CO_2 backpack sprayer at 30 psi in 30 gal/a water, four replications in a randomized complete block design. A surfactant of 0.25% was added to imazethapyr and two DPXM 6316 treatments.

Imazethapyr at rates of 0.075, 0.10, and 0.125 lbs/a gave good to excellent control of annual bluegrass, volunteer wheat, black mustard, and swinecress. March rating showed the higher rates resulted in slight stand reduction and moderate vigor reduction. The alfalfa outgrew this early injury by July. Bromoxynil gave good to excellent control of black mustard and swinecress, respectively, at a rate of 0.13 lbs ai/a. Pronamide at 1.0 lb ai/a gave excellent control of annual bluegrass and black mustard. (University of California, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

Post-emergence weed control in seedling alfalfa

CHEMICAL & FORMULATION		RATE kg/ha	WEED CONTROL[1] Rating dated March 20: ANNUAL BLUEGRASS	VOL. WHEAT	BLACK MUSTARD	SWINE-CRESS	ALFALFA[1] STAND REDUCTION 3/20	7/24	VIGOR REDUCTION 3/20	7/24
imazethapyr	1.92E	0.05	5.3	4.5	10.0	10.0	0.0	0.0	1.5	0.0
imazethapyr	1.92E	0.075	8.5	8.3	10.0	10.0	0.0	0.0	1.8	0.0
imazethapyr	1.92E	0.10	10.0	9.1	10.0	10.0	3.0	0.0	5.5	0.0
imazethapyr	1.92E	0.125	10.0	9.6	10.0	10.0	1.3	0.0	5.3	0.0
bromoxynil	2E	0.13	0.0	0.0	10.0	8.3	0.0	0.0	0.0	0.0
bromoxynil	4E	0.13	0.0	0.0	10.0	4.5	0.0	0.0	0.0	0.0
pronamide	50W	1.00	9.8	9.0	7.3	0.0	0.0	0.0	0.5	0.0
oxyfluorfen	1.6E	0.10	0.0	0.0	0.0	0.0	4.5	0.0	4.0	0.0
oxyfluorfen	1.6E	0.13	2.5	0.0	7.5	3.0	5.5	0.0	5.8	0.0
DPXM 6316 + surfactant	75DF	0.125	[2]0.0	0.0	5.0	0.0	2.3	0.0	4.5	0.0
DPXM 6316 + surfactant	75DF	0.25	[2]0.0	0.0	10.0	0.0	2.8	0.0	5.5	0.0
DPXM 6316	75DF	0.125	[2]0.0	0.0	5.0	0.0	2.5	0.0	3.0	0.0
DPXM 6316	75DF	0.25	[2]0.0	0.0	10.0	0.0	3.8	0.0	5.5	0.0
Control	----	----	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

[2] All DPXM 6316 treatments stunted.

Post-emergence timing study in established alfalfa. Orr, J.P. On June 9, July 16, August 17, and September 14, 1987, in Elk Grove, California, herbicides were applied post-emergence to alfalfa after the second cutting, in four separate experiments. Treatments were applied in a randomized complete block design, with a CO_2 backpack sprayer, three replications, 30 psi, and 20 gal/a water. Pace oil concentrate was added to sethoxydim 1 qt/a in comparison to BCH 815 1 qt/a. A1166 had the addition of 8 and 12 oz/a surfactant, respectively.

Due to a second germination of yellow foxtail in July, a retreatment to the June 9, 1987, experiment was necessary. A third and fourth experiment were established on August 17 and September 14. In all four trials, sethoxydim + BCH 815 gave better yellow foxtail control than sethoxydim + Pace. Alfalfa tolerance was excellent. A1166 gave poor control, with alfalfa showing excellent tolerance. (University of Califonria Cooperative Extension, Sacramento, County, 4145 Branch Center Road, Sacramento, CA 95827)

Post-emergence timing study in established alfalfa

TABLE 1: June 9, 1987, Application

		WEED CONTROL[1]		ALFALFA[1]		
CHEMICAL & FORMULATION	RATE lb ai/a	YELLOW 7/13	FOXTAIL 8/14	STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
sethoxydim 1.5E	0.20	8.0	7.3	0.0	0.0	0.0
sethoxydim 1.5E	0.30	5.0	6.3	0.0	0.0	0.0
sethoxydim 1.5E	0.40	5.3	5.7	0.0	0.0	0.0
sethoxydim 1.5E	0.50	8.7	8.7	0.0	0.0	0.0
sethoxydim 1.5E	0.20					
+ BCH 815	1QT.	8.5	8.3	0.0	0.0	0.0
sethoxydim 1.5E	0.30					
+ BCH 815	1QT.	6.7	6.2	0.0	0.0	0.0
sethoxydim 1.5E	0.40					
+ BCH 815	1QT.	9.0	8.3	0.0	0.0	0.0
A1166 1.0E	0.06	1.7	3.0	0.0	0.0	0.0
A1166 1.0E	0.09	1.0	1.7	0.0	0.0	0.0
CONTROL ----	----	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

Post-emergence timing study in established alfalfa

TABLE 2: August 17, 1987, Retreatment

CHEMICAL & FORMULATION	RATE lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 9/14	ALFALFA[1] STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
sethoxydim 1.5E	0.20	9.2	0.0	0.0	0.0
sethoxydim 1.5E	0.30	9.5	0.0	0.0	0.0
sethoxydim 1.5E	0.40	9.9	0.0	0.0	0.0
sethoxydim 1.5E	0.50	10.0	0.0	0.0	0.0
sethoxydim 1.5E	0.20				
+ BCH 815	1QT.	9.7	0.0	0.0	0.0
sethoxydim 1.5E	0.30				
+ BCH 815	1QT.	10.0	0.0	0.0	0.0
sethoxydim 1.5E	0.40				
+ BCH 815	1QT.	10.0	0.0	0.0	0.0
A1166	0.06	3.0	0.0	0.0	0.0
A1166	0.09	3.3	0.0	0.0	0.0
CONTROL	0.00	0.0	0.0	0.0	0.0

TABLE 3: July 16, 1987, Application

CHEMICAL & FORMULATION		RATE lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 8/17	9/17	STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
sethoxydim	1.5E	0.20	7.9	7.6	0.0	0.0	0.0
sethoxydim	1.5E	0.30	8.9	8.7	0.0	0.0	0.0
sethoxydim	1.5E	0.40	9.3	9.7	0.0	0.0	0.0
sethoxydim	1.5E	0.50	9.7	10.0	0.0	0.0	0.0
sethoxydim	1.5E	0.20					
+ BCH 815		1QT.	9.0	8.7	0.0	0.0	0.0
sethoxydim	1.5E	0.30					
+ BCH 815		1QT.	9.0	9.2	0.0	0.0	0.0
sethoxydim	1.5E	0.40					
+ BCH 815		1QT.	9.7	9.9	0.0	0.0	0.0
A1166	1.0E	0.06	8.2	8.0	0.0	0.0	0.0
A1166	1.0E	0.09	8.6	7.2	0.0	0.0	0.0
CONTROL	----	----	0.0	0.0	0.0	0.0	0.0

1 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

Post-emergence timing study in established alfalfa

TABLE 4: August 17, 1987, application

CHEMICAL & FORMULATION		RATE lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 9/17	10/19	ALFALFA[1] STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
sethoxydim	1.5E	0.20	8.6	8.0	0.0	0.0	0.0
sethoxydim	1.5E	0.30	9.8	9.2	0.0	0.0	0.0
sethoxydim	1.5E	0.40	9.8	8.7	0.0	0.0	0.0
sethoxydim	1.5E	0.50	9.9	9.0	0.0	0.0	0.0
sethoxydim	1.5E	0.20					
+ BCH 815		1QT.	9.3	10.0	0.0	0.0	0.0
sethoxydim	1.5E	0.30					
+ BCH 815		1QT.	9.6	10.0	0.0	0.0	0.0
sethoxydim	1.5E	0.40					
+ BCH 815		1QT.	9.7	9.9	0.0	0.0	0.0
A1166	1.0E	0.06	7.8	5.0	0.0	0.0	0.0
A1166	1.0E	0.09	7.7	7.3	0.0	0.0	0.0
Control	----	----	0.0	0.0	0.0	0.0	0.0

TABLE 5: September 14, 1987, Application

CHEMICAL & FORMULATION		RATE LBS.A.I. lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 10/19	ALFALFA[1] STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
sethoxydim	1.5E	0.20	6.0	0.0	0.0	0.0
sethoxydim	1.5E	0.30	7.8	0.0	0.0	0.0
sethoxydim	1.5E	0.40	8.2	0.0	0.0	0.0
sethoxydim	1.5E	0.50	9.2	0.0	0.0	0.0
sethoxydim	1.5E	0.20				
+ BCH 815		1QT.	7.5	0.0	0.0	0.0
sethoxydim	1.5E	0.30				
+ BCH 815		1QT.	8.3	0.0	0.0	0.0
sethoxydim	1.5E	0.40				
+ BCH 815		1QT.	9.2	0.0	0.0	0.0
A1166	1.0E	0.06	3.3	0.0	0.0	0.0
A1166	1.0E	0.09	3.7	0.0	0.0	0.0
CONTROL	----	----	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

Post-emergence yellow foxtail control in established alfalfa. Orr, J.P. On June 11, 1987 in Elk Grove, California, herbicides were applied post-emergence to alfalfa after the 2nd cutting. A high population of yellow foxtail was 2 to 3 inches in height. Treatments were applied with a CO_2 backpack srayer at 30 psi and 20 gal/A, except for oxadiazon and prodiamine granulars which were applied with a granular speader. Treatments were replicated 4 times in a randomized complete block design. Pace oil concentrate at the 1 qt/A was added to sethoxydim. Ratings were taken on July 13, August 14, and September 17. Granular applications were flood irrigated.

All treatments, except the combination sethoxydim at 0.2 lbs/A with Urea, gave good to excellent control of yellow foxtail. Control was still good to excellent at the second rating. A second population of yellow foxtail emerged at the time of the third rating. Prodiamine + sethoxydim was the most outstanding treatment through September. There was no stand or vigor reduction or phytotoxicity from any treatment. (University of California, Sacramento County, 4145 Branch Center, Sacramento, CA 95827)

Post-emergence yellow foxtail control in established alfalfa

CHEMICAL & FORMULATION		RATE lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 7/13	8/14	9/17	ALFALFA[1] STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
oxadiazon	2%G	2.00						
+ sethoxydim	1.5E	0.40	9.0	8.9	8.6	0.0	0.0	0.0
oxadiazon	2%G	3.00						
+ sethoxydim	1.5E	0.40	9.9	9.5	8.9	0.0	0.0	0.0
prodiamine	65WP	2.00						
+ sethoxydim	1.5E	0.40	9.9	9.8	9.4	0.0	0.0	0.0
prodiamine	65WP	3.00						
+ sethoxydim	1.5E	0.40	9.9	9.9	9.8	0.0	0.0	0.0
sethoxydim	1.5E	0.20						
+ AmSO4		2.00	9.6	9.6	8.9	0.0	0.0	0.0
sethoxydim	1.5E	0.30						
+ AmSO4		2.00	9.3	8.4	8.9	0.0	0.0	0.0
sethoxydim	1.5E	0.40						
+ AmSO4		2.00	9.3	9.0	8.9	0.0	0.0	0.0
sethoxydim	1.5E	0.20						
+ urea		1GAL	7.0	6.4	6.8	0.0	0.0	0.0
sethoxydim	1.5E	0.30						
+ urea		1GAL	9.1	9.0	7.3	0.0	0.0	0.0
sethoxydim	1.5E	0.40						
+ urea		1GAL	9.3	9.0	8.3	0.0	0.0	0.0
sethoxydim	1.5E	0.20						
+ surphtac		1GAL	9.1	9.0	7.5	0.0	0.0	0.0
sethoxydim	1.5E	0.30						
+ surphtac		1GAL	9.6	9.4	8.1	0.0	0.0	0.0
sethoxydim	1.5E	0.40						
+ surphtac		1GAL	9.6	9.6	9.3	0.0	0.0	0.0
sethoxydim	1.5E	0.20	8.0	7.3	7.6	0.0	0.0	0.0
Control	----	----	0.0	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% Control, crop dead
0 = no weed control, no crop damage

Post-emergence yellow foxtail control in established alfalfa. Orr, J.P. On August 21, 1987 at Elk Grove, California on the Van Stein Ranch, herbicides were applied post-emergence to alfalfa after the 4th cutting. Yellow foxtail was two to three inches in height. Oxadiazon granules were applied on September 17th and are, therefore, rated only on the second rating date. All other treatments were applied with a CO_2 backpack sprayer at 30 psi and 20 gal/a water. Treatments were replicated four times in a randomized complete block design using Pace oil concentrate at the 1 qt/a rate. Ratings were taken on September 17 and October 19. Granular treatments were flood irrigated after application.

All treatments gave good to excellent initial control followed by fair to good control in October. A new population of foxtail was starting to come at the time of the second rating. There was no stand or vigor reduction and no phytotoxicity from any treatment. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

Post-emergence yellow foxtail control in established alfalfa

CHEMICAL & FORMULATION		RATE lb ai/a	WEED CONTROL[1] YELLOW FOXTAIL 9/17	10/19	ALFALFA[1] STAND REDUCTION	VIGOR REDUCTION	PHYTO-TOXICITY
oxadiazon	2%G	2.00					
+ sethoxydim	1.5E	0.40	-	7.9	0.0	0.0	0.0
oxadiazon	2%G	3.00					
+ sethoxydim	1.5E	0.40	-	7.9	0.0	0.0	0.0
prodiamine	65WP	2.00					
prodiamine	65WP	3.00					
+ sethoxydim	1.5E	0.40	9.6	8.5	0.0	0.0	0.0
sethoxydim	1.5E	0.20					
+ AmSO4		2.00	8.9	7.3	0.0	0.0	0.0
sethoxydim	1.5E	0.30					
+ AmSO4		2.00	9.1	8.0	0.0	0.0	0.0
sethoxydim	1.5E	0.40					
+ AmSO4		2.00	9.9	8.9	0.0	0.0	0.0
sethoxydim	1.5E	0.20					
+ urea		1GAL	8.5	7.3	0.0	0.0	0.0
sethoxydim	1.5E	0.30					
+ urea		1GAL	9.5	8.3	0.0	0.0	0.0
sethoxydim	1.5E	0.40					
+ urea		1GAL	9.9	9.0	0.0	0.0	0.0
sethoxydim	1.5E	0.20					
+ surphtac		1GAL	9.0	7.3	0.0	0.0	0.0
sethoxydim	1.5E	0.30					
+ surphtac		1GAL	8.9	8.6	0.0	0.0	0.0
sethoxydim	1.5E	0.40					
+ surphtac		1GAL	9.5	8.3	0.0	0.0	0.0
sethoxydim	1.5E	0.20	8.6	8.0	0.0	0.0	0.0
Control	----	----	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control; crop dead
0 = no weed control; no crop damage

The evaluation of application rates and timing of post emergence grass herbicides in established alfalfa. Stewart, V. R. and Todd K. Keener. Two post emergence grass herbicides were evaluated in an established stand of Apollo alfalfa (*Medicago sativa*) to determine the most effective rate and timing of applications for control of quackgrass (*Agropyron repens*). Plots 10' x 20' were established within three replications in a complete randomized block design. Herbicides were applied using a tractor mounted, research-type sprayer with 8001 nozzles that delivered 11.67 gpa at 32 psi going 2.64 mph. The herbicide sethoxydim was applied post emergence to quackgrass in established alfalfa at various intervals and rates previous to the 1st, 2nd, and 3rd harvest. Fluazifop was applied post emergence to quackgrass and alfalfa, with both applications being prior to first cutting but two weeks apart. Yield samples were obtained from 32 square feet of plot with a Rhem forage plot harvester. Whole plant samples were taken at random from each treatment and separated to determine species composition.

Sequential applications of sethoxydim between cuttings of alfalfa and repeated applications of fluazifop to alfalfa previous to first cutting did not significantly affect yields, Table 1. Quackgrass growth was suppressed by all herbicide treatments, with little growth seen above the alfalfa canopy. Control of quackgrass averaged about 50% in all herbicide treatments when measured May 26, 1987, Table 2. Although shorter and less vigorous a fair percentage of quackgrass did survive in each treatment. Percent alfalfa composition was increased for all sethoxydim and fluazifop treatments. Grass percentages were significantly reduced in the first cutting. In the second and third cutting the percentage of grass fell below 2.2% and herbicide induced differences were negligible or difficult to detect, Table 3. (Montana Agric. Exp. Sta., Kalispell, MT 59901).

Table 1. Data from the post emergence grass herbicide study
1st Cut: 6/8/87 2nd Cut: 7/21/87 3rd Cut: 9/25/87

		Yield Tons/Acre 2/					
		1st Harvest		2nd Harvest		3rd Harvest	
Treatment 1/	lb ai/a	Hay	Alfalfa	Hay	Alfalfa	Hay	Alfalfa
Check	--	2.40	2.18	.89	.81	1.07	1.03
Sethoxydim + C.O.C.	.5 + .5	2.40	2.38	1.08	1.07	1.50	1.47
Sethoxydim + C.O.C.	.4 + .3 + .3	2.40	2.38	1.09	1.08	1.36	1.36
Fluazifop + C.O.C.	.125 + .125	2.24	2.20	.97	.95	1.50	1.48
Fluazifop + C.O.C.	.88 + .125	2.22	2.18	1.16	1.14	1.14	1.12
Overall Mean		2.33	2.26	1.04	1.01	1.31	1.29
F-ratio treatments		.423	.645	.815	1.11	2.72	2.76
CV (SE/Mean)		6.36	5.80	11.7	12.5	9.28	9.48
LSD (0.05)		.484	.429	.397	.415	.398	.401

1/ Sequential treatments represented by multiple rates. Sethoxydim applications were between second and third cuttings timed according to quackgrass growth stage. Fluazifop applications were all previous to the first harvest, 2 weeks between applications.

2/ Yield, Tons/a of dry matter (Hay) or pure alfalfa (Alfalfa)

Application Date	5/4/87	5/19/87	7/7/87	8/13/87
Treatment	1st Treatments	2nd Fluazifop	2nd Sethoxydim	3rd Sethoxydim
Air	60	59	62	75
Soil	63	60	65	63
R.H.%	22	35	25	0
Wind (mph)	0-3	4-6	0-2	0
From the	SW	SW	SSW	--
Sky	Clear	Cloudy	Prtly Cldy	Cldy
Soil: top	Good	Good	Fair	Good
Subsoil	V.Good	V.Good	Fair	Fair
Stage of Growth				
Alfalfa	12"	24"	7"	6"
Quackgrass	12-13"	24-26"	6-8"	5-6"
Dandelion	10-12"	10-12"	--	--
Plantain	8-10"	10-11"	--	--

Table 2. Weed control data from the post emergence grass study
1st Cut: 6/8/87 2nd Cut: 7/21/87 3rd Cut: 9/25/87

		Quackgrass Observations		
Treatment	Rate lb ai/a	Supress.3/ 5/26	Control 5/26	Presence4/ 9/21
Check	--	0.0	0.0	5.5
Sethoxydim + C.O.C. (1.25% v/v)	.5 + .5	100.0a	55.00a	3.3
Sethoxydim + C.O.C.	.4 + .3 + .3	100.0a	68.33a	2.8
Fluazifop + C.O.C. (1% v/v)	.125 + .125	100.0a	58.33a	6.3
Fluazifop + C.O.C.	.88 + .125	100.0a	53.33a	6.6

3/ Suppression of quackgrass instead of control, i.e. quackgrass still alive yet reduced in growth.

4/ Presence of quackgrass rated on scale of 0-10, 0 = no quackgrass, 10 = normal population in test site.

a/ Values significantly greater than the check (0.05 level)

Table 3. Species composition data, post emergence herbicide study
1st Cut: 6/8/87 2nd Cut: 7/21/87 3rd Cut: 9/25/87

		% Species Composition 5/								
		1st Harvest			2nd Harvest			3rd Harvest		
Treatment	lb ai/a	Alf	Grs	Brd	Alf	Grs	Brd	Alf	Grs	Brd
Check	--	91.2	8.8	.01	99.7	.30	.0	97.0	2.1	.20
Sethoxydim + C.O.C.	.5 + .5	98.9	.8b	.20	99.9	.10	.0	97.8	2.2	.01
Sethoxydim + C.O.C.	.4 + .3 + .3	99.3	.5b	.20	100.0	.01	.0	99.8a	0.2	.01
Fluazifop + C.O.C.	.125 + .125	98.6	.8b	.60a	99.9	.10	.0	98.7a	1.2	.04
Fluazifop + C.O.C.	.188 + .125	98.4	1.0b	.30a	98.8	1.20	.0	98.7a	1.3	.00
Overall Mean		97.2	2.38	.26	99.6	.34	.0	98.4	1.3	.05
F-ratio treatments		3.63	3.85	9.0**	.855	.86	.0	4.47*	1.7	2.30
LSD (0.05)		5.85	5.96	.21	1.80	1.8	.0	1.63	1.9	.21

5/ % Species composition determined by hand separation of a 500-1000 gram subsample and percentages determined on a weight basis. Grass species was quackgrass (Agropyron repens AGRRE), broadleaf species: dandelion (Taraxacum officinale TAROF) and common plantain (Plantago major PLAMA).

*,** Statistically significance at the 0.05 or .01 level

a/ Values significantly greater than the check (0.05 level)

b/ Values significnatly less than the check (0.05 level)

Wild oat control in no-till seeded spring barley. Dial, M.J., D.C. Thill, and J.M. Lish. Granular wild oat (AVEFA) herbicides were applied preplant surface (PPS) into standing barley stubble during the fall of 1986 near Soda Springs, Idaho. The herbicides were not incorporated mechanically. The experimental area was seeded to 'Steptoe' spring barley with a Haybuster no-till drill on April 23, 1987. Three experimental wild oat herbicides, along with diclofop and difenzoquat, were applied postemergence (POST) on June 3. The barley was in the three tiller growth stage and the wild oat growth stage ranged from five leaves to one tiller. The granular herbicide treatments were applied with a Gandy spreader calibrated to deliver 102 pounds of granular product per acre at 3 mph. The approppriate active ingredient rate was attained by mixing commercial product with formulation blanks. The spring herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. Plots were 15 by 50 ft and treatments were arranged in a randomized complete block design replicated four times. Wild oat control was estimated visually on July 21. The plots were not harvested because of severe hail damage and lodging. Application data are in Table 1.

Table 1. Application data

Application date	10/29/86	6/3/87
Air temperature (F)	63	55
Soil temperature (F)	52	50
Relative humidity (%)	49	72
Wind speed (mph) - direction	4-S	2-N
Soil pH	5.6	
OM (%)	3.4	
CEC (meq/100 g soil)	18.2	
Texture	loam	

The triallate and triallate + trifluralin granular herbicide treatments controlled the wild oat (Table 2). Imazamethabenz and PP604 at the higher rates, and difenzoquat applied in the spring controlled the wild oat as effectively as the fall applied granular treatments (Table 2). The PP604 25 dispersible granule formulation was difficult to get into solution. FOE3304A at either rate also controlled wild oat effectively. Diclofop, and the lower rate of imazamethabenz did not control wild oat (Table 2). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Wild oat control in no-till spring barley

Treatment[1]	Formulation	Rate	Time of application	AVEFA control
		(lb ai/a)		(%)
check	---	---	---	--
triallate	10 GR	1.25	fall	89
trifluralin	10 GR	0.5	fall	66
triallate +	10 GR	1.25	fall	91
trifluralin	10 GR	0.5		
FOE3340A +	3.34 EC	0.125	spring	89
surfactant		0.25%		
difenzoquat	2 SC	1.0	spring	78
diclofop	3 EC	1.0	spring	33
FOE3340A +	3 EC	0.25	spring	88
surfactant		0.25%		
imazamethabenz	2.5 SC	0.47	spring	80
imazamethabenz	2.5 SC	0.3	spring	24
PP604 +	25% DF	0.25	spring	64
vegcocon		2.0%		
PP604 +	25% DF	0.5	spring	88
vegcocn		2.0%		
Wild oat density (no./ft^2)				34
LSD (0.05)				36

[1]Vegcocn is a vegetable base crop oil concentrate. Surfactant (nonionic) and vegcocn concentrations are expressed as % v/v.

<u>Wild oat and wild buckwheat control in irrigated spring barley in southeast Idaho</u>. Dial, M.J. and D.C. Thill. Wild oat (AVEFA) and broadleaf weed herbicide tank mixtures were tested near Idaho Falls, Idaho. The herbicides were applied to 'Klages' spring barley on May 6 with a CO_2 pressurized backpack sprayer calibrated to deliver 20 gal/a at 42 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design, replicated four times. The treatments were evaluated visually for percent control of wild buck-wheat (POLCO) on July 21 and wild oat on August 7. The plots were harvested with a plot combine on August 7 for grain yield. Application data are in Table 1.

Table 1. Application data

Crop growth stage	2 to 5 leaves
Wild oat growth stage	2 to 5 leaves
Air temperature (F)	80
Soil temperature (F)	92
Relative humidity (%)	55
Wind speed (mph) - direction	4-W
Soil pH	6.4
OM (%)	1.6
CEC (meq/100 g soil)	17.8
Texture	loam

All treatments except diclofop + DPXE8698 effectively controlled wild oat (Table 2). Wild buckwheat control was less than acceptable with diclofop or difenzoquat alone, diclofop + bromoxynil, and difenzoquat + metsulfuron (Table 2). The barley grain yield in all treatments except diclofop + DPXE8698 was greater than the weedy control (Table 2). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Wild oat and broadleaf weed control and spring barley grain yield

Treatment [1]	Rate	Control AVEFA	Control POLCO	Grain yield
	(lb ai/a)	------(%)------		(lb/a)
check	---	---	---	4032
diclofop	1.00	95	5	5328
imazamethabenz +	0.38	98	98	5952
surfactant	0.25%			
difenzoquat	1.00	96	5	5712
diclofop +	1.00	88	21	5184
bromoxynil	0.25			
diclofop +	1.00	76	99	4944
DPXE8698	0.0156			
imazamethabenz +	0.38	99	99	6192
DPXE8698 +	0.0156			
surfactant	0.25%			
difenzoquat +	1.00	99	99	5760
DPXE8698	0.0156			
imazamethabenz +	0.38	99	99	5616
metsulfuron +	0.0039			
surfactant	0.25%			
difenzoquat +	1.00	94	82	5568
metsulfuron +	0.0039			
surfactant	0.25%			
weed density (no./ft^2)		28	15	
LSD (0.05)		14	13	960

[1]Surfactant is nonionic, concentration is expressed as % v/v.

Broadleaf weed control in spring barley in Fremont county. Dial, M.J. and D. C. Thill. Herbicide control of corn spurry (SPRAR), redroot pigweed (AMARE), cone catchfly (SILCD), and Russian knapweed (CENRE) was evaluated in four separate experiments near Ashton, Idaho. Eight herbicide treatments were applied to 'Klages' spring barley at the three tiller growth stage at four locations on May 21, 1987 with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The experimental design was the same at all locations. The treatments were arranged in a randomized complete block design replicated four times. The 10 by 30 ft plots were evaluated visually for weed control on July 21. Two of the experiments were harvested for grain yield with a plot combine on August 26. Application data are listed in Table 1.

Table 1. Application data

Air temperature (F)	74
Soil Temperature (F)	79
Relative humidity (%)	89
Wind speed (mph) - direction	3-W
Weed growth stage	
(SPRAR)	4 to 6 leaves
(AMARE)	3 to 4 leaves
(SILCD)	3 to 5 leaves
(CENRE)	prebloom
Soil pH	5.3
OM (%)	2.4
CEC (meq/100 g soil	13.2
Texture	silt loam

All treatments effectively controlled corn spurry (Table 2). The sulfonylurea herbicides alone and in tank mixtures with 2,4-D LVE and bromoxynil controlled redroot pigweed and cone catchfly. When 2,4-D LVE was applied alone, control of redroot pigweed and cone catchfly was reduced. The herbicide treatments only suppressed the growth of Russian knapweed. The herbicide treatments did not affect grain yield. (Agricultural Research Station, Moscow, Idaho 83843)

Table 2. Broadleaf weed control and spring barley grain yield in Fremont County

Treatment[2]	Rate	Weed control SPRAR 3[3]	SPRAR 4	AMARE 4	SILCD 2	CENRE[1] 1	Grain yield 2	Grain yield 4
	(lb ai/a)	-----------(%)----------					(lb/a)	
check	---	---	---	---	---	---	3900	5000
metsulfuron	0.0039	100	100	100	100	85	3900	5100
DPXL5300	0.0078	100	100	96	100	76	4150	5100
DPXL5300	0.0156	100	100	94	100	78	3900	5050
metsulfuron	0.0039	100	100	98	100	90	4100	4950
DPXL5300 +	0.0078	100	100	96	100	91	3950	5300
2,4-D LVE	0.25							
metsulfuron +	0.0039	100	98	100	100	79	4000	5400
bromoxynil	0.25							
DPXL5300 +	0.0078	100	100	98	100	74	3750	5200
bromoxynil	0.25							
2,4-D LVE	0.75	90	91	88	88	91	3800	4700
weed density (no./ft^2)		50	35	10	10	9		
LSD (0.05)		3	ns	ns	ns	ns	ns	ns

[1]Control rating reflects growth suppression.
[2]All treatmwnts except 2,4-D alone contained a nonionic surfactant at 0.25% v/v.
[3]Number refers to location. All experiments were within a 10 square mile area.

Injury and grain yield of spring barley treated with diclofop and thiameturon. Evans, R.M. and D.C. Thill. Diclofop and thiameturon tank mixes were applied to spring barley (var. Andre) at the 2 to 3 tiller stage to determine herbicide induced crop injury and grain yield reduction. The study was designed as a three (diclofop rates) by four (thiameturon rates) factorial, randomized complete block, replicated four times. The plots were 10 by 30 ft. All herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 20 gal/a at 42 psi and 3 mph. Crop injury was evaluated June 5, 8[1] and 12. The grain was harvested August 1 with a Hege plot combine. The cooperator applied triallate to the entire study area preplant incorporated. Diclofop treatments, with no thiameturon, were tank mixed with bromoxynil EC 4.0 at 0.25 lb ai/a. Weed control was uniformly good over all treatments except the check, which received only triallate. Environmental data are listed in Table 1.

Table 1. Environmental data

Location	Potlatch, Idaho
Date of application	May 20
Stage of growth	2 to 3 tiller
Air temperature (F)	49
Soil temperature (F) 2 in.	59
Relative humidity (%)	88
Wind (mph) direction	5 - E
Soil type	Silt loam
Organic matter (%)	3.2
pH	5.3
CEC (meg/100 g soil)	17.1

All diclofop-containing treatments decreased plant height and caused yellowing on the June 5 evaluation date (Table 2). Diclofop treatments injured barley regardless of thiameturon but at 0.75 lb ai/a rate of diclofop the addition of thiameturon increased the barley injury (Table 2). However, by June 12 the barley treated with thiameturon recovered from injury symptoms, but the barley treated with diclofop continued to show injury (Table 3). Overall, barley grain yield decreased as diclofop rate increased (Table 4). At the two highest rates of thiameturon, grain yield tended to decrease as diclofop rates increased (Table 4). (Idaho Agricultural Experimental Station, Moscow, Idaho 83843)

[1] Data not shown because they were similar to June 5 data.

Table 2. Diclofop and thiameturon injury to spring barley on June 5, 1987

Thiameturon (lb ai/a)	Diclofop (lb ai/a) 0	0.75	1.0	Mean[b]
	------	%	------	
0	0[a]	9	15	8
0.0039	3	6	16	8
0.0117	6	15	20	14
0.0234	5	16	18	13
Mean[c]	4	12	17	

[a]LSD (0.05) = 6 for diclofop by thiameturon
[b]LSD (0.05) = 3 for thiameturon
[c]LSD (0.05) = 2 for diclofop

Table 3. Diclofop and thiameturon injury to spring barley on June 12, 1987

Thiameturon (lb ai/a)	Diclofop (lb ai/a) 0	0.75	1.0	Mean[b]
	------	%	------	
0	0[a]	13	20	11
0.0039	6	19	21	15
0.0117	8	14	26	16
0.0234	10	21	21	17
Mean[c]	6	17	22	

[a]LSD (0.05) = ns for diclofop by thiameturon
[b]LSD (0.05) = ns for thiameturon
[c]LSD (0.05) = 4 for diclofop

Table 4. Grain yield of spring barley treated with diclofop and thiameturon

Thiameturon	Diclofop (lb ai/a) 0	0.75	1.0	Mean[b]
(lb ai/a)	(lb/a)			
0	4246[a]	4669	4213	4376
0.0039	4376	4451	4447	4548
0.0117	4892	4607	4148	4549
0.0234	4806	4434	4294	4511
Mean[c]	4673	4540	4275	

[a] LSD (0.05) = 385 for diclofop by thiameturon
[b] LSD (0.05) = ns for thiameturon
[c] LSD (0.05) = 192 for diclofop

Evaluation of bromoxynil tank mixes for weed control in spring barley. Kidder, D.W. and D.P. Drummond. The herbicide bromoxynil, in combination with DPX-M6316, DPX-L5300 and DPX-R9674, was evaluated for control of redroot pigweed (*Amaranthus retroflexus* L. # AMARE), common lambsquarters (*Chenopodium album* L. # CHEAL) and hairy nightshade (*Solanum sarricoides* Sendt. # SOLSA) in spring barley at the University of Idaho Research and Extension Center, Kimberly, Idaho. Eighteen treatments, including the control, were applied in a randomized complete block design with four replications. Spring barley (Steptoe) was planted on June 9, 1987 at a rate of 100 lb/a and furrow irrigated according to recommended procedures.

Herbicides were applied on July 3 as the early treatment and on July 13 as the late treatment using a CO_2 backpack sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 7.3 feet wide and 30 feet long. Soil was a Portneuf silt loam with a organic matter of 1.5% and a pH of 8. Visual evaluations of percent weed control were made on July 29 and August 17. Harvest yields were taken on September 17. At the first application, redroot pigweed was 1 to 3 inches tall, common lambsquarters was 1 to 2 inches tall and hairy nightshade was 1 inch tall. At the second application, redroot pigweed was 5 to 8 inches tall, common lambsquarters was 3 to 6 inches tall and hairy nightshade was 2 to 4 inches tall. Weed densities for redroot pigweed, common lambsquarters and hairy nightshade were approximately 4,000, 57,000, and 27,000 plants/a, respectively.

The addition of bromoxynil to DPX-M6316 increased hairy nightshade control. Death of 5 to 8 inch redroot pigweed plants with DPX-R9674 was more rapid when bromoxynil was added. Death of 3 to 6 inch common lambsquarters plants with DPX-R9674 and DPX-L5300 was also more rapid with the addition of bromoxynil. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in spring barley

Date of application	7/03/87	7/13/87
Air temperature (F)	70	77
Soil temperature @ surface (F)	80	70
Soil temperature @ 8 cm (F)	70	68
Relative humidity (%)	70	52
Dew present	none	none
Wind (mph)	0	0
Cloud cover (%)	0	0
pH	8	
OM (%)	1.5	
soil texture	silt loam	

Table 2. Bromoxynil tank mixes in spring barley

Treatment	Rate	Time of application[1]	Control: July 29 AMARE[2]	Control: July 29 CHEAL[2]	Control: July 29 SOLSA[2]	Control: August 17 AMARE	Control: August 17 CHEAL	Control: August 17 SOLSA	Grain yield
	(lb a.i./A)		(%)						(lb/A)
Check	...		0	0	0	0	0	0	3021.0
Bromoxynil	0.38	EPOST	87	99	100	85	100	98	3832.6
2,4-D amine	0.50	EPOST	88	96	93	91	94	94	3993.3
DPX-M6316 + Surf.[3]	0.016 + .25% v/v	EPOST	100	97	60	100	98	64	3806.9
DPX-L5300 + Surf.	0.016 + .25% v/v	EPOST	97	99	100	95	94	98	4080.3
DPX-R9674 + Surf.	0.016 + .25% v/v	EPOST	99	96	91	100	99	89	4314.6
Bromoxynil + DPX-M6316 + Surf.	0.25 + 0.016 + .25% v/v	EPOST	100	99	96	100	100	96	4418.0
Bromoxynil + DPX-L5300 + Surf.	0.25 + 0.016 + .25% v/v	EPOST	96	100	100	93	99	97	4365.1
Bromoxynil + DPX-R9674 + Surf.	0.25 + 0.016 + .25% v/v	EPOST	100	100	96	100	99	94	4388.1
Bromoxynil	0.38	LPOST	85	100	100	81	100	100	3820.9
2,4-D amine	0.50	LPOST	89	89	98	90	93	100	4030.8
DPX-M6316 + Surf.	0.016 + .25% v/v	LPOST	96	96	63	99	100	63	3742.1
DPX-L5300 + Surf.	0.016 + .25% v/v	LPOST	91	95	96	92	98	97	3891.7
DPX-R9674 + Surf.	0.016 + .25% v/v	LPOST	92	93	96	96	99	94	3719.1
Bromoxynil + DPX-M6316 + Surf.	0.25 + 0.016 + .25% v/v	LPOST	99	100	100	100	100	99	3606.3
Bromoxynil + DPX-L5300 + Surf.	0.25 + 0.016 + .25% v/v	LPOST	97	99	100	96	100	100	3954.3
Bromoxynil + DPX-R9674 + Surf.	0.25 + 0.016 + .25% v/v	LPOST	99	99	100	99	99	100	3683.7
2,4-D amine + DPX-L5300 + Surf.	0.50 + 0.016 + .25% v/v	LPOST	94	96	99	98	100	100	3659.0
LSD (0.05)			6	3	10	5	3	12	696.3

[1] EPOST applied July 3 when barley was in the 4 leaf stage and broadleaf weeds were 1 to 3 inches tall.
LPOST applied July 13 when barley was in the 6 leaf stage and broadleaf weeds were 2 to 8 inches tall.

[2] AMARE = redroot pigweed
CHEAL = common lambsquarters
SOLSA = hairy nightshade

[3] Surfactant (R-11)

Mayweed chamomile and catchweed bedstraw control in winter barley in northern Idaho. Lish, J.M. and D.C. Thill. Mayweed chamomile (ANTCO) and catchweed bedstraw (GALAP) control was evaluated in 'Boyer' winter barley west of Potlatch, Idaho. Clopyralid combinations were evaluated against 2,4-D and three sulfonylurea herbicides. Herbicides were applied March 30, 1987 except clopyralid + 2,4-D amine + bromoxynil was applied April 2. The experiment was a randomized complete block design with four replications. Treatments were applied with a CO_2 pressurized backpack sprayer at 20 gal/a and 42 psi. Environmental data is in Table 1. ANTCO control was evaluated visually May 18 and June 15, and GALAP control was evaluated June 15. Grain was harvested July 14.

Table 1. Environmental data for ANTCO and GALAP control in winter barley

Date	March 30	April 2
Barley growth stage	5 to 8 tillers	
Air temperature (F)	57	58
Soil temperature at 2 in. (F)	53	60
Relative humidity (%)	61	70
Soil pH	5.3	
CEC	16.7	
Texture	silt loam	

ANTCO control was excellent with all treatments (Table 2). GALAP control tended to be best with sulfonylurea treatments and clopyralid + 2,4-D combined with diuron; however, means were not different statistically due to variability. Grain yield was not different from the check when clopyralid was applied at 0.062 lb ai/a unless metribuzin or diuron was included in the treatments. Grain yield was higher than the check with all other treatments except 2,4-D. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Broadleaf weed control and barley grain yield

Treatment	Rate	ANTCO	GALAP	Grain yield
	(lb ai/a)	(% of check)		(lb/a)
clopyralid + 2,4-D amine	0.09 + 0.5	100	75	4288
XRM-4813	0.61	96	63	4362
clopyralid + MCPA-amine	0.09 + 0.75	100	83	4043
clopyralid + MCPA-Na salt	0.09 + 0.75	100	88	4018
clopyralid + 2,4-D amine	0.06 + 0.375	98	61	3799
clopyralid + 2,4-D amine + metribuzin	0.06 + 0.38 + 0.16	100	74	4057
clopyralid + 2,4-D amine + diuron	0.06 + 0.38 + 0.5	100	98	4288
clopyralid + 2,4-D amine + terbutryn	0.06 + 0.38 + 0.5	100	73	3436
clopyralid + 2,4-D amine + bromoxynil	0.06 + 0.5 + 0.25	99	75	3827
clopyralid + 2,4-D amine + difenzoquat	0.06 + 0.5 + 1	98	58	3923
DPXL5300[1]	0.0234	100	100	4621
DPXM6316[1]	0.0234	96	91	4109
DPXR9674[1]	0.0234	99	94	4026
2,4-D amine	0.75	93	71	3515
check	---	-	-	3098
	LSD (0.05)	4	ns	705

[1]Applied with R11 nonionic surfactant at 0.25% v/v

Effect of ethephon-bromoxynil and ethephon-DPXR9674 on spring barley yield. Lish, J.M. and D.C. Thill. An experiment was established in 1987 to investigate possible antagonism of ethephon and DPXR9674 when applied to spring barley. 'Steptoe' spring barley was planted May 8 on the University of Idaho Plant Science farm. DPXR9674 and bromoxynil were applied on June 9, and ethephon was applied on June 24 with a CO_2 pressurized backpack sprayer at 42 psi and 20 gal/a. The experiment was a Latin square design and plots were 10 by 30 ft. Environmental data is in Table 1. Grain was harvested August 25.

Table 1. Environmental data for ethephon interaction with DPXR9674 and bromoxynil

Date	June 9	June 24
Barley growth stage	4 to 5 leaf	late boot
Air temperature (F)	52	75
Soil temperature at 2 in. (F)	62	77
Relative humidity (%)	98	59
Cloud cover (%)	70	20
Soil pH	4.8	
CEC (meq/100 g)	19.1	
OM (%)	3.7	
Texture	clay	

Ethephon did not affect barley grain yield or test weight (Table 2). (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Effect of ethephon-DPXR9674 and ethephon-bromoxynil on barley grain yield and test weight

Treatment	Rate	Grain yield	Test weight
	(lb ai/a)	(lb/a)	(lb/bu)
DPXR9674	0.0234	3298	45.1
Bromoxynil	0.25	3404	44.9
DPXR9674 + ethephon	0.0234 + 0.38	3103	45.3
Bromoxynil + ethephon	0.25 + 0.38	3311	44.8
	F(0.05)	NS	NS

Wild oat control with PP604 plus vegetable crop oil. Mallory, C. A., J. M. Lish and D. C. Thill. A field study was established in Boundary County, Idaho to evaluate wild oat (AVEFA) control by PP604 plus vegetable based crop oil concentrate (veg COC). Diclofop, difenzoquat and imazamethabenz were included for comparison. Herbicides were applied with a CO_2 backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The experimental design was a randomized complete block with three replications. In addition, PP604 plus veg COC treatments were analyzed as a three by four factorial to determine the rate effect. Plot size was 10 by 30 ft. PP604 had low solubility and plugged the spray nozzles. Application and edaphic data are in Table 1. All treatments except difenzoquat were applied on May 13. Difenzoquat was applied on May 29 for the appropriate leaf stage of wild oat. Wild oat control was evaluated visually on July 14 and the grain was harvested on August 11.

Table 1. Application and edaphic data

Treatment dates	May 13		May 29
Barley stages	3 lf		1 to 2 tiller
Wild oat leaf stages	1 to 3		3 to 5
Wild oat/ft^2	25		25
Method of application		broadcast	
Air temperature (F)	52		72
Soil temperature (F at 2 in.)	64		64
Relative humidity (%)	72		52
Soil type		silt loam	
Organic matter (%)		3.7	
pH		7.7	
CEC (meq/100 g soil)		14.7	

None of the treatments controlled more than 70% of the wild oat (Table 2). Barley treated with imazamethabenz and PP604 at the 0.5 lb ai/a plus 2% v/v veg COC yielded higher than the control.

Analysis of the factorial arrangement of the PP604 and veg COC treatments showed no difference in yield among any of the treatments (Data not shown). Concentration of veg COC did not effect wild oat control at the PP604 0.125 lb ai/a rate (Table 3). Wild oat control was better with PP604 at 0.25 lb ai/a plus veg COC than PP604 alone. Wild oat control increased as the concentration of veg COC increased at both the 0.25 and 0.5 lb ai/a PP604 rates. (Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83843)

Table 2. Wild oat control and barley yield

Treatment	Rate	AVEFA control	Grain yield
	(lb ai/a)	(% of check)	(lb/a)
check	--	--	1960
PP604 + veg COC[1]	0.125 + 0.0[2]	8	2201
PP604 + veg COC	0.125 + 0.5	13	2010
PP604 + veg COC	0.125 + 1.0	13	2102
PP604 + veg COC	0.125 + 2.0	8	1916
PP604 + veg COC	0.25 + 0.0	3	2072
PP604 + veg COC	0.25 + 0.5	25	1886
PP604 + veg COC	0.25 + 1.0	40	2135
PP604 + veg COC	0.25 + 2.0	58	2270
PP604 + veg COC	0.5 + 0.0	8	1982
PP604 + veg COC	0.5 + 0.5	20	2402
PP604 + veg COC	0.5 + 1.0	45	2186
PP604 + veg COC	0.5 + 2.0	65	2516
diclofop	1.0	45	2245
imazamethabenz[3]	0.38	70	2998
difenzoquat	1.0	60	1946
LSD (0.05)		25	491

[1]Cenex Land O'Lakes vegetable crop oil concentrate
[2]Rates expressed as % v/v
[3]Applied with 0.25% v/v Cenex nonionic surfactant

Table 3. Herbicide by crop oil concentrate interaction

	Herbicide (lb ai/a)[1]			
COC	0.125	0.25	0.5	mean[2]
(% v/v)	--------% control--------			
0	10	3	10	8
0.5	17	33	27	26
1	17	47	57	40
2	7	67	70	48
mean[3]	13	38	41	

[1]LSD (0.05) veg COC by herbicide interaction = 24
[2]LSD (0.05) veg COC = 14
[3]LSD (0.05) PP604 rate = 12

Wild oat control in spring barley. Mallory, C. A., J. M. Lish and D. C. Thill. Efficacy of four experimental wild oat (AVEFA) herbicides was evaluated in spring barley (var. Lud) in a field trial in Boundary County, Idaho. Herbicides were applied with a CO_2 backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The experiment was designed as a randomized complete block with three replications. Plot size was 10 by 30 ft. Application and edaphic data are in Table 1. Wild oat control was evaluated visually July 14 and grain was harvested with a plot combine on August 11.

Table 1. Application and edaphic data

Treatment date	May 19
Barley leaf stage	3
Wild oat leaf stage	1 to 3
Wild oat/ft^2	25
Method of application	broadcast
Air temperature (F)	51
Soil temperature (F at 2 in.)	60
Relative humidity (%)	42
Cloud cover (%)	90
Soil type	silt loam
Organic matter (%)	7.7
pH	3.7
CEC (meq/100 g soil)	14.7

Imazamethabenz controlled 85% of the wild oat (Table 2). No other treatment controlled more than 50% of the wild oat. However, there was a rate response to HOE7125. HOE7125 at the high rate compared to the low rate controlled twice as many wild oat. There was no difference between yield of the check and any treatment (Table 2). (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Wild oat control and barley yield

Treatment	Rate	AVEFA control	Grain yield
	(lb ai/a)	(% of check)	(lb/a)
check	--	--	1712
FOE3440A[1]	0.125	0	1565
FOE3440A	0.25	10	1814
FOE3440A	0.38	10	1436
HOE7125	0.107	25	1574
HOE7125	0.134	50	1799
imazamethabenz	0.38	85	2012
PP604	0.125	3	1731
PP604	0.25	3	1714
PP604	0.5	0	2059
LSD (0.05)		12	456

[1]All treatments except HOE7125 were applied with 0.25% v/v Cenex nonionic surfactant.

Wild oat control with imazamethabenz tank mixes. Mallory, C. A., M. J. Dial, J. M. Lish and D. C. Thill. Two field studies were established to evaluate tank mix interactions of imazamethabenz and broadleaf herbicides and their effect on wild oat control. One study was in Boundary County, Idaho and the other in Bonneville County. Herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 20 gal/a at 40 psi and 3 mph. The experiments were designed as randomized complete blocks with four replications. Plot size was 10 by 30 ft. Application and edaphic data are in Table 1. At the Boundary County site, wild oat control was evaluated visually July 14 and the grain was harvested August 22. Wild oat control was evaluated August 7 and the grain was harvested the same day at the Bonneville County site.

Table 1. Application and edaphic data

	Boundary County	Bonneville County
Application date	May 19	May 5
Barley variety	'Lud'	'Klages'
Barley leaf stage	3	3 to 5
Wild oat leaf stage	2	2 to 5
Wild oat/ft^2	30	25
Method of application	broadcast	broadcast
Air temperature (F)	48	80
Soil temperature (F at 2 in.)	52	92
Relative humidity (%)	70	55
Soil texture	clay loam	loam
Organic matter (%)	4.0	1.6
pH	7.7	6.4
CEC (meq/100 g soil)	13.8	17.8

All herbicide treatments at the Bonneville County site controlled at least 97% of the wild oat and there was no difference in grain yield with any of the herbicide treatments (Data not shown). However, average barley grain yield in the herbicide treated plots was 5540 lb/a and only 4112 lb/a in the untreated control plots. In Boundary County, all treated plots had a higher grain yield than the untreated checks (Table 2).

There was no interaction between imazemethabenz and the sulfonylurea herbicides (Table 3). However, both wild oat control and grain yield were affected adversely when bromoxynil alone or bromoxynil and MCPA were tank mixed with imazamethabenz. Orthoganal contrasts for control among imazamethabenz, sulfonylurea and bromoxynil treatments accounted for 56% of the model for control by these herbicides indicating that there was antagonism. The same comparison for yield accounted for 21% of the model. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Wild oat control and barley yield in Boundary County

Treatment	Rate	AVEFA control	Grain yield
	(lb ai/a)	(% of check)	(lb/a)
check	--	--	677
imazamethabenz[1]	0.38	65	2700
imazamethabenz	0.42	68	3014
imazamethabenz + metsulfuron	0.38 + 0.0039	61	3005
imazamethabenz + metsulfuron	0.42 + 0.0039	71	3130
imazamethabenz + thiameturon	0.38 + 0.0156	58	2996
imazamethabenz + thiameturon	0.42 + 0.0156	75	3271
imazamethabenz + DPXL5300	0.38 + 0.0156	65	2988
imazamethabenz + DPXL5300	0.42 + 0.0156	75	3625
imazamethabenz + DPXR9674	0.38 + 0.0156	60	2707
imazamethabenz + DPXR9674	0.42 + 0.0156	65	2859
imazamethabenz + bromoxynil	0.38 + 0.1875	45	2524
imazamethabenz + bromoxynil	0.38 + 0.25	53	2292
imazamethabenz + bromoxynil	0.42 + 0.1875	58	2541
imazamethabenz + bromoxynil	0.42 + 0.25	50	2611
imazamethabenz + bromoxynil + MCPA	0.38 + 0.1875 + 0.5	45	2569
imazamethabenz + bromoxynil + MCPA	0.38 + 0.25 + 0.5	35	2360
imazamethabenz + bromoxynil + MCPA	0.42 + 0.1875 + 0.5	45	2338
imazamethabenz + bromoxynil + MCPA	0.42 + 0.25 + 0.5	38	2242
imazamethabenz + bromoxynil/MCPA[2]	0.38 + 0.1875	33	2310
imazamethabenz + bromoxynil/MCPA	0.38 + 0.25	43	2335
imazamethabenz + bromoxynil/MCPA	0.38 + 0.38	40	2791
imazamethabenz + bromoxynil/MCPA	0.42 + 0.1875	53	2457
imazamethabenz + bromoxynil/MCPA	0.42 + 0.25	43	2843
imazamethabenz + bromoxynil/MCPA	0.42 + 0.35	40	2395
check	--	--	945
LSD (0.50)	--	15	678

[1] All treatments applied with 0.25% v/v nonionic surfactant
[2] Commercially formulated product

Table 3. Comparisons of herbicide treatments by class

	% Control[1]	Grain yield
		(lb/a)
Imazamethabenz vs sulfonylurea	100/101	2822/3071
Imazamethabenz vs all bromoxynil	100/67**	2822/2489*
Sulfonylurea vs bromoxynil	100/67**	3071/2489**
Bromoxynil vs bromoxynil + MCPA	77/64**	2552/2363
Bromoxynil + MCPA vs bromoxynil/MCPA	62/65	2552/2552

[1] /% control based on control by imazamethabenz alone treatments
* Significant at the 0.05 level
**Significant at the 0.05 level

Weed control in barley. Miller, S.D. and J. Lauer. Research plots were established at the Powell Research and Extension Center, Powell, WY, to evaluate the efficacy of HOE-7125 and HOE-7121 for broad-spectrum weed control in barley. Barley (var. Moravian III) was seeded in a clay loam soil (42% sand, 29% silt and 29% clay) with 1.5% organic matter and a 7.7 pH May 4, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 1 to 4-leaf green foxtail, 2 to 4 inch wild mustard, 4 to 6-leaf wild oat and 5-leaf barley June 3, 1987 (air temp 69 F, relative humidity 24%, wind SE at 6 to 10 mph, sky partly cloudy and soil temp - 0 inch 68 F, 2 inch 66 F and 4 inch 66 F). Plots were established under furrow irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made June 23 and plots harvested August 12, 1987. Wild oats (AVEFA) infestations were light and green foxtail (SETVI) and wild mustard (SINAR) infestations moderate throughout the experimental area.

No injury or stand reduction was observed with any treatment. Barley yields were 7 to 14 bu/A higher in herbicide treated plots compared to the weedy check. Wild mustard control was 90% or greater with all treatments, green foxtail control 90% or greater with HOE-7125 at 0.49 and 0.66 lb/A or HOE-7121 at 0.66 lb/A and wild oat control 85% or greater with HOE-7125 at 0.49 and 0.66 lb/A. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1512.)

Weed control in barley

		Barley[2]			Control[3]		
Treatment[1]	Rate lb ai/A	injury %	stand red %	yield bu/A	SETVI %	AVEFA %	SINAR %
HOE-7125	0.33	0	0	93	83	72	100
HOE-7125	0.49	0	0	96	96	85	100
HOE-7125	0.66	0	0	91	98	88	100
HOE-7121	0.33	0	0	92	70	68	93
HOE-7121	0.49	0	0	92	88	82	100
HOE-7121	0.66	0	0	96	93	83	100
difenzoquat + 2,4-D	0.75 + 0.5	0	0	89	0	53	100
weedy check	----------	0	0	82	0	0	0

[1] Treatments applied June 3, 1987
[2] Barley injury and stand reduction (red) visually evaluated June 23 and plots harvested August 12, 1987
[3] Weed control visually evaluated June 23, 1987

Broadleaf weed control in barley. Miller, S.D. and J. Lauer. Research plots were established at the Powell Research and Extension Center, Powell, WY, to evaluate the efficacy of herbicide treatments for broadleaf weed control in barley. Barley (var. Klages) was seeded in a clay loam soil (42% sand, 29% silt and 29% clay) with 1.5% organic matter and a 7.7 pH April 19, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 1 to 2 inch wild mustard, 0.5 to 1 inch redroot pigweed and 3 to 4-leaf barley May 12, 1987 (air temp 78 F, relative humidity 27%, wind S at 4 to 5 mph, sky clear and soil temp - 0 inch 92 F, 2 inch 70 F and 4 inch 65 F). Plots were established under furrow irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made June 2 and plots harvested August 12, 1987. Wild mustard (SINAR) and redroot pigweed (AMARE) infestations were heavy and uniform throughout the experimental area.

No treatment reduced barley stand; however, dicamba combinations injured barley 5 to 10%. Herbicide treatments increased barley yields 8 to 16 bu/A compared to the weedy check. Wild mustard and redroot pigweed control was excellent with all treatments. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1489.)

Broadleaf weed control in barley

Treatment[1]	Rate lb ai/A	Barley[2] injury %	stand red %	yield bu/A	Control[3] SINAR %	AMARE %
clopyralid + 2,4-D	0.06 + 0.38	0	0	99	98	100
XRM-4813	0.52	0	0	100	99	100
XRM-4813 + DPX-M6316 + s	0.42 + 0.008	0	0	97	100	100
XRM-4813 + DPX-L5300 + s	0.42 + 0.008	0	0	100	100	100
XRM-4813 + DPX-R9674 + s	0.42 + 0.008	0	0	100	100	100
DPX-R9674 + s	0.008	0	0	103	93	100
DPX-R9674 + s	0.016	0	0	99	98	100
bromoxynil	0.5	0	0	103	94	100
bromoxynil + MCPA (pm)	0.25 + 0.25	0	0	105	100	100
bromoxynil + DPX-L5300 + s	0.25 + 0.008	0	0	100	98	100
bromoxynil + clopyralid	0.25 + 0.06	0	0	105	90	100
dicamba + MCPA	0.09 + 0.25	5	0	102	99	100
dicamba + picloram	0.09 + 0.015	10	0	99	90	97
dicamba + clopyralid	0.09 + 0.09	5	0	102	91	95
dicamba + DPX-R9674 + s	0.09 + 0.008	10	0	103	99	100
DPX-L5300 + s	0.016	0	0	100	99	99
DPX-M6316 + s	0.008	0	0	104	90	100
DPX-M6316 + s	0.016	0	0	100	93	100
weedy check	-----	0	0	89	0	0

[1]Treatments applied May 12, 1987; s = X-77 at 0.25% v/v and pm = package mix
[2]Barley injury and stand reduction (red) visually evaluated June 2 and plots harvested August 12, 1987
[3]Weed control visually evaluated June 2, 1987

Weed control with clopyralid combinations in barley. Miller, S.D. and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate broadleaf weed control and barley tolerance with clopyralid in combination with other herbicides. Barley (var. Klages) was seeded in a sandy loam soil (72% sand, 15% silt and 13% clay) with 1.2% organic matter and a 7.5 pH April 11, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 0.5 to 1.5 inch common lambsquarters, 0.5 to 1 inch kochia, emerging hairy nightshade and 3 to 4-leaf barley May 5, 1987 (air temp 65 F, relative humidity 35%, wind NE at 5 mph, sky partly cloudy and soil temp - 0 inch 70 F, 2 inch 62 F and 4 inch 60 F). Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made May 27, plant height measured June 17 and plots harvested July 22, 1987. Kochia (KCHSC) and hairy nightshade (SOLSA) infestations were light and common lambsquarters (CHEAL) infestations moderate throughout the experimental area.

No treatment reduced barley stand; however, clopyralid-dicamba combinations injured barley 7%. Barley yields were 2 to 7 bu/A higher in herbicide treated plots compared to the weedy check. Broad-spectrum weed control was good with all treatments except clopyralid plus 2,4-D, XRM-4813 or MCPA. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1508.)

Broadleaf weed control in barley

Treatment[1]	Rate lb ai/A	Barley[2] injury %	stand red %	height inches	yield bu/A	Control[3] CHEAL %	KCHSC %	SOLSA %
clopyralid + 2,4-D	0.06 + 0.38	0	0	37	83	83	73	93
clopyralid + 2,4-D	0.09 + 0.5	0	0	36	83	90	80	96
XRM-4813	0.42	0	0	36	84	80	65	90
XRM-4813	0.52	0	0	36	82	83	72	93
XRM-4813 + DPX-M6316 + s	0.42 + 0.008	0	0	36	85	95	95	92
XRM-4813 + DPX-L5300 + s	0.42 + 0.008	0	0	36	82	97	97	92
XRM-4813 + DPX-R9674 + s	0.42 + 0.008	0	0	36	82	95	95	91
clopyralid + bromoxynil	0.06 + 0.25	0	0	37	82	88	88	93
clopyralid + DPX-M6316 + s	0.06 + 0.008	0	0	36	82	93	90	92
clopyralid + DPX-L5300 + s	0.06 + 0.008	0	0	37	84	95	92	90
clopyralid + DPX-R9674 + s	0.06 + 0.008	0	0	36	87	93	91	93
clopyralid + dicamba	0.06 + 0.09	7	0	35	82	90	90	95
clopyralid + dicamba	0.125 + 0.09	7	0	35	84	92	92	95
MCPA (es)	0.5	0	0	36	83	78	62	82
MCPA (es)	0.75	0	0	36	82	75	60	80
weedy check	----	0	0	36	80	0	0	0

[1] Treatments applied May 5, 1987; s = X-77 at 0.25% v/v and es = iso-octyl ester

[2] Barley injury and stand reduction (red) visually evaluated May 27, plant height measured June 17 and plots harvested July 22, 1987

[3] Weed control visually evaluated May 27, 1987

Low volume herbicide application for broadleaf weed control in barley. Miller, S.D. and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of several 2,4-D formulations at 5 and 10 gpa for broadleaf weed control in barley. Barley (var. Klages) was seeded in a sandy loam soil (72% sand, 15% silt and 13% clay) with 1.2% organic matter and a 7.5 pH April 11, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 5 gpa at 45 psi or 10 gpa at 40 psi to 2 to 3 inch common lambsquarters, 1 to 2 inch kochia, 0.5 to 1.5 inch hairy nightshade, 1 to 2 inch wild buckwheat and 4 to 5-leaf barley May 11, 1987 (air temp 73 F, relative humidity 39%, wind SE at 6 mph, sky partly cloudy and soil temp - 0 inch 84 F, 2 inch 74 F and 4 inch 74 F). Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made May 27, plant height measured June 17 and plots harvested July 22, 1987. Common lambsquarters (CHEAL) and hairy nightshade (SOLSA) infestations were moderate and kochia (KCHSC) and wild buckwheat (POLCO) infestations light throughout the experimental area.

No injury, stand reduction or plant height reduction was observed with any treatment. Barley yields were 9 to 14 bu/A higher in herbicide treated plots compared to the weedy check. Weed control was similar with EH-736 or 2,4-D and was not influenced by spray volume. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1511 .)

Broadleaf weed control in barley with several 2,4-D formulations

		Barley[2]				Control[3]			
Treatment[1]	Rate lb ai/A	injury %	stand red. %	height inches	yield bu/A	CHEAL %	KCHSC %	SOLSA %	POLLO %
5 gal									
EH-736	0.5	0	0	36	102	93	78	93	33
EH-736	0.75	0	0	36	99	95	77	95	38
2,4-D	0.5	0	0	35	102	90	73	92	27
10 gal									
EH-736	0.5	0	0	36	98	92	75	92	30
EH-736	0.75	0	0	35	100	95	80	93	33
2,4-D	0.5	0	0	36	97	92	78	92	33
weedy check	---	0	0	36	88	0	0	0	0

[1]Treatments applied May 11, 1987; EH-736 = SULV amine and 2,4-D = dimethylamine
[2]Barley injury and stand reduction (red) visually evaluated May 27, plant height measured June 17 and plots harvested July 22, 1987
[3]Weed control visually evaluated May 27, 1987

Broadleaf weed control in barley with sulfonyl urea herbicides. Miller, S.D. and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate weed control and crop tolerance with several sulfonyl urea herbicides. Barley (var. Klages) was seeded in a sandy loam soil (72% sand, 15% silt and 13% clay) with 1.2% organic matter and a 7.5 pH April 11, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 0.5 to 1.5 inch common lambsquarters, 0.5 to 1 inch kochia and 3 to 4-leaf barley May 6, 1987 (air temp 75 F, relative humidity 20%, wind calm, sky clear and soil temp - 0 inch 95 F, 2 inch 74 F and 4 inch 70 F). Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made May 27, plant height measured June 17 and plots harvested July 22, 1987. Kochia (KCHSC) infestations were light and common lambsquarters (CHEAL) infestations moderate throughout the experimental area.

No treatment reduced crop stand; however, DPX-R9674 at rates of 0.016 lb/A or higher caused slight barley injury (10% or less). Barley yields were 9 to 15 bu/A higher in herbicide treated plots than in weedy check plots. Common lambsquarters and kochia control was 85% or greater with all herbicide treatments. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1510.)

Broadleaf weed control in barley

Treatment[1]	Rate lb ai/A	Barley[2] injury %	stand red %	height inches	yield bu/A	Control[3] CHEAL %	KCHSC %
DPX-R9674 + s	0.004	0	0	36	100	88	85
DPX-R9674 + s	0.008	0	0	36	97	90	88
DPX-R9674 + s	0.012	0	0	36	99	93	90
DPX-R9674 + s	0.016	5	0	35	100	95	92
DPX-R9674 + s	0.02	10	0	35	96	93	92
DPX-R9674 + s	0.024	10	0	34	98	95	92
DPX-L5300 + s	0.004	0	0	36	99	87	88
DPX-L5300 + s	0.008	0	0	36	97	92	92
DPX-L5300 + s	0.016	0	0	35	100	92	90
DPX-L5300 + bromoxynil + s	0.004 + 0.06	0	0	36	97	90	90
DPX-L5300 + bromoxynil + s	0.004 + 0.09	0	0	36	98	92	90
DPX-L5300 + bromoxynil + s	0.004 + 0.18	0	0	35	96	93	92
DPX-L5300 + bromoxynil + s	0.008 + 0.06	0	0	36	100	92	92
DPX-L5300 + bromoxynil + s	0.008 + 0.09	0	0	36	102	95	92
DPX-15300 + bromoxynil + s	0.008 + 0.18	0	0	36	99	95	93
weedy check	------------	0	0	36	87	0	0

[1] Treatments applied May 6, 1987 and s = X-77 at 0.25% v/v
[2] Barley injury and stand reduction (red) visually evaluated May 27, plant height measured June 17 and plots harvested July 22, 1987
[3] Weed control visually evaluated May 27, 1987

Broadleaf weed control in barley with postemergence herbicide treatments. Miller, S.D. and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of postemergence herbicide treatments for broadleaf weed control in barley. Barley (var. Klages) was seeded in a sandy loam soil (72% sand, 15% silt and 13% clay) with 1.2% organic matter and a 7.5 pH April 11, 1987. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 0.5 to 1.5 inch common lambsquarters, 0.5 to 1 inch kochia, emerging hairy nightshade and 3 to 4-leaf barley May 6 (air temp 70, relative humidity 29%, wind calm, sky partly cloudy and soil temp - 0 inch 82 F, 2 inch 68 F and 4 inch 64 F) or to 2 to 3 inch common lambsquarters, 1.5 to 2 inch kochia, 1 to 2 inch hairy nightshade and 5 to 6-leaf barley May 18, 1987 (air temp 74 F, relative humidity 24%, wind calm, sky clear and soil temp - 0 inch 86 F, 2 inch 75 F and 4 inch 69 F). Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made June 2, plant height measured June 17 and plots harvested July 22, 1987. Common lambsquarters (CHEAL) and hairy nightshade (SOLSA) infestations were moderate and kochia (KCHSC) infestations light throughout the experimental area.

No stand reduction was observed with any treatment; however, barley was injured 2 to 20% by dicamba treatments and 5 to 12% by F5231 treatments. Barley yields were somewhat variable and did not relate closely to weed control and/or crop injury. Hairy nightshade control was 85% or greater with all treatments except DPX-M6316, DPX-L5300 or DPX-R9674 alone; common lambsquarters control 85% or greater with all treatments except F5231 at 0.063 lb/A; and kochia control 85% or greater with all treatments except 2,4-D at 0.5 lb/A, F5231 at 0.063 and 0.125 lb/A, dicamba-picloram combinations at 0.06 plus 0.015 lb/A or picloram-2,4-D combinations at 0.015 plus 0.38 and 0.023 plus 0.38 lb/A. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1509.)

Broadleaf weed control in barley

Treatment[1]	Rate lb ai/A	Barley[2] injury %	stand red %	height inches	yield bu/A	Control[3] CHEAL %	KCHSC %	SOLSA %
1 to 3-leaf barley								
bromoxynil	0.25	0	0	34	83	88	87	90
bromoxynil	0.38	0	0	34	86	95	93	97
bromoxynil	0.5	0	0	34	83	97	98	100
bromoxynil + MCPA (pm)	0.25 + 0.25	0	0	34	86	97	96	98
dicamba + MCPA	0.06 + 0.385	2	0	33	80	93	87	95
dicamba + MCPA	0.09 + 0.385	5	0	34	82	96	93	98
dicamba + picloram	0.06 + 0.015	3	0	33	83	90	78	93
deicamba + picloram	0.09 + 0.015	10	0	33	80	92	85	99
picloram + 2,4-D	0.015 + 0.385	0	0	34	82	90	77	93
picloram + 2,4-D	0.023 + 0.385	0	0	34	81	92	83	96
DPX-M6316 + s	0.016	0	0	35	82	98	98	0
DPX-L5300 + s	0.016	0	0	35	84	100	98	53
DPX-R9674 + s	0.016	0	0	34	82	97	99	30
bromoxynil + DPX-M6316 + s	0.25 + 0.008	0	0	34	84	93	96	90
bromoxynil + DPX-L5300 + s	0.25 + 0.008	0	0	34	81	95	98	95
bromoxynil + DPX-R9674 + s	0.25 + 0.008	0	0	33	87	93	98	95
dicamba + DPX-M6316 + s	0.09 + 0.008	20	0	30	85	93	93	90
dicamba + DPX-L5300 + s	0.09 + 0.008	8	0	32	87	95	92	93
dicamba + DPX-R9674 + s	0.09 + 0.008	12	0	32	83	96	92	92
F5231 + s	0.063	5	0	34	83	83	72	88
F5231 + s	0.125	10	0	33	81	93	82	92
F5231 + s	0.25	12	0	33	81	96	87	95
F5231 + s	0.5	13	0	33	84	98	93	98
5 to 6-leaf barley								
F5231 + s	0.063	4	0	34	84	75	63	85
F5231 + s	0.125	7	0	34	86	85	75	90
F5231 + s	0.25	10	0	34	82	95	85	92
F5231 + s	0.5	12	0	34	81	96	87	95
2,4-D	0.5	0	0	34	84	90	77	92
DPX-R9674 + s	0.016	0	0	35	85	92	90	0
check	-----	0	0	34	79	0	0	0

[1] Treatments applied May 6 and May 18, 1987; s = X-77 at 0.25% v/v and pm = package mix

[2] Barley injury and stand reduction (red) visually evaluated June 2, plant height measured June 17 and plots harvested July 22, 1987

[3] Weed control visually evaluated June 2, 1987

The combination of chlorsulfuron and metasulfuron with AC 222,293 at various rates to determine an effective rate for broad spectrum weed control. Stewart, V. R. and Todd K. Keener. Combinations of the post emergence herbicides chlorsulfuron, 2-chloro-N-[[(4-methoxy-6-methyl-1, 3, 5- triazin- 2-yl) amino]carbonyl]benzenesulfonamide, and metasulfuron, methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] sufonyl]benzoic acid, with AC 222,293 , +methyl-6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2 yl)-m-toulate, were evaluated for broad spectrum weed control in Lewis spring barley. The barley was seeded in 12 foot drill strips, which were planted parallel to one another and separated by 5 foot cultivated alleys. Plots were 10 x 12 feet and positioned at right angles to the drilled strips in a randomized complete block design. Treatments were replicated four times. Herbicides were applied using a tractor mounted research-type sprayer with 8002 nozzles at 32 psi applying 24.85 gpa. There was a very high natural population of broadleaf weeds and a light population of wild oats (Avena fatua) in the test. Forty-eight square feet was harvested with a Hege combine for yield.

Broadleaf weed control with chlorsulfuron and metasulfuron was very good. Chlorsulfuron and metasulfuron provided excellent control of broadleaf weeds. The high rate of AC 222,293 (.45 lb ai/A) in combination with high rates of chlorsulfuron (.187 oz ai/A) did not give any more effective control of broadleaf weeds and wild oats than the lower rates used in the experiment. Likewise the lower rate combinations of AC 222,293 plus metasulfuron proved as effective as the higher rate. AC 222,293 alone gave poor broadleaf weed control but 83-91% wild oat control. Excellant broadleaf weed control was seen in chlorsulfuron plots whereas metasulfuron alone proved just fair for all broadleaf weed species present. Chlorsulfuron and metasulfuron showed no activity against wild oats.

There was no antagonistic effect noted in weed ratings. It was observed that AC 222,293 wild oat control was less when mixed with metasulfuron, but not significantly less than AC 222,293 alone or in other mixtures. Antagonism was not detected in the yields. Yields were significantly higher in all those treatments combined with AC 222,293. An exception to this was chlorsulfuron applied at the .125 oz ai/A rate. Test weights were significantly higher in all combinations except AC 222,293 plus metasulfuron at the low rate. Where herbicides were evaluated individually barley test weights were lower.

Table 1. Weed control evaluations when chlorsulfuron or metasulfuron is combined with AC 222,293 in spring barley.
Seeded: April 15,1987 Harvested: August 19, 1987

Treatment 1/	Rate lb ai/A	------ Percent Weed Control 6/10/87 ----- 2/ THLAR	PLOCO	LAMAM	CHEAL	AVEFA	HT(IN)
AC222,293+Chlor + Surf.	.38+.008	96.00	86.25	100.0	91.00	87.25	34.4
AC222,293+Chlor + Surf.	.45+.008	65.00	88.75	97.50	96.25	90.50	33.7
AC222,293+Chlor + Surf.	.38+.012	97.50	97.50	100.0	92.50	89.50	33.7
AC222,293+Chlor + Surf.	.45+.012	91.25	98.75	100.0	82.50	85.00	34.2
AC222,293+Meta + Surf.	.38+.004	92.25	75.00	100.0	88.75	83.75	35.1
AC222,293+Meta + Surf.	.45+.004	74.75	80.00	98.75	50.00	83.75	33.7
AC222,293+C.O.C.	.38	48.75	57.50	36.25	22.50	82.50	34.9
AC222,293+C.O.C.	.45	93.75	68.75	47.50	20.00	91.25	36.0
Chlor + Surf.	.008	97.50	92.50	100.0	93.75	.0000	35.5
Chlor + Surf.	.012	90.00	93.75	96.25	92.25	.0000	35.9
Meta + Surf.	.004	52.50	47.50	72.50	62.50	.0000	36.0
Check		.0000	.0000	.0000	.0000	.0000	34.9

1/ Chlor = chlorsulfuron, meta = metasulfuron, C.O.C.= Crop oil concen.
2/ Weed stages at application: Crop: 5 leaf,tillering
THLAR = Fanweed (Thlaspi arvense L.) 4-8 lvs, 1/2" dia
CHEAL = Lambsquarter (Chenopodium album L.) 4-10 lvs, 1 1/2 " tall
POLCO = Wild buckwheat (Polygonum convolvulus L.) 1-2 lvs
LAMAM = Henbit (Lamium amplexicaule L.) 2-6 lvs
AVEFA = Wild oat (Avena fatua L.) 2 1/2- 3 lf

Application: Post Date: 5/11/87 Air temp: 75 F Soil temp: 80 F
Rel. Hum. 20% Wind veloc: 2-5 mph from the SEE
Sky: Clear Soil: Creston silt loam, pH 7.2, OM 4%
Soil moisture: topsoil dry, subsoil - v. good moisture
Seeding depth 1 1/2 to 2 ", seeding rate 60 lbs/A
Previous crop: Spring barley

Table 2. Yield data taken when chlorsulfuron and metasulfuron are combined with AC 222,293 in spring barley.

	Treatment	Rate lb ai/A	YIELD BU/A	TEST WT LBS/BU	% PLUMP
1.	AC222,293+Chlor + Surf.	.38+.008	103.7a	51.50a	94.50
2.	AC222,293+Chlor + Surf.	.45+.008	112.8a	52.05a	94.50
3.	AC222,293+Chlor + Surf.	.38+.012	104.0a	52.42a	95.75
4.	AC222,293+Chlor + Surf.	.45+.012	110.7a	51.88a	94.75
5.	AC222,293+Meta + Surf.	.38+.004	99.3a	50.98	94.00
6.	AC222,293+Meta + Surf.	.45+.004	104.3a	51.58a	95.25
7.	AC222,293+C.O.C.	.38	113.8a	50.35	93.50
8.	AC222,293+C.O.C.	.45	106.8a	52.28a	93.25
9.	Chlor + Surf.	.008	96.2a	50.42	90.00
10.	Chlor + Surf.	.012	84.0	50.70	90.00
11.	Meta + Surf.	.004	76.9	48.75	88.75
12.	Check		70.6	49.58	89.00
		OVERALL MEAN	98.57	51.04	92.52
		F VALUE 1/	3.781**	3.137**	2.076NS
		C.V. %	7.388	1.249	1.842
		L.S.D.	20.95	1.834	4.902

1/ F value for variety comparison
a/ Values significantly greater than the check at the .05 level.
** Indicates values significantly different at the .01 level

Surfactant used in treatments was R-11: .25% v/v with Chlorsulfuron, label rate with AC 222,293 (For each gallon in excess of 10 gpa, add 6/10 fluid ounces of a non ionic surfactant).

Preplant incorporated herbicide evaluations in pinto beans. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on May 13, 1987 at the Agricultural Science Center to evaluate efficacy of individual and/or herbicide combinations applied preplant incorporated in pinto beans (var. UI-114). Soil type was a Kinnear very fine sandy loam with a pH of 7.9 and an organic matter content of less than 1%. Individual plots were 12 by 30 ft in size with four replications arranged in a randomized complete block design. Herbicides were applied with a CO_2 backpack sprayer calibrated to deliver 30 gal/A at 25 psi. Treatments were immediately incorporated using a tractor driven disc and spike-tooth harrow to a depth of 2 to 4 in. Pinto beans were planted on 34 in beds at a rate of 60 lb/A on May 14. Rows of Russian thistle, kochia and prostrate pigweed were planted between each row at 1.0 lb/A using a cone seeder. Pinto beans were harvested for yield September 11, 1987.

Visual evaluations of crop injury and weed control were made July 10, 1987. All treatments provided excellent to good control of all weed species. Trifluralin applied at 2.0 lb ai/A was the only treatment to cause substantial crop injury. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Broadleaf evaluations in pinto beans, 1987.

Treatment	Rate lb ai/A	Crop Injury[1]	Weed Control[1] Prpw	Kocz	Ruth	Yield lb/A
			------------%	-----------	-----------	
ethalfluralin	0.75	0	100	93	87	2400
ethalfluralin	2.0	10	100	100	97	1998
trifluralin	1.0	0	100	98	95	2267
trufluralin	2.0	40	100	100	100	1191
ethalfluralin + EPTC R-33865	0.75 + 3.0	0	100	94	93	2190
ethalfluralin + EPTC R-33865	1.5 + 3.0	0	100	100	96	2229
trifluralin + EPTC R-33865	0.75 + 3.0	0	100	95	94	2498
trifluralin + EPTC R-33865	1.5 + 3.0	3	100	100	97	2037
ethalfluralin + metolachlor	1.5 + 2.0	0	100	96	95	2344
trifluralin + metolachlor	1.5 + 2.0	3	100	100	98	1960
check		0	0	0	0	884
handweeded check		0	100	100	100	2267

[1]Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

Evaluation of preplant incorporated herbicides in dry bean. Kidder, D.W. and D.P. Drummond. Preplant incorporated herbicides were evaluated for control of redroot pigweed (*Amaranthus retroflexus* L. # AMARE), common lambsquarters (*Chenopodium album* L. # CHEAL), common mallow (*Malva neglecta* Wallr. # MALNE), hairy nightshade (*Solanum sarricoides* Sendt. # SOLSA) and green foxtail (*Setaria viridis* (L.) Beauv. # SETVI) in dry bean at the University of Idaho Research and Extension Center, Kimberly, Idaho. Eighteen treatments, including the control, were applied in a randomized complete block design with four replications. Dry bean (Viva pink) was planted on June 5, 1987 at a population of 95,000 seeds/a and furrow irrigated according to recommended procedures.

Herbicides were applied on June 4 as preplant incorporated treatments using a CO_2 backpack sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatments were incorporated 2 to 4 inches using a roller harrow in two directions at right angles immediately after application. Treatment plots were cultivated on July 30 after the first evaluation. Treatment plots were 10 feet wide and 30 feet long. Soil was a Portneuf silt loam with organic matter of 1.5% and a pH of 8. Visual evaluations of percent weed control were made on July 28 and August 17. Weed densities for redroot pigweed, common lambsquarters, common mallow, hairy nightshade and green foxtail were 10,000, 6,000, 6,000, 4,000, and 44,000 plants/a respectively.

Weed control results for preplant incorporated herbicides in dry bean are given in Table 2. Dry bean injury was not evident in any of the treatments. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in dry bean

Date of application	6/04/87
Air temperature (F)	88
Soil temperature @ surface (F)	100
Soil temperature @ 8 cm (F)	75
Relative humidity (%)	48
Dew present	none
Wind (mph)	6
Cloud cover (%)	20
pH	8
OM (%)	1.5
soil texture	silt loam

Table 2. Preplant incorporated herbicides in dry bean

Treatment[1]	Rate	Control							
		July 28					August 17		
		AMARE[2]	CHEAL[2]	MALNE[2]	SETVI[2]	SOLSA[2]	AMARE	CHEAL	SOLSA
	(lb a.i./A)	(%)							
Check	...	0	0	0	0	0	0	0	0
Alachlor	2.50	100	98	100	63	94	96	91	94
Metolachlor	2.00	78	84	98	59	93	92	81	95
EPTC	3.00	86	88	100	92	100	58	59	89
Trifluralin	0.63	100	85	68	44	88	100	99	99
Ethalfluralin	1.30	100	100	100	81	100	100	100	100
Pendimethalin	0.75	100	100	51	64	89	98	100	95
Chloramben	2.00	18	28	28	28	52	5	0	43
DCPA	6.00	83	90	71	56	87	82	92	97
Imazaquin	0.124	95	93	90	86	49	88	72	24
EPTC + Alachlor	2.00 + 2.00	100	100	100	98	100	100	96	91
EPTC + Metolachlor	3.00 + 1.50	100	100	100	91	96	73	68	75
EPTC + Trifluralin	2.00 + 0.75	100	100	100	99	98	100	100	100
EPTC + Ethalfluralin	3.00 + 1.00	100	100	100	100	100	96	100	93
EPTC + Pendimethalin	2.20 + 0.75	100	100	100	100	99	100	100	100
Trifluralin + Alachlor	0.50 + 2.50	100	100	100	93	90	100	100	100
Trifluralin + Metloachlor	0.63 + 2.00	100	100	100	88	99	100	100	100
Ethalfluralin + Metolachlor	1.30 + 2.00	100	100	100	95	100	100	100	100
LSD (0.05)		19	21	22	28	15	20	23	21

[1] Herbicides applied as preplant incorporated treatments on June 4, 1987.

[2] AMARE = redroot pigweed
CHEAL = common lambsquarters
MALNE = common mallow
SETVI = green foxtail
SOLSA = hairy nightshade

Evaluation of postemergence herbicides in dry bean. Kidder, D.W. and D.P. Drummond. Postemergence herbicides were evaluated for control of redroot pigweed (*Amaranthus retroflexus* L. # AMARE), common lambsquarters (*Chenopodium album* L. # CHEAL), common mallow (*Malva neglecta* Wallr. # MALNE), hairy nightshade (*Solanum sarricoides* Sendt. # SOLSA) and green foxtail (*Setaria viridis* (L.) Beauv. # SETVI) in dry bean at the University of Idaho Research and Extension Center, Kimberly, Idaho. Nineteen treatments, including the control, were applied in a randomized complete block design with four replications. Dry bean (Viva pink) was planted on June 5, 1987 at a population of 95,000 seeds/a and furrow irrigated as needed.

Herbicides were applied on June 30 as the early postemergent treatment and on July 9 as the late postemergent treatment using a CO_2 backpack sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 10 feet wide and 30 feet long. Soil was a Portneuf silt loam with organic matter of 1.5% and a pH of 8. Visual evaluations of percent weed control were made on July 29 and August 17. Weed densities for redroot pigweed, common lambsquarters, common mallow, hairy nightshade and green foxtail were 13,000, 9,800, 16,000, 5,000, and 66,000 plants/a, respectively.

Weed control results are shown in Table 2. Bentazon, when mixed with Uran liquid fertilizer, gave better redroot pigweed and common lambsquarters control when applied early postemergence than when applied late postemergence. Bentazon applied with a crop oil concentrate did not show an application timing response. The addition of sethoxydim to bentazon increased common lambsquarters control and decreased redroot pigweed control. Dry bean injury was not evident in any of the treatments. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in dry bean

Date of application	6/30/87	7/09/87
Air temperature (F)	80	76
Soil temperature @ surface (F)	90	90
Soil temperature @ 8 cm (F)	73	73
Relative humidity (%)	48	40
Dew present	none	none
Wind (mph)	4	5
Cloud cover (%)	75	100
pH	8	
OM (%)	1.5	
soil texture	silt loam	

Table 2. Postemergence herbicides in dry bean

			Control							
			July 29					August 17		
Treatment	Rate	Time of application[1]	AMARE[2]	CHEAL[2]	MALNE[2]	SETVI[2]	SOLSA[2]	AMARE	CHEAL	SETVI
	(lb a.i./A)		-------------------------------- (%) --------------------------------							
Check	...		0	0	0	0	0	0	0	0
Bentazon + COC[3]	0.75 + 1.0 qt.	EPOST	64	85	94	0	95	18	68	0
Bentazon + COC	1.00 + 1.0 qt.	EPOST	63	86	95	0	96	25	60	0
Bentazon + COC	1.00 + 1.0 qt.	LPOST	56	66	74	0	89	15	35	0
Bentazon + 32% N[4]	1.00 + 1.0 gal.	EPOST	76	82	97	0	100	56	48	0
Bentazon + 32% N	1.00 + 1.0 gal.	LPOST	48	43	86	0	94	45	10	0
Acifluorfen	0.38	EPOST	79	40	90	0	85	88	0	0
Acifluorfen	0.50	EPOST	90	45	97	0	80	88	4	0
Sethoxydim + COC	0.10 + 1.0 qt.	EPOST	0	0	0	92	0	0	0	100
Sethoxydim	0.30	EPOST	0	0	0	90	0	0	0	100
Sethoxydim + Bentazon + COC	0.30 + 0.75 + 1.0 qt.	EPOST	29	98	93	91	98	0	93	100
Sethoxydim + BCH 815	0.30 + 0.50	EPOST	0	0	0	100	0	0	0	100
Sethoxydim + Bentazon + BCH 815	0.30 + 0.75 + 0.50	EPOST	38	99	91	98	100	0	99	100
BAS 517 + COC	0.05 + 1.0 qt.	EPOST	0	0	0	98	0	0	0	100
BAS 517 + COC	0.10 + 1.0 qt.	EPOST	0	0	0	100	0	0	0	100
BAS 517 + COC	0.15 + 1.0 qt.	EPOST	0	0	0	100	0	0	0	100
AC 263,499 + Surf.[5]	0.06 + 0.25% v/v	EPOST	95	50	92	65	99	100	0	90
AC 263,499 + 32% N	0.06 + 1.0 gal	EPOST	93	39	98	64	99	99	10	76
Imazaquin + Surf.	0.124 + 0.25% v/v	EPOST	92	41	78	58	79	90	0	70
LSD (0.05)			16	25	10	7	16	18	22	11

[1] EPOST applied June 30 when beans were in the 2 to 3 trifoliolate stage and broadleaf weeds were 1 to 2 inches tall.
LPOST applied July 9 when beans were in the 4 to 5 trifoliolate stage and broadleaf weeds were 6 to 14 inches tall.

[2] AMARE = redroot pigweed
CHEAL = common lambsquarters
MALNE = common mallow
SETVI = green foxtail
SOLSA = hairy nightshade

[3] Crop oil concentrate (Atplus 411F)

[4] Uran liquid fertilizer (32% N)

[5] Surfactant (R-11)

Weed control in pinto beans with preplant incorporated or complementary preplant incorporated/preemergence herbicides. Miller, S.D. and K.J. Fornstrom. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of preplant incorporated or complementary preplant incorporated/preemergence herbicide treatments for weed control in pinto beans. Plots were established under irrigation and were 9 by 45 ft with three replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi and incorporated twice immediately after application with a roller harrow operating at a 2 to 2.5 inch depth June 2, 1987 (air temp 54 F, relative humidity 37%, wind W at 5 mph, sky clear and soil temp - 0 inch 62 F, 2 inch 58 F and 4 inch 60 F). Pinto beans (var. UI-111) were planted immediately after herbicide incorporation and preemergence treatments applied June 3, 1987 (air temp 68 F, relative humidity 27%, wind NW at 7 mph, sky clear and soil temp - 0 inch 92 F, 2 inch 70 F and 4 inch 66 F). The soil was classified as a sandy loam (78% sand, 13% silt and 9% clay) with 1.2% organic matter and a 7.4 pH. Weed counts, crop stand counts and visual injury ratings were made June 24, visual weed control ratings August 6 and yields determined September 8, 1987. Weed infestations were light but uniform throughout the experimental area.

Herbicide treatments reduced pinto bean stands 3 to 15%. In addition, preplant incorporated applications of pendimethalin plus AC-263,499 caused 5 to 20% pinto bean injury. Pinto bean yields generally reflected weed control and were 881 to 1229 lb/A higher in herbicide treated plots compared to weedy check plots. Season long control of redroot pigweed (AMARE), hairy nightshade (SOLSA), green foxtail (SETLU), common lambsquarters (CHEAL) and stinkgrass (ERACN) was excellent with EPTC combination with pendimethalin, ethafluralin and trifluralin or pendimethalin combinations with AC-263,499. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1502 .)

Weed control with preplant incorporated or complementary preplant incorporated/preemergence herbicides in pinto beans

		Pinto beans[2]			Weed control[3]							
					June 24			August 6				
Treatment[1]	Rate lb ai/A	injury %	stand red %	yield lb/A	AMARE %	SOLSA %	SETLU %	AMARE %	SOLSA %	SETLU %	CHEAL %	ERACN %
Preplant incorporated												
EPTC	2.0	0	9	1400	100	100	100	43	93	90	30	93
EPTC + pendimethalin	2.0 + 1.0	0	11	1657	100	100	100	98	98	100	98	100
EPTC + ethafluralin	2.0 + 0.25	0	8	1687	100	100	100	97	97	98	100	100
EPTC + trifluralin	2.0 + 0.75	0	9	1674	100	100	100	93	90	100	88	100
pendimethalin	1.5	0	9	1360	100	40	100	97	13	97	97	100
ethafluralin	0.94	0	12	1452	100	100	100	95	67	100	100	100
trifluralin	1.0	0	10	1352	100	0	100	95	0	98	93	97
AC-263,499	0.063	0	3	1461	72	60	83	100	95	83	100	20
pendimethalin + AC-263,499	1.0 + 0.032	5	15	1700	100	100	100	98	97	100	100	100
pendimethalin + AC-263,499	1.0 + 0.063	20	10	1474	100	100	100	100	100	100	100	100
Preplant incorporated/preemergence												
pendimethalin/AC-263,499	1.0/0.032	0	7	1626	100	100	100	100	97	100	100	100
pendimethalin/AC-263,499	1.0/0.063	0	10	1652	100	100	100	100	98	100	100	100
pendimethalin/chloramben	1.0/2.25	0	8	1352	100	100	100	97	60	95	100	100
trifluralin/chloramben	0.75/2.25	0	8	1352	100	100	100	100	53	100	100	100
ethafluralin/chloramben	0.75/2.25	0	10	1421	100	100	100	97	77	97	98	98
weedy check	---------	0	0	471	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	3.6	---	0.1	0.1	0.3	---	---	---	---	---

[1] Treatments applied June 2 and 3, 1987
[2] Crop stand counts and visual crop injury evaluated June 24 and plots harvested September 8, 1987
[3] Weed stand counts June 24 and visual weed control ratings August 6, 1987

Weed control with preemergence and complementary preemergence/postemergence herbicides in pinto beans. Miller, S.D. and K.J. Fornstrom. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of preemergence or complementary preemergence/postemergence herbicide treatments for weed control in pinto beans. Plots were established under irrigation and were 9 by 45 ft with three replications arranged in a randomized complete block. Pinto beans (var. UI-111) were planted in a sandy loam soil (78% sand, 13% silt and 9% clay) with 1.2% organic matter and a 7.4 pH June 2, 1987. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi June 2 (air temp 66 F, relative humidity 25%, wind NW at 5 mph, sky clear, and soil temp - 0 inch 90 F, 2 inch 75 F and 4 inch 68 F) or June 16, 1987 (air temp 82 F, relative humidity 32%, wind calm, sky clear and soil temp - 0 inch 100 F, 2 inch 82 F and 4 inch 71 F) to first trifolilate beans and 0.5 to 1 inch weeds. Weed counts, crop stand counts and visual injury ratings were made June 24, visual weed control ratings August 6 and plots harvested September 8, 1987. Weed infestations were light but uniform throughout the experimental area.

No pinto bean injury or stand reduction was observed with any treatment. Pinto bean yields related closely to weed control and were 423 to 1081 lb/A higher in herbicide treated compared to weedy check plots. Hairy nightshade (SOLSA), redroot pigweed (AMARE), common lambsquarters (CHEAL), yellow foxtail (SETLU) and stinkgrass (ERACN) control was excellent with preemergence applications of AC-263,499 in combination with metolachlor or cinmethylin. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1503.)

Weed control with preemergence or complementary preemergence/postemergence herbicides in pinto beans

Treatment[1]	Rate	Pinto beans[2]			Weed control[3] June 24				Weed control[3] August 6				
	Rate	injury	stand red	yield	SOLSA	AMARE	CHEAL	SETLU	SOLSA	AMARE	CHEAL	SETLU	ERACN
	lb ai/A	%	%	lb/A	%	%	%	%	%	%	%	%	%
Preemergence													
cinmethylin	0.75	0	0	1012	35	57	40	100	7	43	47	90	97
metolachlor	2.5	0	0	1256	85	100	40	100	78	80	77	82	97
alachlor	2.5	0	0	1299	85	100	40	100	90	83	80	93	97
AC-263,499	0.063	0	0	1456	90	100	100	74	97	100	98	82	0
metolachlor + AC-263,499	2.0 + 0.032	0	0	1670	100	100	100	100	97	100	98	100	100
metolachlor + AC-263,499	2.0 + 0.063	0	0	1626	100	100	100	100	100	100	98	100	100
cinmethylin + AC-263,499	0.75 + 0.032	0	0	1644	100	100	100	93	97	100	97	98	100
cinmethylin + AC-263,499	0.75 + 0.063	0	0	1670	100	100	100	100	98	98	100	100	100
chloramben	2.5	0	0	1195	85	72	100	74	57	37	52	75	87
Preemergence/postemergence													
cinmethylin/AC-263,499	0.75/0.032	0	0	1299	85	100	100	100	65	77	78	93	97
cinmethylin/AC-263,499	0.75/0.063	0	0	1378	85	100	100	93	60	73	78	100	100
weedy check	----------	0	0	589	0	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	3.5	---	0.4	0.2	0.2	0.6	---	---	---	---	---

[1] Treatments applied June 2 and June 16, 1987
[2] Crop stand counts and visual crop injury evaluated June 24 and plots harvested September 8, 1987
[3] Weed stand counts June 24 and visual weed control ratings August 6, 1987

Weed control in red kidney beans with preemergence and complementary preemergence/postemergence treatments. Miller, S.D. and K.J. Fornstrom. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of preemergence or complementary preemergence/postemergence herbicide treatments for weed control in red kidney beans. Plots were established under irrigation and were 8 by 45 ft with three replications arranged in a randomized complete block. Red kidney beans (var. Royal Red) were planted in a sandy loam soil (78% sand, 13% silt and 9% clay) with 1.2% organic matter and a 7.4 pH June 2, 1987. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi June 2 (air temp 70 F, relative humidity 22%, wind NW at 7 mph, sky clear and soil temp - 0 inch 102 F, 2 inch 72 F and 4 inch 66 F) or June 16, 1987 (air temp 82 F, relative humidity 32%, wind calm, sky clear and soil temp - 0 inch 100 F, 2 inch 82 F and 4 inch 71 F) to first trifolilate beans and 0.5 to 1 inch weeds. Weed counts, crop stand counts and visual injury ratings were made June 24, visual weed control ratings August 6 and plots harvested September 8, 1987. Hairy nightshade (SOLSA) and yellow foxtail (SETLU) infestations were moderate and redroot pigweed (AMARE) and common lambsquarters (CHEAL) infestations light throughout the experimental area.

No red kidney bean injury or stand reduction was observed with any treatment. Red kidney bean yields related closely to weed control and were 353 to 1373 lb/A higher in herbicide treated compared to weedy check plots. Weed control was excellent with preemergence applications of metolachlor plus AC-263,499. (Wyoming Agric. Exp. Sta. Laramie, WY 82071 SR 1501.)

Weed control in red kidney beans

Treatment[1]	Rate	Red kidney bean[2]			Weed control[3]							
					June 24				August 6			
	Rate	injury	stand red	yield	SOLSA	AMARE	CHEAL	SETLU	SOLSA	AMARE	CHEAL	SETLU
	lb ai/A	%	%	lb/A	%	%	%	%	%	%	%	%
Preemergence												
metolachlor	2.0	0	0	1330	88	100	0	100	33	53	37	82
AC-263,499	0.047	0	0	1495	62	100	0	44	85	100	90	70
metolachlor + AC-263,499	2.0 + 0.032	0	0	1626	98	100	100	98	97	100	95	100
metolachlor + AC-263,499	2.0 + 0.047	0	0	1683	100	100	100	100	100	100	100	100
metolachlor + AC-263,499	2.0 + 0.063	0	0	1670	100	100	100	100	100	100	100	100
metolachlor + AC-263,499	2.0 + 0.094	0	0	1652	100	100	100	100	100	100	100	100
Preemergence/postemergence												
metolachlor/bentazon	2.0/1.0	0	0	1439	100	100	100	100	83	83	68	87
metolachlor/AC-263,499	2.0/0.032	0	0	1264	94	100	100	100	57	93	63	93
metolachlor/AC-263,499	2.0/0.047	0	0	1347	96	100	100	100	70	97	67	100
metolachlor/AC-263,499	2.0/0.063	0	0	1373	94	100	100	100	80	95	73	100
metolachlor/AC-263,499	2.0/0.094	0	0	1391	98	100	100	98	83	100	80	100
AC-263,499	0.047	0	0	663	32	0	0	22	40	90	17	53
weedy check	-----	0	0	310	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	2.5	---	2.1	0.2	0.1	1.8	---	---	---	---

[1] Treatments applied June 2 and June 16, 1987

[2] Crop stand counts and visual crop injury evaluated June 24 and plots harvested September 8, 1987

[3] Weed stand counts June 24 and visual weed control ratings August 6, 1987

Container study of kidney bean plants with barnyardgrass and hairy nightshade in the presence of variable amounts of soil phosphorus. Mitich, L.W., and G.B. Kyser. Kidney beans (B), barnyardgrass (G), and hairy nightshade (N) were planted in 6 competititive arrangements (BBB, BBG, BBN, BGG, BNN, BGN) in 6 soil types [3 levels of soil phosphorus (P) vs. lime or no lime]. The intent was to investigate interaction of these 3 species under variable availability of P; addition of hydrated lime [$Ca(OH)_2$] increased soil pH, thereby decreasing availability of P. The basic soil was a loamy sand, pH 6.7, from Tulare County. P was added at rates of 0, 50, or 100 parts per million by weight in the form of 0-25-0 fertilizer mortared to pass through a size 50 screen; lime was added to half the soil at 0.3% by weight, raising pH in this soil to 7.9 to 8.1. The experiment was designed as a split-block trial as follows:

- The 6 soil types were randomized within each of 4 replication blocks.
- Within each soil type, competitive arrangements were randomized.

Plants were seeded in 6-inch pots in a 'warm' greenhouse on the UC Davis campus on June 30, 1987. Before planting, pots were set up and watered for 1 week to allow pH in limed soils to equalize. Barnyardgrass emerged on July 3, and beans and nightshade emerged by July 6. Each pot was fertilized weekly with 120 ml of 10x Hoagland's solution without P. All plants were cut at ground level on 21 August and placed in a protected sunny area for drying. After 3 weeks of outside drying, plants were further dried in a drying shed at 100 F for 2 days.

Bean plants varied significantly between replications, probably owing to available light on different sides of the greenhouse. In both limed and unlimed soils, bean plant weight increased greatly from 0 to 50 ppm P; from 50 to 100 ppm P, bean plant weight decreased slightly but significantly (a response to excess P which, apparently, is shared with other legumes). Bean plant weight decreased significantly with addition of lime; this is at least partially attributable to the debilitating effect of higher pH on P availability, as confirmed by significant interaction of lime and P. Competititive arrangements had a marked effect on bean plant weight: bean plants grown with 2 nightshade plants were significantly heavier than those grown with 1 nightshade plant and 1 bean plant or with 2 other bean plants; and any of these arrangements yielded significantly heavier bean plants than did arrangements including any number of barnyardgrass plants.

Barnyardgrass plant weight increased significantly from 0 to 50 ppm P and from 50 to 100 ppm P. Grass plants grown with 1 bean and 1 nightshade plant weighed significantly more than grass plants grown with 2 bean plants, and the latter outweighed grass plants grown 3 to a pot. Barnyardgrass plants showed no significant response to lime; moreover, no replication effects were observed for this species, probably because the tall grass plants had available sunlight throughout the greenhouse.

Nightshade plants showed no statistically significant variation with experimental factors; however, they showed a significant inverse correlation with weight of bean plants. This suggests nightshade plants may have capitalized on reduced bean plant vigor. (University of California Cooperative Extension, Davis, CA 95616)

Table. Summary of significant statistical data from bean/barnyardgrass/nightshade greenhouse competition study with 3 rates of soil phosphorus and 2 rates of lime, UC Davis

Plant	Character	Group	Mean dry weight (g)
kidney bean (B)	replication:	1	9.98
		2	10.35
		3	10.89
		4	7.92
	hydrated lime:	unlimed (U)	10.88
		limed (L)	8.69
	phosphorus (P):	0 ppm	5.65
		50 ppm	12.07
		100 ppm	11.64
	lime X P:	U0	6.51
		U50	14.06
		U100	12.07
		L0	4.78
		L50	10.07
		L100	11.21
	competition:	BBB	9.21
		BBG	7.59
		BBN	10.99
		BGG	7.85
		BNN	15.13
		BGN	7.94
barnyardgrass (G)	phosphorus (P):	0 ppm	22.17
		50 ppm	25.15
		100 ppm	31.23
	competition:	BBG	24.05
		BGG	20.88
		BGN	33.61
hairy nightshade (N)	No significant variation with experimental factors; however, a significant inverse correlation with bean plant weight was observed.		

Control of subclover in birdsfoot trefoil. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Subclover and other legumes can be weed problems in birdsfoot trefoil grown for seed. A field trial was conducted to evaluate the efficacy and crop tolerance of six herbicide treatments. The trial was a randomized complete block with two replications and 2.5 m by 6 m plots. Spray volume was 234 L/ha delivered at 134 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. The subclover was 15 cm to 30 cm in diameter and the trefoil was 20 to 40 cm tall when the herbicides were applied on December 10, 1986.

The soil was a silty clay loam with an organic matter content of 3.4% and a pH of 5.0. The crop was grown without irrigation.

Visual evaluations on April 2, 1987 indicated that dicamba, imazapyr, imazaquin, and chlorimuron controlled the subclover, but imazapyr caused too much crop injury (see table). A higher rate of imazethapyr might have been selective. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Subclover control in birdsfoot trefoil

Herbicide	Rate	Subclover control	Trefoil injury
	(kg/ha)	(%)	
dicamba	0.14	88	10
2,4-D	0.6	10	60
imazapyr	0.1	100	80
imazaquin	0.4	95	0
chlorimuron	0.04	100	0
imazethapyr	0.2	45	0
check	0	0	0

Evaluation of postemergence herbicides on field corn. Kidder, D.W. and D.P. Drummond. Postemergence herbicides were evaluated for control of redroot pigweed (*Amaranthus retroflexus* L. # AMARE), common lambsquarters (*Chenopodium album* L. # CHEAL), hairy nightshade (*Solanum sarricoides* Sendt. # SOLSA), common mallow (*Malva neglecta* Wallr. # MALNE) and green foxtail (*Setaria viridis* (L.) Beauv. # SETVI) in field corn at the University of Idaho Research and Extension Center, Kimberly, Idaho. Nineteen treatments, including the control, were applied in a randomized complete block design with four replications. Field corn (Pioneer 3969) was planted on June 5, 1987 at a population of 34,000 seeds/a and furrow irrigated according to recommended procedures.

Herbicides were applied on June 30 using a CO_2 pressurized backpack sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 10 feet wide and 30 feet long. Soil was Portneuf silt loam with organic matter of 1.5% and a pH of 8. Broadleaf weeds were 1 to 2 inches tall and corn was in the 5 leaf stage at the time of application. Weed densities for redroot pigweed, common lambsquarters, common mallow, hairy nightshade and green foxtail were 20,000, 8,200, 9,800, 3,800 and 9,500 plants/a, respectively

Weed control for the herbicide treatments are shown in Table 2. DPX-M6316 at the higher rate and DPX-L5300 caused injury to the corn. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in field corn

Date of application	6/30/87
Air temperature (F)	85
Soil temperature @ surface (F)	90
Soil temperature @ 8 cm (F)	73
Relative humidity (%)	40
Dew present	none
Wind (mph)	0
Cloud cover (%)	80
pH	8
OM (%)	1.5
soil texture	silt loam

Table 2. Postemergence herbicides in field corn

Treatment[1]	Rate	July 28						August 18			
			Control						Control		
		Crop Inj.	AMARE[2]	CHEAL[2]	MALNE[2]	SETVI[2]	SOLSA[2]	Crop Inj.	AMARE	CHEAL	SOLSA
	(lb a.i./A)	(%)									
Check	...	0	0	0	0	0	0	0	0	0	0
Atrazine + COC[3]	1.00 + 1.0 qt.	0	100	100	98	5	100	0	100	100	8
2,4-D amine	0.38	0	76	83	67	0	97	0	88	64	23
Bromoxynil	0.38	0	63	99	94	0	99	0	36	100	0
Pyridate	0.90	0	94	89	80	30	99	0	93	86	45
Pyridate	1.80	0	100	95	96	32	100	0	100	97	44
DPX-M6316 + Surf.[4]	0.008 + 0.25% v/v	9	98	30	78	0	48	0	99	0	3
DPX-M6316 + Surf.	0.016 + 0.25% v/v	85	100	99	97	0	30	73	100	100	25
DPX-M6316	0.016	38	99	45	95	0	64	10	100	9	0
SC-0735 + Surf.	0.25 + 0.25% v/v	0	91	96	95	40	93	0	92	98	40
SC-0735 + Surf.	0.50 + 0.25% v/v	0	96	99	96	64	96	0	94	99	35
DPX-L5300 + Surf.	0.008 + 0.25% v/v	85	83	100	85	8	91	80	55	100	0
DPX-L5300 + Surf.	0.016 + 0.25% v/v	95	88	100	83	0	99	98	64	100	0
SC-0051 + Surf.	0.25 + 0.25% v/v	0	74	95	93	43	83	0	56	100	48
SC-0051 + Surf.	0.50 + 0.25% v/v	0	84	99	95	76	76	0	68	100	44
SC-0051 + Surf.	0.75 + 0.25% v/v	0	88	100	100	46	96	0	84	100	40
SC-0051 + Atrazine + Surf.	0.25 + 1.00 + 0.25% v/v	0	100	100	100	72	100	3	100	100	76
SC-0051 + Atrazine + Surf.	0.50 + 1.00 + 0.25% v/v	0	100	100	100	70	100	0	100	100	85
SC-0051 + Atrazine + Surf.	0.75 + 1.00 + 0.25% v/v	0	100	100	100	83	100	0	100	100	84
LSD (0.05)		10	9	10	15	33	20	9	14	15	55

[1] Treatments were applied June 30 when the corn was in the 5 leaf stage and broadleaf weeds were 1 to 2 inches tall.

[2] AMARE = redroot pigweed
CHEAL = common lambsquarters
MALNE = common mallow
SETVI = green foxtail
SOLSA = hairy nightshade

[3] Crop oil concentrate (Atplus 411F)

[4] Surfactant (R-11)

Wild proso millet control in corn. Miller, S.D. Research plots were established at Cassa, WY, to evaluate the efficacy of preplant incorporated, preemergence, postemergence and complementary preplant incorporated/preemergence or postemergence herbicide treatments for wild proso millet control in corn. Plots were established under furrow irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi. Preplant herbicides were applied May 4, 1987 (air temp 62 F, relative humidity 54%, wind calm, sky cloudy and soil temp - 0 inch 72 F, 2 inch 66 F and 4 inch 60 F) and incorporated twice with a roller harrow operating at 2.5 to 3 inches immediately after application. Corn (var. Golden Harvest 2235) was planted May 11 in a silt loam soil (52% sand, 34% silt and 14% clay) with 2.1% organic matter and a 7.7 pH and preemergence treatments applied May 13 (air temp 85 F, relative humidity 20%, wind calm, sky partly cloudy and soil temp - 0 inch 90 F, 2 inch 82 F and 4 inch 78 F). Postemergence treatments were applied to 0.5 inch wild proso millet and 1-leaf corn May 21, 1987 (air temp 48 F, relative humidity 73%, wind N at 2 mph, sky cloudy and soil temp - 0 inch 60 F, 2 inch 56 F and 4 inch 52 F). Visual crop damage ratings were made June 17; visual weed control ratings June 17, July 14 and August 17; and plots harvested August 26, 1987. Wild proso millet infestations were heavy (>50 plants/linear ft of row) and uniform throughout the experimental area.

No corn injury or stand reduction was observed with any treatment. Silage yields related closely to wild proso millet control and were 6.2 to 13.4 T/A higher in herbicide treated compared to weedy check plots. Season long wild proso millet control was 90% or greater with preplant incorporated applications of EPTC-dichlormid-metolachlor or preplant incorporated applications of metolachlor, metolachlor-atrazine or cycloate-dichlormid followed by complementary preemergence applications of pendimethalin alone or with cyanazine and complementary postemergence applications of cyanazine with tridiphane or pendimethalin. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1505.)

Wild proso millet control in corn

Treatment[1]	Rate lb ai/A	Corn[2] injury %	Corn[2] stand red %	Corn[2] silage T/A	Wild proso millet control[3] June %	Wild proso millet control[3] July %	Wild proso millet control[3] August %
Preplant incorporated							
EPTC + dichlormid (pm)	6.0	0	0	15.3	65	60	60
EPTC + dichlormid (pm-encap)	6.0	0	0	12.5	52	40	33
cycloate + dichlormid (pm)	6.0	0	0	18.0	83	83	83
EPTC + dichlormid (pm) + metolachlor	4.0 + 2.0	0	0	19.1	99	91	93
alachlor + triallate	4.0 + 4.0	0	0	16.3	76	71	72
Preplant incorporated/preemergence							
EPTC + dichlormid (pm)/cyanazine	4.0/1.5	0	0	16.5	89	82	78
EPTC + dichlormid (pm)/pendimethalin	4.0/1.5	0	0	18.1	92	85	86
EPTC + dichlormid (pm)/cyanazine + pendimethalin	4.0/1.5 + 1.5	0	0	18.7	96	93	88
cycloate + dichlormid (pm)/cyanazine	4.0/1.5	0	0	18.3	93	87	82
cycloate + dichlormid (pm)/pendimethalin	4.0/1.5	0	0	19.3	99	96	96
cycloate + dichlormid (pm)/cyanazine + pendimethalin	4.0/1.5 + 1.5	0	0	19.7	99	98	98
metolachlor/pendimethalin	2.0/1.5	0	0	19.1	98	96	85
metolachlor/cyanazine + pendimethalin	2.0/1.5 + 1.5	0	0	19.4	97	97	93
metholachlor + atrazine (pm)/cyanazine + pendimethalin	1.4 + 0.7/1.5 + 1.5	0	0	18.7	99	98	96
Preplant incorporated/postemergence							
EPTC + dichlormid (pm)/cyanazine + tridiphane	4.0/1.0 + 0.75	0	0	16.0	91	84	78
EPTC + dichlormid (pm)/cyanazine + pendimethalin	4.0/1.0 + 1.5	0	0	19.1	95	89	89
cycloate + dichlormid (pm)/cyanazine + tridiphane	4.0/1.0 + 0.75	0	0	18.9	99	98	96
cycloate + dichlormid (pm)/cyanazine + pendimethalin	4.0/1.0 + 1.5	0	0	19.1	99	98	95
metolachlor/cyanazine + tridiphane	2.0/1.0 + 0.75	0	0	18.9	100	99	97
metolachlor/cyanazine + pendimethalin	2.0/1.0 + 1.5	0	0	18.7	98	97	93
metolachlor + atrazine (pm)/cyanazine + tridiphane	1.4 + 0.7/1.0 + 0.75	0	0	18.7	99	98	96
Preemergence							
cyanazine + pendimethalin	1.5 + 1.0	0	0	18.6	92	90	89
cyanazine + SC-0735 + R-29148	1.5 + 0.5 + 0.083	0	0	17.5	80	78	78
cyanazine + SC-0774 + R-29148	1.5 + 0.75 + 0.125	0	0	18.3	97	93	87
Postemergence							
cyanazine + tridiphane	1.0 + 0.75	0	0	16.1	85	73	70
cyanazine + SC-0735	1.0 + 0.375	0	0	18.9	97	93	88
cyanazine + SC-0051	1.0 + 0.5	0	0	18.7	98	93	88
weedy check	---------	0	0	6.3	0	0	0

[1]Preplant incorporated treatments applied May 4, preemergence treatments May 13 and postemergence treatments May 21, 1987; pm = package mix

[2]Corn injury and stand reduction (red) visually evaluated June 17 and plots harvested August 26, 1987

[3]Weed control visually evaluated June 17, July 14 and August 17, 1987

Evaluation of postemergence herbicide treatments in corn. Miller, S.D. and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of individual and/or herbicide combinations applied postemergence for weed control in corn. Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi May 26, 1987 (air temp 70 F, relative humidity 45%, wind SE at 5 mph, sky partly cloudy and soil temp - 0 inch 84 F, 2 inch 72 F and 4 inch 68 F) to 1 to 2 inch weeds and 4-leaf corn. Corn (var. Pioneer 3790) was seeded on May 8, 1987 in a sandy loam soil (71% sand, 23% silt and 6% clay) with 1.4% organic matter and a 7.6 pH. Weed counts, crop stand counts and visual crop injury ratings were made June 11 and visual weed control ratings July 9, 1987. Common lambsquarters (CHEAL), redroot pigweed (AMARE), hairy nightshade (SOLSA) and yellow foxtail (SETLU) infestations were moderate and wild buckwheat (POLCO) and common purslane (POROL) infestations light throughout the experimental area.

No treatment reduced corn stand; however, treatments containing cyanazine injured corn 5 to 15%. Early season weed control was excellent and mid season weed control good with herbicide combinations containing cyanazine and/or atrazine. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1495.)

Postemergence weed control in corn

Treatment[1]	Rate lb ai/A	Corn[2] injury %	Corn[2] stand red %	Control[3] June 11 CHEAL %	AMARE %	SOLSA %	POLCO %	POROL %	SETLU %	July 9 CHEAL %	AMARE %	SOLSA %	SETLU %
cinmethylin	0.75	0	0	50	65	60	0	100	66	0	0	0	82
cinmethylin + atrazine	0.5 + 0.75	0	0	100	100	100	100	100	100	100	100	100	96
cinmethylin + atrazine	0.75 + 0.75	0	0	100	100	100	100	100	98	100	100	100	97
DPX-M6316 + cyanazine	0.008 + 1.0	10	0	100	100	100	100	100	100	96	93	91	92
DPX-M6316 + cyanazine	0.015 + 1.0	12	0	100	100	100	100	100	100	95	96	93	92
SC-0735 + atrazine	0.19 + 0.75	0	0	100	100	100	100	100	98	99	99	100	96
SC-0735 + atrazine	0.25 + 0.75	0	0	100	100	100	100	100	98	100	99	100	98
SC-0735 + atrazine	0.38 + 0.75	0	0	100	100	100	100	100	98	100	100	100	98
tridiphane + atrazine	0.5 + 0.75	0	0	100	100	100	100	100	100	100	99	98	95
tridiphane + cyanazine	0.5 + 1.0	15	0	100	100	100	100	100	100	93	85	95	91
bromoxynil	0.25	0	0	100	100	100	100	80	40	83	88	85	0
bromoxynil	0.38	0	0	100	100	100	100	80	52	88	90	87	27
bromoxynil + atrazine	0.25 + 0.75	0	0	100	100	100	100	100	94	100	100	100	95
bromoxynil + atrazine (pm)	0.25 + 0.5	0	0	100	100	100	100	100	87	99	94	96	77
bromoxynil + atrazine (pm)	0.38 + 0.75	0	0	100	100	100	100	100	94	99	99	98	93
bromoxynil + cyanazine	0.25 + 1.0	11	0	100	100	100	100	100	92	93	91	95	90
bromoxynil + dicamba	0.25 + 0.125	0	0	100	100	100	100	100	25	96	88	93	0
dicamba + atrazine (pm)	0.275 + 0.52	0	0	100	100	100	100	100	94	99	96	96	80
dicamba + cyanazine	0.72 + 1.32	9	0	100	100	100	100	100	98	97	92	99	93
dicamba + atrazine (pm) + cyanazine	0.275 + 0.52 + 1.0	5	0	100	100	100	100	100	100	100	96	100	95
dicamba + atrazine + cyanazine	0.22 + 0.33 + 0.99	5	0	100	100	100	100	100	100	98	98	97	100
bentazon + atrazine (pm)	0.5 + 0.5	0	0	100	100	100	100	100	94	100	97	99	78
pendimethalin + cyanazine	1.5 + 1.0	11	0	100	100	100	100	100	100	100	95	100	98
weedy check	---------	0	0	0	0	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	1.7	0.7	0.6	0.7	0.1	0.2	1.5	---	---	---	---

[1] Treatments applied May 26, 1987 and pm = package mix

[2] Crop stand counts and visual crop injury evaluated June 11, 1987

[3] Weed stand counts June 11 and visual weed control ratings July 9, 1987

Early preplant herbicide applications in corn. Miller, S.D., J.M. Krall and K.J. Fornstrom. Several soil persistent herbicides and/or combinations were applied at the Torrington Research and Extension Center, Torrington, WY, 25 and 0 days prior to corn planting to assess weed control and crop tolerance. Plots were established under irrigation and were 9 by 45 ft with three replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi on April 13 (air temp 52 F, relative humidity 40%, wind NW at 10 mph, sky partly cloudy and soil temp - 0 inch 54 F, 2 inch 49 F and 4 inch 44 F) and May 8, 1987 (air temp 82 F, relative humidity 23%, wind calm, sky clear and soil temp - 0 inch 100 F, 2 inch 80 F and 4 inch 76 F). Paraquat was included at 0.75 lb/A with all 0-day treatments, to control emerged weeds. Corn (var. Pioneer 3790) was seeded on May 8 immediately prior to the 0-day herbicide applications. The soil was classified as a sandy loam (71% sand, 23% silt and 6% clay) with 1.4% organic matter and a 7.6 pH. Weed counts, crop stand counts, and visual crop injury ratings were made May 27, visual weed control ratings July 1 and silage yields determined August 25, 1987. Redroot pigweed (AMARE), common lambsquarters (CHEAL), common sunflower (HELAN) and yellow foxtail (SETLU) infestations were moderate and hairy nightshade (SOLSA), wild buckwheat (POLCO), and Russian thistle (SASKR) infestations light but uniform throughout the experimental area.

No corn injury or stand reduction was observed with any treatment. Silage yields related closely to weed control and were 5.5 to 8.3 T/A higher in herbicide treated compared to weedy check plots. Cyanazine-atrazine or metolachlor-atrazine treatments were equally effective at both dates of application; however, weed control with the other treatments was better with applications at planting than with applications 25 days prior to planting. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1498.)

Weed control in corn with early preplant herbicides

Treatment[1]	Rate lb ai/A	Corn[2] injury %	Corn[2] stand red %	Corn[2] silage T/A	Control[3] May 27 AMARE %	CHEAL %	SOLSA %	POLCO %	HELAN %	SETLU %	SASKR %	Control[3] July 1 AMARE %	CHEAL %	SOLSA %	POLCO %	HELAN %	SETLU %	SASKR %
<u>25-day</u>																		
metolachlor + atrazine (pm)	1.5 + 1.2	0	0	21.2	100	100	87	100	100	100	100	98	100	100	100	100	100	100
cyanazine + atrazine (pm)	2.0 + 1.0	0	0	21.6	100	100	100	100	100	93	100	100	100	100	100	100	97	100
cyanazine + metolachlor	1.5 + 1.5	0	0	21.0	87	96	87	100	100	100	100	83	78	85	100	100	82	100
cyanazine	3.0	0	0	20.6	57	94	87	100	100	93	100	67	81	100	100	100	83	100
SC-0774 + R-29148	1.0 + 0.166	0	0	20.2	57	87	53	100	100	73	100	60	72	67	100	95	68	100
SC-0735 + R-29148	0.75 + 0.15	0	0	18.8	35	67	80	100	100	73	100	70	50	72	100	93	62	100
SC-0774 + R-29148 + cyanazine	0.75 + 0.125 + 1.5	0	0	20.0	70	87	100	100	100	93	100	77	80	88	100	100	75	100
SC-0774 + R-29148 + cyanazine	1.0 + 0.166 + 1.5	0	0	19.6	87	96	87	100	100	100	100	88	75	93	100	100	83	100
SC-0774 + R-29148 + cyanazine	1.25 + 0.208 + 1.5	0	0	19.6	87	94	80	100	100	90	100	87	77	93	100	100	82	100
SC-0735 + R-29145 + cyanazine	0.75 + 0.125 + 1.5	0	0	20.2	87	87	87	100	100	83	100	85	78	88	100	100	82	100
<u>0-day</u>																		
metolachlor + atrazine (pm)	1.2 + 1.0	0	0	21.4	100	96	100	100	91	100	100	100	100	100	100	100	97	100
cyanazine + atrazine (pm)	1.4 + 0.7	0	0	21.2	100	100	100	100	100	90	100	98	100	100	100	100	87	100
cyanazine + metolachlor	1.2 + 1.2	0	0	21.2	79	96	100	100	100	100	100	90	95	97	100	100	96	100
cyanazine	2.0	0	0	20.8	87	96	100	100	100	90	100	78	93	90	100	100	87	100
SC-0774 + R-29148	1.0 + 0.166	0	0	21.2	91	94	80	100	91	83	100	83	95	87	100	92	85	100
SC-0735 + R-29148	0.75 + 0.125	0	0	20.6	91	96	87	100	91	83	100	90	82	85	100	98	87	100
SC-0774 + R-29148 + cyanazine	0.75 + 0.125 + 1.2	0	0	21.2	87	100	100	100	91	100	100	93	82	97	100	100	88	100
SC-0774 + R-29148 + cyanazine	1.0 + 0.166 + 1.2	0	0	21.6	91	100	100	100	91	93	100	92	92	96	100	100	90	100
SC-0774 + R-29148 + cyanazine	1.25 + 0.208 + 1.2	0	0	21.0	91	100	100	100	100	100	100	95	97	92	100	100	90	100
SC-0735 + R-29148 + cyanazine	0.5 + 0.083 + 1.2	0	0	21.0	100	100	100	100	100	93	100	90	87	87	100	100	80	100
SC-0735 + R-29148 + cyanazine	0.75 + 0.125 + 1.2	0	0	21.6	91	100	100	100	100	93	100	95	92	92	100	100	93	100
weedy check	------------------	0	0	13.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	1.8	----	0.7	1.2	0.3	0.2	0.7	1.0	0.2	---	---	---	---	---	---	---

[1] Treatments applied April 13 and May 8, 1987; pm = package mix and paraquat (0.75 lb/A) was included with all 0-day treatments

[2] Crop stand counts and visual crop injury evaluated May 27 and plots harvested August 25, 1987

[3] Weed stand counts May 27 and visual weed control ratings July 1, 1987

Evaluation of preemergence or complementary preemergence/postemergence treatments in corn. Miller, S.D., J.M. Krall and K.J. Fornstrom. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of preemergence or complementary preemergence/postemergence herbicide treatments for weed control in corn. Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Corn (var. Pioneer 3790) was planted in a sandy loam soil (78% sand, 13% silt and 9% clay) with 1.2% organic matter and a 7.4 pH May 7, 1987. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi May 8 (air temp 65 F, relative humidity 22%, wind calm, sky clear and soil temp - 0 inch 82 F, 2 inch 64 F and 4 inch 60 F) or May 26, 1987 (air temp 70 F, relative humidity 45%, wind SE at 5 mph, sky partly cloudy and soil temp - 0 inch 84 F, 2 inch 72 F and 4 inch 70 F) to 4-leaf corn and 0.5 to 1.5 inch weeds. Weed counts, crop stand counts, and visual crop injury ratings were made June 11, visual weed control ratings July 8 and grain yields determined September 25, 1987. Common lambsquarters (CHEAL), redroot pigweed (AMARE), hairy nightshade (SOLSA), wild buckwheat (POLCO), common purslane (POROL) and yellow foxtail (SETLU) infestations were light but uniform throughout the experimental area.

No treatment reduced corn stand and only slight injury (2 to 3%) was observed with several treatments. Corn yields related closely to weed control and were 10 to 26 bu/A higher in herbicide treated than weedy check plots. Weed control was good to excellent with preemergence applications of SC-0774, pendimethalin, metolachlor and encapsulated EPTC in combination with cyanazine or preemergence applications of metolachlor in combination with postemergence applications of DPX-M6316, 2,4-D and bromoxynil. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1499.)

Weed control in corn with preemergence or complementary preemergence/postemergence treatments

Treatment[1]	Rate	Corn[2] injury	Corn[2] stand red.	Corn[2] yield	Weed control[3] June 11 CHEAL	June 11 AMARE	June 11 SOLSA	June 11 POLCO	June 11 POROL	June 11 SETLU	July 8 CHEAL	July 8 AMARE	July 8 SOLSA	July 8 SETLU
	lb ai/A	%	%	bu/A										
Preemergence														
SC-0774 + R-29148	0.75 + .125	2	0	191	92	85	80	100	100	89	87	73	70	80
SC-0774 + R-29148 + cyanazine	0.75 + 0.125 + 1.5	2	0	195	100	100	100	100	100	100	97	90	100	97
SC-0774 + R-29148	1.0 + 0.166	3	0	189	100	100	100	100	100	89	88	85	78	80
SC-0774 + R-29148 + cyanazine	1.0 + 0.166 + 1.5	3	0	200	100	100	100	100	100	100	97	95	100	98
metolachlor	2.0	0	0	195	100	85	100	100	100	100	65	77	85	93
metolachlor + cyanazine	2.0 + 1.5	2	0	189	100	100	100	100	100	100	95	97	98	97
pendimethalin	1.5	0	0	191	100	100	30	100	100	100	98	97	20	95
pendimethalin + cyanazine	1.5 + 1.5	0	0	202	100	100	100	100	100	100	100	100	97	100
EPTC + dichlormid (encap)	4.0	0	0	200	80	75	70	100	0	89	63	73	57	82
EPTC + dichlormid (encap) + cyanazine	4.0 + 1.5	0	0	200	100	100	100	100	100	100	93	90	98	99
EPTC + dichlormid (encap)	6.0	0	0	198	100	100	100	100	100	92	80	78	80	85
EPTC + dichlormid (encap) + cyanazine	6.0 + 1.5	0	0	198	100	100	100	100	100	100	100	98	97	97
Preemergence/postemergence														
metolachlor/DPX-M6316	2.0/0.015	0	0	202	92	100	100	100	100	100	92	98	85	95
metolachlor/DPX-M6316	2.0/0.023	0	0	202	100	100	100	100	100	100	90	100	85	95
metolachlor/DPX-M6316 + s	2.0/0.015	0	0	205	100	100	100	100	100	100	95	100	83	97
metolachlor/DPX-M6316 + 2,4-D	2.0/0.015 + 0.125	0	0	198	100	100	100	100	100	100	94	97	95	95
metolachlor/DPX-M6316 + dicamba	2.0/0.015 + 0.125	0	0	200	100	100	100	100	100	100	92	93	95	95
metolachlor/2,4-D	2.0/0.5	0	0	202	88	90	100	72	100	100	92	99	98	95
metolachlor/bromoxynil	2.0/0.375	0	0	198	92	100	100	100	100	100	96	99	99	95
weed check	---------	0	0	179	0	0	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	1.7	---	0.5	0.4	0.2	0.1	0.1	0.6	---	---	---	---

[1] Treatments applied May 8 and May 26, 1987; encap = encapsulated formulation and s = surfactant X-77 at 0.25% v/v

[2] Crop stand counts and visual crop injury evaluated June 11 and plots harvested September 25, 1987

[3] Weed stand counts June 11 and visual weed control ratings July 8, 1987

Evaluation of preplant incorporated herbicides in corn. Miller, S.D., J.M. Krall and K.J. Fornstrom. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of preplant incorporated herbicides treatments for weed control in corn. Plots were established under irrigation and were 9 by 30 ft with three replications arranged in a randomized complete block. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi and incorporated twice immediately after application with a roller harrow operating at 1.5 to 2 inch May 6, 1987 (air temp 75 F, relative humidity 25%, wind calm, sky clear and soil temp - 0 inch 95 F, 2 inch 74 F and 4 inch 72 F). Corn (var. Pioneer 3790) was planted in a sandy loam soil (78% sand, 13% silt and 9% clay) with 1.2% organic matter and a 7.4 pH May 7, 1987. Weed counts, crop stand counts, and visual crop injury ratings were made May 27, visual weed control ratings July 7 and grain yields determined September 25, 1987. Redroot pigweed (AMARE), hairy nightshade (SOLSA), wild buckwheat (POLCO) and yellow foxtail (SETLU) infestations were light and common lambsquarters infestations moderate throughout the experimental area.

Several treatments reduced corn stand 2 to 4% and SC-0774 at 1 lb/A injured corn 12% when applied alone or in combination with cyanazine. Corn grain yields related closely to weed control and were 19 to 28 bu/A higher in herbicide treated compared to weedy check plots. Early and mid season weed control was good to excellent with herbicide combinations containing cyanazine or atrazine. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1500.)

Weed control in corn with preplant incorporated herbicides

Treatment[1]	Rate	Corn[2]			Control[3]								
					May 27					July 7			
	Rate	injury	stand red	yield	CHEAL	AMARE	SOLSA	POLCO	SETLU	CHEAL	AMARE	SOLSA	SETLU
	lb ai/A	%	%	bu/A	%	%	%	%	%	%	%	%	%
SC-0774 + R-29148	0.75 + 0.125	3	2	195	87	100	91	33	83	82	82	78	75
SC-0774 + R-29148 + cyanazine	0.75 + 0.125 + 1.5	7	2	200	90	100	86	100	100	95	93	95	90
SC-0774 + R-29148	1.0 + 0.166	12	0	195	87	100	86	33	89	87	83	78	88
SC-0774 + R-29148 + cyanazine	1.0 + 0.166 + 1.5	12	0	193	96	100	91	100	100	99	93	100	99
EPTC + dichlormid	4.0	0	0	193	81	100	67	100	100	82	60	58	85
EPTC + dichlormid (encap)	4.0	0	0	193	87	100	100	100	100	78	60	72	87
metolachlor	2.0	0	0	193	66	100	91	33	100	80	78	78	95
alachlor	2.0	3	0	191	72	100	100	33	100	80	80	83	93
metolachlor + atrazine	1.2 + 1.0	0	0	195	96	100	100	100	100	100	100	100	100
metolachlor + atrazine	2.4 + 2.0	1	0	195	96	100	100	100	100	100	100	100	100
metolachlor + atrazine (pm)	1.2 + 1.0	0	0	200	94	100	91	100	100	100	100	100	100
metolachlor + atrazine (pm)	2.4 + 2.0	5	2	191	100	100	100	100	100	100	100	100	100
CGA-180937 + atrazine	1.2 + 1.0	0	0	193	90	100	78	100	100	100	100	100	100
CGA-180937 + atrazine	2.4 + 2.0	0	0	195	94	89	100	100	100	100	100	100	100
CGA-180937 + atrazine (pm)	1.2 + 1.0	0	2	191	94	100	87	100	100	100	100	100	100
CGA-180937 + atrazine (pm)	2.4 + 2.0	0	4	198	100	100	100	100	100	100	100	100	100
alachlor + atrazine	1.2 + 1.0	0	0	195	94	100	97	100	100	100	99	100	100
alachlor + atrazine	2.4 + 2.0	0	0	195	100	100	86	100	100	100	100	100	100
weedy check	----------	0	0	172	0	0	0	0	0	0	0	0	0
plants/ft row 6 inch band		---	1.8	---	1.0	0.4	0.5	0.1	0.4	---	---	---	---

[1] Treatments applied May 6, 1987; encap = encapsulated formulation and pm = package mix
[2] Crop stand counts and visual crop injury evaluated May 27 and plots harvested September 25, 1987
[3] Weed stand counts May 27 and visual weed control ratings July 7, 1987

Evaluation of postemergence herbicide treatments in field corn. Mitich, L.W., N.L. Smith, and G.B. Kyser. Eight herbicides in 11 treatments were evaluated for crop tolerance and effectiveness of weed control at the UC Davis Experimental Farm, Yolo County. "Gutwein 2602" corn was planted 29 May 1987. Herbicides were applied 23 June with a CO_2 backpack sprayer with 8002 nozzles at 30 psi, in a total spray volume of 20 gpa. At the time of application, corn plants were 12 to 15 inches tall, and weeds were 3 to 6 inches tall. The experimental treatments were replicated 4 times, in 10 ft by 20 ft plots (each plot containing four 30-inch rows 20 ft long), and arranged in a randomized complete block design. Corn was fertilized with excess urea (about 200 lb/A of nitrogen) when 12 to 18 inches tall. The well-distributed natural weed population included barnyardgrass (ECHCG), redroot pigweed (AMARE), and common purslane (POROL).

Treatments were evaluated 7 July, and corn was harvested 15 October. The experimental chemical SC-0735 produced adequate control (75% to 88%) of all 3 species at rates of 0.25 and 0.5 lb/A. At the higher rate, SC-0735 caused a 15% reduction in crop vigor - the highest such injury noted in this study. Tank mixes of SC-0735 + atrazine (0.25 + 1.0 and 0.5 + 1.0 lb/A) produced adequate weed control at the low rate and excellent (94% to 100%) control of all 3 species at the high rate. Though SC-0735 was again used at 0.5 lb/A in the latter treatment, the mix caused negligible (5%) reduction in crop vigor. The experimental broadleaf herbicide M-6316, at 0.125 and 0.25 oz/A, produced adequate to good (78% and 90%) control of redroot pigweed, poor control (<50%) of common purslane, no control of barnyardgrass, and negligible crop injury. A tank mix of M-6316 + 2,4-D (0.125 oz/A + 0.5 lb/A) produced similar results, as did 2,4-D applied alone at 1.0 lb/A. A tank mix of tridiphane + atrazine (0.5 + 1.0 lb/A) produced excellent control of redroot pigweed and common purslane, poor control of barnyardgrass, and no crop injury. Atrazine alone (1.0 lb/A) produced adequate control of the broadleaf species, no control of barnyardgrass, and no crop injury.

Yield showed no correspondence with injury, but appeared to correlate strongly with effectiveness of barnyardgrass control. (University of California Cooperative Extension, Davis, CA 95616)

Table. Evaluation of weed control and effect on yield for 12 postemergence treatments in corn, var. "Gutwein 2602," on the UC Davis campus, Yolo County

Herbicide	Rate (lb ai/A)	Evaluation for injury and weed control[1]				Yield (lb/A)[2], significance
		Injury	ECHCG	AMARE	POROL	
SC 0051	0.5 lb (+ 1/4% Tween 20)	0	5.8	6.8	0.8	10214 A B
SC 0735	0.25 lb (+ 1/4% Tween 20)	0.5	8.0	8.3	7.5	10107 A B
SC 0735	0.5 lb (+ 1/4% Tween 20)	1.5	8.4	8.8	7.8	10732 A
SC 0735 + atrazine	0.25 + 1.0 (+ 1/4% Tween 20)	0.5	7.6	8.3	8.5	11224 A
SC 0735 + atrazine	0.5 + 1.0 lb (+ 1/4% Tween 20)	0.5	9.4	10.0	9.5	10333 A B
M6316	0.125 oz (+ 1/4% X-77)	0	0	9.0	2.8	9241 B
M6316	0.25 oz (+ 1/4% X-77)	0.3	0.3	7.8	3.0	9199 B
M6316 + 2,4-D	0.125 oz + 0.5 lb	0	0	8.5	3.5	9200 B
tridiphane + atrazine	0.5 + 1.0 lb (+ 1 qt/A Surfel)	0	3.3	9.5	9.5	10786 A
atrazine	1.0 lb (+ 1 qt/A Surfel)	0	0.3	8.5	7.8	9070 B
2,4-D amine	1.0 lb	0	0.3	7.5	1.3	9030 B
control	-	0	0.3	0	0	9291 B

[1]Evaluated 7 March 1987 on a scale of 0 to 10, where 0 = no injury, no weed control; 10 = dead plants.
[2]Signicant difference at the 5% level; values followed by the same letter are not significantly different.

All values average of 4 replications.

Field competition study with field corn and barnyardgrass. Mitich, L.W., N.L. Smith, and G.B. Kyser. The effect of barnyardgrass competition on yield of field corn was examined for four barnyardgrass population densities and four times of infestation. "Gutwein 2605" field corn was planted 29 May 1987 at the UC Davis Experimental Farm, Yolo County. In a randomized complete block design, barnyardgrass seed was selectively sown 29 May and 6 July; barnyardgrass from the first planting was selectively removed 6 July and 28 July (see table). Soon after emergence, barnyardgrass stands were thinned to populations of 1, 6, and 18 plants/ft. Other weeds were removed by hand. Corn was fertilized with excess urea (about 200 lb/A of nitrogen) when 12 to 18 inches tall. Corn was harvested 15 October.

Moisture content, bushel weight, and dry yield were calculated. Moisture content decreased significantly toward the lower end of the field, dropping from an average of 21.0% in the first replication to 19.8% in the fourth replication. Bushel weight increased inversely, from 58.1 lb/bu in the first replication to 59.7 lb/bu in the fourth replication. These were the only significant variants for these characters.

Dry yield was significantly higher in the fourth replication than in the other three. Yield varied significantly with time of barnyardgrass removal: yield was highest for plots kept free of barnyardgrass for the first 3 weeks, followed by plots in which barnyardgrass was removed after 3 weeks. Plots in which barnyardgrass was removed after 6 weeks, or was left season-long, produced lowest yields. Population of barnyardgrass had no significant effect. (University of California Cooperative Extension, Davis, CA 95616)

Table. Effect of barnyardgrass competition, at four population densities and four lengths of infestation, on field corn, UC Davis, Yolo County

Barnyardgrass time in field	Population (plants/ft)	Yield[1] (lb/A)	Mean yield for time[2] (lb/A)
Until 3 weeks	0	10290	
Until 3 weeks	1	10469	10189
Until 3 weeks	6	9206	
Until 3 weeks	18	10790	
Until 6 weeks	0	10290	
Until 6 weeks	1	9257	9738
Until 6 weeks	6	10030	
Until 6 weeks	18	9375	
Season long	0	10290	
Season long	1	9269	9970
Season long	6	10236	
Season long	18	10087	
After 3 weeks	0	10290	
After 3 weeks	1	10848	10568
After 3 weeks	6	10350	
After 3 weeks	18	10783	

[1]Average of 4 values.
[2]Average of 16 values.

Postemergence control of annual morning-glory in cotton, Blythe California. Cudney, D. W. and Les Ede. Annual morning-glory is a serious weed pest in cotton in the low desert valleys of southern California. It emerges in seedling cotton and has been difficult to control with cultivation or the common postemergence herbicides. Dinoseb formulations had been effective when used as directed sprays at the base of the seedling cotton plants. Dinoseb is no longer available for use in cotton. This study was established to evaluate alternatives to dinoseb treatments. The following herbicides were evaluated for cotton pytotoxicity and annual morning-glory control: paraquat (.28 and .56 kg ai/ha), cyanazine plus paraquat (.56 + .28 and 1.2 + .56 kg ai/ha), cyanazine (.56 and 1.1 kg ai/ha), MSMA (2.2 kg ai/ha), MSMA plus cacodylic acid (3.4 + 1.4 and 6.8 + 2.8 kg ai/ha), cyanazine plus MSMA (1.1 + 2 kg ai/ha), and dinoseb (3.4 kg ai/ha). All treatments were made on June 16th with a constant pressure CO_2 backpack sprayer. Cotton plants were 55 to 65 centimeters in height and annual morning-glory was in the first true leaf stage. Maximum temperature during the application and evaluation period varied from 35 to 38 degrees celcius.

Damage to the bottom leaves of the cotton from the directed sprays was most severe for those treatments containing paraquat at .56 kg ai/ha and the high rate of MSMA plus cacodylic acid. The higher rate of cyanazine plus paraquat caused extensive damage to the cotton stems and leaves.

Cotton height the week after treatment was most effected by the higher rate of cyanazine plus paraquat and the higher rate of MSMA plus cacodylic acid.

The control of established morning-glory plants which were in the first true leaf stage at the time of treatment was best for the cyanazine plus paraquat, MSMA plus cacodylic acid, paraquat, cyanazine plus MSMA, and cyanazine at the higher rate.

The control of germinating morning-glory seedlings was generally better for those plots which received cyanazine alone or in combinations. This is as would be expected as cyanazine is the only herbicide in this study which has appreciable preemergence activity.

The herbicides in this test did show promise for use as replacements for dinoseb when used as directed sprays in cotton for annual morning-glory control. However, paraquat and paraquat combinations did cause some damage particularly when used at the higher rates of application to the bottom leaves of th cotton. The higher rate of MSMA plus cacodylic acid also caused lower leaf damage. (University of California Cooperative Extension, Riverside, CA 92521)

Postemergence herbicide treatments for annual morning-glory control in cotton, Blythe, CA

Treatment	Rating Kg/ha	Percent[1/] Bottom Leaf Damage	Height (cm)	Morning-glory in 3 Meters of Row Establ. Plants	Seedlings
paraquat	0.28	9.5	74.9	3.5	7.0
paraquat	0.56	21.5	74.9	2.5	8.0
cyanazine+paraquat	.56+.28	21.8	77.5	0.0	1.0
cyanazine+paraquat	1.2+.56	43.8	71.1	1.5	0.5
cyanazine	0.56	1.8	79.5	89.8	8.0
cyanazine	1.1	6.8	78.7	1.0	3.8
MSMA+cacodylic acid	3.4+1.4	7.8	76.2	2.8	6.0
MSMA+cacodylic acid	6.8+2.8	19.0	73.2	1.3	3.5
cyanazine + MSMA	1.1+2.2	6.0	78.7	1.0	3.3
MSMA	2.2	7.3	80.0	11.0	16.0
dinoseb	3.4	6.5	80.7	17.5	13.3
check		0.3	80.0	86.5	15.0
LSD .05		11.8	5.6	30.8	9.4

Annual brome control with dimethazone in chemical fallow. Dial, M.J. and D.C. Thill. Annual brome species control in chemical fallow with dimethazone was determined near Lewiston, Idaho. The experimental area had an annual brome complex comprised of downy brome (BROTE), ripgut brome (BRODI), and poverty brome (BROST). Percent control was similar among the brome species. Both fall and spring treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design replicated four times. Brome control with the fall applied herbicide treatments was evaluated on February 20. Brome control was determined visually in all treatments on April 8. Brome regrowth was evaluated visually on May 8. Application data are listed in Table 1.

Table 1. Application data

Application date	10/8/86	12/3/86	3/8/87
Air temperature (F)	71	33	50
Soil temperature (F)	65	39	60
Relative humidity (%)	35	95	95
Wind speed (mph) - direction	2-W	2-N	2-W
Soil pH	5.3		
OM	4.4		
CEC (meq/100 g soil)	21.2		
Texture	silt loam		

The most effective treatment was glyphosate/2,4-D tank mixed with pronamid (Table 2). This treatment maintained 100% control through April 1987. No dimethazone treatment effectively controlled the bromegrass complex, except dimethazone at 2 lb ai/a, which continued to control the brome complex throughout the spring (Table 2). The experimental site was seeded to winter wheat in October, 1987. Wheat will be harvested in the summer of 1988 to determine if any herbicide treatment persisted in the soil and injured the crop. (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Annual brome control and brome regrowth in chemical fallow

Treatment[1]	Rate	Date of application	Annual brome control 2/20/87	Annual brome control 4/8/87	Regrowth[2] 5/8/87
	(lb ai/a)		------(%)-----		-(%)-
dimethazone	0.25	10/86	45	26	88
dimethazone	0.50	10/86	75	55	50
dimethazone	0.75	10/86	70	60	48
dimethazone	1.00	10/86	73	64	29
dimethazone	2.00	10/86	88	88	7
dimethazone	0.25	12/86	28	54	63
dimethazone	0.50	12/86	45	64	51
dimethazone	1.00	12/86	30	73	6
glyphosate/ 2,4-D +	1.10	10/86	100	100	9
pronamide	0.25				
glyphosate/ 2,4-D	0.78	3/87	--	100	48
dimethazone +	0.25	10/86	38	23	90
chlorsulfuron	0.0078				
dimethazone +	0.50	10/86	73	54	63
chlorsulfuron	0.0078				
dimethazone +	0.25	10/86	33	15	60
chlorsulfuron	0.0156				
dimethazone +	0.5	10/86	73	56	58
chlorsulfuron	0.0156				
glyphosate/ 2,4-D +	0.78	3/87	--	91	26
chlorsulfuron+	0.0156				
R-11	0.25%				
check	---	---	--	--	100
weed density (no./ft^2)			40	35	
LSD (0.05)			18	23	29

[1]R-11 is a nonionic surfactant, concentration is expressed as % v/v.

[2]Regrowth is compared to the check.

Testing herbicides for skeletonweed (Lygodesmia juncea) control on fallow land. Fay, P.K. and E.S. Davis. Skeletonweed is a perennial weed that is becoming troublesome in some parts of Montana on land that is being chemically fallowed. Seven herbicides were applied on fallow land on September 10, 1986. The herbicides were applied (Table) with a Co_2-pressurized backpack sprayer to 11 by 25 foot plots in Willow Creek, MT. The herbicides were applied at 40 psi in 10 gpa. There were 3 replications. The number of skeletonweed plants per plot was counted on May 12 and June 30, 1987.

All of the herbicides tested except 2,4-D DPD ester reduced the population of skeletonweed on May 12, 1987. Picloram, clopyralid, HiDep, MCPA isooctyl ester, and 2,4-D LVE were most effective. The only treatments which continued to provide control by June 30, 1987 were picloram and the highest rate of clopyralid. Many of the other treatments did provide significant control, however, the skeletonweed populations were still quite high. (Montana Agric. Exp. Sta., Bozeman, MT 59717.)

The number of skeletonweed plants per plot following a fall application of herbicides in Willow Creek, MT.

Herbicide	Rate	Skeletonweed Plants per Plot 5-12-87	Skeletonweed Plants per Plot 6-30-87
	lb/A		
2,4-D low volatile ester	1.00	14	65
2,4-D low volatile ester	2.00	5	26
MCPA isooctyl ester	1.00	16	32
MCPA isooctyl ester	2.00	5	45
Clopyralid	0.25	8	26
Clopyralid	0.50	2	3
Picloram	0.25	1	6
Dicamba	0.25	43	86
HiDep	1.0	3	52
HiDep	2.0	16	40
2,4-D DPD ester	1.0	57	81
2,4-D DPD ester	2.0	22	62
Control	---	83	116
LSD .05		28	55

Spring herbicide applications in chemical fallow. Lish, J.M. and D.C. Thill. Early season weed control was evaluated in chemical fallow at Lewiston, Idaho. Herbicides were applied to standing stubble with a CO_2 pressurized backpack sprayer delivering 10 gal/a at 42 psi. Treatments were applied April 6, 1987, except glyphosate and paraquat + chlorsulfuron were applied April 7. Downy brome (BROTE) and volunteer wheat (TRIAE) had one to four tillers and density averaged 10 plants per ft^2. The experimental design was a randomized complete block with four replications and plots were 10 by 30 ft. Application data are in Table 1. TRIAE and BROTE were evaluated visually on May 11.

Table 1. Application data for herbicide treatments in fallow

Application date	April 6	April 7
Air temperature (F)	61	55
Soil temperature at 2 in. (F)	51	51
Relative humidity (%)	71	80

Glyphosate/2,4-D and Mon 8783 controlled both TRIAE and BROTE (Table 2). Control of both species was ineffective with paraquat and paraquat/diuron. Hoe 704 appears to be more effective on TRIAE than on BROTE; however, at 1.786 lb ai/a, control of both species was good. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. BROTE and TRIAE control in chemical fallow

Treatment	Rate	Formulation	BROTE	TRIAE
	(lb ai/a)		(% of check)	
Paraquat[1]	0.28	1.5SC	78	25
Paraquat[1]	0.47	1.5SC	52	33
Paraquat/diuron[1]	0.56	3 SC	79	70
Paraquat/diuron[1]	0.38	3 SC	66	56
Paraquat/diuron[2]	0.38	3 SC	68	75
Glyphosate[1]	0.38	3 SC	71	84
Glyphosate/2,4-D	0.75	2.5SC	90	91
Paraquat +	0.28 +	1.5SC	54	41
metsulfuron[1]	0.0039	60 DF		
Paraquat +	0.28 +	1.5SC	47	43
chlorsulfuron[1]	0.0078	75 DF		
Paraquat/diuron +	0.38 +	3 SC	72	66
metsulfuron[1]	0.0039	60 DF		
Paraquat/diuron +	0.38 +	3 SD	59	39
chlorsulfuron[1]	0.0078	78 DF		
Paraquat +	0.28	1.5SC	81	61
2,4-D ester[1]	0.5	3.8EC		
Paraquat/diuron +	0.38	3 SC	75	50
2,4-D ester[1]	0.5	3.8EC		
Paraquat +	0.28 +	1.5SC	71	71
fluazifop[1]	0.125	1 EC		
Glyphosate/2,4-D	0.53	1.7SC	86	90
Mon8783	0.41	1.6SC	93	98
Glyphosate/2,4-D +	0.53 +	1.7SC	86	99
chlorsulfuron	0.0078	75 DF		
Glyphosate/2,4-D +	0.53 +	1.7SC	88	99
metsulfuron	0.0039	60 DF		
Mon 8783 +	0.41 +	1.6SC	92	100
chlorsulfuron	0.0078	75 DF		
Mon 8783 +	0.41 +	1.6SC	86	100
metsulfuron	0.0039	60 DF		
Hoe 704	0.893	1.7EC	60	95
Hoe 704	1.786	1.7EC	89	95
Hoe 86601	0.893	1.7EC	41	16
Hoe 704 +	0.893 +	1.7EC	85	82
2,4-D amine	0.75	3.8WS		
Hoe 704 +	0.893 +	1.7EC	81	91
Hoe 86601	0.893	1.7EC		
Hoe 704 +	0.893 +	1.7EC	74	69
Hoe 86601 +	0.893 +	1.7EC		
2,4-D amine	0.75	3.8WS		
		LSD (0.05)	25	28

[1]Applied with Land O' Lakes nonionic surfactant at 0.5% v/v
[2]Applied with Transbas additive at 0.5% v/v

Germination, seedling survival and seedling vigor of field bindweed as influenced by soil applied metsulfuron. Mashhadi, H.R. and J.O. Evans. Previous field studies have indicated that metsulfuron at rates up to 70 g/ha does not have activity on established field bindweed (Convolvulus arvensis L.). We conducted a greenhouse study to determine the activity of metsulfuron on field bindweed seedlings. Acid scarified field bindweed seeds were planted in 1/2 liter plastic pots containing 2:1:1 soil:sand: vermiculite mixture. There were 10 seeds per pot. Immediately after planting the pots, they were sprayed with 0, 8.8, 17.5, 35.0 and 70.0 g/ha metsulfuron using a laboratory precision sprayer. The pots were irrigated with 50 ml of water after spraying and as needed thereafter. Seedlings were evaluated for percent germination and vigor reduction 10 and 21 days after planting. There were four replications and the results were analyzed in a split plot design.

Metsulfuron did not affect germination of field bindweed seed but many seedlings in metsulfuron treated soil soon became chlorotic and died. Germination, seedling survival and seedling vigor of field bindweed is shown in Figure 1 and 2. There were no significant differences among 17.5, 35 and 70 g/ha treatments in seedling vigor reduction or seedling survival, but 8.8 g/ha caused less injury to bindweed seedlings than higher rates. (Utah State University, Logan, UT 84322-4820)

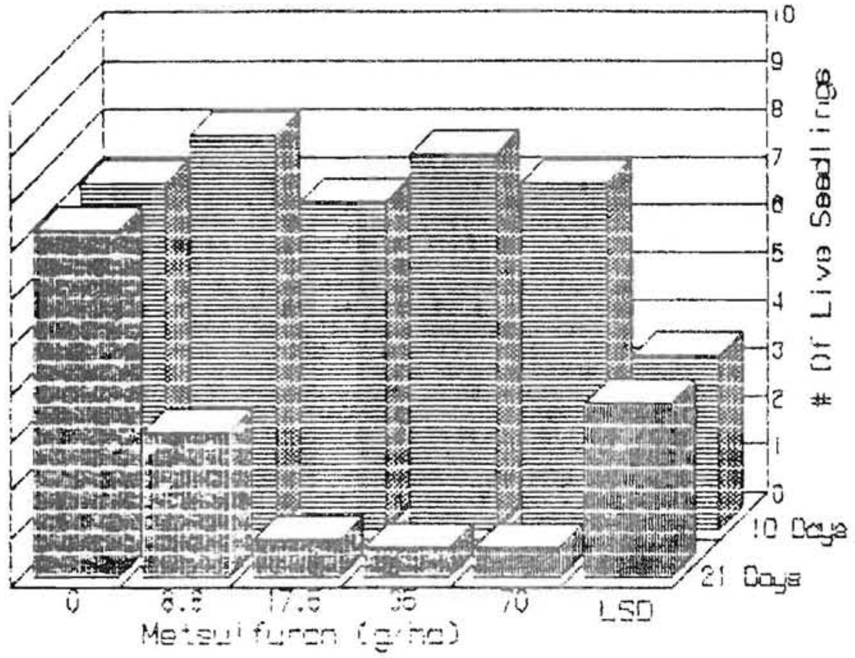


Figure 1. Effect of soil applied metsulfuron on seed germination (10 days after planting) and seedling survival (21 days after planting) of field bindweed.

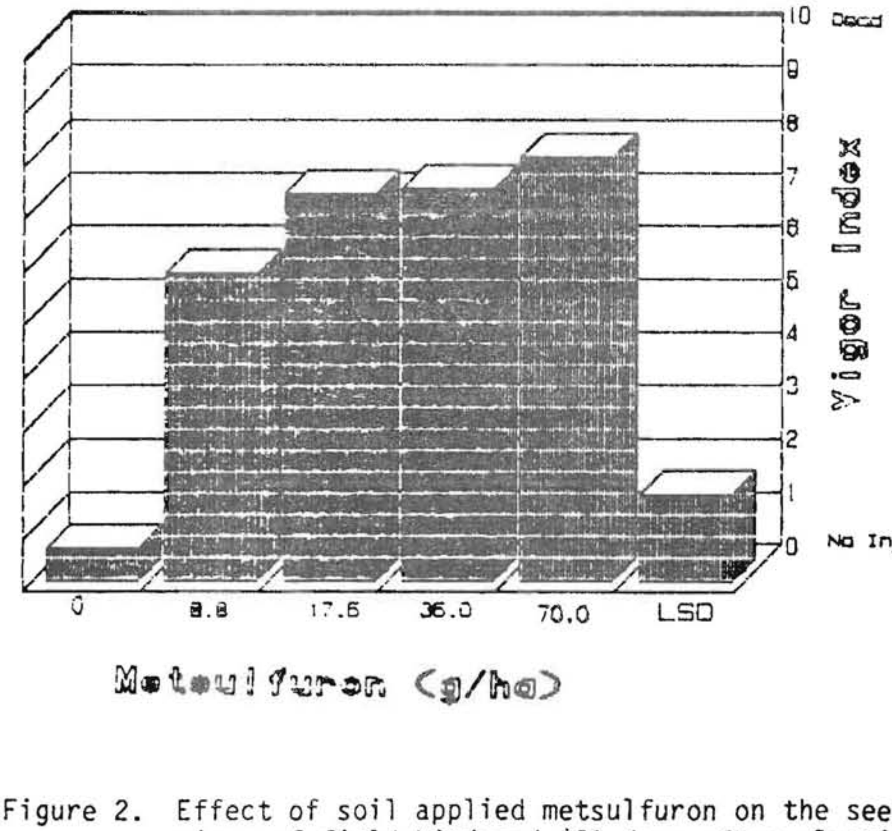


Figure 2. Effect of soil applied metsulfuron on the seedling vigor of field bindweed (21 days after planting).

Residual effect of metsulfuron applied during the fallow year on barley and lentils. Mashhadi, H.R. and J.O. Evans. Metsulfuron is a promising herbicide for weed control during the fallow year before planting small grains. Higher rates of metsulfuron can control or suppress perennial broadleaves which are usually troublesome in fallow fields. A study was conducted to determine safety of metsulfuron applied at three timings during the fallow season on fall planted barley crop. Field plots were established in Cache County, Utah, on silty loam soil, pH 8.2 and 1.32% organic matter. Metsulfuron at four rates, 0, 23, 47, 70 g/ha was applied with a boom type hand-held sprayer calibrated to deliver 70 L/ha at 200 kilo pascals (30 psi). Plot size was 2.4 x 6.1 m with four replications. Treatments were made on June 27, July 28 and September 14 during the summer of 1985. Approximately 8-10 kg soil samples from the top 30 to 50 cm of the middle of each plot were collected on September 25 corresponding to the date when small grains are usually planted in the area. Each soil sample was completely mixed and were potted in 1/2 liter plastic pots. Six pots were prepared from each soil sample; 3 of the pots were planted to barley (var. Steptoe) and the other 3 to lentils. There was one plant per pot. Plants were grown in greenhouses with 16-hr. natural and supplemental high pressure sodium lights (300 umoles m^{-2} s^{-1}). The greenhouse was kept at 26/18^{o}C ($\pm$ 4^{o}C) day/night temperature. The plants were watered with 100 ppm Peters 20-20-20 fertilizer as needed. Pots were irrigated carefully to reduce drainage and possible washout of the herbicide. Twenty-five days after planting plants were cut at soil level and their heights and fresh weights of the above ground parts were measured.

Results showed unacceptable injury resulted from metsulfuron treatments. Slightly higher injury to both barley and lentils were observed by shortening the time intervals between herbicide treatment and planting, but the increased injury was not statistically significant, thus the results of all treatment timings were pooled and shown in Figures 1 to 4. Metsulfuron decreased lentil weight and height. Higher dosages of metsulfuron caused reduction of both lentil weights and heights, but they were not statistically significant. Barley heights and lengths also decreased significantly from the result of metsulfuron treatment. (Utah State University, Logan, UT 84322-4820)

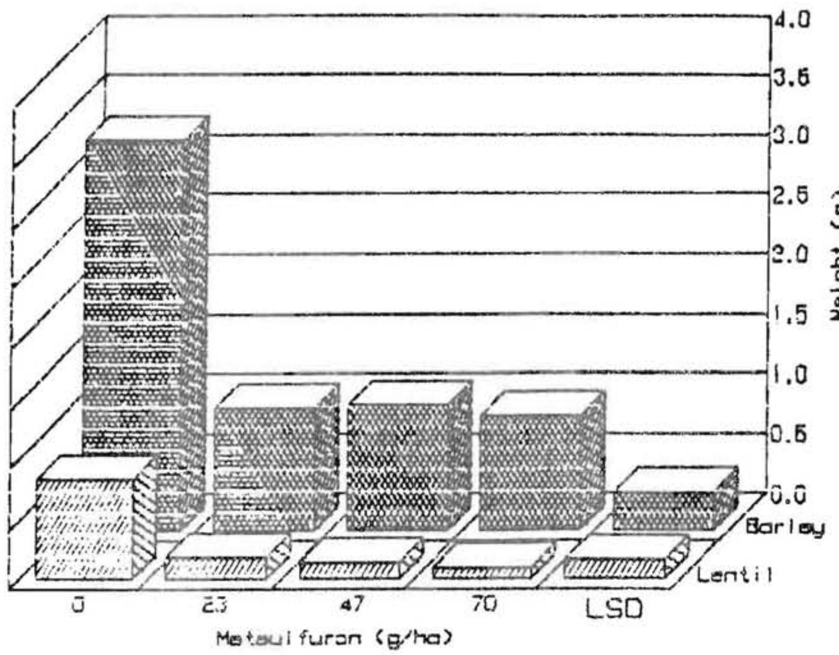


Figure 1. Barley and lentil fresh weight as influenced by different rates of metsulfuron.

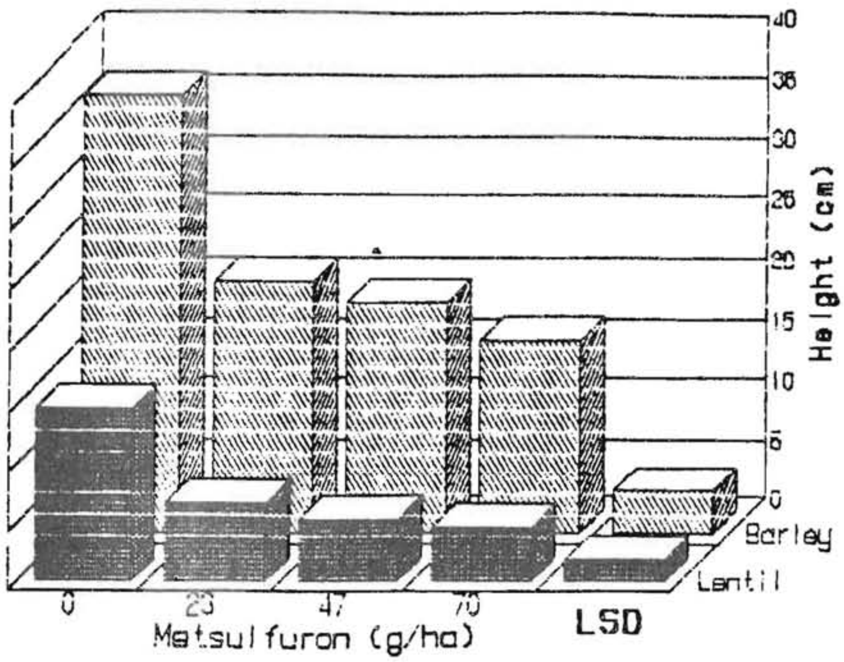
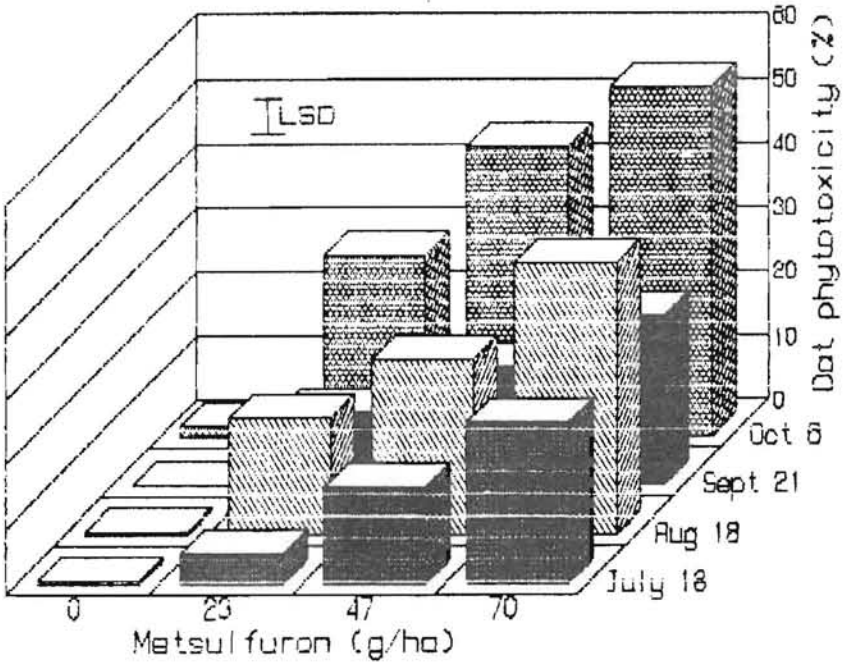


Figure 2. Barley and lentil height as influenced by different rates of metsulfuron.

Spring oats response to metsulfuron treatment during the fallow year. Mashhadi, H.R. and J.O. Evans. Metsulfuron and other sulfonyl urea herbicides can be used to control many annual broadleaf weeds during the fallow year. High rates of metsulfuron may control or suppress many perennial broadleaves. A study was conducted to determine the safety of metsulfuron applied at four timings during the fallow year on spring oats planted the year after treatment. Field plots were established in Smithfield, Utah on silty clay loam soil, pH 8.2 and 2.76% organic matter. Metsulfuron at four rates 0, 23, 47, and 70 g/ha were applied with a boom-type hand-held sprayer calibrated to deliver 70 L/ha at 200 kilo pascals (30 psi). Plot size was 2.4 x 6.1 m with four replications. Treatments were made on July 18, August 23, September 21 and October 6 during the summer of 1985.

Spring oats (*Avena sativa* L.) were planted over the plots with a conventional grain drill. Oat plants were evaluated visually at boot stage for percent crop injury based on plant vigor and height compared to control plants.

Results showed an unacceptable injury to spring oats from all metsulfuron treatments. Higher rates of metsulfuron caused greater injury to crop. Metsulfuron treatment at early fall (Oct. 6, 1985) caused considerably more injury than earlier treatments. Injured oat plants were severely stunted and chlorotic. The plants completed their life cycles but did not recover from the herbicide injury. (Utah Agricultural Experiment Station, Logan, UT 84322-4820).



Residual effect of metsulfuron applied at four timings during the fallow year on spring oats.

Evaluation of postemergence herbicide treatments in fallow. Miller, S.D. Research plots were established at the Archer Research and Extension Center, Archer, WY, to evaluate the efficacy of herbicide treatments for weed control in fallow when applied postemergence. Plots were 9 by 30 ft with three replications arranged in a randomized complete block. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi April 23, 1987 (air temp 75 F, relative humidity 30%, wind SW at 2 to 5 mph, sky clear and soil temp - 0 inch 94 F, 2 inch 72 F and 4 inch 64 F) to 4 to 6 leaf volunteer barley and 2 to 4 tiller downy brome. The soil was classified as a loam (45% sand, 29% silt and 26% clay) with 1.1% organic matter and a 7.3 pH. Visual weed control evaluations were made July 7, 1987. Downy brome (BROTE) and cutleaf nightshade (SOLTR) infestations were heavy and kochia (KCHSC), Russian thistle (SASKR), volunteer barley (HORVL) and skeletonleaf bursage (FRSTO) infestations moderate throughout the experimental area.

Broad-spectrum weed control was excellent with AC-263,499 combinations with glyphosate or glyphosate plus pendimethalin. In addition, HOE-00661 combinations with cyanazine provided excellent control of all weed species except skeletonleaf bursage and glyphosate combinations with CGA-131036 provided excellent control of all weed species except cutleaf nightshade. AC-263,499 and CGA-131036 treatments exhibited excellent activity on skeletonleaf bursage. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1514 .)

Evaluation of postemergence herbicide treatments in fallow

Treatment[1]	Rate lb ai/A	Control[2] BROTE %	HORVL %	KCHSC %	SASKR %	SOLTR %	FRSTO %
HOE-00661 + cyanazine	0.5 + 2.0	96	99	100	100	100	13
HOE-00661 + cyanazine	0.75 + 2.0	99	100	100	100	100	13
HOE-00661 + terbutryn + s	0.5 + 1.6	70	87	87	87	70	0
HOE-00661 + terbutryn + s	0.75 + 1.6	78	86	92	93	72	0
HOE-00661 + FMC-57020	0.5 + 0.5	89	90	97	97	73	53
HOE-00661 + FMC-57020	0.75 + 0.5	88	93	97	97	87	63
glyphosate + pendimethalin + s	0.38 + 1.5	88	92	97	92	13	0
glyphosate + pendimethalin + s	0.38 + 2.0	90	90	93	90	33	0
glyphosate + AC-263,499 + s	0.38 + 0.031	98	99	100	100	100	88
glyphosate + AC-263,499 + s	0.38 + 0.062	99	100	100	100	100	96
glyphosate + AC-263,499 + s	0.38 + 0.125	99	99	100	100	100	98
glyphosate + pendimethalin + AC-263,499 + s	0.38 + 1.5 + 0.031	99	99	100	100	100	90
glyphosate + FMC-57020 + s	0.38 + 0.5	98	98	100	88	82	43
glyphosate + CGA-131036 + s	0.38 + 0.016	98	98	100	100	0	95
glyphosate + pendimethalin + CGA-131036 + s	0.38 + 1.5 + 0.016	97	99	100	100	30	93
terbutryn + CGA-131036 + s	1.6 + 0.016	62	80	97	97	70	93
terbutryn + pendimethalin + CGA-131036 + s	1.6 + 1.5 + 0.016	77	93	100	100	77	95
CGA-131036 + s	0.016	0	0	100	100	0	93
CGA-131036 + 2,4-D + s	0.016 + 0.5	0	0	100	100	82	92
weedy check	-----------	0	0	0	0	0	0

[1] Treatments applied April 23, 1987; s = X-77 at 0.25% v/v
[2] Plots visually evaluated July 7, 1987

Efficacy and lentil tolerance of pyridate and pyridate / methazole. Prather T. S., R. H. Callihan, R. L. Lopez, and D. C. Thill. The purpose of this study was to evaluate tolerance of lentils (*Lens culinaris* Medik. var. Chilean), to pyridate and to evaluate efficacy on common lambsquarters (*Chenopodium alba* L.) (CHEAL) and field pennycress (*Thlaspi arvense* L.) (THLAR). The experimental design was a randomized complete block with three replications. Herbicides were applied on May 22, 1987. To avoid crop injury, herbicide application was delayed until average lentil height was 3 inches. Therefore the herbicides were applied beyond the optimum time for weed control. At the time of application CHEAL had 8 leaves and a density of 21.2 plants/m^2; THLAR had 8 to 10 leaves and a density of 72 plants/m^2. Environmental and application data are summarized in Table 1.

The treatments were evaluated for lentil tolerance and weed efficacy on June 8, 1987. Evaluative criteria was plant density and the data are summarized in Table 2. There were no significant differences in the density of lentils between any treated and untreated plots. No other crop injury symptoms were observed. CHEAL and THLAR control were unacceptable, the best treatment being 2.2 lb ai/a pyridate+methazole at 82% and 35% of check, respectively. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Table 1. Application conditions at Troy, Idaho.

Date	May 22, 1987
Method of application	Broadcast
Time of day	1430
Air temp (C)	18
Soil temp @ 2" (C)	28
Relative humidity (%)	50
Cloud cover (%)	25
Wind (km/hr)	3-7
Dew present	no
Soil surface: moisture	dry
clods	small
Volume of carrier (gpa)	22
Nozzle size	8002
Boom pressure (psi)	40

Table 2. Lentil and weed biomass.

Treatment	Rate	Lentils	CHEAL	THLAR
	(lb ai/a)	--------(% of check)--------		
Pyridate	0.45	98.3	100.0	66.7
Pyridate	0.90	96.7	103.3	100.0
Pyridate	1.35	100.0	93.3	50.0
Pyridate/ Methazole	1.30	96.7	96.7	85.0
Pyridate/ Methazole	1.80	96.7	100.0	98.3
Pyridate/ Methazole	2.20	96.7	81.7	35.0
$LSD_{0.05}$		7.6	15.7	42.4

Weed control in spring peas. Prather, T. S., R. H. Callihan, and D. C. Thill. This study was undertaken to determine the efficacy of herbicides alone and combined with preplant incorporated herbicides currently registered for use in spring peas. Plots were located at Moscow, Idaho in a field which had been fallowed the previous year. The field was seeded on May 20, 1987 to a spring pea variety, SuperAlaska, at a seeding rate of 170 pounds per acre in seven inch rows and two inches deep. The design of the study was a split plot randomized complete block with four replications. Main plot treatments were 20 feet by 140 feet, subplot treatments were 10 feet by 20 feet. Main plot treatments were soil incorporated herbicides currently registered for use in dry spring peas: trifluralin (Treflan) and triallate (Fargo). Subplot treatments were bentazon (Basagran), pyridate (Tough), chloramben (Amiben DS), ethiozine (Tycor), imazethapyr (Pursuit), metribuzin (Lexone), and lactofen (Cobra). Application data are summarized in Table 1. Post emergence treatments were applied at the following stage of the weeds: *Anthemis cotula* (ANTCO) - 6 leaves, *Amaranthus retroflexus* (AMARE) - 5 leaves, *Thlaspi arvense* (THLAR) - 4 to 6 inches and flowering, *Solanum sarrachoides* (SOLSA) - 5 leaves.

Table 1. Application conditions at Moscow, Idaho.

Date applied	4/16[1]	4/28[2]	4/28[3]	5/20[4]
Method of application	Broadcast	Broadcast	Broadcast	Broadcast
Time of day	1400	0700	1400	0600
Air temp (C)	20	20	30	8
Soil temp @ 2" (C)	16	16	27	9
Relative humidity (%)	-	10	24	62
Cloud cover (%)	0	10	80	1
Wind (km/hr)	2	5-10	3	0
Dew present	no	no	no	no
Soil surface: moisture	dry	dry	dry	dry
clods	large	small	small	small
Volume of carrier (gpa)	22	22	22	22
Nozzle size	8001	8002	8002	8002
Boom pressure (psi)	40	40	40	40

[1]Main plot incorporated treatments, incorporation depth - 2 inches.
[2]Pre-emergent treatments.
[3]Treatments applied at this time were lactofen and imazethapyr.
[4]Postemergent treatments.

The herbicides did not decrease pea density which averaged 148 plants/m^2. Visual evaluation of injury indicated an initial 50 to 60% decrease in height after application of 0.125 lb ai/a and 0.200 lb ai/a lactofen. The plants in these treatments were also chlorotic. Chlorosis was not visually discernable after two weeks; the decrease in height of the pea plants in the lactofen treated plots was not visually discernable one month after emergence. No other injury was visually observed in any other treatments.

Weed control was evaluated on June 1, 1987. The evaluative criteria were density of peas and weeds. Weed species were not separated according to species because of distribution problems across the field; the sum of all weed plants per plot were analyzed using an analysis of variance procedure. Data are summarized in Table 2. Data are presented for subplot treatments only because main plot treatments were not significant at alpha=0.05. Table 2 shows that the only treatment that was significantly different from the main plot treatment check was 0.2 lb ai/a lactofen (3.4 vs. 1.75 plants/0.25 m^2, respectively). Herbicides that had significantly lower weed densities than the untreated check were 3.0 lb ai/a chloramben (1.97), 0.06 lb ai/a imazethapyr (2.11), 0.125 lb ai/a lactofen (2.18), 0.38 lb ai/a metribuzin (2.33), 0.03 lb ai/a imazethapyr (2.61), 0.75 lb ai/a ethiozine (2.62), and 2.0 lb ai/a chloramben (2.86).

Table 2. Weed control[1].

Herbicide	Rate	Weed density[2]
	(lb ai/a)	
lactofen	0.20	1.75 a
chloramben	3.00	1.97 ab
imazethapyr	0.06	2.11 abc
lactofen	0.125	2.18 abc
metribuzin	0.38	2.33 abcd
imazethapyr	0.03	2.61 abcde
ethiozine	0.75	2.62 abcde
chloramben	2.00	2.86 abcde
pyridate	1.35	3.34 bcdef
treatment check		3.40 bcdef
pyridate	0.45	3.57 cdef
pyridate	0.90	3.80 def
bentazon	1.00	3.84 ef
untreated check	----	4.44 e
$LSD_{0.05}$		1.49

[1]Expressed as density of weeds per 0.25 meter quadrat after a square root transformation.
[2]Weed densities followed with the same letter are not significantly different at alpha=0.05, LSD=1.49.

Plots were harvested on August 10, 1987 with a Hege small plot combine. The area harvested per plot was 72 ft^2. There were no treatments with significantly higher yield than the untreated check; the only treatment that yielded significantly less than the untreated check was 0.125 lb ai/a lactofen (Table 3). There were no yield differences between main plot treatments.

Table 3. Pea yield.

Herbicide	Rate	Yield
	(lb ai/a)	(lb/a)
chloramben	3.0	1028 a
chloramben	2.0	974 ab
untreated check	---	972 ab
metribuzin	0.38	947 ab
pyridate	0.45	936 ab
imazethapyr	0.06	925 ab
bentazon	1.00	913 ab
ethiozine	0.75	910 ab
imazethapyr	0.03	891 ab
pyridate	1.35	871 bc
lactofen	0.20	866 bc
Treatment check[1]	----	846 bc
pyridate	0.90	845 bc
lactofen	0.125	747 c
$LSD_{0.05}$		137

[1]Main plot treatment rates were 0.75 lb ai/a trifluralin and 1.25 lb ai/a triallate

Differences in the yield of peas were not detected.This may have been due to the high rainfall in June and July. High soil moisture resulted in a very competitive crop, therefore the overall effect of weeds was not as pronounced as in years of lower late spring and early summer rainfall. The only treatment that impacted yield was the 0.125 lb ai/a lactofen treatment, which yielded significantly lower than the untreated check. The chloramben treatment at 3.0 lb ai/a resulted in the best combination of weed control (1.97 $(weeds/meter)^{1/2}$) and crop yield (1028 lb/a). (Idaho Agriculture Experiment Station, Moscow, Idaho 83843)

Control of common dandelion in peppermint with fall application of clopyralid. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Common dandelion is a persistent weed problem in peppermint. Clopyralid causes less crop injury when applied in the fall prior to dormancy than in the spring. The purpose of this research was to evaluate rates of clopyralid for control of large established dandelions. Two trials were conducted in western Oregon, one in Linn County and the other in Lane County. A randomized complete block design with three replications and 2.5 m by 6 m plots was used. Spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. The clopyralid was applied on September 22, 1986 and visual evaluations were conducted in February. The dandelions were up to 30 cm in diameter and the peppermint was 10 cm tall when treated. The soil type at both locations was silt loam.

Dandelion control was about equal among all rates at the Linn County site, but the lowest rate was obviously less effective at the Lane County site (see table). No peppermint injury occurred at either location. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Dandelion control in western Oregon peppermint with fall applications of clopyralid

Clopyralid rate	Dandelion control		Peppermint injury	
	Linn County	Lane County	Linn County	Lane County
(kg/ha)	(%)			
0.14	87	67	0	0
0.21	85	94	0	0
0.28	82	95	0	0
0	0	0	0	0

Peppermint tolerance to urea-sulfuric acid and herbicides. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. A product which is a derivative of urea and sulfuric acid is marketed for desiccating peppermint for rust control. This product also desiccates many small broadleaf weeds, but does not provide satisfactory weed control by itself. This trial was conducted to evaluate peppermint tolerance to tank-mixes of urea-sulfuric acid with terbacil and bentazon, two herbicides used in peppermint. The trial was a randomized complete block with three replications and 2.5 m by 6 m plots. The soil was a sandy loam with a 2.0% organic matter content and a 5.2 pH. Spray volume was 156 L/ha delivered at 345 kPa through 8006 flat fan nozzle tips.

Treatments were applied on April 14, 1987 to peppermint that was 1 to 3 cm tall. Final visual evaluations were made on June 8 and the peppermint was harvested on August 6 (see table). Although the urea-sulfuric acid treatments completely desiccated the emerged peppermint, considerable regrowth had occurred by June 8. However, the plots that received the tank-mix with bentazon produced less growth, and when harvested yielded less foliage fresh weight and oil that did the other treatments. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Peppermint injury, foliage fresh weight, and oil yield following applications of urea-sulfuric acid and herbicides

Treatment	Rate	Injury	Foliage fresh weight	oil
	(kg/ha)	(%)	(t/ha)	(kg/ha)
urea-sulfuric	78 L/ha	37	24.7	70
terbacil + urea-sulfuric	1.3 + 78 L/ha	43	23.9	77
bentazon + urea-sulfuric	1.1 + 78 L/ha	60	17.3	57
terbacil	1.3	0	25.5	74
bentazon	1.1	0	27.6	83
check	0	0	26.6	74
			$LSD_{(.05)}$=5.7	n.s.

Annual grass control in field potatoes, 1987. Arnold, R.N, E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 at the Agricultural Science Center to evaluate the response of Sangre potatoes and annual grasses to herbicides. The experimental design was a randomized complete block with four replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 30 gal/A at 25 psi. Postemergence treatments were applied May 26, 1987 with a COC at 1 qt/A. Preemergence surface applied treatments were applied April 24, 1987 and immediately incorporated with 0.75 in a sprinkler applied water. The preplant incorporated treatment was applied April 16, 1987 and immediately incorporated to a depth of 2 to 3 in with a tractor driven spike-tooth harrow and rolling cultivator. Weed species were planted on April 24, 1987 at 1.0 lb/A in separate rows 34 in apart on each side of the potato row with a cone seeder.

Visual control and crop injury evaluations were assessed June 16, 1987. All treatments gave excellent control of green foxtail and barnyardgrass. Metribuzin applied preemergence surface at 1.0 lb ai/A was the only treatment to cause any noticeable crop injury. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Annual grass evaluations in field potatoes, 1987

Treatment	Timing [1]	Rate lb ai/A	Crop [2] Injury	Weed Control [2] Bygr	Weed Control [2] Grft	Marketable Yield
				-------%-------		cwt/A
metribuzin	PES	0.5	0	100	100	445
trifluralin	PPI	1.0	0	100	100	465
metribuzin	PES	1.0	8	100	100	390
haloxyfop	POST	0.25	0	100	100	460
fluazifop	POST	0.25	0	100	100	466
sethoxydim	POST	0.28	0	100	100	472
haloxyfop	POST	0.13	0	100	92	460
fluazifop	POST	0.13	0	100	94	472
sethoxydim	POST	0.14	0	100	90	461
check			0	0	0	275
handweeded check			0	100	100	456

[1] PES = preemergence surface, PPI = preplant incorporated, and POST = postemergence.

[2] Based on a visual scale from 0-100, where 0 = no control or crop injury and 100 = dead plants.

Broadleaf weed control in field potatoes, 1987. Arnold, R.N., E.J. Gregory and D. Smeal. Research plots were established on April 16, 1987 at the Agricultural Science Center to evaluate the response of Sangre potatoes and annual broadleaf weeds to potatoes. The experimental design was a randomized complete block with four replications. Individual plots were 4, 34 in rows 30 ft long. Treatments were applied with a C02 backpack sprayer calibrated to deliver 30 gal/A at 25 psi. Preemergence surface applied treatments were applied April 24, 1987 and immediately incorporated with 0.75 in of sprinkler applied water. Preplant incorporated treatments were applied April 16, 1987 and immediately incorporated to a depth of 2 to 3 in with a tractor driven spike-tooth harrow and rolling cultivator. Weed species were planted on April 24, 1987 at 1.0 lb/A in separate rows 34 in apart on each side of the potato row with a cone seeder.

Visual weed control and crop injury evaluations were assessed June 16, 1987. All treatments provided excellent control of prostrate pigweed and kochia. Russian thistle control was good to excellent with all treatments except pendimethalin applied preemergence surface at 1.0 lb ai/A. Fluorochloridone applied preemergence surface at 0.25 and 0.5 lb ai/A did cause a slight yellowing effect of the uppermost leaves, but did not cause a substantial loss in potato yield. (Agricultural Science Center, New Mexico State University, Farmington, N.M. 87499)

Broadleaf weed control evaluations in field potatoes, 1987

Treatment	Timing[1]	Rate lb ai/A	Crop[2] Injury	-----Weed Control[2]----- Prpw	Kocz	Ruth	Crop Yield
				---------%-------------			cwt/A
fluorochloridone	PES	0.25	10	100	100	87	450
fluorochloridone	PES	0.5	12	100	100	96	370
metribuzin	PES	0.5	0	100	93	92	452
trifluralin + metolachlor	PPI	0.75 + 1.5	0	100	94	93	375
trifluralin + EPTC R-33865	PPI	0.75 + 3.0	0	100	95	94	420
metolachlor + metribuzin	PES	2.0 + 0.25	0	100	97	95	435
pendimethalin + metribuzin	PES	1.0 + 0.25	0	100	100	97	423
pendimethalin	PES	1.0	0	100	97	60	300
check			0	0	0	0	150
handweeded check			0	100	100	100	428

[1]PES = preemergence surface and PPI = preplant incorporated.

[2]Based on a visual scale form 0-100, where 0 = no control or crop injury and 100 = dead plants.

<u>Annual weed control in potatoes</u>. Haderlie, L.C. Preplant incorporated (PPI), preemergence (PRE), and combinations of preemergence and postemergence (Post) herbicide treatments were evaluated for annual weed control in potatoes. The experiment was conducted at the Research and Extension Center, Aberdeen, Idaho in 1984 on a Declo loam with pH 7.99 and 1.4% organic matter.

Randomized complete block design with four replications per treatment and plots 12 by 42.5 ft (3.7 by 13 m) were used. Russet Burbank potatoes were planted on May 9 and 10, 1984. Potatoes were hilled up on May 14, 1984.

All herbicide treatments were applied with a compressed-air, field plot sprayer mounted on a tractor. The sprayer delivered 17.5 gpa (164 L/ha) carrier, at 28 psi (193 kPa) with TJ11002 nozzles spaced 18 inches (45.7 cm) apart on a 12 ft (3.7 m) boom.

The PPI treatments (EPTC) were incorporated by double discing within 15 min. of spraying on 8 May 84. Early preemergence treatments were made on 17 May 84 and were incorporated by supplying 0.4 inches of irrigation water on 22 May. Late preemergence treatments were sprayed 4 June 84 and received 0.6 inches of water on 6 June 84. Early post treatments (or layby) were applied on 19 June 84.

The predominant weeds present at the first evaluation on 19 June 84 were green foxtail and common lambsquarters. Redroot pigweed was present but less uniform. Hairy nightshade was scattered through the field but not uniform enough to evaluate.

Good early weed control (90% or better) of both foxtail and lambsquarters was achieved with EPTC + PPP-1013 at 3.0 + 0.15 lb a.i./A and from the split application treatments of metribuzin + alachlor at 0.38 + 2.5 lb a.i./A applied early preemergence followed by metribuzin + EPTC at 0.38 + 3.0 lb a.i./A applied early postemergence (Table 1). The other two split application treatments with EPTC at 3.0 lb a.i./A applied PPI followed late preemergence by either alachlor at 2.0 lb a.i./A or pendimethalin at 1.0 lb a.i./A + metribuzin at 0.38 lb a.i./A also gave excellent weed control. This good control lasted through the season (Table 2).

Ethalfluralin treatments in all cases gave good control of less than 60% of both species. Lactofen at 0.25 lb a.i./A and PPG-1013 at 0.2 lb a.i./A controlled 48 and 50%, respectively, of the foxtail. PPG-1013 did, however, control 97% of the lambsquarters present while lactofen gave 75% control.

No injury was observed to potatoes by any treatment. Weed control within a treatment (among replications) was variable except for the three treatments receiving preplant or early preemergence application and an additional application later. Even treatments that typically have given over 90% weed control in several experiments looked poor in this study. One possible reason is the amount of water used to incorporate the chemicals from rain or irrigation. Generally, more water for soil incorporation has been used in experiments where weed control has been excellent. In summary, where weed densities were very high as in this experiment, excellent weed control can be obtained by using early and later herbicide treatments.

Tuber yields were highest in treatments giving 90% weed control for all weeds (Table 3). (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. Weed control as evaluated on 19 June and 18 July following preplant (PPI), early preemergence (EPre), late preemergence (LPre), and early postemergence (Post) or layby herbicide treatments to potatoes at Aberdeen, Idaho in 1984. Data are means of four replications (Haderlie & Petersen).

	Chemical	Formulation	Rate Lb a.i./A	How applied	Weed Control June 19, 1984 Green Foxtail	June 19, 1984 Lambs-quarters	July 18, 1984 Green Foxtail	July 18, 1984 Lambs-quarters
					%			
1.	untreated (weedy)			--	0	0	0	0
2.	untreated (hand Weeded)			--	100	100	100	100
3.	EPTC	7 E	4	PPI	70	93	23	65
4.	EPTC + Cobra	2 E (Cobra)	3.0 + 0.2	PPI;LPre	80	100	51	77
5.	EPTC + PPG-1013	0.25 E (1013)	3.0 + 0.15	PPI;LPre	100	100	45	89
6.	lactofen		0.25	EPre	48	75	5	25
7.	PPG-1013		0.2	EPre	50	97	10	71
8.	alachlor + lactofen	4 E(alachlor)	2.0 + 0.2	TM[2];EPre	48	81	15	30
9.	alachlor + lactofen		2.0 + 0.5	TM;EPre	64	83	50	68
10.	alachlor + PPG-1013		2.0 + 0.15	TM;EPre	85	92	76	71
11.	lactofen + (PP005 + OC*)	1 E (PP005)	0.25 + 0.18 + 1%	EPre;Post	30	58	69	18
12.	PPG-1013 + (PP005 + OC)		0.2 + 0.18 + 1%	EPre;Post	64	95	54	53
13.	alachlor		3.0	EPre	78	58	60	0
14.	ethalfluralin	3 EC	1.5	EPre	30	28	5	20
15.	ethalfluralin+metribuzin	75 DF Met.	1.31 + 0.38	TM;EPre	36	25	23	30
16.	ethalfluralin + alachlor		1.31 + 2.0	TM;EPre	56	33	38	30
17.	ethalfluralin		1.5	Post	NE[1]	NE	78	87
18.	ethalfluralin + EPTC		1.31 + 3.0	TM;Post	NE	NE	88	86
19.	[metribuzin + alachlor + metribuzin + EPTC]		[0.38 + 2.5 0.38 + 3.0]	TM;EPre Post	93	91	99	99
20.	[EPTC + alachlor + metribuzin]		[3.0 + 2.0 + 0.38]	PPI TM;LPre	100	100	99	100
21.	[EPTC + pendimethalin+metribuzin]	4 EC(pendime)	[3.0 + 1.0 + 0.38]	PPI TM;LPre	99	100	99	99
	LSD (0.05)				34	24	31	31
	CV				36	23	43	38
	Weed Counts/m² (2 July 1984)						124	153

*OC = Oil Concentrate (Herbimax)

[1]NE = No evaluation at early evaluation date

[2]TM = Tank mix

Table 2. Season-long weed control as evaluated on 11 Sept 84 following several types of total weed control treatments. Data are means of four replications

	Chemical	Formulation	Rate Lb a.i./A	How applied	Weed Control: Green Foxtail	Barnyard-grass	Lambs-quarters	Redroot Pigweed
					%			
1.	untreated (weedy)			--	0	0	0	0
2.	untreated (hand Weeded)			--	100	100	100	100
3.	EPTC	7 E	4	PPI	46	41	10	0
4.	EPTC + lactofen	2 E(lactofen)	3.0 + 0.2	PPI;LPre	73	59	71	90
5.	EPTC + PPG-1013	0.25 E (1013)	3.0 + 0.15	PPI;LPre	68	48	83	80
6.	lactofen		0.25	EPre	25	15	15	21
7.	PPG-1013		0.2	EPre	13	10	73	85
8.	alachlor + lactofen	4 E(alachlor)	2.0 + 0.2	TM[1];EPre	46	48	24	65
9.	alachlor + lactofen		2.0 + 0.5	TM;EPre	70	61	29	50
10.	alachlor + PPG-1013		2.0 + 0.15	TM;EPre	49	49	61	73
11.	lactofen + (PP005 + OC*)	1 E (PP005)	0.25 + 0.18 + 1%	EPre;Post	95	96	10	60
12.	PPG-1013 + (PP005 + OC)		0.2 + 0.18 + 1%	EPre;Post	55	60	59	76
13.	alachlor		3.0	EPre	85	70	30	70
14.	ethalfluralin	3 EC	1.5	EPre	34	48	18	25
15.	ethalfluralin+metribuzin	75 DF Met.	1.31 + 0.38	TM;EPre	36	51	26	40
16.	ethalfluralin + alachlor		1.31 + 2.0	TM;EPre	60	65	14	20
17.	ethalfluralin		1.5	Post	91	91	85	71
18.	ethalfluralin + EPTC		1.31 + 3.0	TM;Post	92	90	90	64
19.	[metribuzin + alachlor +		[0.38 + 2.5	TM;EPre	99	100	98	98
	metribuzin + EPTC]		0.38 + 3.0]	Post				
20.	[EPTC +		[3.0 +	PPI	99	100	96	98
	alachlor + metribuzin]		2.0 + 0.38]	TM;LPre				
21.	[EPTC +		[3.0 +	PPI	100	100	100	100
	pendimethalin+metribuzin]	4 EC(pendime)	1.0 + 0.38]	TM;LPre				
	LSD (0.05)				35	43	28	42
	CV				39	49	38	48

*OC = Oil Concentrate (Herbimax)
[1]TM = Tank mix

Table 3. Potato tuber yields and percentage in each grade of selected treatments. Various treatments were applied on 8 and 17 May, 4 and 18 June 84 for total weed control. Potatoes were planted on 9-10 May 84 and harvested 21 Sep 84. Data are means of four replications

Chemical	Rate	How	Total Yield		% of Total				
	Lb a.i./A	applied	cwt/A	t/ha	<4 oz	4-10 oz	>10 oz	#1	Malformed
1. untreated (weedy)			101	11.3	72	22	1	23	6
2. untreated (hand Weeded)			193	21.7	52	35	5	40	7
4. EPTC + lactofen		PPI,LPre	219	24.6	47	38	7	45	7
5. EPTC + PPG-1013		PPI,LPre	217	24.4	48	34	7	41	11
13. alachlor	3.0	EPre	155	17.4	62	26	2	28	10
17. ethalfluralin	1.5	Post	218	24.5	45	41	4	44	11
18. ethalfluralin + EPTC	1.31 + 3.0	Post	179	20.1	45	43	4	47	8
19. [metribuzin + alachlor+	[0.38 + 2.5	EPre	216	24.3	37	36	14	49	14
metribuzin + EPTC]	0.38 + 3.0]	Post							
20. [EPTC +	[3.0 +	PPI	246	27.7	38	32	10	42	20
alachlor + metribuzin]	2.0 + 0.38]	LPre							
21. [EPTC +	[3.0 +	PPI	257	28.9	33	41	10	51	16
pendimethalin + metr]	1.0 + 0.38]	LPre							
LSD (0.05)			52	5.9	20	14	7	17	9
CV			18	18.0	29	28	75	28	58

Annual weed control in potatoes with preplant, preemergence and postemergence herbicides. Haderlie, L.C., D.K. Harrington. Weed control in Russet Burbank potatoes and crop yields following several times and types of herbicide application were determined at the Aberdeen Research & Extension Center during 1985. Soil was a Declo fine sandy loam with pH 8.1, 1.6% organic matter, and 13.2 meq. CEC. Potatoes were planted 8,9 May 85 and hilled twice on 13 and 31 May 85 with a Lilliston rolling cultivator. Herbicides were applied with a tractor-mounted compressed-air sprayer with a 12 ft boom. Sprayer volume was 17.5 gpa at 21 psi with TJ11002 or 8002 nozzles. Preplant EPTC was applied 6 May 85 and immediately doubled disced into the soil. Early preemergence herbicides were applied 16 May 85 just 3 days after the first hilling. Late preemergence herbicides were applied 3 June and postemergence treatments were 20 or 27 June.

Plot size was 12 by 42.5 ft with 6 by 25 ft being harvested on the 27, 28 and 30 of Sept 85.

Overall weed control was 90% or above when evaluated 13 July for the following treatments: EPTC preplant + metolachlor + metribuzin late preemergence, lactofen + metribuzin late preemergence, metribuzin at 0.5 and 0.38 lb a.i./A, metribuzin + metolachlor, metribuzin + pendimethalin, metribuzin + XRM-4640, and acetochlor at 3.0 lb ai/A (Table 1). These treatments also resulted in full-season weed control except for metribuzin at 0.38 lb ai/A, and metribuzin + metolachlor (Table 2). Most treatments did not adequately control hairy nightshade. The best treatments for hairy nightshade control were EPTC preplant + metribuzin + metolachlor late preemergence, lactofen + metribuzin, lactofen + metolachlor at 0.6 + 1.5 lb a.i./A and acetochlor, all late preemergence and metribuzin + XRM-4640.

Weakest treatments for weed control were EPTC preplant alone or with PPG-1013 or lactofen late preemergence (Table 1).

Volunteer grain control the first 3 weeks with preplant EPTC was very good and there was a heavy infestation of volunteer grain until after the second hilling and cultivation.

Crop injury was relatively high from the XRM-4640 + metribuzin postemergence treatment and PPG-1013 late preemergence + fluazifop-P-butyl postemergence (Table 1).

Potato yields and grade were generally highest in treatments that controlled weeds the best (Table 3). Those treatments producing the lowest yields (<200 cwt/A) were untreated (weedy) check, EPTC preplant with or without lactofen (0.25 lb a.i./A) late preemergence, lactofen + metolachlor, late preemergence, and PPG-1013 + fluazifop-P-butyl + crop oil. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. Annual weed control in potatoes evaluated on 13 July following application of preplant (PPI), preemergence (Pre) and postemergence (Post) herbicides. Data are means of four replications

Chemical	Formulation	Rate lb a.i./A	Type of Application	% Control: Fox tail	Kochia	Night shade	Redroot Pigweed	Wild Oat/ V. Grain	Lambs qrtrs	Overall Weed Cntrl	% Injury
1. untreated (weedy)				0	0	0	0	0	0	0	0
2. untreated (hand weeded)				100	100	100	100	100	100	100	0
3. EPTC	7 E	3.0	PPI (6 May)	10	74	15	5	15	10	18	2
4. EPTC +		3.0 +	PPI	87	95	71	69	88	73	86	1
EPTC		3.0	Late pre (3,4 June)								
5. EPTC +		3.0 +	PPI	16	100	77	94	36	55	28	4
PPG-1013	.25 EC	0.1	Late pre								
6. EPTC +		3.0 +	PPI	41	93	84	78	59	56	44	4
lactofen	2 EC	0.15	Late pre								
7. EPTC +		3.0 +	PPI	30	97	88	78	61	36	42	5
lactofen		0.25	Late pre								
8. EPTC +		3.0 +	PPI	99	100	97	100	98	100	98	1
metolachlor + metribuzin	8 E (meto) 75 DF(metr)	1.75 + 0.38	Late pre								
9. lactofen + metribuzin		0.25 + 0.5	Late pre	93	100	91	100	93	100	94	6
10. lactofen + metolachlor		0.15 + 1.5	Late pre	85	95	81	89	70	84	78	4
11. lactofen + metolachlor		0.25 + 1.5	Late pre	67	100	86	96	51	74	70	5
12. lactofen + metolachlor		0.6 + 1.5	Late pre	88	99	100	100	65	80	76	4
13. lactofen + metolachlor		0.25 + 2.0	Early pre (16 May)	77	65	68	73	69	67	71	6
14. lactofen +		0.25 +	Late pre	78	93	88	75	82	60	81	4
fluazifop-P-butyl+O.C.*	1 E	0.188 + 1%	Post (20 June)								
15. PPG 1013 +		0.2 +	Late pre	83	98	85	86	88	68	86	9
fluazifop-P-butyl+O.C.		0.188 + O.C.	Post (20 June)								
16. metolachlor + pendimethalin	4 EC pPendim)	0.75 + 1.0	Late pre	74	100	70	74	68	79	76	5
17. metolachlor + pendimethalin		2.0 + 1.0	Early pre	93	99	69	98	86	96	87	5
18. metribuzin		0.25	Late pre	64	100	70	96	73	100	76	1
19. metribuzin		0.38	Late pre	87	100	53	96	88	98	90	3
20. metribuzin		0.5	Late pre	93	100	75	97	94	100	93	4
21. metribuzin + metolachlor		0.38 + 1.75	Late pre	97	100	78	95	92	95	93	4
22. metribuzin + pendimethalin		0.38 + 1.0	Late pre	83	100	80	100	88	100	92	3
23. metribuzin + metolachlor		0.5 + 2.0	Early pre	92	100	66	96	84	96	91	3
24. metribuzin+XRM-4640+O.C.	4 EC(XRM-4640)	0.5 + 0.5 + 1%	Early post (20 June)	98	100	88	100	96	100	96	9
25. metribuzin + XRM-4640 + O.C.		0.5 + 0.5 + 1%	Post (27 June)	99	100	95	100	96	100	98	14
26. acetochlor	8 EC	2.0	Late pre	91	100	93	97	88	91	88	2
27. acetochlor		3.0	Late pre	96	100	94	98	88	96	91	7
LSD (0.05)				24	18	20	21	20	19	15	n.s.
CV				23	14	18	18	19	17	14	106
Mean number of weeds/m^2 on June 245 in untreated checks				50	1	1	8	25	9		

*O.C. = Herbimax crop oil

PPI treatments were incorporated by double discing; early pre by 0.12 inch (0.3 cm) rain on 16 May and for late pre's 1 inch (2.5 cm) water on 5 June.

Table 2. Annual weed control in potatoes evaluated on 24 September following application of preplant (PPI), preemergence (Pre) and postemergence (Post) herbicides. Data are means of four replications

Chemical	Formulation	Rate lb a.i./A	Type of Application	% Control Redroot Pigweed	Lambs-quarter	Green Foxtail	Wild Oat/ Vol. Grain
1. untreated (weedy)				0	0	0	0
2. untreated (hand weeded)				89	87	92	86
3. EPTC	7 E	3.0	PPI (6 May)	11	11	34	24
4. EPTC +		3.0 +	PPI	48	64	84	73
EPTC		3.0	Late pre (3,4 June)				
5. EPTC +		3.0 +	PPI	80	49	48	20
PPG-1013	.25 EC	0.1	Late pre				
6. EPTC +		3.0 +	PPI	48	15	41	41
EPTC	2 EC	0.15	Late pre				
7. EPTC +		3.0 +	PPI	65	9	34	43
EPTC		0.25	Late pre				
8. EPTC +	8 E (metolachlor)	3.0 +	PPI	96	100	97	95
metolachlor + metribuzin	7 5 DF(metr)	1.75 + 0.38	Late pre				
9. lactofen + metribuzin		0.25 + 0.5	Late pre	100	100	94	91
10. lactofen + metolachlor		0.15 + 1.5	Late pre	69	60	88	63
11. lactofen + metolachlor		0.25 + 1.5	Late pre	95	58	98	33
12. lactofen + metolachlor		0.6 + 1.5	Late pre	99	80	99	49
13. lactofen + metolachlor		0.25 + 2.0	Early pre (16 May)	78	59	86	51
14. lactofen +		0.25 +	Late pre	48	18	77	70
fluazifop-P-butyl+O.C.*	1 E	0.188 + 1%	Post (20 June)				
15. PPG 1013 +		0.2 +	Late pre	53	23	62	66
fluazifop-P-butyl+O.C.		0.188 +O.C.	Post (20 June)				
16. metolachlor + pendimethalin	4 EC (pendimethalin)	0.75 + 1.0	Late pre	40	55	93	61
17. metolachlor + pendimethalin		2.0 + 1.0	Early pre	78	96	94	77
18. metribuzin		0.25	Late pre	93	96	71	71
19. metribuzin		0.38	Late pre	88	93	73	71
20. metribuzin		0.5	Late pre	100	100	97	92
21. metribuzin + metolachlor		0.38 + 1.75	Late pre	79	85	96	81
22. metribuzin + pendimethalin		0.38 + 1.0	Late pre	100	100	91	91
23. metribuzin + metolachlor		0.5 + 2.0	Early pre	100	100	99	60
24. metribuzin + XRM-4640 + O.C.	4 EC	0.5 + 0.5 + 1%	Early post (20 June)	100	100	92	94
25. metribuzin + XRM-4640 + O.C.		0.5 + 0.5 + 1%	Post (27 June)	100	100	98	96
26. acetochlor	8 EC	2.0	Late pre	96	89	91	81
27. acetochlor		3.0	Late pre	96	88	96	83
LSD (0.05)				28	25	24	30
CV				26	26	22	33

Table 3. Potato tuber yield and percent in each grade following applications of preplant (PPI), preemergence (Pre) and postemergence (Post) herbicides. Harvested 27, 28 & 30 Sept. 85. Data are means of four replications

Chemical	Formulation	Rate lb a.i./A	Type of Application	Total Yield cwt/A	t/ha	% of Total <4 oz	4-10 oz	>10 oz	No. 1's	Malformed
1. untreated (weedy)				155	17.4	36	32	14	46	17
2. untreated (hand weeded)				256	28.7	17	27	28	55	28
3. EPTC	7 E	3.0	PPI (6 May)	175	19.7	29	35	18	53	19
4. EPTC +		3.0 +	PPI	239	26.8	20	33	22	55	25
EPTC		3.0	Late pre (3,4 June)							
5. EPTC +		3.0 +	PPI	203	22.8	19	37	26	63	18
PPG-1013	.25 EC	0.1	Late pre							
6. EPTC +		3.0 +	PPI	208	23.4	27	39	16	54	18
lactofen	2 EC	0.15	Late pre							
7. EPTC +		3.0 +	PPI	191	21.4	28	38	18	56	17
lactofen		0.25	Late pre							
8. EPTC +		3.0 +	PPI	230	25.9	20	22	30	52	28
metolachlor + metribuzin		1.75 + 0.38	Late pre							
	8 E (metolachlor) 75 DF(metr)									
9. lactofen + metribuzin		0.25 + 0.5	Late pre	243	27.3	19	27	24	52	29
10. lactofen + metolachlor		0.15 + 1.5	Late pre	222	25.0	19	30	26	56	25
11. lactofen + metolachlor		0.25 + 1.5	Late pre	199	22.4	24	27	21	48	29
12. lactofen + metolachlor		0.6 + 1.5	Late pre	193	21.7	27	21	21	42	31
13. lactofen + metolachlor		0.25 + 2.0	Early pre (16 May)	177	19.9	33	24	13	36	31
14. lactofen +		0.25 +	Late pre	234	26.3	20	34	24	58	22
fluazifop-P-butyl+O.C.*	1 E	0.188 + 1%	Post (20 June)							
15. PPG 1013 +		0.2 +	Late pre	195	21.9	26	30	23	53	20
fluazifop-P-butyl+O.C.		0.188 +O.C.	Post (20 June)							
16. metolachlor + pendimethalin		0.75 + 1.0	Late pre	222	24.9	19	27	30	57	24
	4 EC (pendimethalin)									
17. metolachlor + pendimethalin		2.0 + 1.0	Early pre	237	26.6	23	33	24	57	20
18. metribuzin		0.25	Late pre	223	25.1	24	33	20	54	23
19. metribuzin		0.38	Late pre	253	28.4	17	33	26	58	24
20. metribuzin		0.5	Late pre	245	27.5	19	28	31	59	22
21. metribuzin + metolachlor		0.38 + 1.75	Late pre	248	27.8	21	34	26	60	19
22. metribuzin + pendimethalin		0.38 + 1.0	Late pre	252	28.3	18	31	27	57	25
23. metribuzin + metolachlor		0.5 + 2.0	Early pre	236	26.5	17	24	34	58	25
24. metribuzin + XRM-4640 + O.C.	4 EC	0.5 + 0.5 + 1%	Early post (20 June)	235	26.4	19	28	25	53	28
25. metribuzin + XRM-4640 + O.C.		0.5 + 0.5 + 1%	Post (27 June)	224	25.2	26	21	24	45	29
26. acetochlor	8 EC	2.0	Late pre	250	28.1	16	28	29	57	27
27. acetochlor		3.0	Late pre	239	26.8	25	30	24	54	21
LSD (0.05)				39	4.3	9	n.s.	10	13	9
CV				12	12	28	31	31	18	28

Tolerance of direct-seeded pyrethrum to herbicides. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Six herbicides were evaluated in a trial conducted on direct-seeded pyrethrum. Pyrethrum is the source of a widely used insecticide, but it is not widely grown in the United States. The trial was a randomized complete block with three replications and 2.5 m by 6 m plots. Spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. EPTC and trifluralin were incorporated into the soil with a tractor-mounted rototiller prior to seeding. Six rows of pyrethrum were seeded across each plot on September 9, 1986, immediately after the herbicides were incorporated. The preemergence applications were made the same day. The postemergence treatments were applied to cotyledon-stage pyrethrum on October 1, 1986.

The soil at the trial site was a sandy loam with an organic matter content of 1.9% and pH of 5.3.

Stand density and crop injury ratings were obtained on November 17, 1986. No symptoms developed in any treatment, although some weeds were controlled by all herbicides. Stand counts of pyrethrum were greater in the herbicide treatments than in the hand-weeded check. This difference may have been a result of weed competition and cultivator loss in the check plots. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Pyrethrum stand counts and injury ratings following preplant, preemergence,and early postemergence herbicide applications

Herbicide	Rate	Application timing	Stand density	Injury
	(kg/ha)		(plants/6 m)	(%)
EPTC	3.4	PPI	67	0
trifluralin	1.1	PPI	66	0
pronamide	2.2	PES	72	0
pendimethalin	1.1	PES	53	0
metolachlor	1.1	PES	49	0
AC 222,293	0.6	EPOE	57	0
check	0		35	0
			$LSD_{(.05)}$ = 22	

PPI (preplant incorporated)
PES (preemergence surface)
EPOE (early postemergence)

Tolerance of transplanted pyrethrum to herbicides. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. A trial was conducted at Corvallis, Oregon to evaluate the tolerance of pyrethrum to several herbicides. Pyrethrum is grown as the source of a widely used insecticide. The trial was a randomized complete block with five replications and 2 m by 5 m plots. Spray volume was 234 l/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. Five-cm-tall transplants were set out in a 60 cm by 60 cm pattern on June 12, 1986. Herbicides were applied on June 16 and August 1, 1986, and on January 9, 1987.

The soil at the trial site was a sandy loam with an organic matter content of 2.3% and a pH of 5.7. The plots were watered once a week through the summer with sprinkler irrigation.

Visual evaluations indicated that only bromoxynil and paraquat caused injury to the crop. Although three rates of each herbicide were applied, only the results from the highest rate of each herbicide is reported here when no injury was encountered. The lower rates of bromoxynil caused injury soon after application, but by February the crop had recovered. Paraquat caused excessive injury, which included death of some plants at three rates of application. Paraquat had been used successfully in previous research when applied to dormant pyrethrum. In this work, the winter was quite mild and the pyrethrum continued to grow slowly through the year. This may have been the reason for its sensitivity to paraquat. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Crop injury following herbicide applications on transplanted pyrethrum

Herbicide	Rate	Application date	Pyrethrum injury August 8, 1986	Pyrethrum injury February 5, 1987
	(kg/ha)			
metolachlor	9	June 16, 1986	0	0
oryzalin	4.5	June 16, 1986	0	0
fluazifop-P-butyl	1.1	June 16, 1986	0	0
pendimethalin	2.2	June 16, 1986	0	0
bromoxynil	0.28	August 1, 1986	17	0
bromoxynil	0.56	August 1, 1986	24	0
bromoxynil	1.1	August 1, 1986	40	12
AC 222,293	1.1	August 1, 1986	0	0
paraquat	0.28	January 9, 1987	-	40
paraquat	0.56	January 9, 1987	-	66
paraquat	1.1	January 9, 1987	-	68
check	0		0	0

Tolerance of winter rapeseed to pronamide. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Pronamide is an effective herbicide on many grass species when applied under cool, wet conditions. This research was conducted to determine whether seven rapeseed cultivars could tolerate pronamide in the damp winter conditions of western Oregon. Each cultivar was seeded in a separate field trial at the Hyslop agronomy farm near Corvallis. Each trial was a randomized complete block with four replications and 2.5 m by 8 m plots. Spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. The soil was a silt loam with a 2.9% organic matter content and a 5.5 pH. The treatments were applied on October 29, 1986. The soil was wet and the rapeseed was 15 cm to 20 cm tall when treated.

No symptoms of pronomide injury developed after treatment, and no differences among seed yield means occurred within cultivars (see table). (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Seed yield of seven rapeseed cultivars treated with pronamide

Pronamide rate	Cultivar Seed Yield						
	Bridger	Jet Neuf	Tandem	Dwarf Essex	Bienvenu	Cascade	Liradonna
(kg/ha)	(kg/ha)						
1.1	3460	4370	4640	3630	4380	2790	2500
2.2	3530	4400	4100	3650	4200	2800	2240
0	3400	4470	4360	3390	4480	2430	2720
$LSD_{(0.5)}$	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Response of winter rape to clopyralid and pyridate. Callihan R.H., and L. Lass. The objective of this experiment was to determine the effects of three different herbicides on winter rape growth. Winter rape is a competitive crop which does not normally require application of herbicides if planted in fallowed fields in mid-August. Attempts are being made to skip the fallowing process and recrop the current year. When winter rape is planted as a recrop after September 1 the crop density and vigor is reduced; consequently weeds become a problem.

The experiment was established north of Troy, Idaho on April 23, 1987 on late planted Dwarf Essex winter rape. Plots were 10 by 20 ft, replicated four times in a split block design. The treatments consisted of single applications of clopyralid (0.0, 0.25, 0.5, 1.0 lb ai/a), pyridate EC (0.0, 0.94, 1.87, 3.75 lb ai/a), pyridate WP (0.0, 0.9, 1.35, 1.8 lb ai/a).

Treatments were applied at 23 gal/a water carrier with TeeJet 8002 nozzles from a backpack sprayer on April 23, 1987. The crop was 12 inches tall and bolting. Henbit (Lamium amplexicaule L.) was 2-3 inches in diameter. The air temperature at the time of spraying was 65 F and the relative humidity was 55%. Soil temperatures were 70 F at surface, 60 F at 2 inches, 50 F at 6 inches. There was a 90% cloud cover. Wind was from the west at 0-2 mph. No dew was present. Visual estimates of crop injury and henbit control were made May 5, 1987. Two samples of height measurements were taken from each plot on July 14, 1987.

Winter rape height was not affected by herbicides. Pyridate caused more than 50 % chlorosis of the leaf tip when used at rates of 1.8 lb ai/a WP and 3.75 lb ai/a EC on 15 to 17% of the plants. There was a 50% reduction in living biomass henbit when sprayed with pyridate WP (1.8 lb ai/a), but total kill was never achieved by this chemical. Clopyralid and pyridate EC did not have an effect on henbit control. Although henbit control was poor, these herbicides have a potential use in late plant winter rape because of crop tolerance and potential on other weed species. (Idaho Agricultural Experiment Station, Moscow ID. 83843)

Weed control and winter rape response to clopyralid and pyridate.

Herbicide	Rate	Chlorosis 5/5/87	Rape Height[1] 7/14/87	Henbit Control[1] 5/5/87
	(ai/A)	(%)	(cm)	(%)
clopyralid	0.00	0 a)	135 a)	100 a)
	0.25	0 a	137 a	100 a
	0.50	0 a	136 a	100 a
	1.00	0 a	125 a	100 a
pyridate (EC)	0.00	0 a	137 a	100 a
	0.94	0 a	130 a	100 a
	1.87	2 a	133 a	100 a
	3.75	15 b	136 a	100 a
pyridate (WP)	0.00	0 a	139 a	100 a
	0.90	0 a	137 a	100 a
	1.35	2 a	139 a	95 a
	1.80	17 b	140 a	50 b

[1] Estimated % of living material, expressed as percent of control.

[2] Any two means having a common letter are not significantly different at the 5% level of significance according to the Protected Duncan's test.

Spring and summer development of mayweed chamomile in association with winter rape. Lass, L., and R.H. Callihan. Winter rape is is considered to be a competitive crop which does not normally require application of herbicides when planted in fallow fields in mid-August. Late winter rape planting dates may result in poor vigor and low stand density, which allows weeds to become established. Mayweed chamomile (Anthemis cotula L.)(ANTCO) will often take advantage of these conditions in recropped winter rape.

The experiment was established in a late planted (Sept. 9) Dwarf Essex winter rape field near Troy, Idaho. Three sampling units were used to obtain information from two populations consisting of mayweed chamomile with winter rape and mayweed chamomile without winter rape. The row spacing of the winter rape was 7 inches and the mayweed chamomile was a randomly dispersed natural population. Mayweed density was 8 plants per ft^2 and the winter rape density was 12 plants per ft^2. Ten mayweed chamomile plants were randomly selected in each sampling unit and flagged with a wire stake. The competitive response of mayweed chamomile was measured by determining mayweed chamomile height, rosette diameter, number of capitulum, main stem branches with more than one flower head, basal branches, leaf number, and stem, leaf, and flower biomass. These mayweed chamomile parameters were measured on May 5, May 18, June 2, and July 6, 1987.

The height of the mayweed chamomilegrown in association with winter rape was suppressed 43 to 68 % lower than without winter rape after May 18. Diameter of the mayweed chamomile plant was smaller (32 to 63%) in the rape plot. Capitula production by mayweed chamomile was significantly reduced (95%) in the presence of rape plants. Mayweed's main stem branches having more than one capitulum were 94% fewer in winter rape plots. Branching of the base of the plant was 75% less in the mayweed chamomile in the rape plots.

Winter rape interference with mayweed chamomile reduced the biomass of mayweed chamomile plants. Stem weight per mayweed chamomile plant was 98% lower with rape; leaf weight per mayweed chamomile plant was 95% lower; leaf number per plant was 91% lower and and leaf weight was 51% lower in mayweed chamomile growing in association with rape.

Winter rape appeared to be responsible for the reduction in mayweed height, biomass, seed production and leaf size. Dwarf Essex winter rape thus appears to be able to effectively suppress nearly all components of mayweed chamomile shooth and seed production even when planted as late as September 9. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Mayweed growth

Mayweed Parameter	Crop Competition [1] Without Winter Rape	With Winter Rape	Percent Difference.
Height (cm)			
May 5, 1987	11.6 a	11.2 b	3%
May 18, 1987	27.7 a	15.8 b	43%
June 2, 1987	47.9 a	17.9 b	63%
July 6, 1987	82.3 a	26.3 b	68%
Plant diameter (cm)			
April 4, 1987	4.2 a	2.0 b	52%
May 5, 1987	7.3 a	5.0 b	32%
May 18, 1987	9.4 a	4.0 b	57%
June 2, 1987	7.2 a	2.7 b	63%
Capitula frequency (No./plant)			
June 2, 1987	5.0 a	0.1 b	98%
July 6, 1987	27.8 a	1.3 b	95%
Main stem branches with more than one flower head. (No./plant)			
July 6, 1987	6.1 a	0.4 b	94%
Basal branches (No./plant)			
July 6, 1987	2.0 a	0.5 b	75%
Harvested Biomass			
Shoot Dry Weight			
Flowers (g/head)	0.95 a	0.30 b	68%
Stems (g/plant)	3.20 a	0.05 b	98%
Leaves (g/plant)	0.65 a	0.03 b	95%
Total dryweight	4.80 a	0.38 b	92%
Leaves			
number/plant	115.7 a	10.8 b	91%
g/leaf	0.006 a	0.003 b	51%

[1] Any two means with a common letter are not significantly different at the 5% level of significance according to the Protected Duncan's test.

Mayweed chamomile control in late planted winter rape. Lass, L., R.H. Callihan, and T. Miller. The purpose of this experiment was to determine the effects of clopyralid and two formulations of pyridate at three rates on mayweed chamomile (*Anthemis cotula* L.)(ANTCO) in winter rape (*Brassica napus* L.).When winter rape is recropped, the late planting dates may cause losses in vigor and stand reduction which increases weed competition. Mayweed chamomile is a common weed of recropped winter rape in northern Idaho.

The experiment was established in late-seeded (Sept. 9) Dwarf Essex winter rape field east of Troy, Idaho. The treatments were applied on April 23, 1987. Plots were 10 by 20 ft, replicated four times in a split block design. The winter rape was 9 inches tall but not bolting. The mayweed rosettes were .5 to 2 inches in diameter. The treatments were single applications of clopyralid (0.0, 0.25, 0.5, 1.0 lb ai/a), pyridate EC (0.0, 0.94, 1.87, 3.75 lb ai/a), and pyridate WP (0.0, 0.9, 1.35, 1.8 lb ai/a).

Treatments were applied in 23 gal/a water carrier, with TeeJet 8002 nozzles, from a backpack sprayer. The air temperature was 65 F and relative humidity 69%. The soil temperature was 80 F at surface, 59 F at 2 inches, and 50 F at 6 inches. The wind was from the E 0-2 mph and no dew was present. There was a 70% cloud cover. Visual estimates of crop injury were made May 5, 1987. Mayweed control was based on visual estimates of biomass on May 5, and June 12. Two samples of height measurements were taken from each plot on July 12, 1987.

Herbicide treatments did not affect the height of the winter rape plants. In plots treated with pyridate EC at rates of 1.87 lb ai/a and 3.75 lb ai/a, 52% and 81% of the plants respectively had nore than 25% leaf tip chlorosis.

Mayweed was controlled (100%) by clopyralid at all rates (0.25 to 1.0 lbs ai/a). Pyridate EC at 1.87 and 3.75 lb ai/a reduced the mayweed biomass to 42 and 27% respectively. The higher rates of pyridate also reduced the percent of the mayweed with flowers to 25%. Pyridate WP effects on mayweed was variable but generally tended to reduce both biomass and heads.

Timing of clopyralid application was not essential for control of mayweed but data suggest pyridate control is correlated to plant size. It was observed that pyridate was effective on mayweed which was less than 0.5 inch in diameter. When the mayweed was 1-2 inches in diameter about 70% of the plants survived pyridate. Clopyralid gave the best results, but pyridate may be effective with more attention to on mayweed morphology and size at time of application. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Mayweed chamomile and winter rape response to clopyralid and pyridate.

Herbicide	Rate	Chlorosis 5/5/87	Rape Height 6/12/87	Mayweed Spring Biomass 5/5/87	Mayweed Summer Biomass 6/12/87	Mayweed Summer Bloom 6/12/87
	(lb/ai or ae/A)	(%)[1]	(cm)[1]	------	(%)[1]	------
clopyralid	0.00	0 a	114 a	100 a	100 a	100 a
	0.25	0 a	114 a	63 b	0 c	0 c
	0.50	13 a	108 a	40 c	0 c	0 c
	1.00	0 a	119 a	33 c	0 c	0 c
pyridate (EC)	0.00	0 a	116 a	100 a	100 a	100 a
	0.94	43 a	118 a	100 a	75 b	70 ab
	1.87	53 b	110 a	100 a	43 b	26 b
	3.75	81 c	106 a	70 b	28 c	25 b
pyridate (WP)	0.00	0 a	119 a	100 a	100 a	100 a
	0.90	5 a	115 a	100 a	73 a	40 b
	1.35	25 a	113 a	100 a	35 b	3 c
	1.80	0 a	123 a	100 a	88 a	78 ab

[1] Any two means having a common letter are not significantly different at the 5% level of significance according to the Protected Duncan's Test.

Evaluation of safflower tolerance to herbicides. Wichman, D.M., G.R. Carlson and P.K. Fay. Safflower is an important oilseed crop in the Northern Great Plains. Currently used herbicides require preplant incorporation, which makes a loose seed bed and increases the potential for wind erosion. This research was conducted to evaluate herbicide treatments for compatability with safflower (Carthamus tinctorius L.)

The studies were of randomized complete block design with three replications. Plots were 10 ft wide by 30 ft long. Treatments were applied with a tractor mounted CO_2 sprayer, operated at 30 psi, delivering 7.7 gal/a water carrier through 8002 nozzles. Preemergence treatments were applied 4 days after seeding. Postemergence treatments were applied when the safflower was in the 3-6 leaf stage. The varieties S-208 and S-541 were used in 1986 and 1987, respectively. The 1986 preemergence study was at Moccasin, MT. The other studies were at Geraldine, MT. The 1986 studies had low weed densities and the 1987 studies were almost weed free.

Preemergence applied FMC 57020 and RE 40885 did not affect safflower yield, (see table 1). FMC 57020 caused some chlorosis which persisted 10-15 days after emergence. Safflower was tolerant of DPX M6316 at .125 and .25 oz ai/a with and with out surfactant (see table 2). Higher rates of DPX M6316 reduced safflower yields in the absence of weeds. The effect of DPX M6316 on safflower maturity was increased by adding surfactant or tank mixing with gramincides (see tables 2 & 3). (Central Ag Research Center, Montana State University, Moccasin, MT; Northern Ag Research Center, M.S.U., Havre, MT; and Plant and Soils Dept., M.S.U., Bozeman, MT).

Table 1. Evaluation of safflower tolerance to preemergence herbicides

Herbicide	Rate	1987		1986	
	oz ai/a	yield lbs/a	maturity % dry seed	yield lbs/a	barley % control
Check untreated	--	1592	94	383	0
FMC 57020	8	1469	93	517	68
FMC 57020	12	1705	93	516	93
FMC 57020	16	1479	89	571	96
RE 40885	8	1421	94	467	0
RE 40885	12	1639	94	442	0
LSD (0.05)		ns	2	128	6

Table 2. Evaluation of safflower tolerance to postemergence DPX M6316

Herbicide	Rate oz ai/a	1987 yield lbs/a	1987 maturity % dry seed	1986 yield lbs/a	1986 kochia % control
check	untreated	1314	89	907	00
DPX M6316	.125	1561	89	1139	14
DPX M6316	.25	1458	89	1097	43
DPX M3616	.375	1184	81	----	--
DPX M6316	.75	1074	80	1152	65
DPX M6316 + surf. 1/	.125 + .125%v/v	1508	87	1175	82
DPX M6316 + surf.	.25 + .125%v/v	1293	84	1148	75
DPX M6316 + surf.	.125 + .25 %v/v	1358	86	1304	18
DPX M6316 + surf.	.25 + .25 %v/v	1317	85	1372	79
DPX M6316 + surf.	.375 + .25 %v/v	1039	77	1236	99
DPX M6316 + surf.	.75 + .25 %v/v	1123	77	1158	48
LSD (0.05)		184	3	255	36

1/ surf. = surfactant

Table 3. Evaluation of safflower tolerance to postemergence herbicides

Herbicide	Rate oz ai/a	1987 yield lbs/a	1987 maturity % dry seed	1986 yield lbs/a	1986 kochia % control
check	untreated	1502	92	822	00
check 2	untreated	1540	91	---	--
AC 222,293 + surf. 1/	6.0 + 1%	1517	89	1129	44
sethozydim + COC	3.0 + 2pt	1484	93	1029	-16
DPX Y6202 + surf.	0.8 + 1%	1683	92	844	-45
fluazifop + COC	6.0 + 1pt	1614	92	980	-35
M6316 2/+ surf.	.25 + .2%	1435	89	----	--
M6316+sethozydim+COC	.25 + 3 + 2pt	1369	88	1088	77
M6316+DPX Y6202+surf.	.25 +.8 + .2%	1366	88	1084	13
M6316+fluazifop + COC	.25 + 4 + 1pt	1416	86	1233	86
M6316+AC 222,293+surf.	.25 + 6 + .1%	1309	84	1282	90
LSD (0.05)		190	3	199	64

1/ surf. = surfactant volume to volume
2/ M6316 = DPX M6316

Kochia infestation levels in proso millet as affected by planting date. Anderson, R. L. Proso millet is a drought-tolerant crop that is well suited for a winter wheat-spring planted crop-fallow rotation in the drier areas of the Central Great Plains. No-till production systems have been developed for proso millet, but rely on the usage of atrazine for non-crop and in-crop weed control. Kochia is a major weed infesting proso millet, and has developed triazine-resistant ecotypes. Proso millet matures in 60 to 80 days, thus, wide latitude exists in choosing when to plant proso millet. The objective of this study was to determine if varying the planting date of proso millet influenced the level of kochia infestation within the crop.

'Cope' proso millet was planted with a hoe drill on three dates: May 15, June 3, and June 22, 1987. Two production systems, conventional tillage and no tillage, were compared. The conventional tillage system included disking prior to planting with atrazine applied preemergence. With the no tillage system, atrazine was applied after wheat harvest the previous fall and paraquat plus surfactant was applied prior to planting. A randomized split- block design was used with 4 replications. Kochia seedlings in each plot were recorded 6 weeks after planting for each date.

Disking the soil prior to planting reduced kochia seedling establishment in the crop compared to the no tillage systems (Table 1). Planting date also influenced kochia establishment, as an average of only 1.4 plants/8 yd^2 were established in proso millet planted on June 22, compared to 13.5 plants-/8 yd^2 in proso millet planted on May 15. Table 2 gives the environmental data following each planting date. The major difference occurred with soil temperature. Kochia germination appeared to decrease when soil temperatures approached 75°F, as precipitation levels were similar between the first and last planting dates. Yield data for proso millet was not collected as the plant stand was destroyed by hail on August 4, 1987. These results indicate that altering planting date may be a management tool for reducing weed competition in proso millet. Also, kochia germination and establishment appears to be strongly influenced by tillage operations in this climatic area. Producers using a no-till production scheme will have a more severe kochia infestation level when planting early, thus possibly requiring a postemergence broadleaf weed herbicide to ensure a successful crop cycle in this drought-prone region. (USDA-ARS, Akron, CO 80720).

Table 1. Number of kochia plants infesting proso millet planted at three dates

Tillage system	Herbicide treatment	Planting date May 15	June 3	June 22	Mean
	(lbs/ac)	------	plants/8 yd^2	-----	
Conventional tillage	atrazine 0.5 (spring)	1.6	0.6	0.1	0.8
No tillage	atrazine 1.0 (fall)[1]	12.9	5.1	0.5	6.2
No tillage	atrazine 1.25 (fall)[1]	18.6	6.0	2.4	9.0
No tillage	atrazine 1.0 (fall) + 0.25 (spring)[1]	20.9	11.0	2.8	11.5
Mean		13.5	5.7	1.4	

LSD (0.05) interaction: NS
LSD (0.05) planting date: 3.2
LSD (0.05) herbicide treatment: 3.7

[1] Paraquat at 0.5 lbs ai/ac was applied before planting.

Table 2. Environmental data for the two week periods after planting

Planting date	Days after planting	Average daily temperatures Air	Soil (4 in. depth)	Precipitation
		°F	°F	in.
May 15	0- 7	60	68	.97
	8-14	57	63	.98
June 3	0- 7	66	74	.48
	8-14	72	75	.29
June 22	0- 7	69	77	.94
	8-14	67	75	.86

Evaluation of BAS 514 for broadleaf weed control in grain sorghum. Morishita, D. W. and M. L. Diamond. An experiment was initiated near Garden City, Kansas to evaluate BAS 514 and tank mixtures for broadleaf weed control. The herbicides were applied postemergence in furrow irrigated grain sorghum ('Triumph 280d'). The experiment was a randomized complete block design with four replications. Plot size was 7.5 by 25 ft. Herbicides were applied with a CO_2 pressurized sprayer calibrated to deliver 20 gpa. Application and weather data are shown on Table 1. Visual evaluation for weed control and crop injury was made July 27. Plots were harvested October 22 with a plot combine.

The tank mixture of BAS 514 + 2,4-D LVE caused severe crop injury. BAS 514 + atrazine at 0.5 + 1.2 lb ai/A and both BAS 514 + basagran and atrazine (Laddok) treatments caused less, but significant crop injury. Only BAS 514 alone at 0.25 lb ai/A did not adequately control devilsclaw (PROLO), redroot pigweed (AMARE), and puncturevine (TRBTE). Weed control with all BAS 514 tank mixture treatments was good to excellent (83 to 100%). Grain sorghum yields of all treatments were equal to the check, except BAS 514 + 2,4-D and BAS 514 + atrazine at 0.25 + 1.2 lb ai/A. (Southwest Kansas Branch, Kansas Agric. Exp. Sta., Garden City, Kansas 67846).

Table 1. Application and weather data

Date of application	6/15/87	6/26/87
Crop growth stage	2 to 3 leaf	3 to 6 leaf
Air temperature (F)	78	73
Soil temperature (F) @ 2 in	78	75
Relative humidity (%)	54	66
Cloud cover	clear	partly cloudy
Wind speed (mph)	8	1

Table 2. Broadleaf weed control with BAS 514 postemergence applications near Garden City, Kansas

Treatment	Rate	Appl date	Crop injury	Weed Control[a] PROLO	AMARE	TRBTE	Crop yield
	(lb/A)		(%)				(bu/A)
Check	-	-	-	-	-	-	97
BAS 514[b]	0.25	6/15	1	50	68	73	119
BAS 514	0.50	6/15	6	75	94	94	91
BAS 514	1.0	6/15	0	75	100	100	109
BAS 514 + dicamba	0.25 + 0.25	6/26	1	83	100	100	112
BAS 514 + dicamba	0.50 + 0.25	6/26	0	100	100	100	91
Dicamba	0.25	6/26	0	81	100	100	110
BAS 514 + 2,4-D LVE	0.50 + 0.50	6/26	51	100	99	100	67
2,4-D LVE	0.50	6/26	5	100	100	100	104
BAS 514 + atrazine	0.25 + 1.2	6/26	7	100	100	100	76
BAS 514 + atrazine	0.50 + 1.2	6/26	9	100	100	100	98
Atrazine + crop oil	1.2 + 1.0 qt	6/26	3	100	100	100	91
BAS 514 + basagran & atrazine	0.25 + 1.0	6/26	10	100	100	100	88
BAS 514 + basagran & atrazine	0.50 + 1.0	6/26	8	100	100	100	93
Basagran & atrazine	1.0	6/26	1	100	100	100	108
BAS 514 + bromoxynil	0.50 + 0.38	6/26	5	99	96	100	100
Bromoxynil	0.38	6/26	3	100	100	100	100
LSD (0.05)			8	34	16	18	22

[a]abbreviations are WSSA code letters from Composite List of Weeds, Weed Sci. 32, Suppl. 2.
[b]All BAS 514 treatments applied with BAS 090 02S at 1 qt/A.

Sorghum hybrid response to tridiphane and atrazine tank mixtures. Morishita, D. W. and M. L. Diamond. The susceptibility of five grain sorghum hybrids ('DeKalb DK46', 'DeKalb DK59', 'Funks G550', 'NC+ 262', and 'Golden Acres TEY75') to tank mixtures and application timings of tridiphane and atrazine was investigated. The experiment was established at the Southwest Kansas Branch Experiment Station under furrow irrigated conditions. Experimental design was a strip plot with four replications. Grain sorghum was planted June 1, 1987, and the herbicides were applied with a CO_2 pressurized sprayer at three applications dates (Table 1). Two visual evaluations for crop injury were made July 21 and August 6. The crop was harvested October 22 with a plot combine.

At the first evaluation date, both tridiphane + atrazine with sequential applications of atrazine + crop oil injured all sorghum hybrids the greatest. Application of tridiphane + atrazine at 0.75 + 1.0 lb ai/A also injured the grain sorghum at the first evaluation date. There was no significant crop injury at the second evaluation date. Grain sorghum yields were compared between herbicide treatments within sorghum hybrid. 'Funks G 550' was the most sensitive hybrid to herbicide treatment, followed by 'Golden Acres TEY 75'. The most tolerant grain sorghum hybrids to the herbicide treatments appeared to be 'DeKalb DK 46' and 'NC+ 262'. (Southwest Kansas Branch, Kansas Agric. Exp. Sta., Garden City, Kansas 67846).

Table 1. Application and weather data

Date of application	6/22/87	6/26/87	7/8/87
Crop growth stage	1 to 3 leaf	4 to 6 leaf	5 to 8 leaf
Air temperature (F)	65	73	67
Soil temperature (F) @ 2 in	75	75	78
Relative humidity (%)	90	66	92
Cloud cover	cloudy	ptly cloudy	clear
Wind speed (mph)	0	1	5

Table 2. Response of sorghum hybrids to applications of tridiphane and atrazine tank mixtures near Garden City, Kansas

Herbicide treatment	Rate	Variety[a]	Appl. date	Crop injury		Crop yield
	(lb/A)			—(%)—		(bu/A)
Check	-	DK 46	-	-	-	46
	-	DK 59				82
	-	G 550				62
	-	NC 262				43
	-	TEY 75				66
Tridiphane + atrazine	0.50 + 1.25	DK 46	6/22	5	1	64
		DK 59				84
		G 550				52
		NC 262				59
		TEY 75				74
Tridiphane + atrazine	0.75 + 1.0	DK 46	6/22	5	2	70
		DK 59				65
		G 550				54
		NC 262				63
		TEY 75				68
Tridiphane + atrazine	0.75 + 1.25	DK 46	6/22	13	4	51
		DK 59				69
		G 550				57
		NC 262				54
		TEY 75				59
Tridiphane + atrazine	0.50 + 1.0	DK 46	6/26	9	2	50
		DK 59				83
		G 550				43
		NC 262				55
		TEY 75				53
Tridiphane + atrazine/ atrazine	0.50 + 1.0/ 1.0	DK 46	6/26 7/8	20	4	41
		DK 59				72
		G 550				37
		NC 262				45
		TEY 75				40
Tridiphane	0.75	DK 46	6/26	1	0	63
		DK 59				100
		G 550				42
		NC 262				53
		TEY 75				44
Tridiphane + atrazine/ atrazine	0.75 + 1.0/ 1.0	DK 46	6/26 7/8	18	3	54
		DK 59				95
		G 550				25
		NC 262				37
		TEY 75				35
LSD (0.05)				10	ns	15

[a]Sorghum variety sources are DK 46 and DK 59 from DeKalb, G 550 from Funks, NC 262 from NC+, and TEY 75 from Golden Acres.

[b]All herbicide treatments except tridiphane alone applied with crop oil at 1 qt/A.

Annual weed control in sugarbeets with metamitron. Haderlie, L.C. and D.K. Harrington. Weed control and crop injury in sugarbeets was tested after applying several herbicides, including metamitron, preplant, preemergence, and postemergence. The experiment was conducted during 1985 at the Aberdeen Research & Extension Center, Aberdeen, Idaho in the field with a declo fine sandy loam soil, pH 7.95, 1.5% organic matter, and 10.2 meq. CEC. Sugarbeets were planted with a six-row plate planter 1 May, disced and replanted (var. Beta 8555) 21 May 85. Herbicides were applied with a tractor-mounted compressed air sprayer with an 11 ft (3.4 m) boom at 17.5 gpa (164 L/ha) and 30 psi (207 kPa) with TJ11002 or TJ8002 nozzles, except for the first postemergence treatments which were made at 8.8 gpa (82 L/ha) with TJ11001 nozzles. Larger nozzles were used in later postemergence treatments because of nozzle plugging problems with metamitron wettable powder. Preplant herbicides were applied 30 April and double disced for incorporation; preemergence applications were made 23 May and postemergence 8, 19, 28 June 85. Sugarbeets were planted initially into dry soil and irrigated 3 May 85 for germination. The next time irrigation was to incorporate preemergence herbicides on 26 May. Irrigation was by sprinkler. Plot size was 11 (6-row) by 40 ft and replicated four times in a randomized complete block design. Harvest was by two-row digger on center two rows by 30 ft 11 Oct 85. Topping was accomplished by a six-row flail topper within 1 hr prior to harvest. Seed for several weeds were spread over experimental area before planting for uniform density. Although kochia seed was planted, no kochia germinated.

Weed control was excellent (over 90%) for several treatments, including preplant, preemergence, and postemergence, by 12 June. Of course, several postemergence applications had not been made by this time. Overall weed control as evaluated 1 July was over 90% for at least one-half the treatments (Table 1). Treatments with metamitron alone, whether preplant, preemergence or postemergence, did not adequately control green foxtail. Preplant metamitron, alone, did not last long enough to provide control through June since the sugarbeets were planted late and size of sugarbeets were still relatively small at evaluation time (Table 1). Preemergence application of Metamitron at the same rate gave excellent control of common lambsquarters and redroot pigweed. Cycloate preplant did give very good control, even up to 1 July. Most ethofumesate treatments gave good weed control but sugarbeet injury was relatively high also.

Visual ratings of crop vigor, size, and injury showed metamitron to be much safer than ethofumesate at 12 June and some ethofumesate treatments on 1 July (Table 1). As the sugarbeets grew, they overcame much of the ethofumesate injury.

Sugarbeet yield corresponded to weed control in most instances (Table 2). Even though metamitron, alone, had little or no injury, yields were not higher than other treatments, at least partly because of more green foxtail growth.

In summary, metamitron can be used preplant, preemergence, or postemergence with safety to sugarbeets. It gives good control of common lambsquarters and redroot pigweed but not of green foxtail. Another herbicide for grass control is essential in Idaho sugarbeets where grasses are common. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. Annual weed control in sugar beets following application of preplant (PPI) preemergence (Pre) and postemergence (Post) herbicides at Aberdeen, Idaho. Data are means of four replications

Chemical	Formulation	Rate (lb a.i./A)	Type of Application	% Sugar Beet Injury		% Control - July 1			
				Jn 12	Jly 1	Overall Weed Control	Green Foxtail	Lambs-quarters	Redroot Pigweed
1. check				0	0	0	0	0	0
2. metamitron	70 WG	3.0	PPI (30 April)	4	3	58	30	78	78
3. cycloate	6 EC	4.0	PPI	20	6	92	100	90	93
4. metamitron + cycloate		2 + 4.0	PPI	20	14	99	100	99	100
5. metamitron		3.0	Pre (23 May)	6	8	77	30	99	96
6. metamitron + ethofumesate	1.5 E (Nort)	2 + 1.5	Pre "	20	13	97	96	98	100
7. metamitron + diethatyl	4 ES (Dieth)	2 + 2	Pre "	19	8	97	95	98	98
8. ethofumesate		1.5	Pre "	25	13	88	95	83	94
9. ethofumesate + pyrazon	4.2 F (Pyra)	1.5 + 1.5	Pre "	19	11	94	95	94	99
10. ethofumesate + pyrazon		2.0 + 2.0	Pre "	33	17	97	96	97	98
11. ethofumesate + diethatyl		1.5 + 1.5	Pre "	23	11	91	96	88	98
12. metamitron+ethofumesate+pyrazon		1.5 + 1.0 + 1.0	Pre "	24	16	96	94	96	98
13. metamitron + ethofumesate + phenmedipham+desmedipham	1.3 EC	2 + 1.5 + 0.5	Pre " Post (x 2) (8, 19 June)	41	21	99	98	100	100
14. metamitron + ethofumesate + metamitron + phenmedipham+desmedipham		2 + 1.5 + 1.25 + 0.3	Pre (23 May) Post (x 1) (8 June)	26	22	97	95	100	100
15. metamitron + metamitron + phenmedipham+desmedipham		2.5 + 1.25 + 0.3	Pre (23 May) Post (x 3) (8, 19, 28 June)	12	17	85	61	100	100
16. metamitron + metamitron + phenmedipham+desmedipham + metamitron+phenmedipham +desmedipham+fluazifop-P-butyl	1 E (Fusil)	2.5 + 1.25 + 0.3 + 1.25 + 0.3 + 0.12	Pre (23 May) Post (x 1) (8 June) Post (x 1) (19 June)	14	15	82	68	99	100
17. ethofumesate + phenmedipham+desmedipham		1.5 + 0.3	Pre (23 May) Post (x 2) (8, 19 June)	36	23	96	88	99	100
18. ethofumesate + phenmedipham+desmedipham + phenmedipham+desmedipham + fluazifop-P-butyl		1.5 + 0.3 + 0.3 + 0.12	Pre (23 May) Post (8 June) Post (19 June)	28	18	98	97	100	100
19. metamitron + oil		2.0 + 1%	Post (x 2) (19, 28 June)	5	1	46	3	95	93
20. phenmedipham+desmedipham		1.0	Post (x 1) (19 June)	1	6	65	45	66	68
21. phenmedipham+desmedipham + fluazifop-P-butyl		0.5 + 0.12	Post (x 2) (8, 19 June)	24	14	92	93	95	91
22. metamitron + metamitron + oil		2.5 + 1.25 + 1%	Pre (23 May) Post (x 2) (8, 19 June)	9	10	79	45	100	100
23. metamitron + phenmedipham+desmedipham		1.5 + 0.3	Post (x 3) (8, 19, 28 June)	9	5	70	15	84	91
24. metamitron + phenmedipham+desmedipham + metamitron+phenmedipham+desmedipham +fluazifop-P-butyl		1.5 + 0.3 + 1.5 + 0.3 + 0.12	Post (8 June) Post (19 June)	9	8	63	33	84	86
LSD (0.05)				9	8	18	26	15	14
CV				34	48	15	27	12	11
Mean number of weeds/m² on 24 Jul in untreated checks						26	15	39	

Table 2. Harvest weights of sugar beets following applications of herbicide at Aberdeen, Idaho
Harvested 11 Oct 85. Data are means of four replications

	Chemical	Formulation	Rate (lb a.i./A)	Type of Application	T/A	t/ha
1.	check				5.9	13.3
2.	metamitron	70 WG	3.0	PPI (30 April)	19.9	44.8
3.	cycloate	6 EC	4.0	PPI	23.1	51.8
4.	metamitron + cycloate		2 + 4.0	PPI	25.9	58.1
5.	metamitron		3.0	Pre (23 May)	23.5	52.7
6.	metamitron + ethofumesate	1.5 E (Nort)	2 + 1.5	Pre "	25.1	56.1
7.	metamitron + diethatyl	4 ES (Dieth)	2 + 2	Pre "	23.3	52.1
8.	ethofumesate		1.5	Pre "	22.1	49.5
9.	ethofumesate + pyrazon	4.2 F (Pyra)	1.5 + 1.5	Pre "	25.1	56.1
10.	ethofumesate + pyrazon		2.0 + 2.0	Pre "	23.9	53.7
11.	ethofumesate + diethatyl		1.5 + 1.5	Pre "	18.8	42.0
12.	metamitron+ethofumesate+pyrazon		1.5 + 1.0 + 1.0	Pre "	26.1	58.6
13.	metamitron + ethofumesate +		2 + 1.5 +	Pre (23 May)	24.4	54.7
	phenmedipham+desmedipham	1.3 EC	0.5	Post (x 2) (8, 19 June)		
14.	metamitron + ethofumesate +		2 + 1.5 +	Pre (23 May)	25.7	57.6
	metamitron + phenmedipham+desmedipham		1.25 + 0.3	Post (x 2) (8 June)		
15.	metamitron +		2.5 +	Pre (23 May)	23.5	52.6
	metamitron + phenmedipham+desmedipham		1.25 + 0.3	Post (x 3) (8, 19, 28 June)		
16.	metamitron +		2.5 +	Pre (23 May)	24.1	53.9
	metamitron + phenmedipham+desmedipham +		1.25 + 0.3 +	Post (x 1) (8 June)		
	metamitron+phenmedipham	1 E (Fusil)	1.25 + 0.3 + 0.12	Post (x 2) (19, 28 June)		
	+desmedipham+fluazifop-P-butyl					
17.	ethofumesate +		1.5 +	Pre (23 May)	24.8	55.6
	phenmedipham+desmedipham		0.3	Post (x 2) (8, 19 June)		
18.	ethofumesate +		1.5 +	Pre (23 May)	24.1	53.9
	phenmedipham+desmedipham +		0.3 +	Post (x 1) (8 June)		
	phenmedipham+desmedipham + fluazifop-P-butyl		0.3 + 0.12	Post (19 June)		
19.	metamitron + oil		2.0 + 1%	Post (x 2) (19, 28 June)	16.6	37.2
20.	phenmedipham+desmedipham		1.0	Post (x 1) (19 June)	16.4	36.8
21.	phenmedipham+desmedipham + fluazifop-P-butyl		0.5 + 0.12	Post (x 2) (8, 19 June)	27.1	60.7
22.	metamitron +		2.5 +	Pre	25.2	56.3
	metamitron + oil		1.25 + 1%	Post (x 2) (8, 19 June)		
23.	metamitron + phenmedipham+desmedipham		1.5 + 0.3	Post (x 3) (8, 19, 28 June)	20.5	45.9
24.	metamitron + phenmedipham+desmedipham +		1.5 + 0.3 +	Post (8 June)	21.2	47.5
	metamitron+phenmedipham+desmedipham		1.5 + 0.3 + 0.12	Post (19 June)		
	+fluazifop-P-butyl					
LSD	(0.05)				5	12
CV					17	17

Evaluation of postemergence grass herbicides in sugarbeets. Miller, S.D., K.J. Fornstrom and J.M. Krall. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate the efficacy of postemergence grass herbicides for weed control in sugarbeets. Plots were established under irrigation and were 10 by 20 ft with three replications arranged in a randomized complete block. Sugarbeets (Monohikari) were planted in sandy loam soil (71% sand, 17% silt and 12% clay) with 1.3% organic matter and a 7.3 pH April 15, 1987. Desmedipham plus phenmedipham was applied for broadleaf weed control to all plots except the weedy check May 11, 1987 (sugarbeets 2 to 4-leaves and broadleaf weeds 0.5 to 1 inch tall with a tractor mounted sprayer delivering 40 gpa at 25 psi). Postemergence grass herbicide treatments were applied with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi on May 26 (air temp 65 F, relative humidity 52%, wind calm, sky overcast and soil temp - 0 inch 78 F, 2 inch 72 F and 4 inch 70 F) to 8-leaf sugarbeets and 1 to 2 inch yellow foxtail and June 3, 1987 (air temp 77 F, relative humidity 19%, wind calm, sky clear and soil temp - 0 inch 80 F, 2 inch 76 F and 4 inch 70 F) to 10 to 12-leaf sugarbeets and 3 to 4 inch yellow foxtail. Weed counts, crop stand counts and visual injury ratings were made June 24 and plots harvested September 25, 1987. Yellow foxtail (SETLU) infestations averaged 3.3 plants/ft row throughout the experimental area.

No sugarbeet injury or stand reduction was observed with any treatment. Sugarbeet yields were increased 3.8 T/A by application of desmedipham plus phenmedipham and an additional 1.4 to 6.4 T/A by the application of the postemergence grass herbicides. Yellow foxtail control exceeded 80% with all postemergence grass herbicide treatments except fluazifop at 0.25 lb/A when applied at the 3 to 4 inch stage. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1504.)

Postemergence grass control in sugarbeets

Treatment[1]	Rate lb ai/A	Sugarbeet[2] injury %	initial stand 1000 pl/A	harvest stand 1000 pl/A	sugar %	yield T/A	Control[3] SETLU %
desmedipham + phenmedipham	0.5 + 0.5	0	46.5	31.9	16.5	16.9	36
<u>Grass 1 to 2 inch</u>							
/sethoxydim + oc	0.5 + 0.5/0.15	0	41.8	28.4	16.7	21.1	86
/sethoxydim + oc	0.5 + 0.5/0.2	0	45.3	31.9	16.3	22.4	86
/sethoxydim + oc	0.5 + 0.5/0.3	0	48.3	32.6	16.7	20.6	92
/sethoxydim + BCH 815	0.5 + 0.5/0.2	0	42.3	31.9	16.7	20.4	88
/sethoxydim + 28% N + oc	0.5 + 0.5/0.2	0	47.0	33.1	16.7	20.1	91
/sethoxydim + 28% N + BCH 815	0.5 + 0.5/0.2	0	46.5	34.3	16.7	20.1	94
/BAS-517 + oc	0.5 + 0.5/0.05	0	46.5	33.1	16.8	23.3	88
/BAS-517 + oc	0.5 + 0.5/0.1	0	42.3	33.1	16.8	20.8	99
/BAS-517 + oc	0.5 + 0.5/0.15	0	41.3	30.8	16.9	22.5	99
/BAS-517 + BCH 815	0.5 + 0.5/0.1	0	45.3	31.4	16.9	20.0	97
/BAS-517 + 28% N + oc	0.5 + 0.5/0.1	0	48.3	34.3	16.6	21.6	96
/BAS-517 + 28% N + BCH 815	0.5 + 0.5/0.1	0	41.8	29.6	16.7	20.8	100
/haloxyfop + oc	0.5 + 0.5/0.1	0	46.5	34.3	16.9	20.4	94
/fenoxaprop + oc	0.5 + 0.5/0.2	0	44.8	33.1	16.5	22.5	94
/quizalofop + oc	0.5 + 0.5/0.1	0	43.0	33.1	16.6	21.5	100
/fluazifop + oc	0.5 + 0.5/0.19	0	46.5	36.1	16.8	20.2	86
/fluazifop + oc	0.5 + 0.5/0.25	0	47.6	33.6	16.7	20.6	92
<u>Grass 3 to 4 inch</u>							
/sethoxydim + oc	0.5 + 0.5/0.2	0	48.1	33.6	16.5	21.2	84
/sethoxydim + BCH 815	0.5 + 0.5/0.2	0	48.8	31.9	16.8	20.1	86
/sethoxydim + 28% N + oc	0.5 + 0.5/0.2	0	44.1	30.8	16.6	20.4	89
/sethoxydim + 28% N + BCH 815	0.5 + 0.5/0.2	0	46.5	31.9	16.8	20.1	87
/BAS-517 + oc	0.5 + 0.5/0.1	0	44.8	31.4	16.5	20.2	97
/BAS-517 + BCH 815	0.5 + 0.5/0.1	0	45.8	31.4	16.8	22.0	100
/BAS-517 + 28% N + oc	0.5 + 0.5/0.1	0	45.3	32.6	16.9	22.3	94
/BAS-517 + 28% N + BCH 815	0.5 + 0.5/0.1	0	45.3	33.6	16.7	22.3	97
/fluazifop + oc	0.5 + 0.5/0.25	0	45.8	30.1	16.5	18.3	71
untreated check	--------------	0	43.0	31.4	16.9	13.1	0
plants/ft row 3 inch band		---	2.5	----	----	----	3.3

[1]Desmedipham plus phenmedipham applied May 11, 1 to 2 inch grass treatments May 26 and 3 to 4 inch grass treatments June 3, 1987; oc = At Plus 411 F at 1 qt/A, BCH 815 at 2 qt/A and 28% N = 28% (w/w) nitrogen at 1 gal/A

[2]Visual injury and stand counts determined June 24 and plots harvested September 25, 1987

[3]Weed counts determined June 24, 1986

Post-emergence antagonism study in sugarbeets. Orr, J.P. and Stucki, L.F. On June 16, 1987, at the Cosumnes River College Research Farm, herbicides were applied post-emergence to sugarbeets grown in a clay loam soil. Sugarbeets were three inches in height and at the six-leaf stage. Barnyard grass was seedling to eight inches in height; redroot pigweed, lambsquarter, and purslane were two to three inches in height and multi-leaved at time of application. All herbicide had the addition of 1 pt/A Pace oil concentrate.

Treatments were applied with a CO_2 backpack sprayer at 25 PSI and 30 gal/A water in a randomized complete block design. Irrigation was furrow.

The addition of cycloate 6E at 1 qt/A (phenmedipham + desmedipham) + sethoxydim resulted in excellent control of barnyard grass, lambsquarter, and purslane and good control of redroot pigweed with slight vigor reduction and phytotoxic burn. Sethoxydim + (phenmedipham + desmedipham) resulted in no weed control. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

Post-emergence antagonism study in sugarbeets

CHEMICAL & FORMULATION		RATE LBS.A.I. /ACRE	WEED CONTROL[1]								SUGARBEETS					
			BARNYARD GRASS		REDROOT PIGWEED		PURSLANE		LAMBS-QUARTER		STAND[1] REDUCTION		VIGOR[1] REDUCTION		PHYTO-[1] TOXICITY	
			6/26	8/20	6/26	8/20	6/26	8/20	6/26	8/20	6/26	8/20	6/26	8/20	6/26	8/20
A1166	1E	0.03	8.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
A1166	1E	0.06	9.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.8	0.0	0.0
A1166	1E	0.12	10.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A1166	1E	0.25	10.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
A1166	2E	0.06	9.5	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.8	0.0	0.0
A1166	2E	0.12	10.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sethoxydim	1.5E	0.30	8.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fluazifop-butyl	1E	0.25	8.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DPX 6202	0.8E	0.06	7.5	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
sethoxydim	1.5E	0.30														
+(phenmedipham +desmedipham)	1.3E	1.00														
+cycloate	6E	1.QT	10.0	8.8	8.7	8.5	10.0	10.0	10.0	10.0	0.0	0.0	2.5	2.0	2.5	1.0
sethoxydim	1.5E	0.30														
+(phenmedipham +desmedipham)	1.3E	1.00	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Control	----	----	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

Post-emergence antagonism study in sugarbeets. Orr, J.P. and Stucki L.F. On July 14, 1987, at Cosumnes River College Research Farm, herbicides were applied post-emergence to sugarbeets in the cotyledon stage, grown in a clay loam soil. Barnyard grass was four to six inches in height and redroot pigweed was two to four inches and multi-leaved.

Treatments were applied by a CO_2 backpack sprayer, replicated four times, in a randomized complete block design. Irrigation was sprinkler.

The addition of cycloate, sethoxydim, and phenmedipham + desmedipham resulted in excellent weed control. However, the sugarbeets being in the cotyledon stage, resulted in moderate to severe injury.

A1166 plus phenmedipham + desmedipham resulted in good weed control, but severe injury to the sugarbeets in the cotyledon stage. (University of California Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827)

Post-emergence antagonism study in sugarbeets

CHEMICAL & FORMULATION			RATE LBS.A.I. /ACRE	WEED CONTROL[1] BARNYARD 7/24	BARNYARD 8/20	PIGWEED 7/24	PIGWEED 8/20	SUGARBEETS STAND[1] REDUCTION 7/24	STAND REDUCTION 8/20	VIGOR[1] REDUCTION 7/24	VIGOR REDUCTION 8/20	PHYTO-[1] TOXICITY 7/24	PHYTO-TOXICITY 8/20
A1166 1.0E + surfactant			0.03	9.7	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A1166	1E		0.06	9.0	8.7	0.0	0.0	0.0	0.0	1.3	1.3	0.7	0.0
A1166	1E		0.12	8.3	8.0	0.0	0.0	3.3	3.3	3.3	3.3	0.0	0.0
A1166	1E		0.25	10.0	9.7	1.3	0.0	2.7	2.7	4.0	2.0	0.7	0.0
A1166	2E		0.06	9.0	8.3	0.0	0.0	3.3	3.3	4.7	4.0	0.7	0.0
A1166	2E		0.12	10.0	9.7	0.0	0.0	2.3	2.3	3.7	2.3	0.7	0.0
fluazifop-butyl	1E		0.25	6.0	5.3	0.0	0.0	0.0	0.0	1.3	0.7	0.7	0.0
DPX 6202	0.8E		0.06	8.7	8.3	0.0	0.0	0.0	0.0	1.3	0.7	0.7	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00										
+ cycloate	6E		1QT.	9.7	9.0	8.7	6.3	9.7	9.7	9.7	10.0	0.0	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00	0.0	0.0	0.0	0.0	6.7	6.7	6.7	6.7	0.0	0.0
A1166	1E		0.12										
+ phenmedipham	+ desmedipham			9.7	9.0	9.3	7.7	8.0	8.0	8.0	7.3	1.3	0.0
A1166	2E		0.12										
+ phenmedipham	+ desmedipham			9.3	8.7	9.7	8.0	6.3	6.7	7.7	7.3	0.0	0.0
sethoxydim	1.5E		0.20	5.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sethoxydim	1.5E		0.30	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
sethoxydim	1.5E		0.40	10.0	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sethoxydim	1.5E		0.20										
+ BCH 815			1QT.	8.0	7.7	0.0	0.0	0.0	0.0	1.3	0.7	0.7	0.0
sethoxydim	1.5E		0.30										
+ BCH 815			1QT.	10.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sethoxydim	1.5E		0.40										
+ BCH 815			1QT.	9.7	9.3	3.3	1.3	0.0	0.0	0.0	0.0	0.7	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00										
+ cycloate	6E		1QT.	10.0	10.0	9.0	8.3	4.0	4.3	5.3	4.3	1.7	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00										
+ cycloate	6E		1PT.	10.0	9.8	7.3	6.7	4.7	5.3	5.3	4.0	4.0	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00										
+ BCH 815			1QT.	10.0	9.9	9.3	8.7	3.3	4.0	3.3	2.0	1.0	0.0
sethoxydim	1.5E		0.30										
+ phenmedipham	+ desmedipham	1.3E	1.00										
+ cycloate	6E		.5PT.	10.0	9.7	9.7	8.3	2.7	3.0	3.0	1.7	2.3	0.0
Control	----		----	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] 10 = 100% weed control, crop dead
0 = no weed control, no crop damage

Pace oil at 1 qt/A was added to all treatments, except where BCH 815 is indicated.

Crop injury and grain yield following applications of DPX G8311 and DPX R9674. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. This trial was conducted to evaluate whether changing weather conditions or growth stage would affect the tolerance of 'Owens' spring wheat to DPX G8311 or DPX R9674. The trial was conducted as a split plot with four replications and 2.5 m by 6 m subplots. The main plots were seeding dates and the subplots were herbicide applications. Wheat was seeded on March 25, April 7, and April 22, 1987. The herbicides were applied on May 4, May 18, and June 3, 1987. Wheat growth stage within seeding dates on each application date are listed in table 1.

The herbicide spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. A surfactant (X-77) was added to the spray carrier in each treatment at a rate of 0.25% v/v. The soil at the trial site was a silt loam with a 3.2% organic matter content and a 5.8 pH.

Visual evaluations 1 week after each application indicated that more injury occurred in all seedings from the first two applications (Table 2).

Large differences in grain yield among seeding dates resulted from the low precipitation during the growing season. Within seeding dates grain yields tended to be lower in the two earlier applications dates, especially with DPX G8311 (Table 3). The lowest yield in each seeding date was DPX G8311 applied on May 4. For the three days prior to May 4 the air temperature remained below 16 C, but exceeded 33 C the week following treatment. This rapid change in temperature may have contributed to the crop sensitivity. Temperature change following the May 18 and June 3 applications was less dramatic.

Table 1. Seeding date, growth stage, and herbicide application date in three plantings of 'Owens' spring wheat in 1987

application date	Seeding date		
	March 25	April 7	April 22
	Growth stage		
May 14	2 to 3 tillers	3 leaf	1 to 2 leaf
May 18	1 node	4 to 5 tillers	3 leaf, 1 tiller
June 3	headed	50% headed	boot

Table 2. Wheat injury following application of DPX G8311 and DPX R9674 on three dates in three plantings of 'Owens' spring wheat in 1987

Herbicide	Rate	Application date	Seeding date: March 25	April 7	April 22
			Wheat injury		
	(kg/ha)		(%)		
DPX G8311	21	May 4	28	28	28
DPX R9674	18	May 4	13	15	19
DPX R9674	26	May 4	16	18	23
DPX G8311	21	May 18	5	13	13
DPX R9674	18	May 18	8	8	8
DPX R9674	26	May 18	11	10	13
DPX G8311	21	June 3	5	0	0
DPX R9674	17	June 3	0	0	0
DPX R9674	26	June 3	3	0	0
check	0		0	0	0

Table 3. Wheat grain yield following application of DPX G8311 and DPX R9674 on three dates in three plantings of 'Owens' spring wheat in 1987

Herbicide	Rate	Application date	Seeding date: March 25	April 7	April 22
			Grain yield		
	(g/ha)		(kg/ha)		
DPX G8311	21	May 4	970	450	360
DPX R9674	18	May 4	1700	790	420
DPX R9674	26	May 4	1770	820	460
DPX G8311	21	May 18	1570	750	400
DPX R9674	18	May 18	1800	830	530
DPX R9674	26	May 18	1750	830	430
DPX G8311	21	June 3	1970	1080	500
DPX R9674	18	June 3	1830	930	450
DPX R9674	26	June 3	1880	1010	500
check	0		2020	1010	400

$LSD_{(0.5)}$ for means within seeding dates = 310 kg/ha.

<u>Broadleaf weed control in spring wheat</u>. Dial, M.J. and D. C. Thill. A two (herbicides) by seven (spray additives) factorial arrangement of treatments was used to evaluate common lambsquarters (CHEAL) control with thiameturon and DPXR9674, with and without surfactant and five concentrations of urea ammonium nitrate (UAN) in spring wheat (var. 906R) near Moscow, Idaho. The concentration of (UAN) ranged from 20 to 100 percent of the spray solution volume. Broadleaf weed control with SC0735 at three rates with Tween 20 added to the spray solution was determined in an adjacent experiment. Treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gpa at 41 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design replicated four times. Application data are in Table 1.

Table 1. Application data

Application date		5/20
Crop growth stage		2 to 3 leaves
Weeds present and growth stage		
Common lambsquarters	(CHEAL)	5 leaves, 3 in. tall
Field pennycress	(THLAR)	3 leaves, rosette
Henbit	(LAMAM)	2 in. diameter
Air temperature (F)		50
Soil temperature (F)		51
Relative humidity (%)		70
Wind speed (mph) - direction		3-E
Soil pH		5.3
OM (%)		3.5
CEC (meq/100 g soil)		19.6
Texture		silt loam

Broadleaf weed control in both experiments was determined visually on June 9 and June 24. Grain yield could not be determined because the plots were harvested accidentally by the cooperator. Thiameturon and DPXR9674 treatments with nonionic surfactant controlled common lambsquarters better than treatments without additive or any concentration of UAN (Table 2). No interactions were detected. Spray additives did not affect control for field pennycress or henbit with thiameturon and DPXR9674 (Table 2). Broadleaf weeds were controlled equally with thiameturon and DPXR9674 (Table 2).

Broadleaf weeds were controlled effectively with all rates of SC0735 + Tween 20 (Table 3). These treatments caused chlorosis of the crop after application. The level and duration of the chlorosis was rate dependant (data not shown). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Broadleaf weed control

Additive[1]	Rate	Weed control[2]					
	(% v/v)	---(% of untreated control)---					
		CHEAL		THLAR		LAMAM	
		1	2	1	2	1	2
nonionic surfactant	0.25	90	94	78	91	85	90
no spray additive	---	11	17	79	90	64	86
UAN	20.0	1	17	67	86	70	87
UAN	40.0	11	26	79	89	72	81
UAN	60.0	0	6	86	91	78	78
UAN	80.0	1	19	78	90	69	81
UAN	100.0	0	8	75	87	65	76
weed density (no./ft^2)		12		5		8	
LSD (0.05)		11	19	ns	ns	ns	ns
Herbicide	Rate[3]						
	(lb ai/a)						
Thiameturon	0.0156	16	27	80	85	72	86
DPXR9674	0.0156	15	25	76	93	72	79
LSD (0.05)		ns	ns	ns	ns	ns	ns

[1]Summed over herbicides.
[2]Numbers 1 and 2 refer to evaluation date, June 9 and June 24, respectively.
[3]Summed over spray additives.

Table 3. Broadleaf weed control with SC0735

Treatment[1]	Rate	Weed control[2]					
	(lb ai/a)	(% of untreated control)					
		CHEAL		THLAR		LAMAM	
		1	2	1	2	1	2
SC0735 +	0.125	93	95	95	95	92	97
Tween 20	0.25%						
SC0735 +	0.25	94	95	95	98	95	98
Tween 20	0.25%						
SC0735 +	0.5	98	98	98	100	96	100
Tween 20	0.25%						
weed density (no./ft^2)		12		5		8	
LSD (0.05)		ns	ns	ns	ns	ns	ns

[1]Tween 20 is a nonionic surfactant, concentration is expressed as % v/v
[2]Numbers 1 and 2 refer to evaluation date, June 9, and June, 24 respectively.

Tolerance of spring barley and spring wheat cultivars to sulfonylurea herbicides. Dial, M.J. and D.C. Thill. The tolerance of five cultivars of spring barley and spring wheat to DPXR9674 and DPXG8311 was evaluated at the University of Idaho Plant Science farm near Moscow, Idaho. Bromoxynil/MCPA was included in the experiment as a standard. The barley and wheat cultivars were advance breeding lines from regional breeding programs. Standard barley (Steptoe) and wheat (Spillman) cultivars were included in the experiment. All treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 25 ft. Each experiment (barley or wheat) was a randomized complete block, three (herbicides) by five (cultivar) factorial design replicated four times. Application data are in Table 1.

Table 1. Application data

Application date	5/9/87
Barley growth stage	3 to 5 leaves
Wheat growth stage	1 tiller
Air temperature (F)	72
Soil temperature (F)	70
Relative humidity (%)	79
Wind speed (mph) direction	5-E
Soil pH	5.4
OM (%)	2.6
CEC (meq/100 g soil)	17.0
Texture	silt loam

Barley and wheat cultivars were evaluated for visible symptoms of sensitivity to the treatments through the growing season. No injury symptoms developed (data not shown). Barley and wheat grain was harvested on August 6, and 18, respectively, to determine if the treatments affected grain yield.

Herbicides did not affect grain yield of the barley or wheat cultivars (Table 2, 3). No grain yield difference were detected among barley cultivars (Table 2). However, wheat cultivar grain yields were different (Table 3). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Effect of herbicides on spring barley cultivar grain yield

Herbicide[1]	Rate	Grain yield
	(lb ai/a)	(lb/a)
DPXR9674	0.0234	4746
DPXG8311	0.0234	4896
bromoxynil/MCPA	0.25	4667
LSD (0.05)		n.s.
Barley cultivar		
OR8407		4892
Steptoe		4821
Cougar		4783
Gallatin		4768
WA8898		4667
LSD (0.05)		n.s.

[1]Sulfonylurea treatments were applied with 0.25% v/v nonionic surfactant.

Table 3. Effect of herbicides on spring wheat cultivar grain yield

Herbicide[1]	Rate	Grain yield
	(lb ai/a)	(bu/a)
DPXR9674	0.0234	73
DPXG8311	0.0234	70
bromoxynil/MCPA	0.25	68
LSD (0.05)		n.s.
Wheat cultivar		
Lloyd		86
ID0266		78
Treasure		70
Wakanz		65
Spillman		54
LSD (0.05)		10

[1]Sulfonylurea treatments were applied with 0.25% v/v nonionic surfactant.

<u>Response of wheat genotypes to trifluralin, triallate, and ethiazin.</u> Garcia-Torres, L. and A.P. Appleby. Fifteen experimental lines of hard red spring wheat and two soft white winter standard cultivars were treated with three herbicides in an attempt to find sources of resistance and also to determine whether there were unusually sensitive genotypes. With all three herbicides, wheat seeds and the lower part of the coleoptile were suspended in tubes filled with various concentrations of the herbicide. In each case, fresh weights of the seedling tops were determined 13 days for trifluralin and triallate and 30 days for ethiazin following the beginning of treatment and the results were analyzed using linear regression methods. GR_{50} values (concentration required to reduce topgrowth by 50%) were calculated from the regression models and differences between cultivars were determined by standard analyses of variance.

Especially in the cases of trifluralin and ethiazin, a wide range of tolerance was measured. Differences in GR_{50} between the most sensitive and most tolerant genotypes were 10X and 14.9X for trifluralin and ethiazin, respectively. Much less range was seen with triallate, the difference being 3.4X. In Table 1, two genotypes at the more sensitive end of the scale, and two experimental genotypes at the more tolerant end of the scale are included. For each herbicide, the GR_{50}s of' Malcolm' and 'Stephens' commercial varieties are also given. For trifluralin and triallate, Stephens and Malcolm ranked near the middle of the 15 experimental genotypes. In the case of ethiazin, both commercial cultivars were among the most tolerant.

The pedigrees of the experimental lines included in Table 1 are provided in Table 2. There seems to be no association between genotype and tolerance to the various herbicides. Genotype 9, for example, was among the most tolerant to triallate and among the most sensitive to trifluralin. (Departamento de Proteccion Vegetal, Cordoba, Spain, and Crop Science Department, Oregon State University, Corvallis, OR)

Table 1. GR_{50} values for wheat genotypes to three herbicides

Herbicide	Genotype	GR_{50}[a]
		(µM)
Trifluralin		
	8	1.0 a
	9	1.8 a
	Malcolm	2.9 a
	Stephens	3.0 a
	3	5.8 b
	2	9.5 c
Triallate		
	4	4.0 a
	6	4.5 ab
	Malcolm	7.3 ab
	Stephens	10.8 ab
	9	12.1 ab
	1	13.6 b
Ethiazine		
	3	2.7 a
	5	5.6 ab
	7	24.2 bcd
	Malcolm	27.3 cd
	1	34.6 d
	Stephens	40.3 d

[a]Numbers within a herbicide followed by the same letter are not significantly different at the 0.05 level of probability.

Table 2. Pedigree of experimental genotypes included in Table 1.

Genotype	Pedigree
1	BSV50/CAN.S//VEE
2	VPM/MOS//TORIM
3	DOVE S./BUC S.
4	SAP S./MON S.
5	KVZ/CGN
6	NS732/PIMA
7	PFAU.S.
8	TTR S./JUN S.
9	BOW S.//YOS./ZZS.

Evaluation of diclofop tank mixes for wild oat control in spring wheat. Kidder, D.W., I.C. Hopkins and D.P. Drummond. The herbicide diclofop, in combination with the herbicides bromoxynil, DPX-M6316, DPX-R9674 and AC 222,293 was evaluated for control of wild oat (*Avena fatua* L. # AVEFA) in spring wheat, in Minidoka County, Idaho. Sixteen treatments, including the control, were applied in a randomized complete block design with four replications. Spring wheat (Western Seeds var. 906R) was planted on April 10,1987 at a rate of 100 lb/a and sprinkler irrigated according to recommended practices.

Herbicides were applied on May 27, 1987 as postemergence applications using a CO_2 pressurized bicycle sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 10 feet wide and 30 feet long. Soil was a silt loam with a pH of 7.2 and organic matter of 1.9%. Wild oat plants were in the 3 to 5 leaf stage and starting to tiller. Crop plants were 12 inches tall and tillered. Visual evaluations of percent weed control were made on June 10 and June 29.

Wild oat control for the herbicide treatments are shown in Table 2. Wild oat control obtained with HOE7125 was greater than that obtained from any of the diclofop or AC 222,293 treatments. The addition of bromoxynil, the sulfonyl-urea compounds or AC 222,293 did not effect diclofop activity. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in spring wheat

Date of application	5/27/87
Air temperature (F)	65
Soil temperature @ surface (F)	70
Soil temperature @ 8 cm (F)	59
Relative humidity (%)	76
Dew present	none
Wind (mph)	7
Cloud cover (%)	50
pH	7.2
OM (%)	1.9
soil texture	silt loam

Table 2. Diclofop tank mixes for wild oat control in spring wheat

Treatment[1]	Rate	Wild oat control June 10	Wild oat control June 29
	(lb a.i./A)	------(%)------	
Check	...	0	0
Diclofop	0.75	49	73
Diclofop + COC[2]	0.75 + 1.0 qt.	64	70
Diclofop	1.00	55	70
Diclofop + Bromoxynil	0.80 + 0.40	46	58
Diclofop + Bromoxynil	1.00 + 0.25	59	69
Diclofop + Bromoxynil + DPX-M6316	0.80 + 0.40 + 0.006	56	64
Diclofop + Bromoxynil + DPX-R9674	0.80 + 0.40 + 0.006	51	61
Diclofop + DPX-M6316 + Surf.[3]	0.75 + 0.016	55	71
Diclofop + DPX-M6316 + Surf.	1.00 + 0.016	63	74
Diclofop + DPX-R9674 + Surf.	0.75 + 0.016	53	66
Diclofop + DPX-R9674 + Surf.	1.00 + 0.016	53	68
Diclofop + AC 222,293	0.75 + 0.47	55	76
Difenzoquat + Surf.	1.00	60	85
HOE7125	0.67	69	95
AC 222,293	0.47	40	40
LSD (0.05)		14	15

[1] Treatments applied May 27 when the wheat was 12 inches tall and the wild oat was in the 3 to 5 leaf stage.
[2] Crop oil concentrate (Atplus 411F)
[3] Surfactant (R-11) 0.25% v/v

Wild oats control in spring wheat. Miller, S.D. and R. Hybner. Research plots were established at the Sheridan Research and Extension Center, Sheridan, WY, to evaluate wild oats control with postemergence herbicides applied at several stages. Spring wheat (var. Olaf) was seeded in a loam soil (49% sand, 27% silt and 24% clay) with 1.4% organic matter and a 6.3 pH April 7, 1987. Treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 1 to 2-leaf wild oats, 2 to 3 inch wild mustard and 2 to 3-leaf spring wheat May 6 (air temp 67 F, relative humidity 45%, wind SE at 4 mph, sky clear and soil temp - 0 inch 95 F, 2 inch 70 F and 4 inch 63 F) or to 4 to 5-leaf wild oats, 4 inch wild mustard and 5-leaf spring wheat May 13, 1987 (air temp 77 F, relative humidity 35%, wind calm, sky clear and soil temp - 0 inch 98 F, 2 inch 80 F and 4 inch 76 F). Plots were established under dryland conditions and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control, crop damage and plant height measurements were made June 18 and plots harvested August 4, 1987. Wild oats (AVEFA) and wild mustard (SINAR) infestations were moderate and uniform throughout the experimental area.

FOE-3440A applied at the 4 to 5-leaf stage reduced spring wheat stand 13 to 18%, caused 30 to 40% wheat injury, reduced plant height 5 to 6 inches and reduced wheat yield 5 to 8 bu/A compared to the weedy check. Several other treatments caused slight wheat injury (less than 10%); however, stand was not reduced. Wheat yields were closely related to weed control and/or crop injury and were 5 to 9 bu/A higher than in the weedy check with herbicide treatments providing 80% or greater wild oats control. Wild oats control was 90% or greater with diclofop combinations with oil concentrate, AC-222,293, fenoxaprop or FOE-3440A at both stages of application. Wild oats control was reduced when diclofop was applied in combination with CGA-131036, DPX-L5300, DPX-R9674 or XRM-4813 and when FOE-3440A was applied in combination with MCPA. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1513 .)

Wild oats control in spring wheat

Treatment[1]	Rate lb ai/A	Spring wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] AVEFA %	SINAR %
1 to 3 leaf wild oats							
diclofop	1.0	0	0	26	28	85	0
diclofop + oc	1.0	0	0	26	29	91	0
diclofop + bromoxynil	1.0 + 0.38	0	0	26	29	87	88
diclofop + DPX-M6316 + s	1.0 + 0.015	0	0	25	28	88	100
diclofop + DPX-M6316 + s	1.0 + 0.023	0	0	25	27	83	100
diclofop + CGA-131036 + s	1.0 + 0.015	0	0	26	25	68	100
diclofop + CGA-131036 + s	1.0 + 0.023	0	0	25	25	65	100
diclofop + DPX-L5300 + s	1.0 + 0.015	0	0	25	24	68	100
diclofop + DPX-L5300 + s	1.0 + 0.023	0	0	25	24	66	100
diclofop + DPX-R9674 + s	1.0 + 0.015	0	0	25	27	78	100
diclofop + DPX-R9674 + s	1.0 + 0.023	0	0	25	27	75	100
diclofop + XRM-4813	1.0 + 0.52	0	0	26	26	68	100
diclofop + clopyralid	1.0 + 0.09	0	0	25	28	82	0
diclofop + clopyralid + bromoxynil	1.0 + 0.09 + 0.25	0	0	25	30	82	92
AC-222,293 + s	0.38	0	0	25	31	100	100
FOE-3440A + RN	0.25	3	0	25	26	93	0
FOE-3440A + RN	0.38	8	0	24	26	95	0
FOE-3440A + bromoxynil + RN	0.38 + 0.38	3	0	25	27	95	95
FOE-3440A + MCPA + RN	0.38 + 0.5	3	0	24	26	83	100
FOE-3440A + DPX-R9674 + RN	0.38 + 0.015	7	0	25	27	97	100
4 to 5-leaf wild oats							
difenzoquat	0.75	2	0	26	24	72	0
difenzoquat + 2,4-D	0.75 + 0.5	8	0	25	24	73	100
difenzoquat + MCPA	0.75 + 0.5	0	0	25	24	70	100
difenzoquat + bromoxynil	0.75 + 0.38	3	0	25	26	77	93
difenzoquat + CGA-131036 + s	0.75 + 0.015	0	0	25	24	77	100
fenoxaprop + 2,4-D + MCPA	0.16 + 0.12 + 0.38	2	0	25	29	95	100
fenoxaprop + 2,4-D + bromoxynil	0.16 + 0.25 + 0.25	0	0	25	28	90	100
FOE-3440A + RN	0.25	30	13	21	17	100	0
FOE-3440A + RN	0.38	40	18	20	14	100	0
weedy check	----	0	0	26	22	0	0

[1]Treatments applied May 6 and May 13, 1987; s = X-77 at 0.25% v/v, RN = Renex 36 at 0.25% v/v and oc = At Plus 411 F at 1 qt/A

[2]Wheat injury, stand reduction and plant height measurements June 18 and plots harvested August 4, 1987

[3]Weed control visually evaluated June 18, 1987

Wild oats control in spring wheat with AC-222,293. Miller, S.D. and R. Hybner. Research plots were established at the Sheridan Research and Extension Center, Sheridan, WY, to evaluate wild oats control with AC-222,293 alone or in combination with broadleaf herbicides. Spring wheat (var. Olaf) was seeded in a loam soil (49% sand, 27% silt and 24% clay) with 1.4% organic matter and a 6.3 pH April 7, 1987. Treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 10 gpa at 40 psi to 1 to 2-leaf wild oats, 2 to 3 inch wild mustard and 2 to 3-leaf spring wheat May 6, 1987 (air temp 67 F, relative humidity 45%, wind SE at 4 mph, sky clear and soil temp - 0 inch 95 F, 2 inch 70 F and 4 inch 63 F). Plots were established under dryland conditions and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control, crop damage and plant height measurements were made June 18 and plots harvested August 4, 1987. Wild oats (AVEFA) and wild mustard (SINAR) infestations were moderate and uniform throughout the experimental area.

No treatment reduced crop stand; however, AC-222,293 at 0.47 lb/A in combination with dicamba or at 0.38 lb/A in combination with DPX-M6316, DPX-L5300 and dicamba caused slight wheat injury (less than 10%). Wheat yields were 5 to 9 bu/A higher in herbicide treated plots than in the weedy check. Wild oats and wild mustard control was excellent with AC-222,293 alone or in combination with broadleaf herbicides. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1515.)

Wild oats control with AC-222,293 in spring wheat

Treatment[1]	Rate lb ai/A	Spring wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] AVEFA %	SINAR %
AC-222,293 + s	0.31	0	0	26	30	100	100
AC-222,293 + s	0.38	0	0	26	30	100	100
AC-222,293 + s	0.47	0	0	25	30	100	100
AC-222,293 + bromoxynil + s	0.38 + 0.38	0	0	25	29	99	100
AC-222,293 + bromoxynil + s	0.47 + 0.38	0	0	25	28	100	100
AC-222,293 + bromoxynil + MCPA + s	0.38 + 0.25 + 0.25	0	0	26	30	100	100
AC-222,293 + bromoxynil + MCPA + s	0.47 + 0.25 + 0.25	0	0	26	28	100	100
AC-222,293 + MCPA + s	0.38 + 0.5	0	0	26	30	100	100
AC-222,293 + MCPA + s	0.47 + 0.5	0	0	25	28	100	100
AC-222,293 + DPX-M6316 + s	0.38 + 0.015	3	0	25	31	100	100
AC-222,293 + DPX-M6316 + s	0.38 + 0.023	3	0	24	29	100	100
AC-222,293 + DPX-R9674 + s	0.38 + 0.015	0	0	24	30	100	100
AC-222,293 + DPX-R9674 + s	0.38 + 0.023	0	0	25	30	100	100
AC-222,293 + clopyralid + s	0.38 + 0.09	0	0	26	29	100	100
AC-222,293 + XRM-4813 + s	0.38 + 0.52	0	0	25	28	100	100
AC-222,293 + DPX-L5300 + s	0.38 + 0.015	7	0	24	28	100	100
AC-222,293 + DPX-L5300 + s	0.38 + 0.023	7	0	24	28	100	100
AC-222,293 + CGA-131036 + s	0.38 + 0.015	0	0	25	28	100	100
AC-222,293 + CGA-131036 + s	0.38 + 0.023	0	0	25	29	100	100
AC-222,293 + dicamba + s	0.38 + 0.06	7	0	25	28	95	100
AC-222,293 + dicamba + s	0.47 + 0.06	7	0	25	27	98	100
diclofop	1.0	0	0	25	28	87	0
weedy check	---	0	0	25	22	0	0

[1] Treatments applied May 6, 1987 and s = X-77 at 0.25% v/v

[2] Wheat injury, stand reduction and plant height measurements June 18 and plots harvested August 4, 1987

[3] Weed control visually evaluated June 18, 1987

Bioactivity of metribuzin in a controlled-release formulation on 'Vona' winter wheat and downy brome. Anderson, R. L. and B. D. Riggle. Metribuzin selectively controls downy brome in winter wheat, but several wheat varieties are not tolerant to metribuzin. Encapsulating metribuzin with kraft lignin results in a controlled-release formulation which has increased soybean tolerance to metribuzin. The objective of this study was to determine if a controlled-release formulation of metribuzin encapsulated with kraft lignin (Westvaco Corp., Charleston Heights, SC 29405)* would increase the tolerance of a susceptible wheat variety to metribuzin without decreasing its bioactivity on downy brome.

'Vona' winter wheat, a variety sensitive to metribuzin injury, was treated in the fall of 1986 at two growth stages: before wheat emergence and early tillering (recommended application period on label). An adjacent stand of downy brome was also sprayed at three growth stages: before emergence, 2-4 leaf stage, and tillering. Metribuzin was applied at 0.25 and 0.50 lbs ai/ac alone or encapsulated with kraft lignin. Encapsulation was achieved by maintaining a water solution of metribuzin and kraft lignin for 4 hours. A randomized complete block design with 3 replications was used for both studies. Plot size was 6 feet by 15 feet. The soil type was a fine sandy loam with a pH of 7.2 and 1.2% OM. For the winter wheat study, plant stand reduction was estimated visually on April 8, 1987, and plots were harvested for yield on July 17, 1987. Metribuzin bioactivity on downy brome was visually evaluated on 3 dates: April 8, April 28, and May 28, 1987.

Results indicated that encapsulating metribuzin did not increase tolerance of 'Vona' winter wheat to metribuzin (Table 1). Yield losses of >80% occurred with a preemergence application of metribuzin at 0.25 lbs/ac. Metribuzin at 0.50 lbs/ac reduced grain yields 26 to 40% when applied to tillered wheat. No inhibition of metribuzin toxicity occurred with the controlled-release formulation.

Preemergence bioactivity of metribuzin at 0.25 lbs/ac on downy brome was not affected by encapsulation, but extensive late-season growth by downy brome did occur (Table 2). Postemergence applications of metribuzin at 0.25 were ineffective, regardless of formulation. When metribuzin at 0.50 lbs/ac was encapsulated, a reduction in bioactivity did not occur until April 28, a period when winter wheat would be more competitive due to jointing. Thus, encapsulating metribuzin with kraft lignin would not be deleterious to metribuzin at this rate controlling downy brome early in the crop season. Without reducing injury to Vona, however, this controlled-release formulation would not be an improvement over the commercial formulation. The sensitivity ranges of 'Vona' winter wheat and downy brome to metribuzin may overlap to the extent that the level of encapsulation required to protect 'Vona' winter wheat from metribuzin may reduce downy brome control below acceptable levels, thus eliminating any advantage due to the encapsulation. (USDA-ARS, Akron, CO 80720).

* Trade name used for identification purposes only and does not constitute recommendation or endorsement by USDA-Agricultural Research Service over other comparable products.

Table 1. Response of 'Vona' winter wheat to metribuzin in a controlled-release formulation

Growth stage	Metribuzin rate	Lignin rate	Visual stand reduction	Grain yield loss
	(lbs/ac)	(qt/ac)	%	%
Preemergence	.25	0	94	86
	.25	1	93	87
	.25	2	95	86
		LSD(0.05)	NS	NS
Early tillering	.25	0	9	0
	.25	1	3	0
	.25	2	0	0
	.50	0	43	26
	.50	1	41	29
	.50	2	44	40
		LSD(0.05)	19	23

Table 2. Downy brome response to a controlled-release formulation of metribuzin

Growth stage	Metribuzin rate	Lignin rate	% area not infested with downy brome April 8	April 28	May 28
	(lbs/ac)	(qt/ac)	%		
Preemergence	.25	0	75	37	3
	.25	1	90	60	13
	.25	2	80	33	7
		LSD(0.05)	NS	NS	NS
2-4 leaf stage	.25	0	67	28	18
	.25	1	28	13	12
	.25	2	50	18	10
		LSD(0.05)	NS	NS	NS
Tillering	.25	0	20	17	12
	.25	1	28	12	5
	.25	2	20	10	3
	.50	0	88	80	52
	.50	1	82	72	30
	.50	2	78	70	37
		LSD(0.05)	14	6	20
LSD(0.05) for all treatments			19	15	16
CV%			19	24	57

Control of catchweed bedstraw in winter wheat. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Seven herbicide treatments were evaluated in winter wheat for catchweed bedstraw control. The trial was a randomized complete block with four replications and 2.5 m by 8 m plots. Spray volume was 234 L/ha delivered through 8002 flat fan nozzle tips at 138 kPa. The nozzles were arranged in a double-overlap pattern. The wheat had 1 to 3 tillers and the bedstraw stems were 5 cm to 15 cm long when the herbicides were applied on February 20, 1987. The soil was a silt loam with an organic matter content of 5.2% and a pH of 5.3. The surfactant X-77 was added to all treatments except dicamba plus MCPA at a rate of 0.25% v/v.

Visual evaluations in April indicated that all treatments except DPX R9674 provided good bedstraw control. There were no significant differences among wheat means. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Catchweed bedstraw control, wheat injury, and wheat grain yield following postemergence herbicide applications

Herbicide	Rate	Catchweed bedstraw control	Wheat injury	Wheat yield
	(kg/ha)	(%)	(%)	(kg/ha)
DPX R9674	0.026	78	0	3630
trisulfuron	0.026	96	0	3560
DPX R9674 + bromoxynil	0.026+0.42	90	0	3630
trisulfuron + dicamba	0.026+0.14	99	0	3900
DPX R9674 + dicamba	0.026+0.14	99	0	3560
trisulfuron + bromoxynil	0.026+0.42	100	0	3560
dicamba + MCPA	0.14+1.1	96	0	3960
check	0	0	0	3360
		$LSD_{(.05)}$		n.s.

<u>Interaction of cinmethylin with chlorsulfuron and metsulfuron-methyl in winter wheat</u>. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. Most wheat fields in western Oregon are infested with more than one species of grass weeds. This study was conducted at the Hyslop agronomy farm at Oregon State University to evaluate the effectiveness of cinmethylin alone and in combination with chlorsulfuron plus metsulfuron on three grass species. The trial was a randomized complete block design with four replications and 2.5 m by 10 m plots. Spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. Two-and-one-half m wide strips of downy brome, ripgut brome, and Italian ryegrass were seeded across each plot prior to seeding the wheat. The wheat and grasses were in the 2-to-3-leaf stage when the treatments were applied on October 28, 1986. The soil was a silt loam with a 2.9% organic matter content and a 5.7 pH.

Visual evaluations in February indicated that cinmethylin alone was better than the combination on ripgut brome, but the opposite was true with Italian ryegrass. The combination was about equal to cinmethylin alone on downy brome. There was much less yellowing of the wheat when cinmethylin was tank-mixed with chlorsulfuron plus metsulfuron, but wheat yield was not greater than in plots treated only with cinmethylin. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Grass control, wheat injury, and wheat yield following applications of cinmethylin and cinmethylin + chlorsulfuron + metsulfuron-methyl

Herbicide	Rate	Control: Downy brome	Control: Ripgut brome	Control: Italian ryegrass	Wheat injury	Wheat yield
	(kg/ha)	(%)				(kg/ha)
cinmethylin	0.42	94	69	53	15	6520
cinmethylin + chlorsulfuron + metsulfuron-methyl	0.42 + 0.011 + 0.003	89	33	94	3	6380
check	0	0	0	0	0	5780
					$LSD_{(.05)}$ =	625

Wheat tolerance to preplant and preemergence applications of glyphosate plus 2,4-D. Brewster, Bill D., Robert L. Spinney, and Arnold P. Appleby. This study was undertaken to determine whether glyphosate plus 2,4-D could cause wheat yield losses when applied preplant or prior to crop emergence. Two trials were conducted at the Hyslop agronomy farm near Corvallis. The earlier trial was established when the soil was still relatively dry, while the second was established after the soil moisture exceeded field capacity and the temperature had cooled. The earlier trial was seeded on October 14, 1986 while the later trial was seeded on November 17. The soil was a silt loam with a 2.9% organic matter content and a 5.3 pH.

Each trial was conducted as a randomized complete block with four replications and 2.5 m by 8 m plots. Spray volume was 234 L/ha delivered at 138 kPa through 8002 flat fan nozzle tips arranged in a double-overlap spray pattern. Glyphosate plus 2,4-D was applied at two rates on three different dates in each trial. The timings were 7 days prior to planting, the same day of planting, and 5 days after planting.

Visual evaluations indicated that much more injury occurred in the later planting (see table). Some 'onion-leafing' occurred in the earlier trial, especially in wheel tracks where the seed was planted shallow, but plants were killed in the later planting. The greatest injury occurred when treatments were applied on the day of seeding at the higher rate of glyphosate and 2,4-D. Wheat grain yield was significantly reduced by this treatment. (Crop Science Department, Oregon State University, Corvallis, OR 97331).

Wheat grain yield and crop injury ratings following preplant and preemergence applications of glyphosate plus 2,4-D

Glyphosate rate	2,4-D rate	Applica. timing	Wheat injury Oct 14, '86	Wheat injury Nov 17, '86	Grain yield Oct 14, '86	Grain yield Nov 17, '86
(kg/ha)			(%)		(kg/ha)	
0.4	0.7	7 days preplant	6	0	8400	6790
0.8	1.4	7 days preplant	18	3	8530	6450
0.4	0.7	planting day	13	13	8060	6920
0.8	1.4	planting day	16	63	8130	5980
0.4	0.7	5 days postplant	8	15	7860	6650
0.8	1.4	5 days postplant	16	30	7930	6520
untreated check			0	0	7860	6990
				$LSD_{(0.5)}$	n.s.	820

<u>Broadleaf weed control with fall and spring applied sulfonylurea herbicides on winter wheat</u>. Dial M.J., J.M. Lish and D.C. Thill. Thiameturon, DPXR9674, DPXE8698, and DPXL5300 at 0.0156, 0.0234, and 0.0312 lb ai/a, were applied to winter wheat (var. Lewjain) near Potlatch, Idaho in the fall of 1986 and spring of 1987. The fall herbicide treatments were applied preemergence to any weeds, and at the 2 to 3 leaf stage of the crop. The spring treatments were applied to the wheat at the 3 tiller stage. The dominant weed in the experimental area, mayweed chamomile (ANTCO), which was approximately 2 in. in diameter at the spray application time. All treatments included 0.25% v/v, nonionic surfactant added to the spray solution. The treatments were applied with a CO_2 pressurized backpack sprayer, calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block, split plot, four (herbicides) by three (application rates) by two (application dates) factorial design, replicated four times. Herbicide treatments were the whole plots and application dates were the subplots. The herbicide rates were factored within each application date. Application data are in Table 1. Percent control of mayweed chamomile was visually evaluated on June 22, 1987 and the grain was harvested with a plot combine on August 8.

Table 1. Application data for fall and spring herbicide applications on winter wheat

	Fall	Spring
Application date	11/5/86	4/28/87
Air temperature (F)	41	75
Soil temperature (F)	43	76
Relative humidity (%)	95	81
Wind, (mph) - direction	2-S	4-W
Soil surface	damp	damp
Soil pH	4.3	
OM	4.1	
CEC (meq/100 g soil)	20.0	
Texture	silt loam	
ANTCO density (no./ft^2)	10	

No treatment interactions were detected in this experiment. There also were no differences between herbicides for control of mayweed chamomile. Rate and date of application affected control of mayweed chamomile (Table 2, 3). However, control level was not related to herbicide rate. As expected, spring-time applications of these short residual herbicides controlled mayweed chamomile better than fall applications. Grain yield was not significantly affected by either herbicide rate or date of application. However, in this experiment grain yield was increased by an average three bushels per acre when the herbicide was applied in the spring. (Agricultural Research Station, Moscow, Idaho 83843)

Table 2. Rate of sulfonylurea herbicide application and percent control of mayweed chamomile

Rate	Control
(lb ai/a)	-%-
0.0156	78
0.0234	69
0.0312	71
LSD (0.05)	7

Table 3. Date of sulfonylurea application and percent control of mayweed chamomile

Date	Control
	-%-
Fall	52
Spring	94
LSD (0.05)	11

<u>Bromus sp. control in no-till winter wheat</u>. Dial, M.J. and D.C. Thill. Two field experiments near Lewiston, Idaho were established to evaluate herbicide efficacy on a <u>Bromus</u> sp. complex consisting of downy brome (BROTE), ripgut brome (BRODI), and poverty brome (BROST). Ethiozin alone and in tank mixtures was applied preplant surface (PPS), preemergence (PES), early spring (ESPRI), and when the wheat crop (var. Crew) had developed 2 in. adventitious roots (2ADV). Diclofop was applied PES alone and in tank mixtures with chlorsulfuron, metsulfuron, DPXE8698 and DPXG8311. Terbutryn + metribuzin was applied when the winter wheat crop had developed 2ADV. The treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design replicated four times. Application data for both experiments are listed in Table 1.

Table 1. Application data.

Type of application	PPS	PES	ESPRI	2ADV
Crop growth stage	--	--	3-5 leaf	6 tiller
<u>Bromus</u> .spp growth stage.	--	1-3 leaf	4-6 leaf	2 tiller
Date of application	9/24/86	10/13/86	4/8/87	3/31/87
Air temperature (F)	54	62	50	64
Soil temperature (F)	59	62	60	62
Relative humidity (%)	74	45	90	70
Wind speed (mph) - direction	2-E	3-N	3-W	4-N
Soil pH	5.0			
OM	4.3			
CEC (meq/100 g soil)	26.0			
Texture	silt loam			

Percent control of the <u>Bromus</u> complex was evaluated visually on May 22, and June 17, 1987. Crop density per plot was estimated on July 21, 1987. These data were collected because harvest residue interfered with wheat seeding and intercepted the herbicide spray solution, which interfered with crop stand establishment and weed control, respectively, (data not shown). <u>Bromus</u> complex control differed among herbicide treatments (Table 2). The ethiozin treatments applied ESPRI at 1.0 and 1.5 lb ai/a controlled the <u>Bromus</u> complex, while the same treatments applied PPS or PES were not as effective (Table 2). When cyanazine or cinmethylin were tank mixed with ethiozin, brome control was greater than 90%. However, when chlorsulfuron and DPXG8311 were tank mixed with ethiozin, brome control was less than 75% (Table 2). Average wheat grain yield was increased when the <u>Bromus</u> complex was controlled (Table 2).

When diclofop and the diclofop tank mixtures were applied, <u>Bromus</u> control differed among herbicide treatments (Table 3). However, commercially acceptable control was not attained with any treatment. Wheat grain yield did not differ among treatments (Table 3). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Control of *Bromus* spp. with ethiozin and ethiozin tank mixtures

Treatment[1]	Formulation	Rate	Time of application	*Bromus* sp. control		Grain yield
		(lb ai/a)		-------(%)-------		(bu/a)
				5/22/87	6/17/87	
check	-----	---	---	---	---	30
ethiozin	50WP	1.0	PPS	21	22	31
ethiozin	50WP	1.5	PPS	55	44	47
ethiozin	50WP	1.0	PES	13	0	50
ethiozin	50WP	1.5	PES	49	46	47
ethiozin	50WP	0.75	ESPRI	69	66	64
ethiozin	50WP	1.0	ESPRI	94	95	62
ethiozin	50WP	1.5	ESPRI	96	90	60
ethiozin	50DF	0.75	ESPRI	77	68	61
ethiozin	50DF	1.0	ESPRI	74	57	54
ethiozin	50DF	1.5	ESPRI	91	93	67
ethiozin +	50DF	1.0	ESPRI	92	90	58
cyanazine	80WP	0.375				
ethiozin +	50DF	1.0	ESPRI	91	94	64
cyanazine	80WP	0.625				
ethiozin +	50DF	1.0	ESPRI	90	88	63
cinmethylin	7EC	0.5				
ethiozin +	50DF	1.0	ESPRI	92	92	54
cinmethylin	7EC	0.75				
ethiozin +	50DF	1.0	ESPRI	69	71	59
chlorsulfuron+	75DF	0.0156				
R-11		0.25%				
ethiozin +	50DF	1.0	ESPRI	72	71	59
DPXG8311 +	75DF	0.0156				
R-11		0.25%				
cinmethylin	7EC	1.0	PES	18	0	43
cinmethylin	7EC	2.0	PES	29	23	42
cinmethylin	7EC	1.0	ESPRI	33	18	27
cinmethylin	7EC	2.0	ESPRI	46	39	40
terbutryn +	80WP	0.6	2ADV	32	0	34
metribuzn	75DF	0.25				
weed density (no./ft^2)				10		
LSD (0.05)				35	38	17

[1]R-11 nonionic surfactant concentation is expressed as % v/v.

Table 3. Control of *Bromus* sp. with diclofop and diclofop tank mixtures.

Treatment[1]	Rate[2]	*Bromus* sp. control		Grain yield
	(lb ai/a)	-------(%)--------		(bu/a)
		5/22/87	6/17/87	
check	---	--	--	40
diclofop	1.0	43	68	44
diclofop + chlorsulfuron	1.0 0.0156	26	40	46
diclofop + DPXG8311	1.0 0.0117	44	49	40
diclofop + DPXG8311	1.0 0.0156	38	69	47
diclofop + DPXG8311	1.0 0.0195	30	68	43
diclofop + metsulfuron	1.0 0.0039	28	45	41
diclofop + DPXE8698	1.0 0.0234	46	67	43
chlorsulfuron + R-11	0.0156 0.25%	58	70	48
metribuzin + terbutryn	0.25 0.6	66	71	47
LSD (0.05)		33	41	ns
weed density (no./ft^2)		15		

[1]All treatments were applied PES except metribuzin + terbutryn, which was applied when winter wheat had developed 2ADV.

[2]R-11 is a nonionic surfactant, concentation is expressed as % v/v.

Effect of imazamethabenz rate, spray volume, and spray additive on control of wild oat. Dial, M.J. and D.C. Thill. A threee (herbicide) by three (spray additive) by two (spray volume) factorial was used to evaluate affect of herbicide rate, spray volume, and spray additive on wild oat (AVEFA) control in winter wheat. Imazamethabenz was applied at 0.235, 0.352, and 0.470 lb ai/a without a spray additive, or with 0.25% v/v nonionic surfactant, or 2.0% v/v vegetable oil base crop oil concentrate at 10 and 20 gal/a. The experiment was on conventionally seeded winter wheat near Cusdesac, Idaho and a no-till seeded site near Moscow, Idaho. All treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 10 or 20 gal/a at 42 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design replicated four times. Application data are listed in Table 1.

Table 1. Application data

Location	Culdesac	Moscow
Application date	4/15	4/24
Wheat variety	Stephens	Cashup
Crop growth stage	3 to 4 tiller	3 to 5 tiller
Wild oat growth stage	2 to 3 leaves	3 to 5 leaves
Wild oat density (no./ft^2	6	10
Air temperature (F)	60	69
Soil temperature (F)	62	74
Relative humidity (%)	80	60
Wind (mph) - direction	3-W	3-W
Soil pH	5.1	5.4
OM (%)	5.1	3.1
CEC (meq/100g soil)	22.9	17.6
Texture	silt loam	silt loam

The plots at Culdesac were evaluated on June 18, and the Moscow plots were evaluated on June 26.

At Culdesac, herbicide rate, spray volume, and spray additive did not affect wild oat control (average control was 85%) or grain yield. At Moscow, spray additive affected wild oat control when averaged across herbicide rate and spray volume (Table 2). Herbicide rate, (65% average wild oat control) or spray volume (79% average wild oat control) did not affect wild oat control or grain yield. Spray additive did not affect grain yield. (Agricultural Research Station, Moscow Idaho 83843)

Table 2. Wild oat control with imazamethabenz and spray additive at Moscow, Idaho

Additive	Rate	Control
	(% v/v)	--(%)--
nonionic surfactant	0.25	84
vegetable oil base crop oil concentrate	2.00	81
no spray additive	--	72
LSD (0.05)		8

Preemergence Ventenata and interrupted windgrass control in winter wheat. Dial, M.J. and D.C. Thill. Ventenata (VENDU) and interrupted windgrass (APERA) control with herbicides was evaluated in winter wheat (var. Hill 81) near Plummer, Idaho. Herbicide treatments were applied on April 1, preemergence to the grass weeds. The winter wheat plants had 2 in. adventitious roots (2ADV) and four tillers. The herbicides were applied with a CO_2 pressurized back pack sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 30 ft and treatments were arranged in a randomized complete block design replicated four times. Control of the grass weeds was evaluated on June 22. To avoid possible spread of ventenata to other cooperator's fields plots were not harvested. Application data are in Table 1.

Table 1. Application data

Air temperature (F)	60
Soil temperature (F)	58
Relative humidity (%)	59
Wind speed (mph) - direction	4-N
Soil pH	5.1
OM (%)	2.8
CEC (meq/100 g soil)	13.2
Texture	silt loam

Cinmethylin and ethiozin + metribuzin effectively controlled Ventenata (Table 2). Nearly all treatments containing metribuzin, imazamethabenz, DPXE8698, ethiozin, or cinmethylin controlled interrupted windgrass (Table 2). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Ventenata and interrupted windgrass control in winter wheat

Treatment[1]	Rate	Control VENDU	Control APERA
	(lb ai/a)	---(%)---	
check	---	--	--
metribuzin	0.25	79	73
metribuzin	0.38	79	96
metribuzin + bromoxynil	0.25 0.38	83	76
metribuzin bromoxynil	0.38 0.38	83	76
metribuzin + terbutryn	0.25 0.6	59	98
diclofop	1.0	9	13
diclofop + bromoxynil	1.0 0.38	18	0
imazamethabenz + surfactant	0.47 0.25%	50	96
imazamethabenz + DPXR9674 + surfactant	0.47 0.0156 0.25%	79	98
difenzoquat + surfactant	1.0 0.25%	8	10
difenzoquat + DPXR9674 + surfactant	1.0 + 0.0156 0.25%	58	18
DPXE8698 + surfactant	0.0234 0.25%	28	98
ethiozin	0.75	50	98
ethiozin	1.0	63	95
cinmethylin	1.5	96	100
ethiozin + metribuzin	1.0 0.1875	91	94
weed density (no./ft^2)		30	15
LSD (0.05)		48	30

[1]Surfactant is nonionic, rate is expressed as % v/v.

Scentless mayweed and mayweed chamomile control in winter wheat. Dial M.J. and D.C. Thill. Scentless mayweed (MATIN) and mayweed chamomile (ANTCO) control with herbicides was evaluated in 'Stephens' winter wheat near Moscow, Idaho. Plots adjacent to the experimental area were established to compare a fall applied treatment (0.25 lb ai/a bromoxynil and 0.6 lb ai/a diuron) with the spring applied treatments. All treatments were applied on March 24, 1987, when the winter wheat crop had developed 2 in. long adventitious roots. The scentless mayweed was 2 to 3 in. in diameter and the mayweed chamomile was less than 1 in. in diameter. The herbicides were applied with a CO_2 pressurized sprayer calibrated to deliver 10 gal/a at 40 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design, replicated four times. Scentless mayweed and mayweed chamomile control were evaluated visually on June 11 1987. The grain was harvested on July 30 with a plot combine. Application data are in Table 1.

Table 1. Application data

Application date	3/24/87
Air temperature (F)	42
Soil Temperature (F)	38
Relative humidity (%)	70
Wind speed (mph) - direction	3-W
Soil pH	5.3
OM (%)	4.7
CEC (meq/100 g soil)	21.1
Texture	loam

Herbicide control of scentless mayweed ranged from 15 to 100% (Table 2). The fall treatment controlled scentless mayweed and mayweed chamomile through harvest (Table 2). SC0051 caused severe chlorosis of the crop through most of the spring and early summer, and did not control either scentless mayweed or mayweed chamomile (Table 2). Control was similar for both scentless mayweed and mayweed chamomile except when CGA13106 was used (Table 2). The crop injury related to the chlorosis and reduced weed control were expressed in reduced grain yield (Table 2). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Scentless mayweed and mayweed chamomile control and winter wheat grain yield

Treatment	Rate	Control MATIN	Control ANTCO	Grain yield
	(lb ai/a)	------(%)------		(bu/a)
check	---	---	---	44
diuron +	0.6	15	0	79
bromoxynil	0.25			
CGA13106 +	0.0156	91	39	93
surfactant[1]	0.25%			
CGA131036 +	0.0078	97	50	90
bromoxynil	0.1875			
CGA131036 +	0.0078	83	71	101
bromoxynil/MCPA	0.1875			
CGA131036 +	0.0156	99	99	95
terbutryn +	0.6			
surfactant	0.25%			
dicamba +	0.09	99	100	85
thiameturon	0.0234			
bromoxynil +	0.1875	97	96	90
thiameturon	0.0234			
bromoxynil +	0.1875	99	99	97
DPXR9674	0.0234			
thiameturon +	0.0313	100	100	97
surfactant	0.25%			
bromoxynil/MCPA	0.38	41	50	61
DPXR9674 +	0.0234	99	100	91
surfactant	0.25%			
metribuzin +	0.25	38	63	94
bromoxynil	0.38			
CGA131036 +	0.0156	93	65	93
metribuzin +	0.12			
surfactant	0.25%			
terbutryn +	0.8	93	99	87
MCPA amine	0.5			
SC0051 +	0.75	23	25	77
Tween 20	0.25% v/v			
SC0051 +	0.37	10	20	60
Tween 20	0.25% v/v			
CGA131036 +	0.0156	98	85	97
diuron +	0.4			
surfactant	0.25%			
CGA131036 +	0.0156	98	80	96
terbutryn +	0.3			
surfactant	0.25%			
weed density (no./ft^2)		22	10	
LSD (0.05)		28	33	22
diuron +	0.6	100	100	105
bromoxynil[2]	0.25			

[1]Nonionic surfactant, concentration expressed as % v/v.
[2]Grower applied on October 23, 1986. Area included for comparison only.

Volunteer winter rape control in winter wheat. Dial, M.J. and D.C. Thill. Eighteen herbicide treatments and herbicide combinations were evaluated for volunteer winter rape (BRSNA) control in winter wheat (var. Daws) near Pullman, Washington. Herbicide treatments were applied in the fall and spring. In the fall, the wheat plants had 1 to 3 leaves and the volunteer rape had 2 to 4 leaves and was 3 in. tall. The spring herbicide treatments were applied when the winter wheat had three tillers and 2 in. long adventitious roots (2ADV). The volunteer rape was in the stem elongation stage and had topped the wheat canopy. Fall and spring herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 20 gal/a at 42 psi and 3 mph. The plots were 10 by 30 ft and the treatments were arranged in a randomized complete block design replicated four times. Application data are in Table 1.

Table 1. Application data

Application dates	10/21/86	3/24/87
Air temperature (F)	59	56
Soil temperature (F)	62	52
Relative humidity (%)	79	70
Wind (mph) - direction	2-S	4-W
Soil pH	5.7	
OM (%)	3.4	
CEC (meq/100 g soil)	16.1	
Texture	silt loam	

The plots were evaluated visually for control of volunteer winter rape control on March 24, April 27, and June 11 1987. Grain yield was not determined because the plots were infested with jointed goatgrass (AEGCY). Bromoxynil at 0.38 lb ai/a controlled the volunteer rape (Table 2). Tank mixing bromoxynil did not enhance activity. DPXG8311 also controlled volunteer rape (Table 2). Dicamba and duiron applied alone did not control the winter rape (Table 2). (Agricultural Experiment Station, Moscow, Idaho 83843)

Table 2. Volunteer winter rape control in winter wheat

Treatment[1]	Rate	Time of application	BRSNA control		
	(lb ai/a)		--------(%)--------		
			3/24/87	4/27/87	6/11/87
check	---	---	---	---	---
dicamba	0.09	fall	0	0	0
dicamba +	0.09	fall	97	99	98
DPXG8311	0.0188				
dicamba +	0.09	fall	56	45	83
DPXE8698	0.0234				
dicamba +	0.09	fall	15	33	50
DPXM6316	0.0243				
bromoxynil	0.25	fall	89	94	77
bromoxynil	0.38	fall	95	99	96
bromoxynil +	0.1875	fall	92	96	98
DPXM6316	0.0234				
diuron	0.8	fall	8	46	41
diuron +	0.6	fall	99	97	95
bromoxynil	0.25				
DPXG8311 +	0.0188	fall	100	100	100
surfactant	0.25%				
bromoxynil +	0.25	fall	99	100	100
DPXR9674 +	0.0156	spring			
surfactnat	0.25%				
diuron +	0.6	spring	---	63	83
bromoxynil	0.25				
bromoxynil/MCPA	0.375	spring	---	96	94
terbutryn +	0.8	spring	---	93	96
MCPA amine	0.5				
DPXR9674 +	0.0234	spring	---	93	80
surfactant	0.25%				
bromoxynil +	0.1875	spring	---	94	90
DPXR9674	0.0156				
metribuzin +	0.125	spring	---	96	98
DPXR9674 +	0.0156				
surfactant	0.25%				
diuron +	0.6	spring	---	91	98
DPXR9674 +	0.0156				
surfactant	0.25%				
weed density (no./ft^2)				15	
LSD (0.05)			17	27	23

[1]Surfactant is a nonionic surfactant, concentration is expressed % v/v.

Diuron formulations on winter wheat. Gleichsner, J.A., D.C. Peek, and A.P. Appleby. Diuron is often a good starting point for basic weed control in winter wheat in western Oregon. It controls many annual broadleaves, annual bluegrass, and Italian ryegrass that is not too dense. Diuron is available in three formulations: a wettable powder (wp), a liquid flowable (lf), and a new dry flowable (df). Four trials were established in Oregon's Willamette Valley to compare the effect of these formulations on crop tolerance and weed control in winter wheat ('Stephens'). Plot size was 2.4 m by 7.6 m, arranged in a randomized complete block design with four replications. Treatments were applied with a unicycle plot sprayer calibrated to deliver 234 l/ha at 131 kPa pressure when wheat was 1 to 2 leaf. Growers were asked to overspray the trial site with all herbicides normally used in the field, with the exception of diuron. Wheat injury and weed control were visually evaluated in mid December and again in February or March. Because weeds (species and number) varied from location to location, ratings were made only where uniform populations existed. Plots were harvested in late July and early August with a small-plot combine.

All herbicide treatments caused slight to moderate (3-21%) wheat injury early in the season (data not shown) that was still present at the second evaluation (Table 1). Yields at locations 1, 2, and 3 were little affected by this injury and all treatments either outyielded or were not significantly different from the check (Table 2). The wheat stand at location 4 was extremely weak and, unlike the other sites, was not able to fully recover from injury, thus all treatments yielded lower (538-1344 kg/ha) than the check.

Annual bluegrass was controlled by all treatments (Table 3). In fact, yields at location 1 were significantly increased (806-1411 kg/ha) when bluegrass, the only major weed problem, was controlled. Diuron, regardless of formulation, effectively controlled red dead nettle (85-90%) with slightly better control (1-4%) at the higher rate (Table 3).

In general, differences among diuron formulations or between rates for crop tolerance and weed control did not exist or were inconsistent. (Crop Science Dept., Oregon State Univ., Corvallis, OR 97331)

Table 1. Visual evaluations of wheat injury from four locations treated with diuron formulations.[a]

Treatment	Rate	Wheat injury[b] Location 1	2	3	4	Avg
	(kg/ha)	(%)				
Diuron wp	1.34	9	9	11	8	9
Diuron wp	1.79	15	14	8	10	12
Diuron lf	1.34	5	8	14	14	10
Diuron lf	1.79	15	16	13	15	15
Diuron df	1.34	9	5	11	13	10
Diuron df	1.79	11	5	13	11	10
Check		0	0	0	0	0

[a]Evaluations were taken at locations 1 and 2 on February 17, 1987, and March 19, 1987, at locations 3 and 4.
[b]Wheat injury: 0 = no wheat injury, 100 = wheat kill.

Table 2. Wheat grain yields from four locations treated with diuron formulations.

Treatment	Rate	Wheat grain yield Location 1	2	3	4	Avg
	(kg/ha)	(kg/ha)				
Diuron wp	1.34	6600	6570	8060	4920	6540
Diuron wp	1.79	6180	6150	8150	4940	6360
Diuron lf	1.34	5950	6470	8530	4990	6490
Diuron lf	1.79	6380	6500	8470	4920	6570
Diuron df	1.34	6380	6850	8530	5020	6700
Diuron df	1.79	6500	6650	8690	4250	6520
Check		5140	6380	8550	5560	6410
$LSD_{0.05}$ =		690	n.s.	610	610	
C.V. (%) =		7.5	9.9	4.8	8.3	

Table 3. Weed control in winter wheat treated with diuron formulations.[a]

		Weed control[b]			
		Annual bluegrass			Red dead nettle
		Location			Location
Treatment	Rate	1	3	Avg	3
	(kg/ha)	(%)			
Diuron wp	1.34	100	94	97	86
Diuron wp	1.79	100	99	100	90
Diuron lf	1.34	100	96	98	88
Diuron lf	1.79	100	95	98	89
Diuron df	1.34	100	94	97	85
Diuron df	1.79	100	98	99	88
Check		0	0	0	0

[a]Evaluations were taken February 17, 1987, at location 1 and March 19, 1987, at location 3.
[b]Weed control: 0 = no control, 100 = complete control.

Evaluation of bromoxynil, sulfonyl-urea tank mixes in winter wheat. Kidder, D.W., I.C. Hopkins and D.P. Drummond. The herbicide bromoxynil, in combination with DPX-L5300, DPX-M6316, and DPX-R9674, was evaluated for control of pinnate tansymustard (*Descurainia pinnata* (Walt.) Britt. # DESPI) and tumble mustard (*Sisymbrium altissimum* L. # SSYAL) in winter wheat located in Minidoka County, Idaho. Fifteen treatments, including the control, were applied in a randomized complete block design with four replications. Winter wheat (hard red var. Ute) was planted on September 22, 1986 at a rate of 60 lb/a on nonirrigated cropland.

Herbicides were applied on April 1, 1987 as postemergence applications using a CO_2 pressurized bicycle sprayer using 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 10 feet wide and 30 feet long. Soil was a silt loam with a pH of 7.2 and organic matter content of 1.1%. Pinnate tansymustard was 2 to 3 inches in diameter and tumble mustard was 1 to 2 inches in diameter at the time of application. Winter wheat was 2 to 3 inches tall and tillering. Visual evaluations were made on April 23 and May 27.

Weed control results are given in Table 2. (Univ. of Idaho Cooperative Extension Service, Twin Falls, ID 83301)

Table 1. Application data for weed control in winter wheat

Date of application	4/01/87
Air temperature (F)	64
Soil temperature @ surface (F)	77
Soil temperature @ 8 cm (F)	52
Relative humidity (%)	66
Dew present	none
Wind (mph)	4
Cloud cover (%)	0
pH	7.20
OM (%)	1.08
soil texture	silt loam

Table 2. Bromoxynil, sulfonyl-urea tank mixes in winter wheat

Treatment[1]	Rate	Control April 23 DESPI[2]	Control April 23 SSYAL[2]	Control May 27 DESPI	Control May 27 SSYAL
	(lb a.i./A)	(%)			
Check	...	0	0	0	0
Bromoxynil	0.25	50	60	44	53
Bromoxynil	0.50	60	73	56	63
Dicamba	0.125	69	76	71	79
DPX-M6316 + Surf.[3]	0.0156	76	93	80	75
DPX-L5300 + Surf.	0.0156	95	92	97	86
DPX-R9674 + Surf.	0.0156	49	59	38	56
Bromoxynil + DPX-M6316 + Surf.	0.25 + 0.0078	56	84	71	80
Bromoxynil + DPX-M6316 + Surf.	0.25 + 0.0156	59	83	66	81
Bromoxynil + DPX-L5300 + Surf.	0.25 + 0.0078	91	81	90	75
Bromoxynil + DPX-L5300 + Surf.	0.25 + 0.0156	91	95	95	86
Bromoxynil + DPX-R9674 + Surf.	0.25 + 0.0078	75	92	61	84
Bromoxynil + DPX-R9674 + Surf	0.25 + 0.0156	88	94	84	94
2,4-D amine	0.50	85	90	89	93
2,4-D amine + DPX-L5300 + Surf.	0.25 + 0.0156	91	98	99	99
LSD (0.05)		23	24	21	20

[1] Treatments applied April 1 when the wheat was 2-3 inches tall and the broadleaf weeds were 1-3 inches in diameter.
[2] DESPI = pinnate tansymustard
SSYAL = tumble mustard
[3] Surfactant (R-11) 0.25% v/v

Downy brome control in winter wheat. Miller, S.D. Research plots were established near Hawk Springs, WY, to evaluate the efficacy of SMY-1500 for downy brome control in winter wheat when applied at several stages. Winter wheat (var. Thunderbird) was seeded in a sandy loam soil (72% sand, 18% silt and 10% clay) with 1.6% organic matter and a 7.5 pH September 10, 1986. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi September 26 (air temp 70 F, relative humidity 45%, wind N 8 mph, sky partly cloudy and soil temp - 0 inch 80 F, 2 inch 60 F and 4 inch 55 F) to 2 to 3-leaf winter wheat and 1 to 2-leaf downy brome and October 29, 1986 (air temp 68 F, relative humidity 34%, wind calm, sky clear and soil temp - 0 inch 71 F, 2 inch 60 F and 4 inch 55 F) to 2 to 3 tiller winter wheat and 2 tiller downy brome. Plots were established on non-irrigated land and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made April 29, 1987. Downy brome (BROTE) and tansymustard (DESPI) infestations were moderate but variable throughout the experimental area.

SMY-1500 reduced winter wheat stand 40% when applied at 2.0 lb/A to 2 to 3-leaf winter wheat. Slight stand loss (10% or less) was observed with SMY-1500 at rates of 1.0 to 1.5 lb/A. Downy brome and tansymustard control with SMY-1500 was 87% or greater regardless of stage or rate of application. Weed control with SMY-1500 at 1.0 lb/A tended to decrease as plant maturity increased. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1494.)

Downy brome control in winter wheat

Treatment[1]	Rate lb ai/A	Winter wheat[2] injury %	Winter wheat[2] stand red %	Control[3] BROTE %	Control[3] DESPI %
1 to 2-leaf downy brome					
SMY-1500	1.0	0	2	97	95
SMY-1500	1.25	0	7	100	100
SMY-1500	1.5	2	10	100	100
SMY-1500	2.0	8	40	100	100
2-tiller downy brome					
SMY-1500	1.0	0	0	90	87
SMY-1500	1.5	0	5	97	97
SMY-1500 + metribuzin	1.0 + 0.063	0	7	100	100
SMY-1500 + metribuzin	1.25 + 0.063	0	10	100	100
weedy check	------------	0	0	0	0

[1]Treatments applied September 26 and October 29, 1986
[2]Wheat injury and stand reduction (red) visually evaluated April 29, 1987
[3]Weed control visually evaluated April 29, 1987

Downy brome control in winter wheat. Miller, S.D. and J.M. Krall. Research plots were established at the Archer Research and Extension Center, Archer, WY, to evaluate the efficacy of herbicide treatments for downy brome control in winter wheat when applied at several stages. Winter wheat (var. Buckskin) was seeded in a loam soil (46% sand, 28% silt and 26% clay) with 1.3% organic matter and a 7.3 pH September 11, 1986. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi September 18, 1986 (air temp 65, relative humidity 45%, wind SE 10 mph, sky cloudy and soil temp - 0 inch 65 F, 2 inch 62 F and 4 inch 64 F) to emerging winter wheat and 1 to 2-leaf downy brome; October 25, 1986 (air temp 55 F, relative humidity 37%, wind NW 10 mph, sky clear and soil temp - 0 inch 58 F, 2 inch 44 F and 4 inch 40 F) to 3 to 4-leaf winter wheat and 3-leaf downy brome or April 7, 1987 (air temp 53 F, relative humidity 19%, wind SE 10, sky partly cloudy and soil temp - 0 inch 64 F, 2 inch 52 F and 4 inch 45 F) to 4 tiller winter wheat and 1 to 2 tiller downy brome. Plots were established on non-irrigated land and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made April 29, winter wheat height measured June 23 and plots harvested July 27, 1987. Downy brome infestations were heavy and uniform throughout the experimental area.

Winter wheat injury and stand loss was evident with 1 to 2-leaf applications of DPX-R7910 at 2 lb/A, SMY 1500 combinations with metribuzin at 0.063 and 0.125 lb/A, or metribuzin alone at 0.25 lb/A. The only treatment causing injury and stand loss at the 3 to 4-leaf stage was metribuzin alone at 0.25 lb/A. All herbicide treatments increased winter wheat yields when compared to the weedy check. Winter wheat yields were generally highest with the 1 to 2-leaf applications. Downy brome (BROTE) control ranged from 80 to 99% at the 1 to 2-leaf stage, 57 to 77% at the 3 to 4-leaf stage and 50 to 67% at the 1 to 2 tiller stage. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1493.)

Downy brome control in winter wheat

Treatment[1]	Rate lb ai/A	Winter wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] BROTE %
1 to 2-leaf downy brome						
DPX-R7910 (wp)	0.75	2	0	30	23	92
DPX-R7910 (wp)	1.0	2	0	30	24	95
DPX-R7910 (wp)	1.5	3	5	30	23	99
DPX-R7910 (wp)	2.0	10	15	30	21	99
DPX-R7910 (df)	0.75	0	0	29	23	80
DPX-R7910 (df)	1.0	0	0	30	24	88
DPX-R7910 (df)	1.5	0	5	29	25	95
DPX-R7910 (df)	2.0	3	10	30	23	98
SMY-1500	0.75	0	0	29	23	85
SMY-1500	1.0	0	0	30	23	93
SMY-1500	1.25	0	0	28	24	96
SMY-1500 + chlorsulfuron	1.0 + 0.016	0	3	29	25	88
SMY-1500 + metribuzin	0.5 + 0.125	2	5	29	23	92
SMY-1500 + metribuzin	0.75 + 0.063	2	5	30	22	94
SMY-1500 + metribuzin	1.0 + 0.063	7	12	29	22	95
SMY-1500 + metribuzin + chlorsulfuron	0.75 + 0.063 + 0.016	2	13	29	21	92
metribuzin	0.25	7	15	29	21	85
3 to 4-leaf downy brome						
SMY-1500	1.0	0	0	29	20	65
SMY-1500	1.25	0	0	28	21	70
SMY-1500 + chlorsulfuron	1.25 + 0.016	0	0	28	20	68
SMY-1500 + metribuzin	0.5 + 0.125	0	0	28	20	57
SMY-1500 + metribuzin	0.75 + 0.063	0	0	28	19	67
SMY-1500 + metribuzin	1.0 + 0.063	0	0	28	19	77
metribuzin	0.25	7	7	28	18	70
1 to 2-tiller downy brome						
SMY-1500	1.25	0	0	27	12	50
SMY-1500 + metribuzin	1.25 + 0.063	0	0	28	14	57
SMY-1500 + metribuzin	1.25 + 0.125	0	0	28	14	67
weedy check	------------	0	0	25	5	0

[1] Treatments applied September 18, 1986, October 25, 1986 and April 7, 1987; wp = wettable powder and df = dry flowable

[2] Wheat injury and stand reduction (red) visually evaluated April 29, plant height measured June 23 and plots harvested July 27, 1987

[3] Weed control visually evaluated April 29, 1987

Jointed goatgrass control in winter wheat. Miller, S.D. and J.M. Krall. Research plots were established near Lingle, WY, to evaluate the efficacy of SMY-1500 for jointed goatgrass control in winter wheat when applied at several stages. Winter wheat (var. Buckskin) was seeded in a sandy loam soil (72% sand, 18% silt and 10% clay) with 1.4% organic matter and a 7.2 pH September 8, 1986. The herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi September 26 (air temp 65 F, relative humidity 30%, wind W at 6 mph, sky partly cloudy and soil temp - 0 inch 60 F, 2 inch 58 F and 4 inch 58 F) to 2 to 3-leaf wheat and 1 to 2-leaf jointed goatgrass and October 29, 1986 (air temp 59 F, relative humidity 47%, wind calm, sky clear and soil temp - 0 inch 58 F, 2 inch 52 F and 4 inch 51 F) to 3 to 4 tiller wheat and 2 to 3-leaf jointed goatgrass. Plots were established on non-irrigated land and were 9 by 30 ft with three replications arranged in a randomized complete block. Visual weed control and crop damage evaluations were made April 29, winter wheat height measured July 12 and plots harvested July 13, 1987. Jointed goatgrass and tansymustard infestations were moderate and uniform throughout the experimental area.

SMY-1500 at rates of 1.25 lb/A or higher caused slight wheat injury (less than 10%); however, neither stand or yield were reduced. Jointed goatgrass (AEGCY) control with SMY-1500 decreased as plant maturity increased; however, tansymustard (DESPI) control was similar at both stages of application. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1492.)

Jointed goatgrass control in winter wheat

Treatment[1]	Rate lb ai/A	Winter wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] AEGCY %	DESPI %
1 to 2-leaf jointed goatgrass							
SMY-1500	1.0	0	0	32	47	88	88
SMY-1500	1.25	2	0	32	48	92	91
SMY-1500	1.5	5	0	31	44	95	92
SMY-1500	2.0	8	0	32	43	99	99
2 to 3-leaf jointed goatgrass							
SMY-1500	1.0	0	0	33	50	73	85
SMY-1500	1.5	3	0	33	50	85	90
SMY-1500 + metribuzin	1.0 + 0.063	0	0	33	50	83	95
SMY-1500 + metribuzin	1.25 + 0.063	3	0	33	50	83	95
weedy check	------------	0	0	33	47	0	0

[1] Treatments applied September 26 and October 29, 1986

[2] Wheat injury and stand reduction (red) visually evaluated April 29, plant height measured July 12 and plots harvested July 13, 1987

[3] Weed control visually evaluated April 29, 1987

Weed control in winter wheat with CGA-131036. Miller, S.D. and J.M. Krall. Research plots were established at the Archer Research and Extension Center, Archer, WY, to evaluate weed control and winter wheat tolerance with pre and postemergence applications of CGA-131036. Plots were established on non-irrigated land and were 9 by 30 ft in size with three replications arranged in a randomized complete block. Winter wheat (var. Buckskin) was planted in a loam soil (46% sand, 28% silt and 26% clay) with 1.2% organic matter and a 7.3 pH September 10, 1986. Herbicide treatments were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi September 10, 1986 (air temp 58, relative humidity 41%, wind SE 3 mph, sky cloudy and soil temp - 0 inch 64 F, 2 inch 62 F and 4 inch 61 F) preemergence to winter wheat and tansymustard; October 25, 1986 (air temp 52 F, relative humidity 37%, wind calm, sky cloudy and soil temp 0 inch 54 F, 2 inch 50 F and 4 inch 50 F) to 3 to 4-leaf winter wheat and emerging tansymustard or April 23, 1987 (air temp 68 F, relative humidity 30%, wind SE at 5 mph, sky partly cloudy and soil temp - 0 inch 75 F, 2 inch 56 F and 4 inch 52 F) to 6 tiller winter wheat and 3 to 6 inch tansymustard. Visual weed control and crop damage evaluations were made June 4, winter wheat height measured June 23 and plots harvested July 27, 1987. Tansymustard infestations were moderate and uniform throughout the experimental area.

Slight winter wheat injury (less than 10%) was observed with several treatments; however, winter wheat stand or height was not affected. Winter wheat yields generally reflected weed control and were 3 to 7 bu/A higher in herbicide treated plots than in the weedy check plots. Tansymustard (DESPI) control was excellent with all treatments. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1496.)

Weed control in winter wheat with CGA-131036

Treatment[1]	Rate lb ai/A	Winter wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] DESPI %
Preemergence						
CGA-131036	0.009	3	0	29	38	100
CGA-131036	0.018	3	0	30	34	100
chlorsulfuron	0.018	7	0	29	34	100
Fall post						
CGA-131036 + s	0.009	0	0	30	36	100
CGA-131036 + s	0.018	2	0	30	36	100
chlorsulfuron	0.018	0	0	31	36	100
Fall/spring post						
CGA-131036 + s/CGA-131036 + s	0.009/0.009	0	0	31	38	100
Spring post						
CGA-131036 + s	0.009	0	0	31	38	95
CGA-131036 + s	0.013	0	0	30	37	100
CGA-131036 + s	0.018	0	0	31	37	100
CGA-131036 + terbutryn + s	0.013 + 0.13	2	0	31	35	100
CGA-131036 + bromoxynil + s	0.009 + 0.125	0	0	31	36	98
CGA-131036 + bromoxynil + s	0.018 + 0.125	0	0	31	35	100
CGA-131036 + 2,4-D (DMA) + s	0.009 + 0.25	3	0	30	36	100
CGA-131036 + 2,4-D (DMA) + s	0.018 + 0.25	7	0	29	36	100
CGA-131036 + dicamba + s	0.009 + 0.063	0	0	31	36	100
CGA-131036 + dicamba + s	0.018 + 0.063	7	0	31	37	100
CGA-131036 + SMY-1500 + s	0.009 + 1.0	2	0	30	36	100
CGA-131036 + SMY-1500 + s	0.018 + 1.0	8	0	30	36	100
chlorsulfuron + s	0.018	0	0	32	35	100
weedy check	-----	0	0	29	31	0

[1]Treatments applied September 10, 1986, October 25, 1986 and April 23, 1987; s = X-77 at 0.25% v/v and DMA = dimethylamine

[2]Wheat injury and stand reduction (red) visually evaluated June 4, plant height measured June 23 and plots harvested July 27, 1987

[3]Weed control visually evaluated June 4, 1987

Tansymustard control in winter wheat. Miller, S.D. and J.M. Krall. A series of postemergence herbicide treatments were applied near Chugwater, WY, to evaluate their effectiveness for tansymustard control in winter wheat. Winter wheat (var. Buckskin) was seeded in a sandy loam soil (65% sand, 20% silt and 15% clay) with 1.4% organic matter and a 7.7 pH September 3, 1986. Plots were 9 by 20 ft with three replications arranged in a randomized complete block. The herbicides were applied broadcast with a CO_2 pressurized six-nozzle knapsack sprayer delivering 20 gpa at 40 psi April 24, 1987 (air temp 76 F, relative humidity 30%, wind SW at 4 to 7 mph, sky clear and soil temp - 0 inch 84 F, 2 inch 72 F and 4 inch 58 F) to 4 tiller winter wheat and 4 to 8 inch tansymustard. Visual weed control, crop damage and height measurements were made June 15 and plots harvested July 23, 1987. Tansymustard (DESPI) infestations were heavy and uniform throughout the experimental area.

Slight wheat injury (5% or less) was observed with several treatments. Chlorsulfuron or metsulfuron in combination with cyanazine reduced winter wheat stand 8 and 5%, respectively. Herbicide treatments increased winter wheat yields 6 to 13 bu/A compared to the weedy check and yield increases were generally related to tansymustard control. Tansymustard control exceeded 80% with all treatments containing chlorsulfuron or metsulfuron. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1490 .)

Tansymustard control in winter wheat

Treatment[1]	Rate lb ai/A	Winter wheat[2] injury %	stand red %	height inches	yield bu/A	Control[3] DESPI %
clopyralid + 2,4-D	0.06 + 0.38	0	0	32	20	57
clopyralid + 2,4-D + dicamba	0.06 + 0.38 + 0.06	3	0	31	22	57
clopyralid + 2,4-D + picloram	0.06 + 0.38 + 0.02	3	0	31	23	57
clopyralid + 2,4-D + chlorsulfuron	0.06 + 0.38 + 0.005	0	0	31	25	83
clopyralid + 2,4-D + metsulfuron	0.06 + 0.38 + 0.004	0	0	32	24	82
clopyralid + 2,4-D + CGA-131036	0.06 + 0.38 + 0.005	0	0	32	25	88
XRM-4813	0.52	0	0	32	23	70
picloram + 2,4-D	0.02 + 0.38	0	0	31	24	77
picloram + MCPA	0.02 + 0.38	3	0	30	20	63
picloram + chlorsulfuron	0.02 + 0.004	3	0	31	25	81
picloram + chlorsulfuron	0.02 + 0.008	5	0	31	25	87
chlorsulfuron + s	0.008	0	0	32	25	87
chlorsulfuron + s	0.015	0	0	32	26	92
chlorsulfuron + cyanazine + s	0.015 + 0.45	3	8	32	24	95
chlorsulfuron + clopyralid + s	0.015 + 0.06	0	0	31	25	83
chlorsulfuron + clopyralid + s	0.015 + 0.125	0	0	32	24	83
metsulfuron + s	0.004	0	0	32	25	83
metsulfuron + s	0.008	0	0	32	27	87
metsulfuron + cyanazine + s	0.004 + 0.45	2	5	32	25	80
metsulfuron + clopyralid + s	0.004 + 0.125	0	0	31	24	82
metsulfuron + 2,4-D + s	0.004 + 0.38	0	0	31	27	90
metsulfuron + 2,4-D + s	0.008 + 0.25	0	0	31	26	96
metsulfuron + dicamba + s	0.004 + 0.06	3	0	32	27	83
2,4-D	0.75	0	0	31	24	73
weedy check	----	0	0	32	14	0

[1]Treatments applied April 24, 1987 and s = X-77 at 0.25% v/v
[2]Wheat injury, stand reduction (red) and plant height determined June 15 and plots harvested July 23, 1987
[3]Tansymustard control visually evaluated June 15, 1987

Evaluation of postemergence herbicide treatments with experimental compounds in wheat. Mitich, L.W., N.L. Smith, and G.B. Kyser. Eight herbicides in 20 treatments were evaluated for broadleaf weed control and crop tolerance in 'Yecora Rojo' wheat at the UC Davis Experimental Farm, Yolo County. Wheat was drill planted 13 November 1986 at 100 lb/A. Treatments were applied 27 February 1987, when wheat had 3 to 5 tillers, with a CO_2 backpack sprayer calibrated at a total spray volume of 20 gpa at 30 psi. Temperature at application was approximately 50 F. Plots were 10 ft by 20 ft, arranged in a randomized complete block design. Treatment effects were visually evaluated 15 March, and wheat was harvested 9 July. Weeds naturally present in the field included coast fiddleneck (AMSIN), shepherdspurse (CAPBP), common chickweed (STEME), henbit (LAMAM), common groundsel (SENVU), wild radish (RAPRA), and minerslettuce (CLAPE).

The experimental chemical AC-222,293, primarily a wild oat herbicide, produced adequate (70%) to excellent (100%) control of shepherdspurse, wild radish, and henbit at rates of 0.25 to 0.5 lb/A. A tank mix of AC-222,293 with bromoxynil + MCPA (0.38 + 0.5 + 0.5 lb/A) controlled these weeds, plus fiddleneck and groundsel, as did bromoxynil + MCPA (0.5 + 0.5 lb/A) alone. Tank mixes of AC-222,293 with chlorsulfuron (0.38 lb/A + 0.5 oz/A) and DPX-M6316 (0.38 lb/A + 0.5 oz/A) successfully controlled all species, as did DPX-R9674 at rates of 0.125 to 0.5 oz/A. DPX-M6316 alone (0.25 to 1.0 oz/A) produced inconsistent control at the lowest rate applied, but controlled all species at higher rates. CGA-131036 (0.0132 and 0.0263 lb/A) controlled all species at both rates but may have been inconsistent on henbit. Ethiozin (BAY SMY 1500)(1.0 lb/A) and ethiozin + metribuzin (1.0 lb/A + 2.0 oz/A) controlled all species except groundsel; their control of minerslettuce was inconsistent.

None of the treatments produced any visible crop injury. DPX-R9674 may have reduced yields at high rates, but results were inconsistent. Yield of wheat treated with ethiozen + metribuzin (1.0 lb/A + 2.0 oz/A) was reduced compared to that of ethiozen (1.0 lb/A) alone, though weed control was not significantly different. Low yields from plots treated with the low rate of AC-222,293 (0.25 lb/A) or with bromoxynil + MCPA (0.5 + 0.5 lb/A) are attributable to relatively poor weed control. (University of California Cooperative Extension, Davis, CA 95616)

Table. **Evaluation of broadleaf weed control and effect on wheat yield for 20 herbicide treatments in wheat at the UC Davis campus, Yolo County**

Herbicide	Rate (ai/A)	Evaluation for weed control, 3/15/87[1]							Yield (lb/A),[2] Significance	
		AMSIN	CAPBP	STEME	LAMAM	SENVU	RAPRA	CLAPE		
DPX-M6316	0.25 oz	10	9	7	6	9	9	10	4893.75	ABCDE
DPX-M6316	0.375 oz	10	10	9	7	9	8	10	5220.5	ABCD
DPX-M6316	0.5 oz	10	9	9	10	10	9	10	4968.5	ABCDE
DPX-M6316	1.0 oz	10	10	10	7	10	9	10	5274.75	ABCD
DPX-R9674	0.125 oz	10	10	10	10	10	8	10	5860.25	ABC
DPX-R9674	0.25 oz	10	10	10	10	9	9	10	5138.75	ABCD
DPX-R9674	0.375 oz	10	10	10	10	10	9	10	4328.75	DE
DPX-R9674	0.5 oz	10	9	10	10	10	8	10	5356.75	ABCD
AC-222,293	0.25 lb	2	7	0	7	0	10	0	3675.25	E
AC-222,293	0.38 lb	5	10	0	10	0	10	0	4900.5	ABCDE
AC-222,293	0.5 lb	1	10	0	10	0	10	0	5206.75	ABCD
AC-222,293 + bromoxynil + MCPA	0.38 + 0.5 + 0.5 lb	10	10	0	10	7	9	0	4603.25	CDE
AC-222,293 + chlorsulfuron	0.38 lb + 0.5 oz	10	10	10	10	10	9	10	4968.75	ABCDE
AC-222,293 + DPX-M6316	0.38 lb + 0.5 oz	10	10	10	7	9	10	10	6119.0	A
CGA-131036	0.0132 lb	10	9	10	10	9	9	10	4859.75	ABCDE
CGA-131036	0.0263 lb	10	10	10	5	10	9	10	5479.0	ABCD
ethiozin	1.0 lb	10	10	10	10	0	10	6	6043.75	AB
ethiozin + metribuzin	1.0 lb + 2.0 oz	7	10	10	10	3	9	7	4356.25	DE
bromoxynil + MCPA	0.5 + 0.5 lb	10	9	0	7	7	7	0	4192.75	DE
unweeded control	---	0	2	0	7	0	2	0	4743.75	BCDE

[1]Evaluations conducted on a scale of 0 to 10, where 0 = no weed control and 10 = complete control.
[2]Significant difference at the 5% level; values followed by the same letter are not significantly different.

All values average of 4 replications.

Winter wheat cultivar response to SMY-1500 and metribuzin. Stahlman, P., J.M. Krall, and S.D. Miller. Research plots were established at the Torrington Research and Extension Center, Torrington, WY, to evaluate winter wheat cultivar response to fall or spring SMY-1500 and/or metribuzin applications. Winter wheat cultivars were seeded in a sandy loam soil (70% sand, 17% silt and 13% clay) with 1.2% organic matter and a 7.7 pH October 4, 1986. Herbicide treatments were applied broadcast with a tractor mounted sprayer delivering 20 gpa at 30 psi November 2, 1986 (air temp 50 F, relative humidity 30%, wind calm and sky clear) to 2 to 3-leaf winter wheat and March 26, 1987 (air temp 45 F, relative humidity 62%, wind W at 2 mph and sky clear) to 3 to 4 tiller winter wheat. Plots were established under irrigation in an area with relatively little weed pressure. All plots were sprayed with bromoxynil for broadleaf weed control. Plots were 8 by 20 ft with four replications arranged in a split block. Visual crop damage ratings were made May 7 and plots harvested July 16, 1987.

Wheat injury and stand reduction with SMY-1500 and/or metribuzin was generally greater with fall than spring application. Vona and Wings were more susceptible to SMY-1500 and/or metribuzin than the other cultivars tested. Fall application of SMY-1500 at 1.5 lb/A caused the greatest injury, stand loss and yield reduction. For example, fall application of SMY-1500 at 1.5 lb/A reduced yield of Vona 19% and Wings 14% compared to their respective untreated check. (Wyoming Agric. Exp. Sta., Laramie, WY 82071 SR 1491.)

Winter wheat response to SMY-1500 and metribuzin

Treatment[1]	Rate lb ai/A	Cultivar								
		Buckskin	Vona	Brule	Hail	Wings	Hawk	Centurk 78	Cheyenne	Archer
		% injury[2]								
SMY-1500 (f)	1.5	4	16	6	6	14	4	3	3	4
SMY-1500 + metribuzin (f)	1.0 + 0.125	1	13	6	5	12	4	5	3	1
metribuzin (f)	0.25	4	6	4	4	8	4	5	3	1
SMY-1500 (sp)	1.5	1	6	4	5	8	0	5	4	1
SMY-1500 + metribuzin (sp)	1.0 + 0.125	1	3	0	3	1	0	1	0	0
metribuzin (sp)	0.25	3	3	1	3	5	1	0	3	0
		% stand reduction[2]								
SMY-1500 (f)	1.5	8	35	15	11	30	1	5	4	8
SMY-1500 + metribuzin (f)	1.5 + 0.125	1	26	9	4	20	5	12	5	3
metribuzin (f)	0.25	5	13	8	4	9	4	10	6	3
SMY-1500 (sp)	1.5	3	11	2	4	8	0	5	4	1
SMY-1500 + metribuzin (sp)	1.5 + 0.125	1	4	0	3	1	0	3	0	0
metribuzin (sp)	0.25	3	6	3	3	5	1	0	1	0
		yield bu/A[2]								
SMY-1500 (f)	1.5	64	68	73	70	65	76	65	53	69
SMY-1500 + metribuzin (f)	1.5 + 0.125	62	75	78	71	69	80	67	51	75
metribuzin (f)	0.25	61	73	76	68	68	73	65	56	69
SMY-1500 (sp)	1.5	62	76	76	69	73	76	69	55	72
SMY-1500 + metribuzin (sp)	1.5 + 0.125	62	85	78	73	75	79	69	53	73
metribuzin (sp)	0.25	63	86	78	73	76	79	70	53	74
untreated check	----	63	84	77	71	76	78	68	54	72

[1] Fall (f) treatments applied November 2, 1986 and spring (sp) treatments March 26, 1987
[2] Crop damage evaluations were made May 7 and plots harvested July 16, 1987

Wild oat and broadleaf weed control in winter wheat. Swensen, J.B., and D.C. Thill. The objective of this study was to determine the effects of tank mixing broadleaf herbicides with diclofop on wild oat control in winter wheat. The trial was in a commercial stand of 'Stephens' winter wheat located one mile east of Moscow, Idaho. Soil at the site was a silt loam with 4.4 % organic matter, pH 6.6, and CEC of 26.2 meq/100g. Each treatment area measured 10 by 30 ft and the experimental design was a randomized complete block with four replications.

Treatments were broadcast on April 18, April 24, and May 2 when wild oat plants were in the 3-leaf, 4-leaf, and 2-tiller stages of development, respectively. Wild oat populations averaged 13 plants/ft^2. Other weed populations and growth stages are noted in Table 1. Environmental conditions at the time of application are listed in Table 2.

Browning of wheat leaves, mostly at tips and margins was scored May 6 as percent of total leaf area discolored. Weed control relative to the untreated check was evaluated May 6, May 23, and July 3 for wild oat, mayweed chamomile, and wild buckwheat control. Plots were harvested with a Hege small plot combine July 28, and the seed dried and weighed.

Leaf area showing browning was significantly greater than the untreated check in plots treated with HOE7125 and with difenzoquat (Table 3). The remaining treatments resulted in browned areas similar to the check plots.

Diclofop controlled wild oat seedlings best when applied at a rate of 0.75 lb ai/a with crop oil at the 4-leaf stage on April 24 (Table 3). Within the diclofop tank mixtures applied at the 4-leaf stage, only bromoxynil at a rate of .4 lb ai/a resulted in reduced wild oat control compared to diclofop plus crop oil, and then only at the earliest evaluation (May 6). By July 3 all diclofop tank mixtures applied on April 24 resulted in wild oat control equal to diclofop plus crop oil. HOE7125 applied at the 2-tiller stage of wild oat development on May 2 resulted in poorer wild oat control than either diclofop or difenzoquat applied at the 4-leaf stage.

Diclofop applied to wild oat at the 3-leaf stage on April 18 tended to result in poorer control than equivalent applications on April 24 (Table 3). However, these differences were significant only with the diclofop plus bromoxynil tank mixture at the last two evaluations (May 23 and July 3). As with the April 24 applications, best wild oat control within treatments applied on April 18 resulted from diclofop at .75 lb ai/a plus crop oil. At the May 6 evaluation, all tank mixed combinations with diclofop applied on April 18 resulted in reduced wild oat control compared to diclofop with crop oil and no broadleaf herbicide. In later evaluations on May 23 and July 3, wild oat control in tank mixed combinations with thiameturon and bromoxynil improved relative to diclofop with crop oil. However, reduced wild oat control persisted in combinations containing chlorsulfuron and DPX-R9674.

Mixtures containing thiameturon, DPX-R9674, chlorsulfuron, or CGA13103 applied on either April 18 or April 24 resulted in good to excellent control of mayweed chamomile (Table 4).

When evaluated on May 23, mayweed chamomile control was better in these treatments than with bromoxynil alone. Control of wild buckwheat was generally poor. Only bromoxynil applied on April 18 resulted in good control.

Seed yield of winter wheat ranged from 4000 to 5100 lbs/a and was not correlated with either wild oat or broadleaf weed control (Table 4). Variability in seed yield was probably the result of variability in wheat stand and edapic factors. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Crop and weed population densities and growth stages at times of application.

Common name (Bayer code)	April 18 Density[1/]	April 18 Stage	April 24 Density	April 24 Stage	May 2 Density	May 2 Stage
winter wheat (TRZAK)	14	4-til	14	5-til	14	5-til
wild oat (AVEFA)	13	3-lf	12	4-lf	13	5-lf
mayweed camomile (ANTCO)	2.3	2-lf	3.0	3-lf	2.3	4-lf
wild buckwheat (POLCO)	-[2/]	-	-	-	1.3	3-lf

1/ Population density in plants/ft^2.
2/ Data not taken.

Table 2. Environmental data during broadcast aplications.

	Application date		
	April 18	April 24	May 2
Air temperature (F)	40	62	49
Soil temperature (F)	40	58	58
RH (%)	60	75	60
Cloud cover	100	0	80
Wind speed (mph)	3	5	1
Rainfall (in.):			
previous week	.17	.00	.20
following week	.00	.20	.10
Surface moisture:			
soil	dry	wet	wet
leaf	dry	wet	dry

Table 3. Percent discolored leaf area in winter wheat and wild oat control observed May 6, May 23, and July 3, 1987.

Herbicide	Rate	Wild oat stage at application	Leaf burn	Wild oat control		
				May 6	May 23	July 3
	(lb ai/a)		------------	%	------------	
check	-	-	3	-	-	-
diclofop[1/]	0.75	3 lf	4	73	83	86
diclofop	1.0	3 lf	7	38	60	87
diclofop + bromoxynil	0.80 0.40	3 lf	6	28	65	77
diclofop + bromoxynil + thiameturon	0.80 0.40 0.008	3 lf	4	23	73	75
diclofop + bromoxynil + DPXR9674	0.80 0.40 0.008	3 lf	3	43	70	76
diclofop + bromoxynil + chlorsulfuron	0.80 0.40 0.008	3 lf	2	20	53	48
diclofop + bromoxynil + CGA13103	0.80 0.40 0.008	3 lf	3	23	70	70
diclofop + thiameturon[2/]	0.75 0.024	3 lf	3	33	75	85
diclofop + DPXR9674[2/]	0.75 0.016	3 lf	3	28	70	68
diclofop[1/]	0.75	4 lf	4	83	90	99
diclofop	1.0	4 lf	7	60	83	97
diclofop + bromoxynil	0.80 0.40	4 lf	5	40	85	98
diclofop + thiameturon[2/]	1.0 0.024	4 lf	4	70	88	98
diclofop + DPXR9674[2/]	1.0 0.016	4 lf	5	73	88	88
diclofop + chlorsulfuron[2/]	1.0 0.012	4 lf	4	63	90	98
diclofop + bromoxynil + thiameturon	1.0 0.25 0.016	4 lf	4	68	88	99
HOE7125	0.134	2 til	11	18	73	78
HOE7125	0.107	2 til	10	18	63	67
difenzoquat[2/]	1.0	4 lf	9	53	88	98
		LSD (0.05)	5	27	16	17

1/ Applied with 0.625% v/v Moract crop oil concentrate.
2/ Applied with 0.25% v/v Cenex surfactant.

Table 4. Broadleaf weed control of mayweed chamomile (ANTCO) and wild buckwheat (POLCO) in winter wheat at two observation dates, and seed yield of winter wheat.

Herbicide	Rate	Wild oat stage at application	Weed control May 23 ANTCO	Weed control May 23 POLCO	Weed control July 3 ANTCO	Seed yield
	(lb ai/a)		%	%	%	lb/a
check	-	-	-	-	-	4434
diclofop[1/]	0.75	3 lf	18	8	0	5131
diclofop	1.0	3 lf	18	60	38	4511
diclofop + bromoxynil	0.80 0.40	3 lf	48	85	79	4441
diclofop + bromoxynil + thiameturon	0.80 0.40 0.008	3 lf	85	6	93	4213
diclofop + bromoxynil + DPXR9674	0.80 0.40 0.008	3 lf	88	5	93	4741
diclofop + bromoxynil + chlorsulfuron	0.80 0.40 0.008	3 lf	89	6	100	5145
diclofop + bromoxynil + CGA13103	0.80 0.40 0.008	3 lf	58	40	87	4818
diclofop + thiameturon[2/]	0.75 0.024	3 lf	70	22	91	4774
diclofop + DPXR9674[2/]	0.75 0.016	3 lf	68	29	93	4683
diclofop[1/]	0.75	4 lf	15	19	25	4042
diclofop	1.0	4 lf	13	15	10	4362
diclofop + bromoxynil	0.80 0.40	4 lf	69	40	89	4913
diclofop + thiameturon[2/]	1.0 0.024	4 lf	53	30	90	5121
diclofop + DPXR9674[2/]	1.0 0.016	4 lf	88	5	95	4490
diclofop + chlorsulfuron[2/]	1.0 0.012	4 lf	78	13	100	4965
diclofop + bromoxynil + thiameturon	1.0 0.25 0.016	4 lf	88	5	100	4779
HOE7125	0.134	2 til	40	29	78	4776
HOE7125	0.107	2 til	23	10	70	4598
difenzoquat[2/]	1.0	4 lf	63	5	85	4318
		LSD (0.05)	29	41	17	637

1/ Applied with .625% v/v Moract crop oil concentrate.
2/ Applied with .25% v/v Cenex surfactant.

Ivyleaf speedwell control in winter wheat. Zamora, D. L. and D. C. Thill. Ivyleaf speedwell (VERHE), henbit (LAMAM), field pennycress (THLAR), tumble mustard (SSYAL), and catchweed bedstraw (GALAP) control was evaluated in a herbicide screening trial conducted near Grangeville, Idaho. Treatments were applied to 'Dusty' winter wheat on March 25, 1987, using a CO_2 pressurized sprayer calibrated to deliver 10 gpa at 3 mph and 40 psi. The wheat had 2 in long adventitious roots and ivyleaf speedwell had four to six leaves at the time of application. The experiment was a randomized complete block design with four replications and 10 by 30 ft plots. Weather and edaphic data are in Table 1. Weed control was evaluated visually May 7. Grain was harvested with a small plot combine on August 3.

There were no differences among treatments for control of any species or grain yield (Table 2). Considerable variation in weed distribution and density obscured treatment differences. Weed control was good to excellent for all species except catchweed bedstraw, which averaged only 65%. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Table 1. Application and soil data

Date applied	3/25/87
Method of application	broadcast
Maximum/minimum air temperature (F)	54/26
Maximum/minimum soil temperature (F) at 4 in	45/36
Cloud cover (%)	0
Wind speed (mph)	2-4
Soil type	silt loam

Table 2. Ivyleaf speedwell control in winter wheat

Treatment[1]	Formulation	Rate	Weed control VERHE	LAMAM	THLAR	SSYAL	GALAP	Grain yield
		(lb ai/a)	(%)					(bu/a)
check	--	--	--	--	--	--	--	68
metribuzin + bromoxynil/MCPA	75DF 3EC	0.25 0.38	99	93	100	99	67	70
terbutryn	80WP	1.6	97	100	100	98	50	69
terbutryn + MCPA amine	80WP 3.8EC	0.8 0.5	99	95	100	100	74	76
terbutryn + thiameturon	80WP 75DF	0.8 0.016	100	70	100	100	50	63
terbutryn + DPXR9674	80WP 75DF	0.8 0.016	97	86	100	100	59	74
terbutryn + DPXE8698	80WP 75DF	0.8 0.016	100	75	100	100	44	70
metribuzin + thiameturon	75DF 75DF	0.25 0.016	93	99	99	93	73	76
metribuzin + DPXR9674	75DF 75DF	0.25 0.016	95	99	100	98	56	70
metribuzin + DPXE8698	75DF 75DF	0.25 0.016	98	96	100	100	83	72
diuron + thiameturon	80DF 75DF	0.6 0.016	94	88	100	100	68	75
diuron + DPXR9674	80DF 75DF	0.6 0.016	87	56	100	100	73	68
diuron + DPXE8698	80DF 75DF	0.6 0.016	92	81	100	100	68	69
diuron + bromoxynil	80DF 4EC	0.6 0.25	92	94	95	100	93	72
cyanazine + DPXR9674	80WP 75DF	0.45 0.016	96	74	100	100	51	74
LSD(0.05)			NS	NS	NS	NS	NS	NS

[1] Tank mixtures with thiameturon, DPXR9674, and DPXE8698 were applied with 0.25% v/v nonionic surfactant.

Postemergence herbicide application on three accessions of wild oat. Tapia L.S., C.A. Sattler, M.J. Dial and D.C. Thill. Three accessions of wild oat (AVEFA) common to Idaho were evaluated under greenhouse conditions for susceptibility to diclofop. Two of the accessions, one accession from Moscow and one from the Arbon Valley of southeastern Idaho, are known to be susceptible to standard application rates of diclofop. A third accession from Bonners Ferry in northern Idaho is not exhibiting typical symptomology or control in spring cereals of the area. Two greenhouse experiments were established using a randomized complete block design with the three wild oat accessions and five rates of diclofop replicated four times. Wild oat seed was planted in a greenhouse potting mix in 4 inch square pots for both experiment 1 and 2. Diclofop was applied when wild oat plants reached the 1 to 3 leaf stage of growth. Diclofop was applied in experiment 1 at 0, 0.125, 0.25, 0.50, and 0.75 lb ai/a. In experiment 2, the 0.125 rate was dropped and 1.0 lb ai/a was applied. A nonherbicide treatment was included as a control. Above ground plant parts were harvested 14 days after application, dried in a forced air oven for 48 hours at 60 C, and weighed.

Mean above ground biomass for the three wild oat accessions, was the same (Table 1). All accessions responded similarly to diclofop applications in both experiments (Table 2). Diclofop applied at 0.25 lb ai/a significantly reduced biomass of all three accessions. Biomass was reduced most by 0.5 lb ai/a or greater diclofop rate for all accessions and both experiments. (Table 2). (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Mean biomass of three wild oat accessions pooled over all diclofop rates.

Accession	Wild oat biomass	
	Experiment 1	Experiment 2
Location	(mg/pot)	
Arbon valley	369	203
Bonners Ferry	333	226
Moscow	389	215
LSD (0.05)	NS	NS

Table 2. Effect of diclofop application rate on wild oat above ground biomass when pooled over three wild oat accessions.

Diclofop	Biomass	
	Experiment 1	Experiment 2
(lb ai/a)	(mg/pot)	
0	487	368
0.125	492	1/
0.25	359	316
0.50	249	153
0.75	231	119
1.0	1/	117
LSD (0.05)	75	44

1/ treatment omitted

PROJECT 6.

AQUATIC, DITCHBANK AND NON-CROP WEEDS

Barbra Mullin - Project Chairman

<u>Broadleaf weed control in conservation reserve program (CRP) grass plantings.</u> Adams, E.B. and D.G. Swan. Broadleaf weeds are a major problem in the establishment year of CRP grass plantings. This research was conducted at Ritzville, WA in a fall 1986 dormant seeding of crested wheatgrass and sheep fescue planted on summerfallow to compare the efficacy of 11 herbicide treatments.

The experiment was a randomized complete block design with four replications. Plots were 4 m wide and 10 m long. Carrier volume was 187 l/ha delivered at 240 kPa pressure through 8002 flat fan nozzles on 50 cm centers. Herbicides were applied on May 4, 1987. The grasses were 5 cm tall with 4 tillers. Russian thistle (SALIB) was 7 cm tall. The tansy mustard (DESPI) had 30 cm rosettes, and tumble mustard (SASAL) had 25 cm rosettes. Visual evaluations were conducted on June 25, 1987.

The high rate of 2,4-D amine, bromoxynil alone and in combination with chlorsulfuron, and DPX-8311 provided good weed control although DPX-8311 did damage the grass slightly. Injury included stunting and chlorosis. Russian thistle control was generally poor. (Cooperative Extension, Washington State University, N. 222 Havana, Spokane WA 99202)

Grass Injury and Broadleaf Weed Control at Ritzville WA

Herbicide	Rate	Grass Injury	---- Control ---- DESPI	SISAL	SALIB
	(kg ai/ha)	-----------	-----%-----		-----------
check	0	0	0	0	0
2,4-D amine	0.43	5	53	96	0
2,4-D amine	0.84	0	84	99	38
dicamba	0.28	3	26	91	70
dicamba	0.56	5	56	95	50
MCPA amine	1.12	0	66	99	0
bromoxynil	0.56	5	94	97	30
bromoxynil + MCPA	0.43 + 0.43	0	83	85	23
bromoxynil + MCPA	0.56 + 0.56	0	73	93	23
chlorsulfuron	0.018	5	77	99	0
DPX-8311	0.028	10	99	99	38
chlorsulfuron + bromoxynil	0.009 + 0.28	3	96	86	23

Russian thistle control in conservation reserve program (CRP) grass plantings. Adams, E.B. and D.G. Swan. Russian thistle is a major problem in the establishment year of CRP grass plantings. This research was conducted at Lind, WA in a fall dormant seeding of crested wheatgrass and sheep fescue planted on summerfallow to compare the efficacy of 11 herbicide treatments.

The experiment was a randomized complete block design with four replications. Plots were 4 m wide and 10 m long. Carrier volume was 187 l/ha delivered at 240 kPa pressure through 8002 flat fan nozzles on 50 cm centers. Herbicides were applied on May 1, 1987, when the grasses were 5 cm tall and begining to tiller, and the Russian thistle (450/square m) was 5 cm tall. Visual evaluations were conducted on May 28, 1987 and June 28, 1987.

Bromoxynil and bromoxynil plus MCPA provided excellent early control. Chlorsulfuron, DPX-8311, and chlorsulfuron plus bromoxynil provided good early control. None of the treatments damaged the seedling grasses. Rain showers in June and July were enough to cause multiple flushes of Russian thistle but were apparently not enough to activate soil uptake of the residual herbicides. There was no control of Russian thistle by June or throughout the summer. (Cooperative Extension, Washington State University, N. 222 Havana, Spokane WA 99202)

Grass Injury and Russian thistle control at Lind WA

Herbicide	Rate	Injury	--Control-- May	June
	(kg ai/ha)	---------%	--------	
check	0	0	0	0
2,4-D amine	0.43	0	66	0
2,4-D amine	0.84	0	88	0
dicamba	0.28	0	65	0
dicamba	0.56	0	65	0
MCPA amine	1.12	0	60	0
bromoxynil	0.56	0	97	0
bromoxynil + MCPA	0.43 + 0.43	0	96	0
bromoxynil + MCPA	0.56 + 0.56	0	99	0
chlorsulfuron	0.018	0	89	0
DPX-8311	0.028	0	89	0
chlorsulfuron + bromoxynil	0.009 + 0.28	0	91	0

Effect of very low concentrations of bensulfuron methyl on the growth of sago pondweed. Anderson, L.W.J. and N. Dechoretz. A greenhouse study was conducted to determine minimum concentrations of bensulfuron methyl which would affect the growth and development of sago pondweed. One week old potted sago pondweed plants were placed in 20 l jars containing Davis well water and treated with bensulfuron methyl at rates ranging from 0.1 to 2.0 ppbw. Each treatment was replicated four times. Four weeks after treatment the plants were harvested to measure the various growth parameters presented in the accompanying table.

Significant reduction in main shoot length was obtained at the 0.8 ppbw treatment rate. Shoot and root dry weight were significantly reduced at 0.2 and 0.4 ppbw, respectively. However, the ratio of shoot dry weight to root dry weight was not affected until the level of bensulfuron methyl was 2.0 ppbw. The effect of bensulfuron methyl on ramet production was somewhat contradictory. Although the production of ramets was reduced in all treatments, the effects were inconsistent. For example, the number of ramets produced at the 0.1, 0.2, and 2.0 ppbw were not significantly different. However, the number of ramets produced in jars treated at 0.4 to 1.0 ppbw was higher than the number treated at 2.0 ppbw. Furthermore, the average length of each ramet or the cummulative length of the ramets were not affected by bensulfuron methyl except at rates of 0.8 and 0.6 ppbw, respectively. Based on these results, sago pondweed growth can be significantly reduced when young plants are exposed to extremely low concentrations of bensulfuron methyl. (U.S. Department of Agriculture, Agricultural Research Service, University of California, Davis, CA 95616).

Table 1. Response of sago pondweed 14 days after 2 week exposure to low concentration of bensulfuron methyl.[1]

Treatment rate (ppbw)	Shoot length (cm)	Shoot dwt (mg)	Root dwt (mg)	Sdwt/Rdwt	No. of ramets	Length of ramets (cm)	Cummulative length of ramets (cm)
0	61.8 AB[2]	395 A	131 A	2.91 A	4.5 A	21.4 A	97.2 A
0.1	58.0 AB	381 A	127 AB	2.71 AB	3.5 AB	25.3 A	88.0 A
0.2	52.8 AB	384 A	124 AB	2.52 BC	3.0 BC	24.4 A	73.1 AB
0.4	65.0 A	308 AB	128 A	2.21 CD	3.5 ABC	20.8 A	74.6 AB
0.6	50.9 AB	241 BC	110 ABC	2.49 BC	3.5 ABC	26.5 A	100.9 A
0.8	40.8 BC	235 BC	80 C	2.81 AB	3.5 ABC	24.0 A	81.9 AB
1.0	44.5 BC	205 C	94 BC	2.06 D	2.5 C	19.5 A	46.0 BC
2.0	26.7 C	85 D	81 C	1.93 D	3.8 AB	8.4 B	32.9 C

1/ Plants were 7 days old at time of treatment.
2/ Means followed by the same letter within a column are not significantly different at the 5% level according to Fishers Protected LSD test.

Table 2. Response of sago pondweed after 4 week exposure to low concentration of bensulfuron methyl.[1]

Treatment rate (ppbw)	Shoot length (cm)	Shoot dwt (mg)	Root dwt (mg)	Sdwt/Rdwt	No. of ramets	Length of ramets (cm)	Cummulative length of ramets (cm)
0	48.6 AB[2]	379 A	150 A	2.65 A	5.8 A	23.3 ABC	128 A
0.1	53.3 A	343 AB	143 AB	2.68 A	3.0 CD	31.0 A	94.4 AB
0.2	46.3 AB	315 B	141 ABC	2.74 A	3.3 CD	29.6 AB	94.9 AB
0.4	52.8 A	283 BC	131 BD	2.38 A	3.8 BC	23.0 ABC	85.5 AB
0.6	47.5 AB	292 BC	109 CDE	2.33 A	3.0 c	19.9 ABCD	58.4 BC
0.8	33.6 B	221 CD	116 BCDE	2.07 AB	4.0 BC	13.7 CD	58.8 BC
1.0	36.5 B	220 CD	86 EF	2.82 A	4.0 BC	13.1 CD	49.6 BC
2.0	13.1 C	147 D	74 F	1.15 B	2.0 D	8.6 D	24.3 C

1/ Plants were 7 days old at time of treatment.
2/ Means followed by the same letter within a column are not significantly different at the 5% level according to Fishers Protected LSD test.

Response of Eurasian watermilfoil to various exposure periods and treatment rates of bensulfuron methyl. Anderson, L.W.J. and N. Dechoretz. Previous studies have shown that the growth of young watermilfoil is significantly inhibited when grown in culture solution treated with bensulfuron methyl at 5 ppbw and above. A greenhouse study was conducted to determine the relationship between treatment rate and exposure period on the herbicidal activity of bensulfuron methyl in Eurasian watermilfoil. Apical cuttings (15 cm) were planted to a depth of 5 cm in 7.5 x 7.5 cm pots containing UC mix and placed in 20 l aquaria containing Davis well water. One week after planting, the water was treated with bensulfuron methyl at 0, 20, 50, and 100 ppbw. Plants were removed from the treated water 1, 2, 4, 7, 10 and 14 days after treatment, placed in 90 l tanks and flushed with water for 30 minutes. The plants were then transferred to 90 l tanks and then removed 28 days after the initial treatment. Herbicidal activity was based on the oven-dried weight of shoots at the time of harvest.

Bensulfuron methyl applied to watermilfoil at 20 ppbw for 10 days produced approximately a 50 percent reduction in shoot dry weight. Similar results were obtained at 50 and 100 ppbw after 7 and 4 day exposures, respectively. The growth of watermilfoil was not reduced after 1 or 2 day exposure to bensulfuron methyl. Similiar studies conducted previously with sago pondweed indicated significant growth inhibition after 1 and 2 day exposure at 20, 50 and 100 ppbw. Under these test conditions, Eurasian watermilfoil is apparently more resistant to bensulfuron methyl than sago pondweed. (U.S. Department of Agriculture, Agricultural Research Service, University of California, Davis, CA 95616).

Shoot dry weight of Eurasian watermilfoil after exposure to bensulfuron methyl.

Treatment rate (ppbw)	Shoot dry weight (mg)1/ Exposure period (days)2/ 1	2	4	7	10	14
0	1069 Aa3/	1255 Aa	1271 Aa	903 Aa	986 Aa	916 Aa
20	1067 Aa	1029 Aa	1118 Aa	643 ABa	551 Bb	557 Bb
50	1069 Aa	1061 Aa	967 Aa	458 Bb	469 Bb	324 Cb
100	988 Aa	898 Aab	590 Bbc	350 Bc	387 Bc	312 Cc

1/ Values determined 28 days after initial treatment.
2/ Plants were 7 days old at time of treatment.
3/ Means followed by the same upper case letter within a column or by the same lower case letter within a row are not significantly different at the 5% level according to Fishers Protected LSD test.

Growth of sago pondweed from tubers after limited exposure to bensulfuron methyl. Anderson, L.W.J. and N. Dechoretz. Previous studies have shown the growth of sago pondweed from tubers exposed to bensulfuron methyl for 24 h at 100 ppbw and above was significantly inhibited. This study was conducted to determine whether or not concentrations or exposure periods less than those mentioned above will reduce the growth of sago pondweed.

Sago pondweed tubers were placed in 1 l Erlenmyer flasks containing 500 ml of water for 24 h and then treated with bensulfuron methyl at 0, 10, 50, or 100 ppbw. The tubers were removed from the treated water 0.25, 0.5, 1, 2, 4 or 8 h after treatment, rinsed for 60 seconds under fresh tap water and then planted in 7.5 x 7.5 cm plastic pots containing UC mix. The potted tubers were placed in 90 l tanks containing Davis well water. Four weeks after treatment, the plants were removed from the water and washed to expose the roots. Growth inhibition on a dry weight basis was determined by separating the roots from shoots and oven-drying both components at 80 C for 24 h. Each treatment was replicated three times with 3 tubers per replicate.

Shoot and root dry weight of sago pondweed four weeks after treatment are present in Table 1 and 2, respectively. Bensulfuron methyl at 50 and 100 ppbw inhibited shoot production by approximately 65 percent and root production by 50 percent. Although four hour exposure at 100 ppbw reduced shoot and shoot development by 50 percent, more of the other treatments affected the growth of sago pondweed. The results of this study indicate that the growth of sago pondweed from hydrosoil containing available bensulfuron methyl may be significantly reduced. (U.S. Department of Agriculture, Agricultural Research Service, University of California, Davis, CA 95616).

Table 1. Shoot dry weight of sago pondweed 4 weeks after short exposure of tubers to bensulfuron methyl.

Treatment rate (ppbw)	Shoot dry weight (mg)1/					
	Exposure period (h)					
	.25	.50	1	2	4	8
0	210 Aa2/	169 Aa	173 Aa	171 Aa	202 Aa	179 Aa
10	176 ABa	155 Aa	148 Aa	128 Aa	132 ABa	160 Aa
50	178 ABa	164 Aa	142 Aa	147 Aa	148 Aa	66 Bb
100	146 Ba	165 Aa	154 Aa	125 Aa	115 Bab	63 Bb

1/ Value determine four weeks post treatment.
2/ Means followed by the same upper case letter within a column or by the same lower case letter within a row are not significantly different according to Fishers LSD test.

Table 2. Root dry weight of sago pondweed 4 weeks after short exposure of tubers to bensulfuron methyl.

Treatment rate (ppbw)	Root dry weight (mg)1/					
	Exposure period (h)					
	.25	.50	1.0	2.0	4.0	8.0
0	83 Aa2/	59 Ab	72 Aab	58 Ab	67 Aab	65 Aab
10	58 ABa	60 Aa	57 Aa	43 Aa	41 Ba	48 ABa
50	75 ABa	65 Aa	56 Aab	50 Aab	47 ABab	29 Bb
100	42 Bab	61 Aa	60 Aa	45 Aab	30 Bb	30 Bb

1/ Value determine four weeks post treatment.
2/ Means followed by the same upper case letter within a column or by the same lower case letter within a row are not significantly different according to Fishers LSD test.

Response of sago pondweed to bensulfuron methyl applied under various treatment rates and exposure periods. Anderson, L.W.J. and N. Dechoretz. Greenhouse and field studies have indicated bensulfuron methyl will effectively inhibit the growth of submersed aquatic weeds. Greenhouse studies were established to evaluate the relationship between treatment rate and exposure period on the herbicidal activity of bensulfuron methyl to sago pondweed.

Germinated sago pondweed tubers were placed in 4 l aquaria containing 1 l of 1% Hoaglands solution. After a two week growth period, the plants were placed in fresh culture solution and then treated with bensulfuron methyl at 0, 1, 5, 10, 20, 50 or 100 ppbw. Each aquarium contained 6 plants and each treatment was replicated 6 times. To determine the effect of exposure period, one sago pondweed plant was removed from each aquarium 1, 2, 4, 7, 10 and 14 days after treatment. The plants were washed for 60 seconds under tap water, planted in 7.5cm x 7.5cm plastic pots containing UC mix, and then placed in 90 l tanks containing Davis well water. Twenty eight days after the initial treatment, the plants were removed from the 90 l tanks, and oven-dried for 24 hr at 80 C to determine shoot biomass.

Bensulfuron methyl applied at 1.0 ppbw did not effect the growth of sago pondweed. However significant growth inhibit occurred when plants were exposed to bensulfuron methyl for 2 days at 5 ppbw. In general, the optimum treatment rates were 10 or 20 ppbw depending on exposure period and optimum exposure period was 4 or 7 days depending on treatment rate. (U.S. Department of Agriculture, Agricultural Research Service, University of California, Davis, CA 95616).

Shoot Dry Weight of sago pondweed after an application of bensulfuron methyl.

Treatment rate (ppbw)	Shoot dry weight (mg)1/ Exposure period (days) 1	2	4	7	10	14
0	443 Aa2/	448 Aa	459 Aa	448 Aa	339 Aa	383 Aa
1	329 ABa	421 Aa	402 Aa	454 Aa	364 Aa	354 Aa
5	394 ABa	304 Bb	269 Bbc	222Bcd	173 Bd	182 Bd
10	368 BCa	233 BCd	231 Bb	164 BCbc	123 BCc	124 BCe
20	270 CDa	237 BCab	183 BCabc	164 BCbcd	166 BCcd	80 cd
50	182 Da	184 Ca	124 CDab	142 BCab	122 BCab	88 cb
100	206 Da	177 Cab	110 CDbc	86 cc	87 Cc	121 Cc

1/ Determined 28 days after initial treatment.
2/ Means followed by the same upper case letter within a column or by the same lower case letter within a row are not significantly different at the 5% level according to Fishers Protected LSD test.

Control of aquatic plants after short exposure to fluridone in combination with copper. Anderson, L.W.J. and N. Dechoretz. Fluridone and the (ethylenediamine complex of copper) (EDA-Cu) are two herbicides registered for the control of aquatic weeds. Fluridone is a systemic herbicide requiring long exposure periods for adequate control, whereas EDA-Cu is a contact herbicide which generally results in rapid control after relatively short periods of exposure. Studies were conducted to determine whether or not short exposure of fluridone plus EDA-Cu is more phytotoxic than either herbicide alone.

Five species of aquatic weeds were planted in 7.0 x 7.0 cm plastic pots containing UC mix and placed in 154 20 1 buckets lined with polyethylene bags and filled with Davis well water. Each bucket contained one pot of each species with one plant per pot. Half the buckets were treated with fluridone, EDA-Cu or fluridone plus EDA-Cu one week after planting while the remaining plants were treated 4 weeks after planting. Each treatment was replicated four times. The plants were exposed to the herbicides for 4h and then transferred to cement vaults where they were flushed for 30 minutes. Treated plants were harvest 4 weeks after treatment, oven dried for 24h at 80 C and then weighed. Treatment rates, dry weight, and percent of control are presented in accompanying tables.

As expected, 4h exposure of fluridone did not result in a satisfactory level of control. Of the plants treated, only one week old dioecious hydrilla exposed to fluridone at 1.0 ppmw showed significant reduction in biomass (47.2% of control). EDA-Cu provided good control of both biotypes of hydrilla and excellent control of elodea. Acceptable control of watermilfoil and sago pondweed was not obtained with EDA-Cu. When herbicidal activity was increased the increase was additive rather than synergistic. As a result, short exposure of aquatic weeds to combinations of fluridone plus EDA-Cu does not result in a significant increase in herbicidal activity when compared to the degree of control obtained with EDA-Cu alone. (U.S. Department of Agriculture, Agricultural Research Service, University of California, Davis, CA 95616).

Table 1. Response of aquatic plants 4 weeks after a 4 hour exposure of one week old plants to fluridone, EDA-Cu[1/], and fluridone plus EDA-Cu.

Treatment (PPMW)		Dry Weight (mg) Monoecious hydrilla	% of control	Dioecious hydrilla	% of control	Eurasian watermilfoil	% of control	Elodea	% of control	Sago pondweed	% of control
control		457±56[2/]		669±56[2/]		485±24		380±39		661±59	
fluridone	0.25	371±57	81.2	474±37	70.8	436±28	89.9	361±35	95.0	547±67	82.8
	0.50	386±51	84.5	421±10	62.9	470±32	96.9	427±54	112.3	446±44	67.5
	1.0	361±58	79.0	319±37	47.2	515±49	106.2	400±46	105.3	526±57	79.6
EDA-Cu	1.0[3/]	114±11	24.9	215±21	32.1	358±47	73.8	110±12	28.9	636±92	96.2
	2.0	149±8	32.6	216±19	32.3	246±36	50.7	44±18	11.6	528±61	79.9
	4.0	144±10	31.5	147±34	22.0	240±34	49.5	21±12	5.5	555±49	84.0
fluridone + EDA-Cu	.25+1.0	134±24	29.3	218±28	32.6	240±19	49.5	101±9	26.6	549±57	83.1
	.25+2.0	146±24	31.9	210±12	31.4	210±29	43.3	54±34	14.2	540±107	81.7
	.25+4.0	201±25	44.0	158±37	23.6	220±22	45.4	15±15	3.9	547±65	82.8
	.50+1.0	108±8	23.6	191±32	28.5	231±43	47.6	47±16	12.4	514±42	77.8
	.50+2.0	128±9	28.0	180±37	26.9	197±37	40.6	67±23	17.6	463±60	70.0
	.50+4.0	105±17	23.0	146±8	21.8	251±42	51.8	38±15	10.0	439±50	66.4
	1.0+1.0	113±22	24.7	114±21	17.0	227±32	46.8	69±27	18.2	408±74	61.7
	1.0+2.0	116±13	25.4	139±30	20.8	202±35	41.6	81±40	21.3	399±38	60.4
	1.0+4.0	88±23	19.3	59±24	8.8	160±15	33.0	31±19	8.2	390±68	59.0

[1/] EDA-Cu = ethylenediamine complex of copper.
[2/] Value represent mean ± standard error; n=4.
[3/] Concentration of copper in treated solutions.

Table 2. Response of aquatic plants 4 weeks after a 4 hour exposure of four week old plants to fluridone, EDA-Cu[1/], and fluridone plus EDA-Cu.

Treatment (PPMW)		Dry Weight (mg) Monoecious hydrilla	% of control	Dioecious hydrilla	% of control	Eurasian watermilfoil	% of control	Elodea	% of control	Sago pondweed	% of control
control	0	749±64[2/]		733±80		981±87		503±68		1344±101	
fluridone	0.25	701±86	93.6	609±86	83.1	827±104	84.3	440±29	87.5	1390±100	103.4
	0.50	741±101	98.9	629±60	85.8	889±67	90.6	303±45	60.2	1309±78	97.4
	1.0	616±10	82.2	690±76	94.1	902±75	91.9	230±22	45.8	844±22	62.8
EDA-Cu	1.0[3/]	332±36	44.3	380±45	51.8	492±39	50.2	68±18	13.5	706±77	52.5
	2.0	231±15	30.8	249±32	34.0	433±24	44.1	40±11	7.9	790±40	58.8
	4.0	169±42	22.6	148±27	20.2	425±79	43.3	47±15	9.3	554±45	41.2
fluridone + EDA-Cu	.25+1.0	294±36	39.2	426±97	58.1	628±96	64.0	66±12	13.1	594±64	44.1
	.25+2.0	345±35	46.1	258±65	34.9	494±66	50.4	68±7	13.5	620±106	46.1
	.25+4.0	138±12	18.4	155±17	21.1	385±30	39.2	55±15	10.9	522±73	38.8
	.50+1.0	336±7	44.9	376±88	51.3	411±65	41.9	51±17	10.1	777±85	57.8
	.50+2.0	276±47	36.8	269±37	36.7	315±19	32.1	72±20	14.3	502±37	37.4
	.50+4.0	132±27	17.6	170±7	23.2	305±32	31.1	48±10	9.5	434±31	32.3
	1.0+1.0	282±56	37.6	404±59	55.1	486±73	49.5	61±11	12.1	766±85	57.0
	1.0+2.0	202±10	27.0	305±55	41.6	456±47	46.5	47±16	9.3	562±58	41.8
	1.0+4.0	142±28	19.0	117±31	16.0	263±6	26.8	31±11	6.2	436±47	32.4

[1/] EDA-Cu = ethylenediamine complex of copper.
[2/] Value represent mean ± standard error; n=4.
[3/] Concentration of copper in treated solutions.

Field horsetail control in water. Lass, L., and R.H. Callihan. Equisetum is a weedy species in canals, wild rice paddies, stream banks, roadsides, and flood plain crop land. The objectives of this project was to determine the affects of fluridone on flooded Equisetum.

Newly emerged field horsetail (*Equisetum arvense* L.) (EQUAR) were transplanted from a stream bank near Moscow, Idaho into one gallon containers on 4/8/1987. Each of the one gallon containers were half full of soil. The containers were filled to the 3/4 level with water and placed in a greenhouse with maximum daily temperature of 76 F. Three weeks after transplanting (4/29/87) the rapidly growing plants were sprayed with fluridone at 1.0, 1.5, and 3.0 lb ai./a. using a greenhouse sprayer delivering 27.2 gal/a at 0.568 mph.

Chlorosis of plants treated with fluridone increased rapidly after spraying. Twelve days after application all of the fluridone treated horsetail plants were 80% chlorotic. Twenty days after application, chlorosis was 95% in all the fluridone treated plants. None of the treated plants were alive 25 days after application.

High soil residual has reportedly limited the use of fluridone to aquatic systems. Vegetation control prior to wild rice production may potentially be a new application for fluridone. (University of Idaho Agricultural Experiment Station, Moscow, ID. 83843)

Effects of fluridone on Equisetum arvense shoots in flooded pots.

	Chlorosis [1]		Necrosis
Rate	5/11/1987	5/19/1987	5/24/1987
(ai/A)			
0 lb	0 a)	0 a	0
1 lb	87 b	98 b	100
1.5 lb	75 b	94 b	100
3 lb	83 b	97 b	100

[1]Estimated chlorosis.

)Any two means having a common letter are not significantly different at the 5% level of significance using protected Duncan's Test.

PROJECT 7.

CHEMICAL AND PHYSIOLOGICAL STUDIES

Jodie Holt - Project Chairman

Evaluation of paclobutrazol plant growth regulator on Tifway II hybrid bermudagrass. Cockerham, S. T. and N. E. Jackson. Paclobutrazol (2SC) was evaluated for effect on turfgrass quality on Tifway II hybrid bermudagrass. Treatments were applied on May 6, 1987 at four rates--0.56, 1.12, 1.68, and 2.24 kilograms active ingredient per hectare. Mefluidide (2S) was applied at 1.12 kilogram active ingredient per hectare as a standard for comparison. Applications were made using a compressed air sprayer at 138 kPa with one 8004 nozzle. Plots were 1.52 by 3.04 meters replicated four times in a random complete block design. There was no wind and the air temperature at the time of application was 22C, later in the day the air temperature reached 37C. The plots were irrigated approximately 24 hours after application. Visual observations were made using a rating system of 1 to 9. (1 = poorest turfgrass quality; 9 = highest quality possible). Plots were maintained using good cultural practices.

Mefluidide (2S) inhibited growth of the turf, although not nearly to the extent expected, and the quality was considered to be unusually high, rating in the 8 to 9 range. (see table).

All application rates of paclobutrazol inhibited the growth of the turf. In addition, all rates had a negative impact on quality. The two lower rates (0.56 and 1.12 kg ai/ha rates) would not be acceptable on fine turf, but might be on other sites. The two higher rates would not have been considered acceptable for any turf. The worst quality in each treatment was expressed at 5 to 7 weeks after application, this did not correlate to daily temperatures. Phytotoxicity by the two high rates was still apparent at the end of the trial--12 weeks after application. (Agricultural Experiment Station, University of California, Riverside 92521, and Monsanto Agricultural Company, 24551 Raymond Way, Suite 285, El Toro, CA 92630).

Paclobutrazol plant growth regulator on Tifway II hybrid bermudagrass

Treatment	Rate kg ai/ac	Turf quality rating* 5/18	5/29	6/12	6/23	7/06	7/23	7/31	Treatment Mean**
paclobutrazol (2SC)	.56	8.0	7.3	8.0	8.0	7.5	8.8	9.0	8.1 AB
paclobutrazol (2SC)	1.12	7.5	6.8	6.3	6.3	6.0	8.0	8.8	7.1 BC
paclobutrazol (2SC)	1.68	7.0	6.5	5.8	5.5	4.8	5.8	6.3	5.9 CD
paclobutrazol (2SC)	2.04	7.0	6.0	5.0	4.3	3.3	5.0	6.0	5.2 D
mefluidide (2S)	1.12	9.0	8.8	8.8	9.0	8.8	9.0	9.0	8.9 A
Control		8.8	8.3	9.0	9.0	9.0	9.0	9.0	8.9 A

* 1 = Poorest quality; 9 = Highest quality possible (treated 5/6/87)
**Duncan's Multiple Range Test (.05); means followed by the same letter are not significantly different.

Potato injury and weed control from metribuzin and metolachlor. Haderlie, L.C., R.W. Downard and M. Poulson. Preemergence and postemergence herbicides were applied to Russet Burbank potatoes to measure crop injury and weed control at Aberdeen, Idaho during 1987. Application of preemergence herbicides was May 21 at 15.8 gpa, 20 psi and 3 mph, whereas postemergence herbicides were applied at 17.5 gpa, 22 psi and 3 mph on June 13. All herbicide treatments were applied with a hand-held sprayer equipped with TJ8002 nozzles spaced 12 inches apart on a 6 foot boom. The plot size was 12 by 40 feet and 6 by 25 feet was harvested with a single-row Grimme commercial digger on September 17, 1987. The experimental design was a randomized complete block with four replication.

Visual evaluations on crop injury and weed control were integrated as biomass, density, vigor and injury symptoms. Crop injury was below 20% on June 12 except for metribuzin at 2.0 lb ai/A applied both preemergence and postemergence, alachlor (3.0 lb ai/A) plus metribuzin (0.5 lb ai/A) applied preemergence and postemergence, and metolachlor (2.0 lb ai/A) plus metribuzin (0.5 lb ai/A) applied postemergence (Table 1).

Weed control evaluations on September 3, 1987 indicated metribuzin at all rates, applied preemergence and postemergence gave good control (84% or above) on broadleaved weeds, whereas the higher rates of metribuzin, from 0.5 to 2.0 lb ai/A, gave good control on wild oat. Good weed control resulted from the combinations of metolachlor (2.0 lb ai/A) plus metribuzin (0.5 lb ai/A) applied preemergence and postemergence, and preemergence application of alachlor (3.0 lb ai/A) plus metribuzin (0.5 lb ai/A).

Potato tuber yields were very good (352-433 cwt/A) on all treatments. Metribuzin at 2.0 lb ai/A significantly reduced yields when compared to the untreated check indicating early crop injury may have resulted in lower yields. Alachlor plus metribuzin applied postemergence also significantly lowered yields. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. First and second weed control and vine desiccation evaluation following late preemergence (Pre) herbicide application sprayed May 21, and postemergence (Post) herbicide application sprayed June 13, to potatoes. Data are means of four replications (Haderlie, Downard, Poulson).

				6/18/87	9/3/87		
						% Control	
Chemical	Formulation	Rate (lb ai/A)	Type of Application	% Injury	% Vine Desiccation	Wild Oats	Broadleaf Weeds
1. Untreated (Weedy)				6	84	0	0
2. Untreated (Hand weeded)				1	83	84	76
3. metribuzin	75 DF	0.12	Pre	3	81	50	85
4. metribuzin		0.25	Pre	3	73	79	90
5. metribuzin		0.5	Pre	5	81	88	95
6. metribuzin		1.0	Pre	12	72	94	100
7. metribuzin		2.0	Pre	26	68	95	100
8. metolachlor	8 E	1.5	Pre	4	78	48	30
9. metolachlor		2.0	Pre	10	84	68	56
10. alachlor	4 E	3.0	Pre	15	81	68	66
11. alachlor + metribuzin		3.0 + 0.5	Pre	21	75	91	86
12. metolachlor + metribuzin		2.0+0.5	Pre	13	79	83	88
13. metribuzin		0.12	Post	7	76	60	84
14. metribuzin		0.25	Post	4	79	59	100
15. metribuzin		0.5	Post	7	81	84	100
16. metribuzin		1.0	Post	19	74	94	88
17. metribuzin		2.0	Post	24	61	95	100
18. alachlor + metribuzin		2.25 + 0.5	Pre	14	76	88	96
19. metolachlor		2.0	Post	16	80	59	61
20. metolachlor + metribuzin		2.0+0.5	Post	29	73	90	95
21. alachlor		3.0	Post	15	80	55	53
22. alachlor + metribuzin		3.0 + 0.5	Post	30	71	78	84
LSD (0.05)				8	N.S.	24	34
CV				43	12	23	31

Table 2. Potato tuber yield and percent in each grade following application of preemergence and postemergence herbicides. Harvested Sept. 17, 1987. Data are means of four replications (Haderlie, Downard, Poulson).

Chemical	Formulation	Rate (lb ai/A)	Type of Application	Total Yield cwt/A*	Total Yield t/ha**	% of Total <4 oz	% of Total 4-10 oz	% of Total >10 oz	% of Total No. 1's***	% of Total Malf
1. Untreated (Weedy)				416	47	18	41	22	63	19
2. Untreated (Hand weeded)				419	47	15	47	20	67	18
3. metribuzin	75 DF	0.12	Pre (21 May)	425	48	16	46	21	67	17
4. metribuzin		0.25	Pre (21 May)	433	49	18	41	27	68	15
5. metribuzin		0.5	Pre (21 May)	399	45	14	45	28	73	13
6. metribuzin		1.0	Pre (21 May)	421	47	19	49	23	72	10
7. metribuzin		2.0	Pre (21 May)	371	42	15	48	27	75	11
8. metolachlor	8 E	1.5	Pre (21 May)	425	48	16	57	19	76	8
9. metolachlor		2.0	Pre (21 May)	402	45	19	58	18	76	5
10. alachlor	4 E	3.0	Pre (21 May)	402	45	20	48	19	67	13
11. alachlor + metribuzin		3.0+0.5	Pre (21 May)	398	45	19	48	23	71	10
12. metolachlor + metribuzin		2.0+0.5	Pre (21 May)	393	44	15	60	20	80	5
13. metribuzin		0.12	Post (13 June)	410	46	15	56	22	78	7
14. metribuzin		0.25	Post (13 June)	422	47	15	49	27	76	10
15. metribuzin		0.5	Post (13 June)	415	47	17	46	24	70	14
16. metribuzin		1.0	Post (13 June)	408	46	17	44	25	69	14
17. metribuzin		2.0	Post (13 June)	352	40	18	46	20	66	16
18. alachlor + metribuzin		2.25 + 0.5	Pre (21 May)	404	45	20	55	17	72	8
19. metolachlor		2.0	Post (13 June)	406	46	18	47	19	66	16
20. metolachlor + metribuzin		2.0+0.5	Post (13 June)	392	44	18	52	20	72	10
21. alachlor		3.0	Post (13 June)	399	45	18	47	19	66	16
22. alachlor + metribuzin		3.0 + 0.5	Post (13 June)	377	42	18	48	18	66	17
LSD (0.05)				31	4	4	8	6	5	6
CV				6	6	15	11	19	5	34

*cwt/A=Hundred weight/Acre; **t/ha=Tons/hectare; ***No. 1's = (4-10 oz) + (>10 oz).

Weed control in potatoes with preemergence herbicides. Haderlie, L.C., R.W. Downard and M. Poulson. Preplant incorporated and preemergence herbicides were applied to Russet Burbank potatoes for annual weed control at the University of Idaho Experiment Station in Aberdeen, Idaho, during 1987. Herbicide treatments were applied by a tractor-mounted sprayer equipped with TJ8002 nozzles spaced 18 inches apart on a 12 foot boom, except for treatments 5 and 6 in the first replicaiton, and treatment 17 in the first three replication. These treatments were applied by a hand-held sprayer with an 18 inch nozzle spacing on a 6 foot boom. Preplant incorporated treatments (PPI), were applied on May 4, at 17.6 gpa and 32 psi. Preemergence treatments (Pre), were applied on May 29, at 17.5 gpa and 30 psi. Reapplication of treatments 5, 6 and 17 were made on June 2, at the same gpa and psi. Vines were flailed on September 14, and tubers were harvested on September 18, by a single-row Grimme commercial digger.

Crop injury and annual weed control were integrated as biomass, density, vigor and injury symptoms. Annual weed control on June 17, 1987, excluding wild oat, was good (85% or above) on all treatments except for EPTC at 3.0 lb ai/A applied singly and metribuzin (0.38 lb ai/A) plus alachlor (2.5 ai/A) (Table 1). Wild oat was controlled best by metribuzin at 0.25, 0.38 and 0.50 lb ai/A applied singly. On September 12, 1987, annual control, excluding wild oat, was good (83% or above) on all treatments except for EPTC at 3.0 lb ai/A singly, and metribuzin + alachlor at 0.38 + 2.5 lb ai/A (Table 1).

Potato tuber yields were excellent (350 cwt/A or above), except for the untreated check and EPTC at 3.0 lb ai/A (Table 2). A high percentage (70% or above) of No. 1 potatoes were seen in treatments of metribuzin at 0.5 lb ai/A, RE-40885 at 0.75 lb ai/A and metribuzin at 0.75 lb ai/A plus alachlor at 3.5 lb ai/A. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. Early injury rating (June 17, 1987), and annual weed control evaluation (Sept. 12, 1987), in potatoes with preemergence herbicides. Data are means of four replications (Haderlie, Downard, Poulson).

Chemical	Formulation	Rate (lb ai/A)	Type of Application	6/17/87 % Injury	9/12/87 % Weed Control: Overall Weed Control	Fox-tail	Wild Oat	Pig-weed	Lbs-qrtr	Kochia	Hairy Night-shade
1. Untreated (Weedy)				0	0	0	0	0	0	0	0
2. Untreated (Hand weeded)				5	88	89	93	89	89	91	83
3. EPTC	7 EC	3.0	PPI	14	18	43	13	19	13	20	29
4. EPTC +		3.0	PPI	16	93	95	85	94	93	95	93
metribuzin + metolachlor	75 DF (met), 8E (metolachlor)	0.38 + 1.75	Pre								
5. EPTC +		3.0	PPI	11	98	100	93	100	99	100	100
metribuzin + alachlor	4 EC (alachlor)	0.38 + 2.5	Pre								
6. EPTC +		3.0	PPI	9	96	96	91	98	100	100	95
metribuzin + pendimethalin	4 EC (pendimethalin)	0.38 + 1.0	Pre								
7. metribuzin		0.25	Pre	3	90	99	86	100	100	99	65
8. metribuzin		0.38	Pre	3	96	100	91	100	100	100	84
9. metribuzin		0.5	Pre	6	96	98	93	100	100	100	85
10. metribuzin + metolachlor		0.38 1.75	Pre	10	90	96	83	93	95	94	85
11. metribuzin + pendimethalin		0.38 + 1.0	Pre	9	98	100	91	100	100	100	98
12. pendimethalin + metolachlor		1.0 + 2.0	Pre	11	88	97	44	94	99	96	96
13. metribuzin + alachlor		0.38 + 2.5	Pre	7	69	75	48	63	65	60	64
14. RE-40885	80 WP	0.5	Pre	14	75	91	0	91	100	96	100
15. RE-40885		0.75	Pre	20	85	99	24	95	100	100	93
16. RE-40885		1.0	Pre	29	83	92	25	91	98	100	100
17. metribuzin + alachlor		0.75 + 3.5	Pre	14	100	100	99	100	100	100	100
LSD (0.05)				10	16	18	26	19	19	19	27
CV				70	14	15	29	16	16	15	23
Weed density (No. weeds/m^2)						53	27	11			6

Table 2. Potato tuber yield and percent in each grade following application of preemergence herbicides. Harvested Sept. 18, 1987. Data are means of four replications (Haderlie, Downard, Poulson).

Chemical	Formulation	Rate (lb ai/A)	Type of Application	Total Yield cwt/A[1]	Total Yield t/ha[2]	% of Total <4 oz	% of Total 4-10 oz	% of Total >10 oz	% of Total No 1's[3]	% of Total Mal.
1. Untreated (Weedy)				281	32	25	48	16	64	12
2. Untreated (Hand weeded)				366	41	13	41	25	66	21
3. EPTC	7 EC	3.0	PPI	290	33	22	46	15	61	17
4. EPTC +		3.0	PPI	369	41	17	45	23	68	16
metribuzin + metolachlor	75 DF (met), 8E (metolachlor)	0.38 + 1.75	Pre							
5. EPTC +		3.0	PPI	359	40	17	44	23	67	16
metribuzin + alachlor	4 EC (alachlor)	0.38 + 2.5	Pre							
6. EPTC +		3.0	PPI	388	44	15	39	26	65	20
metribuzin + pendimethalin	4 EC (pendimethalin)	0.38 + 1.0	Pre							
7. metribuzin		0.25	Pre	384	43	17	43	21	64	20
8. metribuzin		0.38	Pre	392	44	14	41	25	66	19
9. metribuzin		0.5	Pre	401	45	13	46	28	74	13
10. metribuzin + metolachlor		0.38 1.75	Pre	378	42	16	46	20	66	18
11. metribuzin + pendimethalin		0.38 + 1.0	Pre	363	41	15	48	16	64	21
12. pendimethalin + metolachlor		1.0 + 2.0	Pre	374	42	14	44	23	67	18
13. metribuzin + alachlor		0.38 + 2.5	Pre	350	39	16	45	22	67	17
14. RE-40885	80 WP	0.5	Pre	373	42	18	42	23	65	17
15. RE-40885		0.75	Pre	378	42	15	47	24	71	14
16. RE-40885		1.0	Pre	370	42	16	42	23	65	20
17. metribuzin + alachlor		0.75 + 3.5	Pre	382	43	18	46	24	70	13
LSD (0.05)				38	4	5	6	6	6	6
CV				7	7	23	10	19	6	24

[1]cwt/A = Hundred weight/Acre; [2]t/ha = Tons/Hectare, [3]No. 1's=(4-10 oz) + (>10 oz).

<u>Potato growth and symptoms when grown in clopyralid soil residue</u>. Haderlie, L.C. and D.K. Harrington. Potatoes (Russet Burbank) were planted 8,9 May 85 into soil previously treated with clopyralid to determine effects on potato growth and yield under field conditions at the Aberdeen Research & Extension Center. Soil was a declo fine sandy loam with pH 8.1, 1.6% organic matter and 13.2 meq CEC. Herbicide treatments were made 12 Nov 84 to wheat stubble by a tractor-mounted compressed-air sprayer with a 12 ft boom. Spray delivery was 17.5 gpa at 35 psi with TJ11002 nozzles. Plot size was 18 by 50 ft but only 12 by 40 ft was sprayed and 6 by 30 ft was harvestd on 1 Oct 85. Experimental design was randomized complete block with four replications for each treatment. Weed control was generally poor, but metribuzin + alachlor was applied at 0.25 + 2.5 lb a.i./A on 3 June and irrigated in with wheel-line sprinkler.

All clopyralid soil residue treatments greatly reduced potato growth and yield (Table 1). At all rates but the 0.25 lb a.i./A, potato foliage was sparse. Foliar symptoms were typical of picloram or severe dicamba injury. Addition of 2,4-D to clopyralid did not increase potato injury compared to clopyralid alone. Potato yields were poor, even in the untreated plots due to weed interference--mostly wild oat.

There was little or no tuber malformation caused by clopyralid (Table 2). A bull's eye appearance around the eyes was observed with clopyralid + 2,4-D. Such a malformity has been caused from dicamba or dicamba + 2,4-D drift in potatoes, also. Knobs and jelly-end were caused from stress from weeds and insufficient irrigation.

In summary, clopyralid applied at 0.25 lb a.i./A or more the fall previous to potato planting caused severe potato growth reductions. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Table 1. Potato tuber yield and percent in each grade following fall application of clopyralid at different rates and clopyralid + 2,4-D. Harvested 1 Oct 85 and graded 13 Nov 85. Data are means of four replications

CHEMICAL	FORMULATION	Rate lb a.i./A	Total Yield cwt/A	Total Yield t/ha	% of Total <4 oz	% of Total 4-10 oz	% of Total >10 oz	% of Total No. 1's*	% of Total Malformed
1. untreated			256	28.7	25	31	15	46	29
2. clopyralid (M-3972)	3 EC	0.25	144	16.2	44	27	3	31	26
3. clopyralid		0.5	55	6.1	68	13	2	15	17
4. clopyralid		1.0	21	2.4	80	8	0	8	12
5. clopyralid		2.0	4	0.4	100	0	0	0	0
6. clopyralid + 2,4-D	4 EC amine (2,4-D)	0.5 + 2.0	62	7.0	71	14	1	15	15
LSD 0.05			42	4.7	17	16	3	17	13
CV			31	30.9	17	69	61	61	52

*No. 1's = 4-10 oz + >10 oz.

Table 2. Evaluation of general appearance at grading, 6 wk after harvest. Data are means of four replications

CHEMICAL	FORMULATION	Rate lb a.i./A	Crease	Elephant Hide	White Grub	Jelly End	Bull's Eye	Knobs	Rot
1. untreated			4	0	9	11	0	27	1
2. clopyralid (M-3972)	3 EC	0.25	3	0	18	8	1	33	1
3. clopyralid		0.5	1	0	12	1	2	14	0
4. clopyralid		1.0	0	1.3	1	1	5	23	1
5. clopyralid		2.0	0	0	3	0	0	20	0
6. clopyralid + 2,4-D	4 EC amine (2,4-D)	0.5 + 2.0	2	0	14	1	24	28	0
LSD 0.05			n.s.	n.s.	n.s.	6	5	n.s.	n.s.
CV			107	490	99	111	66	84	202

Total weed control in sugarbeets without hand labor. Haderlie, L.C., P.J. Petersen and J.J. Gallian. Various preplant, preemergence, and postemergence herbicide treatments were compared in the field for annual weed control in sugarbeets at the Research and Extension Center, Aberdeen, Idaho in 1984. Randomized complete block design with four replications was used. Plot size was 11 by 42.5 ft (3.4 by 13 m). All treatments were applied with a tractor-mounted, compressed air-powered, field sprayer. Nozzles were TJ11002's spaced 22 inches (45.7 cm) on a 11 ft (3.4 m) boom. The spray pressure was 28 psi (193 kPa). Carrier volume was 17.5 gpa (164 L/ha), and application speed was 3 mph (4.8 km/hr). Cycloate at 4.0 lb a.i./A was applied 4 May 84 and incorporated by double discing within 15 min. Ethofumesate, ethofumesate+pyrazon, ethofumesate+diethatyl ethyl, metolachlor and SC-1102 were applied 11 May 84 and incorporated by application of 0.23 inches of rainwater within 5 days of application. Desmedipham/phenmedipham (1:1 ratio) in premix (desmedipham+phenmedipham) was applied with and without ethofumesate and PP-005 as a postemergence treatment. Weeds were mainly redroot pigweed (*Amaranthus retroflexus*), lambsquarters (*Chenopodium album*) and kochia (*Kochia scoparia*) which were in the 4 to 5 leaf stage at the time of the first postemergence treatment application. Evaluations were made on 18 June and 18 July 84 by visual comparison to checks.

Excellent early season control was achieved with cycloate at 4.0 lb a.i./A applied preplant incorporated and by a treatment of ethofumesate preemergence at 0.5 lb/A followed by a postemergence application of desmedipham/phenmedipham + oil concentrate (Herbimax) + PP-005 at 0.5 + 0.125 lb a.i./A + 0.5% v/v for oil concentrate (Table). Poor control was realized from metolachlor at 2.0 lb a.i./A and SC-1102 at 1.5 or 3.0 lb a.i./A. The best control on the latter evaluation was from the treatment of ethofumesate + desmedipham/phenmedipham + PP-005 + OC. All other treatments produced less control with SC-1102 and metolachlor being particularly ineffective.

Cycloate control lasted about 6 wk after which time the weed populations increased rapidly within these plots. Harvest was not taken. (University of Idaho Research and Extension Center, Aberdeen, ID 83210)

Sugarbeet weed control at two dates following application preplant (PPI), preemergence (Pre), and postemergence (Post) herbicides in the field at Aberdeen, Idaho. Data are means of four replications

Chemical	Formulation	Rate Lb a.i./A	Type of Application	Pigweed	Lambs-quarters	Lambs-quarters	Pigweed	Kochia
				% CONTROL				
Evaluation				Date Evaluated				
				18 June 1984		18 July 84		
1. Untreated (weedy)				0	0	0	0	0
2. Untreated (Hand Weeded)				100	100	100	100	100
3. Cycloate	6 EC	4.0	PPI	99	99	83	41	20
4. Ethofumesate	1.5 EC	1.5	Pre	70	53	45	59	38
5. Ethofumesate + Pyrazon	4.2 F (Pyra)	1.5+1.5	Pre	74	54	75	74	55
6. Ethofumesate + Diethatyl ethyl	4 ES (Antor)	1.5+1.5	Pre	80	75	64	89	69
7. [Ethofumesate +		1.5+	Pre	89	89	92	89	64
desmedipham+phenmedipham + PP-005 + OC*]	1.3 EC (Beta):1 E (PP005)	0.5+0.125+0.5%	Post X 2					
8. desmedipham+phenmedipham + PP-005 + OC.		0.325+0.063+0.5%	Post X 2	79	87	53	5	23
9. [desmedipham+phenmedipham +		0.325+	Post	75	76	43	28	13
desmedipham+phenmedipham + PP-005 OC		0.325+0.125+0.5%	Post X 2					
10. metolachlor	8 EC	2.0	Pre	18	20	18	38	18
11. SC-1102	3.3 EC	1.5	Pre	25	45	0	0	0
12. SC-1102		3.0	Pre	44	54	15	15	25
	LSD (0.05)			32	35	33	24	25
	CV			41	45	47	37	50
Weed counts/m² (2 July 1984) in untreated checks						17	51	5

*Oil concentrate (Herbimax)

Evaluation of herbicides for pre-harvest dessication of potato vines. Kidder, D. W., G. D. Kleinschmidt and D. P. Drummond. Evaluation of herbicides used for vine dessication in potato (Russet Burbank) prior to harvest was evaluated in Jerome County, Idaho. Twelve treatments, including the control, were applied in a randomized complete block design with four replications.

Herbicides were applied on September 14, 1987 as postemergence applications using a CO_2 pressurized backpack sprayer with 8002 nozzles at a rate of 20 gal/a (187 L/ha) and a pressure of 30 psi (207 kPa). Treatment plots were 9 feet wide and 25 feet long. Visual evaluations of percent defoliation were made on September 16, 18 and 21. Visual evaluation of percent dead stems was made on September 25. The number of plants with regrowth in the center row of each plot were recorded on September 28.

Results of vine dessication treatments in potato are given in Table 2. Ametryn was the slowest compound to cause dessication of the vines; however, by 7 days after treatment, ametryn was not different from the other compounds, and all treatments were acceptable. (University of Idaho Cooperative Extension Service, Twin Falls, ID 83301).

Table 1. Application data for potato vine defoliation.

Date of application	9/14/87
Air temperature (F)	74
Soil temperature @ surface (F)	60
Soil temperature @ 8 cm (F)	54
Relative humidity (%)	58
Dew present	none
Wind (mph)	0-6
Cloud cover (%)	0

Table 2. Pre-harvest dessication of potato vines

Treatment[1]	Rate	Necrosis				Regrowth
		Foliage			Stem	
		9/16	9/18	9/21	9/25	9/28
	(lb a.i./A)	--------(%)--------				Plants per 25 ft of row
Check	...	9	55	64	68	0.25
Diquat + surf.[2]	0.50 + 0.125% v/v	48	83	91	88	0.25
Diquat + surf. (buffered[3])	0.50 + 0.125% v/v	39	76	90	90	0.75
Dessicate[4]	2.00 gal.	44	74	88	84	0.75
Dessicate + diquat + surf.	1.50 gal + 0.25 + 1.0 pt.	40	75	88	87	0.00
Dessicate + diquat + surf.	1.00 gal + 0.25 + 1.0 pt.	29	73	86	89	0.25
Endothall[5] + NH_4SO_4[6]	1.00 + 5.00	44	74	91	90	1.00
Endothall + diquat + NH_4SO_4 + surf.	0.75 + 0.25 3.75 + 1.0 pt.	41	79	93	91	0.00
Endothall + diquat + NH_4SO_4 + surf.	0.50 + 0.25 2.50 + 1.0 pt.	30	69	84	83	0.75
Ametryn + surf.	2.40 + 1.0 pt.	5	51	80	87	0.50
Ametryn + diquat + surf.	2.40 + 0.125 + 1.0 pt.	5	61	88	89	0.50
Enquik[7]	20 gal.	70	81	91	91	0.25
LSD (0.05)		13	13	9	9	0.91

1 Treatments applied September 14, three weeks prior to harvest.
2 Surfactant (Activator 90)
3 Water buffered to pH 5.6
4 Dessicate [endothall(0.52 lb/gal) + NH_4SO_4(2.49 lbs/gal)]
5 Endothall (Hydrothall 191)
6 Sprayable NH_4SO_4
7 Enquik (monocarbamide dihydrogen sulfate 81.6%)

The use of bacterially modified lignin as a slow release carrier for triallate. L.S. Tapia, S.P. Yenne and D.C. Thill A growth chamber experiment was designed to test the decay rate of triallate with an experimental lignin carrier and two commercial clay formulations. The experimental lignin formulation was developed by the Department of Bacteriology, University of Idaho, Moscow, Idaho. The lignin used was a bacterially modified corn lignin. Technical grade triallate was bound physically to the lignin with glycerin.

Trillate at 0.5, 1.0 and 2.0 lb ai/a was tested with each carrier formulations. The commercial formulations were Fargo EC (an emulsifiable concentrate) and a water dispersible granular formulation from Monsanto (WDG). Each treatment was applied to 4720 g of soil (Palouse Silt Loam fine-silty, mixed, mesic, Pathic Ultic Haploxerol with 25% sand by weight), thoroughly mixed, and divided into 10 equal portions. These portions were put into freezer bags and frozen. Four days later one portion of each treatment was removed from the freezer and further divided into four equal parts, which were layered into the top of a 2 by 2 by 3 in. pot that was half full of untreated soil. Treatments were removed from the freezer at 7 day intervals for a 9 week period before planting. The pots were arranged in a completely random design with four replications

To accelerate herbicide degradation, pots with treated soil were placed in a growth chamber set at 90 F for 16 hrs and 70 F for 8 hours, all in the dark. Soil in individual pots was watered when the treated soil was added and covered with plastic. Five domestic (tame) oat seeds were planted into each pot the same day the last set of treatments were removed from the freezer. Above ground plant parts were harvested 14 days after planting. The plant samples were dried in a forced air dryer at 60 C for 48 hours and weighed to determine total biomass.

There was a significant interaction for decay time by herbicide rate by formulation in the experiment. Triallate activity was not consistent among carriers over time. Generally, the EC formulation of triallate applied at 0.5 and 1.0 lb ai/a reduced oat growth more and for a longer period of time than the other formulations (Table). At 2.0 lb ai/a rate, the triallate formulations were equivalent. The triallate GL formulation did not increase triallate activity or extend the soil-life of the product compared to existing commercially available formulations. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83843)

Table. Domestic oat biomass percent reduction over time with three triallate carriers.

Treatment 1/	Carrier	Degradations (weeks before planting)									
		0	1	2	3	4	5	6	7	8	9
(lb ai/a)		(% of check)									
0.5	EC	8	1	5	9	8	12	6	41	26	93
0.5	WDG	65	63	58	84	71	50	68	89	55	52
0.5	GL	30	16	25	31	33	50	27	55	65	79
1.0	EC	6	7	5	5	6	7	12	21	57	41
1.0	WDG	65	76	57	46	40	29	47	37	51	60
1.0	GL	15	29	28	26	28	55	71	71	18	69
2.0	EC	0	0	4	0	2	0	10	11	3	12
2.0	WDG	3	10	2	6	3	5	5	5	15	31
2.0	GL	15	25	21	42	7	25	19	33	32	7
LSD (0.05)		31									

1/ 10G = 10% granule GL = granular lignin

The use of bacterially modified lignin as a slow release carrier for EPTC. S.P. Yenne, L.S. Tapia and D.C. Thill. A greenhouse experiment was designed to evaluate decay time of two different EPTC formulations. Tame oats were used in the bioassay as indicator plants to evaluate herbicide activity over time. A bacterially modified corn lignin carrier was developed by the Department of Bacteriology and Biochemistry at the University of Idaho, Moscow. Technical grade EPTC herbicide was solubilized, mixed with the lignin, and the solvent evaporated off. This formulation was compared with a commercial 10% granular formulation.

EPTC at 3 and 6 lb ai/a was tested with each carrier formulation. Each treatment was applied to 4000 g of soil (Palouse Silt Loam fine-silty, mixed, mesic, Pathic Ultic Haploxerol with 25% sand by weight), thoroughly mixed and divided into eight equal portions. The portions were put into freezer bags and frozen at 0 C to prevent EPTC decay. One portion of each herbicide treated soil was removed from the freezer and further divided into four equal parts and layered in 2 by 2 by 3 in. pots already half full of untreated soil. Treatments were removed from the freezer at different time intervals for a 63 day period before planting,

The pots were arranged on a greenhouse bench in a completely random design with four replications, watered and covered with plastic to allow EPTC degradation. Five tame oat seeds were planted in each pot the same day the last set of treatments were removed from the freezer. Above ground plant parts were harvested 14 days after planting. The plant samples were dried in a forced air dryer at 60 C for 48 hours and weighed to determine total biomass production.

Decay time by formulation, and decay time by herbicide rate interactions were significant. Generally, both EPTC formulations reduced tame oat growth in a similar manner over time (Table 1). After 63 days of degradation before planting, the lignin formulation was slightly more active than the commercial formulation. Both EPTC rates reduced tame oat growth similarly through 21 days of degradation, after which the higher rate predictably was more effective (Table 2). (Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho 83843)

Table 1. Tame oat percent biomass reduction with two EPTC formulations averaged over rates.

Treatment[1/] (carrier)	0	2	4	10	21	32	42	63
	Degradation time before planting (days)							
	(% of check)							
10G	0	0	1	0	5	9	63	109
GL	0	0	0	0	7	26	53	91
LSD (0.05)	13							

1/ 10G = commercial 10% granule GL = experimental granular lignin

Table 2. Tame oat percent biomass reduction with two EPTC rates averaged over formulations

Treatment[1/] (lb ai/a)	0	2	4	10	21	32	42	63
	Degradation time before planting (days)							
	(% of check)							
3	0	0	1	0	9	27	71	103
6	0	0	0	0	3	7	44	98
LSD (0.05)	13							

1/ 10G = commercial 10% granule GL = experimental granular lignin

AUTHOR INDEX
(alphabetically by last name)

Page/Pages

HERBACEOUS WEED INDEX

(alphabetically by scientific name)

HERBACEOUS WEED INDEX

(alphabetically by common name)

WOODY PLANT INDEX

(alphabetically by scientific name)

WOODY PLANT INDEX

(alphabetically by common name)

CROP INDEX

HERBICIDE INDEX

(by common name or code designation)

This table was compiled from approved nomenclature adopted by the Weed Science Society of America (Weed Science 35(5):1986) and the herbicide handbook of the WSSA (5th edition). "Page" refers to the page where a report about the herbicide begins; actual mention may be on a following page.

Common Name or Designation	Chemical Name	Page
BAS-517	2-[1-(ethoxyimino)butyl]-3-hydroxy-5-(2H-tetrahydrothio-pyran-3-yl)-2-cyclohexen-1-one	120, 150, 157, 158, 223, 301
benefin	N-butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl)benzenamine	137
bensulfuron	2-[[[[[4,6-dimethoxy-2-pyri-midinyl)amino]carbonyl]amino] sulfonyl]methyl]benzoic acid	369, 371, 372, 374
bensulide	O,O-bis(1-methylethyl)S-[2-[(phenylsulfonyl)amino]ethyl] phosphorodithioate	137
bentazon	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide	135, 139, 223, 229, 238, 264, 268, 294, 171
bisulfate of soda	same	171
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile	34, 78, 112, 139, 155, 160, 162, 164, 178, 189, 191, 193, 196, 198, 200, 208, 210, 213, 214, 234, 238, 242, 282, 294, 311, 316, 318, 320, 324, 334, 336, 338, 343, 349, 353, 357, 362, 367, 368
cacodylic acid	dimethyl arsinic acid	249
CGA-131036	N-(6-methoxy-4-methyl-1,3,5-triazin-2-yl-aminocarbonyl-2-(2-chloroethoxy)benzene-sulfonamide	261, 318, 320, 324, 336, 349 351, 353, 357
CGA-180937	not available	244
chloramben	3-amino-2,5-dichlorobenzoic acid	105, 128, 133, 134, 221, 225, 227, 264

Common Name or Designation	Chemical Name	Page
chlorflurenol	methyl 2-chloro-9-hydroxy-fluorene-9-carboxylate	6, 139, 142, 145
chlorimuron	2-[[[[4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]benzoic acid	233
chloroxuron	N'-[4-(4-chlorophenoxy)phenyl]-N,N-dimethylurea	112
chlorsulfuron	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide	4, 11, 14, 21, 70, 144, 216, 251, 254, 325, 329, 346, 349, 351, 353, 357, 367, 368
cinmethylin	exo-1-methyl-4-(1-methylethyl)-2-[(2-methylphenyl)methoxy]-7-oxabicyclo[2.2.1]heptane	227, 238, 325, 329
CIPC	1-methylethyl 3-chlorophenylcarbamate	133
clethodim	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohenen-1-one	120, 150, 174, 176
cloproxydim	(E,E)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cylcohexen-1-one	131
clopyralid	3,6-dichloro-2-pyridinecarboxylic acid	4, 6, 8, 11, 14, 28, 34, 36, 43, 47, 78, 86, 96, 142, 208, 210, 253, 267, 284, 288, 318, 320, 351, 387
cyanazine	2-[[4-chloro-6-(ethylamino)-1,3,5-triazin-2-yl]amino]-2-methyl propanenitrile	152, 236, 238, 240, 242, 244, 249, 261, 329, 351, 362

Common Name or Designation	Chemical Name	Page
cycloate	S-ethyl cyclohexylethylcarbamothioate	236, 298, 303, 305, 390
2,4-D	(2,4-dichlorophenoxy)acetic acid	4, 16, 18, 21, 24, 26, 34, 36, 38, 39, 43, 47, 52, 53, 54, 55, 57, 59, 60, 70, 72, 75, 77, 86, 89, 94, 139, 142, 145, 191, 196, 207, 210, 212, 214, 233, 234, 242, 246, 251, 253, 261, 294, 326, 343, 349, 351, 367, 368, 387
2,4-DB	4-(2,4-dichlorophenoxy)butanoic acid	155, 158, 162, 164, 168
dalapon	2,2-dichloropropanoic acid	86
DCPA	dimethyl 2,3,5,6-tetrachloro-1, 4-benzenedicarboxylate	114, 116, 128, 221
desmedipham	ethyl [3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate	298, 301, 303, 305, 309
dicamba	3,6-dichloro-2-methoxybenzoic acid	4, 6, 21, 24, 26, 34, 36, 43, 53, 57, 70, 75, 77, 139, 142, 145, 208, 210, 214, 233, 238, 242, 253, 294, 320, 324, 336, 338, 343, 349, 351, 367, 368
dichlormid (safener)	2,2-dichloro-N,N-di-2-propenylacetamide	236, 242, 244
diclofop	(±)-2-[4-(2,4-dichlorophenoxy) phenoxy]propanoic acid	187, 189, 193, 201, 316, 318, 320, 329, 334, 357, 364

Common Name or Designation	Chemical Name	Page
diesel	petroleum distillate	96, 171
diethatyl	N-(chloroacetyl)-N-(2,6-diethylphenyl)glycine	122, 124, 126, 133, 134, 298, 390
difenzoquat	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium	189, 198, 201, 207, 316, 318, 334
dimethazone (clomazone)	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone	251, 261, 290
dinoseb	2-(1-methylpropyl)-4,6-dinitrophenol	105, 171, 249
diphenamid	N,N-dimethyl-α-phenyl benzeneacetamide	122, 124, 126
diquat	6,7-dihydrodipyrido[1,2-α:2',1'-c]pyrazinediium ion	171, 392
diuron	N'-(3,4-dichlorophenyl)-N,N-dimethylurea	148, 152, 171, 198, 254, 336, 338, 340, 362
DPX-E8698	DPX-M6316 + metsulfuron(10:1)	189, 329, 334, 362
DPX-G8311	chlorsulfuron + metsulfuron(5:1)	307, 311, 329, 338, 367, 368
DPX-L5300	methyl 2-[[[[N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl) methylamino]carbonyl]amino] sulfonyl]benzoate	11, 14, 21, 24, 28, 191, 196, 198, 204, 208, 213, 214, 234, 318, 320, 327, 343
DPX-M6316	see thiameturon	111, 162, 164, 168, 178, 193, 208, 210, 214, 234, 238, 242, 246, 290, 309, 316, 318, 320, 327, 338, 343, 353, 357, 362
DPX-R7910	4-amino-6-(1,1-dimethylethyl-3-(ethylthio)-1,2,4-triazin-5(4H)-one	346

Common Name or Designation	Chemical Name	Page
DPX-R9674	DPX-M6316 + DPX-L5300(2:1)	9, 196, 200, 204, 208, 210, 213, 214, 307, 309, 311, 316, 318, 324, 327, 334, 336, 338, 343, 353, 357, 362
DPX-T6206	not available	43
DPX-Y6202	see quizalofop	31, 32, 33, 37, 120, 155, 157, 176, 290, 301, 303, 305
EH-736	sulv-amine 2,4-D	212
endothall	7-oxabicyclo[2.2.1]heptane-2, 3-dicarboxylic acid	171, 392
EPTC	S-ethyl dipropylcarbamothioate	105, 133, 219, 221, 225, 236, 242, 244, 271, 273, 277, 281, 384, 396
ethalfluralin	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	219, 221, 225, 273
ethephon (growth regulator)	(2-chloroethyl)phosphonic acid	200
ethiozin (ethyl metribuzin)	4-amino-6-(1,1-dimethylethyl-3-(ethylthio)-1,2,4-triazin-5(4H)-one	32, 33, 152, 264, 311, 329, 334, 345, 346, 348, 349, 353, 355
ethofumesate	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate	298, 390
ethylene diamine copper complex	same	375
F-5231	not available	214

Common Name or Designation	Chemical Name	Page
fenoxaprop	(±)-2-[4-[(6-chloro-2-benz-oxazolyl)oxy]phenoxy]propanoic acid	120, 155, 157, 301, 318
fluazifop-P	(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]propanoic acid	31, 32, 33, 107, 112, 114, 120, 150, 155, 174, 176, 184, 254, 269, 273, 277, 282, 290, 298, 301, 303, 390
fluorochloridone	3-chloro-4-(chloromethyl)-1-[3-(trifluoromethyl)phenyl]-2-pyrrolidinone	107, 109, 271
fluridone	1-methyl-3-phenyl-5-[3-(trifluoro-methyl)phenyl]-4(1H)-pyridinone	375, 377
fluroxypyr	4-amino-3,5-dichloro-6-fluro-2-pyridyloxy acetic acid	21, 26, 34, 36, 38, 39, 47, 48, 57, 72, 73, 78, 96
FMC-57020	see dimethazone (clomazone)	251, 261, 290
FOE-3440A	not available	203
fosamine	ethyl hydrogen(aminocarbonyl) phosphonate	14, 18, 21, 36, 52, 55, 59
glufosinate	ammonium(3-amino-3-carboxypropyl) methyl phosphinate	171, 261
glyphosate	N-(phosphonomethyl)glycine	18, 28, 31, 37, 52, 55, 60, 86, 89, 92, 94, 99, 100,251, 254, 261, 326
haloxyfop	2-[4-[[3-chloro-5-(trifluoro-methyl)-2-pyridinyl]oxy]phenoxy] propanoic acid	31, 107, 114, 120, 155, 174, 269, 301

Common Name or Designation	Chemical Name	Page
hexazinone	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione	86, 96, 148, 152
HOE-00661	see glufosinate	171, 261
HOE-704	not available	254
HOE-7121	not available	207
HOE-7125	not available	203, 207, 316, 357
HOE-86601	not available	254
imazapyr	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid	89, 100, 233
imazaquin	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-quinolinecarboxylic acid	135, 139, 221, 223, 233
imazamethabenz	see AC-222,293	187, 189, 201, 203, 216, 281, 282, 290, 316, 320, 332, 334, 353
imazethapyr	(±)-2-[4,5-dihydro-4-methyl-4-(methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid	155, 157, 158, 162, 164, 168 176, 178, 223, 225, 227, 229, 233, 261, 264
LAB 191	not available	131
lactofen	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl) phenoxy]-2-nitrobenzoate	264, 273, 277
linuron	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea	107, 109
MCPA	(4-chloro-2-methylphenoxy)acetic acid	34, 78, 208, 210, 214, 253, 311, 324, 336, 338, 353, 362, 367, 368

Common Name or Designation	Chemical Name	Page
MCPP	see mecoprop	139, 142, 145
mecoprop	(±)-2-(4-chloro-2-methylphenoxy) propanoic acid	139, 142, 145
mefluidide	N-[2,4-dimethyl-5-[[(trifluoro-methyl)sulfonyl]amino]phenyl] acetamide	379
metamitron	4-amino-3-methyl-6-phenyl-1,2,4-triazin-5-(4H)-one	298
metham	methylcarbamodithioic acid	129, 130
methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	263
metolachlor	2-chloro-N-(2-ethyl-6-methyl-phenyl)-N-(2-methoxy-1-methyl-ethyl)acetamide	104, 116, 219, 221, 227, 229, 236, 240, 242, 244, 271, 277, 281, 381, 384, 390
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5 (4H)-one	31, 32, 33, 131, 148, 152, 198, 269, 271, 273, 277, 322, 329, 334, 336, 338, 345, 346, 348, 353, 355, 362, 381, 384
metsulfuron	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] amino]sulfonyl]benzoic acid	11, 14, 24, 28, 34, 43, 55, 77, 89, 100, 189, 191, 216, 254, 256, 258, 260, 325, 329, 351, 362
MON-8161	not available	92
MON-8783	glyphosate+dicamba	254
MSMA	monosodium salt of MAA	135, 139, 145, 249
N-Tac®	urea sulfuric acid	118, 171

Common Name or Designation	Chemical Name	Page
napropamide	N,N-diethyl-2-(1-naphthalenyloxy)propanamide	122, 124, 126
norflurazon	4-chloro-5-(methylamino)-2-(3-(trifluoromethyl)phenyl)-3(2H)-pyridazinone	148
oryzalin	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide	137, 282
oxadiazon	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3H)-one	133, 134, 137, 182, 183
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	116, 171, 178
paclobutrazol	1-(4-chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)pentan-3-ol	379
paraquat	1,1'-dimethyl-4,4'bipyridinium ion	32, 164, 168, 171, 249, 254, 282
pebulate	S-propyl butylethylcarbamothioate	133
pendimethalin	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	112, 116, 137, 221, 225, 236, 238, 242, 261, 271, 273, 277, 281, 282, 384
phenmedipham	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate	298, 301, 303, 305, 390
picloram	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	2, 4, 11, 14, 16, 18, 21, 24, 26, 28, 34, 36, 38, 47, 48, 50, 52, 53, 55, 57, 59, 68, 70, 72, 73, 75, 77, 78, 96, 208, 214, 253, 351

Common Name or Designation	Chemical Name	Page
PP-005	see fluazifop-P	31, 32, 33, 107, 112, 114, 120, 150, 155, 174, 176, 184, 254, 269, 273, 277, 282, 290, 298, 301, 303, 390
PP-604	2-[1-(ethoxyimino)propyl-3-hydroxy-5-(2,5,6-trimethyl-phenyl)cyclohex-2-enone	201
PPG-1103	not available	273, 277
PPG-1259	3-[5-(1,1-dimethylethyl)-3-isoxazalyl]-4-hydroxy-1-methyl-2-imidazolidone	43
prodiamine	N^3,N^3-di-N-propyl-2,4-dinitro-6-(trifluoromethyl)-m-phenylenediamine	137, 182, 183
pronamide	3,5-dichloro(N-1,1-dimethyl-2-propynyl)benzamide	32, 123, 128, 134, 168, 178, 251, 281, 283
propazine	6-chloro-N,N'-bis(1-methylethyl)-1,3,5-triazine-2,4-diamine	78
pyrazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	298, 390
pyridate	O-(6-chloro-3-phenyl-4-pyridazinyl)-S-octyl carbamothiate	131, 153, 160, 234, 263, 264, 284, 288
quinclorac	see BAS-514	142, 145, 294
quizalofop	(±)-2-[4[(6-chloro-2-quinoxalinyl)oxy]phenoxy]propanoic acid	31, 32, 33, 37, 120, 155, 157, 176, 290, 301, 303, 305
R11	not available	92
R-29148 (safener)	not available	236, 240, 242, 244
RE-40885	not available	290, 384

Common Name or Designation	Chemical Name	Page
SC-0051	not available	234, 246, 336
SC-0735	not available	234, 236, 238, 240, 246, 309
SC-0774	not available	236, 240, 242, 244
SC-1102	not available	390
sethoxydim	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one	31, 32, 33, 37, 105, 107, 112, 114, 120, 150, 153, 157, 158, 160, 162, 174, 176, 179, 182, 183, 184, 223, 269, 290, 301, 303, 305
simazine	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine	78, 152
SMY-1500	see ethiozin	32, 33, 152, 264, 311, 329, 334, 345, 346, 348, 349, 353, 355
sulfometuron	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]benzoic acid	11, 14, 18, 21, 24, 36, 52, 55, 59, 86
tebuthiuron	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea	40, 41, 43, 45
terbacil	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H)-pyrimidinedione	32, 33, 148, 152, 268
terbutryn	N-(1,1-dimethylethyl)-N'-ethyl-6-(methylthio)-1,3,5-triazine-2,4-diamine	198, 261, 329, 334, 336, 349, 362

Common Name or Designation	Chemical Name	Page
thiameturon	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid	111, 162, 164, 168, 178, 193, 196, 208, 210, 214, 234, 238, 242, 246, 290, 309, 316, 318, 320, 327, 336, 338, 343, 353, 357, 362
Thio-sul®	ammonium thiosulfate	118, 171
triallate	S-(2,3,3-trichloro-2-propenyl) bis(1-methylethyl)carbamothioate	187, 193, 264, 311, 394
triclopyr	[3,5,6-trichloro-2-pyridinyl) oxy] acetic acid	34, 36, 38, 39, 43, 47, 72, 77, 89, 96, 99, 100, 102, 139, 142, 145
tridiphane	2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxirane	238, 246, 277, 296
trifluralin	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine	105, 107, 109, 166, 187, 219, 221, 225, 264, 269, 271, 281, 311
trisulfuron	see CGA-131036	261, 318, 320, 324, 336, 349, 351, 353, 357
UC-77179	not available	43
urea - sulfuric acid	same	268
XRM-4640	see tridiphane	238, 246, 277, 296
XRM-4813	clopyralid + MCPA	351

ABBREVIATIONS USED IN THIS REPORT

a	. . . .	acre(s)
A	. . . .	amine
ae or a.e.	. . . .	acid equivalent
ae/a or a.e./a	. . . .	acid equivalent per acre
ai or a.i.	. . . .	active ingredient
ai/a or a.i./a	. . . .	active ingredient per acre
ai/ha	. . . .	active ingredient per hectare
AGGRI	. . . .	Agropyron griffithsi
AGRSM	. . . .	Agropyron smithii
AMABL or Prpw	. . . .	prostrate pigweed (Amaranthus blitoides)
AMARE	. . . .	redroot pigweed (Amaranthus retroflexus)
ANTCO	. . . .	mayweed chamomile (Anthemis cotula)
appl	. . . .	application
Apr	. . . .	April
AREHO	. . . .	Arenaria hookerii
ARTER	. . . .	fringed sagewort (Artemisia frigida)
ASTSP	. . . .	spoonleaf milkvetch (Astragalus spatulatus)
Aug	. . . .	August
AVEFA	. . . .	wild oats (Avena fatua)
bian	. . . .	biannually
BROTE or Dobr	. . . .	downy brome (Bromus tectorum
BRSNI or SOLNI	. . . .	black nightshade (Solanum nigrum)
bu	. . . .	bushels per acre
bu/a	. . . .	bushel/a
BYGR or ECHCG	. . . .	barnyardgrass (Echinochloa crus-galli)
C	. . . .	degree(s) Celsius
CAPBP	. . . .	shepherdspurse (Capsella bursa-pastoris)
CDA	. . . .	controlled droplet applicator
CEC	. . . .	cation exchange capacity
CEC/meq	. . . .	cation exchange capacity/milliequivalent
CENSO	. . . .	yellow starthistle (Centaurea solstitialis)
CHEAL	. . . .	common hambsquarters (Chenopodium album)
CIRAR	. . . .	Canada thistle (Cirsium arvense)
cm	. . . .	centimeter
CO_2 or CO	. . . .	carbon dioxide
COC, C.O.C. or c.o.c.	. . . .	crop oil concentrate
CONAR	. . . .	field bindweed (Convolvulus arvensis)
CRP	. . . .	Conservation Reserve Program
CRYCA	. . . .	Crypthantha caespitosa
CRYCE	. . . .	Crypthantha celosiodes
CV or cv	. . . .	coefficient of variation
cwt/A	. . . .	hundred weight per acre
DAT	. . . .	days after treatment
DESPI	. . . .	pinnate tansymustard (Descurainia pinnata)
DF or df	. . . .	dry flowable
DMRT	. . . .	Duncan's multiple range test

E	. . . .	emulsifiable
EC	. . . .	emulsifiable concentrate
ES	. . . .	emulsifiable solution
EDA-Cu	. . . .	ethylene diamine copper complex
encap.	. . . .	encapsulated
EPHES	. . . .	leafy spurge (Euphorbia esula)
EPOE	. . . .	early postemergence
ERACN	. . . .	stinkgrass (Eragrostis cilianensis)
ERION	. . . .	Eriogonum ovolofolium
ES or es	. . . .	ester
F	. . . .	degrees Fahrenheit
f	. . . .	fall
FL or F	. . . .	flowable
FRSTO	. . . .	skeletonleaf bursage (Ambrosia tomentosa)
ft	. . . .	foot or feet
ft^2 or sq ft	. . . .	square feet
g	. . . .	gram
G	. . . .	granule
GL	. . . .	granular lignin
GALAP	. . . .	catchweed bedstraw (Galium aparine)
gal/A, gal/a, GPA or gpa	. . . .	gallon(s) per acre
Grft or SETVI	. . . .	green foxtail (setaria viridis)
GUESA	. . . .	broom snakeweed (Gutierrezia sarothrae)
h	. . . .	hour
ha	. . . .	hectare
HAPAC	. . . .	Haplopappus acaulis
HAPNU	. . . .	Haplopappus nuttalli
HELAN	. . . .	common sunflower (Helianthus annuus)
HORVL	. . . .	volunteer barley
in	. . . .	inch(es)
Jul	. . . .	July
KCHSC or KOCZ	. . . .	kochia (Kochia scoparia)
kg	. . . .	kilogram
kg/ha	. . . .	kilogram(s) per hectare
km	. . . .	kilometer
km/hr	. . . .	kilometer(s) per hour
kPa	. . . .	kilopascal
2K	. . . .	2% active
L	. . . .	liter
L/ha	. . . .	liter(s) per hectare
lb	. . . .	pound
lb/a, LB/A or lb/A	. . . .	pound(s) per acre

lb ai/A, lbs ai/A, lb a.i./A or lb ai/a	......	pound(s) active ingredient per acre
lb/bu	......	pound(s) per bushel
lf	......	leaf
LSD	......	least significant difference
LVE	......	low volatile ester
m	......	meter
m^2	......	square meter
Mar	......	March
MAT	......	months after treatment
min	......	minute
mph	......	miles per hour
N	......	north
n.s., ns or NS	......	nonsignificant
No. or no.	......	number
Nov	......	November
NW	......	northwest
OC or oc	......	oil concentrate
Oct	......	October
OM	......	organic matter
oz/A or oz/a	......	ounce(s) per acre
oz ai/A or oz ai/a	......	ounce(s) active ingredient per acre
p or %	......	percent
P	......	phosphorus
PANMI	......	proso millet (*Panicum miliaceum* L.)
PE	......	preemergence
PES	......	preemergence surface
pH	......	-log hydrogen ion concentration
plt	......	plant(s)
plt/ft^2	......	plant(s) per square foot
PHLHO	......	Hoods phlox (*Phlox hoodii*)
PM or pm	......	package mix
POLCO	......	wild buckwheat (*Polygonum convolvulus*)
POROL	......	common purslane (*Portulaca oleracea*)
POST, Post, or post	......	postemergence
PPI or ppi	......	preplant incorporated
ppb	......	parts per billion
ppm	......	parts per million
ppbw	......	parts per billion by weight
ppmw	......	parts per million by weight
PROLO	......	unicorn-plant (*Proboscidea louisianica*)
psi	......	pounds per square inch
ptly cloudy	......	partly cloudy

ABBREVIATIONS USED IN THIS REPORT (Cont'd)

qt	quart
qt/A	quart(s) per acre
r	correlation coefficient
Rdwt	root dry weight
red.	reduction
RN	Renex 36
SASKR, SALIB or Ruth	Russian thistle (Salsola iberica)
SASAL	tumble mustard (Sisymbrium altissimum)
Sdwt	shoot dry weight
SECCE	volunteer rye (Secale cereale)
seedl	seedlings
SETLU or Yeft	yellow foxtail (Setaria glauca)
SINAR	wild mustard (Sinapis arvensis)
SOLCU	buffalobur (Solanum sarrachoides)
SOLSA	hairy nightshade (Solanum sarrachoides)
SOLTR	cutleaf nightshade (Solanum triflorum)
sp	spring
ss	stainless steel
STEME	common chickweed (Stellaria media)
STICO	Stipa comata
surf or s	surfactant
SW	southwest
SSW	south southwest
t	metric ton
temp	temperature
THIIN	Taeniatherum caput-medusae
T/A	ton(s) per acre
t/ha	ton(s) per hectare
til	tiller
TRAZX	volunteer wheat
TRBTE	puncturevine (Tribulus terrestris)
UCCGC	yucca (Yucca glauca)
μm	micromolar
V/V or v/v	volume per volume
var.	variety
veg coc	vegetable crop oil concentrate
W	west
WDG	water dispersable granule
WP or wp	wettable powder
w/w	weight per weight
yd	yard