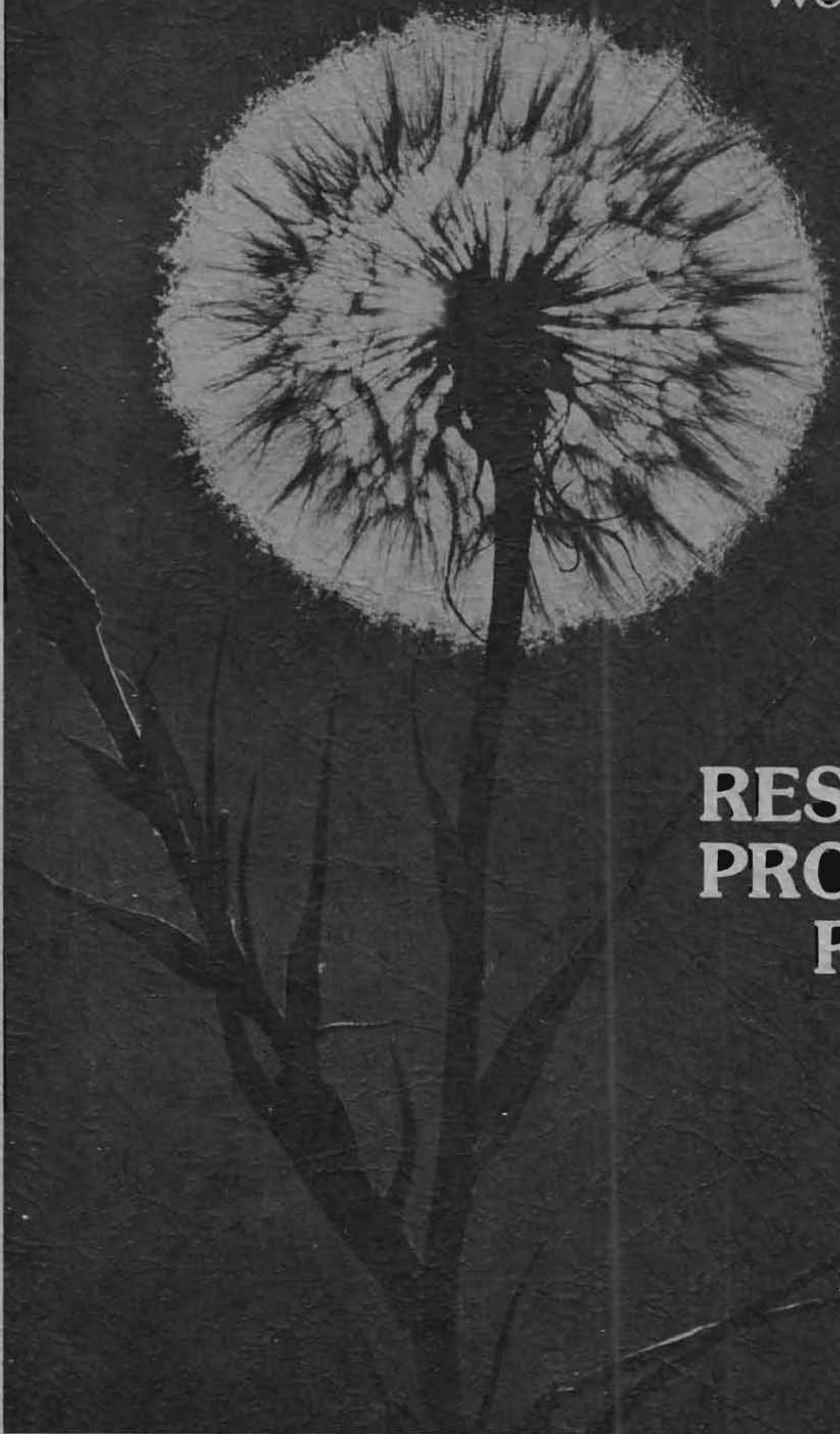
Western Society of Weed Science



1983 RESEARCH PROGRESS REPORT

ISSN 009-8142

Las Vegas, Nevada
March 8, 9, 10, 1983

Western Society
of Weed Science

1983
Research Progress Report

Las Vegas, Nevada March 8, 9, 10, 1983

J. LaMar Anderson
Treasurer-Business Manager
Plant Science Department
UMC 48, Utah State University
Logan, UT 84322
USA

FOREWORD

The Western Society of Weed Science 1983 Research Progress Report is a compilation of brief reports and recent investigations by weed scientists in the Western U.S. 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 In this report, information contained herein is meant to be considered in a preliminary sense, and NOT FOR PUBLICATION.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 1983 Western Society of Weed Science Research Progress Report is prepared by photoreproduction of the 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 accomulation of reports and some index work was the responsibility of the seven project chairmen. Final responsibility of putting the indices and reports together belongs to the research section chairman, who appeals for indulgence in the measure with which it has been granted.

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

Harvey D. Tripple
Chairman, Research Section
Western Society of Weed Science
1983

TABLE OF CONTENTS

Page

PROJECT 1. PERENNIAL HERBACEOUS WEEDS
Tom Schwartz - Project Chairman 1

Comparison of bromacil, terbacil and dichlobenil for purple nutsedge control 2
Comparison of glyphosate and bromacil for purple nutsedge control 3
Comparison of herbicide formulations, rates and application methods for shoot control of Canada thistle 4
Comparison of MSMA and DSMA for purple nutsedge control 6
Comparison of MSMA, bromacil and terbacil for yellow nutsedge control 7
Comparison of oil and water sprays of bromacil and diuron for yellow nutsedge control in citrus 8
Control of honeyvine milkweed with glyphosate 9
Control of purple nutsedge with bromacil and terbacil 11
Control of purple nutsedge with contact herbicides 12
Effect of herbicide treatments applied before and after frost on field bindweed control 14
Evaluation of original treatments, retreatments and combinations on leafy spurge live shoot regrowth 16
Evaluation of several herbicides for control of wild licorice . . 18
Evaluation of various herbicides and rates of application for Canada thistle control 19
Field bindweed control by three substituted glycine herbicides . . 20
Field bindweed control and soil residual study with dicamba and glyphosate 21
Longevity of Canada thistle control in a crested wheatgrass pasture 23
Longevity of Canada thistle control and crop tolerance to selected herbicides 25
Phytotoxicity of atrazine, diuron, terbacil and bromacil to purple nutsedge 27
Quackgrass control with graminicides 29
Retreatment schedules for purple nutsedge control with MSMA and DSMA 32
Timing of paraquat treatments for purple nutsedge control . . . 34
Treatment schedule with weed oil for purple nutsedge control . . 35

PROJECT 2. HERBACEOUS WEEDS OF RANGE AND FOREST
James M. Krall - Project Chairman 36

Pasture weed control in Idaho 37
Effect of picloram and fertilizer on spotted knapweed infested rangeland 40
Interaction of picloram and fertilizer in yellow hawkweed infested pasture 42
Effect of maturation on viability and germination of yellow starthistle seed buried at three depths 43

Page

Control of yellow starthistle at different growth stages with several herbicides 45
Control of common crupina treated at three growth stages . . . 47
Effectiveness of Herbi and conventional knapsack applications on the control of common crupina 49
Evaluation of several new herbicides on desert saltgrass 51
Control of yellow starthistle on California rangeland 52
Genotypic variation among yellow starthistle populations 53
Effects of burning, seeding, fertilization, and herbicide application on yellow starthistle infested rangeland one year after application 55
Competition between yellow starthistle and downy brome 59
Seed and seedling root growth characteristics of several populations of yellow starthistle (*Centaurea solstitialis* L.) 62

PROJECT 3. UNDESIRABLE WOODY PLANTS
Darlene Frye - Project Chairman 64

Effects of various rates and formulations of picloram on broom snakeweed control in Eastern New Mexico 65
Mesquite control with chemical treatments in Eastern New Mexico 66
Effects of tebuthiuron on range species complex and forage production 67
Conifer release with split applications of triclopyr

PROJECT 4. WEEDS IN HORTICULTURAL CROPS
Ray D. William - Project Chairman 70

Postemergent weed control in spring planted onions 71
Postemergent weed control in overwintered onions 73
Preemergence and postemergence herbicide combinations for weed control in onions 74
Postemergence control of grassy weeds in onions 75
Preemergence herbicides for dehydrator onions 76
Toxicity of chloramben to onions and asparagus 77
Bentazon directed applications for yellow nutsedge control in yellow danver onions 78
Garlic tolerance to soil-applied herbicides for winter weed control 80
Garlic tolerance to postemergence and broadleaf herbicides . . . 81
Selective black nightshade control in tomatoes 82
The effect of timing and repeat applications of acifluorfen on the control of black nightshade in processing tomatoes . . 83
The effect of acifluorfen on the general weed control and growth of young processing tomatoes 84
The effect of chlorsuluron on the control of black nightshade in processing tomatoes 85
A comparison of four chemicals for dodder control in a greenhouse study 86

Page

The effect of over-the-top sprays of glyphosate on attached dodder 87
Broadleaf weed control in cucurbits 88
Annual weed control in cucumbers with preemergence herbicides 90
Watermelon tolerance to ethalfluralin and napropamide incorporated with irrigation and a nailboard 93
A comparison of metolachlor with five preplant incorporated herbicides in snap beans 94
Herbicide evaluation in sweet corn 95
Toxicity of alachlor and triallate to lettuce 97
Annual grass control in carrots with fluazifop-butyl (Fusilade) 98
Tolerance of crucifer crops to alachlor, metolachlor, and propachlor 99
Tolerance of crucifer seed crops to winter applications of simazine, pronamide and endothall 101
The effect of water-band application of metham on weed control in a Delhi loamy sand 102
The effect of water-band metham on hot summer soils 103
The effect of fall applied water-banded herbicides on subsequently seeded broccoli, tomatoes and onions 104
An evaluation of the residual activity of metham after water-band applications 105
Annual weed control in ornamental bulbs (iris, tulip and narcissus) 108
Evaluation of herbicides for control of perennial grasses in a citrus orchard 110
Paraquat for orchard weed control 111
Comparison of bromacil, terbacil and dichlobenil for purple nutsedge and bermuda grass control in a tangelo orchard . . . 112
Yellow nutsedge control in citrus with bromacil and terbacil . . . 113
Sweet orange seedling tolerance to 2,4-DB and dichlorprop 114
Sweet orange seedling tolerance to monuron and diuron 115
Sweet orange seedling tolerance to amitrole and dalapon 115
Bermuda grass infestation effects on the population of garden snails infesting a 'Valencia' orange orchard 116
Weed infestation effects on the weight of garden snails infesting a 'Valencia' orange orchard 117
Herbicide evaluation in red delicious apples 118
Herbicide evaluation in golden delicious apples 120
Evaluation of R-40244 in apples 122
Evaluation of Hoe-39866 in non-bearing plums 123
Herbicide evaluation in sweet cherries 124
Cranberry tolerance to napropamide on sandy soils in Oregon . . . 127
Yield and maturity of Thompson seedless graps under four weed control programs 128
Preplant and post-plant application of glyphosate during establishment of red raspberry and trailing blackberry . . . 129

Page

PROJECT 5. WEEDS IN AGRONOMIC CROPS
Larry G. Thompson - Project Chairman 131

Annual grass and broadleaf weed control in established dormant alfalfa 132
Chile pepper tolerance to pendimethalin preplant plus metolachlor postemergence 134
Cotton yields following over-the-top sprays of glyphosate 136
Postemergence grass herbicides for established non-dormant alfalfa 138
Alachlor combinations for annual grass control in winter wheat . . 139
Annual grass control in winter wheat with triallate and trifluralin combinations 140
Quackgrass control in peppermint 141
Sensitivity of Poaceae crops and weeds to several herbicides . . . 142
Soil persistence of six experimental herbicides 144
Desiccation of lentils with sodium chlorate and dinoseb 147
Lentil and weed desiccation with paraquat 148
A comparison of the effectiveness of bentazon applied alone and in combination with six other postemergent herbicides in dark, red kidney beans 150
The weed control effectiveness of bentazon in light, red kidney beans as compared with three postemergence herbicides 152
Canada thistle control the season after chlorsulfuron application 153
Herbicides for volunteer rye and jointed goatgrass control in winter wheat 154
The effect of chlorsulfuron soil residues on seven rotational crops grown in Montana 156
The effect of dicamba soil residues on spring wheat, barley, sunflower, and safflower 158
The effect of time of application and rate of chlorsulfuron on the stand and yield of winter wheat 159
Chemical fallow in a winter wheat-fallow cropping system 160
Controlling yellow nutsedge in corn with preplant incorporated herbicide treatments 162
Field dodder control in established alfalfa 163
Mixing EPTC 10G with alfalfa seed at planting time to control redroot pigweed and green foxtail 164
Postemergence wild oat and green foxtail control in seedling alfalfa 165
Postemergence wild oat control in spring planted barley 167
Vernolate/R25788 and EPTC/R25788 post plant incorporated in silage corn using sprinkler irrigation and shallow mechanical incorporation plus sprinkler irrigation 169
Evaluation of preemergence and postemergence herbicides on blackeye cowpeas 170
Low dose/early weed flush method of postemergence herbicide application on sugarbeets 172
Control of catchweed bedstraw with chlorsulfuron 174

Page

Early-summer herbicide treatments for control of broadleaved weeds in a fallow winter wheat field 175
Effect of late-spring herbicide treatments for fallow-season weed control in a winter wheat field 176
Fall plus spring herbicide treatments for weed control in a fallow winter wheat field 177
Glyphosate and glyphosate-dicamba treatments for fallow-season and at-harvest weed control in winter wheat 179
Postemergence herbicide treatments for control of annual weeds in spring barley 181
Annual grass control in alfalfa 183
Control of wild oat in peas, lentils, and chickpeas with metribuzin and triallate 185
Herbicide screening in peas, lentils, and chickpeas 187
Annual bluegrass (Poa annua) competition with wheat (Triticum aestivum var. Stephens) 190
Effect of linuron on different crops 191
Chloroxuron toxicity to alfalfa, sugarbeets, and barley 192
DCPA as a preemergence herbicide in several crops 193
Effect of methods of irrigation and incorporation on preemergence herbicide 195
Location of weed control on plant beds as affected by method of incorporation, irrigation, and formulation 197
Phytotoxicity of fluorometuron to alfalfa, corn, cotton, sorghum, and sugarbeets 199
Pyrazon as a preemergence herbicide in several crops 200
The effect of the time of application of the phytotoxicity of prometryne to cotton 202
Toxicity of pyrazon and phenmedipham combinations to twelve crops and six weeds 203
Chemical fallow weed control in Southeast Idaho 206
Chemical fallow weed control with fall and spring applied herbicides 209
Effect of tillage and herbicide in fallow at Lewiston, Idaho . . . 211
Tillage and herbicide combinations in Lewiston, Idaho 213
The production potential of leafy spurge 216
A comparison of weed control, crop tolerance and yield in baby lima beans and 'Gloria' pink beans with bentazon and six postemergence herbicides 218
An evaluation of selected preplant incorporated herbicides in baby lima and 'Gloria' pink beans 222
A comparison of glyphosate with three postemergence herbicides for the control of johnsongrass in red kidney beans 225
Alachlor and metolachlor selectivity to treated grain sorghum seed 227
Postemergence herbicides for weed control in field corn 228
Weed control in field corn with preplant incorporated herbicides 231
Tolerance of thirteen wheat varieties to AC 222,293 234
Evaluation of several herbicides for downy brome and broadleaf weed control in winter wheat 236

Page

Postemergence herbicide application for weed control in minimum tillage winter wheat 238
Ripgut brome and broadleaf weed control in winter wheat 240
Tolerance of spring wheat varieties for five herbicides 242
Wild oat control in irrigated spring barley and wheat in Southern Idaho 244
Annual weed control in fall planted faba beans with preemergence herbicides 248
Evaluation of DPX 6376 combinations in spring wheat and spring barley 250
Broadleaf weed control in spring barley 252
Broadleaf weed control in winter wheat 255
Control of wild oat and broadleaf weeds in winter wheat 257
Postemergence broadleaf weed control in winter wheat 260
Wild oat and broadleaf weed control in spring barley 262
Wild oat and broadleaf weed control in spring barley 264
Control of yellow foxtail in alfalfa with postemergence herbicides 266
Spring applied broadleaf herbicides on Nugaines winter wheat . . . 267
Wild proso millet control in field corn 268
Observations on acifluorfen activity on black nightshade in tomato fields in Yolo County, California 269
Wheat variety tolerance to chlorsulfuron 270
Winter wheat tolerance to herbicides applied for broadleaf weed control 271
Yellow nutsedge control in chile, cotton and onions 273
Postemergence wild oat control in dryland barley 274
Preemergence wild oat control in dryland barley 276
Effect of pronamide on winter peas and winter wheat in rotation 277
Dicamba and succeeding crops 279

PROJECT 6. AQUATIC, DITCHBANK AND NONCROPLAND WEEDS
Leslie Sonder - Project Chairman 282

Soil active herbicides for annual weed control 283
Evaluation of non-selective, translocated herbicides for Bermuda grass (Cynodon dactylon (L.) Pers.) control in non-cropland 284
Algae control and seasonal succession 285
Growth of spikerush (Eleocharis spp.) from seedlings in relation to water temperature 286
Growth of American pondweed in soil treated with DPX 5648 287
Evaluation of hydrogen peroxide alone and in combination with copper sulfate for the control of filamentous algae 289
Effect of temperature on the germination of slender spikerush (Eleocharis acicularis (L.) Roehm & Schult 291
The effect of dwarf spikerush and a winter drawdown on four species of rooted submersed aquatic weeds 292

Page

Control of rooted submersed aquatic weeds and filamentous algae in ponds stocked with mirror carp 293
Translocation of Oust (DPX 5648) in hydrilla and American pondweed using a silicone sealant 294
Residues of herbicides in the Sacramento Delta. Following application for control of water hyacinth 298
Advances in Hydrilla verticillata control research in the Imperial Valley, California 301

PROJECT 7. CHEMICAL AND PHYSIOLOGICAL STUDIES
Robert F. Norris, Project Chairman 303

The role of glycolysis pathway intermediates in barnyardgrass seed dormancy and germination 304
The role of citric acid cycle intermediates in barnyardgrass seed dormancy and germination 305
Effects of surfactants WK and X-77 on diuron reduction of Sesbania exaltata growth 306
Effects of surfactants WK and X-77 on bromacil activity 308
The allelopathic potential of yellow starthistle 310
Allelopathic effects of crop and weed residues 313

PROJECT 1.

PERENNIAL HERBACEOUS WEEDS

Tom Schwartz - Project Chairman

Comparison of bromacil, terbacil, and dichlobenil for purple nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Plots were established in a basin-irrigated Coachella Valley, California, citrus orchard to test bromacil, terbacil, and dichlobenil for purple nutsedge control. Before treatment, the vegetation was mowed to 3 inches. Bromacil and terbacil were applied at 3 and 6 lb ai/A in 100 gpa water. Dichlobenil was applied at 6 and 12 lb ai/A as 4% granules. Treatments were made on August 28. The plots were irrigated 7 days after treatment and subsequent irrigations were made at 2-week intervals. Plots were rated at 2-week intervals for purple nutsedge control (%). Results are presented in the table below.

Dichlobenil provided the greatest control of purple nutsedge vegetation. Bromacil was more effective for purple nutsedge control than terbacil. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Percent control of purple nutsedge
foliage with bromacil, terbacil, and dichlobenil

		Weeks after treatment				
Herbicide	Rate (lb/A)	2	4	6	8	10
bromacil	3	39	56	39	30	49
	6	49	71	56	51	65
terbacil	3	43	48	32	22	37
	6	48	65	45	35	59
dichlobenil	6	38	74	69	72	75
	12	49	86	80	79	85
control	--	0	0	0	0	0

Comparison of glyphosate and bromacil for purple nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Treatments with glyphosate were evaluated in comparison with bromacil for the control of purple nutsedge (*Cyperus rotundus*) in a citrus orchard in Ventura County, California. Herbicides were applied as broadcast sprays with a precision plot sprayer to a moderately uniform stand of nutsedge 6 to 8 inches high. Glyphosate was applied at a spray volume of 25 gal/A, and bromacil was applied at a volume of 100 gal/A.

Treatments were made on June 20 and evaluated three times throughout the summer and fall. A split-treatment of glyphosate received the second application on October 12, the date of the last observation. Treatment data and ratings are given in the table. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

A comparative evaluation of glyphosate and bromacil on the control of purple nutsedge

		Control of nutsedge (%)		
Herbicide	Rate (lb/A)	7/13	8/8	10/2
Glyphosate	2	30	68	63
Glyphosate	2 + 2[a]	33	57	47
Glyphosate	4	27	73	73
Bromacil	4	33	82	92
Bromacil	8	33	87	92

[a] Second treatment applied Oct. 12.

Comparison of herbicide formulations, rates and application methods for shoot control of Canada thistle. Alley, H. P. and R. E. Vore. New formulations of 2,4-D amine and dicamba have recently been marketed that were supposed to have greater activity on specific perennial weeds than the common formulations being utilized. Plots were established to compare the efficacy of two 2,4-D amine and two dicamba formulations along with chlorsulfuron, glyphosate and picloram applied by the CDA (Herbi) and conventional TeeJet flat fan nozzles. The two 2,4-D amine formulations were: Formula 40 (alkanolamine salt) and 2,4-D SULV (dimethylamine salt). The two dicamba formulations were: (Na salt and dimethylamine salt).

Plots were established August 31, 1981 on a dense stand of Canada thistle (Cirsium arvense L.) growing in a sub-irrigated pasture. The Canada thistle was in full bloom with an understory of sedges and rushes. Picloram was applied with a conventional knapsack spray unit in 374.2 L/ha or with the CDA (Herbi) in 46.8 L/ha water solution.

Visual Canada thistle shoot control evaluations were made September 6, 1982, 13 months following treatment. Picloram was the most effective treatment, reducing the Canada thistle shoot growth from 95 to 98%. There appeared to be no difference in control obtained whether picloram was applied by the CDA or TeeJet flat fan nozzles. Formulations of dicamba nor 2,4-D amine did not enhance the control obtained. The Na salt of dicamba was no more effective than the dimethylamine formulation and neither of the 2,4-D formulations were effective in reducing shoot regrowth of Canada thistle. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1183).

Canada thistle shoot reduction

Treatment	Rate kg/ha	Percent Shoot Control	Observations
picloram (conv)	0.56	98	No sedge and rush damage
picloram (conv)	1.12	99	
picloram (Herbi)	0.56	95	
picloram (Herbi)	1.12	95	
dicamba DMA	4.48	50	Reduced stand of sedges and rushes at 6.72 kg/ha rate
dicamba DMA	6.72	50	
dicamba Na	4.48	50	
dicamba Na	6.72	50	
Chlorsulfuron	0.14	50	
Chlorsulfuron	0.28	80	
glyphosate	2.24	75	Took out sedges and rushes
2,4-D amine	2.24	0	
2,4-D SULV amine	2.24	0	

Comparison of MSMA and DSMA for purple nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. A uniform stand of purple nutsedge at Coachella, California, was treated with either MSMA or DSMA at 1, 2, 4, and 8 lb ai/A either with or without X-77 surfactant (0.5%) in the spray (100 gpa). Ratings of vegetation control (%) were made for 8 weeks after treatment. Results are presented in the table below.

Purple nutsedge control by MSMA and DSMA without added surfactant was about equal. The initial response of purple nutsedge to DSMA was increased by the addition of X-77 to the spray, but the final rating was not increased. Activity of MSMA was not increased by the surfactant. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Ratings of purple nutsedge control
with MSMA and DSMA applied on October 1

Herbicide	Rate (lb/A)	Surfactant	Control (%)						
			Oct 8	Oct 15	Oct 22	Oct 29	Nov 5	Nov 12	Nov 19
DSMA	1		12	15	30	35	32	21	16
DSMA	2		21	35	61	55	43	45	30
DSMA	4		43	42	75	75	63	55	46
DSMA	8		91	92	91	93	91	88	75
DSMA	1	X-77	28	26	47	47	38	46	21
DSMA	2	(5%)	40	60	65	58	45	56	41
DSMA	4	"	66	78	86	75	61	67	45
DSMA	8	"	97	95	89	90	87	85	77
MSMA	1		26	31	43	42	33	32	31
MSMA	2		28	15	62	46	46	43	27
MSMA	4		43	48	73	71	71	67	42
MSMA	8		90	90	88	86	86	87	68
MSMA	1	X-77	12	32	45	38	38	33	25
MSMA	2	(5%)	31	30	48	48	48	45	30
MSMA	4	"	55	65	78	72	72	52	52
MSMA	8	"	70	88	90	79	79	75	66

Comparison of MSMA, bromacil, and terbacil for yellow nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. A uniform stand of yellow nutsedge in a sprinkler-irrigated citrus grove in the San Louis Rey River Valley, California, was treated on June 2 with MSMA at 4 and 8 lb ai/A in 100 gpa water and bromacil or terbacil at 4 and 8 lb ai/A in 50 gpa of water. Three replications were used. Ratings of (%) control were made from June through October. Results are presented in the table below.

Yellow nutsedge vegetative growth was completely controlled by both bromacil and terbacil. MSMA provided over 90% control at the 8 lb/A rate, but control from 4 lb/A decreased after July. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

A summary of treatments and percent vegetation control of yellow nutsedge in plots treated with uracils. Date of treatment was June 2

		Date					
Herbicide	Rate (lb/A) ai	June 10	June 23	July 14	July 29	Oct 1	Oct 22
Bromacil	4	71	93	99	98	99	100
Bromacil	8	83	93	99	98	100	100
Terbacil	4	76	91	99	98	99	99
Terbacil	8	83	95	99	99	100	100
MSMA	4	85	95	90	80	67	65
MSMA	8	85	99	94	93	90	90

Comparisons of oil and water sprays of bromacil and diuron for yellow nutsedge control in citrus. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Research was conducted to compare water-based soil spray of bromacil with nonphytotoxic oil-based foliar sprays of bromacil and diuron for purple nutsedge control in a basin-irrigated citrus orchard in the Coachella Valley, California. Spray volume for all treatments was 100 gpa. All herbicides were applied at 3 and 6 lb ai/A. The purple nutsedge was 8 inches tall when treated. Soil treatments were made by washing the bromacil off the foliage and onto the soil with 400 gpa of water immediately after treatment. The first basin irrigation was made 10 days after treatment. Control ratings were made at 2-week intervals for 8 weeks after treatment. Results are presented in the table below.

The 6 lb/A bromacil treatment to the soil was more effective than the 3 lb/A treatment. The 3 and 6 lb/A bromacil in nonphytotoxic oil were about equal to each other and to the 6 lb/A bromacil in water treatment to the soil. Diuron with nonphytotoxic oil provided control equal to bromacil. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Percent control of purple
nutsedge foliage with bromacil and diuron

Treatment				Weeks after treatment			
Type	Herbicide	Rate (lb/A)	Carrier	2	4	6	8
Soil	bromacil	3	water	30	50	44	40
Soil	bromacil	6	water	41	70	74	71
Foliar	bromacil	3	nonphytotoxic oil	58	68	66	65
Foliar	bromacil	6	nonphytotoxic oil	54	65	54	62
Foliar	diuron	3	nonphytotoxic oil	41	55	65	42
Foliar	diuron	6	nonphytotoxic oil	56	70	74	62
Foliar	none	-		0	0	0	0

Control of honeyvine milkweed with glyphosate. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Honeyvine milkweed (Ampelamus albidus (Nutt) Britt.) occurs as a serious orchard weed pest in a number of citrus orchards in Ventura County, California, and is widespread throughout many of the citrus growing areas of Florida. As a perennial weed, honeyvine milkweed is not controlled under our common orchard spray programs with soil-acting herbicides such as simazine and diuron. Preliminary experiments with glyphosate on the control of honeyvine milkweed were conducted under greenhouse field conditions.

Plants grown from seed in one-gallon cans were treated with glyphosate at rates shown in the table. Treatments were replicated five times. A number of treatment groups were pretreated with a growth regulator DPX-1840 two weeks before treatment with the herbicide to induce sprouting. DPX-1840 was applied at a spray volume of 50 gpa with 0.1% surfactant. Glyphosate was applied at a volume of 25 gpa. Plants were 12 to 14 inches high at the time of treatment. A rating of the effect of the treatments on top growth of the vines was taken at four weeks after treatment with the herbicide. Results are shown in the table. Plants were cut off at ground-level following the four-week rating so that an evaluation of the treatment's effects on regrowth could be made.

Field studies with glyphosate on the control of honeyvine milkweed were conducted in a citrus orchard near Santa Paula, California, in the summer. Prostrate vines occurring between citrus trees were spot-treated with glyphosate at rates of 2, 4, and 8 lb/A at a spray volume of 25 gal/A. Plants treated on May 23 were evaluated for injury on June 20. Average ratings of percent-kill of top growth from four replicate treatments were as follows: 70% (2 lb/A), 98% (4 lb/A), and 100% (4 lb/A). Subsequent ratings on regrowth were determined to be unreliable because of the close proximity of untreated vines to the treated plants. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

The control of vegetation of honeyvine
milkweed at four weeks after treatment with glyphosate

Herbicide Rate (lb/A)		Control
Glyphosate	DPX-1840[a]	(%)
2	-	4.0
4	-	9.3
8	-	9.7
2	1	8.4
4	1	8.6
8	1	9.9
4	2	9.8
4	0.5	8.7
-	1	1.1
Control	-	0

[a] Pretreatment 2 weeks before application of glyphosate.

Control of purple nutsedge with bromacil and terbacil. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Plots were established at four locations near Redlands, California, to compare bromacil and terbacil for purple nutsedge control. Dense stands of purple nutsedge were treated at 6 to 10 inches tall with 4 and 8 lb ai/A of either bromacil or terbacil in 100 gpa water. Three replications were used. Two weeks after treatment, the plots were sprinkler irrigated with 0.5 inches of water per acre. The percent vegetation control was rated at 7-day intervals after treatment. Results are presented in the table below.

The amount (%) of vegetation control was highly variable among locations. Neither herbicide was consistently more effective for nutsedge control than the other. Purple nutsedge recovery from injury was more rapid in plots as soil moisture increased. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Control of purple nutsedge vegetation with bromacil and terbacil at four locations near Redlands, California

			Date		
Location	Herbicide	Rate (lb/A)	Treatment	Maximum Control	Maximum Control (%)
Lugonia St., Redlands, CA	Bromacil	4	5/17	6/25	28
	Bromacil	8		6/25	68
	Terbacil	4		6/25	23
	Terbacil	8		7/14	63
Walnut St., Redlands, CA	Bromacil	4	5/17	6/14	45
	Bromacil	8		6/14	85
	Terbacil	4		6/23	50
	Terbacil	8		6/23	75
Opal St., Redlands, CA	Bromacil	4	5/17	7/14	95
	Bromacil	8		7/14	95
	Terbacil	4		7/14	65
	Terbacil	8		7/14	90
Silverberger, Redlands, CA	Bromacil	4	5/19	7/14	20
	Bromacil	8		7/29	55
	Terbacil	4		7/14	48
	Terbacil	8		7/29	55

Control of purple nutsedge with contact herbicides. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Research was conducted to determine if repeated treatments with cultivation, weed oil, paraquat, and MSMA can be used to reduce purple nutsedge tuber populations in the sandy soil of a grape vineyard located in the Coachella Valley in California. Cultivation was done when the nutsedge regrowth reached about 10 inches. Herbicides employed were weed oil (100 gpa), paraquat (0.5 lb ai/A), and MSMA (4 lb ai/A). The number of tubers in the top 10-inch soil layer was determined at the start and at the end of the spray program each year and the average control of purple nutsedge vegetation was determined at weekly intervals. Results are presented in the table below.

Cultivation resulted in nutsedge suppression and a reduction in the number of tubers in the soil. Weed oil and paraquat were about equally effective, while MSMA was less effective for reducing tuber population and for controlling vegetative growth. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Year of treatment program	Treatment	Number of treatments	Tuber number before treatment (tubers/ft^3)		Tuber number after treatment (tubers/ft^3)		Average vegetation control
			Total	No. Viable	Total	No. Viable	
1	Cultivation	--	79	39	109	84	--
	Weed oil	23	108	32	33	6	82
	Paraquat	23	162	67	41	10	83
	Diquat	23	166	86	65	27	56
2	Cultivation	--	100	58	78	39	--
	Weed oil	18	17	1	11	1	95
	Paraquat	18	31	.8	14	3	91
	Diquat	18	66	19	45	28	39
3	Cultivation	15	73	36	39	16	--
	Weed oil	15	10	1	14	4	95
	Paraquat	15	12	5	34	20	95
	Diquat	15	100	72	113	60	71

Effect of herbicide treatments applied before and after frost on field bindweed control. Kambitsch, D.L., D.C. Thill, and R.H. Callihan. A field study was conducted at Moscow, Idaho to evaluate the effectiveness of herbicides on field bindweed control when applied before and after frost in wheat stubble. Herbicide treatments were applied to established field bindweed in full bloom on September 23, 1981 and again on October 14, 1981 after the plants were subjected to severe frost. All the herbicides were applied broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L/ha at 2.8 kg/cm^2 pressure from a CO_2 source. Treatments were applied when the air temperature was 15 and 12.7 C, soil temperature was 12 and 7.7 C at 12 cm, and relative humidity was 48 and 53% on September 23, and October 14, 1982, respectively. The experimental design was a randomized complete block containing five replications and individual plots were 3 x 9 m in size.

Field bindweed was visually evaluated for vegetative top growth control 9 and 10 months following herbicide applications. Herbicides applied before frost resulted in significantly greater field bindweed control than did treatments applied after frost. Treatments applied before frost resulting in 90% or better control were glyphosate at 3.36 kg/ha, dicamba at 4.48 kg/ha, and combinations of glyphosate + dicamba at 0.84 + 1.12 and 1.68 + 2.24 kg/ha. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843.)

Herbicide evaluations for field bindweed control
treated before and after frost

Treatment	Rate	Application	Evaluation Dates	
			6/8/82	7/8/82
	(kg/ha)		%	
glyphosate	3.36ae	before frost[1]	97	93
glyphosate	3.36ae	after frost[2]	66	46
dicamba	2.24	before frost	92	80
dicamba	2.24	after frost	83	59
dicamba	4.48	before frost	100	96
dicamba	4.48	after frost	84	58
glyphosate + dicamba	0.84 + 1.12	before frost	97	93
glyphosate + dicamba	0.84 + 1.12	after frost	60	40
glyphosate + dicamba	1.68 + 2.24	before frost	100	96
glyphosate + dicamba	1.68 + 2.24	after frost	88	74
dicamba + 2,4-D	1.12 + 3.36	before frost	86	69
check	-	-	0	0
LSD(0.5)			20	26

[1] Herbicides applied on September 23, 1982

[2] Herbicides applied on October 14, 1981.

Evaluation of original treatments, retreatments and combinations on leafy spurge live shoot regrowth. Whitson, T. D., R. E. Vore and H. P. Alley. Efficacy data is needed on original/retreatment combinations for control of leafy spurge.

Original dicamba and picloram treatments were applied May 15, 1980, to leafy spurge in the pre-bud to full-flower growth stage. Retreatments were made June 10, 1981 (fall 2,4-D August 28, 1981). Liquid formulations were applied with a truck mounted sprayer using 29 gpa water carrier; granules were applied with a hand operated centrifugal broadcaster. Plots were 21.5 by 258 ft and were arranged in a completely random design with one replication. Soil was a sandy loam (55.4% sand, 32.2% silt, 12.4% clay, 0.6% organic matter with a pH of 7.8).

Shoot counts were taken May 19, 1981, and revealed treatments of dicamba 5% granular at 8.0 lb ai/A resulted in 12% higher shoot control than the liquid formulation at the same rate. Dicamba 5% granular at the 8.0 lb ai/A rate gave a 16% higher shoot control than either formulation at 6.0 lb ai/A. Picloram comparisons of liquid and granular formulations at the 1.0 lb ai/A rate showed an 11% higher shoot control for the liquid formulation. The two picloram formulations at the 2.0 lb ai/A rate were equal in their effectiveness. All retreatments of 2,4-D, picloram and dicamba were either equal to the original treatments or increased the shoot control. Original treatments and retreatments with picloram attained a higher percent control than banvel or 2,4-D as original or retreatment combinations. There was no apparent damage to the grass in the experimental area. However, more prostrate grass growth was noted in the treatment areas than in the check. Also grasses were green longer in the growing season in treatment areas than in the check. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1188).

Evaluation of original treatments, retreatments and combinations effect on leafy spurge live shoot regrowth

Original[1] lb ai/A	Percent Shoot Control Retreatment lb ai/A					
	2,4-D Amine 2.0	picloram (K salt) 0.5	dicamba 4L 2.0	Check	picloram (K salt) 1.0	2,4-D Amine (S & F) 2.0
dicamba 5G 6.0	76	93	80	68	99	91
dicamba 5G 8.0	96	97	96	84	100	97
picloram 2K (2% pellet) 1.0	100	100	98	88	100	99
picloram 2K (2% pellet) 2.0	100	100	100	100	100	100
dicamba 4L 6.0	68	83	78	68	100	91
dicamba 4L 8.0	83	98	96	72	100	95
picloram (K salt) 1.0	99	100	99	99	100	100
picloram (K salt) 2.0	100	100	100	99	100	100
Check	0	92	13		100	0

[1] Original treatments made May 15, 1980; retreatments June 10, 1981 (Fall 2,4-D August 28, 1981); evaluated May 18, 1982.

Evaluation of various herbicides and rates of application for Canada thistle control. Alley, H. P. and T. D. Whitson. Various rates of chlorsulfuron, Dowco 290 (M 3972), dicamba and two formulations of 2,4-D amine were compared to obtain efficacy data for the control of Canada thistle (*Cirsium arvense* L.).

The experimental plots were established July 6, 1981, to Canada thistle growing on abandoned farmland. The dense stand of Canada thistle was in the bud to early bloom stage-of-growth at time of treatment. Plots were 2.74 by 9.14 m, arranged in a randomized complete block with three replications. All treatments were applied with a 6-nozzle knapsack unit in a total volume of 374.2 L/ha water solution.

Visual estimates of Canada thistle shoot reductions were made on August 9, 1982, 13 months following treatment. Chlorsulfuron applied at 0.28 kg/ha and Dowco 290 (M 3972) at 0.56 kg/ha reduced the above-ground (shoot stand) by 93 and 99%, respectively. The plots treated with chlorsulfuron were covered with dense stands of cutleaf nightshade (*Solanum triflorum* Nutt.). Low rates of chlorsulfuron, dicamba, and the two formulations of 2,4-D amine were not effective in reducing Canada thistle above-ground growth. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1184).

Canada thistle shoot reduction

Treatment[1]	Rate kg/ha	Percent Shoot Reduction	Observations
chlorsulfuron + WA	0.035	0	Plots covered with dense stand of cutleaf nightshade
chlorsulfuron + WA	0.07	13	
chlorsulfuron + WA	0.14	65	
chlorsulfuron + WA	0.28	93	
Dowco 290 (M 3972)	0.56	99	Quackgrass took over plots
Dowco 290 (M 3972)	1.12	100	
dicamba Na salt	2.24	50	Canada thistle reduced in height
dicamba DMA	2.24	60	
2,4-D amine	2.24	40	No cutleaf nightshade in plots
2,4-D SULV amine	2.24	10	

[1] X-77 added at 0.12% v/v.

<u>Field bindweed control by three substituted glycine herbicides.</u> Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Research was performed to evaluate the control of field bindweed by several herbicides. A heavy infestation of field bindweed was allowed to develop on sprinkler-irrigated noncrop land at the University of California Moreno Field Station. When the bindweed plants were 10 inches tall and the bindweed flowers were in anthesis, the bindweed plants were treated with glyphosate at 2, 4, and 5 lb/A ai, and SC-0224 at 2, 4, 5, and 6 lb/A ai, and SC-0545 at 2, 4, 5, and 6 lb/A a.e. Tests were replicated four times.

Glyphosate, SC-0224, and SC-0545 had similar effectiveness on controlling field bindweed (table). More research is needed to evaluate the comparative effectiveness of the three herbicides on controlling field bindweed. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Field bindweed control after treatment with three herbicides

Herbicide	Rate (lb/A)	Control of field bindweed[a]			
		6/9	7/1	7/30	9/17
glyphosate	2	8.8	9.8	9.2	9.0
glyphosate	4	8.9	10.0	9.6	8.8
glyphosate	5	9.8	10.0	9.5	8.9
SC-0224	2	7.4	9.7	9.2	8.4
SC-0224	4	9.6	10.0	9.2	8.5
SC-0224	5	9.7	10.0	9.4	8.5
SC-0224	6	10.0	10.0	9.4	9.0
SC-0545	2	8.2	9.9	9.3	8.7
SC-0545	4	9.4	10.0	9.4	8.6
SC-0545	5	9.4	10.0	9.5	8.8
SC-0545	6	10.0	10.0	9.2	8.2

[a] 0 = no injury; 10 = death of foliage.

Field bindweed control and soil residual study with dicamba and glyphosate. Mitich, L.W. and N.L. Smith. This experiment was initiated September 17, 1981, on the Davis campus experimental farm to evaluate the effectiveness of dicamba and glyphosate in controlling field bindweed and to determine how long a time dicamba residue might effect the following crop. Dicamba and glyphosate were applied to a mature stand of field bindweed that had been previously irrigated. Four replications were used with individual plot size being 10 by 30 ft. A CO_2 backpack sprayer calibrated to deliver 30 GPA and a shaker jar were used to apply the materials. The soil was sandy loam composed of 39% sand, 42% silt and 19% clay with a pH of 7.5. Weather was clear with a maximum temperature of 90°F. The site received a sprinkler irrigation four days later and was rototilled 6 to 8 inches deep October 19. Early heavy rainfall postponed normal planting (November-December) until February 10, 1982, when wheat (cultivar: Anza @ 150 lb/A) was drilled. The crop received a total of 120 units of nitrogen as ammonium sulfate.

Dicamba (spray and granule) alone and in combination with glyphosate reduced the bindweed stand as measured by counts made May 3, 1982. No toxicity to wheat was observed from any of the treatments. Yields were not adversely affected when harvested July 9. The area was then flood irrigated, rototilled, listed to 30-inch beds and planted to crenshaw and honeydew melons August 8. No phytotoxicity on the melons was observed October 18 indicating the absence of soil residue 13 months after application. (University of California Cooperative Extension, Davis, CA 95616)

Bindweed control and soil residual study

Herbicide	Formulation	Rate Ai/A	Bindweed[1/] counts 5/3/82	Wheat[2/] yield lb/A 7/9/82	Melon[2/] phyto. 10/18/82
dicamba	4 WS	1 lb.	1.25	4284	0
dicamba		2	1.06	4370	0
dicamba		4	1.00	4213	0
dicamba	10 G	2	0.94	3648	0
dicamba		4	1.81	4104	0
dicamba	5 G	2	1.83	3934	0
dicamba		4	0.88	3948	0
dicamba + glyphosate	4 WS	0.5 + 1	1.38	4336	0
dicamba + glyphosate		1 + 2	1.13	4315	0
glyphosate	4 WS	2	2.00	4445	0
control			2.30	4438	0

[1/] Mean number of plants per 4.4 ft^2

[2/] Mean of four replications

Longevity of Canada thistle control in a crested wheatgrass pasture. Alley, H. P. and N. E. Humburg. Plots were established in 1979 to compare the effectiveness and longevity of control of Canada thistle (Cirsium arvense L.) resulting from applications of chlorsulfuron, tebuthiuron, Dowco 290 (M 3972) and the combination of Dowco 290/2,4-D amine (M 3785) as compared to picolinic acid. At time of herbicide application, August 6, 1979, the Canada thistle was in full bloom and growing under extreme drought conditions.

Plots were one treatment per block, 2.7 by 18.3 m in size. Each treatment, except tebuthiuron 20P, was applied in 374 L/ha water carrier. The soil was classified as a loam (45.0% sand, 33.2% silt, 21.8% clay, 4.4% organic matter with 7.3 pH).

Visual evaluations of Canada thistle shoot control and grass damage were made on August 2, 1980, July 27, 1981 and August 9, 1982. Chlorsulfuron at all rates of application, Dowco 290 (M 3972) at 2.24 kg/ha, tebuthiuron at 4.48 kg/ha and the combination of Dowco 290/2,4-D amine at 1.12 + 4.48 kg/ha gave 100% shoot control, three years following treatment. All treatments, except Dowco 290 (M 3972), reduced the stand of crested wheatgrass. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1182).

Herbicides, canada thistle shoot control

Herbicides	Rate kg/ha	Percent Control 1980	 1981	 1982	Observations
chlorsulfuron	0.28	100	100	100	No grass damage
chlorsulfuron	0.56	100	100	100	80% reduction of grass
chlorsulfuron	1.12	100	100	100	80% reduction of grass
chlorsulfuron	2.24	100	100	100	80% reduction of grass
tebuthiuron 20P	1.12	0	40	95	95% reduction of grass
tebuthiuron 20P	2.24	50	90	100	Bare ground
tebuthiuron 20P	4.48	80	100	100	Bare ground
Dowco 290 (M 3972)	1.12	100	95	95	No grass damage
Dowco 290 (M 3972)	2.24	100	100	100	No grass damage
Dowco 290 + 2,4-D amine	0.56 + 2.24	100	90	90	No grass damage
Dowco 290 + 2,4-D amine	1.12 + 4.48	100	100	100	No grass damage
picloram	2.24	100	100	100	50% reduction of grass

Longevity of Canada thistle control and crop tolerance to selected herbicides. Alley, H. P. and T. D. Whitson. A dense stand of Canada thistle (*Cirsium arvense* L.) infesting a cropped area was sprayed with various rates of selected herbicides to evaluate their efficacy for control in cropland situations and crop tolerances in subsequent cropping years.

The study area was cultivated during the early part of the 1980 growing season. Cultivation was terminated by July 1 and the Canada thistle allowed to recover and was in the full-bloom/15 to 46 cm tall at time of treatment on August 18, 1980. Several row crops and small grains were seeded across all treatments in 1981 and entire experimental area seeded to oats in the spring of 1982. The soil was classified as a silty loam (63.2% sand, 17.0% silt, 19.8% clay, 2.1% organic matter with a 7.7 pH).

All herbicide treatments were applied with a truck-mounted spray unit in a total volume of 233.8 L/ha spray solution. Each treatment was one block, 6.5 by 93 m in size. Canada thistle shoot control evaluations made in 1981, one year following treatment, were obtained by actual live shoot counts. Evaluations for 1982 were visual estimates.

Chlorsulfuron as low as 0.034 kg/ha reduced Canada thistle shoot regrowth by 94% two years following treatment. Rates higher than the 0.034 kg/ha resulted in 100% shoot reduction. The soil persistence and crop phytotoxicity is indicated by the oat stand and height reduction. Dowco 290 (M 3972) at application rates of 0.28 and 0.56 kg/ha gave 99 to 100% Canada thistle shoot reduction and did not exhibit oat stand or height reduction. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1185).

Canada thistle shoot control and crop stand

Herbicides	Rate kg/ha	Percent Shoot Control		Oat % Stand	Height (cm)	Observations
		1981	1982			
chlorsulfuron	0.017	14	0	90	121.9	Plots covered with dense stand of cutleaf nightshade
chlorsulfuron	0.034	37	94	90	30.5	
chlorsulfuron	0.069	85	100	70	30.5	
chlorsulfuron	0.14	80	100	70	30.5	
chlorsulfuron	0.28	99	100	70	30.5	
chlorsulfuron	0.56	100	100	70	30.5	
Dowco 290 (M 3972)	0.28	100	99	100	121.9	No cutleaf nightshade in plot area
Dowco 290 (M 3972)	0.56	100	100	100	121.9	
dicamba	2.24	49	0	80	50.8	Oats reduced by competition
Check	--	0	0	80	35.6	Oats reduced by competition

Phytotoxicity of atrazine, diuron, terbacil, and bromacil to purple nutsedge. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Greenhouse research was conducted to determine the toxicity of terbacil, bromacil, atrazine, and diuron to purple nutsedge. Vista sandy loam soil (200 g) was placed into 7-ounce styrofoam cups, and three uniform viable nutsedge tubers were planted 1.5 inches below the soil surface. Herbicide concentrations of 1, 2, 4, 8, and 16 ppm in the soil (w/w) were applied to the soil surface in 10 ml water. The soil water was increased to field capacity; thereafter, water was added as needed to sustain purple nutsedge growth. After 60 days of plant growth, phytotoxicity was evaluated by determining the fresh weight of plant foliage and tubers and by counting the number of tubers in each replicated culture. Results are presented in tables below.

Bromacil and terbacil were the most phytotoxic to purple nutsedge. Both herbicides reduced the plant growth 70%, while 16 ppm reduced it by over 90%. All of the herbicides tested were affective at rates greater than 8 ppm in the soil. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Weight and number of tubers of purple nutsedge

Herbicide	Weight and No.	Concentration of herbicide (ppm)						
		0	1/2	1	2	4	8	16
Bromacil	Wt.	2.74	1.56	0.96	0.26	0.75	0.00	0.87
	No.	13	4	2	1	2	0	3
Terbacil	Wt.	2.70	1.92	0.91	0.58	0.46	0.16	0
	No.	17	6	3	3	2	1	0
Isocil	Wt.	2.46	2.61	0.69	0.50	0.00	0.50	0.00
	No.	14	6	2	1	0	1	0
Diuron	Wt.	2.16	2.36	2.28	2.12	0.50	1.56	0.53
	No.	16	14	11	7	3	4	2
Atrazine	Wt.	2.26	1.95	1.44	1.90	2.51	1.89	0.54
	No.	11	14	8	6	6	5	2

Purple nutsedge vegetative fresh
weight growth as affected by herbicides

	Concentration of herbicide (ppm)						
Herbicide	0	1/2	1	2	4	8	16
Bromacil	.65	.08	.05	.005	.01	.00	.00
	.36	.08	.04	.00	.01	.00	.005
Terbacil	1.05	.80	.03	.01	.02	.00	.005
	.63	.46	.12	.02	.005	.00	.00
Diuron	1.00	1.16	1.26	1.76	.15	.37	.14
	.46	.48	.60	.49	.06	.13	.01
Atrazine	1.05	1.05	.93	1.27	1.86	.89	.09
	.48	.41	.49	.48	.50	.29	.02

Quackgrass control With graminicides. Zamora, D. L., C. H. Huston, R. H. Callihan, and D. C. Thill. The objectives of this study were to determine the effects of two graminicides and glyphosate on efficacy, symptomology, bud viability, and bud activity in quackgrass (Agropyron repens (L.) Beauv.). during the first year for a three-year period. The study area was established near Princeton, Idaho on a Santa silt loam soil, with a pH of 4.9, 2.4% organic matter, and a CEC of 12.7 meq/100g. The plot size is 3 x 20 m; the experimental design is a randomized complete block with 4 replications per treatment.

All herbicides were applied with a knapsack sprayer equipped with Teejet 5002 nozzles and calibrated to deliver 187 l/ha. The initial applications were applied on June 21, 1982 when the quackgrass was 3-30 cm tall. The air temperature was 21 C, the soil temperature was 16 C. The second applications were made July 23, 1982, after quackgrass regrowth had reached 15-30 cm.

Visual evaluations were made on July 20 and August 28, 1982 for chlorosis, necrosis, and stand reduction. Plant height was measured on July 24, 1982. Rhizomes were harvested on August 10, September 3, and October 1, 1982, from a 1.5 x .15 m quadrat to a soil depth of 15 cm. The rhizomes from each plot were weighed, sterilized, cut into 1 cm, single node fragments and germinated in the dark at 23 C for 1 week. Percent germination was determined for all 3 harvest dates, and length of shoots sprouting from these nodes was recorded for rhizomes harvested September 3.

The first evaluation for percent chlorosis, one month after the initial treatments, indicated a trend in percent necrosis and percent stand reduction. Glyphosate treatments caused the most injury, followed by fluazifop, with sethoxydim resulting in the least injury. Plant height, measured five weeks after the first treatment, followed the same trend as in the first visual evaluations, i.e. glyphosate treatments resulted in the least growth, fluazifop resulted in intermediate growth, and sethoxydim permitted most growth. The second evaluations, made one month after application of the second series of treatments, showed that the the split application treatments resulted in significantly more chlorosis than did the single treatments applied June 21. Growth reduction was greatest in plots treated with the split application of glyphosate, less from the 1.12 and 2.24 lb kg/ha rates of glyphosate, less yet from fluazifop treatments, and least from the sethoxydim treatments.

Few significant differences in rhizome weights were noted for the rhizome harvest made on August 10. Glyphosate treatments resulted in the lowest weights, fluazifop resulted in intermediate weights, and plants from the sethoxydim treatments had the highest weights. The results of the third harvest, made on September 3, were similar to those from the first harvest except that overall rhizome weights were higher. As with the weights of the first rhizome harvest, the bud germination results gave little distinction between treatments. In the second bud germination tests, five weeks after the second treatments, the split applications of glyphosate and fluazifop gave significantly lower germination. Shoot length for the second germination test showed the glyphosate split application resulted in the least growth, with intermediate growth in plants treated by the high rate of glyphosate, and most growth resulting from plants treated with the fluazifop split application. In the bud germination test from the third harvest, all split applications resulted in the lowest percent germination. The single glyphosate treatments were intermediate in germination reduction, followed by fluazifop and sethoxydim. (Idaho Agriculture Experiment Station, Moscow, Idaho, 83843)

Table 1. Quackgrass shoot response.

		7/20/82		7/26/82	8/28/82	
Treatments[1]	Rate kg/ha	Chlorosis %	Necrosis %	Height (cm)	Growth Reduction (%)	Stand Reduction (%)
check	-	0d	0a	71a	0d	0e
sethoxydim	.28	3d	8b	52b	23c	8d
sethoxydim	.57	35c	38de	25de	29c	14d
sethoxydim	.28/.28	4d	11c	42c	31c	8d
fluazifop	.28	46c	25d	28d	31c	10d
fluazifop	.57	85a	29de	25de	53b	35c
fluazifop	.28/.28	56c	36de	22de	64b	53bc
glyphosate	1.12	78ab	84de	20de	55b	61b
glyphosate	2.24	45c	90e	17e	57b	68b
glyphosate	1.12/1.12	63abc	88e	18e	94a	98a

[1] Sethoxydim and fluazifop were applied with crop oil concentrate at 1 qt/A. Glyphosate was applied with X-77 at 0.5% v/v.

[2] Means within a column followed by the same letter are not significantly different at the .05 level using Duncan's New Multiple Range Test. Mean separation was conducted on arc sine square root conversions of raw data for all evaluations except height.

Table 2. Quackgrass rhizome response.

		8/10/72		9/3/82		10/1/82	
Treatments[1]	Rate (kg/ha)	Germ (%)	Rhizome Weight (g)	Germ (%)	Shoot Length (mm)	Germ (%)	Rhizome Weight (g)
check	NA	48ab[2]	298a	73ab	24ab	49a	804a
sethoxydim	.28	50ab	357a	67ab	26ab	43ab	723a
sethoxydim	.57	32ab	222abc	64ab	27ab	46ab	675a
sethoxydim	.28/.28	66a	374a	48b	23b	24bcd	529ab
fluazifop	.28	42ab	233abc	57a	29a	47ab	607ab
fluazifop	.57	24b	188abc	34c	22b	43ab	524ab
fluazifop	.28/.28	40ab	254ab	7d	16c	18bcd	320bc
glyphosate	1.12	27b	83bcd	50abc	25ab	35abc	214cd
glyphosate	2.24	33b	28d	50abc	14c	34abc	212cd
glyphosate	1.12/1.12	29b	61cd	16d	5d	12d	65d

---

[1] Sethoxydim and fluazifop were applied with crop oil concentrate at 1 qt/A. Glyphosate was applied with X-77 at 0.5% V/V.

[2] Means within a column followed by the same letter are not significantly different at the .05 level using Duncan's New Multiple Range Test; mean separation was conducted on arc sine square root conversions of raw data for all germination results and on square root conversions of rhizome weight.

Retreatment schedules for purple nutsedge control with MSMA and DSMA. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Research was performed to determine a retreatment schedule for season-long control of purple nutsedge with either MSMA or DSMA. The two herbicides were applied as sprays of 100 gpa applying either 2 or 4 lb ai/A of herbicide either alone or with added X-77 at 0.5%. Ratings of vegetation control (%) were made weekly for 14 weeks after treatment. Results are presented in the table below.

MSMA was slightly more effective than DSMA for purple nutsedge control. The 4 lb/A treatments were more effective than the 2 lb/A treatments. Addition of surfactant increased the vegetative control achieved by each herbicide. The length of time between treatments did not greatly affect the amount of control. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Purple nutsedge control with MSMA and DSMA

Treatment	Rate (lb/A)	Retreatment (weeks)	CONTROL OF NUTSEDGE (PERCENT) FOR 14 WEEKS														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Average
DSMA	2	4	39	43	40	34	52	31	4	2	28	61	27	17	44	61	34
DSMA	2	6	35	34	36	33	28	25	71	28	16	2	2	2	15	48	27
DSMA	2	8	36	37	38	34	31	26	6	6	26	52	26	22	28	34	29
DSMA+S	2	4	42	50	58	47	67	34	14	9	45	74	37	32	52	62	44
DSMA+S	2	6	35	54	48	45	53	36	82	51	29	11	12	6	28	62	39
DSMA+S	2	8	40	38	52	44	47	34	17	25	51	77	48	32	34	39	41
DSMA	4	4	43	65	52	53	69	34	3	0	48	77	36	32	51	58	44
DSMA	4	6	39	76	59	54	45	34	93	77	51	34	16	7	38	67	49
DSMA	4	8	44	72	60	63	63	38	22	21	52	79	43	32	41	35	47
DSMA+S	4	4	47	84	64	56	74	36	9	2	65	82	37	32	66	68	48
DSMA+S	4	6	44	88	66	56	48	36	92	63	31	10	6	4	32	72	32
DSMA+S	4	8	44	86	69	56	57	42	25	30	81	74	42	32	34	47	51
MSMA	2	4	34	45	44	39	55	32	5	5	14	39	22	14	41	59	32
MSMA	2	6	36	48	46	41	39	31	77	55	43	22	11	5	20	46	37
MSMA	2	8	36	39	36	36	34	27	7	5	19	54	21	16	23	23	27
MSMA+S	2	4	40	60	51	43	61	34	4	0	41	73	35	28	50	66	42
MSMA+S	2	6	41	69	50	44	39	31	81	62	30	18	14	9	35	62	42
MSMA+S	2	8	33	49	52	47	55	31	10	11	34	77	40	28	32	40	38
MSMA	4	4	43	73	60	52	78	36	2	2	47	74	31	33	59	61	46
MSMA	4	6	38	77	65	54	52	35	85	66	32	19	15	3	34	71	46
MSMA	4	8	43	78	63	56	48	29	8	6	50	74	35	27	24	22	40
MSMA+S	4	4	50	88	67	54	78	42	12	8	81	78	42	28	81	72	56
MSMA+S	4	6	42	86	73	66	54	39	96	72	42	18	12	4	38	71	51
MSMA+S	4	8	48	90	73	70	59	48	29	32	82	86	50	42	43	40	57

Timing of paraquat treatments for purple nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Paraquat was applied at 0.5 lb ai/A to purple nutsedge vegetation in a date orchard near Indio, California, at 7-, 14-, and 21-day intervals. At the end of the treatment season, tubers were collected from the top 10 inches of soil in each plot to determine effects of paraquat treatment schedules on purple nutsedge tuber population. Results are presented in the table below.

Paraquat treatments spaced 7 and 14 days apart, reduced the purple nutsedge tuber population, while treatments spaced at 21 days did not reduce tuber population. The most effective treatment schedule was at 7-day intervals. The number of tubers increased in the untreated control plots. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Nutsedge tuber population after one season's treatment with paraquat (0.5 lb/A) at three intervals

Treatment interval (days)	Number of treatments	Tuber number before treatment (tubers/ft^3)		Tuber number after treatment (tubers/ft^3)	
		Total	No. Viable	Total	No. Viable
---	---	411	373	600	441
7	25	367	342	298	102
14	22	468	428	416	195
21	8	367	338	459	251

Treatment schedule with weed oil for purple nutsedge control. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Purple nutsedge growing in a date orchard near Thermal, California, was treated with weed oil (100 gpa) at 7-, 14-, and 21-day intervals, resulting in 21, 10, and 7 treatments, respectively. Tubers were collected from test plots before and after the treatment season to determine the effect of treatment schedules on purple nutsedge tuber population. Results are presented in the table below.

The reduction in purple nutsedge tuber population was proportional to the frequency and total number of treatments. Control of purple nutsedge vegetative growth was satisfactory when weed oil treatments were spaced at intervals less than 14 days. Considerable regrowth occurred in plots treated at 21-day intervals. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Nutsedge tuber population after one season's treatment with weed oil (100 gpa) at three intervals

Schedule of treatment interval (days)	Number of treatments	Tuber number before treatment season		Tuber number after treatment season	
		Total	No. Viable	Total	No. Viable
		tubers/ft^3			
Control	--	103	83	156	96
7	21	163	144	70	10
14	10	116	88	89	22
21	7	93	72	98	41

PROJECT 2.

HERBACEOUS WEEDS OF RANGE AND FOREST

James M. Krall - Project Chairman

Pasture weed control in Idaho. Beck, K.G., J.M. Lish, D.C. Thill and R.H. Callihan. Experiments were established to evaluate the efficacy of several herbicides for broadleaf weed control in pasture at Weiser, Bonner's Ferry, and Viola, Idaho. The experimental design at all locations was a randomized complete block with four replications, except at Weiser which had three replications. Herbicide treatments were applied on a non-irrigated pasture at Viola June 3, 1982 at a volume of 187 L/ha and 2.66 kg/cm^2 with a CO_2 pressurized backpack sprayer. Air temperature was 13 C, soil temperature at 10 cm was 10 C, and relative humidity was 62%. Variable winds from 2 to 8 km/hr were recorded and light intermittent rain occurred after herbicides were applied. Weed control was evaluated visually on July 12 and September 6, 1982. The irrigated pasture at Weiser and non-irrigated pasture at Bonner's Ferry were initiated in 1981.

Differences due to treatment were observed when compared to check plots (Table 1.) at the Viola site. Alfalfa damage was greatest with the tank mix of dicamba plus 2,4-D at 1.12 + 2.24 kg/ha and picloram alone at 1.12 kg/ha. However, variability was quite high. Prickly lettuce, gromwell, henbit, field pennycress, and tumble mustard were controlled most effectively with the highest rate of dicamba at 2.24 kg/ha. Again, variability was high. Tumble mustard was controlled by all treatments. Canada thistle was controlled best with picloram at 1.12 kg/ha. No herbicide treatment effectively controlled all weed species.

No differences in weed or forage yield were found at either Weiser or Bonner's Ferry (Tables 2 and 3.). Both study sites had been fenced to keep grazing cattle out. Flood irrigation at the Weiser site and heavy rainfall at Bonner's Ferry may have affected the outcome of both experiments. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Table 1. Influence of herbicide combinations on weed control in pasture at Viola, Idaho.

Treatment	Rate	Alfalfa Damage		Weed Control											
				PRLE		GRWE		HEBI		TUMU		FIPC		CATH	
		1[1]	2[2]	1	2	1	2	1	2	1	2	1	2	1	2
	(kg/ha)	%													
dicamba	0.14	18	13	19	14	8	-	25	-	97	-	13	-	15	10
dicamba	0.28	20	18	61	28	5	-	45	-	100	-	33	-	45	40
dicamba	0.56	68	28	76	33	35	-	50	-	100	-	64	-	58	63
dicamba	1.12	64	34	90	76	62	-	87	-	100	-	38	-	55	75
dicamba	2.24	86	69	100	99	93	-	93	-	100	-	75	-	83	73
2,4-D	0.43	8	13	34	36	0	-	45	-	100	-	84	-	60	45
2,4-D	0.84	23	26	41	31	8	-	23	-	100	-	76	-	50	50
2,4-D	1.68	42.5	50	78	76	8	-	35	-	100	-	100	-	60	80
2,4-D	3.36	50	63	89	94	28	-	30	-	100	-	96	-	60	75
dicamba + 2,4-D	0.14 + 0.43	29	24	49	29	10	-	15	-	100	-	83	-	58	53
dicamba + 2,4-D	0.28 + 0.56	49	45	80	78	10	-	65	-	100	-	88	-	63	53
dicamba + 2,4-D	0.28 + 0.84	45	35	75	51	15	-	40	-	100	-	85	-	70	50
dicamba + 2,4-D	0.56 + 1.12	60	76	88	84	33	-	50	-	100	-	96	-	60	60
dicamba + 2,4-D	0.56 + 1.68	60	45	94	95	22	-	57	-	100	-	100	-	75	80
dicamba + 2,4-D	1.12 + 2.24	79	89	100	99	78	-	83	-	100	-	73	-	80	80
dicamba + 2,4-D	1.12 + 3.36	46	83	100	100	87	-	67	-	100	-	100	-	68	77
picloram	0.28	55	49	48	54	17	-	92	-	90	-	60	-	65	65
picloram	0.56	37.5	6	93	95	18	-	92	-	97	-	100	-	93	85
picloram	1.12	68	93	100	99	58	-	98	-	100	-	49	-	98	90
check	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSD .05		27	27	21	18	24		40		4		36		14	31

[1] Evaluation 1 taken 7/12/82

[2] Evaluation 2 taken 9/6/82

Table 2. Influence of herbicide combinations on yield of forage and weeds on irrigated pasture at Weiser, Idaho.

Treatment	Rate	Forage	Weeds
	(kg/ha)	(kg/ha)	
dicamba	0.28	1463	33
dicamba	0.57	913	410
dicamba	1.12	126	117
dicamba	2.24	1160	30
dicamba	4.48	1073	77
2,4-D	0.42	1227	0
2,4-D	0.84	1233	73
2,4-D	1.68	930	77
2,4-D	3.36	1053	230
dicamba + 2,4-D	0.28 + 0.42	1590	317
dicamba + 2,4-D	0.57 + 0.57	1123	113
dicamba + 2,4-D	1.12 + 1.12	1040	63
dicamba + 2,4-D	1.12 + 1.68	1137	73
dicamba + 2,4-D	2.24 + 2.24	930	23
dicamba + 2,4-D	2.24 + 3.36	1320	10
picloram	0.28	1297	0
picloram	0.57	713	7
picloram	1.12	1237	130
check	-	1593	300
		1160	47
LSD(.05)		NS	NS

Table 3. Influence of herbicide combinations on yield of forage and weeds on dryland pasture at Bonner's Ferry, Idaho.

Treatment	Rate	Forage	Weeds
	(kg/ha)	(kg/ha)	
dicamba	0.14	1107	522
dicamba	0.28	1778	175
dicamba	0.56	1392	320
dicamba	1.12	1278	260
dicamba	2.28	1205	110
2,4-D	0.43	1278	358
2,4-D	0.84	1588	312
2,4-D	1.68	1288	440
2,4-D	3.36	1855	245
dicamba + 2,4-D	0.14 + 0.43	680	850
dicamba + 2,4-D	0.28 + 0.56	1542	312
dicamba + 2,4-D	0.28 + 0.84	1270	305
dicamba + 2,4-D	0.56 + 1.12	1212	58
dicamba + 2,4-D	0.56 + 1.68	1060	232
dicamba + 2,4-D	1.12 + 2.24	1790	80
dicamba + 2,4-D	1.12 + 3.36	1345	175
picloram	0.28	1303	688
picloram	0.56	1478	45
picloram	1.12	2153	7
check	-	2055	60
LSD(.05)		NS	NS

Effect of picloram and fertilizer on spotted knapweed infested rangeland. Callihan, R. L., R. L. Sheley, and D. C. Thill. A study was initiated at Hayden, Idaho to determine the efficacy of picloram and fertilizer alone and in combination for restoring spotted knapweed (Centaurea maculosa) infested rangeland. Picloram at .42 kg/ha, 350 kg/ha of 20-10-10-6.5 fertilizer to provide 70 kg/ha nitrogen, and 350 kg/ha of 20-10-10-6.5 + 200 kg/ha of 34-0-0 fertilizer to give a total of 140 kg/ha of nitrogen were factorially arranged (2 x 3) in a randomized complete block design and replicated four times. Picloram was applied with a backpack sprayer calibrated to deliver 187 l/ha at 28 kg/cm^2 pressure from a CO_2 source. Fertilizer was broadcast with a cyclone seeder. Treatments were applied in the spring of 1982. Plots were harvested July 10, 1982 and samples were dried, separated into weed and grass components, and weighed.

Picloram significantly reduced spotted knapweed yields, regardless of the fertilizer treatment. Neither fertilizer rate significantly changed knapweed yield when applied with picloram; however, a trend of knapweed increase was evident with increasing nitrogen.

Fertilizers increased knapweed yield when applied without picloram. 350 kg/ha of 20-10-10-6.5 fertilizer increased knapweed yield by 1187 kg/ha over treatments without fertilizers. The addition of 200 kg/ha of 34-0-0 fertilizer increased knapweed by 633 kg/ha.

Picloram without fertilizers did not significantly increase grass yield over the control. Both fertilizer rates significantly increased grass yield over the control, and picloram treatments alone.

Combining picloram and fertilizer had an interactive effect on increasing grass yield (Figure 1). Combining picloram with 70 kg/ha of nitrogen doubled grass yields over treatments without picloram, and gave a 5-fold increase over the yield from picloram treatments alone. Combining picloram with 140 kg/ha nitrogen doubled the grass yields over that from the picloram plus 70 kg/ha nitrogen treatment.

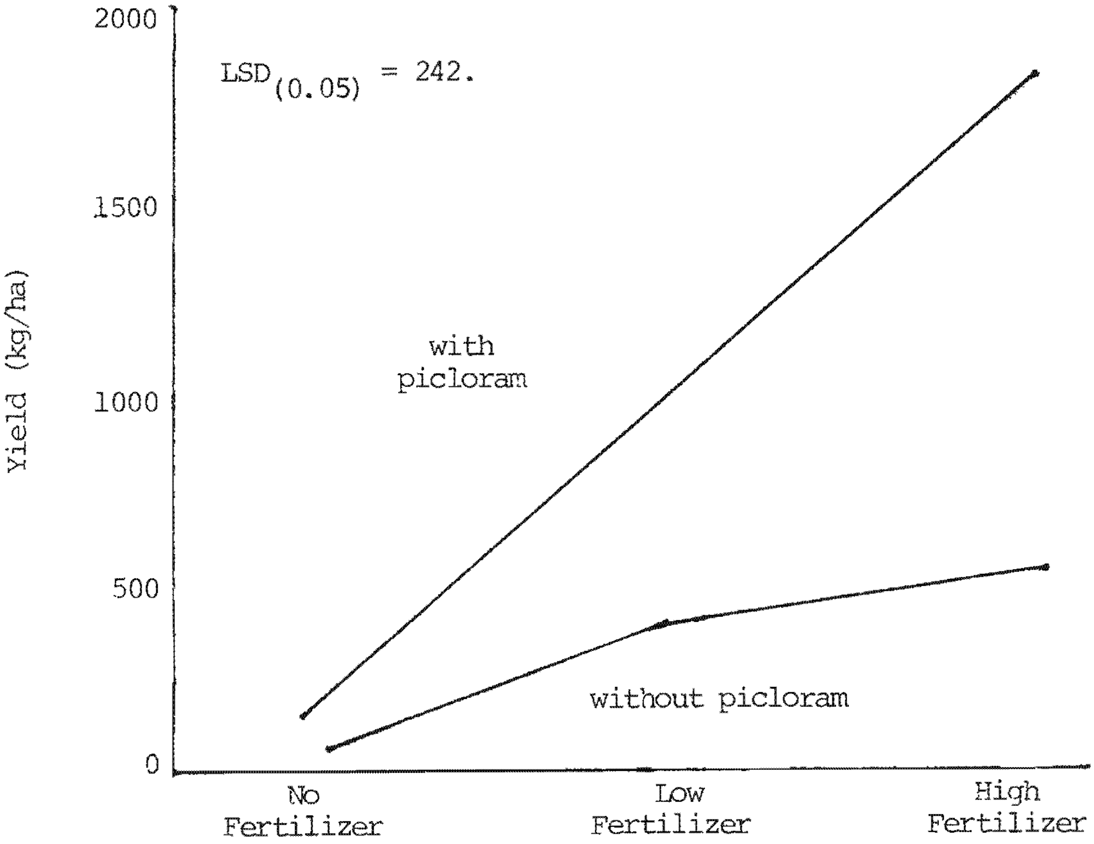
In summary, picloram alone adequately controlled spotted knapweed but did not increase forage yields. Fertilizers alone increased both knapweed and forage yields. Combining picloram and fertilizers controlled knapweed while significantly increasing forage yields. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Table 1. Yield of knapweed and grass after treatments of picloram, low fertilizer and high fertilizer.

Treatment Picloram kg/ha	Fertilizer	Yield Spotted Knapweed (kg/ha)	Yield Grass (kg/ha)
0	0	1674	67
0	Low[1]	2861	392
0	High	3494	582
0.42	0	117	15
0.42	Low	185	1041
0.42	High	485	1961
$LSD_{(.05)}$		403	242

[1] Low = 350 kg/ha 20-10-6.5; high = 350 kg/ha 20-10-6.5 plus 200 kg/ha 34-0-0.

Figure 1. Interaction of picloram and fertilizer on grass yield.



Interaction of picloram and fertilizer in yellow hawkweed infested pasture. Callihan, R. L., R. L. Sheley, and D. C. Thill. A study was initiated at Benewah, Idaho to determine the efficacy of picloram and fertilizer alone and in combination for restoring yellow hawkweed (Hieracium pratense taush). Picloram at .42 kg/ha, 350 kg/ha of 20-10-10-6.5 fertilizer, and 350 kg/ha of 20-10-10-6.5 + 206 kg/ha of 34-0-0 fertilizer were factorially arranged (2 x 3) in a randomized complete block design and replicated four times. Picloram was applied with a backpack sprayer calibrated to deliver 187 l/ha at 28 kg/cm^2 pressure from a CO_2 source. Fertilizer was broadcast via a cyclone seeder. Treatments were applied on May 20, 1982. Plots were harvested July 10, 1982. Yields are shown as air dry weights.

Picloram, with or without fertilizer, controlled yellow hawkweed. All treatments including picloram were completely devoid of yellow hawkweed, suggesting strong susceptibility. Fertilizer did not affect hawkweed yield. The high fertilizer treatment more than doubled the yield of grass; the low fertilizer treatment did not result in significantly lower yields than those resulting from the high fertilizer treatment. Combining picloram and fertilizers did not have a synergistic effect on controlling hawkweed or increasing forage grasses.

In summary, picloram will control hawkweed, while fertilizers will double grass yield the first year of application. Further analysis studying the longevity of high forage yields has important implications in determining the necessity for picloram applications to keep grass yields high. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Effect of picloram and fertilizer on meadow hawkweed and grass yield.

Treatment		Yield	
Picloram (kg/ha)	Nitrogen (kg/ha)	Yellow Hawkweed (kg/ha)	Grass (kg/ha)
0.00	0.00	974	1355
0.00	70.00	1450	2749
0.00	140.00	974	2960
0.42	0.00	0	1176
0.42	70.00	0	2100
0.42	140.00	0	2822
$LSD_{(0.05)}$		434	1276

Effect of maturation on viability and germination of yellow starthistle seed buried at three depths. Huston, C.H., R.L. Sheley, R.H. Callihan, D.L. Zamora and D. C. Thill. Yellow starthistle (Centaurea solstitialis L.) seed was collected in late August, 1981 near Lewiston, Idaho. This collection was separated into plumed and unplumed seed. Four replications of 250 seeds for each type were placed in nylon mesh packets and buried on October 5, 1981 in a sandy loam soil with mean annual precipitation of 25-30 cm. Seeds were buried at 2 cm, 8 cm, and 13 cm. Seed viablility will be tested for fourteen retrieval dates over a ten year period.

Seeds were retrieved on January 1, April 6, July 20, and October 6, 1982 (three, six, nine, and twelve months after burial). Seeds were surface sterilized with a 0.5% sodium hypochlorate solution and placed in petri dishes held at 21 C for thirty days, during this time germinated seeds were periodically counted. Seeds which did not germinate were treated with a one percent tetrazolium chloride solution to determine viability.

Three months after burial 24% of the seeds remained viable with only 7% germinating with no differences between burial depth and seed type. Seeds retrieved six months after burial had an average viability of 24% with 19% germinating. Again there were no differences in germination or viability between depths or seed type. Nine months after burial plumed seed had an average viability of 41% while unplumed seed had average viability of 23%; however these differences were not statistically significant. All viable seed from this retrieval date germinated. Plumed seed buried for twelve months had average viabliity of 38% while unplumed seed had average viability of 23%. Plumed seed buried at 2 cm had significantly greater viablility than all unplumed seed. Unplumed seed buried at 2 cm had significantly less viability than all plumed seed. Less than 1 percent of viable seed failed to germinate in all treatments. (University of Idaho Experiment Station, Moscow,ID 83843)

Effect of maturation on viability and germination of yellow starthistle seed buried at three depths[1].

Depth cm	Seed Type	Retrieved 1/6/82			Retrieved 4/6/82			Retrieved 7/20/82			Retrieved 10/6/82		
		Germinated	Dormant	Total	Germinated	Dormant	Total	Germinated	Dormant	Total	Germinated	Dormant	Total
2	Plumed	19	37	61	60	10	70	107	0	107	111a[2]	1	112a[2]
2	Unplumed	11	47	58	47	12	59	63	0	63	49a	0	49c
8	Plumed	21	44	65	50	17	67	97	0	97	91ab	1	92ab
8	Unplumed	18	31	49	40	11	51	56	0	56	61b	1	63bc
13	Plumed	28	38	65	44	19	63	101	0	101	83ab	1	84abc
13	Unplumed	9	46	55	41	12	53	64	0	64	60b	1	61bc
		NS[3]	NS	NS	NS	NS	NS	NS	NS	NS		NS	

[1] All values are number of seeds from 250 originally buried.

[2] Means followed by the same letter(s) within a column are not significantly different at the .05 level of probability according to Duncan's Multiple Range Test.

[3] NS = values in each column are not significantly different at the .05 level.

Control of yellow starthistle at different growth stages with several herbicides. Huston, C.H., D.L. Zamora, R.H. Callihan, R.L. Sheley, and D.C. Thill. The efficacy of several herbicides applied at different growth stages of yellow starthistle (Centaurea solstitialis L.) was examined near Lapwai, Idaho on October 30, 1981. The soil was in the Gwin-Lapwai series with a pH of 7.0 and organic matter of 4.5%. The first herbicide treatments were applied October 30 and November 5, 1981 just after yellow starthistle emergence. Air temperature on October 30 was 10 C with relative humidity of 95% under cloudy skies. On November 5 air temperature was 9 C with relative humidity of 90% and cloudy skies. On March 26, 1982 the second series of treatments was applied to yellow starthistle in the early rosette stage. Air temperature was 15 C with relative humidity of 85% and cloudy skies. Yellow starthistle plants in the late rosette stage were treated on June 11, 1982. Air temperature was 21 C with relative humidity of 45% and clear skies. On June 30, 1982 herbicide treatments were applied while yellow starthistle was in the bolting stage. Air temperature was 28 C with relative humidity of 20%. The final herbicide treatments were applied on July 20, 1982 while yellow starthistle was flowering. Air temperature was 29 C with relative humidity of 15%.

Weed control resulting from the early postemergence treatments was visually evaluated on March 29, 1982. All rates of picloram (235 g/L) and 2,4-D (propylene glycol butyl ether ester 470 g/L) provided excellent control while both 0.28 and 0.56 kg/ha dicamba (emulsifiable concentrate 470 g/L) and the 0.035 kg/ha DPX 5648 (75% sprayable) treatments provided good control. DPX 5648 at .009 kg/ha provided inadequate control. When evaluated on June 11, 1982 the picloram treatments still provided excellent control. Yellow starthistle plants emerged throughout the spring and consequently all other treatments provided less control than on March 29. The 0.56 kg/ha dicamba and 2,4-D treatments still provided good control. Early rosette treatments were evaluated on June 11, 1982. All picloram treatments provided excellent control, 0.56 kg/ha dicamba good control, and all other treatments unsatisfactory control. Late rosette treatments were evaluated on July 20, 1982. Picloram treatments still produced excellent control of yellow starthistle while the 0.28 and 0.56 kg/ha dicamba and 0.56 kg/ha 2,4-D treatments provided fair control. DPX5648 at both 0.009 and 0.035 kg/ha provided no control. Herbicide treatments applied during the bolt stage were evaluated on July 20, 1982. All picloram rates provided good control while both the dicamba and 2,4-D treatments provided fair to poor control. Both DPX5648 treatments provided no control. When applied during flowering all herbicides tested produced poor control of yellow starthistle. The picloram and dicamba treatments produced slight epinasty while 2,4-D and DPX5648 provided no control. (University of Idaho Experiment Station, Moscow, Idaho 83843)

Control of yellow starthistle at different growth stages with several herbicides

		Application growth stage and evaluation date					
		Early Post Emergence		Early Rosette	Late Rosette	Bolt	Flowering
		3/29	6/11	6/11	7/20	7/20	9/3
Treatment	Rate kg/ha	Control[1]	Control	Control	Control	Control	Control
picloram	0.28	94	99	96	95	84	2[2]
picloram	0.42	99	100	98	96	85	8[2]
picloram	0.56	97	96	96	91	85	2[2]
dicamba	0.28	76	56	20	79	59	2[2]
dicamba	0.56	87	85	85	85	51	2[2]
2,4-D	0.56	90	81	29	80	50	0
DPX 5648	0.009	25	18	2	0	0	0
DPX 5648	0.035	82	54	18	0	0	0
control	-	0	0	0	0	0	0
$LSD_{.05}$	-	15	27	19	0	7	5

[1] 100 = total kill, 0 = no injury

[2] Control limited to slight epinasty

Control of common crupina treated at three growth stages. Kambitsch, D.L., D.C. Thill, and R.H. Callihan. Experiments were established at two locations near Kooskia, Idaho to evaluate the effectiveness of herbicides, and cultural control practices on the control of common crupina treated at the rosette, bolt, and flowering stages of growth. Granular formulations were applied by hand while all other herbicides were broadcast with a backpack sprayer calibrated to deliver 187 L/ha at 2.8 kg/cm^2 CO_2. Cultural methods consisted of hand hoeing, and mowing with a hand-held sickle. The soil at location 1 was a silty clay loam with 13.5% sand, 49.5% silt, 37% clay, 6.5% O.M., pH of 6.4, and a C.E.C. of 36.3 meq/100 g soil. The soil at location 2 was a silty clay with 10.8% sand, 49.1% silt, 40.1% clay, 8.3% O.M., pH of 6.4, and the C.E.C. was 39.1 meq/100 g soil. The experimental design at both locations was a randomized complete block containing 4 replications and individual plots were 3 x 10 m in size. Rosette treatments were applied on May 4, 1982 at an air temperature of 11.1 C, and a relative humidity of 30%. The bolting treatments were applied on June 1, 1982 at an air temperature of 15.5 C, and relative humidity of 35%. The flowering treatments were applied on June 17, 1982 at an air temperature of 31.0 C and a relative humidity of 40%. Common crupina was visually evaluated for percent vegetative top growth control and seedling control on June 23, and October 21, 1982, respectively.

Hand hoeing provided excellent control of common crupina at all treatment dates. Dicamba at 0.56 kg/ha and picloram at 0.28 kg/ha applied at the rosette growth stage gave 90% or greater control of vegetative top growth of common crupina. All treatments, except hand hoeing, failed to give adequate vegetative top growth control when applied after the rosette stage of growth. Picloram at 0.28 kg/ha and 2,4-D at 2.24 kg/ha applied at the bolt and flowering stages resulted in better control at the second evaluation date than at the first date. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Control of common crupina treated at three growth stages.

Treatment	Rate	Stage of growth	Location 1		Location 2	
			Evaluation dates			
			6/23/82	10/21/82	6/23/82	10/21/82
	(kg/ha)		%			
check	--	--	0	0	0	0
picloram	0.28	rosette[1]	91	88	91	78
dicamba	0.56	rosette	99	94	98	86
2,4-D amine	2.24	rosette	90	76	78	55
picloram	0.28	bolting[2]	34	90	61	70
dicamba	0.56	bolting	49	78	37	25
2,4-D amine	2.24	bolting	48	81	29	43
picloram	0.28	flowering[3]	4	26	19	70
dicamba	0.56	flowering	11	60	21	50
2,4-D amine	2.24	flowering	20	86	30	78
picloram granules	0.56	rosette	33	30	25	41
picloram granules	0.56	bolting	11	38	19	54
picloram granules	0.56	flowering	11	19	9	50
hand hoeing	--	rosette	96	90	94	93
hand hoeing	--	bolting	92	91	93	83
hand hoeing	--	flowering	98	91	98	93
mowing	--	bolting	59	64	50	4
mowing	--	flowering	89	59	89	64
LSD (0.05)			16	21	19	26

[1] Herbicides applied on May 23, 1982
[2] Herbicides applied on June 1, 1982
[3] Herbicides applied on June 17, 1982

Effectiveness of Herbi and conventional knapsack applications on the control of common crupina. Kambitsch, D.L., D.C. Thill, R.H. Callihan. A study was established at two locations near Kooskia, Idaho to evaluate the effectiveness of using a Herbi (CDA) and conventional knapsack applicator in the control of common crupina. Herbicides were applied broadcast using a gravity fed Herbi, and a conventional CO_2 pressurized knapsack sprayer calibrated to deliver 187 L/ha at 2.8 kg/cm^2 pressure. The soil at location 1 is a silt loam with 22.9% sand, 52.9% silt, 24.2% clay, 3.4% O.M., pH of 6.3, and a C.E.C. of 31.0 meq/100 g soil. The soil type at location 2 is a silty clay loam with 12.7% sand, 48.3% silt, 38.9% clay, 7.19% O.M., pH of 6.3, and a C.E.C. of 39.1 meq/100 g soil. All treatments were applied on May 4, 1982 when common crupina was in the rosette stage of growth. Air temperature at the time of application was 6.7 C, and relative humidity was 60%. Both studies were arranged in a randomized complete block with 4 replications. Individual plots were 3 x 10 m in size. Visual evaluations of percent control of vegetative top growth and established seedlings were recorded on June 23, and October 21, 1982, respectively.

Herbicides applied with the knapsack sprayer provided better common crupina control than when applied with the Herbi applicator. Dicamba broadcast at 0.56 kg/ha was the best treatment tested at both locations. Picloram at 0.28 kg/ha, dicamba at 0.56 kg/ha, 2,4-D at 2.24 kg/ha, and triclopyr at 0.56 kg/ha applied with the knapsack sprayer gave excellent control of common crupina. All treatments applied with the Herbi resulted in less than 90% common crupina control in both experiments. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Effectiveness of herbi and conventional knapsack applications on common crupina control.

			Location 1		Location 2	
		Type of	Evaluation dates			
Treatment[1]	Rate	application	6/23/82	10/21/82	6/23/82	10/21/82
	(kg/ha)		%			
picloram	0.28	broadcast	96	66	80	85
picloram	10% soln	herbi	16	31	38	38
picloram	20% soln	herbi	61	35	56	54
picloram	40% soln	herbi	88	61	61	65
dicamba	0.56	broadcast	99	90	97	91
dicamba	10% soln	herbi	79	41	60	66
dicamba	20% soln	herbi	75	61	72	59
dicamba	40% soln	herbi	84	48	84	68
2,4-D amine	2.24	broadcast	97	86	41	61
2,4-D amine	20% soln	herbi	25	24	3	5
2,4-D amine	40% soln	herbi	15	8	6	13
2,4-D SULV	10% soln	herbi	3	23	0	0
2,4-D SULV	20% soln	herbi	4	8	4	19
2,4-D SULV	30% soln	herbi	8	21	5	15
triclopyr	0.28	broadcast	35	36	29	28
triclopyr	0.56	broadcast	94	80	44	55
triclopyr	1.12	broadcast	87	80	91	81
triclopyr	0.28	broadcast	21	5	25	24
triclopyr	0.56	broadcast	24	19	10	19
triclopyr	1.12	broadcast	34	24	33	26
check	--	--	0	0	0	0
LSD (0.05)			28	35	28	27

---

[1] Herbicides were applied on May 4, 1982.

Evaluation of several new herbicides on desert saltgrass. Krall, J.M., W.S. Johnson, and D. Kaplan. Four new herbicides were compared to glyphosate for the control of desert saltgrass (*Distichlis stricta* (Torr.) Rybd.). Applications were made June 12, 1982 to a solid stand of actively growing saltgrass located at the Main Station Field Laboratory in Reno, Nevada. Herbicides were applied using the four nozzle backpack sprayer calibrated to deliver 27 gpa at 26 psi from a CO_2 source. All six by fifteen foot plots were replicated four times in a randomized complete block design.

Plots were evaluated for both overall vegetative supression and shoot reduction. Ocular percent flower and top growth reduction and foliar height represent measurements of vegetative control. Percent occupancy, a frequency measurement, using a 60 centimeter linear grid was used as a measurement of shoot reduction. These evaluations made the fall of the treatment year indicate that HOE 00661 applied at four pounds and six pounds active ingredient per acre resulted in substantial saltgrass supression (lowest percent flower and highest percent foliar reduction). No control was observed with the Fluazifop-butyl at 0.25 pounds active ingredient per acre, while Fluazifop-butyl at one pound active ingredient per acre did significantly reduce saltgrass flowering. SC-0545, SC-0224, and glyphosate exhibited marginal control and did not differ significantly in efficacy between lower and higher application rates. Only HOE 00661 treatments produced a significant reduction in saltgrass percent occupancy. Height differences seemed randomly dispersed with no real pattern developed. In summary, only HOE 00661 provided acceptable supression of desert saltgrass during the treatment year. Longevity of control will be assessed in subsequent years. (Nevada Agricultural Experiment Station, Reno, Nevada 89557).

Desert saltgrass response to herbicides

		9/3			9/24
Treatments	Rate lb/ac	Flower %	Foliar Reduction %	Occupancy %	Grass Height cm
SC-0545	3.00 a.e.	35.0	3.8	89.0	11.0
SC-0545	4.50 a.e.	32.5	3.8	88.0	9.6
SC-0224	3.00 a.e.	15.0	6.3	72.0	9.6
SC-0224	4.50 a.e.	18.7	10.0	85.0	9.4
fluazifop-butyl	0.25 a.i.	95.0	0.0	86.0	13.8
fluazifop-butyl	1.00 a.i.	17.5	1.3	91.0	9.0
glyphosate	3.00 a.e.	46.2	2.5	83.0	11.9
glyphosate	4.50 a.e.	57.5	2.5	83.0	12.5
HOE 00661	4.00 a.i.	1.2	78.8	53.0	11.3
HOE 00661	6.00 a.i.	0.0	88.8	35.0	9.4
No Treatment		87.5	0.0	87.0	13.9
LSD 5%		29.8	5.7	15.0	1.1

Control of yellow starthistle on California rangeland. McHenry, W.B. and N.L. Smith. Yellow starthistle infests many acres of rangeland and occasionally severely reduces grazing potential. A site in Calaveras County was chosen to evaluate several herbicides for efficacy when applied at four application spray volumes. Picloram (1 and 2 oz ae/A and 2,4-D amine (0.75 lb ae/A) were applied in 10, 20, 40 and 80 gallons of water per acre. Mefluidide and DPX 4189 were applied in 20 gallon per acre water carrier. Yellow starthistle growth varied from 2 to 8 inches tall when materials were applied to 9 by 15 ft. plots on April 4, 1981, utilizing a CO_2 back-pack sprayer. Surfactant (0.25 X-77 v/v) was added. Four replications were employed. The test site contained a heavy over-story of spent starthistle from the previous year.

Plant counts made June 11 indicated that picloram was more effective than 2,4-D. The lowest spray volume (10 GPA) provided the best control. DPX 4189 and mefluidide were less effective for control of this thistle. (University of California Cooperative Extension, Davis, CA 95616)

Yellow starthistle Calaveras County

Treated: 4/8/81
Evaluated: 6/11/81

Herbicide	Ai/A	Spray volume	Plant[1/] counts	% of control
2,4-D amine	0.75 lb.	10	12.4	26
2,4-D amine		20	20.3	42
2,4-D amine		40	21.1	44
2,4-D amine		80	11.9	25
picloram	1 oz.	10	1.5	3
picloram		20	5.3	11
picloram		40	9.0	19
picloram		80	14.6	30
picloram	2 oz.	10	0	0
picloram		20	2.1	4
picloram		40	4.7	10
picloram		80	7.4	15
DPX 4189	1 oz.	20	19.5	40
DPX 4189	2 oz.	20	21.6	45
mefluidide	0.5 lb.	20	26.7	55
mefluidide	0.75	20	61.2	126
control	-	-	48.5	100

[1/] Plants /10^{-4} acre (average of 4 reps)
LSD 0.5 21.98

Genotypic variation among yellow starthistle populations. Sheley, R. L., R. H. Callihan, C. H. Huston and D. C. Thill. Yellow starthistle (*Centaurea solstitialis* L.) biotypes representing sixteen populations in the western states were studied under uniform garden conditions at Clarkston, Washington to provide a comparative basis for determining genetic, morphological and phenological variation between populations. Seeds were collected in August, 1980 and 1981 from populations in Oregon, Washington, Idaho and California. Four replications of 10 seeds from each population were sown in a randomized complete block design, spaced at 4-foot intervals on November 13 and 16, 1981. Established plants were allowed to mature during the 1982 growing season. During this period observations and measurements of leafiness, rosette width, time of bolting, height of bolting and number of flower heads were taken at selected intervals to assess phenological and morphological variation.

Although significant differences were found with respect to all characteristics, no significant correlations either with location or precipitation were found. One important trend was found concerning the four Idaho populations. In most cases, the population located at Lapwai had the largest rosette width, number of plants initiating bolt, height of bolted plants, and number of flowers per plant. However, the population located at Slate Creek, Idaho consistently had the smallest rosette width, least number of plants initiating bolt, smallest height of bolted plants and least number of flowers per plant. This suggests these populations may be composed of significantly different genetic makeup. Other differences exist, but do not hold any significant trends.

Genotypic variation among yellow starthistle populations.

Population	Precipitation (in)	Rosette width (cm) 5/6/82	Number of plants initiating bolt 5/13/82	Height of bolted plants 5/13/82	Rosette width 5/25/82	Number of bolted plants or bud (1 = bolted, 2 = bud) 5/25/82	Height of bolted plant 5/25/82	Rosette width 6/9/82	Height of bolted plant (cm) 6/9/82	Number of flowers per plant 6/8/82	Leafiness (rating 1-4) 6/9/82	Number of flowers per plant 6/16/82
1. Lichfield, CA	8-12	15.7 bc	4.5 bc	1.75 bcd	39 bc	6.25 c	23 de	43 abc	64 cde	18 bcd	2.2 ef	126 cd
2. Goldendale, WA	8-12	16.6 abc	5.75 ab	1.33 cd	37 cd	9.75 bc	22 de	39 bcde	58 e	14 bcd	2.7 abcd	126 cd
3. Okanogen, WA	12-16	17.3 abc	5.75 ab	1.1 d	39 bc	8.5 bc	15 ef	41 abcd	62 cde	11 cd	3.0 ab	99 d
4. Lockwood, CA	12-16	17.6 abc	4.0 bc	2.75 bcd	36 cd	6.75 c	30 bcde	33 e	69 cde	14 bcd	1.7 g	132 cd
5. Medford, OR	16-20	20.4 ab	6.5 ab	4.7 bc	39 bc	12.0 ab	34 cde	38 bcde	75 bcd	29 abc	2.6 bcde	185 abcd
6. Rock Crk, WA	16-20	21.0 b	8 a	2.0 bcd	42 bc	11.75 ab	29 bcde	41 bcd	65 cde	19 bcd	3.1 a	176 abcd
7. Dayton, WA	20-24	19.2 ab	6.75 ab	2.0 bcd	40 bc	11.4 ab	24 cde	40 bcd	68 cde	33 ab	2.8 abcd	179 abcd
8. San Luis Obispo, CA	20-24	20.2 ab	6.25 ab	5.0 b	39 bc	12.5 ab	39 abc	35 de	76 bc	32 ab	2.4 cdef	171 abcd
9. Lyle, WA	24-32	22.8 a	6.75 ab	1.73 bcd	50 a	12.75 ab	30 bcde	78 a	75 bcd	19 bcd	2.95 ab	133 bcd
10. Kenwood, CA	24-32	21.3 ab	6.5 ab	1.8 bcd	46 ab	10.25 bc	30 bcde	44 ab	71 cde	20 bcd	2.8 abcd	165 abcd
11. Booneville, CA	32-48	20.2 ab	5.5 ab	1.9 bcd	39 bc	9.75 bc	25 cde	40 bcde	61 ce	12 cd	3.0 ab	152 bcd
12. Trinity, CA	32-48	18.5 ab	4.75 bc	3.0 bcd	38 cd	9.5 bc	34 bcd	36 cde	71 cde	26 abcd	2.0 fg	176 abcd
13. Stites, ID	20-24	18.3 ab	7 ab	1.5 cd	41 bc	12.25 ab	27 cde	42 abcd	66 cde	34 ab	29 abc	244 ab
14. Lapwai, ID	12-16	21.9 ab	8.5 a	9.0 a	42 bc	15.5 a	51 a	37.2 bcd	990 a	43 a	2.3 def	264 a
15. Big Canyon, ID	20-24	20.6 ab	6.0 ab	4.6 bc	41 bc	9.75 bc	44 ab	38 bcde	88 ab	33 ab	2.2 ef	220 abc
16. Slate Crk, ID	12-16	12.0 c	2.5 c	.61 d	31 d	6.25 c	7 f	37 bcde	43 f	7 d	2.5 bcde	81 d

Effects of burning, seeding, fertilization, and herbicide application on yellow starthistle infested rangeland 1 year after application. Sheley, R. L., R. H. Callihan and D. C. Thill. A study was established at Lapwai, Idaho on April 5, 1981 to determine techniques for restoration of yellow starthistle (*Centaurea solstitialis* L.) infested rangeland. Treatment combinations include a spring herbicide application of .28 kg/ha picloram alone and followed by every individual combination of backfire burning (burn), aerial seeding (seed) with 16 kg/ha of intermediate wheatgrass (Agropyron intermedium) and fertilization with 112 kg/ha of 16-20-0. The latter treatments were also applied without picloram. These treatments were applied either in the fall (f) or spring (s), depending on theoretical probability of success according to reports of prior studies. Treatments were arranged in a randomized complete block and replicated 4 times. Picloram was applied with a backpack sprayer calibrated to deliver 187 l/ha at 28 kg/cm^2 pressure from a CO_2 source. Plots were evaluated April 15 and 16, 1982 for percent cover by species, and harvested for yield in mid-summer, 1982.

Table 1 shows the yield of grasses, yellow starthistle and forbs harvested during the summer of 1982. Herbicide (s) + burning (f) + fertilization (f) resulted in a maximum yellow starthistle yield of 769 kg/ha. Herbicide (f), herbicide (s) + seeding (f), herbicide (s) + burning (f), and herbicide (s) + seeding (s) + fertilization (s) resulted in minimum yellow starthistle yields of 191, 108, 152, and 109 kg/ha, respectively. All other treatments resulted in a range of yields from 230-644 kg/ha of yellow starthistle, but did not significantly differ. Correspondingly, herbicide (s), herbicide (s) + seeding (f), herbicide (s) + seeding (s) + fertilization (s), and herbicide (s) + burning (f) + seeding (f) + fertilization (f) resulted in maximum grass yields of 1881, 1852, 2106, and 1818 kg/ha, respectively. Herbicide (s) + burning (f) + fertilization (f) yielded 1561 kg/ha of grass, which was not significantly different from herbicide (s) + burning (f), herbicide (s) + burning (f) + seeding (f), seeding (s) + fertilization (s) or fertilization (s) alone. All other treatments were not significantly different, and produced minimum yields. Forb yields did not significantly differ, probably due to the complexity of the forb component in these range environments.

In order to evaluate the success of a rehabilitation program, the plant composition for each treatment must be monitored by species. Table 2 shows the density of yellow starthistle, and percent cover of yellow starthistle, downy brome, redstem filaree, medusa-head wildrye, and Sherman big bluegrass, which were the major components of the yellow starthistle infested ecosystem. Percent cover of all species treated with seeding (s) or seeding (s) + fertilization (s) did not significantly differ from the control. Percent cover of yellow starthistle and downy brome which did not receive herbicide did not significantly differ from the control, with one exception: burning (s) + seeding (s) + fertilization (s) significantly increased downy brome percent cover over the control. Percent cover of yellow starthistle and downy brome was significantly reduced and increased, respectively, over the control by treatments including a herbicide, but no burning. Treatments including a herbicide and burning produced varied results. Herbicide (s) + burning (f) significantly reduced yellow starthistle while not affecting downy brome. Herbicide (s) + burning (f) + seeding (f), and herbicide (s) + burning (f) + fertilization (f) did not change yellow starthistle percent cover from the control, while the latter significantly increased downy brome.

All treatments including burning significantly increased redstem filaree percent cover over the control while those without burning did not significantly differ from the control. Treatments including burning without a herbicide significantly reduced medusa-head wildrye over the the control with one exception. Burning (s) + seeding (s) + fertilization (s) did not significantly decrease medusa head, percent cover however was about half that of the control. Treatments including a buring with a herbicide did not significantly reduce medusa-head wild-rye percent cover.

Although these data are preliminary, they do suggest the following important considerations:

1) Controlling yellow starthistle in the spring with herbicide alone decreased yellow starthistle and increased downy brome.
2) Controlling yellow starthistle in the spring with herbicide and fall burning gave less effective control, and did not increase downy brome. This may be due to picloram binding to organic ash, and downy brome is under heavy competition. The burning may also have had a controlling effect on downy brome.
3) Controlling medusa-head wildrye with spring burning did not change yellow starthistle or downy brome percent covers, however, it did increase redstem filaree.
4) The effects of fertilization and seeding are undetected at this point; in no treatment was the seeded species prevalent.

(Idaho Agricultural Experiment Station, Moscow, ID 83843)

Table 1. Effects of burning, seeding, fertilization and herbicides on yield of yellow starthistle, grasses and forbs.

	Yield		
	Starthistle (kg/ha)	Grasses (kg/ha)	Forbs (kg/ha)
Burn (s)[1]	306ab[2]	464c[3]	815[4]
Seed (s)	588ab	305c	256
Herb (s)	191b	1881a	386
Fert (s)	90ab	881bc	252
Burn (s) + Seed (s)	243ab	477c	547
Burn (s) + Fert (s)	340ab	435c	773
Seed (s) + Fert (s)	230ab	816bc	355
Herb (s) + Burn (f)	152b	867bc	1104
Herb (s) + Seed (f)	108b	1852a	428
Burn (s) + Seed (s) + Fert (s)	371ab	644c	851
Herb (s) + Seed (s) + Fert (s)	109b	2106a	196
Herb (s) + Burn (f) + Seed (f)	478ab	997bc	229
Herb (s) + Burn (f) + Fert (f)	769a	1561ab	589
Herb (s) + Burn (f) + Seed (f) + Fert (f)	644ab	1818a	355
Control	610ab	363c	636

[1] (s) = spring application, (f) = fall application
[2] PR F = .1312
[3] Annual grasses (e.g. Medusa-head wildrye, downy brome) PR F = .001
[4] PR F = .4648

Table 2. Effects of burning, seeding, fertilization, and herbicides on yellow starthistle density and on cover of yellow starthistle and associated species.

	Density	Cover			
Treatment	Yellow Starthistle	Yellow Starthistle	Downy Brome	Redstem Filaree	Medusa-head Wildrye
	%	%	%	%	%
*Burn (s)	23.1ab	37.8abc	5.0de	43.8ab	5.3d
*Seed (s)	31.5a	55.6a	6.3de	2.5ef	36.9ab
*Herb (s)	3.37c	9.4def	26.3bc	18.4cde	16.3bcd
*Fert (s)	21.1abc	39.4abc	2.0e	0 f	51.0a
Burn (s) + Seed (s)	19.8abc	32.5abcd	6.6de	35.3abc	4.7d
Burn (s) + Fert (s)	20.8abc	42.5abc	10.4cde	50.0a	2.5d
Seed (s) + Fert (s)	25.3ab	41.3abc	5.9de	0 f	16.9bcd
Herb (s) + Burn (f)	11.0bc	17.2cdef	12.8cde	46.9ab	10.9cd
Herb (s) + Seed (f)	2.9c	3.1f	33.1ab	5.9def	14.1bcd
Burn (s) + Seed (s) + Fert (s)	14.0abc	28.5bcde	2.8e	33.4abc	15.6bcd
Herb (s) + Seed (s) + Fert (s)	3.1c	7.8ef	45.3a	2.2ef	20.3bcd
Herb (s) + Burn (f) + Fert (f)	23.6ab	32.2abcd	20.6bcd	29.7bc	20.3bcd
Herb (s) + Burn (f) + Seed (f)	17.4abc	27.8bcde	24.4bc	21.9cd	27.9bcd
Herb (s) + Burn (s) + Seed (f) + Fert (f)	10.5bc	18.8cdef	8.8de	29.4bc	26.3bcd
Control	31.3a	49.7ab	5 de	1.9ef	33.8abc

* Burn = backfire burning; Seed = 16 kg/ha intermediate wheatgrass; Herb = .28 kg/ha picloram (Tordon 22K); Fert = 112 kg/ha 16-20-0

Competition between yellow starthistle and downy brome. Sheley, R. L., C. H. Huston, R. H. Callihan and D. C. Thill. In an attempt to depict the competitive relationship between downy brome (*Bromus tectorum*) and yellow starthistle (*Centaurea solstitialis*) several greenhouse competition studies were completed. The first experiment was to ascertain the relative competitive abilities of yellow starthistle and downy brome seedlings. Downy brome and yellow starthistle both have winter annual life cycles, which might cause severe competition between them. Each density (Table 1) of yellow starthistle alone and in combination with downy brome were sown in 10" x 10" x 3" wooden flats, and replicated 4 times in a randomized complete block design. Water and nutrients were not limiting. After one month, the plants were harvested and weighed.

Figure 1 shows the dry weight of yellow starthistle and downy brome grown alone and in combination at varying densities for one month. A trend of decreasing dry weight per plant with increasing densities for each species alone ($p = .1009$) is evident. However, the results show no significant competitive relationship between yellow starthistle and downy brome. This suggests that interaction at the early growth period may not be critical.

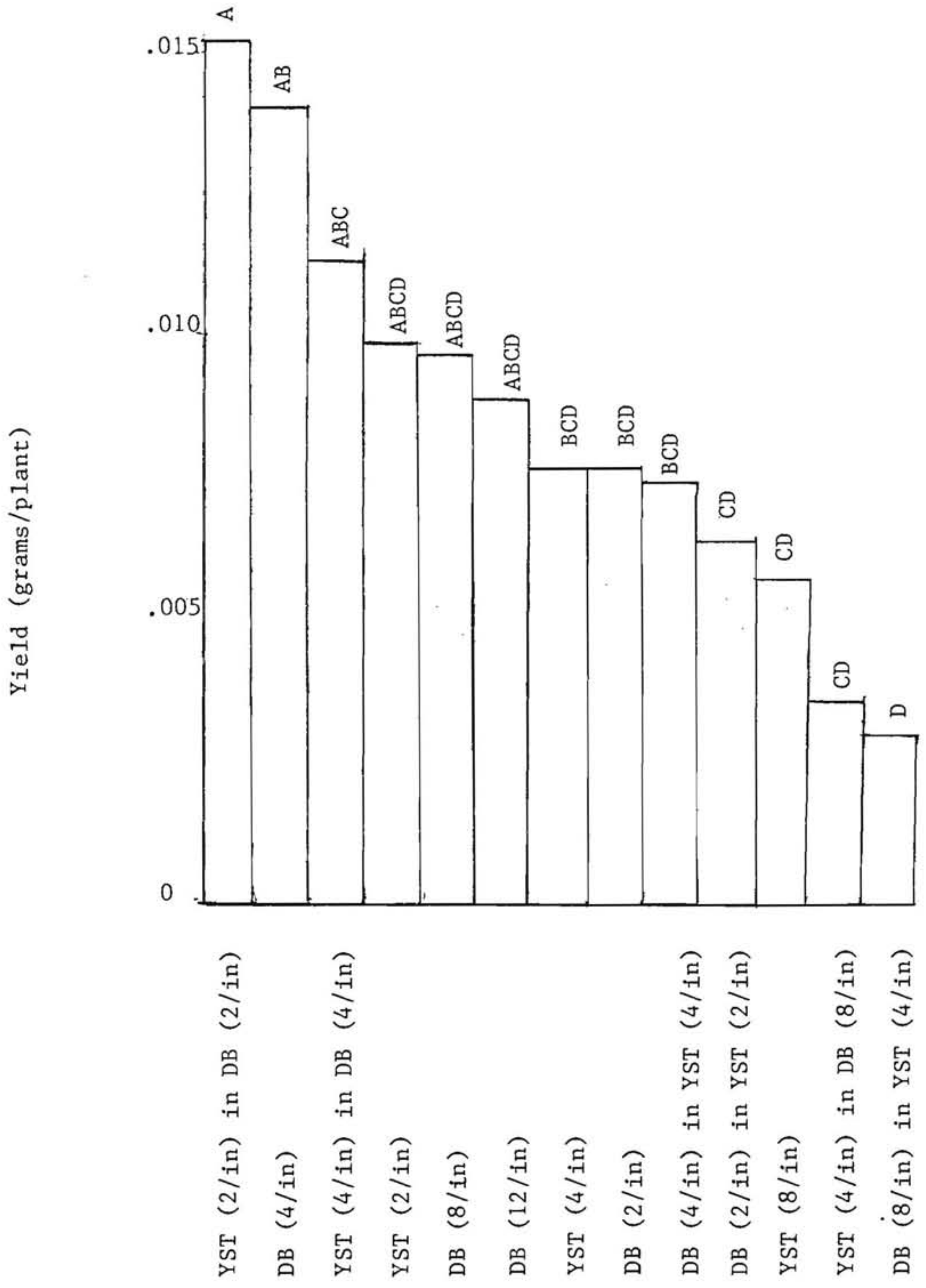
Due to the results of the seedling competition study, a similar study was initiated to observe the relative competitive ability of yellow starthistle and downy brome at the rosette growth stage. Plants were weighed four months after the sowing date.

Figure 2 shows the dry weights of yellow starthistle and downy brome grown alone and in combination at varying densities for four months. No significant differences in plant weights were found, except for downy brome planted at 12 seeds per square inch. Increasing densities of yellow starthistle alone did decrease plant weight; however, this was not found with downy brome. (University of Idaho Agriculture Experiment Station, Moscow, ID. 83843)

Table 1. Seedling density of yellow starthistle and downy brome.

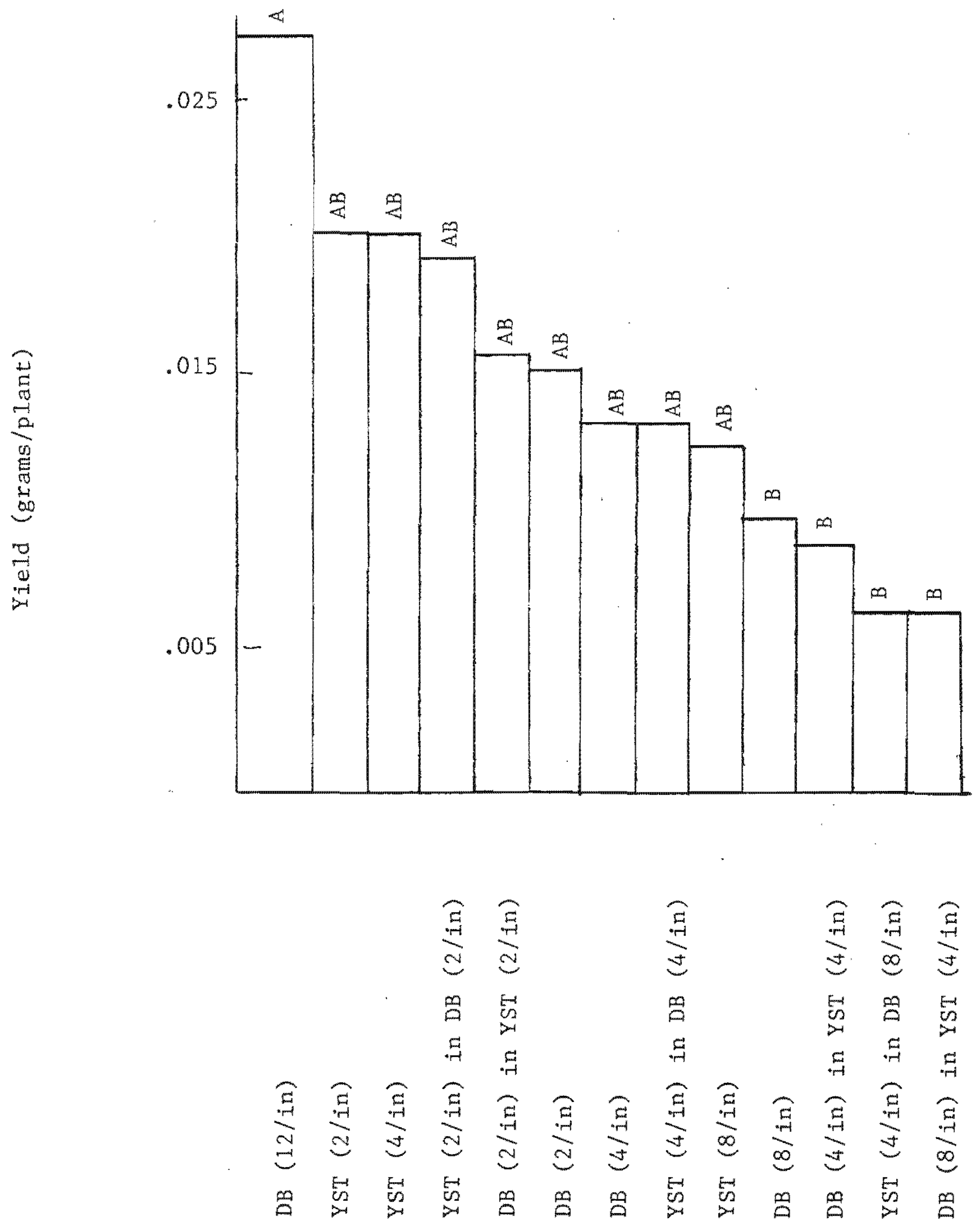
Yellow Starthistle	Downy Brome
(seeds/square inch)	(seeds/square inch)
2	0
4	0
8	0
0	2
0	4
0	8
0	12
2	2
4	4
4	8

Fig. 1 Dry weight (gms) of Yellow Starthistle (YST) and Downy Brome (DB) grown at varying densities for one month.



*Duncan's New Multiple Range Test PR F = .109

Fig. 2 Dry weight (gms) of Yellow Starthistle (YST) and Downy Brome (DB) grown at varying densities for four months.



*Duncan's New Multiple Range Test PR F = .083

Seed and seedling root growth characteristics of several populations of yellow starthistle (Centaurea solstitialis L.). Sheley, R. L., D. L. Zamora, C. H. Huston, R. H. Callihan and D. C. Thill. To determine if significant seed weight differences exist among populations, a random sampling of 15 seeds (both plumed and plumeless) from each of 14 yellow starthistle populations, replicated 10 times were weighed.

To determine if significant root dynamics differences existed among populations, a random sampling of 15 seeds (both plumed and plumeless) from each of 14 yellow starthistle populations were placed in growth packets and germinated in a growth chamber set at a constant 20°C and 12 hours daylight. Germination and root length were measured at four hour intervals until growth cessation.

The Dayton, WA, population had the highest average seed weight (Table 1). Both Okanogan, WA, and Rock Creek, WA, populations had the second highest but significantly less average weights. Stites, ID, Lapwai, ID, Big Canyon, ID, Kenwood, CA, San Luis Obispo, CA, and Goldendale, WA, populations had intermediate seed weights, while those from Lockwood, CA, had the lightest average seed weight of all populations. Seed weights did not correlate with annual average precipitation.

After 16 hours there were no significant differences in average number germinated between populations, except for the Dayton, WA population, which had greater germination than all others. Populational differences became evident after 28 hours. Lapwai, Big Canyon and Stites, Idaho populations had fewer seeds germinate. The lowest germination was found in the Okanogan population. No significant differences were found among populations at the end of the experiment (68 hours).

All populations had the same root length 16 hours after the initiation of germination. After 28 hours, roots of the Dayton population were longest, and roots of the Okanogan population were shortest. These differences persisted until the experiment was terminated after 68 hours; other population differences were not significant. (Idaho Agriculture Experiment Station, Moscow, ID 83843)

Table 1. Seed weight, germination and root length of yellow starthistle from 14 locations.

Location	Seed Weight	Germination		Root Length
		16 hr	28 hr	
	(mg)	(%)	(%)	(mm)
Okanogen, WA	.027b	0b	22d	14c
Trinity Co, CA	.024cd	3b	73ab	31b
Booneville, CA	.023cde	0b	73ab	33b
Kenwood, CA	.022defg	3b	92a	32b
Lower Lyle, CA	.023cdef	3b	80ab	33b
Stites, ID	.019g	0b	49c	28b
Big Canyon, ID	.0215fg	0b	44c	28b
San Luis Obispo, ID	.020g	0b	78ab	25b
Dayton, WA	.029a	16a	76ab	44a
Rockcreek, WA	.024bc	0b	85ab	35b
Lapwai, ID	.021g	5b	62bc	34b
Lockwood, CA	.016h	0b	78ab	27b
Goldendale, WA	.021efg	3b	80ab	28b
Litchfield, WA	.022defg	0b	75ab	32b

PROJECT 3.

UNDESIRABLE WOODY PLANTS

Darlene M. Frye - Project Chairman

Effects of various rates and formulations of picloram on broom snakeweed control in Eastern New Mexico. Dickerson, George. The fall rangeland of Eastern New Mexico is often dominated by a yellow carpet of low growing broom snakeweed. Dense populations of this brush species can severely limit grass production as well as cause abortions in livestock. Applications of picloram 10% pellets have been found effective in controlling broom snakeweed, but distribution can be a problem when relatively low rates of this herbicide are applied.

In the late spring and late fall of 1981, two experiments were set up at ranches near Clovis, Portales and Roswell, New Mexico, comparing the effects of formulation of picloram granules on broom snakeweed control. Picloram 10% pellets and picloram 2% pellets were applied at rates of 1.0 and 0.5 lb ai/A on 50 ft^2 plots. Each of the treated plots was compared to an undisturbed check plot. Plots were arranged in a completely random block design for each experiment with each location representing a replication. Plots were evaluated in the fall of 1982 for percent kill and percent canopy reduction.

Effects of various rates and formulations of picloram on broom snakeweed control, 1981.

Formulation	lb ai/A	% Control		% Canopy Reduction	
		Spring[1]	Fall	Spring	Fall
picloram 2% pellets	1.0	91.9	99.0	95.0	99.9
picloram 2% pellets	0.5	74.2	81.2	82.5	94.9
picloram 10% pellets	1.0	75.0	70.9	81.3	79.2
picloram 10% pellets	0.5	53.6	52.7	63.9	69.7
Check	--	0	0	0	0

[1] Application periods during 1981; plots were evaluated in fall of 1982.

Excellent results were achieved using picloram 2% pellets at 1.0 lb ai/A. The late fall application gave best results with an average of 99 to 99.9% control of both plants and canopy. Picloram 2% pellets at 0.5 lb ai/A was as good or better than the picloram 10% pellets at 1.0 lb ai/A. Grass production also increased on most plots treated with the higher rates of both chemical formulations. (Cooperative Extension Service, New Mexico State University, Las Cruces, New Mexico 88003).

Mesquite control with chemical treatments in eastern New Mexico. Gould, Walter L. The degree of mesquite control in southern New Mexico from treatment with 2,4,5-T is generally greater than 30 percent in years with above average rainfall during the four months prior to treatment. Very little control is obtained in drier years. The degree of control in central eastern New Mexico has regularly been very low regardless of the rainfall amounts. This study was set out to evaluate the effect of time of application of promising herbicide formulations on the degree of control in the latter area.

Four experimental plot areas were selected June 9, 1981 approximately 15 miles southwest of Fort Sumner, New Mexico, and treatments were applied at weekly intervals from June 11 to July 15. Liquid herbicides were applied in water with a boom mounted on the rear bumper of a pickup using 8002 Spraying System nozzles in a total volume of 14 gallons per acre. The plot size was 100 by 150 ft, but the area sprayed was 80 by 120 ft. The liquid herbicide treatments were applied each week in a contiguous group of plots in each area, except that Banvel 2 + 2 was applied on the first three dates only. The Banvel 2 + 2 formulation tended to clog the screens and nozzles, so cleaning of these parts was necessary each time this treatment was applied.

Tebuthiuron was applied as a 20 percent granular formulation on only one date in each experimental area. The desired amount of tebuthiuron per plot was divided into two equal lots, and each lot was applied by hand in making two passes over the plot.

Preliminary evaluations of the plots were made the last week of October 1982, by estimating the percentage of stems with no live tissue. Final evaluations will be made in 1983 for all treatments except tebuthiuron which may cause repeated defoliation of mesquite for several years. The results are presented in the following table. (New Mexico State University Agric. Exp. Sta., Las Cruces, 88003)

Percent control of mesquite in 1982 from
treatments applied in 1981 in eastern New Mexico.

Herbicide	Rate lb ai/A	Treatment date a/ 1	2	3	4	5	6	Ave
Dowco 290 (M-3972)	1/2	45	40	28	60	28	60	43
Dowco 290 (M-3972)	1/4	10	22	8	18	5	22	14
Dowco 290 (M-3972)	1/8	5	8	5	8	2	5	5
Dowco 290 + picloram (K)	1/2 + 1/4	85	62	52	72	42	80	66
Dowco 290 + picloram (K)	1/4 + 1/4	50	30	12	38	20	25	29
Dowco 290 + picloram (K)	1/8 + 1/4	20	25	5	25	10	5	15
T-225E	1/2	25	25	35	30	18	45	30
T-225BE	1/2	30	22	25	32	28	42	30
2,4,5-T	1/2	20	20	22	18	20	25	21
Control	-	0	5	0	0	0	0	<1
Dicamba/2,4,5-T	1/2	20	28	13	-	-	-	20
Tebuthiuron	1	-	-	-	-	14	-	14
Tebuthiuron	1.5	-	-	-	-	20	-	20
LSD (05)b/		32.1	17.6	17.3	21.1	17.2	24.5	-

a/ Treatment dates: 1 = June 11-12; 2 = June 16 to 18; 3 = June 22 to 24; 4 = June 30 to July 1, 5 = July 8-9; 6 = July 14-15.

b/ Data for dicamba/2,4,5-T and tebuthiuron were not used to calculate L.S.D.

Effects of tebuthiuron on range species complex and forage production. Whitson, T. D. and H. P. Alley. Big sagebrush control has resulted in an average of two- to three-fold increases in range grass production when 2,4-D [(2,4-dichlorophenoxy)acetic acid] has been used for control.

Experimental plots were established November 7, 1978, near Ten Sleep, Wyoming, on sagebrush infested rangeland to evaluate the potential of tebuthiuron as a chemical control method. Three rates of 20% granular material, 0.31, 0.67, 0.94 lb ai/A, were aerially applied to plots of 11.23 acres. Forage production from perennial grasses was randomly clipped from five, 4.9 sq ft circular quadrats and oven dried. 1981 yields from the 0, 0.31, 0.67 and 0.94 lb ai/A tebuthiuron treatments were: 308, 382, 715 and 552 lb/A, respectively. Yields in 1982 from the 0, 0.31, 0.67 and 0.94 lb ai/A tebuthiuron treatments were: 266, 518, 690 and 566 lb/A, respectively.

Live canopy cover was determined August 4, 1981 and July 12, 1982, for each herbicide rate using 400 random points. Comparisons show changes the in percent species live canopy cover at four rates of the herbicide treatment 3 and 4 years after tebuthiuron application. Sagebrush defoliation for the 0.31, 0.67 and 0.94 lb ai/A treatments was 34, 100 and 99%, respectively, in 1982. Live canopy of western wheatgrass, the most important forage species, increased 442% in the 0.67 lb ai/A treatment in 1982.
(Wyoming Agric. Exp. Sta., Laramie 82071, SR 1187).

Percent live canopy cover from plots treated with tebuthiuron 3 and 4 years following treatment

Species	Rate lb ai/A							
	0.31		0.67		0.94		Check	
	Years following treatment							
	3	4	3	4	3	4	3	4
Woody								
Sagebrush	14.3 b	23.0 b	1.8 c	0.0 cd	0.3 d	1.3 c	46.5 a	34.5 a
Forbs								
Locoweed	10.5 a	6.0 a	6.3 c	2.8 a	3.3 d	1.8 a	7.5 b	4.0 a
Grass								
Prairie junegrass	24.8 a	8.3 a	17.3 b	10.0 a	8.8 d	5.3 a	14.8 c	11.0 a
Western wheatgrass	17.8 c	39.3 ab	35.5 b	51.5 a	42.3 a	48.5 ab	8.5 d	9.5 c
Other species	5.6	5.4	2.8	5.2	3.8	1.3	6.2	9.0
Bare ground	27.0 c	18.0 b	36.3 b	30.5 ab	41.5 a	41.8 a	16.5 d	32.0 ab

Live canopy cover means based on 400 point transect readings within each treatment.
Means with the same letters in the same year and species are not significantly different at the 5% level according to Duncan's New Multiple Range Test.

Conifer release with split applications of triclopyr. Stovicek, R. F., R. H. Callihan, and D. C. Thill. A study was established in the White Pine Gulch area fifty miles north of Moscow, Idaho, to evaluate the efficacy of split and single applications of triclopyr ester applied in the spring and fall. Applications were made May 25 and August 23, 1982, to a clearcut that had been burned in 1979 and planted with lodgepole pine (*Pinus contorta* Dougl.) and Douglas fir (*Pseudotsuga menziesii* Franco) in 1980. Spring treatments of triclopyr ester were applied at 1.12 and 2.24 kg/ha and fall applications were applied at 0.56 and 1.12 kg/ha. Plots were 3 by 30 m, arranged in a randomized complete block design with four replications. Treatments consisted of spring applications at 1.12 and 2.24 kg/ha, fall applications at 0.56 and 1.12 kg/ha, and spring + fall applications at 1.12 + 0.56 kg/ha and 2.24 + 1.12 kg/ha. Herbicides were applied with a backpack sprayer calibrated to deliver 187 L/ha at 2.8 kg/cm^2.

Brush species present included *Ceanothus velutinus* Dougl., redstem ceanothus (*Ceanothus sanguineus* Pursh.), ninebark (*Physocarpus malvaceus* (Greene) Kuntze), elderberry (*Sambucus* sp.), pachistima (*Pachistima myrsinites* Pursh.), huckleberry (*Vaccinimum* sp.), Rocky Mountain maple (*Acer glabrum* Torr.), current (*Ribes* sp.), spirea (*Spiraea denseflora* Nutt.), rose (*Rosa* sp.), and a small area of bracken fern (*Pteridium aquilinum* L.). *Ceanothus velutinus* Dougl. is the dominant brush species. Evaluations taken July 15, 1982, indicated no efficacy difference between the spring applications of 1.12 and 2.24 kg/ha of triclopyr. Pachistima, raspberry (*Rubus parviflorus* Nutt.), bracken fern, and huckleberry were not strongly affected by the herbicide. Huckleberry developed puckered leaves with slightly darkened tissue, with no appreciable leaf drop. Rocky Mountain maple lost its foliage after the spring application and began resprouting strongly. Other species present experienced complete top kill and showed no signs of regrowth through sprouting.

Lodgepole pine seedlings had broken bud and main shoots had elongated 9 to 12 cm, whereas Douglas fir seedlings had not broken bud at the time of the spring application. Lodgepole pine seedlings were damaged by spring applied triclopyr, showing signs of shoot hyponasty and inhibition of needle growth. In contrast, Douglas fir seedlings were growing normally, with no apparent symptoms of herbicide damage.

The long term effects of spring applied triclopyr and the effect of the fall applications and split applications will be evaluated in 1983. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

PROJECT 4.

WEEDS IN HORTICULTURAL CROPS

R. D. William - Project Chairman

PROJECT 4

WEEDS IN HORTICULTURAL CROPS

R. D. William, Project Chairman

SUMMARY -

Reports on weed control in horticultural crops are arranged by crop grouping beginning with annual cropping systems involving 23 contributions in vegetables, 4 reports on metham application, 1 in ornamentals, and 17 summaries on perennial cropping systems of tree fruits, grapes, cranberries, and cane or trailing berries.

Vegetables - Weed control studies in onions involved both soil-applied (propachlor, bensulide, and pendimethalin) and postemergence grass herbicides (fluazifop, sethoxydim and oxyfluorfen) along with directed applications of bentazon for control of yellow nutsedge. Similar herbicides were evaluated in garlic, except bentazon, but including napropamide and pronamide.

Control of black nightshade or dodder were studied in tomatoes with low rates of diphenylether herbicides or compounds that affect growth such as NAA or glyphosate. In cucurbit crops, weed control and crop tolerance using ethalfluralin was compared with several other herbicides including standard treatments. Single trials involving pre-emergence herbicides in snap beans, sweet corn, lettuce, and 12 crucifer crops along with evaluation of several postemergence herbicides in carrots and crucifer seed crops were reported. Efficacy of metham in water for weed control was compared under various physical and environmental conditions.

Ornamental bulbs - Herbicide combinations, applied both pre- and postemergence, were evaluated for improving weed control in iris, tulip, and narcissus.

Perennial cropping systems - In citrus, fluazifop and sethoxydim were compared for perennial grass control, paraquat requirements were determined for annual weed control used alone or as a supplement to soil-applied herbicides, control of purple and yellow nutsedge was evaluated, and herbicide tolerance to sweet orange seedlings was evaluated. Snail populations in an orange grove were greatest when perennial grasses were controlled and least when no control was achieved. Herbicide combinations involving both pre- and postemergence treatments were evaluated in apples, plums, and cherries. Napropamide rates were evaluated for cranberry production on sandy soils in Oregon. Yield and quality indices were evaluated for Thompson seedless grapes grown under 4 weed control regimes. Studies involving preplant and directed or wiper applications of glyphosate in cane and trailing berries indicated red raspberries were sensitive to this herbicide.

Postemergence weed control in spring planted onions. Anderson, J. L. and M. G. Weeks. As bromoxynil and oxyfluorfen had both shown promise for broad leaf weed control in onions, experimental plots using these chemicals in combination with several grass herbicides were set up on the farms of four commercial onion growers during 1982. Plots were 4.5 m by 15 m and replicated three times in randomized complete block designs. Herbicides were applied at 300 l/ha with a pressurized bicycle sprayer. Oxyfluorfen was applied to onions at the flag, first and second true leaf stages; bromoxynil combinations were applied only at the second true leaf stage. No oxyfluorfen phytotoxicity was observed at the early growth stages with rates of .14 or .28 kg/ha.

One experiment established May 29, 1982 on Bronze Wonder onions in the second true leaf stage at West Layton, Davis County, Utah will be reported in detail. Plots were evaluated for weed control and phytotoxicity June 3 and June 16, after which they were cultivated and hand weeded by the grower. Hand weeding was greatly facilitated by chemical weed control in the bromoxynil and oxyfluorfen plots. A mild leaf curl was observed in all bromoxynil plots; however, the onions outgrew the injury, and essentially no significant yield reductions were attributable to phytotoxicity. Very poor weed control was obtained in the chloroxuron plots; an oil additive should have been used with chloroxuron as it was with the wettable powder formulations of oxyfluorfen.

Diclofop, sethoxydim and fluazifop all provided good control of annual grasses. Grass seedling kill by fluazifop appeared to be a little slower than that provided by the other grass herbicides but ultimately was as effective. A light infestation of cocklebur occurred throughout the field. No treatment adequately controlled cocklebur. The other predominant weeds, purslane, green foxtail, barnyardgrass, and redroot pigweed, were generally controlled by the bromoxynil or oxyfluorfen combinations. No differences in weed control between the wettable powder plus oil and the emulsion formulations of oxyfluorfen was observed. (Utah Agricultural Experiment Station, Logan, 84322.)

Effects of herbicide treatment on weed control and onion growth.

Treatment	Rate (kg/ha)	Oil	Phyto-toxicity[1]	Weed control[1]		Yield[2] (kg)
				(grasses)	(broad leaves)	
oxyfluorfen (WP)	0.28	1/4%	10	9.0	6.0	22.7abc
oxyfluorfen (WP)	0.56	1/4%	9 (flecking)	9.8	7.3	22.5abc
oxyfluorfen (WP) + sethoxydim	.28 + 0.22		10	9.6	9.7	25.2a
oxyfluorfen (EC)	0.56		10	9.8	7.7	22.2abc
oxyfluorfen (EC) + diclofop	0.42 + 0.84		9.6	9.8	9.8	21.0abc
oxyfluorfen (EC) + fluazifop	0.42 + 0.56		10	9.8	9.8	22.3abc
oxyfluorfen + pendimethalin	0.42 + 0.56		10	9.8	9.0	24.4ab
bromoxynil + sethoxydim	0.74 + 0.22		7.3	9.8	9.7	21.3abc
bromoxynil + diclofop	0.74 + 0.84		7.0	9.3	8.8	22.2abc
bromoxynil + pendimethalin	0.74 + 0.56		7.5	9.5	2.5	20.7 bc
bromoxynil + fluazifop	0.74 + 0.56		7.3	9.8	8.8	21.2abc
pendimethalin	0.84	1/4%	10	3.8	2.0	22.5abc
chloroxuron	2.24		10	2.2	0	23.8abc
untreated			10	0	0	19.9 c

[1] rated 0-10; 10 = healthy onions, complete control of weeds

[2] bulb weight from 4 m of center onion bed; weights followed by a common letter are not significantly different at the 5% level.

Postemergent weed control in overwintered onions. Anderson, J.L. In southern Utah bulb onions can be planted in the late fall and overwintered. To test the effectiveness of postemergent weed control treatments in overwintered onions, a field study was established November 13, 1981 in Washington County, Utah on onions at the first true leaf stage growing in a loamy sand. Plots were 4.5 m by 15 m and replicated three times in a randomized complete block design. The herbicides were applied at 206 l/ha with a pressurized bicycle sprayer equipped with 8003 T-Jet nozzles except the DCPA plots which were applied at 280 l/ha with 8004 nozzles.

Bromoxynil, DCPA, and oxadiazon were applied separately and in combination with diclofop or sethoxydim. Plots were evaluated on December 23, 1981 and April 5, 1982. The only phytotoxicity to onions was an occasional curling of an onion leaf in the bromoxynil plots; The onions had largely outgrown this by the April observation date.

Weeds had begun to emerge at the time of treatment application; consequently, DCPA treatment provided little weed control. Plots were uniformly and heavily infested with blue mustard. One replication along the edge of the field was very heavily infested with miscellaneous annual grasses. A single application of diclofop or sethoxydim often failed to provide winter-long control of annual grasses where infestations were particularly heavy. Bromoxynil in combination with diclofop or sethoxydim generally provided commercially acceptable weed control in overwintered onions. Oxadiazon stunted the blue mustard but did not control it. At the April observation date blue mustard was in full bloom where present, except in the oxadiazon plots where it was in the bud stage. (Utah State University, Logan, UT 84322)

Effect of herbicide treatment on winter annual weed control in onions

Treatment	Rate (kg/ha)	Weed Control[1] (grasses)	Weed Control[1] (blue mustard)
DCPA	10.1	5.0	2.5
DCPA + diclofop	10.1 + 0.84	9.8	3.0
DCPA + sethoxydim	10.0 + 0.28	9.8	2.5
bromoxynil	0.74	0	9.8
bromoxynil + diclofop	0.74 + 0.84	9.3	9.8
bromoxynil + sethoxydim	0.74 + 0.28	9.6	9.8
diclofop	0.84	9.3	0
oxadiazon	0.84	6.5	6.5
oxadiazon + diclofop	0.84 + 0.84	9.0	6.5
oxadiazon + sethoxydim	0.84 + 0.28	9.8	6.0
sethoxydim	0.28	9.3	0

[1] Weed control rated 0-10; 10 = 100% control

Preemergence and postemergence herbicide combinations for weed control in onions. Anderson, J. L. and M. G. Weeks. A study using sequential herbicide treatments was established on onions at the Farmington Field Station, Davis County, Utah. Bronze Wonder onions were seeded in a sandy loam having a 1.1% organic matter content April 27, 1982. One-third of the rows were treated with DCPA and one-third with propachlor April 29; the remaining third received no preemergence herbicide. Postemergence plots were set up across the onion rows and treated May 20 and/or June 3, 1982 when the onions were in the flag or second true leaf stage. Postemergence plots were replicated three times. Herbicides were applied at 300 l/ha with a pressurized bicycle sprayer.

Bromoxynil gave good control of most broadleaf weeds; however, the bromoxynil plots contained a fair population of purslane when evaluated June 23. The addition of pendimethalin to bromoxynil did not improve grass nore broadleaf weed control. No phytotoxicity was observed in any of the bromoxynil nor oxyfluorfen plots. When oxyfluorfen was applied only at the two-leaf onion stage, hairy nightshade control was incomplete.

The addition of DCPA or especially propachlor preemergence treatment significantly improved the weed control of the postemergence treatments (data not shown) and increased the onion yields. (Utah Agricultural Experiment Station, Logan, UT 84322.)

Effects of herbicide treatments on onion weed control and yield

	Rate (Kg/ha)		Weed Control[1]		Onion bulb weight (kg/4.5 m of row)		
Treatment	5-20-82	6-3-82	Broad-leaf	Grasses	Post emerg. only	+ DCPA (9 kg/ha)	+ propachlor (4.5 kg/ha)
bromoxynil		0.74	8.0	0	4.1	10.9	10.0
bromoxynil + pendimethalin		.74 + .54	7.0	0	6.2	10.1	13.3
oxyfluorfen (EC)	0.14 +	0.42	9.7	4.3	8.9	13.7	16.9
oxyfluorfen (WP + 1/4% oil)	0.14 +	0.54	9.3	3.3	10.8	11.6	15.8
oxyfluorfen (WP + 1/4% oil)	0.28 +	0.28	9.7	6.3	10.0	10.2	17.7
oxyfluorfen (EC)		0.54	9.7	8.7	8.9	14.3	12.7
oxyfluorfen (EC) + sethoxydim		.42 + .42	8.7	10.0	12.3	13.5	18.2
oxyfluorfec (EC) + fluazifop		.42 + .54	8.7	9.7	9.3	12.7	17.3
untreated			0	0	1.4	5.8	3.7

---

[1] rated 0-10; 10 = complete weed control. Broadleaf weeds present in untreated plots: common lambsquarters, common purslane, hairy nightshade, redroot pigweed, Venice mallow; grasses: barnyardgrass, stinkgrass, witchgrass.

Postemergence control of grassy weeds in onions. Beaver, Gary, J. M. Torell and R. H. Callihan. This study was initiated to investigate the efficiency of sethoxydim and fluazifop-butyl for late postemergence control of barnyardgrass and green foxtail in onions. Barnyardgrass was the predominant species. Herbicides were applied with a knapsack sprayer calibrated to deliver 374 l/ha of water carrier. The grasses had headed and were about 46-61 cm tall at the time of treatment. The experimental design was a randomized complete block with four replications.

Sethoxydim exhibited good activity on both grasses. Fluazifop-butyl provided activity on barnyardgrass but was weak on green foxtail. Neither herbicide resulted in any phytotoxity to the crop. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 82660)

POSTEMERGENCE CONTROL OF GRASSY WEEDS IN ONIONS

		Visual Evaluation[1/],[2/]					
		Crop		Grft		Bagr	
Herbicide	Rate	VR	SR	VR	SR	VR	SR
Sethoxydim + Crop Oil Concentrate	0.6 kg/ha + 2.3 l/ha	0	0	53	71	90	33
Fluazifop-butyl + Crop Oil Concentrate	0.6 kg/ha + 2.3 l/ha	0	0	41	45	83	3
Control		0	0	0	0	0	0

[1/] VR = Vigor Reduction; SR = Stand Reduction. 0-100 Scale

[2/] Grft = green foxtail; Bagr = barnyardgrass.

Preemergence herbicides for dehydrator onions. Bell, C.E. Several herbicides were evaluated for control of winter annual weeds under desert conditions in the Imperial Valley. Two trials were established on sandy loam soils. Herbicides were applied in 25 gal/A spray volume to dry soil after planting. Germination was accomplished using sprinklers. There were 4 replications in each trial. Trials were initiated in November, 1981.

Results from trial #1 show a lack of sufficient selectivity for bensulide, in addition to a lack of efficacy on rabbitfootgrass (Polypogon monspleliensis (L) Desf.) or nettleleaf goosefoot (Chenopodium murale L.). Pendimethalin, oxyfluorfen and oryzalin all showed very good control of the two weeds but a high degree of crop injury. DCPA was the only treatment to show good weed control and good crop safety. At harvest, DCPA and pendamethalin resulted in the highest yields.

In trial #2, bensulide gave similar results compared to trial #1. In this case for control of littleseed canarygrass (Phalaris minor Hitchc.). Oxyfuorfen and oryzalin again resulted in good weed control and in unacceptable crop injury. Propachlor and DCPA gave acceptable weed control without crop injury. (University of California Cooperative Extension, Imperial County, Court House, El Centro, Cal. 92243.)

Trial 1: Preemergence herbicide evaluation for onions

Treatment	lbai/A	rabbitfootgrass % control	nettleleaf goosefoot % control	phyto.	yield lb/A
bensulide	4	57.5	55	1	27334 b
bensulide	6	60.	70.	2	28042 b
bensulide	8	65.	67.5	2.3	24012 b
pendamethalin	1	100.	100.	4.5	37080 a
oxyfluorfen	.25	100.	100.	8.3	20582 b
oryzalin	1	100.	100.	6.8	26572 b
DCPA	14	100.	100.	1	39476 a
untreated control		0.	0.	1	28314 b

Trial 2:

Treatment	lbai/A	canarygrass % control	yield lb/A
bensulide	4	35	24611 bc
bensulide	6	52.5	25657 bc
bensulide	8	80.	23653 c
oxyfluorfen	.25	100.	9627 d
oryzalin	1	100.	4051 e
propachlor	4	87.5	32455 a
DCPA	14	70.	28053 abc
untreated control		0.	29534 ab

phytotoxicity rating: 1 = no injury, 10 = all plants dead.
numbers followed by the same letter are not statistically different at the .05% level according to Duncan's Multiple Range Test.

Toxicity of chloramben to onions and asparagus. Jordan, Lowell S. and James L. Jordan. Chloramben was applied either preplant or preemergence to plots that were planted with either onions ('Early Yellow Globe') or asparagus ('California 500-W'). Chloramben was applied using a tractor-mounted low pressure rig and 8004 nozzles. Rates used were 0, 1, 2, and 4 lbs/A of 50 wp formulation. Preplant treatments were applied to furrow-irrigated plots and incorporated with a power-driven rotary cultivator to a maximum depth of 1-1/2 inches. Preemergence treatments were applied to sprinkler-irrigated plots and incorporated with sprinkler water application. Soil had organic matter of 0.7%, sand of 69%, silt of 22%, clay of 9%, and a pH of 6.3. Plots were evaluated 6 weeks after herbicide application. Tests were replicated four times.

Onions were more sensitive than asparagus for preemergence applications of chloramben (table). Onions and asparagus were similar in their sensitivity to preplant incorporated applications of chloramben. Both preplant and preemergence applications of chloramben had similar toxicities to asparagus. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Injury ratings of asparagus and onions exposed to
either preplant or preemergence treatments of chloramben

Rate (lbs/A)	Asparagus		Onions	
	Preplant	Preemergence	Preplant	Preemergence
0	0	0	0	0
1	3	3	4	5
2	4	4	5	8
4	5	6	5	10

Comments: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

Bentazon directed applications for yellow nutsedge control in yellow danver onions. Kloft, P.J. and R.L. Collins. Bentazon, when broadcast, gave suitable yellow nutsedge control with varying degrees of crop tolerance. Directed applications of bentazon resulted in considerable to full yellow nutsedge control at the higher rates and repeated treatments. Crop tolerance was very favorable.

Two trials were established in the northern Willamette Valley of Oregon in plots 4 by 10 ft and replicated four times in a randomized block design. The uncultivated onions grew on 8-inch row spacings, a silt loam soil containing 5% organic matter and a pH of 6.3. The cultivated onions grew on 11-inch row spacings, a silt loam soil containing 8% organic matter and a pH of 6.5. 'Progress' variety seed was used in both trials which received a total of 18 inches sprinkler irrigation and rain.

Postemergence bentazon applications, using a plot sprayer, began when yellow nutsedge and onions had 4 to 6 and 3 to 5 true leaves, respectively. All applications were directed toward the lower 3 inches of crop, using a single nozzle. The broadcast application was made with a 4-nozzle boom. Mor-Act surfactant was applied with each treatment. Crop and weed foliage was dry during all applications. Three tillage operations were accomplished prior to the postemergence applications.

All treatments significantly reduced the number of yellow nutsedge nutlets in the soils sampled. Significant phytotoxicity was not observed during the trial. Crop tolerance ratings from plots treated with 8 lbs per acre differed little from those treated with 2 lbs per acre. (Student, Oregon State University, Corvallis, Oregon 97331, and Collins Agricultural Consultants, Inc., Hillsboro, Oregon 97123)

Table 1. Effect of directed bentazon applications without tillage.

Herbicide[1]	Rate lb ai/A	No applic.	Nutsedge control[2] 7/16/82	Nutsedge control[2] 7/31/82	Crop[2] 7/31/82	Nutlet[3] count 9/10/82	Yield[4] lb/40 ft^2
bentazon	0.5	2	1.5	1.2	0.4	38	19.1
bentazon	1.0	2	3.0	6.2	0.5	20	29.1
bentazon	2.0	2	5.5	9.2	0.8	12	24.9
bentazon	4.0	2	7.6	9.5	0.9	3	26.9
bentazon	1.0	3	2.8	9.6	0.5	4	25.3
bentazon	1.0	4	3.5	9.8	0.8	8	20.5
bentazon*	1.0	2	5.0	7.9	0.8	10	25.5
Check	0	-	0	0	0	74	15.6

Application dates: June 22, June 29, July 6, July 16, 1982.

Field planted April 28, 1982; harvested August 28, 1982.

Table 2. Effect of directed bentazon application with tillage.

Herbicide[1]	Rate lb ai/A	No applic.	Weed control[2] 7/6/82	7/31/82	Crop[2] 7/31/82	Nutlet[3] count 9/10/82	Yield[4] lb 40 ft^2
bentazon	0.5	2	0.6	1.8	0.5	17	30.8
bentazon	1.0	2	2.0	5.5	1.0	8	33.2
bentazon	2.0	2	2.8	8.5	1.0	8	34.1
bentazon	4.0	2	4.4	9.5	1.0	2	34.6
bentazon	1.0	3	2.0	9.5	1.0	4	40.1
bentazon	1.0	4	1.4	9.9	1.0	5	33.7
bentazon*	1.0	2	1.2	4.0	1.0	19	31.5
Check	0	-	0	0	0	29	30.8

Application dates: June 29, July 6, July 16, July 22, 1982.

Field planted April 22, 1982; harvested September 2, 1982.

*Broadcast sprayed

[1] All treatments applied with Mor-Act paraffin oil surfactant at 1 qt/A.

[2] 0 = no effect; 10 = complete control

[3] Based on one cubic foot sample per plot

[4] Including jumbo, medium, boiler, and cull graded onions.

Garlic tolerance to soil-applied herbicides for winter weed control. William, R.D. and Douglas Behrends. Garlic for seed production requires a winter weed control program in the Willamette Valley where conditions are milder than east of the Cascade mountains. Garlic was planted in mid-September into raised beds. The fall residual, soil-applied herbicides were applied soon after a paraquat treatment on October 12 and 13, 1981. The winter treatments were applied on January 31, 1982. All treatments were activated with rainfall. Three replications were included at two sites on sandy to gravelly loam soils. Weed control was acceptable in all treatments and generally persisted throughout the season. Garlic yields were reduced slightly only at the high rates of pronamide. Either postharvest handling procedures or all soil-applied herbicides increased rot 2 to 3 weeks after harvest. (Oregon State University Cooperative Extension and undergraduate student, Agricultural Engineering Department, OR 97331).

Garlic yield and weed control with fall and winter application times.

		Weed control ratings[1]		Garlic yield	
Herbicide	Rate (lbs ai/ac)	Harnisch	Schleggel	Fall	Winter
				(kg/66 sq ft)	
untreated	-	1.8	0	10.7	4.8
pronamide	0.5	7.5	7.8	-	4.3
pronamide	1.0	7.3	7.6	-	5.5
pronamide	2.0	7.7	7.5	-	4.4
pronamide	4.0	7.3	8.7	-	3.2
pronamide	8.0	8.7	8.6	-	3.5
napropamide	1.0	-	-	10.4	-
napropamide	2.0	7.2	7.5	12.6	6.1
napropamide	4.0	8.3	8.0	9.6	5.6
napropamide	8.0	8.0	9.3	9.7	4.7
ethalfluralin	0.96	7.7	8.2	8.7	5.9
ethalfluralin	1.31	8.5	8.8	9.9	4.9
ethalfluralin	1.50	8.3	7.6	10.4	4.9
oryzalin	1.0	7.0	7.9	10.0	4.8
oryzalin	2.0	7.0	8.3	9.7	5.3
pendimethalin	1.0	8.3	8.5	10.3	5.8
pendimethalin	1.5	7.5	8.5	10.3	5.2
pendimethalin	2.0	8.5	8.7	10.2	4.6
chloroxuron	3.0	8.2	8.7	-	5.7

---

[1] Evaluated 50 days after application. Rating 0 = no control; 10 = complete control.

Garlic tolerance to postemergence grass and broadleaf herbicides. William, R.D., Martin Zimmerman and Douglas Behrends. Garlic growers east of the Cascade Mountains rely on spring cultivation and postemergence herbicides, whereas Willamette Valley growers combine soil-applied and postemergence herbicides without cultivation for weed control. Treatments were applied in April to garlic 14 to 16 inches tall in the Willamette Valley and in June to garlic 6 to 8 inches tall in Jefferson County. Multiple applications were completed 2 weeks after the first application. Only slight leaf scorch was observed with high rates of oxyfluorfen. Oxyfluorfen controlled broadleaf weeds and the postemergence grass herbicides controlled wild oats (*Avena fatua* L.) and other grasses east of the Cascade Mountains (Oregon State University Cooperative Extension and undergraduate student , Agricultural Engineering Department, OR 97331).

Garlic yield and weed control
with postemergence grass and broadleaf herbicides.

		Yield		Weed control ratings[1]	
Herbicide	Rate (lb ai/ac)	W. OR	E. OR	Grass[2]	Broadleaf
		(kg/plot)	(g/plot)		
untreated	-	5.1	573	1.8	4.8
oxyfluorfen (WP)	0.25	5.1	398	2.0	4.0
oxyfluorfen	0.5	5.0	597	3.5	6.5
oxyfluorfen	1.0	6.1	565	3.0	6.2
oxyfluorfen	2.0	5.6	611	1.2	5.2
oxyfluorfen	0.25 + 0.25	5.8	644	1.5	6.2
oxyfluorfen	0.5 + 0.5	5.6	411	1.0	7.0
oxyfluorfen (EC)	0.125	5.7	548	3.8	7.0
oxyfluorfen	0.25	5.5	494	1.2	7.8
oxyfluorfen	0.5	6.7	766	6.5	8.0
oxyfluorfen	1.0	4.7	647	7.5	8.5
oxyfluorfen	0.125 + 0.125	6.1	619	4.2	6.8
oxyfluorfen	0.25 + 0.25	5.2	672	5.8	8.2
diclofop-methyl	1.0	4.7	608	0.8	5.2
diclofop-methyl	2.0	5.6	523	5.8	3.5
sethoxydim	0.5	5.5	710	7.0	4.2
sethoxydim	1.0	5.5	803	8.5	6.0
fluazifop-butyl	0.25	5.5	713	6.2	5.2
fluazifop-butyl	0.5	5.1	521	8.5	3.2
fluazifor-butyl	0.5 + 0.5	5.6	609	9.0	7.7
bromoxynil	0.5	-	618	2.2	8.0

[1] Rated within 30 days after application. Ratings 0 = no control; 10 = complete control.

[2] Mostly wild oats (*Avena fatua* L.).

<u>Selective black nightshade control in tomatoes.</u> Lange, A. H. and W. D. Edson. In earlier work acifluorfen has shown selective control of black nightshade in tomatoes. Another formulation and two related herbicides were compared with acifluorfen to evaluate their relative selectivities. Tomatoes were in the 3-4 inch stage and the black nightshade was in the 2-leaf stage, i.e., 1/3 inch high, on March 10, 1982. Each treatment was replicated 9 times in 4-inch pots. The herbicides were applied with a constant pressure plot sprayer using 100 gallons of water per acre rate. The pots were placed in a greenhouse.

Four days after treatment the nightshade was killed by most herbicides. The least active was bifenox. The two formulations of acifluorfen were the most selective giving the least injury to tomato and the most to the nightshade.

Oxyfluorfen was very active on the nightshade and the tomato. (University of California, Cooperative Extension, Parlier, CA 93648.)

A comparison of 4 postemergence herbicides for the selective control of black nightshade in tomatoes

Herbicides	Lb/A	Average[1/] Tomato Phyto-toxicity	Black Nightshade Control
Acifluorfen	1/16	3.7	9.6
Acifluorfen	1/8	4.0	9.8
Acifluorfen	1/4	4.6	9.9
Acifluorfen	1/16	3.9	9.8
Acifluorfen	1/8	4.6	9.9
Bifenox	1/8	5.3	8.4
Bifenox	1/4	6.8	8.4
Oxyfluorfen	1/32	7.6	10.0
Oxyfluorfen	1/8	8.9	10.0
Check (w/BNS)	-	0.0	0.0
Check (no BNS)	-	0.0	-

[1/] Average of 9 replications where 0 = no effect to plants and 10 - complete kill of plant. Treated March 10, 1982; Evaluated March 14, 1982.

The effect of timing and repeat applications of acifluorfen on the control of black nightshade in processing tomatoes. Lange, A. H. and W. D. Edson. A heavy stand of black nightshade in newly emerging Murietta tomato seedlings growing in a heavy soil northeast of Westley were sprayed May 19, 1982. The tomatoes were 1-1 1/2 inches high and the black nightshade was 1/2 to 3/4 inch across. These plots were resprayed on May 26 with 1/8 pound acifluorfen in 50 gallons per acre. On the May 26 date, a second set of new plots were sprayed. On June 3 this second set of plots were resprayed and a third set of plots were sprayed. This last set was not resprayed because in 2 weeks the black nightshade was obviously too big to control.

The control after the first application indicated fair black nightshade control and little or no phytotoxicity to the tomato plants. Later readings emphasized the importance of early sprays to slow down black nightshade seedlings followed by a higher rate thereby increasing the margin of selectivity. The June 9 rating showed excellent black nightshade control with insignificant phytotoxicity. These ratings were supported by fresh weights taken July 23. According to the fresh weight of the black nightshade and tomatoes an initial rate of 1/16 pound per acre and 1/8 pound per acre the first week followed by 1/8 to 1/4 pound per acre gave minimum nightshade weights and maximum tomato plant weights. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of sequential postemergence application of acifluorfen on black nightshade control in tomatoes

	Rate Per Acre Application Dates			Stage of Tomato Growth	Average Weights 1/	
Herbicide	May 19 +	May 26 +	June 3		Black Night-shade 2/	Tomato 3/
Acifluorfen	1/32 +	1/8		1 leaf	970	24.8
Acifluorfen	1/16 +	1/8		1 leaf	396	19.1
Acifluorfen	1/8 +	1/8		1 leaf	334	16.6
Acifluorfen		1/16 +	1/4	2-4 leaf	588	15.5
Acifluorfen		1/8 +	1/4	2-4 leaf	321	15.2
Acifluorfen		1/4 +	1/4	2-4 leaf	533	18.8
Acifluorfen			1/8	4-6 leaf	1066	11.5
Acifluorfen			1/4	4-6 leaf	1303	14.8
Acifluorfen			1/2	4-6 leaf	1033	12.7
Check					2181	8.1

1/ Average of 3 replications.

2/ Black nightshade - the entire plant was weighed. Weights taken in grams.

3/ Whole tomato plant and fruit was weighed. Weights taken in pounds and converted to kilos. Treatment dates indicated at top of table. Evaluated July 23, 1982.

The effect of acifluorfen on the general weed control and growth of young processing tomatoes. Lange, A. H. and W. D. Edson. A heavy stand of shepherdspurse and lambsquarters growing in a young plug planted tomato field was divided into small plots and sprayed April 28, 1982 with acifluorfen in water at 50 gallons per acre. The soil was a Delhi loamy sand. The plots were furrow irrigated.

The results showed the selective nature of acifluorfen. It controlled shepherdspurse at about 1/2 pound per acre but had little effect on the lambsquarters or the tomatoes below this rate. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of acifluorfen applied postemergence over young transplanted plug planted tomatoes and young weeds

		Average[1/]			
Herbicides	Lb/A	Shepherds-purse Control	Lambs-quarters Control	Phyto-toxicity	Tomato Vigor
Acifluorfen	1/16	3.2	0.2	0.0	9.5
Acifluorfen	1/8	3.5	0.8	0.2	10.0
Acifluorfen	1/4	5.5	1.8	0.2	8.8
Acifluorfen	1/2	8.0	2.5	3.8	6.0
Check	-	0.5	0.0	0.0	8.8

[1/] Average of 4 replications where 0 = no weed control or no phytotoxicity symptoms observed or no tomato growth and 10 = total weed control or all plants dead.
Treated April 28, 1982; Evaluated May 9, 1982; Vigor evaluated May 24, 1982.

The effect of chlorsulfuron on the control of black nightshade in processing tomatoes. Lange, A. H. and W. D. Edson. Extremely low rates of chlorsulfuron have been observed to selectively control black nightshade in direct seeded tomatoes. On July 22, 1982 prepared 30-inch beds of a Panoche clay loam soil were treated with 4 rates of chlorsulfuron in 100 gallons of water per acre. Tomatoes were transplanted and seeded August 2. One-half inch of sprinkler irrigation was applied July 23. Subsequent irrigation was by furrow.

The results show a high degree of black nightshade control even at 1/32 ounce per acre with little or no effect on transplanted tomatoes until 1/4 ounce per acre had been applied. Chlorsulfuron appeared to be much weaker on grassy weeds than broadleaf weed species. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of chlorsulfuron applied preemergence on transplanted and direct seeded tomatoes and weed control

		Average[1/]			
		Tomato Vigor		Weed Control	
Herbicide	Oz/A	Trans- planted	Direct Seeded	Black Nightshade	Water- grass
Chlorsulfuron	1/32	7.5	4.2	7.2	1.5
Chlorsulfuron	1/16	7.8	6.2	7.0	6.2
Chlorsulfuron	1/8	7.2	5.5	9.5	3.0
Chlorsulfuron	1/4	5.0	3.5	9.8	6.8
Check	-	7.5	5.5	5.0	3.2

[1/] Average of 4 replications where 0 = no vigor or no weed control and 10 = healthy tomato plants or best weed control. Tomatoes transplanted on August 2, 1982 and seeded the same day. Evaluated August 20, 1982.

A comparison of four chemicals for dodder control in a greenhouse study. Lange, A. H. and W. D. Edson. Seven to ten-inch tomatoes with about 10 true leaves were sprayed April 2, 1982 and April 14 (for the retreatment) with chemicals in 100 gallons of water per acre. Each plant growing in a 6-inch pot was heavily infested with dodder, cut and placed on the plant a few days before treatment allowing attachment to take place.

The results were somewhat erratic, but suggest better control and less tomato phytotoxicity with mefluidide than with glyphosate or NAA. The NAA may have had a stimulating effect when repeat applications were made. The combination with glyphosate did not improve control.

None of the treatments reduced tomato vigor when chemicals were applied to 7 to 10-inch tomatoes. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of five chemical treatments
on the control of attached and unattached dodder on tomatoes

		Average[1/]		
		Dodder Control		Tomato Vigor
Herbicide	Rate	April 16	April 27	April 27
Glyphosate	1/16 Lb/A	6.0	7.2	7.8
Glyphosate	1/8 Lb/A	6.5	5.2	7.5
Mefluidide	1/16 Lb/A	4.5	6.2	7.2
Mefluidide	1/8 Lb/A	9.8	9.8	7.5
NAA	50 ppm	8.5	9.2	8.5
NAA	50+50 ppm	4.8	3.5	7.8
NAA	100 ppm	6.2	5.0	7.2
NAA	100+100 ppm	3.5	1.0	8.8
Glyphosate+NAA	1/16 Lb/A+50 ppm	5.5	5.0	7.2
Glyphosate+NAA	1/32 Lb/A+100 ppm	5.0	4.8	6.5
Check	-	6.5	6.8	8.0

[1/] Average of 4 replications where 0 = no control of dodder or no tomato growth and 10 = best control of dodder or healthy tomato plants. Treated April 2, 1982. Retreated April 14, 1982. Evaluation dates indicated at top of table.

The effect of over-the-top sprays of glyphosate on attached dodder. Lange, A. H. and W. D. Edson. Dodder has been controlled in field and greenhouse trials selectively in tomatoes in previous work. The objective of this field trial in a commercial field near Crow's Landing was to evaluate glyphosate under commercial growing conditions.

On July 2, 1982 three rates of glyphosate in 100 gallons per acre were applied to a heavy infestation of dodder in 7-10 inch high tomatoes under furrow irrigation. The check plots and the lowest rates were treated with 1/16 pound per acre of glyphosate also on July 9.

On July 23 all plots were sprayed with 1/4 pound of glyphosate per acre in 200 gallons per acre of water.

The early treatment showed good dodder repression with considerable reduction in tomato vigor at all rates. Black nightshade was not greatly affected except at 1/8 pound per acre.

On August 6 the plants were cut off at ground level and weighed. The fresh weight of vine and fruit indicated considerable reduction especially at 1/8 pound per acre initially followed by the late 1/4 pound spray. Most of the reduction was due to the early stunting.

From the results it would appear that more work on timing and varieties is warranted. Even rates as low as 1/64 pound on younger dodder and younger tomatoes should be tried followed by somewhat higher rates at weekly intervals. Rates need to be established which will not affect tomato growth but that will effect young dodder preferably before attachment.

The effect of repeat sprays of glyphosate on dodder in young tomatoes

Herbicide	Application Rates & Dates July 2 + July 9 + July 23					Average[1/] Tomato Vigor	Average[1/] Dodder Control	Tomato Fresh Weight/Plot[2/]
Glyphosate	1/32	+	1/16	+	1/4	5.0	6.3	72.8
Glyphosate	1/16	+	-	+	1/4	4.7	6.3	73.2
Glyphosate	1/8	+	-	+	1/4	2.0	8.3	33.1
Glyphosate	-	+	1/16	+	1/4	6.3	5.7	97.8
Check			-			0.0	0.0	*

1/ Average of 3 replications where 0 = no vigor and no control and 10 = best possible tomato growth and best weed control. Treatment dates indicated at top of table. Evaluated August 1, 1982.

2/ Weights measured as pounds per plot. Average of 3 replications.

* Check weight not taken; plants matted flat.

Broadleaf weed control in cucurbits. Anderson, J.L. and M.G. Weeks. Growers of melons and squash for the fresh market have requested help for a control program of broadleaf weeds. This study was established to evaluate some of the promising herbicides and herbicide combinations for weed control in cucurbits. Plots, 4 m in length, were replicated three times in a randomized complete block design at the Farmington Field Station, Davis County, Utah on a sandy loam soil having an organic matter content of 1.1%. Plots were planted with one row of crenshaw, Crimson Sweet watermelon, 4-50 muskmelon, Pink Banana squash, and Marketmore cucumber on May 5, 1982. Herbicides were applied one day later at 300 l/ha with a pressurized bicycle sprayer. One series of plots was sprinkled for three hours immediately following treatment to aid in herbicide activation. An additional 1.1 inch of rain fell within a week after treatment. Plots were then furrow irrigated following crop emergence.

The cucurbits varied in their tolerance to the herbicide treatments. Watermelon appeared to be more tolerant to naptalam than squash; for all other treatments squash showed more tolerance than the other cucurbits. Chloramben caused a slight stunt of watermelon and cucumbers. Alachlor was recommended to be tried in combination with PPG 603 to bolster control of grassy weeds. Alachlor provided good weed control but severly reduced the stand of all cucurbits except squash; squash was stunted by alachlor treatment but recovered. The cucurbits showed good tolerance to PPG 603, ethafluralin, or oryzalin treatment. Oryzalin failed to control hairy nightshade and shepherdspurse; ethafluralin was also week on these weed species, especially in the unsprinkled plots. PPG 603 plots contained lambsquarters, purslane, hairy nightshade and Russian thistle. The untreated plots contained in addition to these broadleaf weeds, redroot pigweed, and Venice mallow. Cucumber yields of the sprinkled plots treated with ethafluralin, chloramben + naptalam, and PPG 603 exceeded twice that of the untreated plots. (Utah State University, Logan, UT 84322)

Response of cucurbits and broadleaf weeds to preemergence herbicide treatments.

Treatment	Rate (kg/ha)	non-sprinkled plots		sprinkler incorporated	
		cucurbit[1] vigor	weed[2] control	cucurbit[1] vigor	weed[2] control
bensulide + naptalam	4.5 + 2.2	8.3	7.1		
chloramben	1.7	7.0	7.7	9.0	8.4
chloramben + naptalam	1.7 + 2.2	6.0	9.6	8.2	9.3
ethafluralin	0.8	10	4.6		
ethafluralin	1.1			10	9.0
ethafluralin	1.7	10	7.1		
oryzalin	0.8	10	4.7		
oryzalin	1.7	10	5.1		
PPG 603	0.6			9.7	6.5
PPG 603	0.8	10	6.7	10	6.3
PPG 603	1.1			9.7	7.2
PPG 603 + alachlor	0.8 + 2.2			4.0	9.7
PPG 603 + alachlor	1.1 + 2.2			3.5	9.8
alachlor	2.2			4.0	9.6
untreated	---	10	1.5	10	0.5

[1] rated 0-10; 10=healthy plants of each of the following cucurbits: cucumber, crenshaw, muskmelon, squash, watermelon

[2] rated 0-10; 10 = complete control of broadleaf weeds (common lambsquarters, hairy nightshade, redroot pigweed, Russian thistle, shepherspurse, Venice mallow)

Annual weed control in cucumbers with preemergence herbicides. Peabody, D.V. A field experiment was established to evaluate several preemergence herbicides and herbicide combinations for annual weed control and as to their effect on growth and yield of cucumbers. All treatments were replicated four times on single row plots 15 feet long (rows 5 feet apart) in a randomized complete block design. The soil was a silt loam with 4% organic matter with a pH of 6.4. On May 21, 1982 cucumber seed (cultivar Pioneer) was machine planted 0.5 inches deep and approximately 1 inch apart. All treatments were applied on May 25, 1982 with a compressed air sprayer mounted on an Allis-Chalmers G tractor in 45 gpa. Cucumbers started to emerge May 31, 1982. Estimates of control of the predominant annual weed species were made by means of a rating system (1 - no control to 5 - weed eradication) on July 21, 1982. Cucumbers were harvested five times from the center 5 foot section of each row at 5 to 6 day intervals starting August 4, 1982. (Only total yield from each treatment is recorded in the Table.)

Acetochlor and the naptalam combinations with diethatyl or acetochlor caused extensive cucumber injury and stand reduction. The two herbicide combinations which resulted in good to excellent annual weed control with no significant reductions in yield as compared to the handweeded check were: (1) the proprietary, package combination of naptalam with dinoseb-sodium salt and (2) the tank mix of ethalfluralin at 3 lb ai/A with oryzalin at 1.5 lb ai/A. (Northwestern Washington Research and Extension Unit, Washington State University, Mount Vernon, WA 98273-9788).

Effect of preemergence herbicides on annual weed control and total yield of cucumber fruit

Herbicide	Rate	Cucumbers[1/][2/]		Weed control rating[3/][4/]								
	lb ai/A	no/plot	g/plot	GWR	COCW	COLQ	SHPU	POAM	PESW	PRKW	COGR	HEBI
weedy check		353.5c-d	14176a-c	1.0	1.0	4.0	2.8	4.0	3.5	3.3	4.0	3.5
handweeded check		386.6a-b	15267a	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
dinoseb-amine	1.5	408.2a	15843a	3.8	3.9	4.8	5.0	4.5	4.8	4.8	4.8	4.5
dinoseb-amine	3.0	404.6a	16488a	4.5	4.6	4.8	5.0	5.0	5.0	4.8	5.0	5.0
naptalam	4.0	367.3a-b	14581a-b	3.0	3.5	4.0	5.0	4.8	4.8	3.9	5.0	4.5
naptalam	4.0	313.8c-e	12063c-d	3.0	3.6	4.0	4.9	5.0	4.5	4.3	5.0	4.0
naptalam + dinoseb-Na	3.0+1.5	383.4a-b	15032a	4.8	4.8	4.8	5.0	5.0	5.0	4.8	5.0	5.0
ethalfluralin	3.0	376.9a-b	15523a	3.8	3.8	4.8	4.3	4.8	4.8	5.0	3.8	5.0
oryzalin	1.5	358.6a-c	14958a	1.8	2.3	4.8	3.8	4.3	3.8	2.0	3.5	4.0
ethalfluralin + oryzalin	1.5+1.5	342.1b-d	14832a	3.6	3.5	5.0	4.0	4.8	5.0	5.0	4.0	4.5
ethalfluralin + oryzalin	3.0+1.5	369.1a-b	14607a-b	4.3	4.5	5.0	4.3	5.0	5.0	5.0	4.3	5.0
ethalfluralin + oryzalin	1.5+0.75	362.1a-c	14593a-b	3.6	3.8	5.0	4.8	5.0	4.3	4.5	4.5	5.0
ethalfluralin + oryzalin	3.0+0.75	317.9c-e	12397b-d	4.4	4.5	5.0	4.6	5.0	5.0	5.0	4.4	5.0
mefluidide	2.0	297.3d-e	12539b-d	3.5	3.5	4.5	5.0	5.0	5.0	4.0	4.8	4.3
diethatyl	4.0	301.5d-e	11562d	1.5	1.0	4.8	4.3	5.0	5.0	3.3	5.0	3.8
acetochlor	3.0	--	--	4.9	5.0	5.0	5.0	5.0	5.0	4.9	5.0	5.0
diethatyl + naptalam	4.0+4.0	293.6e	11092d	4.3	3.9	4.8	4.5	4.5	5.0	4.8	5.0	4.8
acetochlor + naptalam	3.0+4.0	--	--	4.9	5.0	4.9	5.0	5.0	5.0	5.0	5.0	5.0
mean		352.3	14097									
se$\bar{x}$		15.0	746.8									
cv		7%	12%									

Effect of preemergence herbicides on annual weed control and total yield of cucumber fruit - cont.

[1] Means within a column followed by the same letter are not significantly different at the 5% level of probability as determined by Duncan's multiple range test.

[2] Values are averages of four replicates of the total yield of five separate pickings.

[3] Ratings are an average of two separate observations of four replications. 1 = no control, 2 = poor control, 3 = fair control, 4 = commercially practical control, 5 = weed eradication.

[4] Weed designations: GWR = general weed rating; COCW = chickweed, common; COLQ = lambsquarters, common; SHPU = shepherds purse; POAM = Powell amaranth; PESW = smartweed, Pennsylvania; PRKW = knotweed, prostrate; COGR = groundsel, common; HEBI = henbit.

Watermelon tolerance to ethalfluralin and napropamide incorporated with irrigation and a nailboard. William, R.D. and Lynn Hall. Watermelon seed were planted in a fine sand soil on April 26, 1982 in an experiment with 3 replications. The herbicides were applied on April 29 and incorporated with 0.25 inch overhead irrigation or a nailboard. Bent nails are dragged in two-2 x 12's immediately after herbicide application, but before irrigation. Ethalfluralin incorporated with overhead irrigation and napropamide at 1.5 lb ai/ac incorporated with a nailboard provided acceptable weed control with adequate crop tolerance. Napropamide did not control weeds when incorporated with overhead irrigation in this trial. (Oregon State University Cooperative Extension, OR 97331).

Weed control in watermelons, Hermiston, OR.

Herbicide	Rate (lbs ai/ac)	Weed control Rating[1]	Weed control Time[2] (min.)
untreated		0	22
ethalfluralin	0.96	6	16
ethalfluralin	1.31	7	12
ethalfluralin	1.50	7	7
napropamide	1.0	5	19
napropamide	1.5	3	20
napropamide	2.0	4	13
napropamide (nailboard)	1.0	5	10
napropamide (nailboard)	1.5	7	8

[1] Rating 0 = no control; 10 = complete control of barnyardgrass and mixed broadleaf weeds.

[2] Time required to weed plots in minutes.

A comparison of metolachlor with five preplant incorporated herbicides in snap beans. Mitich, L.W., P.P. Osterli, and S.A. Fennimore. A trial was established in snap beans at Del Puerto Farms near Patterson, California, to compare the crop tolerance and weed control effectiveness of metolachlor with five preplant incorporated herbicides.

Procedure. The trial was initiated on July 2, 1982, when the herbicides were applied and the beans planted. A randomized complete block design was used, and each plot was 5 ft. wide (one twin-row bed) by 25 ft. long. Each treatment was replicated four times. The herbicides were applied with a CO_2 backpack sprayer at a volume of 30 GPA, and all treatments were incorporated to a depth of 2 inches immediately following application. Weed control and phytotoxicity ratings were taken August 11, 1982. Water was supplied by furrow irrigation as needed throughout the growing season.

Herbicide performance. Alachlor at 3.0 lb/A and metolachlor at 2.5 lb/A gave 100% control of yellow nutsedge, but of all the herbicides tested, only diethatyl gave comparable (95%) control of nutsedge. All of the other herbicides gave less than 60% control of nutsedge with ethalfluralin at 0.75 lb/A giving the least control. Most of the herbicides tested gave greater than 80% control of black nightshade with the exception of naptalam at 2.0 lb/A, ethalfluralin at 0.75 lb/A and chlorambem. None of the herbicides caused more than very slight injury. The crop was not harvested for yield. (University of California Cooperative Extension, Davis, CA 95616)

Preplant incorporated herbicides in green beans, Stanislaus County, California

		% Control		
Herbicide	lb/A	Yellow nutsedge	Black nightshade	Crop phytotoxicity[1/]
naptalam	2.0	47.5	57.5	0.25
naptalam	4.0	57.5	82.5	0.75
alachlor	2.0	97.5	90.0	0.0
alachlor	3.0	100.0	100.0	0.75
metolachlor	0.25	92.5	82.5	0.0
metolachlor	2.5	100.0	97.5	0.0
ethalfluralin	0.75	37.5	62.5	0.25
ethalfluralin	1.5	50.0	95.0	0.5
diethatyl	3.0	95.0	82.5	0.0
diethatyl	4.0	95.0	92.5	0.25
chloramben	3.0	47.5	60.0	0.0
control	-	35.0	32.5	0.0

[1/] Phytotoxicity ratings 0 = no phytotoxicity, 10 = dead crop

Herbicide evaluation in sweet corn. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was conducted to evaluate selected herbicides for weed control in sweet corn. Herbicides were applied with a knapsack sprayer calibrated to deliver 140 l/ha for preplant incorporated, preemergence surface and directed postemergence applications, and 374 l/ha for postemergence treatments. Preplant incorporated, preemergence, postemergence and directed postemergence were applied on May 20, May 25, June 24 and July 6, respectively.

Sweet corn, variety white lightning, was planted on May 21, 1982 at 29,000 plants per acre.

EPTC^{+} at 4.5 kg/ha, EPTC^{+}/Extender at 3.4 and 4.5 kg/ha, XRM-4640 (Dowco 356) + atrazine at 0.8 + 1.1 kg/ha, alachlor + atrazine at 2.5 + 1.7 kg/ha and metolachlor + atrazine at 2.2 + 1.8 kg/ha provided excellent broad-spectrum weed control. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660)

Table 1. Herbicide evaluation in sweet corn
Effect of herbicide treatments on weed control

			Visual Evaluation[3/],[4/]							
	Rate	Type of[2/]	Piwe		Colq		Hans		Grass[5/]	
Treatment[1/]	kgai/ha	Application	VR	SR	VR	SR	VR	SR	VR	SR
EPTC$^+$	4.5	PPI	0	93	67	98	20	95	33	99
EPTC$^+$/Extender	3.4	PPI	0	85	37	95	53	93	80	93
EPTC$^+$/Extender	4.5	PPI	0	93	33	95	37	98	78	96
Vernolate$^+$	4.5	PPI	43	97	73	98	10	73	73	96
Vernolate$^+$/Extender	4.5	PPI	33	90	3	93	7	33	52	95
Bromoxynil + MCPA	0.2 + 0.2	DP	47	73	73	93	70	53	8	0
Bromoxynil + MCPA + Atrazine	0.2 + 0.2 + 1.1	DP	68	93	90	99	73	97	47	8
PPG-844 + Alachlor	0.3 + 2.5	PPI	0	95	0	92	7	95	20	93
PPG-844	0.3	PES	0	32	3	32	0	38	3	45
PPG-844	0.5	PES	0	33	0	30	27	60	0	10
PPG-1259	0.06	Post	13	33	0	47	33	33	0	30
PPG-1259	0.12	Post	15	60	0	33	8	33	3	0
PPG-1259	0.18	Post	3	60	0	55	37	65	0	27
PPG-1259	0.24	Post	60	96	42	93	100	100	3	7
XRM-4640 + Atrazine[6/]	0.8 + 1.1	Post	100	100	100	100	100	100	47	95
Alachlor + Atrazine	2.5 + 1.7	PPI	37	95	67	97	27	98	10	98
Metolachlor + Atrazine	2.2 + 1.8	PPI	67	98	100	100	47	99	33	98
Alachlor + 2,4D ester[7/]	2.5 + 0.3	PES + DP	65	48	85	75	80	48	0	0
Weedy Check			0	0	0	0	0	0	0	0
Handweeded Check			100	100	100	100	100	100	100	100

[1/] The + superscript indicates that the formulation contained R-25788, a crop protectant. Formulations with an extender contained R-33865.

[2/] PPI = preplant incorporated, PES = preemergence surface, post = postemergence, DP = directed postemergence. PPI, PES, post and DP treatments were applied on May 20, May 25, June 24 and July 6, respectively.

[3/] VR = Vigor Reduction, SR = Stand Reduction. 0-100 scale. Evaluations were conducted on June 17 for PPI and PES treatments and on August 14 for the post and DP treatments.

[4/] Weed abbreviations: Piwe = pigweed (redroot pigweed and Powell amaranth), Colq = common lambsquarters, Hans, hairy nightshade

[5/] Barnyardgrass and green foxtail were present with barnyardgrass being the predominant species.

[6/] Applied with crop oil concentrate at 2.3 l/ha. XRM-4640 is a formulation of Dowco 356.

[7/] Mean VR-SR values on June 17, 1982 were 0-77, 0-93, 30-93 and 27-87 for PW, Colq, Hans and grass, respectively. The values in the table are for the evaluations on August 14.

Toxicity of alachlor and triallate to lettuce. Jordan, Lowell S. and James L. Jordan. The toxicity of preemergence treatments of alachlor and triallate to lettuce ('Great Lakes 659') was investigated. Alachlor was applied preemergence at either 1 or 2 lbs/A with 8004 nozzles at 50 gpa with a tractor-mounted low pressure sprayer. Each test was replicated four times. Subplots were 5 ft. wide and 20 ft. long. Plots were sprinkler irrigated. Plots were evaluated six weeks after alachlor and triallate applications.

Alachlor and triallate are both toxic to lettuce (Table). Results are summarized in the table. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Toxicity of alachlor and triallate to lettuce

Rate (lb/A)	Injury[1/]	
	Alachlor	Triallate
0	0	0
1	8	8
2	10	10

[1/] Injury Ratings: 0 = no injury; 8 = very severe chlorosis, marginal burn or stunting--also, had an 80 to 90% plant loss; 10 = all plants died.

Annual grass control in carrots with fluazifop-butyl (Fusilade). Crabtree, Garvin, Carol Garbacik, and Anna Muh. Current weed control programs for carrots in western Oregon are based primarily on the use of linuron. Linuron is effective on a wide range of weed species but a greater degree of control of annual grasses, especially barnyardgrass, would be desirable. An evaluation of fluazifop-butyl for potential use as a selective herbicide for grass control in carrots was made in 1982 at Corvallis, OR.

Carrots were seeded into a very light sandy soil in May and maintained free of broadleaf weeds by cultivation and hand weeding. Grass weeds were allowed to grow in the seeded rows. Linuron at the rate of 1 lb ai/ac and fluazifop-butyl at rates of 0.25 and 0.50 lbs ai/ac were sprayed on June 16, when the largest barnyardgrass plants and the carrots were in the 3 to 4 leaf stage. Barnyardgrass control was evaluated by visual ratings and stand and yield determinations were made for carrots at normal harvest maturity.

Fluazifop-butyl at either the 0.25 or the 0.50 lbs ai/ac rates resulted in significant reductions in stand and growth of barnyardgrass when compared to the linuron or untreated plots. All fluazifop-butyl plots remained essentially free of barnyardgrass up to the time of harvest (September 28), with the single application of herbicide.

Carrot stand and yield did not appear to be affected by the fluazifop-butyl and yield increases (fluazifop-butyl 0.25 lbs ai/ac = 8.88 kg/plot, 0.50 lb ai/ac = 9.43 kg/plot, untreated = 6.05 kg/plot) were attributed to the interference of crop plant growth by the barnyardgrass in the untreated plots. No completely hand weeded plot was included in this trial. (Department of Horticulture, Oregon State University, Corvallis, OR 97331).

Tolerance of crucifer crops to alachlor, metolachlor, and propachlor. Crabtree, Garvin, R.D. William, and Anna Muh. Commercial production of several cruciferous crops for food and seed is an established industry in western Oregon and there is interest in the addition of other crops in this family. A significant part of production costs is involved in weed control, especially where cruciferous weeds are present.

Two trials were conducted near Corvallis, OR in 1982 with planting dates on May 14 and July 15, in a field heavily infested with wild radish, in addition to a mixture of other common broadleaf summer annual species. All crops were direct seeded, except for the inclusion of transplanted cauliflower in the second planting. Herbicides were sprayed 4 and 1 days after planting in the May and July trials, respectively. Plots received a light overhead irrigation the day following herbicide application. Plots were cultivated, but only the untreated plots were maintained relatively weed free. Weed pressures were great enough to interfere with crop growth, especially at the lower herbicide application rates.

Fresh weights recorded in the following table were obtained by harvesting the total above ground portion of the crop plants, except for the root crops which included the total plant fresh weight as pulled from the soil. Since responses to the herbicide applications were very similar for the trials established in May and July yields were averaged from the combined dates, except where noted.

Our general conclusions are (1) that these crops did not have an adequate margin of safety for the use of alachlor under the conditions of these trials. (2) All crops were somewhat more tolerant of comparable rates of propachlor than metolachlor, but higher application rates of propachlor were needed to provide comparable levels of weed control. (3) There were differences in tolerance to these three herbicides between crops with broccoli and kohlrabi appearing to be the most tolerant. (4) There were interactive responses between herbicides and crops with radish, daikon radish, and turnip showing moderately good tolerance to propachlor but not to metolachlor. (Department of Horticulture, Oregon State University, Corvallis, OR 97331).

Fresh weight yield (kg/plot) of 12 crucifer crops following application of alachlor, metolachlor and propachlor at 6 rates each.

	Weed Control Treatment[1]																		
	Alachlor						Metolachlor						Propachlor						Weeded check
Crop	1	2	2½	3	4	8	1	2	2½	3	4	8	1	2	2½	3	4	8	
Cabbage[2]	1.0	1.2	1.4	0.4	0.6	0.2	0.6	1.4	1.0	2.4	0.9	0.7	0.6	1.2	0.9	1.6	1.6	1.4	1.1
Broccoli[2]	1.3	1.2	1.0	4.5	0.8	0.3	1.6	1.4	1.7	1.3	1.2	1.7	1.8	1.4	1.8	0.1	1.6	1.2	2.2
Cauliflower (seeded)[2]	0.6	0.4	0.9	0.6	0.8	0.1	1.0	0.6	0.5	0.5	0.6	0.4	0.8	1.5	0.6	0.7	0.8	0.6	1.7
Cauliflower (transplanted)[2]	3.5	2.4	2.9	1.6	3.8	1.0	1.6	3.1	3.2	2.8	2.6	1.0	1.2	2.2	2.4	3.4	2.7	2.1	2.4
Brussels sprouts	0.4	0.5	0.5	0.3	0.3	0.2	0.3	0.7	0.4	0.5	0.3	0.2	0.1	1.0	1.5	0.4	0.5	0.4	0.2
Kohlrabi	1.5	1.1	1.2	1.1	0.9	0.7	1.2	1.3	1.1	1.5	1.2	0.6	1.2	1.6	1.1	1.6	1.5	1.6	1.6
Collards	1.2	1.2	1.1	0.9	0.5	0.5	1.2	2.7	5.1	0.7	1.0	0.7	1.2	1.6	1.0	1.4	1.2	1.2	1.7
Kale	1.6	1.2	1.3	0.8	0.9	0.7	1.3	1.8	1.6	1.1	1.0	0.9	0.9	1.5	1.1	1.2	1.3	0.9	2.0
Chinese cabbage (Pak-Choy)	4.0	2.3	2.5	1.4	1.3	0.6	5.7	2.2	3.7	2.7	3.3	2.0	3.9	5.6	3.9	4.2	4.8	3.4	4.4
Chinese cabbage (Michili)[2]	5.2	1.5	0.8	1.0	0.0	0.0	6.7	6.2	4.5	2.2	0.6	0.2	6.2	5.7	7.6	4.7	5.7	3.6	6.7
Turnip	3.6	1.6	2.9	2.2	0.8	0.2	4.3	3.4	3.8	2.4	2.6	3.4	3.6	5.9	3.8	3.9	3.8	3.4	4.6
Rutabaga	1.9	1.3	1.4	1.4	1.3	0.2	2.0	1.6	1.7	1.7	2.0	1.8	1.3	3.5	1.2	1.7	2.0	1.9	1.8
Radish[3]	1.6	1.4	1.2	0.9	0.8	0.7	2.7	1.5	1.2	0.8	1.0	0.7	1.0	1.2	0.9	1.1	0.6	1.3	---
Daikon radish	4.9	4.5	5.1	4.1	3.6	3.2	4.6	5.0	4.6	4.3	4.6	3.7	4.4	4.4	4.8	5.1	4.9	4.7	4.8

[1] lb ai/ac

[2] Yield from July planting only.

[3] Yield from May planting only.

Tolerance of crucifer seed crops to winter applications of simazine, pronamide and endothall. Hanson, E.J., R.L. Rackham and R.D. William. Representatives of western Oregon seed companies have been conducting field trials in order to register simazine, pronamide and endothall for use on several vegetable crops they grow for seed. The volunteers were trained in field plot techniques and supervised during field operations by extension personnel. We were able to improve our efficiency and accomplish much more with the cooperation of the seed companies. Twenty trials were initiated in 1981-82 and three forths of these provided good to excellent results.

One large trial was conducted in the Willamette Valley to assess the tolerance of cabbage, kale, collards, kohlrabi and brussel sprouts to simazine, pronamide and endothall. Single rows of each crop were planted October 1, 1981. Herbicides were applied over five crops with a 16 ft boom in 20 gal water/A. Simazine and pronamide treatments were applied on January 18, 1982, and endothall treatments on March 19, 1982. Plots were evaluated for crop phytotoxicity by visual ratings on April 7, 1982. Seed samples were collected in July for germination tests.

Simazine, at the 1.6 lb and 3.2 lb rates, resulted in moderate injury to kohlrabi, slight injury to collards and kale, and minimal injury to cabbage and brussel sprouts. The cabbage and brussel sprouts were larger than the other crops at the time of application. All crops tolerated pronamide up to the 4.0 lb rate, where slight to moderate injury was observed. Kohlrabi was the most sensitive to both simazine and pronamide. The 3.0 lb and 6.0 lb rates of endothall resulted in reduced vigor and necrosis of all crops. Some necrosis was observed at the 0.75 lb and 1.5 lb rates, but the plants seemed to recover from this quickly. We found no influence of the herbicides on the seed germination percentage. (Oregon State University Cooperative Extension, OR 97331).

Crucifer tolerance to simazine, pronamide and endothall

		Phytotoxicity Rating[1/]				
Treatment	Rate (lb ai/A)	Cabbage	Collards	Kale	Brussel Sprouts	Kohlrabi
Check	0	0	0	0	0	0
Simazine	0.4	0.1	0.1	0.1	0.1	0.7
Simazine	0.8	0.1	0.1	0.0	0.2	1.2
Simazine	1.6	0.5	1.4	1.2	0.8	4.0
Simazine	3.2	0.7	2.3	3.2	1.4	5.8
Check	0	0	0	0	0	0
Pronamide	0.5	0	0	0.6	0.2	0
Pronamide	1.0	0.1	0	0.3	0.1	0.1
Pronamide	2.0	0.1	0.6	0.4	0.4	0.4
Pronamide	4.0	3.6	3.7	2.4	3.8	4.5
Check	0	0	0	0	0	0
Endothall	0.75	1.1	0.4	0.3	1.5	0.8
Endothall	1.5	2.1	1.3	0.9	1.9	1.9
Endothall	3.0	3.3	3.4	3.1	3.3	3.9
Endothall	6.0	4.6	5.4	4.6	6.0	5.8

[1/] Phytotoxicity rating: 0 = no injury, 10 = complete kill. All ratings average of 4 replications.

The effect of water-band application of metham on weed control in a Delhi loamy sand. Lange, A. H. and W. D. Edson. Thirty-inch prepared beds were seeded April 13 and treated with metham in water on April 14, 1982. At 2, 6, and 8 days after treatment, additional water was applied with a rain simulator at rates of 1/8, 1/2 and 2 acre inches (A") of water.

The weed control was excellent for all rates of metham and amounts of water for incorporation. Breaking the crust did not affect corn vigor or weed control. Adding water with the rain simulator did not significantly affect the 1/4 acre inch of water for incorporation. However, increasing the amount of subsequent water did reduce the weed control at 1/8 inch with the 50 gallon per acre rate of metham. The 100 gallon per acre rate did not show an effect of additional water.

In June fresh weights of the weeds remaining in the plots clearly showed additional weed control at the 1/8 inch level of incorporation with the additional 1/8 to 1/2 inch of water, but not with 2 inches.

Both levels of metham and water for incorporation gave excellent reduction of weed growth in these plots. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of subsequently applied water on
water-banded applications of metham
as expressed by the control of broadleaf weeds

			Average Plant Weight[1/]			
			Inches of Additional Water			
Herbicide	Gal/A	Water for Incorp.	0	1/8"	1/2"	2"
Metham	50	1/8 A"	430	292	255	461
Metham	50	1/4 A"	187	207	215	226
Metham	100	1/8 A"	300	274	178	303
Metham	100	1/4 A"	147	150	130	142
Check	-	1/8 A"	2621	1358	3303	1406
Check	-	1/4 A"	1924	1528	4746	2001

1/ Average of 3 replications. Weeds taken from one 10-foot bed. Weights measured in grams. Weeds present: mainly lambsquarters with some shepherdspurse.

The effect of water-band metham on hot summer soils. Lange, A. H. and W. D. Edson. Thirty-inch beds of a dry Panoche clay loam at the West Side Field Station, Five Points, California were treated with metham in three levels of water on July 22, 1982. Half of the treated plots were covered with clear plastic and half were uncovered. The entire experimental area was then sprinkler irrigated on July 23 to see if the additional 1/2 inch of water would move the metham out of the seed zone or in some other way affect the metham's activity.

The kill of seeded black nightshade was excellent where 1/4 acre inch of water was used to incorporate the metham. An additional 1/2 acre inch of sprinkler irrigation on certain plots did not improve the black nightshade control but appeared to improve the control of naturally occurring barnyardgrass.

There was little or no effect of metham on tomatoes transplanted 10 days after treatment. The additional 1/2 acre inch of water did not produce an effect on the transplanted tomatoes.

The direct seeded tomatoes were more difficult to evaluate, but may have been affected more by the additional water. The results were not clear cut.

The high rate of chloramben applied by water-band gave outstanding barnyardgrass control not normally obtained in conventional preemergence applications. The black nightshade control was also excellent and the tomato growth was affected. Normal rates applied by the water-band technique are worthy of further research. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of water-banding preplant preemergence herbicides on transplanted and direct seeded tomatoes and on the control of seeded black nightshade and a natural stand of barnyardgrass

			Average 1/			
					Weed Control	
		Volume	Tomato Vigor		Black	Barn-
Herbicide	Rate	Per Plot	Transplanted	Direct Seeded	Nightshade	yardgrass
Metham*	100 gpa	1/8 A"	9.8	5.5	7.2	6.2
Metham*	100 gpa	1/4 A"	8.2	5.2	10.0	6.8
Metham*	100 gpa	1/2 A"	9.0	4.8	10.0	7.8
Metham	100 gpa	1/8 A"	8.8	2.8	9.5	8.5
Metham	100 gpa	1/4 A"	9.0	5.0	8.8	8.0
Metham	100 gpa	1/2 A"	8.5	3.8	8.2	8.8
Chloramben	5 gpa	1/2 A"	7.0	2.0	8.2	9.5
Check (water)	-	1/2 A"	9.0	3.5	6.5	2.8
Check	-	-	7.5	5.5	5.0	3.2

1/ Average of 4 replications where 0 = no vigor or no weed control and 10 = healthy tomato plants or complete weed control.

* Covered with plastic during sprinkler irrigation. Tomatoes transplanted on August 2 and seeded on the same day. Evaluated August 20, 1982.

The effect of fall applied water-banded herbicides on subsequently seeded broccoli, tomatoes and onions. Lange, A. H. and W. D. Edson. December 18, 1981 clay loam soil of the Panoche clay loam series, with an intermediate amount of soil moisture, was treated with various herbicides.

A series of 11 different herbicide treatments were made with 4 replications of each in addition to a check with water only. Metham and N-pHuric, in different concentrations, were applied by the use of a CO_2 backpack sprayer at a pressure of 30 psi and a rate of 2 mph with the exception of a few. These were applied with a sprinkling can. A row spacing of 30 inches and a treatment of 4 inches wide was used. Concentrations were given in gallons per acre and different amounts of water were applied for a leaching effect upon the herbicide.

Broccoli, tomatoes, and onions were planted in each plot January 12, 1982. Six-foot strips were planted by hand, breaking the crust with a wooden stake.

Evaluations were made concerning weed control, both for the different herbicides and forwater-band incorporation as a separate factor. These evaluations were made on April 28 and May 19, 1982, respectively. Evaluations were also made on broccoli, tomato and onion vigor on April 28.

Finally, harvesting of onions and tomatoes was completed on July 7. For the onions, the entire plants were taken from a 3-foot strip and the result recorded in ounces. When harvested, the tomato plants were cut off at the ground surface and measurements were recorded in pounds.

The early ratings clearly show the beneficial effects of metham on weed control and crop growth when seeded about 3 weeks after application to cold, wet winter soils. The results below 1/2 inch of water for incorporation did not apparently move the metham into the soil sufficiently. In the second rating the 1 inch incorporated water appeared somewhat more active than the 1/2 inch treatments. The effects of metham on the direct seeded crops were somewhat erratic showing only rather small effects at the higher metham levels.

Sulfuric acid gave good broadleaf weed control and severe injury to broccoli and onions, but did not effect direct seeded tomatoes even at 320 gallons per acre rates. (University of California, Cooperative Extension, Parlier, CA 93648.)

The effect of water-band incorporation of metham
on subsequent crop vigor and weed control

Herbicides	Gal/A	Acre Inch of Water	Average[1/] Weed Control Broad-leaves	Grasses	Average Vigor[2/] Broccoli	Onion	Tomato
Metham	40	1/2	7.8	3.5	8.2	9.8	6.8
Metham	80	1/2	9.2	8.2	5.5	6.2	2.2
Metham	160	1/2	8.0	5.5	5.8	8.0	7.2
Metham	40	1	9.0	8.0	6.5	9.8	5.0
Metham	80	1	8.8	6.0	7.2	8.8	5.0
Metham	160	1	9.8	8.8	5.2	6.8	6.0
Metham	160	1/4	5.8	0.8	5.0	8.2	5.8
Metham	160	1/8	5.0	2.5	4.8	7.0	6.8
N-pHuric	80	1/2	7.5	2.8	7.5	8.8	8.0
N-pHuric	160	1/2	5.8	2.5	6.0	7.8	7.8
N-pHuric	320	1/2	8.0	2.0	1.2	3.8	8.0
Check (water only)		1	0.8	4.0	6.5	8.2	6.0

1/ Average of 4 replications where 0 = no control and 10 = best control.

2/ Average of 4 replications where 0 = no growth and 10 = best growth.
Broadleaf weeds include wosthistle, lambsquarters, groundsel.
Grasses include barnyardgrass.
Treated December 18, 1981. Seeded January 12, 1982. Evaluated May 19, 1982.

An evaluation of the residual activity of metham after water-band applications. Lange, A. H. and W. D. Edson. Metham applied by the water-band technique gives excellent annual weed control in a moist Delhi loamy soil. Applied in early spring (March 23-24, 1982), metham controlled a large number of annual weeds. Tomato and black nightshade seed and nightshade transplants were planted into the water-banded plots on March 25, March 31 and April 9, 1982. The spring frost killed most of the direct seeded plantings so that the black nightshade transplants were used to eveluate the applied metham (Table 1). A later reading gave some direct seeded results (Table 2).

From the record of plant growth it is easy to see the greater activity on 1 day transplants of black nightshade where metham was applied in 1/4 inch of water. These results both at 100 and 200 gallons per acre point up the deeper incorporation when compared to the 1/8 inch application. Since the annual weed control which was essentially perfect, the movement and activity of metham was probably largely in the top 1 inch of soil where the majority of annual weeds germinate.

Between the first day planting and the 8 day planting there was 1/29 inches of rainfall which may account for the poorer growth of the 8 day planting either by moving more metham into the roots of the transplants or in some other way. An additional inch of rainfall fell after the first transplanting.

The results observed in the 16 day planting suggests that all the metham was gone before that planting. This may have been due to the normal breakdown process or the total of 3.13 inches of rainfall between March 26 and April 11.

A later reading of the first day only suggested excellent black nightshade control with acceptable injury when 1/8 inch of water was used for incorporation.

These results suggest that a great deal of work is needed on soil moisture, amounts of water for incorporation, and the amount of subsequent water and the timing and depth of planting. (University of California, Cooperative Extension, Parlier, CA 93648.)

Table 1. The effect of delay in planting after water incorporated metham

			Transplanted Black Nightshade Average Stand and Vigor[1/]		
Herbicide	Gal/A	Water to Incorp.	1 day	8 days	16 days
Metham	100	1/8 A"	7.5	3.2	8.5
Metham	100	1/4 A"	4.3	3.8	9.0
Metham	200	1/8 A"	7.0	2.8	9.0
Metham	200	1/4 A"	0.0	1.8	9.8
Check	-	-	7.8	6.5	6.8

1/ Average of 4 replications where 0 = no stand and 10 = best stand and vigor.

Table 2. The effect of water-banded applications of metham on the control of direct seeded black nightshade in direct seeded processing tomatoes

			Average[1]	
Herbicide	Gal/A	Water to Incorp.	Black Nightshade Control	Phytotoxicity to Tomato
Metham	100	1/8 A"	8.2	1.5
Metham	100	1/4 A"	9.5	4.5
Metham	200	1/8 A"	10.0	2.2
Metham	200	1/4 A"	10.0	8.8
Check	-	-	0.0	0.0

1/ Average of 4 replications where 0 = no control or no phytotoxicity symptoms and 10 = total weed control or tomato plants dead. Treated March 25, 1982. Tomatoes seeded 1 day after application. Evaluated May 10, 1982.

Annual weed control in ornamental bulbs (iris, tulip and narcissus). Peabody, D.V. A field experiment was established to evaluate various tank mix and sequential combinations of oryzalin for annual weed control and effect on yield of iris, narcissus and tulip bulbs. All treatments were replicated four times on single row plots 3 feet long (rows 4 feet apart) in a randomized complete block design. All herbicides were applied with a compressed air sprayer mounted on an Allis-Chalmers G tractor in 60 gpa. The soil was a silt loam with 35% sand, 40% silt and 25% clay, 3.1% organic matter with a pH of 6.0. On October 15, 1981, bulbs of the same size range and number were planted in furrows 3 inches deep which were then filled in and hilled with four to five inches of soil so that there was approximately seven inches of soil covering the bulbs. Iris cultivar was Ideal, narcissus was King Alfred and tulip was Apeldoorn. On December 21, 1981, all preemergent treatments were applied, and on March 10, 1982, the postemergent applications were made; at this time, iris were 6 to 8 inches in height, narcissi were 4 inches and the tulips were 4 inches high. All bulbs were dug by hand from mid-June to late July depending on species, cleaned, sorted, and the weight of bulbs from each plot recorded.

Specific and general weed ratings were made May 17 and August 10, 1982, and are recorded in the Table.

The combinations which included preemergent paraquat applications at 1.0 lb ai/A resulted in the best weed control with the highest bulb yields when compared to the combinations containing either preemergent dinoseb or glyphosate. Of the four treatments which included preemergent paraquat, the preemergent oryzalin, postemergent napropamide combination resulted in the best yield of tulip bulbs and second best yields of iris and narcissus bulbs. (Northwestern Washington Research and Extension Unit, Washington State University, Mount Vernon, WA 98273-9788).

Effect of sequential and tank-mix herbicide combinations on annual weed control[1] and ornamental bulb yield[2]

	Appl	Rate	Bulb yield			Ann weed control	
	time	lb ai/A	iris g/plot	narc g/plot	tulips g/plot	5/17	8/10
weedy check			587d	1426a	1103e	1.0	1.0
handweeded check			737a-c	1498a	1286c-d	5.0	5.0
dinoseb[3] + oryzalin	PRE	3.0+1.5	819a	1624a	1245d	5.0	4.6
oryzalin	POE	0.75					
dinoseb + oryzalin	PRE	3.0+1.5	775a-c	1601a	1315c-d	5.0	4.3
napropamide	POE	4.0					
dinoseb + napropamide	PRE	3.0+4.0	788a-b	1423a	1278c-d	5.0	4.6
oryzalin	POE	0.75					
dinoseb + napropamide	PRE	3.0+4.0	795a-b	1544a	1288c-d	5.0	3.9
napropamide	POE	4.0					
paraquat[4] + oryzalin	PRE	1.0+1.5	711a-c	1525a	1361a-c	5.0	4.4
oryzalin	POE	0.75					
paraquat + oryzalin	PRE	1.0+1.5	822a	1662a	1476a	5.0	3.9
napropamide	POE	4.0					
paraquat + napropamide	PRE	1.0+4.0	805a-b	1673a	1387a-c	5.0	3.5
oryzalin	POE	0.75					
paraquat + napropamide	PRE	1.0+4.0	830a	1441a	1446a-b	5.0	3.4
napropamide	POE	4.0					
glyphosate[4] + oryzalin	PRE	0.75+1.5	810a-b	1711a	1368a-c	4.1	4.6
oryzalin	POE	0.75					
glyphosate + oryzalin	PRE	0.75+1.5	716b-c	1558a	1374a-c	4.4	2.6
napropamide	POE	4.0					
glyphosate + napropamide	PRE	0.75+4.0	679c	1565a	1331b-d	3.0	3.3
oryzalin	POE	0.75					
glyphosate + napropamide	PRE	0.75+4.0	688c	1575a	1319c-d	2.5	1.5
napropamide	POE	4.0					
cv			8%	12%	5%		

---

[1] Ratings are an average of two separate observations of four replications. 1 = no control, 2 = poor control, 3 = fair control, 4 = commercially practical control, 5 = weed eradication.

[2] Means within a column followed by the same letter are not significantly different at the 5% level of probability as determined by Duncan's multiple range test.

[3] A 3 lb/gal phenol formulation was used.

[4] All paraquat and glyphosate applications included a non-ionic surfactant at 25% v/v.

Evaluation of herbicides for control of perennial grasses in a citrus orchard. Jordan, Lowell S., Robert C. Russell, and James L. Jordan. Two selective grass-specific herbicides, fluazifop-butyl and BASF-9052, were tested for efficacy on the seasonal control of dallisgrass (*Paspalum dilatatum* Poir.) and bermudagrass (*Cynodon dactylon* (L.) Pers.) in a sprinkler-irrigated navel orange orchard. Foliar treatments of both herbicides, at rates of 0.5 and 1.0 lb/A, were applied with and without a spray additive, PACE, to nearly solid single stands of dallisgrass and bermudagrass in separate locations in the orchard. Both grasses were 6 to 8 inches tall at the time of treatment. Applications were made in early September.

The herbicidal effect of both materials was slow on both grass species with only 70 to 75% percent control resulting a month after treatment. Maximum effect of the herbicide on dallisgrass was in early December, three months after application. Maximum ratings on bermudagrass control were recorded on November 5. One-lb/A treatments of fluazifop-butyl were only slightly more effective than at the 0.5 lb/A rates. Rate differences with BASF-9052 were in the 20 to 25% range of effectiveness after two to three months. The effect of PACE as a spray additive to both herbicides varied from 0 to 15% with some inconsistencies on both dallisgrass and bermudagrass. There was complete selectivity of the herbicides to broadleafed species, sow thistle (*Sonchus oleraceus* L.), and wild dichondra (*Dichondra repens* Forst.) in the treated areas. Heavy growth of *Poa annua* L. in the bermudagrass plots in late November was evidence of no soil-active effects of either herbicide. No carry-over effects of the herbicides were observed on regrowth in the treated areas the following summer. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Response of dallisgrass and bermudagrass
to two herbicides at two dates after treatment

		Early and maximum weed control[a]			
	Rate	Dallisgrass		Bermudagrass	
Treatment	lb/A ai +Qt/A	10/8	12/8	10/8	11/5
fluazifop-b	0.5	6.0	9.0	7.3	8.2
fluazifop-b + PACE	0.5 + 1	6.2	10.0	6.6	8.3
fluazifop-b	1.0	7.0	9.5	7.0	9.0
fluazifop-b + PACE	1.0 + 1	8.0	9.7	7.3	8.8
BASF-9052	0.5	7.2	7.3	6.0	7.0
BASF-9052 + PACE	0.5 + 1	7.5	8.2	7.0	7.0
BASF-9052	1.0	7.0	9.5	7.0	9.5
BASF-9052 + PACE	1.0 + 1	8.3	10.0	7.0	9.0

[a] 0 = no control; 10 = all plants dead.

Paraquat for orchard weed control. Jordan, Lowell S., James L. Jordan and Robert C. Russell. The purpose of the research was to determine the quantity of paraquat required to control annual weeds when used exclusively or as a supplement to soil-residual herbicides for annual weed control. Replicated plots are treated with simazine, diuron, bromacil, and mixtures (diuron-bromacil, diuron-simazine) or with paraquat at the usual recommended rates. Paraquat treatments were made as needed throughout the season to control weeds surviving the initial treatments. Volume of paraquat spray (1.0 lb/100 gal) required as spot treatments to control weeds surviving different soil-residual herbicide treatment programs is shown below. Some herbicides and combinations requires less paraquat use as subsequent treatments. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Treatment lb/A	Season	Weed Control/Date1/				Paraquat Spray Volume/A/date			
		6-24	8-9	10-8	Avg.	7-2	8-23	10-12	Total
						g			
Diuron 3	W	9.2	8.2	9.0	8.8	3.8	8.3	1.7	13.7
Diuron 4	W	9.9	9.2	9.6	9.6	1.3	5.0	2.4	8.1
Diuron 2 + diuron 2	F S	9.9	9.6	9.8	9.6	0.7	2.7	1.3	4.7
Diuron 2 + bromacil 2	F S	9.9	9.4	9.2	9.5	1.0	4.9	2.7	8.6
Diuron 2 + diuron 1 bromacil 1	S F	10.0	9.1	9.5	9.5	0.5	3.7	1.0	5.1
Diuron 1.5 + bromacil 1.5	W W	9.6	8.1	9.2	9.0	1.8	5.6	2.9	10.3
Diuron 2 + bromacil 2	W W	9.9	8.3	9.6	9.3	1.1	4.7	1.1	6.9
Diuron 2.5 + bromacil 2.5	W W	9.9	8.8	9.5	9.4	0.8	4.7	2.1	7.6
Simazine 3	W	9.6	8.5	8.6	8.9	2.0	10.2	4.4	16.5
Simazine 4	W	9.6	8.0	8.9	8.8	2.6	7.8	2.3	12.7
Simazine 2 + diuron 2	W W	9.7	8.4	8.8	8.9	2.1	5.1	3.1	10.4
Simazine 2 + simazine 2	F S	9.8	9.5	8.5	9.3	1.6	4.6	2.7	8.8
Simazine 2 + diuron 2	F S	16.0	9.9	9.4	9.8	0.5	1.0	1.6	3.0
Paraquat 0.5 (spot)		0	3.5	6.4	3.3	22.0	22.9	4.7	49.6
Paraquat 0.5 (broadcast)		0	4.3	7.3	4.2	50.0	50.0	50.0	150.0

1/ 0 = no control, 10 = complete control; w = winter, f = fall, s = spring

Comparison of bromacil, terbacil, and dichlobenil for purple nutsedge and bermudagrass control in a tangelo orchard. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Test plots were established in a tangelo orchard with a vigorous stand of bermudagrass, 12 inches tall, and an undergrowth of purple nutsedge. Before treatment, the vegetation was mowed to 4 inches. Bromacil and terbacil were applied at 3 and 6 lb ai/A in 100 gpa of water spray. Dichlobenil was applied at 6 and 12 lb ai/A as 4% granules. Treatments were made on August 15 and the plots irrigated immediately following treatment. Control ratings (%) were made at 4-week intervals for 12 weeks after treatment. Results are presented in the table below.

Bromacil and terbacil were more effective than dichlobenil for bermudagrass control. Dichlobenil was more effective for purple nutsedge control than either bromacil or terbacil. The tangelo trees were not injured by any of the herbicides, but interplants of temple orange were injured by the 6 lb/A rate of bromacil. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Percent control of purple nutsedge (PPNS) and bermudagrass (BMGR) foliage with bromacil, terbacil, and dichlobenil treatments

		Weeks after treatment					
	Rate	4		8		12	
Herbicide	(lb/A)	PPNS	BMGR	PPNS	BMGR	PPNS	BMGR
bromacil	3	18	82	2	75	2	75
	6	20	82	10	75	5	82
terbacil	3	12	68	2	55	2	50
	6	8	85	2	75	0	86
dichlobenil	6	78	45	90	20	90	22
	12	95	74	99	48	96	48
control	--	0	0	0	0	0	0

Yellow nutsedge control in citrus with bromacil and terbacil. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Research plots were established in a sprinkler irrigated citrus grove near Sataclay, California, to compare bromacil and terbacil for yellow nutsedge control. Treatment rates for both herbicides were 2, 4, and 8 lb ai/A in 100 gpa water. Plots were replicated three times. The amount of control (%) at various time intervals after treatment is indicated in the table below.

Bromacil provided slightly better control of yellow nutsedge than terbacil. The 2 lb/A rate of either herbicide was insufficient to give adequate control while the 4 and 8 lb/A rates provided adequate control. As the season progressed, the amount of yellow nutsedge control with both bromacil and terbacil increased. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Control (%) of yellow nutsedge foliage treated with either bromacil or terbacil. Treatment date was April 13

		Date			
Herbicide	Rate	May 26	June 23	July 19	August 25
Bromacil	2	43	55	68	72
	4	77	79	83	91
	8	80	90	96	98
Terbacil	2	30	40	68	65
	4	70	76	86	83
	8	83	83	86	93

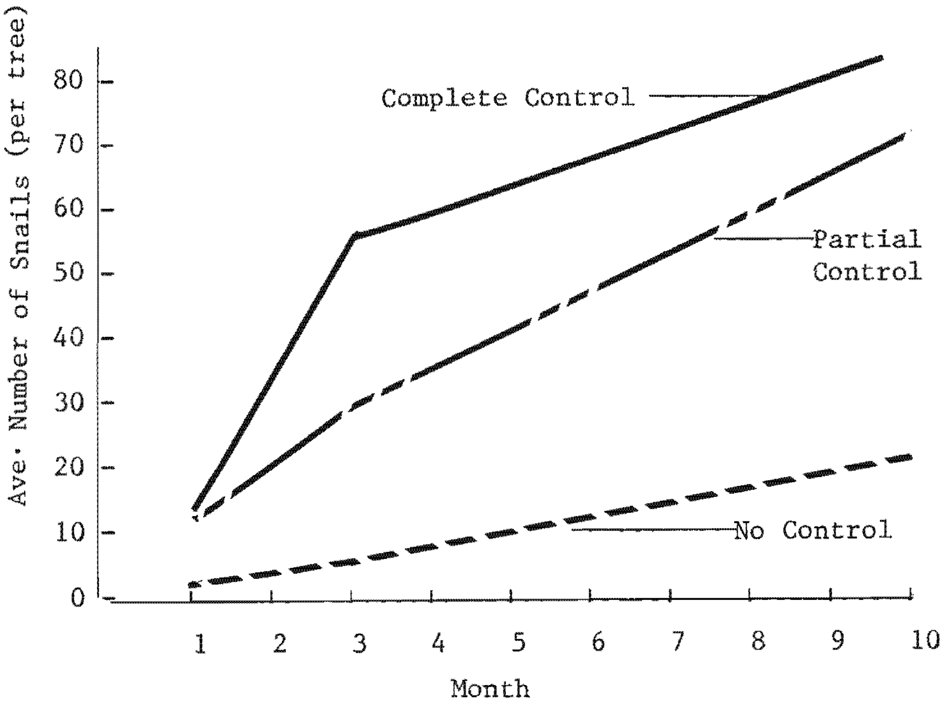
Sweet orange seedling tolerance to 2,4-DB and dichlorprop. Jordan, Lowell A. and James L. Jordan. "Koethen' sweet orange seedlings (*Citrus sinensis* (L.) Osbeck), growing in Vista sandy loam soil (at 65% of the water holding capacity), were used as a basis for the possible field evaluation of 2,4-DB and dichlorprop in citrus orchards. Fifteen ml of the appropriate solution was applied to the soil surface without contacting the foliage. Four sweet orange seedlings were used for each treatment. Treatments were replicated four times. Herbicide treatments were based on the parts per million of active chemical in the soil. Treatment rates varied logarithmetically. The seedlings were placed randomly in a greenhouse. Independent ratings were performed weekly by two researchers to evaluate injury. Fresh weight of the top and root portions of each plant was determined 12 weeks after treatment. For 2,4-DB treated seedlings, initial symptoms appeared at 128 ppm 4 days after treatment; initial symptoms were chlorosis of the terminal leaves, epinasty, and hyponasty. By the end of the second week, the initial symptoms were apparent in all plants treated with 16 through 128 ppm 2,4-DB. Also, by the third week, symptoms included intravenous and general plant chlorosis, leaf vein chlorosis, wilting, and albinoism at the petiole-stem junction. After 12 weeks, plants treated with 8 ppm no longer showed increasing injury, but showed signs of recovery. Recovery was not readily apparent in seedlings treated with 16 ppm 2,4-DB. Plant death occurred for seedlings treated with either 64 or 128 ppm 2,4-DB. For plants treated with dichlorprop, initial injury was apparent by the fourth day post-treatment at 128 ppm as general plant chlorosis, wilting, epinasty, and hyponasty. Injury was general in all plants at 64 ppm dichlorprop by the second week and at 32 ppm by the third week. By 4 weeks, plants at 8 ppm dichlorprop were injured. Initial signs of injury appeared as chlorosis of all plant leaves with leaf veins more severely chlorotic. Chlorosis was accompanied by varying degrees of epinasty and hyponasty. Chlorosis was followed by wilting and desiccation of the leaves. At 64 and 128 ppm dichlorprop, necrosis of the leaf veins rapidly followed chlorosis of the leaf veins. In some plants, death occurred before necrosis of any amount was evident. At 4 ppm dichlorprop, two plants showed slight chlorosis during the latter part of the trial period, but they recovered. The extent and course of injury was more severe as the dichlorprop concentration was increased. At the termination of the trial, all plants at 32 ppm and above were dead. Death occurred by the fifth week. Some plants a lower rates were chlorotic, yet remained for many weeks. Recovery was evident in one plant at 8 ppm dichlorprop by the eighth week and was apparently normal. No recovery was apparent in the other three plants at 8 ppm nor in any plant at a higher rate of treatment. Both 2,4-DB and dichlorprop drastically reduced the top and root growth (as evidenced by weight measurements) of 'Koethen' sweet orange seedlings. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Sweet orange seedling tolerance to monuron and diuron. Jordan, Lowell S. and James L. Jordan. 'Koethen' sweet orange seedlings (*Citrus sinensis* (L.) Osbeck), growing in Vista sandy loam soil (at 65% of water holding capacity), were used as a basis for the field evaluation of monuron and diuron in citrus orchards. Fifteen ml of the appropriate solution was applied to the soil surface without contacting the foliage. Four sweet orange seedlings were used for each treatment. Treatments were replicated four times. Herbicide treatments were based on the parts per million of active chemical in the soil. Treatment rates varied logarithmetically. The seedlings were placed randomly in a greenhouse. Independent ratings were performed weekly by two researchers to evaluate injury. Fresh weight of the top and root portions of each plant was determined. For monuron treated plants, initial symptoms appeared on the 14th day at rates from 4 through 128 ppm. Chlorosis and necrosis of leaf tips and margins were followed by death of all leaf tissues. Higher monuron concentrations resulted in faster symptom development than did lower monuron concentrations. For the diuron treated seedlings, initial symptoms occurred on the 256 ppm concentration by the second week. By the fifth week, monuron treated plants (as low as 4 ppm) showed symptoms. Initial symptoms were leaf necrosis and hyponasty. Later, the leaves died, but remained on the main stem. Both monuron and diuron reduced top and root fresh weights. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Sweet orange seedling tolerance to amitrole and dalapon. Jordan, Lowell S. and James L. Jordan. 'Koethen' sweet orange seedlings (*Citrus sinensis* (L.) Osbeck), growing in Vista sandy loam soil (at 65% of water holding capacity), were used as a basis for the field evaluation of amitrole and dalapon in citrus orchards. Fifteen ml of the appropriate solution was applied to the soil surface without contacting foliage. Four sweet orange seedlings were used for each treatment. Treatments were replicated four times. Herbicide treatments were based on the parts per million of active chemical in the soil. Treatment rates varied logarithmetically. The seedlings were placed randomly in a greenhouse. Independent ratings were performed weekly by two researchers to evaluate injury. Fresh weight of the top and root portions of each plant was determined. Seedlings treated with amitrole continued to grow throughout the entire trial. Seedlings treated with either 16 or 32 ppm amitrole started to overcome their stunting by the end of the 12-week period. For dalapon treated plants (16, 32, or 64 ppm dalapon), abscission of the youngest leaves occurred after 1 week. For seedlings treated with 2 through 8 ppm dalapon, marginal leaf necrosis occurred by the sixth week after treatment. Dalapon treatments reduced top and root weight more than amitrole treatments. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Bermudagrass infestation effects on the population of garden snails infesting a 'Valencia' orange orchard. Jordan, Lowell S. and James L. Jordan. The effect of bermudagrass (*Cynodon dactylon* (L.) Pers.) infestation on the garden snail population infesting a 'Valencia' orange (*Citrus sinensis* L.) orchard was investigated. Bermudagrass in a sprinkler-irrigated, 16-year-old 'Valencia' orange orchard was treated with glyphosate to maintain 100%, 50%, and 0% bermudagrass ground cover. Snail-collecting boards (1 ft. by 1 ft.) were covered on the underside with crushed snails to act as a snail attractant; a board was placed beneath each citrus tree. The number of snails on the underside of each board was counted in January, March, and October. October garden snail populations were highest in the plots with complete weed control (0% bermudagrass cover), lower in the plots with partial weed control (50% bermudagrass cover), and lowest in the plots with no weed control (100% bermudagrass cover) (Figure 1). The effect of weed infestations on garden snail populations in 'Valencia' orange orchards is still being investigated. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Population of garden snails collected in a 'Valencia' orange orchard infested with different levels of bermudagrass



Weed infestation effects on the weight of garden snails infesting a 'Valencia' orange orchard. Jordan, James L. and Lowell S. Jordan. The effects of bermudagrass (*Cynodon dactylon* (L.) Pers.) and Johnsongrass (*Sorghum halepense* (L.) Pers.) on the weight of garden snails infesting a 'Valencia' orange (*Citrus sinensis* L.) orchard were investigated. Bermudagrass and Johnsongrass in a sprinkler-irrigated, 16-year-old 'Valencia' orange orchard were treated with glyphosate to maintain 100%, 50%, and 0% weed ground cover. Snail-collecting boards (1 ft. by 1 ft.) were covered on the underside with crushed snails to act as a snail attractant; a board was placed beneath each citrus tree. Snails were collected in October and the average snail weight in each weed infestation was calculated. Average snail weight was lowest for area with no weed control (table). Partial bermudagrass control also resulted in decreased snail weight. However, partial and complete Johnsongrass control both resulted in greater snail weight than no-Johnsongrass control. In contrast to Johnsongrass infested areas, partial bermudagrass resulted in the same snail weight as no-weed control plots; complete bermudagrass control resulted in greater snail weight than either no-bermudagrass control or partial-bermudagrass control. The effect of weed infestations on garden snails in 'Valencia' orange orchards is still being investigated. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Average weight of individual garden snails collected in a 'Valencia' orange orchard infested with either bermudagrass or Johnsongrass

	Weed Infestation	
	Bermudagrass	Johnsongrass
	g	
Complete Control	6.32	6.32
Partial Control[1]	4.95	6.42
No Control[2]	4.93	4.93

[1] 50% of the area covered by weed infestation.

[2] 100% of the area covered by weed infestation.

Herbicide evaluation in red delicious apples. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was initiated in the fall and winter of 1979-1980 to evaluate the use of several combinations of postemergence and preemergence herbicides for weed control in the tree rows. Postemergence and preemergence treatments were reapplied in the 1980-1981 season and preemergence treatments were reapplied in the 1981-82 season. Spraying in 1981-1982 was done with a knapsack sprayer calibrated to deliver 468 l/ha at 2.4 kg/cm^2 boom pressure. Granular herbicides were applied with a shaker bottle. Treatments were applied on December 22 and 23 of 1981 and on April 12, 1982. The experimental design was a randomized complete block with four replications.

Perennial grass control was generally good where glyphosate has been previously applied as a postemergence treatment. None of the treatments provided satisfactory control of field bindweed. Combinations containing dichlobenil gave excellent control of common dandelion. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660)

HERBICIDE EVALUATION IN RED DELICIOUS APPLES

Herbicide[1/]	Rate kg ai/ha	Time of Application	Vigor Reduction and Stand Reduction[2/,3/,4/]							
			Kebl		Orgr		Fibi		Coda	
			VR	SR	VR	SR	VR	SR	VR	SR
Paraquat	1.1	Fall	0	23	50	75	0	30	0	13
Paraquat + Napropamide	1.1 + 4.5	Fall	0	62	0	80	0	35	0	33
Paraquat + Oxadiazon	1.1 + 5.6	Fall	0	0	0	10	31	68	0	15
Paraquat + Terbacil	1.1 + 2.2	Fall	40	95	100	100	55	25	50	96
Paraquat + Diuron	1.1 + 1.8	Spring-fall	8	92	50	95	0	20	0	24
Paraquat + Dichlobenil	1.1 + 4.5	Fall	33	92	100	100	28	43	100	100
Paraquat + Napropamide + Simazine	1.1 + 4.5 + 1.7	Fall	7	92	0	93	38	68	0	0
Paraquat + Diuron + Terbacil	1.1 + 1.3 + 1.3	Fall	17	93	100	100	0	0	0	60
Paraquat + Oxadiazon + Simazine	1.1 + 4.5 + 1.7	Fall	7	90	50	85	28	50	0	23
Paraquat + Simazine	1.1 + 2.8	Fall	67	98	0	93	25	25	3	45
Glyphosate	1.7	Fall	100	100	100	100	25	63	25	25
Glyphosate + Simazine	1.7 + 2.8	Fall	100	100	100	100	0	0	50	98
Glyphosate + Diuron	1.7 + 3.6	Fall	100	100	100	100	33	50	25	88
Glyphosate + Terbacil	1.7 + 2.0	Fall	67	98	100	100	0	13	25	84
Glyphosate + Dichlobenil	1.7 + 4.5	Fall	100	100	100	100	0	54	100	100
Glyphosate + Simazine	1.7 + 2.8	Spring	100	100	100	100	0	0	55	99
Glyphosate + Diuron	1.7 + 3.6	Spring	67	97	100	100	25	45	9	86
Glyphosate + Napropamide + Simazine	1.7 + 4.5 + 0.9	Fall	100	100	100	100	0	0	0	91
Simazine	2.8	Fall	7	72	50	90	25	25	0	0
Check			0	0	0	0	0	0	0	0

[1/] All paraquat treatments applied with Ortho X-77 at 8 oz/100 gallons of solution. Paraquat was not applied in 1981-1982. Plots were established in 1979.

[2/] Visual evaluations. VR = Vigor Reduction; SR = Stand Reduction. 0-100 scale.

[3/] Weed abbreviations: Kebl = Kentucky bluegrass; Orgr = orchardgrass; Fibi = field bindweed; Coda = common dandelion.

Herbicide evaluation in golden delicious apples. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. The study was initiated in the fall and winter of 1979-1980 to evaluate the use of several combinations of postemergence and preemergence herbicides for weed control in the tree rows. Postemergence and preemergence treatments were reapplied in the 1980-1981 season and preemergence treatments were reapplied in the 1981-1982 season. Spraying in 1981-1982 was done with a knapsack sprayer calibrated to deliver 468 l/ha at 2.4 kg/cm^2 boom pressure. Granular herbicides were applied with a shaker bottle. Treatments were applied on December 22 and 23 of 1981 and split applications were applied on April 12, 1982. The experimental design was a randomized complete block with three replications.

Perennial grass control was good where glyphosate had been previously applied as a postemergence treatment. None of the treatments provided satisfactory control of field bindweed. Combinations containing diuron or dichlobenil gave excellent control of common dandelion. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660)

HERBICIDE EVALUATION IN GOLDEN DELICIOUS APPLES

Herbicide[1]	Rate kg ai/ha	Time of Application	Vigor Reduction and Stand Reduction[2,3,4]							
			Kebl		Orgr		Fibi		Coda	
			VR	SR	VR	SR	VR	SR	VR	SR
Paraquat + Simazine	1.1 + 3.6	Fall	100	100	67	99	0	0	67	90
Paraquat + Terbacil	1.1 + 2.0	Fall	67	92	100	100	0	0	33	65
Paraquat + Dichlobenil	1.1 + 6.7	Fall	67	98	100	100	0	62	100	100
Glyphosate + Napropamide	2.5 + 4.5	Fall	40	98	100	100	0	0	0	32
Glyphosate + Terbacil	2.5 + 2.0	Fall	100	100	100	100	3	30	33	95
Glyphosate + Napropamide + Terbacil	2.5 + 4.5 + 1.3	Fall	100	100	100	100	3	0	33	33
Glyphosate + Diuron + Terbacil	2.5 + 1.3 + 1.3	Fall	100	100	100	100	0	0	100	100
Paraquat + Oxadiazon	1.1 + 4.5	Fall	0	27	67	67	33	33	33	65
Paraquat + Oxadiazon + Simazine	0.6 + 4.5 + 0.9	Fall	100	100	100	100	0	58	67	67
Glyphosate + Diuron (fall) + Diuron (spring)	2.5 + 1.8 + 1.8	Fall/spring	100	100	100	100	0	48	100	100

---

[1] All paraquat treatments applied with Ortho X-77 at 8oz/100 gallons of solution. Paraquat was not applied in 1981-1982.

[2] Visual evaluation: VR = Vigor Reduction; SR = Stand Reduction. 0-100 scale.

[3] Weed abbreviations: Kebl = Kentucky bluegrass; Orgr = orchardgrass; Fibi = field bindweed; Coda = common dandelion

[4] No check plots were included in this trial. Plots were rated relative to the nearest checks in the adjacent red delicious rows.

Evaluation of R-40244 in apples. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was initiated to investigate the efficacy of R-40244 alone and in combination with other residual herbicides. This experiment was set up as a completely randomized design with four replications. Herbicides were applied with a knapsack sprayer calibrated to deliver 299 l/ha of water carrier. Applications were made to a 1.8 m band within the tree rows.

R-40244 alone exhibited activity on Russian thistle at both rates. Activity of R-40244 on downy brome appeared to be quite weak. (See accompanying table). R-40244 tank mixed with napropamide gave better herbicidal activity than either chemical applied alone. Crop injury was not evident in any of the plots. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660.)

Evaluation of R-40244 in Apples

Treatment	Rate kg ai/ha	Visual Evaluation[1][2] Dobr VR	Dobr SR	Ruth VR	Ruth SR	Tree Growth[3] cm
R-40244	2.2	10	33	75	75	3.2
R-40244	3.4	10	35	75	75	3.7
Napropamide + R-40244	2.2 + 2.2	65	85	100	100	3.7
Terbacil + R-40244	1.7 + 2.2	100	100	100	100	4.1
Simazine	1.1	35	61	100	100	4.3
Napropamide	4.5	30	69	25	25	2.8
Norflurazon + R-40244	2.2 + 2.2	94	97	100	100	3.7
Check[4]		0	0	0	10	4.1

[1] Weed abbreviations: Dobr = downy brome, Ruth = Russian thistle

[2] VR = Vigor Reduction, SR = Stand Reduction. 0-100 scale. Evaluated on 4/15/82.

[3] Difference between measurements on April 29, 1982 and November 12, 1982. There were no significant differences between means at the 0.05 level.

[4] Dobr and Ruth had 43 and 97 plants/m^2, respectively.

Evaluation of Hoe-39866 in non-bearing plums. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was initiated to compare the activity of Hoe-39866 with that of paraquat and to evaluate the activity of Hoe-39866 in a tank-mix with norflurazon. The experiment was completely randomized with four replications. Herbicides were applied with a knapsack sprayer calibrated to deliver 374 l/ha of water carrier. Herbicides were applied to a band in the tree rows. Most of the weeds evaluated were flowering at the time of herbicide application. Downy brome was the predominant weed and was distributed uniformly across the plot area. Tumble mustard was present in a much lower density than downy brome. The distribution of yellowflower pepperweed and volunteer barley was highly variable.

Hoe-39866 and paraquat exhibited good activity on downy brome, tumble mustard and yellowflower pepperweed. There appears to have been a substantial recovery of tumble from the paraquat treatment. Phytotoxicity of both herbicides to volunteer barley was less than that for the other weeds. Tank-mixing Hoe-39866 with norflurazon did not appear to have reduced its herbicidal activity. Phytotoxicity to low leaves on the trees was observed but there was no evidence of translocation to leaves on the higher branches. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660).

Evaluation of Hoe-39866 in Non-Bearing Plums

		Mean Vigor Reduction on 0-100 Scale[1/]							
	Rate	Dobr		Tumu		Yepe		Voba	
Herbicide	kg ai/ha	5/18	6/3	5/18	6/3	5/18	6/3	5/18	6/3
Hoe-39866 + Norflurazon	1.1+2.2	84	95	84	98	43	50	80	75
Hoe-39866 + Norflurazon	2.5+2.2	94	98	94	83	65	98	78	71
Hoe-39866 + Norflurazon	1.7+2.2	88	98	94	82	63	96	83	48
Hoe-39866	1.7	89	97	76	93	60	91	73	67
Paraquat	0.84	93	92	93	30	87	93	83	55
Check		0	0	0	0	0	0	0	0

[1/] Weed Abbreviations:

Dobr = downy brome

Tumu = tumble mustard

Yepe = yellowflower pepperweed

Voba = volunteer barley

Herbicide evaluation in sweet cherries. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was initiated in the fall of 1979 to evaluate the use of several combinations of postemergence and preemergence herbicides for weed control in the tree rows. The herbicides were reapplied in the fall of 1980. No herbicide treatments were applied in 1981. Spraying was done with a knapsack sprayer calibrated to deliver 281 l/ha of water carrier. Granular herbicides were applied with a shaker bottle. The experimental design was a randomized complete block with four replications.

Treatments containing glyphosate provided good control of quackgrass and orchardgrass. Glyphosate also appears to have had activity on field bindweed and common dandelion but the data were quite variable. Treatments containing dichlobenil or simazine exhibited the best residual control of annual weeds but numerous seedlings were present when evaluations were conducted in July 1982. Numerical evaluations were taken on annual weeds. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660)

HERBICIDE EVALUATION IN SWEET CHERRIES

Herbicide[1]	Rate (Kgai/ha)	Stand Reductions[2],[3]			
		Qugr	Orgr	Fibi	Coda
Royal Ann Variety					
Paraquat + X-77	1.1	60	0	7	0
Glyphosate	1.7	100	99	95	97
Paraquat + X-77 + Dichlobenil	1.1 + 3.4	77	100	0	27
Glyphosate + Dichlobenil	1.7 + 3.4	100	100	70	47
Glyphosate + Napropamide + Simazine	1.7 + 4.5 + 1.1	100	99	57	30
Glyphosate + Simazine	1.7 + 2.2	100	97	73	67
Paraquat + X-77 + Oxadiazon	0.6 + 4.5	80	82	27	53
Check		0	0	0	0
Van Variety					
Paraquat + X-77	1.1	50	53	30	0
Glyphosate	1.7	100	95	60	63
Paraquat + X-77 + Dichlobenil	1.1 + 3.4	68	98	30	80
Glyphosate + Dichlobenil	1.7 + 3.4	100	100	65	60
Glyphosate + Napropamide + Simazine	1.7 + 4.5 + 1.1	98	100	65	73
Glyphosate + Simazine	1.7 + 2.2	100	100	38	53
Paraquat + X-77 + Oxadiazon	0.6 + 4.5	80	43	20	0
Check		0	0	0	0

---

[1] All paraquat treatments were applied with Ortho X-77 at 8 oz/100 gal.

[2] Visual evaluation. 0-100 scale.

[3] Weed abbreviations: Qugr = quackgrass; Orgr = orchard grass; Fibi = field bindweed; Coda = common dandelion

HERBICIDE EVALUATION IN SWEET CHERRIES

Herbicide[1]	Rate (Kgai/ha	Stand Reductions[2],[3]			
		Qugr	Orgr	Fibi	Coda
Bing Variety					
Paraquat + X-77	1.1	53	76	0	0
Glyphosate	1.7	99	97	83	50
Paraquat + X-77 + Dichlobenil	1.1 + 3.4	83	100	38	67
Glyphosate + Dichlobenil	1.7 + 3.4	99	100	70	97
Glyphosate + Napropamide + Simazine	1.7 + 4.5 + 1.1	100	100	70	67
Glyphosate + Simazine	1.7 + 2.2	97	100	30	67
Paraquat + X-77 + Oxadiazon	0.6 + 4.5	53	30	23	0
Check		0	0	0	0
Lambert Variety					
Paraquat + X-77	1.1	80	57	20	0
Glyphosate	1.7	93	100	58	33
Paraquat + X-77 + Dichlobenil	1.1 + 3.4	76	99	23	100
Glyphosate + Dichlobenil	1.7 + 3.4	99	100	62	60
Glyphosate + Napropamide + Simazine	1.7 + 4.5 + 1.1	99	100	55	57
Glyphosate + Simazine	1.7 + 2.2	100	100	65	93
Paraquat + X-77 + Oxadiazon	0.6 + 4.5	67	50	63	43
Check		0	0	0	0

[1] All paraquat treatments were applied with Ortho X-77 at 8 oz/100 gal.

[2] Visual evaluation. 0-100 scale.

[3] Weed abbreviations: Qugr = quackgrass; Orgr = orchard grass; Fibi = field bindweed; Coda = common dandelion.

Cranberry tolerance to napropamide on sandy soils in Oregon. Poole, A.P. and R.D. William. Napropamide was applied to 2 new cranberry bogs August 7, 1980 and 4 bearing bogs between November 23, 1981 and March 18, 1982. New bogs and the 'Stevens' cultivar were grown on very sandy soils, whereas the older bogs had 2 to 2.75 inches of duff underlain by a layer of sand. Each trial was replicated 4 times. Napropamide injured cranberry plants when applied to weak vines in mid-summer within a few days after planting (Table 1). Cranberry midseason growth (Table 1) and yield (Table 2) confirmed field observations that plants were not injured, except where twig blight (*Lophodermium oxycocci*) infested some plots on the McMahon bog. Control of rice cutgrass (*Leersia oryzoides*), barnyardgrass (*Echinochloa crusgalli*), toad rush (*Juncus bufonius*), and other rush and sedge weeds was acceptable for approximately 6 months. (Oregon State University Cooperative Extension, OR 97331).

Table 1. Growth of newly established and bearing cranberries grown on sandy bogs and treated with napropamide.

Herbicide	Rate (lbs ai/ac)	New bog[1] 'Crowley'	Established 'McFarlin' McMahon[3]	Established 'McFarlin' Aasen	Established 'McFarlin' Scherer	Est. 'Stevens' Scherer
		(vigor rating)	(length of vegetative uprights-cm)			
untreated	-	10	5.7	5.3	4.2	6.0
napropamide	2	4.2	5.6	5.2	4.9	6.3
napropamide	4	3.8	5.5	5.4	4.9	5.8
napropamide	6	3.0	-	-	4.0	6.4
napropamide	8	-	5.0	4.3	-	-
napropamide	16	-	4.6	4.3	-	-

[1] Applied August 7, 1980; vigor rating: 0 = complete kill, 10 = vigorous.

[2] Applications were between November 23, 1981 to March 18, 1982; uprights were measured on July 22, 1982.

[3] Grower name.

Table 2. Yield[1] of established cranberries grown on sandy bogs and treated with napropamide.

Herbicide	Rate (lbs ai/ac)	'McFarlin' McMahon	'McFarlin' Aasen	'McFarlin' Scherer	'Stevens' Scherer
		- - - - - (ounces per 1 sq ft) - - - - - -			
untreated	-	4.4	4.2	2.1	5.0
napropamide	2	3.8	3.7	2.0	4.8
napropamide	4	3.6	3.7	2.3	4.2
napropamide	6	-	-	1.9	5.6
napropamide	8	2.7	3.8	-	
napropamide	16	2.8	4.4	-	

[1] Harvested between October 7 to 13, 1982.

Yield and maturity of Thompson seedless grapes under four weed control programs. Jordan, Lowell S., James L. Jordan, and Robert C. Russell. Three-year field trials were performed to determine effect of repeated use of cultivation, weed oil, paraquat, and MSMA on yield and soluble solid content of Thompson seedless grapes. Weed oil was applied at 100 gpa, paraquat at 0.5 lb ai/A, and MSMA at 4.0 lb ai/A at 2-week intervals throughout the growing season. Yield and soluble solid content are given in tables below.

The lowest yield was obtained from plots treated with weed oil. The lowest soluble solid content occurred in the grapes from the cultivated plots. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Yield (boxes) of Thompson seedless grapes under four treatment programs for weed control

	Year			
Treatment	1	2	3	Average
Cultivation	50.4	33.8	36.2	40.1
Weed Oil	46.6	23.6	25.3	31.8
Paraquat	45.4	27.8	36.3	36.3
MSMA	47.0	31.6	35.5	38.0

Soluble solids (%) from Thompson seedless grapes under four treatment programs for weed control

	Year			
Treatment	1	2	3	Average
Cultivation	13.3	15.8	16.2	15.1
Weed Oil	16.3	16.0	16.3	16.2
Paraquat	15.9	16.3	15.7	16.0
MSMA	16.2	16.8	16.2	16.4

Preplant and post-plant application of glyphosate during establishment of red raspberry and trailing blackberry. Braun, J.W. and R.W. William. In the spring of 1981 a field study was begun to evaluate the effects preplant and post-plant applications of glyphosate have on growth and yield of raspberry and blackberry and to supply data and samples for IR-4 minor use registration. The experiment was established on March 10, 1981 in Clark County, Washington, on Hillsboro silt loam. The plots were a single plant row 9.15 m long with a 2.74 m alleyway between rows. Experimental design was a randomized complete block replicated four times. Experiments were separate for raspberry and blackberry. On March 10, 1981, glyphosate at 0, 2.25, 4.50 and 8.97 kg ai/ha was broadcast in 151 liters/ha of water in a 2.44 m band centered over the future plant rows. Applications were made on bare soil surface in the raspberry test and to cover crop in blackberry test. Raspberry plots were rototilled on March 18 and planted the next day, 10 plants/9.15 m plot. Blackberry plots were rototilled twice, March 18 and May 11, prior to planting on May 11, 5 plants/9.15 plot. During September, 1981, a cover crop of perennial ryegrass (Lolium perenne L.) was established in both blackberry and raspberry test areas. Ryegrass was sown in alleyways leaving a .9 m wide plant bed bare.

Observation of the raspberry plants from planting time until June 4, 1982, revealed no phytotoxicity symptoms. During November, 1981, the lengths of ten mature raspberry primocanes were determined in each plot and the total number of emerged primocanes counted. No significant difference was found between treatments. No significant 1982 fruit yield difference between treatments was found.

On June 4, 1982, three wipe applications of 33% glyphosate solution were applied to the raspberry plots which had received the 8.97 kg ai/ha glyphosate preplant application. The wipe applications were applied to the ryegrass cover crop which had recently headed out. A very good grass kill was obtained. Observation of the wiped plots on June 18, however, revealed some primocanes with phytotoxicity expressed in the form of yellow, unexpanded leaves and dead terminal shoots. Counts were made on July 16 of the total injured primocanes/plot and total primocane population as estimated from counts for two 2-meter lengths of row. The estimated primocane number and percent injured primocanes for the four plots were 439/8%, 447/2%, 351/8%, 265/7%. Glyphosate was probably transferred by the flecking of droplets of dew plus glyphosate from grass leaves during wiping and by contact between grass and raspberry leaves after wiping. An additional trial has shown that wiping 3-4 recently cut-off primocanes on the periphery of a 15-20 cane hill resulted in severe phytotoxicity shown by most or all primocanes in the hill. The raspberry trial results support the recommendations that preplant glyphosate application is safe but that post-plant wipe applications presents considerable risk and should not be recommended.

Observation of the blackberry plants from planting time (March, 1981) until June 4, 1982, revealed no phytotoxicity symptoms. During March, 1982, before spring growth resumed, the total 1981 cane length was determined for two hills (plants) per plot. Two-way AOV performed on mean length/plot indicated no significant difference at the 5% level.

On June 4, 1982, the blackberry plots which had received the 8.97 kg/ha preplant glyphosate application were given both spray and wipe post-plant glyphosate applications. A spray application of 11.2 kg ai/ha glyphosate was applied to the grass cover crop in the alleyway. Application was made using a shield preventing spray contact with the berry canes. Plots also received three wipe applications to the cover crop of 33% glyphosate solution.

Observation of the wiped plots on June 18 revealed primocanes with varying degrees of phytotoxicity expression ranging from yellow areas on the leaves at the tip of the primocane to unexpanded leaves at primocane tip. Observation of primocanes during August revealed that those which had yellow but still expanding leaves in June continued to elongate and apparently overcame the phytotoxicity. Primocanes with phytotoxicity expressed in June as lack of leaf expansion demonstrated death of the apical meristem and branching via elongation of several axillary buds. Overall growth of treated plants appeared to be as vigorous as untreated plants by August.

The blackberry trial indicates that phytotoxicity to glyphosate is transitory if not too severe. One distinction between trailing blackberries and raspberries is that blackberries do not produce root suckers between plants which greatly lessens the danger of exposure to glyphosate applied in the alleyway.

Registration for preplant application of glyphosate for both raspberry and blackberry is being sought. Post-plant application in trailing blackberry appears promising and additional trials warranted. (Southwestern Washington Research Unit, Washington State University, 1918 NE 78th St., Vancouver, WA 98665, and Oregon State University, Department of Horticulture, Corvallis, OR 97331)

PROJECT 5.

WEEDS IN AGRONOMIC CROPS

Larry G. Thompson - Project Chairman

Annual grass and broadleaf weed control in established dormant alfalfa. Alley, H. P. and N. E. Humburg. The treatments were applied to semi-dormant alfalfa on April 16, 1982. Alfalfa was breaking dormancy with green leaf growth at the base of the plant. The downy brome (*Bromus tectorum* L.) was in the 1 to 3 leaf stage with a very dense stand due to good fall moisture. The only broadleaf weed of any density was field pepperweed (*Lepidium campestre* (L.) R. Br.) which was in the 8 to 12 leaf/1.27 to 2.54 cm leaf height. Air temperature was 45F with a relative humidity of 44% at time of treatment. The soil at the experimental site was classified as a loam (50.8% sand, 26.0% silt, 23.2% clay with 2.6% organic matter and a 6.6 pH). All treatments were applied with a 6-nozzle knapsack unit calibrated to deliver 374 L/ha solution at 2.8 kg/cm² pressure. Plots were 2.7 by 4.57 m arranged in a randomized complete block, with three replications.

Visual weed control and crop phytotoxicity evaluations were made May 28, approximately 5 weeks following treatment. There was no serious crop damage or stunting from any of the treatments. Terbacil, metribuzin and the combination of hexazinone/terbicil at the higher rates of application gave 93 to 100% control of the annual broadleaf and grass weeds infesting the treated areas. Fluazifop-butyl + WA exhibited excellent downy brome control at rates of 0.56 kg/ha and above with no activity on the annual broadleaf weed. CGA 82725 + WA showed no activity on either grass or broadleaf weeds. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 1189).

Downy brome and field pepperweed control

Herbicide	Rate kg/ha	Weed Control		Crop Phyto	
		FP	DB	Chlorosis	Stunting
terbacil 80W	0.56	83	60	0.3	0.3
terbacil 80W	1.12	98	93	0.3	0.3
hexazinone 90SP	0.56	100	98	0.0	0.0
hexazinone/terbacil	0.56 + 0.56	100	93	0.0	0.0
hexazinone/terbacil	0.56 + 0.84	100	97	0.0	0.0
metribuzin 70DF	0.84	100	93	0.0	0.0
metribuzin 70DF	1.12	100	96	0.3	0.0
sethoxydim 1.53 EC + WA*	0.22	0	27	1.0	0.3
sethoxydim 1.53 EC + WA*	0.44	0	33	1.0	1.3
CGA 82725 2EC + WA*	0.28	0	3	1.0	1.0
CGA 82725 2EC + WA*	0.43	0	3	0.6	0.6
CGA 82725 2EC + WA*	0.56	0	17	1.0	1.0
fluazifop-butyl 4E + WA**	0.28	0	77	0.0	0.0
fluazifop-butyl 4E + WA**	0.56	0	98	0.0	0.0
fluazifop-butyl 4E + WA**	0.84	0	100	0.0	0.0
fluazifop-butyl 4E + WA**	1.12	0	100	0.0	0.0

*Atplus 411F at 0.25% v/v.

**Atplus 411F at 2.33 L/ha.

Crop phytotoxicity 0-10. 0 = no chlorosis or stunting; 10 = no green color and complete stunting of alfalfa.

Chile pepper tolerance to pendimethalin preplant plus metolachlor postemergence. Anderson, W. Powell and Gary Hoxworth. Field research during the past two years indicated that chile pepper (var. New Mexico 6) plants were not injured by preplant soil incorporated treatments of either pendimethalin at 1.1 or 1.7 kg/ha or metolachlor at any dosage up to 3.4 kg/ha (the highest tested). In addition, indications were that chile peppers were not injured by metolachlor applied preemergence at any dosage up to 3.4 kg/ha, nor by postemergence applications of metolachlor at dosages up to 3.4 kg/ha at any stage of growth of the emerged pepper plants.

In 1982, to avoid crop/weed competition, the entire experimental area was treated with pendimethalin applied preplant soil incorporated at 1.7 kg/ha. The few weeds that emerged during the growing season were removed by hoeing or pulling.

Metolachlor was applied at two dosages (1.7 and 3.4 kg/ha) as over-the-top sprays to chile pepper plants at six stages of growth. The dates of application and the stage of growth of the chile pepper plants on that date were:

April 16	Peppers just emerging from soil and in cotyledonary stage
May 18	Peppers about 2.5 cm tall; most with 4 true leaves
June 4	Peppers 7.5 to 15 cm tall
June 17	Peppers 20 to 30 cm tall
June 28	Peppers beginning to flower
July 9	Peppers setting fruit; some pods up to 10 cm long

Chile pepper plants treated with metolachlor on April 16 and May 18 received a second application of metolachlor at the same dosage on June 28 and July 9.

Individual plot size consisted of three rows of chile peppers 6.1 m long and spaced 1.02 m apart. All treatments were applied with a small-plot, bicycle-type, sprayer equipped with TeeJet 8006 nozzle tips and calibrated to apply the equivalent of 229 l/ha (946 ml/plot). All treatments of metolachlor were replicated three times but, to avoid confusion and the chance of misapplication, the dosage sequence within a replication was not randomized (the low dosage was always the first plot of a three-plot replication, the high dosage the second plot, and the untreated control the third plot).

The chile peppers (var. New Mexico 6) were seeded March 17, 1982, and the systemic insecticide carbofuran (Furadan) in granular formulation was applied in the seed-furrow at planting time. Pepper pods were harvested twice (in mid-August and again in mid-October); only the center row of each plot was harvested. Yield data are presented in the table. (Agr. Expt. Sta., New Mexico State University, Las Cruces, N. M. 88003).

Chile pepper yields following over-the-top applications of metolachlor at six plant growth-stages

Dates when herbicide applied	Pod yield (fresh weight)[1] kg/plot harvest			Number of pepper plants per harvested row[2]
	first	second	total	
<u>Metolachlor applied at 1.7 kg/ha</u>				
April 16 and June 28[2]	6.7	5.3	12.0	18
May 18 and July 9[3]	6.7	3.8	10.5	14
June 4	5.1	3.1	8.2	18
June 17	5.6	4.1	9.7	17
<u>Metolachlor applied at 3.4 kg/ha</u>				
April 16 and June 28[3]	6.5	5.1	11.6	15
May 18 and July 9[3]	6.5	3.7	10.2	17
June 4	5.8	2.9	8.7	20
June 17	5.8	3.0	8.8	18
Untreated control	5.2	2.9	8.1	17

---

[1] Center row 6.1 m long harvested; first harvest mid-August and second harvest mid-October. Pods harvested by hand. Yields expressed as average of three replications.

[2] Average of three replications.

[3] Chile pepper plants received two applications of metolachlor at the designated dosage and on the designated dates.

Cotton yields following over-the-top sprays of glyphosate. Anderson, W. Powell and Gary Hoxworth. Results obtained in 1981 were confirmed in 1982 relative to the effect on cotton yields of over-the-top applications of glyphosate applied on three dates and at three dosages (plus one dosage of glyphosate applied on two dates to cotton pretreated with PIX). Refer to the table for dates and dosages of glyphosate treatments. PIX applied at .04 lb ai/A to its respective plots. Due to wet/muddy conditions in early August in 1982, the treatments scheduled for this date were postponed until mid-September.

All glyphosate and PIX treatments were applied directly to the cotton plants as over-the-top aqueous sprays, equivalent to 318 l/ha (.47 l/plot). Treatments were applied using a shoulder-carried sprayer equipped with pressure regulator and a single TeeJet 8006 nozzle tip. During application, the single nozzle was held about .5 m above and directly over the row of cotton being sprayed, with the spray-fan-pattern extending from side-to-side over the row of plants.

Individual plot size consisted of two adjacent rows of cotton, rows 8.23 m long and spaced 1.02 m apart. Each plot was separated from adjacent plots along its sides by one untreated row of cotton and at its ends by a 2.4 m cleared work area (needed to facilitate machine harvesting). Each treatment was replicated 4 times, and treatments were randomized within replications.

As in 1981, to avoid weed/crop competition, the entire experimental area was pretreated with the herbicide fluridone applied preplant soil incorporated at .33 kg/ha. Fluridone applied April 1, 1981 and February 12, 1982, and area pre-irrigated. The cotton (var. Acala 1517-75) seeded April 29, 1981 and April 23, 1982. In 1981 and 1982, the cotton was harvested with a 1-row, splindle-type, machine picker on October 28 and 25, respectively. Yield data presented in the table represent the average of 4 replications.

At harvest-time in 1982, many unopened bolls were on cotton plants treated with glyphosate in July; one month after harvest, few of these bolls had opened. Conditions for cotton production were optimum in 1981 and much less so in 1982, as expressed by differences in yields obtained. (Agr. Expt. Sta., New Mexico State University, Las Cruces, N. M. 88003.)

Cotton yields in 1981 and 1982 following over-the-top sprays of glyphosate

Glyphosate lb/A	Yield of seed-cotton lb/plot		Yield of seed-cotton percentage of untreated control	
	1981	1982	1981	1982
Glyphosate applied July 15, 1981; July 16, 1982				
1.0	15.1	7.6	84	81
1.5	11.1	2.0	64	21
2.0	7.2	1.1	41	12
Glyphosate applied August 3, 1981				
1.0	17.0	---	94	--
1.5	13.4	---	75	--
1.5 + PIX	13.4	---	75	--
2.0	10.2	---	44	--
Glyphosate applied August 21, 1981; August 20, 1982				
1.0	18.0	9.4	100	100
1.5	16.9	7.3	87	78
1.5 + PIX	16.0	8.3	87	88
2.0	14.9	8.2	81	87
Glyphosate applied September 14, 1982				
1.0	--	9.5	--	101
1.5	--	10.0	--	106
1.5 + PIX	--	9.6	--	102
2.0	--	9.0	--	96
All PIX-treated plots treated July 6, 1981; July 16, 1982				
PIX only	15.6	9.4	87	100
Untreated control				
0	18.1	9.4	100	100

Post-emergence grass herbicides for established non-dormant alfalfa.

Bell, C.E. Three post-emergence grass herbicides were compared for control of prairie cupgrass (Eriochloa contracta Hitchc.) in established alfalfa , var. cuf 101.

Application was made on 5/14/82 to emerged grass varying from two leaf to tillering in a spray volume of 30 gal/A. The alfalfa was in the fourth year of the stand and from 8 to 12 inches tall. The field had been irrigated 5 days before treatment. Plots were replicated 4 times. Two rates of each herbicide were applied (.2 &.4 lb.a.i./A). In addition, adjuvant rate (non-phytotoxic crop oil) was 1 quart/A at each rate and also at 2 quart/A at the .2 lb.a.i./A rate.

Results indicate some differences in the ability of these herbicides to control prairie cupgrass at low rates. It was also apparent that these rates would not be sufficient to eliminate this grass . Additional surfactant did not improve the efficacy of these herbicides. No phytotoxicity was observed. (University of California Cooperative Extension, Imperial County, Court House, El Centro, Cal. 92243).

Treatments	rate (lb.a.i./A)	adjuvant (qt./A)	%control
sethoxidim	0.2	1	80
sethoxidim	0.2	2	65
sethoxidim	0.4	1	82.5
fluazifop-butyl	0.2	1	40
fluazifop-butyl	0.2	2	70
fluazifop-butyl	0.4	1	57.5
CGA-82725	0.2	1	70
CGA-82725	0.2	2	57.5
CGA-82725	0.4	1	75
untreated control			00

Alachlor combinations for annual grass control in winter wheat. Brewster, Bill D. and Arnold P. Appleby. Annual grasses cause large yield reductions in western Oregon winter wheat. A field trial was conducted to evaluate alachlor and alachlor plus diuron applied preemergence followed by metribuzin applied postemergence for field brome, Italian ryegrass, and annual bluegrass control.

Winter wheat was seeded at 55 kg/ha in 36-cm wide rows. Individual plots were 2.5 m by 7.5 m and treatments were replicated five times in a randomized complete block design. The soil was a silt loam with a pH of 6.4 and organic matter content of 2.4%.

The wheat had 3 to 4 leaves and the grasses had 2 to 3 leaves when metribuzin plus dinoseb amine was applied.

Excellent control of all grass species was produced with the alachlor treatments, and yield increases of 4,000 kg/ha over metribuzin alone were obtained. Wheat injury was observed in the treatment that contained diuron, but yield was not significantly reduced. (Crop Science Department, Oregon State University, Corvallis 97331)

		Weed control			
Herbicide	Rate	Italian ryegrass	Field brome	Annual bluegrass	Wheat yield
	(kg/ha)		(%)		(kg/ha)
alachlor/metribuzin	1.1/0.3	99	94	96	9,880
alachlor + diuron/ metribuzin	1.1 + 1.8/ 0.3	100	99	99	9,540
alachlor/metribuzin + dinoseb	1.1/0.3 + 1.7	99	96	94	10,080
metribuzin	0.3	24	0	0	5,640
metribuzin + dinoseb	0.3 + 1.7	6	0	0	5,580
Untreated	0	0	0	0	4,840
				$LSD_{.05}$ =	690
				$LSD_{.01}$ =	910

Annual grass control in winter wheat with triallate and trifluralin combinations. Brewster, Bill D. and Arnold P. Appleby. Triallate and trifluralin applied post-plant incorporated provide partial control of annual grasses in western Oregon winter wheat, but additional weed control is often necessary. A field trial was established to evaluate sequential applications of these herbicides with six other herbicides. All other herbicides except diuron were applied preemergence. Diuron was applied when the wheat had 2 leaves and the annual grasses had 1 to 2 leaves.

Plots were 2.5 m by 7.5 m and treatments were replicated five times in a randomized complete block design. The soil was a silt loam with 2.5% organic matter and a pH of 6.4. The wheat was seeded at 55 kg/ha in 36-cm wide rows.

Trifluralin was superior to triallate on annual bluegrass, but was less effective on field brome. The compounds were comparable on Italian ryegrass. Trifluralin caused visible injury to the wheat, which tended to reduce wheat yields. Triallate followed by alachlor was the best treatment with at least 95% control of each species and wheat yield of over 10,000 kg/ha. (Crop Science Department, Oregon State University, Corvallis 97331)

		Weed control			
Herbicide	Rate	Italian ryegrass	Field brome	Annual bluegrass	Wheat yield
	(kg/ha)		(%)		(kg/ha)
Post-plant incorporated/premergence					
triallate/RH 8817	1.4/0.4	97	95	40	9,000
trifluralin/RH 8817	1.1/0.4	96	85	96	8,330
triallate/alachlor	1.4/1.1	100	99	95	10,150
trifluralin/alachlor	1.1/1.1	99	91	99	9,340
triallate/pendimethalin	1.4/1.1	98	81	94	9,410
trifluralin/pendimethalin	1.1/1.1	95	24	99	7,190
triallate/propachlor	1.4/1.1	98	65	0	8,670
trifluralin/propachlor	1.1/1.1	97	0	90	6,990
triallate/oryzalin	1.4/1.1	100	91	99	7,390
trifluralin/oryzalin	1.1/1.1	100	83	99	6,920
Post-plant incorporated/postemergence					
triallate/diuron	1.4/1.8	99	88	91	9,140
trifluralin/diuron	1.1/1.8	99	46	99	7,260
Check	0	0	0	0	4,570
				$LSD_{.05}$ =	480
				$LSD_{.01}$ =	650

Quackgrass control in peppermint. Brewster, Bill D. and Arnold P. Appleby. A trial was conducted in a 5-year-old peppermint field to evaluate several herbicide treatments for crop tolerance and quackgrass control. Treatments were arranged in a randomized complete block design with three replications. Plots were 2.5 m by 7.5 m. The herbicides were applied with a unicycle plot sprayer that was calibrated to deliver 234 L/ha at 124 kpa.

The initial treatments were applied on May 6, 1981, when the peppermint was 2 to 5 cm tall and the quackgrass was 10 to 20 cm tall. Two sets of sethoxydim plots were retreated on May 26, 1981. An oil concentrate was used at 0.5% v/v.

No symptoms of herbicide injury were seen on the peppermint. Dowco 453 was the most effective herbicide with almost total quackgrass control 1 yr after application. Repeated applications of sethoxydim were more effective than single applications when evaluated 1 mo after treatment, but no difference was observed 1 yr later. (Crop Science Department, Oregon State University, Corvallis 97331)

		Quackgrass control	
Herbicide	Rate	June 26, 1981	May 20, 1982
	(kg/ha)	(%)	
Applied May 6, 1981			
sethoxydim	0.6	30	17
sethoxydim	1.1	20	23
Ro 13-8895	1.1	90	20
fluazifop-butyl	1.1	73	75
Dowco 453	1.1	100	99
terbacil	1.8	70	13
Applied May 6 and May 26, 1981			
sethoxydim	0.6/0.6	73	23
sethoxydim	0.8/0.8	83	30

Sensitivity of Poaceae crops and weeds to several herbicides. Brewster, Bill D. and Arnold P. Appleby. Seven herbicides were compared for efficacy on several grass-family crops and weeds. A single row of each species was planted across each 2.5 m by 7.5 m plot. The treatments were replicated three times. The herbicides were applied on June 8, 1982. A unicycle, compressed-air plot sprayer delivered 234 L/ha of spray solution at 124 kpa. An oil concentrate was added to all treatments at a rate of 0.5% of the spray volume. The growth stages of each species when treated is listed in Table 1.

Visual estimates of plant injury were recorded on June 29 (Table 2). Corn and bentgrass were essentially eliminated by all of the herbicides, while fine fescue and annual bluegrass were resistant to all herbicides. (Crop Science Department, Oregon State University, Corvallis 97331)

Table 1. Growth stage of plants at time of treatment

spring wheat	3-4 tillers, 20-30 cm tall
spring oats	3-4 tillers, 20-30 cm tall
spring barley	3-4 tillers, 20-30 cm tall
rye	3-4 tillers, 20-30 cm tall
corn	4-5 leaves, 12 cm tall
barnyardgrass	3-5 leaves
green foxtail	4-5 leaves
tall fescue	3-4 leaves
fine fescue	3-4 leaves
orchardgrass	4-6 leaves
Kentucky bluegrass	3-4 leaves
downy brome	3-4 tillers
Italian ryegrass	4 tillers, 12 cm tall
perennial ryegrass	3-4 tillers, 8 cm tall
bentgrass	2-4 leaves
annual bluegrass	2-3 leaves
meadow foxtail	4-5 leaves
sorghum	4-5 leaves, 10 cm tall

Table 2. Response of 19 species of Poaceae to seven herbicides

Herbicide	Rate	Wheat	Oats	Barley	Rye	Corn	Wild oats	Barnyard-grass	Green foxtail	Tall fescue	Fine fescue
	(kg/ha)	(% control)									
fluazifop-butyl	0.28	97	90	80	100	99	95	95	50	35	0
Dowco 453	0.14	99	99	83	85	100	100	95	77	53	3
CGA 82725	0.28	43	93	43	3	100	99	92	53	13	0
diclofop-methyl	1.12	0	80	0	0	100	85	65	63	93	13
sethoxydim	0.28	83	85	80	85	100	99	96	93	90	0
HOE 00581	0.11	33	65	37	10	100	75	70	77	7	0
HOE 00583	0.45	100	88	99	98	100	97	98	23	99	0
HOE 00581 + HOE 00583	0.11 + 0.45	99	98	99	98	100	100	99	99	99	0

Herbicide	Rate	Orchard-grass	Kentucky bluegrass	Downy brome	Italian ryegrass	Perennial ryegrass	Bent-grass	Annual bluegrass	Meadow foxtail	Sorghum
	(kg/ha)	(% control)								
fluazifop-butyl	0.28	85	99	100	75	60	100	0	95	100
Dowco 453	0.14	70	99	96	83	72	100	10	99	100
CGA 82725	0.28	65	90	10	72	57	99	10	88	100
diclofop-methyl	1.12	80	90	10	90	85	97	17	60	3
sethoxydim	0.28	99	99	33	99	99	100	0	96	100
HOE 00581	0.11	0	72	0	0	0	100	0	23	100
HOE 00583	0.45	100	99	100	100	100	100	7	100	99
HOE 00581 + HOE 00583	0.11 + 0.45	100	99	100	100	99	100	0	100	99

Soil persistence of six experimental herbicides. Burrill, L.C. A field-bioassay series was conducted to determine the active soil life of six new herbicides. Three commercial herbicides were included as standards. At the Hyslop research station near Corvallis a seedbed was prepared on a silt loam soil containing 3% organic matter. Plots were 8 ft by 18 ft and replicated two times. Herbicides were applied to bare, dry soil on May 28, 1981. HOE 00661, DOWCO 453, fluazifop-butyl, sethoxydim and RO 13-8895 were applied at 0.5 and 1.0 lbs ai/A. Hexazinone was applied at 1.0 and 1.5 lbs ai/A, diruon and atrazine at 1.5 lbs ai/A and trifluralin at 1.0 lb ai/A. Only trifluralin was mechanically incorporated into the soil. On June 3, 1981 0.5 inch of sprinkler irrigation was applied. Rainfall was supplemented with irrigation to simulate a cropping environment through the summer. Weeds in the unplanted portion of the plots were controlled with paraquat and hand hoeing. The soil was not disturbed until just prior to the spring 1982 planting and again prior to the fall 1982 planting. In both of the later cases all plots were worked with a roto-tiller. The same test species were not used for each planting date but for at least one planting date the following species were used: corn, Italian ryegrass, soybeans, cucumbers, sugarbeets, wheat, oats, rape and broccoli. Visual estimations of percent crop injury were made after each planting. The following table gives dates of planting and evaluation. All herbicide rates given are in pounds of active ingredient per acre. (IPPC, Oregon State University, Corvallis, OR 97331)

	planted	evaluated
First planting	June 18, 1981	July 7
Second planting	August 5, 1981	September 24
Third planting	October 15, 1981	December 8
Fourth planting	June 9, 1982	June 29
Fifth planting	August 26, 1982	November 4

Results

HOE 00661

There was no effect on any of the test species.

RO 13-8895

Only the grasses were affected.

rate	corn	Italian ryegrass	wheat
		First planting	
0.5	68	95	15
1.0	85	100	73
		Second planting	
0.5	70	55	25
1.0	93	93	35
		Third planting	
0.5	-	25	0
1.0	-	60	10

DOWCO 453

Only the grass species were affected.

rate	corn	Italian ryegrass	wheat
		First planting	
0.5	98	100	98
1.0	99	100	100
		Second planting	
0.5	93	97	80
1.0	94	100	95
		Third planting	
0.5	-	75	50
1.0	-	80	75
		Fourth planting	
0.5	40	0	0
1.0	55	60	0
		Fifth planting	

No obvious activity but conditions were not ideal.

Hexazinone

rate	corn	Italian ryegrass	soybeans	cucumbers	sugarbeets	wheat	rape	oats	broccoli
				First planting					
1.0	93	95	99	100	100	100	-	-	-
1.5	93	95	99	100	100	100	-	-	-
				Second planting					
1.0	94	100	99	100	100	100	-	-	-
1.5	98	100	100	100	100	100	-	-	-
				Third planting					
1.0	-	0	-	-	10	0	35	-	-
1.5	-	0	-	-	25	0	68	-	-
				Fourth planting					
1.0	0	30	10	75	0	30	-	-	-
1.5	0	20	20	95	25	60	-	-	-
				Fifth planting					
1.0	0	38	0	-	15	-	-	0	25
1.5	0	55	0	-	25	-	-	0	35

Sethoxydim

At 0.5 and 1 lb ai/A average reduction of Italian ryegrass growth was 13 and 55% respectively in the first planting but it was not affected in subsequent plantings. Corn was not affected in the first planting but at 1 lb/A in one replication of the second planting a 40% reduction in growth was recorded.

Fluazifop-butyl

Only the grasses were affected.

rate	corn	Italian ryegrass	wheat
		First planting	
0.5	70	80	5
1.0	90	100	55
		Second planting	
0.5	55	0	10
1.0	83	10	20

Third planting

Corn was not planted. Italian ryegrass and wheat were not affected.

Diuron

corn	Italian ryegrass	soybeans	cucumbers	sugarbeets	wheat
		First planting			
0	60	40	30	10	15
		Second planting			
0	25	0	55	15	15

Third planting

No effects were observed at this and subsequent plantings.

Atrazine

corn	Italian ryegrass	soybeans	cucumbers	sugarbeets	wheat
		First planting			
0	60	45	90	100	85
		Second planting			
0	0	15	55	100	80

Third planting

No effects were observed at this and subsequent plantings.

Trifluralin

corn	Italian ryegrass		soybeans	cucumbers	sugarbeets	wheat	rape
			First planting				
75	100	0	60	100	73	-	-
			Second planting				
75	75	0	0	55	30	-	-
			Third planting				
-	50	-	-	0	40	0	0
			Fourth planting				
40	50	0	0	0	0	-	-

Fifth planting

No effects were observed on any of the species.

Desiccation of lentils with sodium chlorate and dinoseb. Callihan, R. H., Huston, C.H., D.L. Zamora and D.C. Thill. A desiccant harvest aid which does not contaminate edible lentil seed with toxic residues is needed in Pacific Northwest lentil production. This study was established in 1982 near Moscow, Idaho to determine the efficacy of sodium chlorate (720 g/L), dinoseb 5EC (emulsifiable concentrate 587 g/L), and Dinoseb 3EC (emulsifiable concentrate 352 g/L).

Plots were established July 29, 1982 in a stand of actively growing lentils (*Lens culinaris* Merck.) which had immature seeds. Plots were 3.7 m by 6.1 m with three replications in a completely randomized design. All treatments were broadcast using 8015 nozzles in 187 L/ha water. Air temperature was 32 C with 30% relative humidity under clear skies. The days immediately following application were dry and warm.

Visual evaluations of lentil and weed desiccation were recorded three, five, and eight days after application. Three days after application the 2.8 kg/ha dinoseb 5EC and 2.2 kg/ha dinoseb 3EC treatments had desiccated 90% and 80%, respectively, of lentil leaves while the 2.4, 4.5, 6.7 and 9 kg/ha sodium chlorate treatments were of little effect. Five and eight days after application the degree of desiccation continued to increase with all treatments. However all sodium chlorate treatments produced inadequate desiccation (3 to 35%). Dinoseb 5EC, Dinoseb 3EC, and the 6.7 and 9 kg/ha sodium chlorate treatments provided excellent desiccation of mayweed (*Anthemis cotula* L.). Fair (47%) desiccation was provided with 4.5 and 2.4 kg/ha sodium chlorate. Dinoseb 5EC and Dinoseb 3EC also provided excellent desiccation of wild oats (*Avena fatua* L.) while all sodium chlorate treatments produced inadequate desiccation. (University of Idaho Experiment Station, Moscow, Idaho 83843)

Lentil desiccation with sodium chlorate and dinoseb

Treatment	Rate Kg/ha	Lentil desiccation[1] 3 days[2]	5 days	8 days	Weed desiccation[1] Mayweed	Wild Oat
Check	0	0	0	0	0	0
sodium chlorate	2.2	5	3	15	62	10
sodium chlorate	4.5	5	12	13	77	12
sodium chlorate	6.7	7	15	35	80	25
sodium chlorate	9.0	12	27	47	90	38
dinoseb 5EC	2.8	88	94	97	100	92
dinoseb 3EC	2.2	90	99	100	100	92
LSD $_{.05}$		7	9	17	10	13

[1] Percent of leaves and stems desiccated.
[2] Days after treatment.

Lentil and weed desiccation with paraquat. R.H., Callihan, Huston, C.H., D.L. Zamora and D.C. Thill. This study was established at three locations near Moscow, Idaho to determine the efficacy of paraquat on lentils as a harvest aid and to determine subsequent levels of any residues in harvested seed.

Plots were established at location one on August 12 and at locations two and three on August 13, 1982. Plots measured 3 m by 7 m in a randomized complete block design replicated three times. All treatments, 0.28, 0.56, and 1.12 kg/ha paraquat (240 g/L liquid solution), were broadcast using a backpack boom sprayer with 5002 nozzles and calibrated at 187 L/ha. Air temperature at location one was 18 C and soil temerature at 12.7 cm was 15 C. Relative humidity was 49% with 25% cloud cover. At location two air and soil temperature were both 13 C with relative humidity of 92% and clear skies. Air temperature at location three was 8 C and soil temperature at 12.7 cm was 12 C. Relative humidity was 100% with clear skies.

Lentil plants at location one had lost 80% of their leaves through natural maturation prior to spraying. The seeds were fully developed and pods dry at the time of spraying. At location two the lentils had lost 40% of their leaves with seeds filled but not yet mature. Lentils at location three were still actively growing with very little leaf senescence. Most seeds were filled but not yet mature.

Visual evaluations of lentil and weed desiccation were taken on August 18, 1982. At locations one and two all rates of paraquat completely desiccated the lentils. At location three the degree of desiccation was less and was dependent on paraquat rate. The 0.28 kg/ha rate desiccated 57% of lentil leaves and stems while the 0.56 and 1.12 kg/ha rates desiccated 72 and 80% of the plants, respectively. Due to the very dense lentil stand, the spray did not completely penetrate the canopy. All treatments produced excellent desiccation of mayweed (Anthemis cotula L.), common lambsquarter (Chenopodium album L.), and fiddleneck (Amsinckia intermedia Fisch. and Mey.). Paraquat provided poor desiccation of wild buckwheat (Polygonum convolvulus L.). The degree of weed desiccation did not significantly differ between rates. Lentil seed samples were harvested from all locations on August 31, 1982 and were submitted for residue analysis. (University of Idaho Experiment Station, Moscow, Idaho 83843)

Lentil and weed desiccation with paraquat

Paraquat	Lentil Desiccation1/			Weed Desiccation1/			
Rate kg/ha	Location 1	Location 2	Location 3	Mawe2/	Colq2/	Wibw3/	Cofn4/
0	90	40	0	0	0	0	0
0.28	100	100	57	100	84	28	97
0.56	100	100	72	100	94	30	100
1.12	100	100	80	100	97	37	100
LSD .05	2	0	20	0	7	29	6

1/ Percent of stems and leaves desiccated.
2/ Combined data from locations two and three.
3/ Wild buckwheat was found only at location one.
4/ Fiddleneck was found only at location three.

A comparison of the effectiveness of bentazon applied alone and in combination with six other postemergence herbicides in 'Dark Red' kidney beans. Canevari, M.W., L.W. Mitich and S.A. Fennimore. A trial was established on the Dave Celli farm in San Joaquin County, California to evaluate the effectiveness of bentazon alone and in combination with six other postemergence herbicides.

Procedure. The beans were planted July 5, 1982, and the herbicides were applied on July 22. At the time of treatment, the beans were in the third trifoliate stage. A randomized complete block design was used and each treatment was replicated four times. The plots were 2.5 ft. wide by 20 ft. long. The herbicides were applied with a CO_2 backpack sprayer at a volume of 50 GPA. Weed control and vigor ratings were taken July 29, 1982. Water was supplied as needed throughout the growing season by furrow irrigation.

Herbicide performance. Sethoxydim, fluazifop-butyl and fluazifop-butyl plus bentazon all gave 89% or better control of volunteer wheat, while sethoxydim plus bentazon gave 76% control. Bentazon, sethoxydim plus bentazon, fluazifop-butyl plus bentazon and HOE-00581 plus bentazon all gave moderate yellow nutsedge control. All of the herbicides tested gave 79% or better common lambsquarters control except sethoxydim, fluazifop-butyl, CGA-82725 and HOE-00581. All herbicides tested except PPG-844, bentazon applied alone and acifluorfen, gave near perfect barnyardgrass control. Purslane control was excellent in all treatments except sethoxydim, CGA-82725 and HOE-00581. Sethoxydim, PPG-844 and PPG-844 plus sethoxydim caused severe crop injury. The other herbicides caused only slight injury. (University of California Cooperative Extension, Davis, CA 95616)

Postemergence weed control with bentazon compared with six other herbicides

			% Weed control					
Herbicide	Rate lb/A	Surfactant	Volunteer wheat	Yellow nutsedge	Lambs-quarters	Barnyard-grass	Purslane	Crop[2] vigor
sethoxydim	1.0	0.5% Herbimax	91.5	0.0	12.5	99.0	0.0	5.6
fluozifop-butyl	1.0	0.5% X-77	89.8	0.0	0.0	98.0	M[1]	9.3
CGA-82725	1.0	0.5% Atplus 411F	45.5	11.2	0.0	95.0	18.3	9.4
HOE-00581	1.0	----	19.0	0.0	0.0	97.8	13.3	9.4
PPG-844	0.1	0.25% X-77	35.0	49.2	79.2	23.8	93.3	5.9
Bentazon	1.0	0.5% Herbimax	17.0	77.2	91.0	25.0	92.3	9.0
PPG-844 + sethoxydim	0.1 + 1.0	0.5% Herbimax	M[1]	43.2	81.8	94.7	96.8	5.0
sethoxydim + bentazon	0.5 + 1.0	0.5% Herbimax	76.2	75.8	91.5	95.5	95.0	8.8
fluozifop-butyl + bentazon	0.5 + 1.0	0.5% Herbimax	91.2	71.2	91.0	97.5	92.2	9.0
HOE-00581 + bentazon	0.5 + 1.0	0.5% Herbimax	25.0	74.5	89.0	93.5	97.0	9.2
acifluorfen	0.5	---	22.5	41.2	86.8	25.5	96.3	7.9
control	---	---	37.5	0.0	12.5	17.5	25.0	10.0

[1] M = missing data

[2] Crop vigor ratings: 10 = crop healthy and vigorous 0 = crop dead.

The weed control effectiveness of bentazon in 'Light Red' kidney beans as compared with three postemergence herbicides. Canevari, M.W., L.W. Mitich and S.A. Fennimore. A trial was established at the Gene Wallom farm in San Joaquin County, California, to compare the effectiveness of bentazon with three postemergence herbicides in controlling yellow nutsedge, hairy nightshade and common purslane in 'Light Red' kidney beans.

Procedure. The beans were planted July 11, 1982, and the trial was initiated when the herbicides were applied on August 4, 1982. At the time of treatment, the beans were in the fourth trifoliate stage. A randomized complete block design was used and each treatment was replicated four times. The plots were 5 ft. wide by 20 ft. long. The herbicides were applied with a CO_2 backpack sprayer at a volume of 40 GPA. Weed control and vigor ratings were taken August 12, 1982. Water was supplied as needed throughout the growing season by furrow irrigation.

Postemergence herbicide performance. None of the herbicides tested gave over 60% yellow nutsedge control except bentazon which gave over 90% control. Bentazon, PPG-844 and acifluorfen (Blazer) at 0.5 lb/A gave over 80% hairy nightshade control, while the other herbicides gave poor to moderate control. All of the herbicides tested gave good to excellent common purslane control with the exception of acifluorfen (Tackle) at 0.25 lb/A which gave 57% purslane control. PPG-844 caused severe crop injury while the other herbicides caused moderate to slight injury with bentazon at 0.25 lb/A causing the least. (University of California Cooperative Extension, Davis, CA 95616)

Weed control in 'Light Red' kidney beans
San Joaquin County, California

		% Weed control			
Herbicide	Rate lb/A	Yellow nutsedge	Hairy nightshade	Common purslane	Crop vigor [1/]
bentazon + oil	1.0 + 1%	90.2	97.8	98.5	8.7
bentazon + oil	2.0 + 1%	94.8	97.0	95.8	7.5
PPG-844 + X-77	0.05 + 0.25%	51.2	73.0	87.0	5.6
PPG-844 + X-77	0.1 + 0.25%	50.8	83.0	92.0	4.3
acifluorfen (Blazer)	0.25	48.2	70.0	83.0	8.5
acifluorfen	0.5	52.5	92.8	92.5	6.8
acifluorfen (Tackle)	0.25	50.0	52.5	57.5	8.6
acifluorfen	0.5	59.8	70.0	81.8	7.5
control		12.5	15.0	15.0	10.0

[1/] Crop vigor rating: 10 = crop vigorous and healthy, 0 = dead

Canada thistle control the season after chlorsulfuron application. Dyer, W. E. and P. K. Fay. Canada thistle (Cirsium arvense L.) is the most troublesome perennial weed in small grains in Montana. Chlorsulfuron has excellent activity on Canada thistle at high rates of application, and is presently labeled for use in small grains. The following experiment was established to determine the residual control the season after application.

Chlorsulfuron (with .25% v/v surfactant) was applied at 0, 17, 35, and 70 g per ha in the spring of 1981 to Canada thistle at the 5 leaf and the bud stages in a crop of oats (Avena sativa L.). Two,4-D amine was applied (1.12 kg per ha) at the 5 leaf stage for comparison. The herbicides were applied with a CO_2-pressurized backpack sprayer in 138 L of water per ha to 3.4 m by 39.0 m plots. There were 4 replications. Canada thistle stand counts were taken in early July 1982 in a crop of oats. No crop injury was noted either year.

The lowest rate of application (17 g/ha) reduced the Canada thistle stand by 23%, therefore chlorsulfuron at recommended rates of application provides less residual control than 2,4-D amine. At 35 g/ha, the stand reduction was similar to the 2,4-D treatment. Early applications appeared to be more effective than treatments applied at the bud stage.

Retreatments were made at 90^o to the original treatments in 1982 and counts will be taken in subsequent years to determine if repeated, low application rates of chlorsulfuron will eventually provide long-term control of Canada thistle. (Agric. Exp. Stn., Montana State Univ., Bozeman 59717)

The effect of chlorsulfuron and 2,4-D amine on Canada thistle regrowth 1 year after treatment

Trt. No.	Herbicide	Rate g/ha	Timing	Canada thistle 1/ stems/m^2
1	Chlorsulfuron	70	5 lf	4.8
2	Chlorsulfuron	35	5 lf	21.7
3	Chlorsulfuron	17	5 lf	34.9
4	Chlorsulfuron	70	bud	9.6
5	Chlorsulfuron	35	bud	24.6
6	Chlorsulfuron	17	bud	37.9
7	2,4-D amine	1121	5 lf	27.7
8	Check	--	--	45.4
			CV	26.2
			LSD .05	9.9

1/ Numbers represent the mean of 4 replications.

Herbicides for volunteer rye and jointed goatgrass control in winter wheat. Dyer, W. E. and P. K. Fay. Volunteer rye (*Secale cereale* L.) and jointed goatgrass (*Triticum cylindrica* Host) are troublesome grass weeds in winter wheat in Montana. At present, there are no herbicides labeled which control these weeds. Both grasses can be controlled by changing from winter to spring cereals since the weeds are winter annuals. Grain producers are reluctant to make this rotation change because spring grain yields are often 20 to 40% less than winter wheat.

The experiment was established to test herbicide efficacy. Seed of rye and jointed goatgrass was hand broadcast and disc incorporated 5 cm deep into the experimental area on 9-15-81. 'Winridge' winter wheat was seeded on 10-7-81 at a rate of 67 kg per ha in rows 17.8 cm apart. Herbicides were applied with a CO_2 propelled backpack sprayer in 131 L of water per ha to 21 m by 7.6 m plots. There were 3 replications. Herbicide treatments 1 through 4 were pre-plant incorporated 5 cm deep with a Triple K. Treatments 5 through 9 were applied pre-emergence to the crop. Treatments 10 through 14 were applied in the spring when the winter wheat was in the 3 to 5 leaf stage with 2 tillers per plant. Jointed goatgrass and volunteer rye plants were in the 3 to 4 leaf and 5 to 6 leaf stages, respectively, at the time of the spring application.

The efficacy of 14 herbicide treatments on volunteer rye
and jointed goatgrass control in winter wheat

					% control on 6-11-82	
Trt. No.	Herbicide	Rate applied kg/ha	Date of application	Crop injury %	Volunteer rye	Jointed goatgrass
1	Triallate	1.68	9-15-81	3	2	0
2	Diclofop	1.40	9-15-81	30	58	53
3	Trifluralin	.84	9-15-81	47	43	55
4	Ethalfluralin	.84	9-15-81	38	45	52
5	Oryzalin	.84	10-17-81	0	0	0
6	Chlorpropham	1.12	10-17-81	90	63	58
7	CGA 82725	.56	10-17-81	20	25	28
8	Glyphosate	.13	10-19-81	0	81	56
9	Glyphosate	.28	10-19-81	0	85	73
10	ACC 222,293	.84	4-30-82	0	0	3
11	CGA 82725	.56	4-30-82	40	13	20
12	Glyphosate	.13	4-30-82	72	60	53
13	Metribuzin	.56	4-30-82	3	50	43
14	SSH 0860	1.40	4-30-82	0	0	0
15	Control	--	--	0	0	0
			CV	22.1	17.2	20.6
			LSD .05	8.7	7.4	8.8

The most effective herbicide was glyphosate (treatments 8 and 9) applied on 10-19-81 when many of the grass weed seedlings were emerged. Chlorpropham had fair activity but severely injured the winter wheat. None of the other herbicides tested provided satisfactory control.

An effective treatment would be glyphosate applications made in the fall after the grass weeds emerge but before winter wheat emerges. This pattern of emergence does not always occur since dry soil in the fall is common in Montana. Producers can anticipate a problem with these weeds if seed is produced during the fallow season. If seed is produced, a grain grower could prepare a firm seedbed to encourage rapid rye or jointed goatgrass emergence. If favorable moisture is received and the majority of the weed seedlings emerge, glyphosate could be utilized prior to seeding winter wheat. If fall emergence does not occur, farmers could plant spring cereals following thorough spring tillage to kill volunteer rye and jointed goatgrass. (Agric. Exp. Stn., Montana State Univ., Bozeman 59717)

The effect of chlorsulfuron soil residues on seven rotational crops grown in Montana. Dyer, W. E. and P. K. Fay. Chlorsulfuron has excellent potential as a broadleaf herbicide in small grains. However, the rate of degradation of chlorsulfuron appears to be a limiting factor to the planting of rotational crops in the highly alkaline soils in Montana. Field experiments were established at two locations to determine the residual period of chlorsulfuron in soil and the effect of residues on common rotational crops grown the state.

Chlorsulfuron was applied at 35, 70, and 140 g/ha in 135 L of water per ha to 2.1 m by 7.6 m plots using a CO_2-pressurized backpack sprayer. Four replications were used at the Bozeman location and three at the Great Falls location. The treatments were applied in October, 1980 to wheat stubble. Spring wheat was grown in 1981, and in the spring of 1982, spring wheat, barley, sunflower, safflower, corn, pinto beans, and sugar beets were planted. Wheat and barley grain yield measurements were taken in September, 1982. The other crops were harvested by hand in August, 1982 for dry weight determination.

Barley yields were reduced at the highest rate (140 g/ha) of chlorsulfuron application at Bozeman. No other significant yield reductions were observed for wheat or barley, at any rate tested. The dry weights of all other crops were significantly reduced at all rates tested at both locations. The lowest rate of application (35 g/ha) is only 25% greater than the maximum labeled rate in Montana. It appears that chlorsulfuron residues are extremely persistent in high pH soils, and strict precautions should be taken when using chlorsulfuron in diverse crop rotations. (Agric. Exp. Stn., Montana State Univ., Bozeman 59717)

The effect of chlorsulfuron soil residues on seven crops 2 years after application at Bozeman, MT

Chlor-sulfuron rate g/ha	Grain yield kg/ha		Dry weight, g/10 plants				
	Wheat	Barley	Saf-flower	Sun-flower	Corn	Pinto beans	Sugar beets
35	1949	1548	124.7	59.4	47.4	34.5	6.6
70	1882	1156	106.6	42.1	38.0	24.0	0.4
140	1714	957	45.0	9.1	21.0	15.1	0.0
Check	1667	1468	414.1	791.7	255.1	71.8	36.5
CV	19.8	21.2	23.0	53.9	30.3	29.7	55.0
LSD .05	571	435	63.6	194.7	45.0	17.2	9.6

The effect of chlorsulfuron soil residues on seven crops 2 years after application at Great Falls, MT

Chlorsulfuron rate g/ha	Grain yield kg/ha		Dry weight, g/10 plants				
	Wheat	Barley	Safflower	Sunflower	Corn	Pinto beans	Sugar beets
35	1727	1236	54.8	209.3	20.4	21.0	7.7
70	1881	1290	24.9	20.4	6.1	9.9	0.0
140	1929	1236	11.9	8.7	3.3	5.5	0.0
Check	1613	1360	67.0	852.7	52.0	27.4	52.2
CV	17.9	20.8	11.2	13.3	45.4	33.8	48.0
LSD .05	638	532	8.9	72.5	18.6	10.8	14.4

The effect of dicamba soil residues on spring wheat, barley, sunflower, and safflower. Dyer, W. E. and P. K. Fay. The purpose of this study was to determine if fall application of dicamba for field bindweed (*Convolvulus arvensis* L.) or Canada thistle (*Cirsium arvense* L.) control would carry over and injure spring crops. Dicamba was applied with a CO_2-pressurized backpack sprayer at 1.12, 2.24, and 4.48 kg/ha in 134 L per ha of water. The plots were 3.4 m by 18.3 m and were replicated twice in a randomized complete block design. The treatments were applied in September of 1980 and 1981. An additional treatment of .14 kg/ha dicamba was applied as a spring post-emergence treatment in both years. Two formulations (4DMA and 10%G) were compared. Spring wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), sunflower (*Helianthus annuus* L.), and safflower (*Carthamus tinctorius* L.) were planted in May of 1981 and 1982. Visual ratings were taken on July 20 and September of 1981 and 1982.

There was no significant crop injury to spring wheat or barley at any single rate of dicamba tested (Table 1). Both crops were slightly injured when dicamba was applied post-emergence at a rate of .14 kg/ha following a high rate of application the preceding fall. This injury was also noted at the time of harvest (September 1). It appears that spring wheat and barley are not injured by fall applications of dicamba prior to spring seeding. This program will be of benefit to continuous grain producers with perennial weed problems.

Minimal crop injury was detected in sunflower and safflower during visual ratings taken in July, prior to head formation. By September 1 severe head malformations were observed. The 10%G formulation appeared to have more persistence than the 4DMA formulation. Sunflowers were more sensitive to dicamba residues than safflower. (Agric. Exp. Stn., Montana State Univ., Bozeman 59717)

The effect of dicamba soil residues on spring wheat, barley, sunflower, and safflower the season after fall applications

Dicamba formu- lation	Rate kg/ha	Time of appli- cation	% crop injury 1/ Wheat 7/20	9/1	Barley 7/20	9/1	Sunflower 7/20	9/1	Safflower 7/20	9/1
4DMA	1.12	fall	2.5	0.0	0.5	0.0	1.5	18.5	2.0	9.5
4DMA	2.24	fall	4.5	0.0	3.5	0.0	10.5	46.5	10.0	28.5
4DMA	4.48	fall	6.0	2.5	8.0	2.5	13.5	97.5	14.5	85.0
4DMA	2.24&.14	fall & spr	12.5	12.0	11.0	12.5	--	--	--	--
10G	2.24	fall	3.5	0.0	3.5	1.5	13.0	68.0	14.0	58.5
10G	4.48	fall	4.0	0.5	7.0	3.5	12.5	94.0	13.5	80.5

1/ Ratings represent the mean of 2 years' data.

The effect of time of application and rate of chlorsulfuron on the stand and yield of winter wheat. Dyer, W. E. and P. K. Fay. Winter annual broadleaf weeds in winter wheat are often too mature to be controlled by spring applications of herbicides in Montana. Results from previous trials indicate that fall applications of chlorsulfuron can control both emerged winter annuals and spring-germinating weeds. A fall herbicide treatment would be helpful to producers not only by improving efficacy, but also by saving time in the spring, a busy time for grain producers. The purpose of this trial was to determine if chlorsulfuron could be applied to winter wheat at several early growth stages, without causing crop injury.

Chlorsulfuron was applied to weed-free winter wheat (*Triticum aestivum* L. 'Redwin') at 8.7, 26.3, and 52.5 g/ha using a CO_2-pressurized backpack sprayer in 168 L of water per ha. Four replications of 2.1 m by 7.6 m plots were used in a randomized complete block design. The three herbicide treatments were applied in October and November, 1981 and in May and June, 1982. Crop stand counts were taken in late June and the plots were harvested in September. No crop injury was observed at any rate or timing of application.

The same treatments were applied under weedy conditions at a second location. Weed control was excellent for all treatments. (Agric. Exp. Stn., Montana State Univ., Bozeman 59717)

The effect of application timing of chlorsulfuron on the stand and yield of winter wheat

Chlorsulfuron rate (g/ha)	Date of application	Wheat growth stage at time of application	Wheat plants/m	Crop yield kg/ha
8.7	10-25-81	1½ leaf	16.5	2540
26.3	10-25-81	1½ leaf	18.0	3158
52.5	10-25-81	1½ leaf	16.5	2923
8.7	11-10-81	2 tillers	15.0	3145
26.3	11-10-81	2 tillers	18.9	2775
52.5	11-10-81	2 tillers	18.0	2843
8.7	5-25-82	4-5 tillers	15.9	3044
26.3	5-25-82	4-5 tillers	18.0	3091
52.5	5-25-82	4-5 tillers	18.0	3225
8.7	6-11-82	6-8 tillers	17.4	3078
26.3	6-11-82	6-8 tillers	21.0	2797
52.5	6-11-82	6-8 tillers	17.4	3125
Check	--	--	17.4	2808
		CV	14.8	12.4
		LSD .05	3.7	510.7

Chemical fallow in a winter wheat-fallow cropping system. Evans, J. O. and R. W. Gunnell. Broad spectrum chemical weed control in winter wheat fallow near the USU Blue Creek Research Station demonstrated both the usefulness and the unpredictability of manipulating weed communities with herbicides. Treatments were applied with a bicycle sprayer at a rate of 187 ℓ/ha at 30 psi November 17, 1981 on a silt loam soil with a 7.2 pH and 2.1% organic matter. Plot size was 3.4 m by 24.4 m with four replications in a randomized block design. At application volunteer wheat in the three leaf growth stage and snow speedwell in the four leaf stage were present in standing wheat stubble. By May 14, 1982 smallflower collinsia had emerged and weed control was evaluated on a percent basis. Tank mixes containing chlorsulfuron plus propham and atrazine, cyanazine, paraquat and Surfactant WK gave the best early broad spectrum weed control. When plots were reevaluated July 2, tumble redroot had been released in treatments containing atrazine, cyanazine and 2,4-D and in those with atrazine, cyanazine and paraquat, while no sign of tumble redroot was found in check plots. Similarly, prickly lettuce was released in chlorsulfuron-propham treatments with populations equal to or greater than those encountered in check areas. Tumble redroot and prickly lettuce release was closely correlated to treatments which gave the best control of volunteer wheat. (Utah Agricultural Experiment Station, Logan, 84322.)

Chemical fallow weed control

Treatment	Rate (Kg/ha)	Percent control						
		VW[1]		SS		CL	TR	PL
		5-14-82	7-2-82	5-14-82	7-2-82	5-14-82	7-2-82	7-2-82
PPG1259	0.56	10	18	3	23	8	100	80
chlorsulfuron glyphosate WK	0.009+ 0.56+ 1.00%	69	18	38	38	64	100	95
chlorsulfuron glyphosate WK	0.018+ 0.56+ 1.00%	71	18	76	88	88	100	100
chlorsulfuron propham 135	0.009+ 3.36	94	71	87	65	90	100	8
chlorsulfuron propham 135	0.018+ 3.36	96	54	94	74	98	100	49
atrazine cyanazine 2,4-D ester	0.42+ 0.84+ 0.84	81	43	97	98	100	55	98
atrazine cyanazine 2,4-D ester	0.56+ 1.12+ 0.84	88	54	96	99	98	42	100
atrazine cyanazine paraquat WK	0.42+ 0.84+ 0.56+ 0.25%	97	84	94	86	100	0	95
atrazine cyanazine paraquat WK	0.56+ 1.12+ 0.56+ 0.25%	97	85	96	93	100	0	100
metribuzin	0.56	10	13	49	94	53	98	98
amitrole	0.56	8	8	3	23	0	100	55
check	--	0	0	0	0	0	100	49

[1] VW = volunteer wheat, SS = snow speedwell, CL = smallflower collinsia, TR = tumble redroot, PL = prickly lettuce.

Controlling yellow nutsedge in silage corn with preplant incorporated herbicide treatments. Evans, J. O. and R. W. Gunnell. Yellow nutsedge has become an increasingly troublesome weed problem in western Weber County, Utah, and since silage corn is commonly grown in the area, preplant incorporated corn herbicides have proven useful in combating nutsedge. Our 1982 study was initiated May 5 on a loamy sand soil with a pH of 9 and 1.36% organic matter. The plot area had been moldboard plowed and the soil surface firmed with a sand packer prior to herbicide application. All treatments were applied with a bicycle sprayer calibrated to deliver 187 ℓ/ha at 30 psi. Plot size was 4.3 meters by 9.1 meters with four replications in a complete randomized block. After application treatments and controls were incorporated using a tandem disc set to a cut depth of 13 cm followed by a spike tooth harrow.

Crop tolerance and weed injury evaluations were based both on a visual percentage and an actual crop and weed plant count. At first evaluation time, May 27, several treatments appeared promising with metolachlor at 3.9 kg/ha receiving the highest rating at 92% control. By June 21, yellow nutsedge had escaped to unacceptable levels in most treatments, but the metolachlor treatment persisted with an 89% average reading. Post harvest evaluations indicated that metolachlor at 3.9 kg/ha was the only treatment in the experiment to give consistent, full season control of yellow nutsedge. None of the treatments caused any detectable crop injury regardless of corn development stage. (Utah Agricultural Experiment Station, Logan, 84322.)

Yellow nutsedge control in silage corn

Treatment	Rate (Kg/ha)	Corn stand 6-21-82	Nutsedge1/ count 6-21-82	Percent nutsedge control 5-27-82	
				5-27-82	6-21-82
alachlor	3.92	4.3	7.3	85	71
metolachlor	3.92	4.5	3.4	92	89
vernolate/R-25788 R-33865	4.48	5.3	18.0	71	45
vernolate/R-22788 R-33865	6.72	5.1	14.9	85	61
vernolate/R-25788	4.48	5.1	16.6	79	49
vernolate/R-25788	6.72	5.4	18.9	75	46
EPTC/R-25788 R-33865	4.48	5.0	7.4	89	78
EPTC/R-25788 R-33865	6.72	5.1	12.0	88	68
EPTC/R-25788	4.48	4.6	21.6	50	40
EPTC/R-25788	6.72	5.2	28.4	59	36
EPTC/R-25788 SC-7432	4.48	4.9	6.5	83	71
EPTC/R-25788 SC-7432	6.72	4.6	11.5	86	68
check	--	4.9	33.6	0	0

1/ Counts taken within a 10 cm x 92 cm quadrant placed over the corn row at three randomly selected locations in each rep. Numbers are the average of four replications.

Field dodder control in established alfalfa. Evans, J. O. and R. W. Gunnell. The unpredictability of field dodder germination creates a need to extend the activity of popular field dodder herbicide treatments. On April 22, 1982 a field study was initiated in an established alfalfa field in Cache County, Utah on a well-drained loam soil with a pH of 7.5 and 4.2% organic matter. At application alfalfa was just beginning to break dormancy with approximately 3 cms new growth showing. Granular treatments were applied with a push-type Gandy spreader, while other treatments were applied with a bicycle sprayer at 187 ℓ/ha. Operating pressure for chlorporpham 4EC treatments was 30 psi, but DCPA was applied at 60 psi to achieve the 187 ℓ/ha application rate. Plots were 4.3 m by 18.3 m with three replications in a random block design. Field dodder stands were very uniform with check areas showing 60-70% ground cover.

Crop and weed injury were evaluated on a visual percentage basis. Two treatments gave 100% full season control of field dodder - DCPA 8.4 kg ai/ha and chlorpropham 4EC 6.72 kg ai/ha plus carbaryl insecticide 0.84 kg ai/ha. Granular treatments with chlorpropham were not as effective as 4EC chlorpropham treatments and ratings for chlorpropham 4EC plus carbaryl were better than those for chlorpropham 4EC alone. (Utah Agricultural Experiment Station, Logan, 84322.)

Field dodder control in established alfalfa

Treatment	Rate (Kg/ha)	Percent dodder control[1/] 7-1-82
chlorpropham 20G	4.48	60
chlorpropham 20G	6.72	73
chlorpropham 4EC	4.48	80
chlorpropham 4EC	6.72	98
chlorpropham 4EC+ carbaryl 50W	4.48+ 0.56	92
chlorpropham 4EC+ carbaryl 50W	6.72+ 0.84	100
DCPA 75W	8.40	100
check	--	0

[1/] Percent control based on visual comparison with untreated check.

Mixing EPTC 10G with alfalfa seed at planting time to control redroot pigweed and green foxtail. Evans, J. O. and R. W. Gunnell. In an attempt to control redroot pigweed and green foxtail in seedling alfalfa, EPTC 10G was mixed with Lahontan alfalfa seed and broadcast using a conventional double disc drill with 6" row spacing on a sandy loam soil with a pH of 7.3 and 1% organic matter at the USU Farmington Research Station. Three alfalfa seed plus herbicide rates were compared with alfalfa alone at the same seeding rates. The drill setting for each seed and seed plus EPTC 10G treatment was individually calibrated to insure accuracy. Seed drop tubes were removed to allow forward movement and drill frame deflection to create a broadcast rather than a row effect for both seed and herbicide. The seed bed had been prepared using an S-shank harrow followed by a spike-tooth harrow, and the soil surface was firm and free of weed and previous crop residues. After seed and herbicide application the entire plot area was spike-tooth harrowed to facilitate shallow incorporation of both alfalfa seed and EPTC. Plot size was 3.4 m by 9.1 m with three replications in a randomized block design.

Crop and weed injury ratings were based on plant stand counts, plant height, and visual comparisons. Readings taken July 13, 1982 indicated that in herbicide treated plots as the EPTC 10G rate increased weed control improved, but that crop stunting and stand reductions also occurred with increasing herbicide application rate. By August 20, 1982 EPTC treated alfalfa had recovered from most herbicide injury symptoms while crop stunting was more apparent in untreated plots due to weed competition. Both weed control and crop injury data suggest that the competitive advantage of the highest seeding rate with the anticipated decrease in crop phytotoxicity of the lowest EPTC rate could give both acceptable crop injury and weed control in future studies. (Utah Agricultural Experiment Station, Logan, 84322.)

EPTC 10G plus alfalfa seed for redroot pigweed and green foxtail control.

Treatment	Rate 1/herb. - 2/seed	Stand counts/m^2 7-13-82			Avg. ht. cms. 7-13-82			Percent crop inj./ weed cont.		
		A	RP	GF3/	A	RP	GF	A	RP	GF
alfalfa seed	5.6	226	43	52	23	18	8	0	0	0
alfalfa seed	11.2	334	86	56	23	18	10	0	0	0
alfalfa seed	16.8	486	65	84	23	15	5	0	0	0
alfalfa seed+ EPTC 10G	5.6+ 1.1	86	32	11	13	5	5	37	50	94
alfalfa seed+ EPTC 10G	11.2+ 2.2	118	21	7	10	5	3	57	87	98
alfalfa seed+ EPTC 10G	16.8+ 3.4	140	17	0	8	3	0	75	92	100

1/Herbicide rates expressed in kg ai/ha.

2/Seed rates expressed in kg/ha.

3/A = alfalfa, RP = redroot pigweed, GF = green foxtail.

Postemergence wild oat and green foxtail control in seedling alfalfa. Evans, J. O. and R. W. Gunnell. A field study designed to compare the efficacy of several postemergence herbicides in seedling alfalfa was established in Cache County, Utah on a loam soil. WL309 variety alfalfa had been planted at a rate of 12.3 kg/ha April 19, 1982, and postemergence herbicide treatments were applied June 23, 1982. At application alfalfa height was 13 to 18 cm while green foxtail measured 3 to 5 cm (344 plants/sq m), and wild oats 30 to 38 cm (86/sq m). Wild oats were probably beyond optimum treatment stage, but herbicide application had been delayed while green foxtail developed. A bicycle sprayer calibrated to deliver 187 ℓ/ha at 30 psi was used to apply treatments, and plot design was a complete random block with four replications.

Crop tolerance and weed susceptibility were evaluated visually with evaluations July 19, Aug. 27 and Sept. 20, 1982. At the lowest application rate, 0.14 kg ai/ha plus Atplus 411F 1.25% v/v, CGA 82725 showed the greatest activity against wild oat while sethoxydim plus Atplus 411F at the same rate was the least active treatment. With green foxtail, however, both CGA 82725 plus Atplus 411F and sethoxydim plus Atplus 411F gave good control at the highest application rate while control with fluazifop butyl plus Atplus 411F was unacceptable at all rates tested. Alfalfa was harvested between the July and August evaluations, and the post harvest wild oat population was not adequate for further wild oat injury readings. Herbicide injury to alfalfa was not significant in any treatment when compared with the untreated control, but post harvest alfalfa regrowth was slower in check areas and treatments which did not adequately control wild oats. (Utah Agricultural Experiment Station, Logan, 84322.)

Postemergence wild oat and green foxtail control in seedling alfalfa.

Treatment	Rate (Kg/ha)	Percent wild oat control 7-19-82	Percent green foxtail control 7-19-82	8-27-82	9-20-82
CGA 82725+ Atplus 411F	0.14+ 1.25%	75	30	30	5
CGA 82725+ Atplus 411F	0.28+ 1.25%	88	79	44	28
CGA 82725+ Atplus 411F	0.56+ 1.25%	92	89	94	72
fluazifop butyl+ Atpluss 411F	0.14+ 1.25%	35	13	15	5
fluazifop butyl+ Atplus 411F	0.28+ 1.25%	83	41	5	5
fluazifop butyl+ Atplus 411F	0.56+ 1.25%	92	53	14	5
sethoxydim+ Atplus 411F	0.14+ 1.25%	45	13	62	36
sethoxydim+ Atplus 411F	0.28+ 1.25%	39	45	91	95
sethoxydim+ Atplus 411F	0.56+ 1.25%	91	92	85	94
check	--	0	0	0	0

Postemergence wild oat control in spring planted barley. Evans, J. O. and R. W. Gunnell. Cool, moist spring weather in northern Utah during 1982 gave wild oats an excellent opportunity to escape some postemergence wild oat herbicides. On June 2, 1982 a field trial was established on a clay loam soil in northern Cache County, Utah with wild oats in the three to early four leaf stage (387/sq m) and Steptoe barley in the four leaf growth stage. Earlier application had been prevented by adverse weather, and at application time the soil surface was moist with both barley and wild oats showing stress due to excessive moisture. Plot design was a complete randomized block with four replications. A bicycle sprayer was used for herbicide application with treatments containing barban applied at 56 ℓ/ha and 45 psi, while AC 222,293 and difenzoquat treatments were applied at 94 ℓ/ha and 30 psi, and diclofop methyl treatments at 187 ℓ/ha and 30 psi.

Crop tolerance and herbicide efficacy were evaluated on a visual percentage basis with evaluations in late June and mid August. Slight crop injury in the form of stunting was noted in the June evaluation, but was not apparent in mid August. Wild oat control ratings were, in most cases, higher for the earlier evaluation than were later ratings with diclofop methyl at 1.12 kg/ha plus bromoxynil .56 kg/ha giving the most consistent long term control. Wild oat escapes in barban treatments were predictable due to incorrect application timing, but the antagonism between diclofop methyl at 1.12 kg/ha plus DPXT6376 at .02 kg/ha when tank mixed was not anticipated. (Utah Agricultural Experiment Station, Logan, 84322.)

Wild oat control in spring planted barley

Treatment	Rate (Kg/ha)	Percent barley injury 6-29-82	Percent barley injury 9-19-82	Percent wild oat control 6-29-82	Percent wild oat control 9-19-82
AC 222,293	0.42	3	0	45	20
AC 222,293	0.56	3	0	44	38
AC 222,293	0.71	0	0	60	30
AC 222,293	0.84	3	0	45	33
AC 222,293+ DPX-T6376	0.84+ 0.02	8	0	55	43
AC 222,293+ bromoxynil	0.84+ 0.56	5	0	30	33
difenzoquat	0.84	3	0	40	19
difenzoquat	1.12	3	0	78	36
difenzoquat+ DPX-T6376	1.12+ 0.02	13	0	93	40
difenzoquat+ 2,4-D ester	1.12+ 0.56	3	3	93	71
diclofop methyl	0.84	10	0	69	60
diclofop methyl	1.12	8	0	94	68
diclofop methyl+ DPX-T6376	1.12+ 0.02	3	0	10	18
diclofop methyl+ bromoxynil	0.84+ 0.56	3	3	70	70
diclofop methyl+ bromoxynil	1.12+ 0.56	8	3	97	93
barban	0.42	3	0	25	30
barban+ DPX-T6376	0.42+ 0.02	5	0	8	5
check	--	0	0	0	0

Vernolate/R25788 and EPTC/R25788 post plant incorporated in silage corn using sprinkler irrigation and shallow mechanical incorporation plus sprinkler irrigation. Evans, J. O. and R. W. Gunnell. A field study to compare two post plant incorporation methods for vernolate/R25788 and EPTC/R25788 was established June 17, 1982 on a sandy loam soil with a pH of 7.3 and 1% organic matter at the USU Farmington Research Station. Plots were 3.4 m by 9.1 m with 3 replications in a complete randomized block. Herbicides were applied with a bicycle sprayer delivering 187 ℓ/ha at 30 psi. NK PX7 variety corn had been planted at a depth of 6 cms one day prior to herbicide applications. Treatments receiving both mechanical and sprinkler incorporation were incorporated with a spike-tooth harrow set to cut 3 to 4 cms deep followed by a 1.25 cm sprinkler irrigation while sprinkler incorporation treatments received only the 1.25 cm irrigation. An additional 1.25 cm irrigation was applied to the entire plot prior to first evaluation.

Crop and weed injury were evaluated using a visual percent rating. There was no significant difference in weed control of either redroot pigweed or green foxtail when comparing the two incorporation methods. There were, however, indications of crop injury in the form of leaf curl primarily in vernolate/R25788 treatments under both incorporation methods. (Utah Agricultural Experiment Station, Logan, 84322.)

Comparative post plant incorporation methods for vernolate/R25788 and EPTC/R25788 in silage corn.

Treatment	Rate (Kg/ha)	Incorporation	Percent corn injury 7-13-82	Percent control Redroot Pigweed 7-13-82	Green Foxtail
vernolate/R25788	4.48	harrow + sprinkler	20	95	99
vernolate/R25788	6.72	harrow + sprinkler	20	95	98
ETPC/R25788	4.48	harrow + sprinkler	5	92	99
EPTC/R25788	6.72	harrow + sprinkler	5	96	100
vernolate/R25788	4.48	sprinkler only	9	95	100
vernolate/R25788	6.72	sprinkler only	9	97	100
EPTC/R25788	4.48	sprinkler only	3	90	99
EPTC/R25788	6.72	sprinkler only	7	92	100
check	--	--	0	0	0

Evaluation of preemergence and postemergence herbicides on blackeye cowpeas. Frate, C.A. and L.W. Mitich. Several preplant incorporated and postemergence herbicides were evaluated for their selectivity on 'California Blackeye 5' cowpeas. The entire field, including the trial area, was pre-tested with trifluralin at 0.75 lb/A. After the herbicide incorporation, beds were formed. Soil type was Exeter loam. Herbicide treatments for the trial were applied at 30 GPA using a CO_2 backpack sprayer. Plots were 2 beds wide and 40 ft. long with 3 replications. Preemergence herbicides were applied May 21 to beds which had a dry, cloddy surface. Beds were then cultivated twice with a rotary cultivator to a 3-inch depth. Seeds were planted to moisture the same day.

With the exception of fluazifop-butyl at 1 lb/A which was sprayed June 23 and July 9, postemergence herbicides were applied July 9. Cowpeas were in the vegetative, early vining, pre-bloom stage of growth at the time of treatment.

There was no phytotoxicity or stunting in the cowpeas plot treated with preemergence herbicides. Application of the postemergence herbicides PPG 844, MC-10978, and acifluorfen resulted in foliar burn; however, the subsequent growth was unaffected. Treatment with bentazon resulted in chlorotic areas in sprayed leaves. The cowpeas outgrew all the symptoms from postemergence applications and the treated plots were visually undistinguishable by season's end. Weed populations were insufficient to rate for weed control activity. (University of California Cooperative Extension, Visalia, CA 93291)

Vigor and phytotoxicity ratings for preemergence and postemergence herbicide applications to 'California Blackeye 5' cowpeas[1]

Treatments	Rate lb/A	Date applied	Vigor[2] 6/8	Phytotoxicity[3] 7/13	 7/19
check	--	--	8.7	0.2	
Preemergence					
alachlor	1.5	5/21	9.3	0.3	
chlorpropham	1.5	5/21	9.0	0.3	
chlorpropham	2.0	5/21	9.0	0	
metolachlor	1.25	5/21	8.7	0.2	
ethalfluralin	0.75	5/21	9.0	0	
diethatyl	3.0	5/21	9.0	0	
Postemergence					
sethoxydim	0.5	7/9	9.3	0.3	
fluazifop-butyl	0.5	7/9	9.3	0	
PPG 844	0.1	7/9	9.0	3.0	
MC-10978	0.125	7/9	9.0	2.7	
MC-10978	0.375	7/9	8.7	4.0	
acifluorfen	0.125	7/9	9.0	3.3	
acifluorfen	0.375	7/9	9.0	3.7	
bentazon	0.75	7/9	9.0	1.3	
fluazifop-butyl + surfactant	1.0 + 1.0	6/23, 7/9	8.7	0.3	

---

[1] Replications I and II were rated July 13; replication I was rated July 19. Difference in date was due to irrigation.

[2] Vigor ratings: 10 = most vigorous; 0 = dead. Values are the means of 3 replications.

[3] Phytotoxicity ratings: ←0 = no phytotoxicity; ←10 = dead. Values are the means of 3 replications rated at 2 separate dates.

Low dose/early weed flush method of postemergence herbicide application on sugarbeets. Haagenson, K. A. and E. F. Sullivan. A new spray technique for postemergence weed control in sugarbeets was evaluated in 1982. The technique was developed in Britain and is rapidly becoming a commercial practice there. The technique is based on spraying weeds with a reduced rate of herbicide soon after emergence, regardless of beet size.

To evaluate the technique in the Great Plains region, crop and weed planting occurred on April 6, 1982, in a fine, loose, dry seedbed (Sandy clay loam, pH 7.5, O.M. 0.9%) with hard, dry subsoil conditions. MONO HY A4 sugarbeet seed was sown at four seeds per 30.6 cm of row at 2.5 cm soil depth. Natural weed seed populations were enhanced with a weed seed mixture applied in an 18 cm band at planting. Predominant species present in the untreated controls included redroot pigweed, kochia, common lambsquarters, Russian thistle, and green foxtail. Soil and overhead moisture were inadequate for rapid crop and weed emergence, therefore, the plots were surface irrigated twice in April.

Initial treatments were applied on May 3 with air temperatures averaging 23°C at establishment. Spray was delivered at 94 l/ha overall with 8001 nozzle tips at 2.05 kg/cm^2 traveling at 3.54 km/hr with a tractor-mounted sprayer. Plot size measured 9.1 m by 6 rows at 56 cm spacing. Treatments were replicated three times in a randomized complete block design. A second treatment was made on May 10 with air temperatures averaging 20°C at establishment. The standard postemergence treatment was applied also on May 10 in a 28 cm band at 132 l/ha with 80015E nozzle tips at 2.05 kg/cm^2 traveling at 3.54 km/hr.

Weed control, crop stand, and crop vigor estimates were made on May 18 and June 1, 1982.

Evaluations consisted of phenmedipham + desmedipham with the standard method, and with the low-dose method. Other evaluations using the low-dose method included phenmedipham + desmedipham + fluazifop, and phenmedipham + desmedipham + ethofumesate.

Weed control estimates are reported herein as percentages of the untreated control (Table). Phenmedipham + desmedipham applied by standard technique averaged 77 percent total weed control; while applied with the low-dose method, control averaged 85 percent. Phenmedipham + desmedipham + fluazifop averaged 88 percent total weed control, and phenmedipham + desmedipham + ethofumesate averaged 97 percent control.

Crop tolerances were somewhat limiting for commercial utilization under 1982 rates and conditions. However, rainfall subsequent to application and a coarse textured soil condition permitted some preemergence chemical activity to occur which suppressed crop growth further. The low-dose technique, with dosage adjustments for the Great Plains, shows potential for controlling early weed flushes in sugarbeets. (Contribution of The Great Western Sugar Company, Agricultural Research Center, Longmont, CO. Published with approval of the Director as Abstract No. 28-H Journal Series.

Percent weed control and sugarbeet injury estimates when normal postemergence and low dose/early weed flush spray techniques were compared, 1982.

	Dose	Sugarbeet		Total	
Treatment	(kg/ha)	Injury	Stand	Weed Control	Weed Escapes
Phenmedipham, 1.3E + Desmedipham, 1.3E	.56+ .56	32,[a] 23[b]	90,104	87,77	KO, PW, G
Phenmedipham + Desmedipham/ Phenmedipham + Desmedipham	.185+.185/ .185+.185	30, 25	97, 94	88,85	KO, G burned and stunted
Phenmedipham + Desmedipham + Fluazifop, 4E/Phenmedipham + Desmedipham + Fluazifop	.185+.185+ .22/.185+ .185+.22	37, 23	93, 97	90,88	KO stunted
Phenmedipham + Desmedipham + Ethofumesate, 1.5E/Phenmedipham + Desmedipham + Ethofumesate	.185+.185+ .37/.185+ .185+.37	60, 38	85, 92	100,97	KO stunted
Check	0	0, 0	100,100	0, 0	PW, KO, LQ, G moderate density

[a] Visual observations taken on May 18, 1982.

[b] Visual observations taken on June 1, 1982.

Control of catchweed bedstraw with chlorsulfuron. Howard, S. W. and R. E. Whitesides. A field study was established in 1982 to determine the efficacy of chlorsulfuron alone and in combination with other herbicides (bromoxynil, dicamba, 2,4-D, and MCPA) for control of catchweed bedstraw (*Galium aparine* L.) in winter wheat. With the exception of 2,4-D and 2,4-D + chlorsulfuron, all treatments were applied on April 15, 1982, when the wheat had three tillers and the bedstraw was 1 inch high. The 2,4-D and 2,4-D + chlorsulfuron treatments were applied on May 8, 1982, when the wheat had 7 tillers and the bedstraw was 6 inches high. The final evaluations were made on June 29, 1982.

When used alone chlorsulfuron, bromoxynil and 2,4-D provided poor weed control. Tank mixtures of chlorsulfuron with other herbicides resulted in contrasting effects. When chlorsulfuron was combined with bromoxynil or dicamba there was a noticeable increase in control. Conversely, combinations with 2,4-D or MCPA did not increase control. A mixture of bromoxynil + MCPA (LVE) and chlorsulfuron provided fair control of bedstraw. (Department of Agronomy and Soils, Washington State University, Pullman 99164-6420).

Control of Catchweed Bedstraw in Winter Wheat

TREATMENT	RATE lb/A		CONTROL[c]
	Applied April 15,1982[a]	Applied May 8,1982[b]	
Chlorsulfuron	0.005		3
Chlorsulfuron	0.008		4
Chlorsulfuron	0.010		5
Chlorsulfuron	0.016		6
Bromoxynil	0.18		5
Bromoxynil	0.38		8
2,4-D (oil soluble amine)		0.68	4
Chlorsulfuron + bromoxynil	0.005 + 0.18		9
Chlorsulfuron + bromoxynil	0.010 + 0.18		10
Chlorsulfuron + 2,4-D (LVE)		0.005 + 0.5	4
Chlorsulfuron + MCPA (LVE)	0.005 + 0.5		4
Bromoxynil+MCPA+chlorsulfuron	0.12+0.12+0.005		8
Bromoxynil+MCPA+chlorsulfuron	0.12+0.12+0.010		8
Bromoxynil+MCPA+chlorsulfuron	0.25+0.25+0.005		8
Chlorsulfuron+dicamba	0.008+0.125		10
Chlorsulfuron+dicamba	0.016+0.125		10

[a] wheat: 3 tiller. Bedstraw 1 inch high

[b] wheat: 7 tiller. Bedstraw 6 inches high

[c] 0 = no injury, 10 = complete control

Early-summer herbicide treatments for control of broadleaved weeds in a fallow winter wheat field. Humburg, N. E. and H. P. Alley. A study to compare HOE-00661 and SC-0224 with glyphosate for control of volunteer wheat and broadleaved weeds was established north of Cheyenne, Wyo. Herbicide-water solution was applied with a 6-nozzle knapsack sprayer that delivered 10 gpa. TeeJet HSS8001 nozzles gave full coverage. Plots were 9 by 30 ft. Treatments were replicated three times; a randomized complete block design was used. Weather conditions on June 16, 1982, at the time of herbicide application, were: air temperature, 77F; relative humidity, 29%; wind 0 to 1 mph; and partly cloudy sky. Soil temperatures for the surface, 1, 2 and 4 inches were 90, 80, 71 and 63F, respectively. Soil moisture was at field capacity. The sandy loam soil (78.4% sand, 10.8% silt and 10.8% clay) had 0.9% organic matter and 7.5 pH. Plant species and their respective stages of growth and height were: volunteer wheat, 2-leaf to flowering and 5 to 26 in; slimleaf lambsquarters, cotyledon to 10 leaf and 0.5 to 5 in; Russian thistle, cotyledon to multi-leaved and 1 to 3 in; and wild buckwheat, cotyledon to 12 leaf and 1 to 5 in.

Herbicide effects were evaluated visually on July 6, 1982. Volunteer wheat, which was 5 to 26 in tall when herbicides were applied, was only partially controlled by HOE-00661 at the rates studied. Broadleaved weeds were more readily controlled by HOE-00661 at 1.0 lb/A than was volunteer wheat. Lesser rates of glyphosate and SC-0224 would establish threshold levels for the plant species present, as the 0.5 lb/A rate of each herbicide gave 95 to 99+% control. (Wyo. Agric. Exp. Sta., Laramie, WY 82071, SR 1190).

Early-summer herbicide treatments for control of
broadleaved weeds in a fallow winter wheat field

Herbicides[1]	Rate lb/A	Percent Control[2]			
		Volunteer wheat[3]	Slimleaf lambsquarters	Russian thistle	Wild buckwheat
glyphosate	0.5	98	98	95	95
HOE-00661	0.75	60	20	25	45
HOE-00661	1.0	70	85	45	90
HOE-00661	1.5	75	95	90	99+
SC-0224	0.5	99	99+	98	98
SC-0224	1.0	100	98	98	90
Check	---	0	0	0	0
plants/sq ft		*1.5*	*5.9*	*6.2*	*0.1*

[1] Herbicides applied June 16, 1982.

[2] Visual evaluations July 9, 1982, with quadrat counts in check plots.

[3] Spray coverage on June 16 was incomplete; plant height was 5 to 26 in.

Effect of late-spring herbicide treatments for fallow-season weed control in a winter wheat field. Humburg, N. E. and H. P. Alley. A winter wheat field in southeastern Wyoming with soil of 0.9% organic matter and 7.5 pH was the site for herbicides which were broadcast-applied on May 22, 1982. A CO_2-pressured knapsack sprayer with a 6-nozzle boom was used to apply herbicide-water solution at 20 gpa. The field was not tilled following harvest in 1981; herbicides were applied to dry surface soil and wheat stubble 12 to 14 inches tall. Vegetation on May 22 consisted of the following species with respective stages of growth and height: volunteer wheat, 0 to 6 tillers, 3 to 5 leaf and 4 to 14 in; slimleaf lambsquarters, cotyledon to 4 leaf and 0.25 to 1.5 in; Russian thistle, cotyledon to 8 leaf and 0.25 to 2 in; and wild buckwheat, 2 to 4 leaf and 1 to 2 in. Environmental conditions were: air temperature, 75F; relative humidity, 40%; clear sky; and soil temperatures at the surface, 1, 2 and 4-in depths of 116, 99, 86 and 71F, respectively. The soil was sandy loam (78.4% sand, 10.8% silt and 10.8% clay).

Treatments were evaluated 45 days after herbicide application. Weed control and volunteer wheat chlorosis were evaluated visually; quadrat counts were made of plants in untreated check plots. Glyphosate tank-mixed with metribuzin resulted in greater chlorosis and control of volunteer wheat than where metribuzin or metribuzin + chlorsulfuron were applied. All treatments gave 99 to 100% control of slimleaf lambsquarters, Russian thistle and wild buckwheat. (Wyo. Agr. Exp. Sta., Laramie, WY 82071, SR 1191).

Effect of late-spring herbicide treatments for
fallow-season weed control in a winter wheat field

Herbicides[1]	Rate lb/A	Vol. Wheat Chlorosis[2] 0-10	Percent Control[3]			
			VOL WHT	LQ	RT	WBW
metribuzin	0.38	5	25	100	99+	99+
metribuzin	0.5	6	45	100	99+	99+
metribuzin + chlorsulfuron	0.38 + 0.031	5	30	100	100	100
metribuzin + chlorsulfuron	0.5 + 0.031	6	35	100	100	100
metribuzin + glyphosate	0.38 + 0.28	7	70	100	99	100
metribuzin + glyphosate	0.38 + 0.38	8	95	100	99	100
Check	---	4	0	0	0	0
plants/sq ft			*1.5*	*5.9*	*6.2*	*0.1*

[1] Herbicides applied May 22, 1982. X-77 surfactant added to all herbicide-water solutions at 0.25% v/v. Three replications.

[2] Evaluated July 9, 1982. Chlorosis rating: 0 = none; 10 = no green color.

[3] Visual evaluations July 9, 1982, with quadrat counts in check plots. Abbreviations: VOL WHT = volunteer wheat; LQ = slimleaf lambsquarters; RT = Russian thistle; and WBW = wild buckwheat.

Fall plus spring herbicide treatments for weed control in a fallow winter wheat field. Humburg, N. E. and H. P. Alley. Platte County, in southeastern Wyoming, was the location of a study to evaluate fall plus spring applications of herbicides for control of volunteer wheat and broadleaved weeds in winter wheat stubble. The study was established Sept. 9, 1981. Treatments of atrazine tank-mixed with glyphosate and X-77, and metribuzin tank-mixed with glyphosate and X-77 were applied by a truck-mounted sprayer to separate 90 by 90 ft blocks. The loamy sand soil (79.6% sand, 11.8% silt and 8.6% clay) had 7.1 pH and 1.1% organic matter. Wheat stubble from the crop harvested in late July was 12 to 14 in tall. Major weed species, stages of development and heights were: Russian thistle, flowering and 4 to 18 in; and lambsquarters, flowering and 1 to 20 in.

Spring application of herbicides to the fall-treated blocks was on April 22, 1982. Herbicide-water solutions were applied with a knapsack sprayer through TeeJet HSS8002 flat fan tips on a 6-nozzle boom. Plots were 9 by 30 ft. A randomized complete block design was used, with each treatment replicated three times. Solutions were applied at 20 gpa. Environmental conditions were: air temperature, 66F; relative humidity, 7%; clear sky; and soil temperatures at the surface and depths of 1, 2 and 4 in were 97, 86, 75 and 54F, respectively. No broadleaved weeds were present, but volunteer wheat had 1 to 4 tillers, was in the 2 to 3-leaf stage, was 3 to 6-in tall, and most plants were slightly chlorotic and had dead basal leaves.

Evaluations of control and height of volunteer wheat and control of lambsquarters and Russian thistle were made visually on June 17, 1982. Quadrat counts were made in check plots which received only the fall treatments. Fall-applied herbicides provided partial weed control; densities of volunteer wheat, lambsquarters and Russian thistle were similar for the atrazine- and metribuzin-treated blocks. The contribution of spring-applied herbicides was to give total control of lambsquarters and 98 to 100% control of Russian thistle. Control of volunteer wheat and height suppression generally were superior on plots where atrazine was applied in the fall, as compared to metribuzin. Minimum spring application rates were less for the plots that received fall-applied atrazine than for those that received metribuzin. The minimum spring rate of cyanazine was less than 1.0 lb ai/A, whereas that of terbutryn was more than 1.5 lb ai/A. Spring rates of atrazine and metribuzin at 0.5 lb ai/A were optimum. All spring treatments reduced the height of volunteer wheat. (Wyo. Agric. Exp. Sta., Laramie, WY 82071, SR 1192).

Fall plus spring herbicide treatments for weed control in a fallow winter wheat field

Treatment[1]	Rate lb/A	Volunteer Wheat Height[2] in	Percent Control[2]		
			Volunteer wheat	Lambs-quarters	Russian thistle
Fall 1981 -- atrazine + glyphosate + X-77 (0.5 + 0.38 lb/A)					
Spring 1982					
atrazine	0.25	6	98	100	99
atrazine	0.38	10	85	100	100
atrazine	0.5	8	99	100	100
cyanazine	1.0	7	99	100	100
cyanazine	1.5	2	99	100	100
terbutryn	1.0	13	60	100	100
terbutryn	1.5	12	88	100	100
metribuzin	0.38	10	85	100	100
metribuzin	0.5	7	98	100	100
Check (fall treatment)	---	15	0	0	0
plants/sq ft			*0.8*	*0.7*	*2.8*
Fall 1981 -- metribuzin + glyphosate + X-77 (0.75 + 0.38 lb/A)					
Spring 1982					
metribuzin	0.25	10	53	100	98
metribuzin	0.38	13	63	100	98
metribuzin	0.5	7	99	100	99
cyanazine	1.0	9	98	100	100
cyanazine	1.5	8	99	100	100
terbutryn	1.0	12	81	100	99
terbutryn	1.5	12	20	100	99
atrazine	0.25	13	70	100	100
atrazine	0.5	7	98	100	100
Check (fall treatment)	---	15	0	0	0
plants/sq ft			*1.2*	*0.5*	*1.6*

---

[1] Fall treatments: herbicides applied Sept. 9, 1981. Spring treatments: herbicides applied April 22, 1982. X-77 added to all herbicide solutions at 0.25% v/v.

[2] Volunteer wheat measured and weed control visually evaluated June 17, 1982. Quadrat counts in check plots.

Glyphosate and glyphosate-dicamba treatments for fallow-season and at-harvest weed control in winter wheat. Humburg, N. E. and H. P. Alley. The study was established on a fallow winter wheat field in southeastern Wyoming. Spring applications of glyphosate and glyphosate-dicamba combinations were evaluated for control of volunteer wheat and broadleaved weeds. Herbicides were applied June 9, 1981, with a knapsack sprayer equipped with a 6-nozzle boom using TeeJet HSS 8001 flat fan tips. Herbicide-water solution was broadcast-applied at 10 gpa. Plant stages of growth and height ranges were: volunteer wheat, boot to flowering and 10 to 24 in; Russian thistle, 4 to 20-leaf and 1.5 to 3 in; and Chenopodium spp., 4 to 8-leaf and 1 to 4 in. Plots were 9 by 30 ft, with three replications and randomized complete block design. Environmental conditions when herbicides were applied were: air temperature, 67F; relative humidity, 48%; high broken clouds; and soil temperatures at the surface, 1, 2 and 4-in depths were 87, 79, 75 and 66F, respectively. The sandy loam soil (72.4% sand, 18.0% silt and 9.6% clay) had 1.4% organic matter and 8.1 pH. Buckskin winter wheat was planted August 30, 1981, in 14-in rows.

The initial herbicide performance evaluation was made visually on June 30, three weeks after herbicides were applied. Response of Russian thistle to glyphosate was negligible. Dicamba tank-mixed with glyphosate enhanced Russian thistle control. An increase in application rate of glyphosate, with a constant rate of dicamba, resulted in increased control of Russian thistle to a maximum of 55%. No differences in control resulted from dicamba at 0.125 and 0.25 lb/A. Control of volunteer wheat was 35 and 95% for each treatment where glyphosate was applied at 0.125 and 0.38 lb/A, respectively.

Quadrat counts of weeds were made at wheat harvest, July 20, 1982. All herbicide treatments resulted in reduced populations of Russian thistle and cutleaf nightshade. Two treatments resulted in unchanged or increased populations of lambsquarters. This study illustrated weed control for an extended period of time that resulted from application of short-residual herbicides. (Wyo. Agric. Exp. Sta., Laramie, WY 82071, SR 1193).

Glyphosate and glyphosate-dicamba treatments for fallow-season and at-harvest weed control in winter wheat

Herbicides[1]	Rate lb/A	Percent Control[2]				
		1981		1982		
		RT	VOL WHT	LQ	RT	CL NS
glyphosate	0.125	5	35	30	60	85
glyphosate	0.25	5	65	5	40	65
glyphosate	0.38	15	95	0	60	45
glyphosate + dicamba	0.125 + 0.125	40	35	5	60	70
glyphosate + dicamba	0.25 + 0.125	45	65	5	50	20
glyphosate + dicamba	0.38 + 0.125	55	95	30	65	80
glyphosate + dicamba	0.125 + 0.25	35	35	-50	40	55
glyphosate + dicamba	0.25 + 0.25	45	45	20	45	5
glyphosate + dicamba	0.38 + 0.25	50	95	35	40	90
Check	---	0	0	0	0	0
plants/sq ft		*7.0*	*4.2*	*1.3*	*1.0*	*1.3*

[1] Herbicides applied June 9, 1981. X-77 surfactant added to all herbicide solutions at 0.5% v/v.

[2] Visual evaluations June 30, 1981, and quadrat counts July 20, 1982. Abbreviations: RT = Russian thistle; VOL WHT = volunteer wheat; LQ = lambsquarters; CL NS = cutleaf nightshade. Negative designation denotes a population greater than that of untreated check plots.

Postemergence herbicide treatments for control of annual weeds in spring barley. Humburg, N. E. and H. P. Alley. The Torrington Research and Extension Center was the site of a study to evaluate the effectiveness of postemergence herbicide treatments for annual weed control in irrigated spring barley. Individual herbicides and herbicide combinations were applied on June 4, 1982 with a CO_2-pressured knapsack sprayer. Herbicide-water solution was applied full-coverage at 20 gpa through TeeJet HSS8002 flat fan tips on a 6-nozzle boom. Three replications of 9 by 30 ft plots were arranged in a randomized complete block design. Steptoe barley, planted March 29 in 7-in rows, was in the 2 to 4-leaf stage and 10 to 16 in tall when herbicides were applied. Weeds present and respective stages of growth and/or heights were: kochia, 2 to 4 in; common lambsquarters, 2 to 4 in; Russian thistle, 2 to 6 in; and witchgrass, 1 to 2 leaf and 2 to 3 in. Environmental conditions were: air temperature, 75F; relative humidity, 58%; and clear sky. The plots were irrigated with a low-pressure, lateral-move sprinkler system.

Plots were harvested and quadrat counts of weeds in the barley stubble were made on Aug. 18, 1982. All herbicide treatments, with the exception of diclofop grass herbicide at 1.0 lb/A, gave total control of common lambsquarters and 90 to 100% control of Russian thistle. Bromoxynil, DPX-T6376 at 0.031 and 0.047 lb/A, and treatments including metribuzin at 0.25 or 0.375 lb/A gave 100% control of kochia. Kochia and witchgrass were reduced in height by chlorsulfuron and DPX-T6376. Chlorsulfuron + metribuzin and bromoxynil + diclofop were the best treatments for total control of broadleaved weeds and witchgrass. Barley injury resulted from treatments of DPX-T6376 at 0.031 and 0.047 lb/A. Diuron, in combination with chlorsulfuron, caused an approximate 50% reduction in the number of barley heads. (Wyo. Agr. Exp. Sta., Laramie, WY 82071, SR 1194).

Postemergence herbicide treatments for control of annual weeds in spring barley

Herbicides[1]	Rate lb/A	Percent Weed Control[2]			
		Kochia	Lambs-quarters	Russian thistle	Witch-grass
chlorsulfuron + X-77	0.008	0	100	100	0
chlorsulfuron + X-77	0.016	0	100	100	10
chlorsulfuron + X-77	0.031	20	100	100	10
chlorsulfuron + X-77	0.047	0	100	100	60
chlorsulfuron + metribuzin + X-77	0.016 + 0.125	60	100	100	0
chlorsulfuron + metribuzin + X-77	0.016 + 0.25	100	100	100	100
chlorsulfuron + diuron + X-77	0.016 + 0.8	90	100	100	100
DPX-T6376 + X-77	0.008	40	100	100	10
DPX-T6376 + X-77	0.016	90	100	100	0
DPX-T6376 + X-77	0.031	100	100	100	0
DPX-T6376 + X-77	0.047	100	100	100	0
bromoxynil	0.375	100	100	100	0
bromoxynil	0.5	100	100	100	0
bromoxynil + 2,4-D amine	0.375 + 0.375	100	100	100	50
bromoxynil + diclofop	0.375 + 1.0	100	100	100	100
diclofop	1.0	0	0	90	100
metribuzin + X-77	0.25	70	100	90	100
metribuzin + X-77	0.375	100	100	90	100
2,4-D amine	0.375	0	100	90	0
Check	---	0	0	0	0
plants/sq ft		*1.2*	*1.2*	*1.2*	*1.1*

[1] Herbicides applied June 4, 1982. X-77 added at 0.125% v/v.
[2] Quadrat counts Aug. 18, 1982.

Annual grass control in alfalfa. Huston, C. H., D. L. Zamora, R. H. Callihan, and D. C. Thill. This study was established at the USDA Conservation Farm in Pullman, Washington, on Athena silt loam, with a pH of 6.1-7.3 and 3-5 % organic matter. The purpose was to determine the weed control efficacy and alfalfa (*Medicago sativa* L.) tolerance to fluazifop and different combinations of sethoxydim plus 2,4-DB or bromoxynil. The experimental design was a randomized complete block with four replications; the plots were 3 x 10 m. All applications were made with a knapsack sprayer and hand held boom equipped with Teejet 8002 flatfan nozzles and calibrated to deliver 187 l/ha. Two application dates were used in this study. When treatments were applied on May 20, the air and soil temperature, at a depth of 15 cm, was 10 C. Wind was from the SE at 8 km/hr, and relative humidity was 55 %. When treatments were applied on August 7, the air temperature was 29 C, soil temperature was 23 C, relative humidity was 32 %, and the wind was from the west at 0-2 km/hr. Visual evaluations of weed control and crop injury, resulting from May 20 treatments, were made on June 1 and June 17. Visual evaluations of treatments applied August 7 were made on August 17. Harvests were made on June 22 and August 24. Sethoxydim plus bromoxynil treatments at 0.22 + 1.12 kg/ha and 0.48 + 1.12 kg/ha caused siginificant crop injury for May 20 treatments. Treatments of sethoxydim at 0.34 and 0.48 kg/ha, sethoxydim plus bromoxynil at 0.48 + 1.12 kg/ha, and fluazifop at 0.28 and 0.57 kg/ha resulted in the highest weed control. The best yield from the first cutting resulted from the fluazifop treatment at 0.57 kg/ha.

August 7 treatments applied after the first cutting caused more injury than May 20 treatments. Highest injury resulted from treatments of sethoxydim plus bromoxynil at 0.22 + 1.12 kg/ha and 0.48 + 1.12 kg/ha. Each of the other tank mix treatments of sethoxydim plus 2,4-DB or bromoxynil also caused injury after the August 7 applications in contrast to May 20 applications. There were no significant differences in yield between the treatments after August 7 applications. (Idaho Agriculture Experiment Station, Moscow, Idaho, 83843)

Efficacy and injury of graminicides in alfalfa.

		May 20 Treatments					August 7 Treatments	
		Injury[2]		Weed Control[3]		Yield	Injury	Yield
Treatment[1]	Rate	June 1	June 17	June 1	June 17	June 22	August 17	August 24
	kg/ha	(%)	(%)	(%)	(%)	(kg/ha)	(%)	(kg/ha)
Check	-	0	0	0	0	6436	0	1850
Sethoxydim	.22	0	0	49	66	6040	0	1925
Sethoxydim	.34	0	0	63	88	5965	0	2190
Sethoxydim	.48	0	0	63	88	5965	0	2190
Sethoxydim + 2,4-DB	.22 + .57	0	5	13	10	6342	13	1661
Sethoxydim + 2,4-DB	.2 + 1.12	0	16	15	18	5059	19	1850
Sethoxydim + 2,4-DB	.48 + 1.12	0	16	50	56	5247	19	1661
Sethoxydim + Bromoxynil	.22 + .57	1	4	50	66	6191	11	2152
Sethoxydim + Bromoxynil	.22 + 1.12	13	0	46	53	5884	33	1548
Sethoxydim + Bromoxynil	.48 + 1.12	10	0	76	90	5398	23	1762
Fluazifop	.28	0	0	66	99	5455		
Fluazifop	.57	0	0	73	99	6682		
$LSD_{.05}$		1.5	4	20	16	1184	11	978

[1] Crop oil concentrate was used with each treatment at 1 qt/A.

[2] Percent injury/plant

[3] 0 = no control, 100 = total control

Control of wild oats in peas, lentils, and chickpeas with metribuzin and triallate. Huston, C.H., R.H. Callihan, D. L. Zamora and D. C. Thill. The effects of metribuzin (75% dry flowable) applied preemergence surface, preemergence incorporated, and postemergence and preemergence incorporated triallate (emulsufiable concentrate 480 g/l treatments on wild oat (*Avena fatua* L.) control and crop tolerance in peas (*Pisum sativum*), lentils (*Lens culinaris* Medik.), and chickpeas (*Cicer arietinum* L.) were evaluated. Plots were 2 m by 10 m in a split plot design replicated four times. 'Tracer' peas, 'Chilean 78' lentils, and 'UC-5' chickpeas were each planted in the sub plots on May 6, 1982. Peas and lentils were planted in 5-18 cm rows while chickpeas were planted in 4-18 cm rows. All herbicide treatments were broadcast using a three-wheeled, gasoline engine powered sprayer equiped with a 6 m boom and 8002 nozzles and calibrated at 187 L/ha. The soil at this location was a Latahco silt loam with a C.E.C. of 47 meq/100g, pH of 4.6 and organic matter of 6.8%. All triallate treatments were applied post plant incorporated at 1.12 kg/ha on May 10, 1982. Post plant incorporated and preemergence surface metribuzin treatments were also applied on May 10, 1982. Air and soil surface temperature were 15 C and soil temperature at 12.7 cm was 13 C. Relative Humidity was 50% with overcast skies. Post plant incorporated treatments were immediately incorporated to a depth of 4 cm by cross harrowing with a spike tooth harrow. Post emergence metribuzin treatments were applied on June 10, 1982. Air temperature was 21 C and soil temperature at 12.7 cm was 17 C. Relative humidity was 20%. Visual weed control and crop injury evaluations were taken on June 24, 1982. Pea and lentil seeds were harvested from 8.5 square meters in each plot with a Hege plot combine on August 18 and 26, 1982, respectively. Chickpeas were not harvested.

Wild oat control was similar in all three crops. Metribuzin applied alone post plant incorporated provided poor wild oat control (17 to 32%) with all rates tested. Control was also erratic with the triallate and metribuzin combinations. Control with triallate plus 0.28 kg/ha post plant incorporated metribuzin and triallate plus 0.21 kg/ha post emergence metribuzin treatments did not significantly differ from the check. All other treatments provided 32 to 71% wild oat control, but did not significantly differ from each other.

The metribuzin treatments applied postplant incorporated and preemergence surface did not cause any crop phytotoxicity while metribuzin applied post emergence caused chlorosis and stunting in all three crops. The degree of injury was slight (2 to 10%) in peas and chickpeas and more severe (10 to 22%) in lentils. Post plant incorporated triallate did not cause any crop injury or influence metribuzin injury. Due to the erratic weed control seed yield in peas and lentils did not significantly differ between treatments. (University of Idaho Experiment Station, Moscow, Idaho 83843)

Control of wild oats in peas, lentils and chickpeas with metribuzin and triallate.

			Wild Oat	Peas		Lentils		Chickpeas
Treatment	Rate kg/ha	Application[1] time	control %	Crop [2] Injury	Yield kg/ha	Crop [2] Injury	Yield kg/ha	Crop [2] Injury
Check			0	0	1070	0	252	0
metribuzin	0.28	POPI	32	2	1659	0	260	0
metribuzin	0.42	POPI	17	0	1120	0	288	0
metribuzin & triallate	0.28 & 1.12	POPI POPI	32	0	1768	0	434	4
metribuzin & triallate	0.42 & 1.12	POPI POPI	54	0	1130	0	382	0
metribuzin & triallate	0.56 & 1.12	POPI POPI	70	0	2075	0	298	0
metribuzin & triallate	0.28 & 1.12	PES POPI	49	0	2156	0	459	0
metribuzin & triallate	0.42 & 1.12	PES POPI	52	0	2028	1	512	0
metribuzin & triallate	0.56 & 1.12	PES POPI	51	0	1159	0	251	0
metribuzin & triallate	0.14 & 1.12	POST POPI	48	2	1528	10	406	2
metribuzin & triallate	0.21 & 1.12	POST POPI	29	9	1104	22	202	9
metribuzin & triallate	0.28 & 1.12	POST POPI	71	10	1295	19	220	8
LSD .05			36	5	NS	12	NS	6

[1] PES = preemergence surface, POPI = post plant incorporated, POST = post emergence
[2] 0 = no injury, 10 = total crop kill

Herbicide screening in peas, lentils, and chickpeas. Huston, C.H., R.H. Callihan, D.L. Zamora, and D.C. Thill. This study was established to evaluate herbicides for crop tolerance and weed control in peas (Pisum sativum L.). lentils (Lens culinaris Merck.), and chickpeas (Cicer arietinum L.). The study was arranged in a split plot design with four replications. Individual plot size was 6 m by 10 m. 'Tracer' peas, 'Chilean 78' lentils, and 'UC-5' chickpeas were planted in the sub plots on May 14, 1982. Peas and lentils were planted in 5-18 cm rows and chickpeas were planted in 4-18 cm rows. All herbicides were broadcast using a three-wheeled gasoline engine powered sprayer equipped with a 6 m boom and 8002 nozzles calibrated at 187 L/ha. The soil was a Palouse-Latahco silt loam with a pH of 5.6 to 7.3 and organic matter of 2 to 4%. Preemergence surface dinoseb (emulsifiable concentrate 360 g/L) and SD95481 (emulsifiable concentrate 240 g/L) treatments were applied May 19, 1982. Air and soil surface temperatures were 20 C and soil temperature at 12.7 cm was 18 C. Relative humidity was 30%. Early postemergence treatments of acifluorfen (emulsifiable concentrate 480 g/L) were applied on June 2, 1982. Air and soil surface temperatures were 18 C and relative humidity was 20%. Bentazon (emulsifiable concentrate 240 g/L) treatments were applied June 10, 1982. Air and soil surface temperature were 21 C and relative humidity was 15%. Late postemergence treatments of acifluorfen, MCPA (dimethyl amine 434 g/L), MCPA (sodium salt 240 g/L, fluazifop (emulsifiable concentrate 480 g/L), sethoxydim (emulsifiable concentrate 184 g/L), and MCPA plus fluazifop or sethoxydim tank mixes were applied June 17, 1982. Air and soil surface temperatures were 27 C and relative humidity was 30%. Visual weed control and crop injury evaluations were made on June 16 and July 23, 1982. Peas and lentils were harvested from 8.5 square meters in each sub plot with a Hege plot combine on August 18 and 26, respectively. Chickpeas were harvested from 6.8 square meters in each sub plot on September 30, 1982.

Weed control was similar in all three crops for each herbicide tested. Acifluorfen treatments of 0.56 and 0.84 kg/ha provided excellent control (96%) of redroot pigweed (Amaranthus retroflexus L.). Fair control (65 to 82%) was obtained with the dinoseb plus SD95481 tank mix. The 0.28 and 0.42 kg/ha acifluorfen treatments applied early postemergence and the 0.42 kg/ha acifluorfen treatments applied late post emergence provided fair control (65 to 82%). All other treatments provided less than 50% control. Good to excellent control (85 to 100%) of field pennycress (Thlaspi arvense L.) was obtained with all early postemergence acifluorfen treatments, 1.12 kg/ha bentazon, 0.42 kg/ha MCPA (sodium salt) and 0.84 kg/ha dinoseb treatments. The dinoseb plus SD95481 tank mix and 0.42 kg/ha MCPA plus 0.56 kg/ha fluazifop or 0.56 kg/ha sethoxydim tank mixes provided fair control (75 to 81%). All other treatments provided less than 55% control. Fluazifop, applied alone produced distinct cupping and chlorosis of field pennycress leaves. The MCPA plus fluazifop or sethoxydin tank mix treatments produced excellent control (97%) of common lambsquarter (Chenopodium album L.). Fair control (61 to 74%) was obtained with the dinoseb alone and tank mixed with SD95481, 0.35 kg/ha MCPA (dimethyl amine), 0.42 kg/ha MCPA (sodium salt) and, 0.56 and 0.84 kg/ha acifluorfen treatments. All other treatments provided less than 38% control. Excellent control (94 to 100%) of mayweed (Anthemis cotula L.) was obtained with all early postemergence acifluorfen and the bentazon treatments. Poor to fair control (58 to 78%) was obtained with the dinoseb alone and tank mixed with SD95481, 0.34 and 0.42 kg/ha MCPA, 0.42 kg/ha acifluorfen applied late post emergence, and the MCPA plus sethoxydim or fluazifop tank mix treatments. All other treatments provided less than 45% control of mayweed.

Crop injury occurred in all three crops with all early post emergence acifluorfen treatments. Chlorosis and temporary stunting (6 to 16% growth reduction) was slight in peas and chickpeas, but severe chlorosis, necrosis, and temporary stunting (15 to 74 % growth reduction) was present in lentils. By July 23, 1982, very little visual injury symptoms remained. However, seed yield of peas and lentils was significantly reduced with the 0.42, 0.56, and 0.84 kg/ha acifluorfen treaments. Severe chlorosis (34 to 36%) of lentil and chickpea leaves occurred with the bentazon treatment. By July 23 most of the visual injury symptoms had dissipated, however, lentil yield was significantly less than the check. All MCPA treatments produced epinasty and chlorosis in lentils and chickpeas. Yield was also significantly less than the check in these two crops with all MCPA treatments. The MCPA plus fluazifop or sethoxydim tank mix treatments produced severe epinasty and stunting (34 to 59% growth reducton) in lentils and chickpeas. Epinasty and stunting (21 to 25% growth reduction) occurred in normally MCPA resistant peas. Yields in all three crops were significantly less than the check with these treatments. Fluazifop, alone caused a slight chlorotic mottling of lentil leaves and also delayed maturation by up to two weeks. Lentil seed yield of the fluazifop treatment was significantly less than the check. (University of Idaho Experiment Station, Moscow, ID 83843)

Herbicide screening in peas, lentils, and chickpeas

Treatment	Appl[1/] Time	Rate kg/ha	Weed Control				Lentil			Pea			Chickpea		
			%												
			CoLq	Mawe	RrPw	FlPc	Crop 6/16	Injury[2/] 7/23	Yield kg/ha	Crop 6/16	Injury[2/] 7/23	Yield kg/ha	Crop 6/16	Injury[2/] 7/23	Yield kg/ha
dinoseb	PES	0.84	64	68	22	88	0	0	1082	0	0	4317	0	4	1894
dinoseb + SD95481	PES	0.84 0.84	65	60	65	75	16	8	657	0	2	3780	0	10	1472
SD95481	PES	0.84	29	45	5	0	0	0	1406	0	0	3276	0	0	1244
bentazon	Post Early	1.12	20	100	12	100	34	8	120	1	6	3306	36	8	1213
acifluorfen	Post Early	0.28	5	100	82	94	15	0	724	6	0	3276	6	0	1564
acifluorfen	Post Early	0.42	38	100	71	100	59	0	470	10	0	2681	15	0	2084
acifluorfen	Post Early	0.56	62	94	96	89	42	5	433	11	0	2766	9	0	1914
acifluorfen	Post Early	0.84	74	100	96	100	74	2	237	16	0	2686	16	0	1981
acifluorfen	Post Late	0.28	20	12	32	0	--	9	627	--	8	2729	--	9	791
acifluorfen	Post Late	0.42	5	78	76	55	--	8	737	--	4	2568	--	14	1115
MCPA (dimethyl amine)	Post Late	0.17	5	5	45	41	--	42	319	--	0	2882	--	8	809
MCPA (dimethyl amine)	Post Late	0.34	61	30	38	74	--	30	424	--	6	3323	--	30	917
MCPA (sodium salt)	Post Late	0.42	64	58	48	85	--	48	261	--	2	3276	--	48	628
fluazifop	Post Late	0.56	0	0	0	18	--	5	366	--	0	3157	--	0	1375
fluazifop + MCPA	Post Late	0.56 + 0.42	97	68	30	81	--	34	64	--	25	1761	--	34	775
sethoxydin	Post Late	0.56	0	0	18	0	--	0	816	--	0	2941	--	0	940
sethoxydin + MCPA	Post Late	0.56 + 0.42	97	68	30	81	--	59	120	--	21	1225	--	45	696
Control	--	--	0	0	0	0	0	0	989	0	0	3874	0	0	1522
LSD$_{.05}$	--	--	36	35	37	37	12	14	375	4	11	1002	9	13	508

[1/] PES = preemergence surface, Post Early = Post emergence applied June 2 for acifuorfen and June 10, 1982 for bentazon, Post emergence late = June 17, 1982

[2/] 0 = no injury, 100 = total crop kill.

Annual bluegrass (Poa annua) competition with wheat (Triticum aestivum var. Stephens). J.J. Jachetta and D. McAuliffe. *Poa annua* has been observed to depress wheat yields up to 20% when present as the predominant weed species. The large differences in growth habit between wheat and *Poa annua* have led to the supposition that the yield depression is due to the release of an allelopathic substance by *Poa annua* and not to competition for available resources. This study was undertaken to clarify the nature of the competition between *Poa annua* and wheat. A replacement series experiment arranged in a randomized complete block design with 4 replicates was established at the Oregon State University Hyslop Research Farm. Each experimental unit was a 1-m^2 plot subdivided into 169 squares (59 cm^2). The squares were planted to either wheat or *Poa annua*. One wheat plant or 10 *Poa annua* plants were established per square. The proportion of squares planted to wheat or *Poa annua* was altered in each experimental unit (0:1.0, .05:.95, .25:.75, .50:.50).

Both the wheat and *Poa annua* were harvested just prior to seed shed for the annual bluegrass. The wheat was in the late boot stage when harvested. The aboveground portions of the *Poa annua* and wheat were dried at 60°C and dry weights were used to measure relative growth.

Analysis of data indicated that wheat plants were less affected by competition from *Poa annua* than from competition with other wheat plants. These data do not indicate that *Poa annua* is as serious competitor with wheat as observed reductions in wheat seed yield would indicate. No indication of an allelopathic effect of *Poa annua* on wheat was indicated. The possibility remains that *Poa annua* may deplete the soil nitrogen sufficiently during its growing season to reduce nitrogen availability during subsequent grain-filling of the wheat. This may explain the observed yield losses for wheat infested with this weed. (Oregon State University, Corvallis, OR 97331)

Relative growth of *Poa annua* and wheat in a replacement series experiment

	Poa annua		Wheat	
Rel. plant frequencies	Dry wt (grams)	% yield	Dry wt (grams)	% yield
0	0	0	0	0
.05	32	0.03	564	0.24
.25	122	0.11	1597	0.69
.50	224	0.20	2063	0.88
.75	488	0.44	2163	0.93
.95	873	0.79	2299	0.99
1.0	1110	1.00	2333	1.00

Affect of linuron on different crops. Jordan, Lowell S. and James L. Jordan. Preemergence treatments of linuron were applied to nine different crops. The crops used in these tests were lettuce ('Great Lakes 659'), alfalfa ('Moapa'), sugar beets ('USH 7'), spinach ('Bloomsdale Long Standing'), asparagus ('Mary Washington'), onions ('South Port White Globe'), broccoli ('De Cicco'), barley ('Briggs'), and carrots ('Long Imperiator 58'). Linuron was tested at four rates (0, 1/2, 1, and 2 lbs/A). The plots were sprinkler irrigated. Each test was replicated four times. Subplots were 1.7 m wide and 6.7 m long. One-hundred gallons per acre of the appropriate solution was applied using 8008 nozzles to each subplot.

Linuron was fatal to six of the crops tested and very toxic to two other crops. Only asparagus, of the nine crop species investigated, did not show severe damage to linuron application. The results of this investigation are summarized in the table below. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Treatment Rate (lbs/A)	Crop[1/]								
	1	2	3	4	5	6	7	8	9
1/2	10	10	10	10	1	10	10	6	7
1	10	10	10	10	2	10	10	8	8
2	10	10	10	10	2	10	10	8	9
Control	0	0	0	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, marginal burn, or stunting; 5 = considerable chlorosis, marginal burn, or stunting; 6 = severe chlorosis, marginal burn, or stunting; 7 = very severe chlorosis, marginal burn, or stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of the plants died; 10 = all plants died.

[1/] 1 = lettuce; 2 = alfalfa; 3 = sugar beets; 4 = spinach; 5 = asparagus; 6 = onions; 7 = broccoli; 8 = barley; 9 = carrots.

Chloroxuron toxicity to alfalfa, sugar beets, and barley. Jordan, Lowell S. and James L. Jordan. Chloroxuron was applied either preemergence or postemergence at 2, 4, and 8 lbs/A to alfalfa ('Moapa'), sugar beets ('USH 7'), and barley ('Briggs') to investigate the toxicity of Chloroxuron to the three crops. Preemergence treatments were applied with 8004 nozzles at 50 gpa with a tractor-mounted low pressure sprayer. Postemergence treatments were applied with 8008 nozzles at 100 gpa with a tractor-mounted low pressure sprayer. Postemergence treatments occurred when alfalfa and sugar beets were in the two-leaf stage and when barley was in the three-leaf (tillered) stage.

Chloroxuron was most toxic to alfalfa when applied preemergence and severely affected sugar beets with either preemergence or postemergence treatments (Table). Barley was the most chloroxuron tolerant crop of the three crops investigated. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

The effect of applying chloroxuron either preemergence or postemergence to alfalfa, sugar beets, and barley

Treatment Rate (lbs/A)	Preemergence			Postemergence		
	Crop[1/]			Crop[1/]		
	1	2	3	1	2	3
2	10	10	1	5	9	2
4	10	10	3	7	10	3
8	10	10	5	8	10	3
Control	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

[1/] Crops: 1 = alfalfa; 2 = sugar beets; 3 = asparagus.

DCPA as a preemergence herbicide in several crops. Jordan, Lowell S. and James L. Jordan. DCPA was applied at three different rates to different crops before seedling emergence. The crops used in these tests were lettuce ('Great Lakes 659'), spinach ('Bloomsdale Long Standing'), asparagus ('Mary Washington'), onions ('South Port White Globe'), broccoli ('De Cicco'), and carrots ('Long Imperiator 58'). Weeds that were used in these tests were common lambsquarters (*Chenopodium album* L.), (prostrate knotweed (*Polygonum aviculare* L.), black mustard (*Brassica nigra* [L.] koch), (London rocket (*Sisymbrium irio* L.), little mallow (*Malva parviflora* L.), reed canarygrass (*Phalaris arundinacea* L.), annual bluegrass (*Poa annua* L.), Italian ryegrass (*Lolium multiflorum* Lam.), volunteer oats (*Avena sativa* L.), wild oats (*Avena fatua* L.), and barnyardgrass (*Echinochloa crusgalli* [L.] Beauv.).

DCPA was applied preemergence at 4, 8, or 16 lbs/A with 8004 nozzles at 50 gpa with a tractor-mounted low pressure sprayer. Each test was replicated four times. Subplots were 5 ft. wide and 20 ft. long.

Increased preemergence treatment rates did not result in greatly increased phytotoxicity to onions, broccoli, black mustard, volunteer oats, and wild oats (Table). Crops and weeds sensitive to DCPA include lettuce, spinach, asparagus, common lambsquarters, prostrate knotweed, reed canarygrass, annual bluegrass, and barnyardgrass. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Table The effect of applying DCPA as a preemergence herbicide to six horticutural crops and eleven species of weeds.

Treatment Rate (lb/A)	Crop1/						Weed2/										
	1	2	3	4	5	6	a	b	c	d	e	f	g	h	i	j	k
4	7	6	2	3	3	5	10	9	2	4	5	9	7	6	2	2	10
8	8	7	4	4	3	5	10	10	4	6	5	10	9	7	2	3	10
16	9	7	7	4	4	5	10	10	4	6	6	10	10	7	2	3	10
Control	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

1/Crops: 1 = lettuce; 2 = spinach; 3 = asparagus; 4 = onions; 5 = broccoli; 6 = carrots.

2/Weeds: a = common lambsquarters; b = prostrate knotweed; c = black mustard; d = London rocket; e = little mallow; f = reed canarygrass; g = annual bluegrass; h = Italian ryebgrass; i = volunteer oats; j = wild oats; k = barnyardgrass.

Effects of methods of irrigation and incorporation on preemergence herbicides. Jordan, Lowell S. and James L. Jordan. Research was conducted to investigate the interactions of irrigation, incorporation, and application on preemergence herbicides.

Two fields were planted to Japanese millet and alternate rows of corn and safflower. The herbicides were then applied (50 gal/A) as spray or granules, and either incorporated or left on the soil surface. The herbicide treatments (ai) were EPTC (3 lb/A), chlorpropham (6 lb/A), propham (6 lb/A), and diphenamide (6 lb/A). Incorporation equipment included a power-driven rotary-tiller, wheel-hoe, row-wheel, cultipacker, and sub-surface blade. The plots were irrigated 4 days after treatment and as required for the remainder of the trials. Plots were rated 6 weeks after treatment.

All methods of incorporation improved Japanese millet control by EPTC under furrow irrigation (Table). Almost no Japanese millet survived in EPTC plots under sprinkler irrigation. The activity of chlorpropham increased by incorporation under furrow irrigation, but decreased by incorporation under sprinkler irrigation. Propham activity usually increased by incorporation under furrow irrigation. Under sprinkler irrigation, propham activity depended on application method and incorporation method. Diphenamide activity differed between spray and granular applications. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Table Ratings of grass and broadleaf weed control by EPTC, chlorpropham, propham, and diphenamide applied as sprays or granules, incorporated with different equipment, and sprinkler or furrow irrigated. Rating scale is as follows: 0 = no control, 10 = completed control.

Method of Incorporation	Furrow irrigated		Sprinkler irrigated	
	Spray	Granule	Spray	Granule
	EPTC			
Roto-till	9.1	9.7	10.0	10.0
Cultipack	9.4	8.9	10.0	10.0
Wheel-hoe	9.9	9.7	9.9	10.0
Row-wheel	7.3	8.1	10.0	10.0
Blade	8.8	8.6	10.0	9.8
Surface	4.7	5.5	10.0	10.0
	Chlorpropham			
Roto-till	9.7	7.1	9.9	5.0
Cultipack	8.7	8.0	9.9	6.4
Wheel-hoe	6.7	6.5	6.5	3.4
Row-wheel	7.3	7.3	7.0	9.3
Blade	9.3	5.8	5.3	6.0
Surface	4.8	4.1	10.0	9.7
	Propham			
Roto-till	3.8	4.3	4.0	3.5
Cultipack	4.4	3.4	3.1	2.9
Wheel-hoe	5.3	6.3	5.3	5.6
Row-wheel	3.9	5.6	8.4	9.1
Blade	3.5	1.0	5.3	6.0
Surface	0.1	0.0	7.3	6.5
	Diphenamide			
Roto-till	3.3	2.5	5.2	5.4
Cultipack	3.7	5.4	5.7	4.9
Wheel-hoe	2.9	4.0	6.3	6.6
Row-wheel	4.4	3.3	8.4	9.0
Blade	5.7	0.3	8.3	8.1
Surface	2.2	4.9	5.7	3.6

Location of weed control on plant beds as affected by method of incorporation, irrigation, and formulation. Jordan Lowell S. and James L. Jordan. The effect of the method of incorporation on the location of weed control on plant beds was investigated.

Two fields were planted with Japanese millet (Echinochloa crusgalli var. frumentacea [Roxb.] W. F. Wight). One was furrowed for furrow irrigation, and the other was set up for sprinkler irrigation. Plots were established in three randomized blocks in each field. The treatments were: trifluralin 1 lb/A, EPTC 3 lb/A, CDEC 6 lb/A, and untreated controls. All herbicides were applied in paired plots as sprays and granules. Five methods of incorporation were used: rotary-tiller, wheel-hoe, row-wheel, cultipacker, and sub-surface blade. Nonincorporated plots were also established. The spray volume (except blade) was 50 gpa. The blade was operated at 2 mph and delivered 80 gpa. The blade was used to incorporate granules by pulling it under the soil surface after they were spread. Incorporation equipment was operated at 4 mph. The rotary-tiller, wheel-hoe, and blade were operated at a depth of 2 inches. Plots were irrigated 5 days after treatment and thereafter as needed. Plots were rated 6 weeks after treatment.

Generally, under furrow irrigation, the herbicides controlled weeds best toward the center of the bed. Under sprinkler irrigation, Japanese millet control was more uniform across the top of the bed. When trifluralin was applied as a spray and incorporated, Japanese millet control under furrow irrigation was uniform aross the beds, while Japanese millet control by granules increased toward the center of the beds. EPTC usually gave a pattern of uniform Japanese millet control across the tops of plant beds under sprinkler irrigation and increasing Japanese millet control from the furrow edge to the center of the bed with furrow irrigation. In most cases, CDEC granules gave better Japanese millet control than the spray application; also, the pattern across the beds was more uniform. For the three herbicides, under all conditions studied, the rotary-tiller gave the most uniform and best weed control (Table). (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Table Ratings of Japanese millet control by trifluralin, EPTC, and CDEC applied as sprays or granules, incorporated with different equipment, and sprinkler or furrow irrigated. Rating scale is as follows: 0 = no control; 10 = complete control.

Method of Incorporation	Furrow irrigated		Sprinkler irrigated	
	Spray	Granule	Spray	Granule
		Trifluralin		
Roto-till	9.2	8.2	5.2	5.4
Cultipack	9.3	8.1	5.7	4.9
Wheel-hoe	6.6	6.2	6.3	6.6
Row-wheel	8.5	7.4	8.4	9.0
Blade	9.7	8.1	5.7	3.6
Surface	6.1	4.6	8.3	8.1
		EPTC		
Roto-till	9.1	9.7	10.0	10.0
Cultipack	9.4	8.9	10.0	10.0
Wheel-hoe	9.9	9.7	9.9	10.0
Row-wheel	7.3	8.1	10.0	10.0
Blade	8.8	8.6	10.0	9.8
Surface	4.7	5.5	10.0	10.0
		CDEC		
Roto-till	5.6	8.7	4.6	8.4
Cultipack	6.7	9.2	2.8	5.9
Wheel-hoe	6.3	7.4	3.0	8.1
Row-wheel	3.5	8.0	0.0	4.2
Blade	7.9	1.9	6.9	2.0
Surface	0.4	1.7	7.4	3.3

Phytotoxicity of fluorometuron to alfalfa, corn, cotton, sorghum, and sugar beets. Jordan, Lowell S. and James L. Jordan. Fluorometuron was applied either preemergence or postemergence to plots that were planted with alfalfa ('California Common'), corn ('Funks G44 RF'), cotton ('Acala SJ1'), sorghum ('RS-610'), and sugar beets ('HH 7'). Preemergence fluorometuron treatments were applied 50 gpa using a tractor-mounted low pressure rig and 8004 nozzles. Rates used were 0, 1/2, 1, and 2 lbs/A of 80 wp formulation. Soil had organic matter of 0.7%, sand of 69%, silt of 22%, clay of 9%, and a pH of 6.3. Postemergence treatments were made when alfalfa was in the 2- to 3-leaf stage, sorghum was in the 4- to 6-leaf stage, and sugar beets were in the 2 cotyledon-2 true leaf stage. Postemergence fluorometuron treatments were applied 100 gpa using a tractor-mounted low pressure rig and 8008 nozzles. Plots were evaluated 6 weeks after fluorometuron applications. Tests were repeated four times.

Alfalfa was more sensitive to preemergence applications of fluorometuron than to postemergence applications (table). Sugar beets were extremely sensitive to both preemergence and postemergence applications of fluorometuron. The results for corn, cotton, and sorghum tests are presented in the table. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Injury ratings of alfalfa, corn, cotton, sorghum, and sugar beets to either preemergence or postemergence treatments of fluorometuron

Rate (lbs/A)	Alfalfa		Corn		Cotton		Sorghum		Sugar beets	
	pre	post	pre	post	pre	post	pre	post	pre	post
0	0	0	0	0	0	0	0	0	0	0
1/2	10	5	4	4	3	4	3	2	10	9
1	10	8	4	5	4	4	4	3	10	9
2	10	10	7	8	6	4	7	6	10	10

Comments: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

Pyrazon as a preemergence and postemergence herbicide in several crops. Jordan, S. and James L. Jordan. Either preemergence or postemergence treatments of pyrazon were applied to control weeds in 12 different crops either before seedling emergence or when barnyardgrass seedlings were in the 2- to 3-leaf stage (Table). The crops used in these tests were lettuce ('Great Lakes 659'), sesame ('Margo'), alfalfa ('Moapa'), tomatoes ('V. Earlypak 7'), onions ('South Port White Globe'), safflower ('Gila'), sorghum ('RS-610'), field corn ('SX 14'), cotton ('Acala SJ-1'), sugar beets ('USH 7'), asparagus ('Mary Washington'), and cantaloupe ('Golden Gate 45'). Weeds that were used in these tests were little mallow (Malva parviflora L.), redroot pigweed (Amaranthus retroflexus L.), tumble pigweed (Amaranthus albus L.), common lambsquarters (Chenopodium album L.), large crabgrass (Digitaria sanguinalis (L.) Scop.), junglerice (Echinochloa colonum (L.) Link), and barnyardgrass (Echinochloa crusgalli (L.) Beauv. var. frumentacea).

Pyrazon was applied preemergence at 1, 2, or 4 lbs/A with 8004 nozzles at 50 gpa with a tractor-mounted low pressure rig. Postemergence applied at either 1 or 2 lbs/A with 8008 nozzles at 100 gpa with a tractor-mounted low pressure rig. Each test was replicated four times. Subplots were 5 ft. wide and 20 ft. long.

Preemergence applications of pyrazon to lettuce, alfalfa, tomatoes, onions, and cantaloupe resulted in greater phytotoxicity than did postemergence applications of pyrazon to those crops (table). Weeds were also affected more by preemergence applications of pyrazon than by postemergence applications. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

Table The effect of applying pyrazon either preemergence or postemergence to 12 crop and 7 weed species. Postemergence treatments were made when the barnyardgrass was in the 2- to 3-leaf stage. Plot evaluations were made 5 weeks after treatment

Treatment[1] Rate (lb/A)	Crop[2]												Weed[3]					
	1	2	3	4	5	6	7	8	9	10	11	12	a	b	c	d	e	f
1 (Pre)	10	10	10	9	9	6	4	4	7	3	1	10	10	10	10	10	10	10
2 (Pre)	10	10	10	10	10	8	5	6	9	7	2	10	10	10	10	10	10	10
4 (Pre)	10	10	10	10	10	10	6	9	10	10	3	10	10	10	10	10	10	10
0 (Pre)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 (Post)	5	10	4	5	3	3	2	2	4	2	2	6	5	2	2	4	5	4
2 (Post)	5	10	5	5	5	3	3	2	5	3	3	8	5	5	3	5	6	5
0 (Post)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

[1] Pre = pre-emergence; post = postemergence.

[2] 1 = lettuce; 2 = sesame; 3 = alfalfa; 4 = tomatoes; 5 = onions; 6 = safflower; 7 = field corn; 8 = sorghum; 9 = cotton; 10 = sugar beets; 11 = asparagus; 12 = cantaloupe.

[3] a = little mallow; b = redroot pigweed and tumble pigweed; c = common lambsquarters; d = large crabgrass; e = junglerice; f = barnyardgrass.

The effect of the time of application on the phytotoxicity of prometryne to cotton. Jordan, Lowell S. and James L. Jordan. Prometryne was applied preplant, preemergence, and postemergence to plots planted with cotton ('Acala SJ1'). Rates used were 0, 1, 2, and 4 lbs/A. Preplant and preemergence treatments were applied at 50 gpa; postemergence treatments were applied at 100 gpa. Preplant treatments were incorporated with a power-driven rotary cultivator to a maximum depth of 1.5 inches; preplant treated plots were subsequently furrow irrigated. Postemergence treatments were made when cotton was in the 2- to 3-leaf stage. Both preemergence and postemergence plots were sprinkler irrigated. Plots were evaluated 6 weeks after prometryne application. Tests were replicated four times.

Premetryne was most toxic to cotton if applied as a postemergence treatment and least toxic as a preemergence treatment (table). (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Rate (lbs/A)	Time of application		
	Preplant	Preemergence	Postemergence
0	0	0	0
1	3	3	6
2	4	4	7
4	6	4	7

Comments: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

Toxicity of pyrazon and phenmedipham combinations to 12 crops and 6 weeds.

Jordan, Lowell S. and James L. Jordan. Postemergence treatments of pyrazon with phenmedipham were applied to control weeds in 12 different crops when barnyardgrass seedlings were either in the 2- to 3-leaf stage (Table I) or in the 4- to 5-leaf stage (Table II). The crops used in these tests were lettuce ('Great Lakes 659'), sesame ('Margo'), alfalfa ('Moapa'), tomatoes ('V. Earlypak 7'), onions ('South Port White Globe'), safflower ('Gila'), sorghum ('RS-610'), field corn ('SX 14'), cotton ('Acala SJ-1'), sugar beets ('USH 7'), asparagus ('Mary Washing'), and cantaloupe ('Golden Gate 45'). Weeds that were used in these tests were little mallow (*Malva parviflora* L.), redroot pigweed (*Amaranthus retroflexus* L.), tumble pigweed (*Amaranthus albus* L.), common lambsquarters (*Chenopodium album* L.), large crabgrass (*Digitaria sanguinalis* (L.) Scop.), junglerice (*Echinochloa colonum* (L.) Link), and barnyardgrass (*Echinochloa crus-galli* (L.) Beauv. var. *frumentacea*).

Pyrazon with phenmedipham was used at three constant rates on sprinkler-irrigated plots. Each test was replicated four times. Subplots were 1.7 m wide and 6.7 m long. One-hundred gallons per acre of the appropriate solution was applied using 8008 nozzles to each subplot.

Application of pyrazon with phenmedipham at a later stage of plant growth tended to result in decreased injury to both crop and weed plants. The data are summarized in Tables I and II. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521.)

Table 1. The effect of applying pyrazon with phenmedipham postemergence to 12 crop and 6 weed species when barnyardgrass was in the 2- to 3-leaf stage.

Treatment[1] Rate (lb/A)	Crop[2]												Weed[3]					
	1	2	3	4	5	6	7	8	9	10	11	12	a	b	c	d	e	f
1 + 1	7	10	4	10	3	3	3	5	4	3	3	9	6	7	9	8	8	5
2 + 1	9	10	7	10	4	5	6	7	5	3	4	10	7	10	10	9	10	8
4 + 1	10	10	10	10	8	7	9	9	8	4	5	10	9	10	10	10	10	10
Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

[1] First number is the lbs/A pyrazon; second number is the lbs/A phgenmedipham.

[2] 1 = lettuce; 2 = sesame; 3 = alfalfa; 4 = tomatoes; 5 = onions; 6 = safflower; 7 = field corn; 8 = sorghum; 9 = cotton; 10 = sugar beets; 11 = asparagus; 12 = cantaloupe.

[3] a = little mallow; b = redroot pigweed and tumble pigweed; c = common lambsquarters; d = large crabgrass; e = junglerice; f = barnyardgrass.

Table 11. The effect of applying pyrazon with phenmedipham postemergence to 12 crop and 6 weed species when barnyardgrass was in the 4- to 5-leaf stage.

Treatment[1] Rate (lb/A)	Crop[2]												Weed[3]					
	1	2	3	4	5	6	7	8	9	10	11	12	a	b	c	d	e	f
1 + 1	5	9	4	4	2	2	2	2	3	0	2	4	5	4	4	2	3	3
2 + 1	4	8	6	9	4	3	4	3	4	2	3	6	6	6	8	7	8	5
4 + 1	8	10	9	10	6	7	7	5	5	4	4	8	10	9	10	9	10	9
Control	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comment: Rating scale used is as follows: 0 = no injury; 1 = suspicion of slight phytotoxicity symptoms; 2 = slight chlorosis; 3 = definite chlorosis and slight stunting; 4 = definite chlorosis, or marginal burn, or marginal stunting; 5 = considerable chlorosis, or marginal burn, or stunting; 6 = severe chlorosis, or marginal burn, or stunting; 7 = very severe chlorosis, or marginal burn, or marginal stunting - also, a 70 to 79% plant loss; 8 = very severe chlorosis, or marginal burn, or stunting - also, an 80 to 89% plant loss; 9 = 90 to 99% of plants dead; 10 = all plants dead.

[1] First number is the lbs/A pyrazon; second number is the lbs/A phgenmedipham.

[2] 1 = lettuce; 2 = sesame; 3 = alfalfa; 4 = tomatoes; 5 = onions; 6 = safflower; 7 = field corn; 8 = sorghum; 9 = cotton; 10 = sugar beets; 11 = asparagus; 12 = cantaloupe.

[3] a = little mallow; b = redroot pigweed and tumble pigweed; c = common lambsquarters; d = large crabgrass; e = junglerice; f = barnyardgrass.

<u>Chemical fallow weed control in Southeast Idaho</u>. Lish, J. M., D. C. Thill, and R. H. Callihan. Herbicides were evaluated for weed control at three southeast Idaho locations. Fall treatments were applied November 3, 1981, at Tetonia and American Falls and November 4, 1981, at Idaho Falls. Contact herbicides were included in fall treatments at Idaho Falls because volunteer wheat was present at the time of application. Spring treatments were applied June 8, May 12 and 23, and May 20 at Tetonia, Idaho Falls, and American Falls, respectively. Volunteer wheat was present at the time of application at Tetonia and American Falls. Russian thistle, downy brome, prickly lettuce, and volunteer wheat was present at Idaho Falls. Glyphosate treatments were applied in 93.5 L/ha solution at 4 kg/cm^2 with a handheld boom. All other treatments were applied in 187 L/ha solution at 2.8 kg/cm^2. Plot size was 3 by 10 m. The experiments were in a randomized complete block design with four replications. Weed control was evaluated visually on June 9 (fall treatments) and June 23 (spring treatments) at Idaho Falls and June 23 at Tetonia. Fall and spring treatments were evaluated on May 5 and June 10, respectively, at American Falls and all treatments were evaluated a second time on June 24.

Volunteer wheat control was greater than 90% at all locations with fall applied pronamide at 0.42 kg/ha and glyphosate + chlorsulfuron at 0.21 + 0.009 kg/ha. Weed control was generally better at Idaho Falls and Tetonia than at American Falls. Tall, dense, lodging wheat stubble at American Falls may have interfered with spray solution contact with weeds. Russian thistle was controlled best with chlorsulfuron treatments at Idaho Falls. Chlorsulfuron + glyphosate 0.017 + 0.21 kg/ha in the spring resulted in the best control across all weeds evaluated at Idaho Falls. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Chemical fallow weed control at Idaho Falls, Idaho.

		Time of application	Weed Control			
Treatment	Rate		Vowh	Dobr	Ruth	Prle
	(kg/ha)		(% of check)			
propham + PCMC	3.36	fall	98	100	40	22
propham + dicamba	2.24+.28	fall	95	100	12	50
propham + dicamba	2.25+.56	fall	79	75	19	25
propham + chlorsulfuron	2.24+0.009	fall	95	100	56	79
propham + diuron	2.24+1.12	fall	100	99	0	12
propham + metribuzin	2.24+.373	fall	99	99	2	74
propham + metribuzin + paraquat	1.56+ .28+.28	fall	91	99	2	48
chlorsulfuron	0.009	fall	21	41	60	52
chlorsulfuron	0.017	fall	0	28	84	96
chlorsulfuron	0.035	fall	2	42	85	100
chlorsulfuron	0.07	fall	22	38	89	100
chlorsulfuron + glyphosate	0.009+.21	spring	94	99	86	98
chlorsulfuron + glyphosate	0.017+.21	spring	99	99	91	100
chlorsulfuron + paraquat	0.035+.28	spring	86	96	91	99
paraquat	.28	spring	41	90	48	88
paraquat + metribuzin	.28+.42	fall	64	88	2	56
metribuzin	.75	fall	98	100	42	99
metribuzin + paraquat	.75+.28	fall	98	100	75	100
pronamide	.28	fall	92	100	44	54
pronamide	.42	fall	99	99	52	50
pronamide	.56	fall	99	100	10	29
pronamide + glyphosate	.28+.28	fall	96	99	40	2
pronamide + dicamba	.28+.42	fall	98	100	26	31
glyphosate + dicamba	.21+.28	spring	54	41	71	95
glyphosate	.21	spring	98	100	68	100
glyphosate	.42	spring	95	98	72	88
cyanazine + atrazine + paraquat	3.36+.22+ .28	fall	95	100	35	100
MC10108	.56	fall	0	95	76	99
MC10108	1.12	fall	8	71	79	100
LSD 0.05			24	32	39	43

Table 2. Chemical fallow weed control at Tetonia, Idaho.

Treatment	Rate	Time of application	Volunteer Wheat
	(kg/ha)		(% of check)
propham + PCMC	3.36	fall	94
propham + dicamba	2.24+.28	fall	94
propham + dicamba	2.24+.56	fall	84
propham + chlorsulfuron	2.24+0.009	fall	91
propham + diuron	2.24+1.12	fall	69
propham + metribuzin	2.24+.373	fall	94
propham + metribuzin + paraquat	1.56+.28+ .28	fall	88
chlorsulfuron	0.009	fall	0
chlorsulfuron	0.017	fall	0
chlorsulfuron	0.035	fall	0
chlorsulfuron	0.07	fall	0
chlorsulfuron + glyphosate	0.009+.21	spring	91
chlorsulfuron + paraquat	0.035+.28	spring	48
paraquat	.28	spring	36
metribuzin	.42	fall	5
metribuzin	.75	fall	19
pronamide	.28	fall	89
pronamide	.42	fall	90
pronamide	.56	fall	71
pronamide + dicamba	.28+.42	fall	79
glyphosate + dicamba	.21+.28	spring	82
glyphosate	.21	spring	95
glyphosate	.42	spring	100
cyanizine + atrazine	3.36+.22	fall	73
MC10108	.56	fall	34
MC10108	1.12	fall	44
chlorsulfuron + glyphosate	0.017 + .21	spring	94
LSD 0.05			21

Table 3. Chemical fallow weed control at American Falls, Idaho.

Treatment	Rate	Time of application	Weed Control[1] Eval 1	Weed Control[1] Eval 2
	(kg/ha)		(% of check)	
propham + PCMC	3.36	fall	78	78
propham + dicamba	2.24 + 0.28	fall	78	65
propham + dicamba	2.24 + 0.56	fall	88	71
propham + chlorsulfuron	2.24 + 0.009	fall	76	68
propham + diuron	2.24 + 1.12	fall	76	70
propham + metribuzin	2.24 + 0.37	fall	46	36
propham + metribuzin	1.56 + 0.28	fall	45	41
chlorsulfuron	0.009	fall	0	0
chlorsulfuron	0.017	fall	20	10
chlorsulfuron	0.035	fall	2	0
chlorsulfuron	0.07	fall	0	5
metribuzin	0.75	fall	16	42
pronamide	0.28	fall	89	79
pronamide	0.42	fall	93	88
pronamide	0.56	fall	92	90
pronamide + dicamba	0.28 + 0.42	fall	38	35
cyanazine + atrazine	3.36 + 0.42	fall	51	60
MC10108	0.56	fall	36	24
MC10108	1.12	fall	15	6
paraquat	0.28	spring	45	34
glyphosate + dicamba[2]	0.21 + 0.28	spring	83	70
glyphosate	0.21	spring	80	81
glyphosate	0.42	spring	99	97
chlorsulfuron + glyphosate	0.009 + 0.21	spring	78	93
chlorsulfuron + glyphosate	0.017 + 0.21	spring	86	85
chlorsulfuron + paraquat	0.035 + 0.28	spring	51	28
LSD 0.05			25	26

---

[1] Mainly volunteer wheat, some downy brome.

[2] Glyphosate and paraquat applied with nonionic surfactant

Chemical fallow weed control with fall and spring applied herbicides. Lish, J. M., D. C. Thill, and R. H. Callihan. An experiment was established in wheat stubble at Lewiston, Idaho, to determine herbicide efficacy. Fall and spring treatments were applied on December 8 and 9, 1981 and April 10, 1982, respectively, in 187 L/ha solution with a hand-held boom. Broadleaf and grassy winter annuals were in the cotyledon and two to three leaf stage, respectively, at the time of fall application. Volunteer wheat and downy brome were tillered, prickly lettuce had three to five leaves, common chickweed was in the late bud stage, and tumble mustard was an 8 cm rosette at the time of spring application. The experimental design was a randomized complete block with four replications and plot size was 3 by 10 m. Fall and spring treatments were evaluated March 24 and April 24, 1982, respectively, and all treatments were evaluated again on June 3, 1982.

Downy brome and volunteer wheat were controlled best with propham (3FL) at 3.36 kg/ha, propham + diuron at 2.24 + 1.12 kg/ha, glyphosate + metribuzin at 0.31 + 0.75 kg/ha, and pronamide + glyphosate at 0.57 + 0.31 kg/ha. Prickly lettuce control was good in early spring with Hoe 00661 and glyphosate + metribuzin at 0.31 + 0.75 kg/ha; however, control declined by June. Common chickweed and tumble mustard were controlled with several treatments. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Fall and spring herbicide applications in chemical fallow at Lewiston, Idaho.

			Weed Control								
			Vol. wheat		Dobr		Tumu		Prle		Cocw
Treatment	Rate	Time	Eval 1[a]	Eval 2	Eval 1	Eval 2	Eval 1	Eval 2	Eval 1	Eval 2	Eval 1
	(kg/ha)		%								
propham (3 FL)	3.36	Fall	99	100	100	100	-	28	0	5	89
propham (70WP)	3.36	Fall	76	99	72	98	-	59	21	0	61
propham + diuron	2.24 + 1.12	Fall	95	100	99	99	-	25	22	0	76
glyphosate + metribuzin	0.31 + 0.75	Fall	99	94	100	100	-	100	95	56	100
PPG 1259	0.28	Fall	0	0	4	0	-	55	36	18	60
PPG 1259	0.56	Fall	5	8	19	12	-	98	74	25	100
pronamide + glyphosate	0.57 + 0.31	Fall	100	100	100	100	-	43	81	18	100
glyphosate	0.42	Fall	99	75	75	75	-	54	86	8	98
atrazine	0.57	Fall	12	32	85	96	-	46	46	79	96
glyphosate	0.42	Spring	42	89	82	92	78	92	18	32	10
glyphosate + chlorsulfuron	0.31 + 0.009	Spring	20	69	50	79	100	99	42	75	15
glyphosate + chlorsulfuron	0.31 + 0.018	Spring	75	86	75	89	60	100	40	75	26
glyphosate + dicamba (DMA)	0.31 + 0.28	Spring	68	40	55	61	100	100	45	64	15
glyphosate + dicamba (Al salt)	0.31 + 0.28	Spring	45	58	22	72	78	99	40	64	11
Hoe 00661	1.12	Spring	62	55	45	38	100	93	100	50	89
Hoe 00661	1.68	Spring	90	74	91	95	100	83	98	52	78
buthidazole + glyphosate	0.28 + 0.42	Spring	28	91	42	96	55	92	30	56	18
paraquat + chlorsulfuron	0.28 + 0.018	Spring	20	33	22	48	88	98	75	91	72
LSD (0.05)			40	34	41	32	35	36	30	26	31

[a] Eval 1 = 3/24/82 for fall applications and 4/21/82 for spring applications. Eval 2 = 6/3/82.

Effect of tillage and herbicide in fallow at Lewiston, Idaho. Lish, J. M., D. C. Thill, and R. H. Callihan. An experiment was initiated in 1981 to determine the effect of various tillage dates and herbicide applications in fallow. Dates of initial chiseling were April 28, May 21, and July 1, 1981. April and May chiseled treatments were disced on May 27 and July chiseled treatments were disced on September 11. All tillage treatments were cultivated on July 31. Stephens winter wheat was planted on September 22, 1981 with a deep- furrow drill. No-till plots were burned to facilitate planting due to heavy straw residue. Dicamba + glyphosate + surfactant at 0.28 + 0.57 kg/ha + 0.05 % v/v was applied March 29 and May 15, 1981. Volunteer wheat and downy brome were in the one to two leaf stage on March 29. Downy brome was in the boot to early head stage and volunteer wheat was 10 cm on May 20. The experimental design was a randomized complete block with four replications and plots were 4.6 by 7.3 m^2. Downy brome and prickly lettuce were evaluated visually on April 10 and August 30, 1981, respectively. Wheat was harvested with a Hege plot combine on July 27, 1982.

Variability of downy brome control was high; however, the no-till treatments had significantly more ground cover than tilled treatments. Prickly lettuce was controlled by tillage; however, densities were $0.3/m^2$ in the no-till + March herbicide treatment and $1.5/m^2$ in the check.

Wheat yield was best with initial tillage in April + March herbicide application and the no-till treatments yielded the lowest. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Effect of tillage and herbicides in fallow on weed control and wheat yield.

Initial tillage	Herbicide[1] application	Downy brome	Wheat yield
		(% ground cover)	(kg/ha)
April	March	4	7233
May	March	0	6999
July	March	2	5452
May	March and May	6	6139
No-till	March	18	4814
April	None	0	6613
April	May	1	6178
No-till	None	22	4958
$LSD_{(0.05)}$		10	1173

[1] glyphosate + dicamba + surfactant (0.57 + 0.28 kg/ha + 0.5% v/v)

Tillage and herbicide combinations in fallow at Lewistion, Idaho. Lish, J. M., D. C. Thill, and R. H. Callihan. An experiment was initiated in 1980 to determine the effect of various herbicide and tillage combinations on weed control, soil moisture, and wheat yield. Herbicides were applied preemergence November 18, 1980, except glyphosate which was applied March 28, 1981. Downy brome was in the one leaf stage and volunteer wheat was in the one to two leaf stage when glyphosate was applied. Subsequent applications of glyphosate at 0.84 kg/ha and paraquat at 1.12 kg/ha on May 16 and July 1, 1981, respectively, were to prevent seed production in weedy plots. The tillage treatments were an early, mid-season, and late chisel plowing on March 4, April 28, and May 21, 1981, respectively, and a full season no-till. All tillage treatments were chiseled a second time about one month after the first chiseling, disced twice on May 27, and cultivated with a duckfoot cultivator on July 31, 1981. Downy brome and volunteer wheat were evaluated on April 27 and broadleaf weeds were evaluated on May 26. The experimental design was a split block, replicated four times, with tillage as main plots. Herbicide subplots were 4.6 by 7.6 m.

Soil moisture was determined for soil depth intervals of 0 to 15, 15 to 30, 30 to 61, 61 to 91, 91 to 122, 122 to 152, and 152 to 183 cm. Stephens wheat was planted with a deep-furrow drill on Septmeber 22, 1981. Much of the straw residue was pulled off the no-till plots with the drill. Wheat was harvested July 27, 1982, with a Hege plot combine.

Atrazine + cyanazine at 0.28 + 3.4 kg/ha, propham at 3.4 kg/ha, and propham + metribuzin at 3.4 + 0.28 kg/ha resulted in good grass control in tilled and no-till treatments (Table 1). Broadleaf weed control was greater than 90% in all tillage treatments except the March initial tillage treatment with no herbicide. Broadleaf weed control in no-till was best with atrazine + cyanazine at 0.28 + 3.4 kg/ha.

Treatments had little effect on soil moisture throughout the profile (Table 2); however, this may have been due to unseasonally high rainfall in spring and early summer.

Wheat yield was best with propham at 3.4 kg/ha in all tillage systems (Table 3). Metribuzin at 0.57 kg/ha and glyphosate at 0.4 kg/ha in no-till had the lowest yeild. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Weed control in 1981.

Treatment	Rate	Evaluation Date[1]					
		April 27		May 26			
				Time of Tillage			
		March	No-till	March	April	May	No-till
	(kg/ha)	%					
atrazine + cyanazine	0.28 + 3.4	98	99	100	99	96	90
metribuzin	0.57	88	66	95	95	95	52
propham w/PCMC	3.4	98	98	96	98	99	76
propham w/PCMC metribuzin	3.4 + 0.28	99	92	96	96	96	69
glyphosate (spring)	0.42	79	61	91	91	90	51
control	-	70	0	84	91	90	0
$LSD_{(0.05)}$		16	38	6	4	4	28

[1] Downy brome and volunteer wheat on April 27. Jim hill mustard, clasping pepperweed, prickly lettuce on May 26.

Table 3. Wheat Yield 1982.

Treatment	Rate	Time of initial tillage			
		March	April	May	No-till
		(kg/ha)			
atrazine + cyanazine	0.28 + 3.4	4056	4241	4674	3354
metribuzin	0.57	3647	4766	3741	1904
propham w/PCMC	3.4	5341	4541	5668	3794
propham w/PCMC + metribuzin	3.4 + 0.28	5149	4313	4809	4384
glyphosate (spring)	0.4	3700	3140	4051	2120
control	-	3243	2924	3508	1346
$LSD_{(0.05)}$[1]		1320			

[1] $P > F = 0.06$.

Table 2. Soil moisture as influenced by tillage and herbicide.

			Moisture							
		Date of	Soil depth, (cm)							
Treatment	Rate	tillage	15	30	61	91	122	152	183	$\bar{x}$
	(kg/ha)		(%)							
atrazine + cyanazine	0.28 + 3.4	March	14	16	16	13	12	15	17	15
		April	13	13	15	15	13	16	19	15
		May	14	15	16	14	13	15	17	15
		No-till	13	17	16	15	14	18	19	16
metribuzin	0.57	March	14	15	15	14	13	15	16	14
		April	13	16	15	14	14	16	17	15
		May	12	4	15	15	14	17	17	13
		No-till	13	16	15	11	15	13	18	14
propham (PCMC)	3.4	March	15	15	15	14	13	16	16	15
		April	14	14	15	14	14	16	17	14
		May	14	16	16	7	12	15	19	13
		No-till	10	13	12	12	12	15	19	13
propham (PCMC) + metribuzin	3.4 + 0.28	March	15	16	16	15	13	14	18	15
		April	13	15	15	14	13	16	18	15
		May	13	14	15	15	12	14	18	14
		No-till	12	15	15	14	13	16	18	15
glyphosate	0.25	March	13	14	15	13	12	14	17	14
		April	12	13	14	13	15	14	18	14
		May	15	16	15	16	15	18	19	16
		No-till	12	15	16	14	14	16	18	15
control	-	March	14	15	15	13	11	14	16	14
		April	12	15	15	14	13	15	16	14
		May	14	15	16	15	14	16	18	15
		No-till	13	16	16	15	14	18	20	16
LSD (0.05)			3	NS	2	NS	2	3	NS	

The production potential of leafy spurge. Maxwell, B. D., P. K. Fay and C. B. Veseth. It has been reported that some *Euphorbia* species produce adequate amounts of oil and hydrocarbon compounds to serve as economical alternatives to petrochemicals. This experiment was established to determine the agronomic potential of leafy spurge following applications of fertilizer and irrigation.

Plots 4.6 m by 9.1 m were established in an area heavily infested with leafy spurge. Grasses were removed by applying .75 kg BAS90520H per ha on September 15, 1981 and April 3, 1982. Phosphorus fertilizer (80 kg P_2O_5 per ha) was applied on September 15, 1981 by banding in rows 18 cm apart. Ammonium nitrate fertilizer (80 kg per ha) was hand applied to individual plots on April 3, 1982. Irrigation water (5 cm) was applied to individual plots once a week with a garden sprinkler. Leafy spurge production was measured by cutting plants at the soil surface with a 1-meter wide sicklebar mower once or twice during the growing season (Table 1). Cut plants were oven dried and weighed to determine production. The plots were arranged in a randomized complete block design with 3 replications. Acid soluble protein was measured on dry harvested spurge material.

Highest yields of leafy spurge were obtained with two cuttings, however the amount of regrowth following the first cutting was minimal (Table 1). Leafy spurge is slow to resume growth and is nonvigorous. Highest yields from a single cutting occurred when plant material was harvested in mid-July.

Leafy spurge was quite responsive to fertilizer. Yields increased nearly two-fold for each fertilized treatment compared to the unfertilized plots. There was no response to irrigation, possibly because the experimental area was subirrigated and water was not limiting. The highest yielding treatment (12) produced nearly 9 metric tons of dry material per hectare. We will now be able to measure "barrels of oil" per ha when oil and hydrocarbon production values are determined later this fall. The potential economic value of leafy spurge produced under good agronomic conditions will be determined at that time.

The percent protein and metric tons of dry matter produced per hectare following fertilization, irrigation, and cutting of leafy spurge at Whitehall, MT

Trt. no.	Treatment	Cuttings	Harvest date	Leafy spurge production M.T./ha	Protein % by wt.
1	Irr Fert	1	7/15	7.46	14.2
2	Irr Fert	1	8/3	5.50	12.2
3	Irr Fert	1	8/17	5.60	8.2
4	Irr Fert	2	7/15&9/1	8.34	
5	Irr Nonfert	1	7/15	3.53	14.0
6	Irr Nonfert	1	8/3	2.68	11.4
7	Irr Nonfert	1	8/17	3.33	9.8
8	Irr Nonfert	2	7/15&9/1	3.88	
9	Nonirr Fert	1	7/15	8.41	14.5
10	Nonirr Fert	1	8/3	5.61	11.5
11	Nonirr Fert	1	8/17	5.92	10.9
12	Nonirr Fert	2	7/15&9/1	8.92	
13	Nonirr Nonfert	1	7/15	4.76	13.2

Trt. no.	Treatment	Cuttings	Harvest date	Leafy spurge production M.T./ha	Protein % by wt.
14	Nonirr Nonfert	1	8/3	3.27	9.5
15	Nonirr Nonfert	1	8/17	2.99	8.8
16	Nonirr Nonfert	2	7/15&9/1	4.99	
			CV	19.14	
			LSD .05	1.69	3.65

A comparison of weed control, crop tolerance and yield in baby lima beans and 'Gloria' pink beans with bentazon and six postemergence herbicides. Mitich, L.W. and S.A. Fennimore. A trial was established at the University of California, Davis, to compare the effectiveness of bentazon with, and in combination with, six postemergence herbicides in baby lima and 'Gloria' pink beans.

Procedure. The beans were planted to moisture June 9, 1982, and the treatments were applied July 19, 1982, when the weeds--purslane, black nightshade, hairy nightshade and barnyardgrass--were 1 to 2 inches tall. A complete randomized block design was used and the plots were 5 ft. (two rows wide) by 20 ft. long. Each treatment was replicated eight times, four times in the baby limas and four times in the pinks. Both varieties were planted separately in contiguous plots. The herbicides were applied with a CO_2 backpack sprayer at a volume of 50 GPA. Weed control ratings, given in the accompanying tables, are based on quadrat weed counts made July 27, 1982. The quadrant size was 72 square inches. Phytotoxicity and vigor ratings were made on July 27 and August 16, 1982, respectively. Water was supplied by furrow irrigation at 14 to 20 day intervals thoroughout the growing season until early September. The pinks were harvested October 2, 1982, but the baby limas were not harvested due to the untimely wet weather.

Herbicide performance in the pink beans. All herbicides tested, with the exception of HOE-00581 at 0.05 lb/A, gave good to excellent (80% to 100%) nightshade control. PPG-844 plus sethoxydim, HOE-00581, and sethoxydim plus bentazon gave very good (85% to 90%) barnyardgrass control. Moderate (65% to 80%) barnyardgrass control was achieved from treatments of PPG-844 at 0.2 lb/A both with and without surfactant, PPG-844 at 0.25 lb/A, PPG-1013, acifluorfen at 0.5 lb/A and bentazon plus Orchex. Acifluorfen at 0.25 and 0.375 lb/A gave the poorest control (10% to 40%) of barnyardgrass. All herbicides gave more than 94% purslane control with the exception of CGA-82725, HOE-00581 at 0.1 lb/A, acifluorfen at 0.5 lb/A, sethoxydim plus bentazon and bentazon. CGA-82725 and acifluorfen at 0.5 lb/A gave good (78% to 82%) purslane control. Purslane was poorly controlled (48% to 58%) by sethoxydim plus bentazon and bentazon alone. PPG-844 with and without surfactant, PPG-844 plus sethoxydim, PPG-1013 and acifluorfen at 0.375 and 0.5 lb/A caused 10% to 27.5% injury in the pinks, while the other herbicides caused 10% or less injury. However, as the August 16, 1982, vigor rating shows, the crop had outgrown most herbicide induced injury in less than a month. The yield of plots treated with acifluorfen at 0.25 lb/A and HOE-00581 at 0.1 lb/A were significantly higher than yields from any other treatments. All other treatments gave crop yields which were lower due to injury and or weed competition. Sethoxydim plus bentazon gave the lowest yield in the experiment.

Herbicide performance in baby lima beans. Very good nightshade control (87% to 100%) resulted from treatments of PPG-844 at 0.2 lb/A plus surfactant, PPG-844 at 0.25 lb/A, PPG-1013 and acifluorfen at 0.25 and 0.5 lb/A. Acifluorfen at 0.375 and HOE-00581 at 0.1 lb/A gave moderate (66% to 73%) nightshade control, and all other herbicides gave zero to poor control (0% to 54%). CGA-82725, PPG-844 plus sethoxydim, HOE-00581, sethoxydim plus bentazon and bentazon plus Orchex treatments all gave good to excellent (82.5% to 95%) barnyardgrass control. Moderate barnyardgrass control

(62.5% to 77.5%) resulted from treatments of PPG-844, PPG-1013 and acifluorfen at 0.5 lb/A. Acifluorfen at 0.25 and 0.375 lb/A gave poor barnyardgrass control (10% to 40%). Injury resulting from treatments of PPG-844 at 0.2 lb/A plus surfactant and PPG-844 at 0.25 lb/A, PPG-844 plus sethoxydim, PPG-1013,and acifluorfen at 0.5 lb/A, was moderate to severe, 20% to 45%. PPG-1013 caused the greatest injury at 45%. All of the other herbicides caused only slight injury, 15% or less. As in the pinks the baby limas recovered from this injury for the large part. The August 16, 1982, rating shows that with the exceptions of those treatments which caused the most severe injury, (PPG-844 at 0.25 lb/A and PPG-1013), the injury was temporary. (University of California Cooperative Extension, Davis, CA 95616)

Postemergence herbicides in baby limas

Table 1:

Herbicide	lb/A	Surfactant	% Control		Phytotoxicity[1/]	Vigor[2/]
			nightshade	barnyardgrass	7/27/82	8/16/82
PPG-844	0.2	---	54	72.2	1.50	10.00
PPG-844	0.25	---	87	65.0	3.75	9.00
PPG-844	0.2	X-77 0.25 by volume	87	72.5	3.50	9.75
CGA-82725	0.5	A + 411F 1 qt/A	20	95.0	1.25	10.00
PPG-844 + sethoxydim	0.2 + 0.2	X-77 0.25 by volume	54	87.5	2.50	9.50
PPG-1013	0.04	---	93	77.5	4.50	9.00
PPG-1013	0.06	---	93	62.5	4.50	8.50
HOE-00581	0.05	---	0	90.0	1.25	10.00
HOE-00581	0.1	---	66	95.0	0.25	10.00
acifluorfen	0.25	---	93	5.0	1.50	9.50
acifluorfen	0.375	---	73	32.5	1.25	10.00
acifluorfen	0.5	---	100	70.0	3.00	9.75
sethoxydim + bentazon	0.5 + 0.75	---	33	95.0	0.75	9.75
bentazon	0.75	Orchex 2 qt/A	54	82.5	0.75	10.00
control	---	---	0	0	0.00	10.00

1/ Phytotoxicity ratings: 0 = no phytotoxicity, 10 = plants dead

2/ Vigor ratings: 10 = plants healthy and vigorous 0 = plants dead

Postemergence herbicides in Gloria pink beans

Table 2:

		% Weed control			Phyto-toxicity[2]	Vigor[3]	Yield (kg.)[4]
Herbicide	lb/A	nightshade[1]	barnyardgrass	purslane	7/27/82	8/16/82	per plot
PPG-844	0.2	94.5	80.0	100.0	1.0	9.5	2.61 b
PPG-844	0.25	100.0	65.0	100.0	2.0	10.0	2.50 bc
PPG-844 (surfactant X-77 0.25% by vol.)	0.2	98.2	80.0	100.0	2.0	9.75	2.60 B
CGA-82725 (surfactant at + 411F 1 qt/acre)	0.5	82.9	95.0	82.0	0.75	9.75	2.92 ab
PPG-844 + sethoxydim (surfactant X-77 0.25% by volume)	0.2 + 0.2	98.2	87.5	100.0	2.5	10.0	2.49 bc
PPG-1013	0.04	96.4	72.5	100.0	2.25	10.0	2.37 bc
PPG-1013	0.06	100.0	80.0	94.0	2.75	10.0	2.09 c
HOE-00581	0.05	77.4	85.0	94.0	0.5	9.75	2.5 bc
HOE-00581	0.1	80.0	90.0	56.0	0.5	10.0	3.2 a
acifluorfen	0.25	89.1	10.0	100.0	0.5	9.75	3.11 a
acifluorfen	0.375	92.8	40.0	96.0	1.25	10.0	2.77 ab
acifluorfen	0.5	98.0	70.0	78.0	1.75	10.0	2.21 bc
sethoxydim + bentazon	0.5 + 0.75	84.7	85.0	48.0	1.0	9.5	1.96 c
bentazon (surfactant Orchex 1 qt/acre)	0.75	94.6	80.0	58.0	0.75	10.0	2.90 ab
control	-	0	0	0	0	10.0	3.04 ab

1/ Nightshade species consisted or 80% Solanum nigrum and 20% Solanum sarachoides

2/ Phytotoxicity ratings: 0 = no phytotoxicity, 10 = plants dead

3/ Vigor ratings: 10 = plants healthy and vigorous, 0 = plants dead

4/ Treatments with the same letters are approximately equal according to Fisher's Protected Least Significant Difference

An evaluation of selected preplant incorporated herbicides in baby lima and 'Gloria' pink beans. Mitich, L.W. and S.A. Fennimore. A study was established on the University of California, Davis Experimental farm to evaluate the effectiveness of several experimental herbicides in comparison with several standard use herbicides on baby lima and 'Gloria' pink beans.

Procedure. The experiment with 18 treatments, including a weeded and an unweeded control, was planted June 9, 1982. Two classes of beans, 'Gloria' pinks and baby limas were used to determine any differences in tolerance to the various herbicide treatments. The beans were planted separately in contiguous plots. Each treatment consisted of eight replications--four replications in the baby limas and four replications in the pinks. A randomized complete block design was used, and each plot was 5 ft. (two rows) wide by 20 ft. long. The herbicides were applied on June 4, 1982, at a volume of 50 GPA with a CO_2 backpack sprayer, and incorporated immediately thereafter with a power incorporator to a depth of 2 inches. Water was supplied by furrow irrigation at 15 to 20 day intervals until early September. The pinks were harvested October 2, 1982.

Herbicide performance in the pink beans. Metolachlor at 2.5 lb/A, metolachlor plus-trifluralin and EPTC all gave over 90% control of nightshade. Alachlor in both the ME (microencapsulated) and in the EC formulations, and PPG-1013 gave over 75% nightshade control. All other herbicides gave very poor to moderate nightshade control. All of the herbicide treatments, except UBI-S734, gave better than 80% control of barnyardgrass. None of the herbicides caused more than slight phytotoxicity in the pinks and none of the treatments caused a significant difference in bean yields.

Herbicide performance in baby limas. Metolachlor at 2.5 lb/A plus trifluralin at 0.75 lb/A, alachlor ME and alachlor EC, and metolachlor at 2.5 lb/A plus PPG-844 (PPG-844 applied postemergence) all gave better than 90% control of nightshade. Metolachlor at 2.0 and 2.5 lb/A, ethalfluralin and metolachlor at 2.0 lb/A plus PPG-844 (applied simultaneously), gave good control of nightshade. All other herbicides gave zero to moderate control of nightshade, with UBI-S734 at 1.0 lb/A giving the least control. As in the pinks, most herbicides gave better than 80% control of barnyardgrass. Only ethalfluralin, UBI-S734 and PPG-1013 gave less than 80% control of barnyardgrass. With the exception of EPTC, EPTC + R-33865 and EPTC + trifluralin, none of the herbicides caused more than slight injury to the crop. The baby limas were not harvested due to untimely wet weather. (University of California Cooperative Extension, Davis, CA 95616).

Preplant incorporated herbicides in baby lima beans at the U.C. Davis Experimental Farm

Table 1:

		% Control		Crop phytotoxicity[3]	
Herbicide	Rate lb/A	Nightshade[2]	Barnyardgrass	6/28	7/27
metolachlor + trifluralin	2.0 + 0.75	54.4	97.5	0.25	0
metolachlor + trifluralin	2.5 + 0.75	94.8	95.0	0.25	0
alachlor ME	3.0	97.4	85.0	0.25	.25
alachlor EC	3.0	97.4	97.5	0	0
EPTC + R-33865	3.0	20.3	92.5	2.5	1.25
EPTC	3.0	51.6	80.0	2.75	2.0
EPTC + trifluralin	1.5 + 0.5	17.7	97.5	1.75	.25
metolachlor	2.0	82.9	92.5	1.0	0
metolachlor	2.5	78.1	95.0	1.0	0
ethalfluralin	1.5	82.9	75.0	0.5	0
UBI-S734	1.0	0	75.0	0.75	0
UBI-S734	1.5	61.0	70.0	0.5	0
metolachlor + PPG-844	2.0 + 0.25	78.1	92.5	.75	.5
metolachlor + PPG-844	2.0 + 0.25[1]	100.0	85.0	.75	.75
PPG-844	0.25	0	85.0	.5	0
PPG-1013	0.20	67.2	72.5	.75	0
weeded control	-	100.0	97.5	0	0
unweeded control	-	0	10.0	0	0

[1] PPG-844 applied July 1, 1982
[2] Nightshade species; 20% *Solanum sarachoides*, 80% *Solanum nigrum*
[3] Phytotoxicity ratings: 0 = no phytotoxicity, 10 = plant death

Preplant incorporated herbicides in Gloria Pink beans at the U.C. Davis Experimental Farm

Table 2:

Herbicide	Rate lb/A	% Nightshade 2/ control		% Control		Phytotoxicity 3/		Yield 4/ (kg.)
		7/27/82	8/16/82	Purslane 7/27/82	Barnyard-grass 8/16/82	6/28/82	7/27/82	
metolachlor + trifluralin	2.0 + 0.75	79.2	80.0	92.8	82.5	0.25	1.0	2.87
metolachlor + trifluralin	2.5 + 0.75	95.7	97.5	100.0	91.3	0	0	3.26
alachlor ME	3.0	91.4	87.5	84.4	67.5	.5	.25	2.74
alachlor EC	3.0	87.5	85.0	100.0	80.0	.5	.25	2.95
EPTC + R-33865	3.0	1.1	22.5	83.9	80.0	.25	0	2.89
EPTC	3.0	94.0	92.5	89.1	95.0	.25	0	3.12
EPTC + trifluralin	1.5 + 0.5	79.5	90.0	95.4	90.0	.25	.25	2.95
metolachlor	2.0	97.4	80.0	89.1	92.5	.75	0	3.31
metolachlor	2.5	95.7	90.0	92.8	87.5	.75	0	2.92
ethalfluralin	1.5	91.0	72.5	95.4	65.0	.75	0	2.84
UBI-S734	1.0	71.6	70.0	66.7	85.0	1.0	.5	2.72
UBI-S734	1.5	53.4	72.5	0	90.0	.5	0	2.83
metolachlor + PPG-844	2.0 + 0.25	81.9	77.5	93.8	80.0	.5	0	2.83
metolachlor + PPG-844	2.0 + 0.25 1/	92.4	80.0	92.8	92.5	.75	0	2.95
PPG-844	0.25	60.1	82.5	98.5	82.5	.5	.25	2.76
PPG-1013	0.20	91.3	87.5	95.4	72.5	.5	0	3.28
weeded control	-	100.0	100.0	100.0	100.0	0	0	2.98
unweeded control	-	0	7.5	0	0	0	0	2.60

1/ PPG-844 applied July 1, 1982

2/ Nightshade species 20% Solanum sarachoides, 80% Solanum nigrum

3/ Phytotoxicity ratings: 0 = no phytotoxicity, 10 = plant death

4/ Harvested October 2, 1982

A comparison of glyphosate with three postemergence herbicides for the control of johnsongrass in Red Kidney beans. Mitich, L.W., S.A. Fennimore, E.E. Sieckert and B. Smith. Sethoxydim, fluazifop-butyl and HOE 00581 were compared with wiper applied glyphosate for effectiveness in controlling johnsongrass.

The crop was planted June 20, 1982, near Wheatland, California. An area rather severely infested with seedling johnsongrass was chosen for the trial which was established on July 15 and contained seven treatments and an unweeded control. A complete randomized block design was used and all treatments were replicated four times. Each plot was 15 by 40 ft. (6 rows wide). Glyphosate was applied as a 33% solution with a hand held rope-wick applicator to the johnsongrass which extended above the crop. The first glyphosate treatment was made on July 15 when the johnsongrass was in the preboot stage and about 15 to 20 inches tall. Glyphosate was reapplied in treatment one on August 12. The first glyphosate application was made in treatment two on July 22, 1982, when the johnsongrass was in the postboot stage. Glyphosate was reapplied in treatment two on August 12 and 31. Treatments three through seven were applied with a CO_2 backpack sprayer at a volume of 30 GPA, the first herbicide applications were made July 15 and the second applications on August 12. The trial was furrow irrigated as needed during the growing season and harvested October 5, 1982.

Glyphosate gave fair control of johnsongrass and sethoxydim, fluazifop-butyl at 0.5 lb/A and HOE 00581 at 0.2 lb/A gave 93% to 96% control. Fluazifop-butyl inadvertently applied without a surfactant at 0.1 lb/A gave poor control of johnsongrass. Due to johnsongrass competition, the vigor of the beans in the plots receiving the glyphosate treatments was reduced by 25%. Yield from plots treated with sethoxydim, HOE 00581 at 0.1 and 0.21 lb/A and fluazifop-butyl at 0.2 lb/A were significantly greater than either of the glyphosate treatments. Low yields in the control plots and the fluazifop-butyl 0.1 lb/A treatment demonstrate the high degree of competition exerted by johnsongrass. (University of California Cooperative Extension, Davis, CA 95616)

Postemergence herbicides in large 'Red' kidney beans

Herbicide	Rate lb/A	Surfactant (% v/v)	Johnsongrass control		Crop vigor		Yield	
			8/12/82[4]	9/3/82[4]	8/12/82[5]	9/3/82[5]	Kg[6]	[7]
glyphosate[1]	33% wiper	---	3.6	7.2	9.75	7.4	6.75	b
glyphosate[2]	33% wiper	---	4.6	7.5	10.00	7.4	5.98	b
sethoxydim[3]	0.5	0.25 Orchex	9.1	9.5	10.00	9.8	9.64	ab
fluazifop-butyl[3]	0.25	0.25 Orchex	2.0	1.0	10.00	1.7	5.36	b
fluazifop-butyl[3]	0.5	0.25 Orchex	8.9	9.6	9.32	9.9	10.61	ab
HOE 00581[3]	0.1	0.25 Orchex	7.5	8.1	10.00	9.4	9.99	ab
HOE 00581[3]	0.2	0.25 Orchex	7.9	9.3	10.00	9.6	11.72	a
check	---		1.0	1.0	10.00	2.6	1.48	c

[1] Treatment was made when the johnsongrass was in the preboot stage.

[2] Treatment was made when the johnsongrass was in the postboot stage.

[3] Treatments 3 through 7 were applied twice. The first application was made July 15, 1982, and the second application on August 12, 1982. Orchex surfactant was included only in the August 12, 1982 application.

[4] 10 = 100% control 1 = 0% control.

[5] 10 = extremely vigorous 1 = dead.

[6] Harvested October 5, 1982

[7] Means with the same letters are not significantly different at 5% according to the Duncan's multiple range test.

Alachlor and metolachlor selectivity to treated grain sorgum seed. Mitich, L.W. and N.L. Smith. A trial was conducted at the Davis campus experimental farm to evaluate the effectiveness of two safeners with alachlor and metolachlor on grain sorghum. Alachlor and metolachlor (2.5 and 3.0 lb/A) were applied to 30 inch preformed beds August 5, 1982 and immediately incorporated to a 1.5 inch depth with a power driven bed shaper. Four replications were used with individual plots 15 by 20 ft. (6 rows wide). Two rows were planted to each seed treatment (CGA 92194 and MON 4606) in each plot along with untreated sorghum seed (cultivar: G 251). The experiment was furrow irrigated the following day. Both herbicides reduced crop stand when untreated seed was used. No loss of stand was observed from the rows planted with treated seed. The stand count was lower in plots where MON 4606 treated seed was used. Both alachlor and metolachlor provided excellent control of barnyardgrass. (University of California Cooperative Extension, Davis, CA 95616)

Herbicide selectivity to grain sorghum

		Stand count[1/]			
Herbicide	Ai/A	Untreated	CGA 92194	MON 4606	% Control barnyardgrass
alachlor	2.5	6.4	13.4	7.6	10.0
alachlor	3.0	4.3	13.3	7.6	10.0
metolachlor	2.5	4.0	12.3	8.8	10.0
metolachlor	3.0	2.9	12.6	9.6	9.9
control	---	11.8	12.3	7.5	6.9

[1/] Number of sorghum plants/meter of row.

<u>Postemergence herbicides for weed control in field corn.</u> Mitich, L.W. and N.L. Smith. A study was established on the Davis experimental farm to evaluate several foliar applied herbicides for crop tolerance and broadleaf weed control. Corn (cultivar: Pioneer 3906) was planted May 20, 1982, to preformed 30-inch beds. The experimental area contained a population of common purslane, redroot pigweed and common lambsquarters; black nightshade was hand seeded in the plots. The area was furrow irrigated immediately after planting. Herbicides were broadcast in 30 GPA water carrier June 21 on 10-to 18-inch tall corn, 2-to 4-inch pigweed and lambsquarters, seedling to 4-inch nightshade and seedling to 6-inch diameter purslane. Four replications were employed with individual plots 10 by 20 ft. Nonphytotoxic oil (Pace) was added to bentazon and cyanazine treatments.

Corn phytotoxicity evaluations on June 28 indicated moderate injury from cyanazine and slight symptoms from dinoseb combinations and PPG 1259. Dicamba and cyanazine gave excellent control of broadleaf species when evaluated July 21. Bromoxynil was weak on purslane. CN-10-4359T, an aluminum salt of dicamba, was considerably weaker than the dimethylamine salt. (University of California Cooperative Extension, Davis, CA 95616)

Postemergence weed control in field corn

			% control[2]			
Herbicide	Rate Ai/A	Corn[1] Phytotoxicity 6/28/82	Common purslane	Black nightshade	Redroot pigweed	Common lambs-quarters
control		0.3	1.25	0.5	2.5	7.5
dicamba	0.75	0	9.5	10.0	10.0	10.0
dicamba	1.5	0.5	9.75	10.0	10.0	10.0
bromoxynil (AXF 1050)	0.375	1.5	1.75	10.0	10.0	10.0
bromoxynil + dinoseb	0.395 + 0.5	2.8	3.5	7.0	8.75	8.75
bromoxynil + dinoseb	0.375 + 1.0	3.5	5.75	8.0	10.0	10.0
bromoxynil + MCPA	0.375	1.8	5.75	8.5	8.0	10.0
bromoxynil + MCPA + dinoseb	0.375 + 0.375 + 0.5	4.0	7.75	7.25	8.5	10.0
Dowco 356 + atrazine	0.375 + 0.75	0.5	10.0	8.5	10.0	10.0
Dowco 356 + 2,4-D amine	0.375 + 0.25	0.5	4.25	5.0	10.0	10.0
Dowco 356 + atrazine + cyanazine + oil	0.375 + 0.5 + 0.75	4.3	10.0	8.25	8.0	10.0
Dowco 356	0.375	0	2.5	2.5	5.0	10.0
dicamba	0.25	0.3	6.5	9.0	10.0	10.0
dicamba	0.5	0.3	9.75	10.0	10.0	10.0
dicamba	1.0	0	9.5	10.0	10.0	10.0
dicamba II	0.25	0	7.25	10.0	10.0	10.0
dicamba II	0.5	0.3	5.75	10.0	10.0	10.0
CN-10-4359T	0.25	0.5	4.0	7.25	9.0	10.0
CN-10-4359T	0.5	0.3	3.25	7.25	10.0	10.0
CN-10-4359T	1.0	0.3	6.0	10.0	10.0	10.0
PGG-1259 FL3	0.05	0.5	8.0	3.25	6.25	10.0
PPG-1259 FL3	0.1	2.0	4.25	5.25	9.0	7.0
PPG-1259 FL3	0.15	3.0	6.25	4.25	7.5	7.5
PPG-1259 FL3	0.20	3.3	8.25	5.5	10.0	10.0
MBR 23709	1.0	1.8	0.0	4.75	7.25	2.5
MBR 23709	2.0	1.8	0.25	4.75	5.25	8.25

(Table continued on next page)

Postemergence weed control in field corn
(continued)

			% control[2]			
Herbicide	Rate Ai/A	Corn[1] Phytotoxicity 6/28/82	Common purslane	Black nightshade	Redroot pigweed	Common lambs-quarters
cyanazine + oil	2.0 + 1 gal.	5.0	10.0	10.0	9.75	10.0
2,4-D amine	0.5	0	6.25	7.25	10.0	10.0
bentazon + oil	0.75 + 1 qt.	0.3	10.0	3.25	10.0	9.5
control		0	6.25	1.25	3.75	5.0

[1] Average of four replications

[2] Visual evaluation where 0=no control 10=complete control

Weed control in field corn with preplant incorporated herbicides. Mitich, L.W. and N.L. Smith. A site was selected on the Davis experimental farm to evaluate eight soil active herbicides and combinations for control of barnyardgrass, black nightshade, common purslane, redroot pigweed and to evaluate corn phytotoxicity. Herbicides were applied on 30-inch preformed beds May 20, 1982, using a CO_2 backpack sprayer calibrated to deliver 30 GPA spray volume. A power driven bed shaper was used to incorporate herbicides to a 2-inch depth. Four replications were used with an individual plot size of 10 by 20 ft. Corn (cultivar: Pioneer 3906) was planted May 20, 1982, and furrow irrigated up five days later. The plot area had been seeded to black nightshade and barnyardgrass and, in addition, there was a natural stand of common purslane and redroot pigweed. Dicamba was applied postemergence to certain plots on June 18 when broadleaf weeds were less than 4-inches tall and the corn was 12-inches in height.

No corn phytotoxicity was observed on June 17. Weed control was excellent from alachlor and cyanazine combinations. The postemergence application of dicamba offered additional broadleaf control over butylate alone. Control of purslane and pigweed was good with PPG 844. MBR 23709 was weak on nightshade and purslane. (University of California Cooperative Extension, Davis, CA 95616)

Weed control in field corn

		% control[2/]							
		6/18/82[1/]					10/21/82		
Herbicide	Rate Ai/A	Corn Phyto-toxicity	Barnyard-grass	Black night-shade	Purslane	Pigweed	Barnyard-grass	Black night-shade	pigweed
butylate + dicamba	4.0 + 0.75	0	6.5	1	3.8	8	7.2	9.6	9.6
butylate + dicamba	4.0 + 1.0	0	6.2	0	1	9.3	8.2	9.0	9.0
alachlor + dicamba	3.0 + 0.75	0	8.3	7.3	10.0	10.0	9.0	9.5	9.5
EPTC + R25788 + R-33865	4.0	0	9.4	4.5	5.8	6.8	8.9	5.3	9.1
MBR 23709	1.5	0	5.6	0.8	2.8	6.5	6.8	6.5	5.5
MBR 23709	3.0	0	4.5	1.8	2.8	6.0	4.3	5.5	4.5
PPG 844	0.25	0	4.7	7.5	9.5	9.0	5.3	7.3	7.8
PPG 844	0.4	0	3.8	5.8	10.0	8.3	4.5	8.5	8.5
PPG 844 + alachlor	0.25 + 2.5	0	9.2	9.2	10.0	9.9	7.6	7.0	9.1
PPG 844 + alachlor	0.4 + 2.5	0	9.6	0.8	10.0	10.0	7.5	6.0	8.0
alachlor	2.5	0	9.9	9.7	9.9	10.0	9.3	8.0	9.0
metolachlor	2.5	0	7.3	9.9	2.3	6.8	6.9	6.0	6.3
cyanazine + metolachlor	1.5 + 2.0	0	9.7	9.2	9.8	9.9	9.6	9.6	8.3
cyanazine + alachlor	1.5 + 2.0	0	9.9	9.9	10.0	10.0	9.0	9.1	9.4
cyanazine	1.5	0	3.5	9.2	10.0	6.8	7.0	8.8	8.3

(table continued on next page)

		% control[2/]							
		6/18/82[1/]					10/21/82		
Herbicide	Rate Ai/A	Corn Phyto-toxicity	Barnyard-grass	Black night-shade	Purslane	Pigweed	Barnyard-grass	Black night-shade	pigweed
control	-	0	2.3	1.0	4.0	5.0	4.3	8.3	6.5
control	-	0	4.9	1.5	1.3	4.0	5.8	6.3	5.8

1/ dicamba applied 6/18/82

2/ visual evaluation where 0= no control 10=complete control

Tolerance of thirteen wheat varieties to AC 222,293. Mitich, L.W., N.L. Smith and K. Baghott. Thirteen wheat varieties were planted on the Tulelake Field Station on April 14, 1982, to evaluate the tolerance of the wheat varieties to AC 222,293, an experimental wild oat herbicide. A split plot design was used with herbicide treatments as main plots (20 by 65 ft.) and varieties being subplots (5 by 20 ft.). AC 222,293 (0.75 and 1.5 lb/A) was applied May 18 using a CO_2 backpack sprayer calibrated to deliver 20 GPA spray volume. A surfactant (X-77) at 0.25% v/v was included in the spray mix. Wheat was in the 3-leaf stage with 1 to 2 tillers. The experimental area was sprinkler irrigated.

Crop phytotoxicity was evaluated June 6. Some stunting was noted on WB-881, WB 1000D, WB-803, Modoc, TL 409 and Shasta, none being severe. Wild oat control from both rates of AC 222,293 was 95% or more. Yields and bushel weights were significantly higher from all varieties where wild oat was controlled. Severe competition and reduced yields from a heavy stand of wild oat prevented statistical comparisons on yield of individual varieties. At harvest none of the varieties appeared to be affected from the herbicide treatments. (University of California Cooperative Extension, Davis, CA 95616)

Variety tolerance to AC 222,293

	Injury[1]			Yield[2] (lb)				Bushel Wt.[3]			
	AC 222,293			AC 222,293			Variety	AC 222,293			Variety
Variety	0.75	1.5	Control	0.75	1.5	Control	average	0.75	1.5	Control	average
Yolo	0	0.5	0	7000	7208	5435	6548	54.8	57.0	53.4	55.1
Anza	0	0.5	0	6652	6365	4066	5694	56.5	57.0	55.6	56.4
Yecora Rojo	0	0	0	6185	6194	4450	5600	58.5	58.8	55.1	57.4
Shasta	0.25	1.0	0	6072	5928	3656	5218	56.5	57.3	51.7	55.1
TL 409	0.25	1.0	0	6581	6424	4826	5943	57.9	56.4	52.7	55.7
Modoc	0.25	1.0	0	6607	6130	4689	5808	59.6	60.1	57.6	59.1
Fielder	0	0.25	0	6816	6918	4251	5995	57.3	57.4	54.5	56.4
Oslo	0.25	1.0	0	6820	6698	5508	6342	57.1	57.2	53.5	55.9
Fieldwin	0	0.25	0	7397	7311	5249	6652	57.6	53.7	57.7	56.3
Dirkwin	0	0.25	0	6313	7137	5106	6185	52.5	54.4	54.0	53.6
WB 803	0.5	1.0	0	6902	7144	4711	6285	58.8	58.5	55.6	57.6
WB 881	1.25	2.0	0	5676	5979	4499	5384	58.8	58.9	57.9	58.5
WB 1000D	1.0	2.0	0	6920	6940	3673	5844	55.8	57.3	51.5	54.9
				6609	6644	4632		57.04	57.21	54.66	

1/ Average of 4 reps. 0 = no injury. 10 = all dead

2/ LSD 5%

Between varieties	613
Between herbicide treatments	368

3/ LSD 5%

Between varieties	3.04
Between subplot treatments for different main plot treatments	3.26

Evaluation of several herbicides for downy brome and broadleaf weed control in winter wheat. Morishita, D. W., D. C. Thill, and R. H. Callihan. Several herbicides were applied postemergence alone and in combination to evaluate their efficacy for weed control and phytotoxicity to winter wheat (var. Stephens). All herbicide treatments were applied April 9, 1982, with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L/ha at 5 km/h. Plot size of each treatment was 3 by 10 m with four replications arranged in a randomized complete block design. Soil type at the study area was a silt loam with 2.07% organic matter, soil pH 5.2, and CEC of 16.5 meq/100 g soil. Visual evaluations for weed control and crop tolerance were taken May 18, and June 17, 1982. The crop was harvested July 27, 1982, with a Hege small plot combine.

Metribuzin + chlorsulfuron at 0.42 + 0.0175 kg/ha gave the best overall control of clasping pepperweed and prostrate knotweed (100%) and downy brome control (85%) at both evaluation dates. No other herbicide treatment resulted in good broadspectrum control of the weed species in this experiment.

Metribuzin + chlorsulfuron at the above rate and metribuzin + bromoxynil at 0.42 + 0.42 kg/ha provided the highest yields of all herbicide treatments. (Idaho Agricultural experiment Station, Moscow, Idaho 83843)

Downy brome and broadleaf weed control in winter wheat

		Crop		Weed Control					
		Injury		Dobr		Clpw		Prkw	
Treatment	Rate	E^1	L^2	E	L	E	L	E	Yield
	(kg/ha)	------------------				%		-------------	(kg/ha)
SSH-0860	0.84	0	0	10	8	3	8	98	4508
SSH-0860	1.68	0	0	13	18	69	11	100	4413
metribuzin	0.42	1	0	59	50	81	58	86	4572
metribuzin + terbutryne	.028 + 0.672	0	0	49	20	63	23	100	4542
metribuzin + bromoxynil	0.42 + 0.28	1	0	59	46	75	25	100	4361
metribuzin + bromoxynil	0.42 + 0.42	0	0	63	55	85	39	100	5099
AC-222-293	0.56	1	0	30	29	96	90	33	4177
AC-222-293	0.84	0	0	34	18	94	91	55	3951
metribuzin + chlorsulfuron	0.42 + 0.0175	0	0	85	86	100	100	100	5409
pendimethelin + dinoseb	1.12 + 1.68	0	0	28	25	63	26	94	4554
check	-	0	0	0	0	0	0	0	4011
LSD (0.05)		2	NS	34	37	21	29	25	671

E^1 = early evaluation (5/18)

L^2 = late evaluation (6/17)

Postemergence herbicide applications for weed control in minimum tillage winter wheat. Morishita, D. W., D. C. Thill, and R. H. Callihan. A study was initiated at Peck, Idaho, to determine the control of four broadleaf and one grass weed species in minimum tillage winter wheat (var. Stephens). The crop was seeded with a chisel planter designed by the University of Idaho Agricultural Engineers. Each plot was 3 by 10 m in size and the experiment was arranged in a randomized complete block design with four replications. Postemergence herbicide treatments were applied at the 3 to 5 leaf and early boot stage of crop growth on April 30, and June 2, 1982, respectively. Environmental conditions on April 30, were air temperature 22 C, soil temperature 23 C at 5 cm, relative humidity 36%, and wind speed 0 to 5 km/h. On June 2, air temperature was 20 C, relative humidity 62%, and wind speed 3 to 6 km/h. All herbicides were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L/ha. The soil was a silt loam with 3.82% organic matter, pH 4.7, and CEC of 17.3 meq/100 g soil. Visual evaluation for crop tolerance and weed control was made June 17, 1982, and the crop was harvested August 31, 1982.

Crop injury was observed in the MCPA + terbutryne at 0.28 + 0.84 kg/ha and metribuzin alone at 0.42 kh/ha. Good to excellent overall control of henbit, mayweed, forget-me-not, and shepherdspurse was obtained with chlorsulfuron + metribuzin at 0.009 + 0.14 kg/ha, DPX-6376 at 0.018 kg/ha, metribuzin + bromoxynil at 0.42 + 0.28 kg/ha, and metribuzin + terbutryne at 0.28 + 0.62 kg/ha. None of the herbicides effectively controlled windgrass.

Highest crop yields resulted from dicamba + metribuzin at 0.14 + 0.14 kg/ha and DPX-6376 at 0.009 kg/ha treatments. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Weed control and yield in minimum tillage winter wheat

Treatment	Rate	Date of application	Crop injury	Weed Control					Yield
				Hebi	Mawe	Fomn	Shpu	Wigr	
	(kg/ha)		----------	----------	---------- %	----------	----------	----------	(kg/ha)
check	0.009	-	0	0	0	0	0	0	2496
chlorsulfuron[1/]	0.009+0.14	4/30	0	70	72	80	97	17	3189
chlorsulfuron + metribuzin	0.009+0.14	4/30	0	89	86	95	98	64	3093
dicamba + bromoxynil + MCPA	0.07+0.28	4/30	0	45	51	80	75	33	2630
dicamba + metribuzin	0.14+0.14	4/30	1	63	26	66	66	44	3385
diuron + bromoxynil	0.89+0.28	4/30	0	79	88	94	99	39	3071
DPX-6376[1/]	0.009	4/30	0	89	89	70	93	20	3348
DPX-6376	0.018	4/30	0	88	95	86	100	34	3055
MCPA + bromoxynil	0.28+0.28	4/30	1	35	38	68	88	24	3042
MCPA + terbutryne	0.28+0.84	6/2	9	79	79	93	88	20	2208
metribuzin	0.42	6/2	8	75	74	51	59	13	2279
metribuzin + bromoxynil	0.42+0.28	6/2	6	89	84	98	98	29	1712
metribuzin + terbutryne	0.28+0.62	6/2	3	85	83	92	92	48	2078
2,4-D	1.12	6/2	3	44	61	0	66	0	2474
$\text{LSD}_{(0.05)}$			6	25	32	26	31	43	817

[1/] chlorsulfuron and DPX-6376 used with 0.5% v/v WK surfactant

Ripgut brome and broadleaf weed control in winter wheat. Morishita, D. W., D. C. Thill, and R. H. Callihan. A study was conducted near Lewiston, Idaho, to evaluate the control of ripgut brome, wild oat, and four broadleaf weeds with several herbicides in winter wheat (var. Walladay) applied at four application dates. All herbicide applications were applied broadcast with a CO_2 pressurized knapsack sprayer calibrated to deliver 187 L/ha at 2.8 kg/cm^2 and 5 km/h. Soil type at the study area was a silt loam with 3.38% organic matter, soil pH 4.8, and CEC of 20.6 meq/100 g soil. The experimental design was a randomized complete block with four replications and the plots were 3 by 10 m. Preplant incorporated (PPI) and preemergence surface (PES) applications were made November 4, and November 11, 1981, respectively. Postemergence (post) applications were made March 26, and April 26, 1982. Chlorsulfuron was applied on all diclofop treatments at a rate of 0.0175 kg/ha on May 30, 1982. Incorporation of all PPI herbicide treatments was done twice in opposite directions with a flex-tine harrow to a depth of 5 cm. Crop tolerance and weed control were evaluated visually on May 19, and June 23, 1982. The crop was harvested with a Hege small plot combine on August 24, 1982.

Post and PES applications of SSH-0860 and diclofop applied PES at 1.28 kg/ha provided the best long-term control of ripgut brome. Chlorsulfuron + diclofop applied post at 0.0175 + 1.12 kg/ha, SSH-0860 applied PPI at 2.24 kg/ha and PES at 1.12 kg/ha resulted in the best long-term control of prickly lettuce, tumble mustard, field pennycress, and prostrate knotweed with minimal or no crop injury. The late application of chlorsulfuron on the diclofop alone treatments also resulted in excellent control of the broadleaf weeds with the exception of prostrate knotweed. All RH-8817 treatments applied PES provided excellent broadleaf weed control except for prostrate knotweed. None of the herbicide treatments adequately controlled wild oat.

Highest yields resulted from diclofop applied PPI at 1.12 and 1.28 kg/ha and SSH-0860 at 1.12 and 2.24 kg/ha applied PPI and SSH-0860 at 1.12 kg/ha applied PES. Other SSH-0860 treatments applied post resulted in excellent weed control but severely injured the crop and consequently reduced crop yield. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Ripgut brome and broadleaf weed control in winter wheat

Treatment	Rate	Date of application	Crop injury		Weed Control											
					Rgbr		Prle		Tumu		Fipc		Wioa	Prkw	Yield
			E[1]	L[2]	E	L	E	L	E	L	E	L	L	E	
	(kg/ha)		%												(kg/ha)
Check	–	–	0	0	0	0	0	0	0	0	0	0	0	0	870
RH-8817	.42	11/4	4	0	50	0	89	98	99	100	69	48	6	26	1111
propham	.84	11/4	40	38	66	9	6	0	6	0	23	0	0	0	778
propham	1.12	11/4	55	49	70	45	4	0	15	0	30	0	25	18	517
SSH-0860	1.12	11/4	10	0	74	36	78	66	78	58	98	100	18	93	2519
SSH-0860	2.24	11/4	19	0	83	68	94	90	89	86	96	100	13	95	2886
diclofop	1.12	11/4	8	0	81	64	19	99	13	99	35	100	43	0	3132
diclofop	1.28	11/4	16	8	83	70	10	96	13	98	40	100	38	13	3055
triallate	1.40	11/4	4	6	70	38	33	30	36	18	51	0	59	15	2188
RH-8817	.20	11/11	0	15	1	0	95	96	99	100	89	99	19	39	831
RH-8817	.42	11/11	0	9	1	0	99	99	100	100	98	100	25	56	631
RH-8817	.56	11/11	25	6	21	0	100	100	100	100	91	99	0	45	718
propham	.84	11/11	18	66	49	10	0	0	0	0	0	0	0	0	221
propham	1.12	11/11	58	79	69	41	3	0	0	0	5	0	0	0	315
SSH-0860	1.12	11/11	19	3	85	76	99	98	100	100	99	100	8	99	2607
SSH-0860	2.24	11/11	43	10	89	93	99	100	100	100	100	100	44	100	2282
diclofop	1.12	11/11	5	5	71	51	0	98	0	98	0	100	13	0	1966
diclofop	1.28	11/11	30	9	81	76	3	99	8	99	26	99	45	0	2167
CME-12701	1.46	11/11	0	0	3	0	3	13	31	15	35	25	15	0	564
CME-12701	2.24	11/11	0	4	0	0	19	23	41	26	31	58	20	0	612
CME-12701	3.08	11/11	0	15	20	1	30	41	54	43	40	44	0	14	944
chlorsulfuron + diclofop	0.0175 + 1.12	4/26	8	13	23	0	98	96	100	100	98	100	28	100	946
metribuzin	.24+.67	4/26	5	3	16	0	73	83	88	83	86	99	0	0	677
metribuzin	.42	4/26	0	5	35	0	66	76	75	76	84	73	0	0	861
pendimentholin + dinoseb amine	1.12 + 1.68	3/25	1	0	30	0	96	99	98	99	98	96	0	98	601
R-40244	.56	11/11	13	0	53	40	76	98	100	100	100	95	0	61	984
R-40244	1.12	11/11	25	0	69	13	96	85	100	100	100	100	0	99	1437
SSH-0860	1.68	3/25	43	5	89	89	100	100	100	100	100	100	9	100	1613
SSH-0860	3.36	3/25	70	13	94	94	100	100	100	100	100	100	55	100	1584
$LSD_{(0.05)}$			29	21	19	22	18	23	23	23	35	30	33	28	1001

---

[1] E = early evaluation (5/19/82)

[2] L = late evaluation (6/23/82)

Tolerance of spring wheat varieties to five herbicides. Morishita, D. W., D. C. Thill, and R. H. Callihan. A study to determine differential phytotoxic tolerances of four spring wheat varieties; 'Borah', 'Fieldwin', 'McKay', and 'Owens', to five herbicides was conducted at Moscow and Kimberly, Idaho, under dryland and irrigated conditions, respectively. The experimental design at both locations was a split-plot randomized complete block with four replications. Each plot was 3 by 10 m in size. At the Moscow location, chlorsulfuron, diclofop, difenzoquat, and DPX-6376 were applied June 2, 1982, at the 3 leaf stage of crop growth. Metribuzin was applied June 14, 1982, when the adventitious roots of the crop were two inches in length. Chlorsulfuron, diclofop, and DPX-6376 were applied May 20, 1982, at the Kimberly location followed by applications of difenzoquat and metribuzin on June 9, 1982. The early applications were applied at the 2 to 3 leaf stage of crop growth, and the later applications were made after adventitous roots had reached two inches in length. All applications were made with a CO_2 pressurized backpack sprayer calibrated to deliver 187 L/ha with exception of difenzoquat which was applied at 93.5 L/ha. Soil type at Moscow was a silty clay with 3.68% organic matter, pH 4.9, and CEC of 33.3 meq/100 g soil. The Kimberly soil type was a silt loam with 1.27% organic matter, pH 7.2, and CEC of 19.1 meq/100 g soil. Visual evaluations for crop tolerance at Moscow and Kimberly were made on June 30, and July 7, 1982, respectively. The wheat was harvested at their respective locations on September 1, and August 28, 1982, with a Hege small plot combine.

Difenzoquat applied to 'Borah' and 'Fieldwin' at the Moscow location resulted in early chlorosis and leaf tip burn (Table 1). 'Borah' also exhibited a phytotoxic response to metribuzin at the Moscow location. No consistent phytotoxicity was observed in any varieties from the herbicides applied at Kimberly (Table 2). However, the chlorsulfuron treatment did result in some early stunting of the 'Fieldwin' and 'McKay' varieties at Kimberly, but was inconsistent among replications.

Yields of the 'Borah' variety were reduced by all herbicide treatments compared to the check at Moscow (Table 1). Metribuzin also reduced the yield of 'Fieldwin' at Moscow, but no other yields were reduced by the herbicide treatments. No significant yield reductions were observed at the Kimberly location. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Tolerance of spring wheat varieties to herbicides at Moscow.

		Borah		Fieldwin		McKay		Owens	
Treatment	Rate	injury[1]	yield[2]	injury	yield	injury	yield	injury	yield
	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)
chlorsulfuron	0.07	4	1927	3	2499	1	2670	0	2424
diclofop	1.40	0	2059	0	2630	1	2529	1	2714
difenzoquat	1.12	44	1886	9	2314	5	2316	4	2579
DPX-6376	0.0175	3	2039	3	2439	0	2458	0	2529
metribuzin	0.28	9	1767	3	1845	1	2717	6	2736
check	-	0	2730	0	2714	0	2523	0	3022

1/ LSD (0.05) Injury level = 7.

2/ LSD (0.05) Yield = 621.

Table 2. Tolerance of spring wheat varieties to herbicides at Kimberly.

		Borah		Fieldwin		McKay		Owens	
Treatment	Rate	injury[1]	yield[2]	injury	yield	injury	yield	injury	yield
	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)	(%)	(kg/ha)
chlorsulfuron	0.07	0	4832	5	6129	15	4805	0	5863
diclofop	1.40	0	4342	0	6007	0	4366	0	5004
difenzoquat	1.12	0	2997	0	4671	0	4134	0	4980
DPX-6376	0.0175	0	5508	0	6156	5	5044	0	5426
metribuzin	0.28	0	4352	5	5749	5	3857	0	4681
check	-	0	3869	0	5577	0	4506	0	4790

[1] LSD (0.05) nonsignificant.

[2] LSD (0.05) nonsignificant.

Wild oat control in irrigated spring barley and wheat in southern Idaho. Morishita, D. W., D. C. Thill, and R. H. Callihan. One spring wheat and four spring barley experiments were established at three locations in southern Idaho to determine the effectiveness of several wild oat herbicides applied preplant incorporated and postemergence, at two growth stages of wild oat. Application information for each study site is listed in Table 1. Each experiment was arranged as a randomized complete block design with four replications. Plots were 3 by 10 m in size. All herbicide treatments were applied with a water carrier at a volume of 187 L/ha with the exception of difenzoquat and barban, alone and in combination, which were applied at 93.5 L/ha.

Wild oat control in barley at the Malta location was variable. This may possibly have been due to a combination of environmental conditions and high population density of wild oat (Table 2). Barban + diclofop at 0.28 + 0.56 kg/ha and triallate at 1.4 kg/ha provided the best control. Poor wild oat control with all difenzoquat treatments may have been due to the presence of dew at the time of application. The control of wild oat in barley at the Blackfoot location was best achieved with difenzoquat at 1.12 kg/ha, difenzoquat + bromoxynil at 1.12 + 0.42 kg/ha, difenzoquat + DPX-6376 at 1.12 + 0.0071 kg/ha, and the sequential treatment of triallate applied preplant incorporated followed by diclofop applied postemergence at 0.84 kg/ha. However, the wild oat population was nonuniform throughout the study site (Table 3). At location-1 of the Idaho Falls study site, the application of triallate plus a sequential application of diclofop was the only treatment which gave acceptable wild oat control at the early evaluation date (Table 4); while at the later evaluation date the above treatment as well as the difenzoquat + bromoxynil treatment resulted in the highest level of control. The same level of wild oat control was observed at location-2 of the Idaho Falls study site (Table 5). Due to a low population density of wild oat at the spring wheat study in Blackfoot, no wild oat control or yield data are included.

Herbicide treatments at the Malta location which resulted in the highest yields were triallate at 1.4 kg/ha and barban at 0.42 kg/ha (Table 2). Difenzoquat + bromoxynil at 1.12 + 0.42 kg/ha and DPX-6376 + difenzoquat at 0.0071 + 1.12 kg/ha resulted in the highest yields at location-1 of the Idaho Falls study site (Table 4). Triallate at 1.4 kg/ha and DPX-6376 + difenzoquat resulted in the highest yields at location-2 of the Idaho Falls study site (Table 5). No differences in yields of the spring barley and spring wheat studies at Blackfoot were observed. This may possibly be attributed to the nonuniform and low population of wild oat at each location. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Crop and environmental conditions at irrigated spring cereal grain locations in southern Idaho.

	Malta	Blackfoot	Blackfoot	Idaho Falls-1	Idaho Falls-2
Crop	barley	barley	wheat	barley	barley
Variety	Steptoe	Klages	Dirkwin	Moravian	Klages
Treatment dates	4/9, 5/11, 5/25	4/21, 5/22, 6/8	4/21, 5/21	4/21, 5/12, 5/22	4/22, 5/23, 6/8
Air temp. c	6.6, 10.6, 12.7	11.6, 13.3, 16.6	8.3, 13.9	15.3, 13.9, 22	11.1, 10, 14.4
Soil temp. (5 cm) c	5.5, 7.8, 6.6	10.0, 13.3, 15.5	8.0, 16.7	10.0, 25.5	14.4, 11.6, 18.9
% relative humidity	45, 96, 80	29, 60, 48	30, 67	40, 66, 39	48, 89, 48
Soil type	silty clay loam	silt loam	silt loam	silt loam	loam
% o.m.	3.67	1.63	1.99	2.77	1.34
Soil pH	7.6	7.4	7.5	7.3	7.0
CEC/100 g soil	31.3	17.7	17.1	21.0	13.7
Evaluation date	7/7	7/8	7/8	7/8, 8/2	7/8, 8/2
Harvest date	8/18	8/17	8/27	8/14	8/27
Wild oat density/m^2	817	31	2	194	258

Table 2. Wild oat control in irrigated spring barley at Malta

Treatment	Rate	Date of application	Crop injury	Wioa control	Yield
	(kg/ha)		%		(kg/ha)
difenzoquat + bromoxynil	1.12 + 0.42	5/25	3	53	4059
difenzoquat	1.12	5/25	0	60	4077
bromoxynil + MCPA	0.38	5/25	3	0	2997
barban + difenzoquat	0.28 + 0.56	5/11	0	53	4350
barban + dicamba	0.28 + 0.14	5/11	21	10	3620
barban	0.28	5/11	0	44	4153
barban	0.42	5/11	0	44	4962
barban + diclofop	0.28 + 0.56	5/11	0	80	4524
DPX-6376[1] + difenzoquat	0.0071 + 1.12	5/25	3	61	4676
DPX-6376 + diclofop	0.0071 + 1.12	5/11	0	11	3684
DPX-6376	0.0071	5/25	4	0	3257
triallate	1.40	4/19	0	78	5027
triallate	1.68	4/19	1	43	4461
triallate/diclofop	1.4/0.84	4/19 5/11	0	64	4594
diclofop + bromoxynil	1.12 + 0.42	5/11	1	40	4451
diclofop	1.12	5/11	0	68	4325
SSH-0860	0.84	4/19	0	1	3847
SSH-0860	1.68	4/19	0	0	4029
check	-	-	0	0	3720
LSD (0.05)			6	34	913

[1] DPX-6376 used with 0.5% v/v WK surfactant

Table 3. Wild oat control in irrigated spring barley at Blackfoot

Treatment	Rate	Date of application	Crop injury	Wioa control	Yield
	(kg/ha)		%		(kg/ha)
difenzoquat + bromoxynil	1.12 + 0.42	6/8	3	99	5657
difenzoquat	1.22	6/8	0	100	5582
bromoxynil + MCPA	0.38	6/8	0	0	5523
barban + difenzoquat	0.28 + 0.56	5/22	0	73	5431
barban + dicamba	0.28 + 0.14	5/22	0	3	5138
barban	0.28	5/22	3	3	5390
barban	0.42	5/22	5	63	5493
barban + diclofop	0.28 + 0.56	5/22	1	93	5613
DPX-6376[1/] + difenzoquat	0.0071 + 1.12	6/8	3	95	5415
DPX-6376 + diclofop	0.0071 + 1.12	5/22	6	80	5573
DPX-6376	0.0071	5/22	0	0	5151
triallate	1.40	4.21	0	35	5484
triallate	1.68	4/21	0	73	5787
triallate/diclofop	1.4/0.84	4/21 5/22	0	97	5462
diclofop + bromoxynil	1.12 + 0.42	6/8	3	80	5512
diclofop	1.12	5/22	1	94	5539
SSH-0860	0.84	4/21	0	5	5436
SSH-0860	1.68	4/21	0	33	5366
check	-	-	0	0	5696
LSD (0.05)			4	29	NS

[1/] DPX-6376 used with 0.5% v/v WK surfactant

Table 4. Wild oat control in irrigated spring barley at Idaho Falls - Location 1

Treatment	Rate	Date of appl.	Crop injury E[1]	Crop injury L[2]	Wioa control E	Wioa control L	Yield
	(kg/ha)		%				(kg/ha)
difenozquat + bromoxynil	1.12+0.42	5/22	0	0	76	91	6974
difenzoquat	1.12	5/22	0	0	71	86	6035
bromoxynil + MCPA	0.38	5/22	0	3	5	29	4008
barban + difenzoquat	0.28+0.56	5/12	0	0	43	56	5381
barban + dicamba	0.28+0.14	5/12	0	0	15	6	4523
barban	0.42	5/12	0	0	55	65	5903
barban	0.28	5/12	0	0	40	60	5465
barban + diclofop	0.28+0.56	5/12	0	3	49	55	5186
DPX-6376[3] + difenzoquat	0.0071+1.12	5/22	0	0	43	86	6659
DPX-6376 + diclofop	0.0071+1.12	5/12	0	0	25	15	5294
DPX-6376	0.0071	5/22	0	0	13	30	4135
triallate	1.4	4/21	0	0	78	56	5982
triallate	1.68	4/21	0	0	49	55	6051
triallate/ diclofop	1.4/0.84	4/21/ 5/22	0	5	88	91	5867
diclofop + bromoxynil	1.12+0.42	5/12	0	0	29	39	5288
diclofop	1.12	5/12	0	5	49	75	5384
SSH-0860	0.84	4/21	0	0	9	14	5453
SSH-0860	1.68	4/21	0	0	24	46	5911
check	-	-	0	0	0	0	3878
LSD(0.05)			NS	3	33	33	986

[1] E = early evaluation (7/8)

[2] L = late evaluation (8/2)

[3] DPX-6376 used with 0.5% v/v WK surfactant

Table 5. Wild oat control in irrigated spring barley at Idaho Falls - Location 2

Treatment	Rate	Date of appl.	Crop injury E[1]	Crop injury L[2]	Wioa control E	Wioa control L	Yield
	(kg/ha)		%				(kg/ha)
difenozquat + bromoxynil	1.12+0.42	6/8	0	0	81	96	4246
difenzoquat	1.12	6/8	3	0	70	88	4241
bromoxynil + MCPA	0.38	6/8	0	4	0	3	2504
barban + difenzoquat	0.28+0.56	5/23	0	0	38	61	3706
barban + dicamba	0.28+0.14	5/23	0	0	8	33	2428
barban	0.42	5/23	0	1	41	74	3779
barban	0.28	5/23	3	0	10	43	2867
barban + diclofop	0.28+0.56	5/23	0	0	51	65	4344
DPX-6376[3] + difenzoquat	0.0071+1.12	6/8	0	0	55	83	4096
DPX-7-6376 + diclofop	0.0071+1.12	5/23	8	4	26	14	3189
DPX-6376	0.0071	5/23	3	0	20	20	3640
triallate	1.4	4/22	0	3	85	69	4679
triallate	1.68	4/22	0	0	74	75	3330
triallate/ diclofop	1.4/0.84	4/22/ 5/23	0	0	88	95	4373
diclofop + bromoxynil	1.12+0.42	5/23	0	0	63	68	4214
diclofop	1.12	5/23	0	0	63	83	4048
SSH-0860	0.84	4/22	0	0	29	49	3966
SSH-0860	2.24	4/22	0	0	83	77	3795
check	-	-	0	0	0	0	2626
LSD(0.05)	-	-	4	3	33	32	1491

[1] E = early evaluation (7/8)

[2] L = late evaluation (8/2)

[3] DPX-6376 used with 0.5% v/v WK surfactant

Annual weed control in fall planted faba beans with preemergence herbicides. Peabody, D.V. A field experiment was established to evaluate preemergent applications of simazine, dinoseb-phenol and several combinations of these two herbicides as to their effect on annual weed control and on growth and yield of faba beans. All treatments were replicated four times in a randomized complete block design. Plot size was five 40 foot rows; rows were 15 inches apart. The soil was a silt loam with 3.1% organic matter and a pH of 6.0. On October 16, 1981 faba beans (cultivar Friedrichs) were planted one inch deep with a grain drill in rows 15 inches apart. All treatments were applied on October 19, 1981 with a compressed air sprayer mounted on an Allis-Chalmers G tractor in 45 gpa. Estimates of control of the predominate annual weed species were made by means of a rating system (1 - no control to 5 - weed eradication) on April 22, 1982. Green weights (silage yield) were taken July 19, 1982; dry beans were harvested on September 7 and 8, 1982 with a Vogel small plot thrasher, cleaned, dried to uniform moisture and weighed.

All herbicide treatments resulted in excellent control of all weed species present. Only the two highest rates of simazine (2 and 4 lb ai/A) caused faba bean plant injury and reduced plant height, green weight and bean yield. (Northwestern Washington Research and Extension Unit, Washington State University, Mount Vernon, WA 98273-9788).

Effect of preemergence herbicides on annual weed control and growth, height and yield of faba beans

		Faba beans[1]			Weed control ratings[2/3]					
Herbicide	Rate lb ai/A	Grain yield g	Green weight kg	Height cm	COCW	HEBI	SHPU	PEBC	ANBG	COGR
weedy check		1856a	9.5b	190a	1.0	1.0	1.0	1.0	1.0	1.0
handweeded check		2253a	13.7a	205a	5.0	5.0	5.0	5.0	5.0	5.0
simazine	1.0	2089a	15.2a	198a	5.0	5.0	5.0	5.0	5.0	5.0
simazine	2.0	1927a	11.9a-b	200a	5.0	5.0	5.0	5.0	5.0	5.0
simazine	4.0	1365b	5.5c	150b	5.0	5.0	5.0	5.0	5.0	5.0
simazine	8.0	177c	1.8d	90c	5.0	5.0	5.0	5.0	5.0	5.0
dinoseb-phenol	5.0	2219a	15.2a	208a	4.0	4.5	5.0	5.0	4.0	5.0
dinoseb-phenol simazine	2.5 1.0	2266a	15.3a	213a	5.0	5.0	5.0	5.0	5.0	5.0
dinoseb-phenol simazine	5.0 1.0	2165a	12.7a-b	205a	5.0	5.0	5.0	5.0	5.0	5.0
dinoseb-phenol simazine	2.5 2.0	2048a	11.9a-b	193a	5.0	5.0	5.0	5.0	5.0	5.0
mean		1836	11.26	185.3						
se$\bar{x}$		144	1.14	7.7						
cv		16%	20%	8%						

---

[1] Means within a column followed by the same letter are not significantly different at the 5% level of probability as determined by Duncan's multiple range test.

[2] Ratings are an average of two separate observations of four replications. 1 = no control, 2 = poor control, 3 = fair control, 4 = commercially practical control, 5 = weed eradication.

[3] Weed designations: COCW = chickweed, common; HEBI = henbit; SHPU = shepherds purse; PEBC = bittercress, Pennsylvania; ANBG = bluegrass, annual; COGR = groundsel, common.

Evaluation of DPX 6376 combinations in spring wheat and spring barley. Peabody, D.V. A field experiment was established to evaluate various low rate combinations of DPX 6376 with diuron and with metribuzin and to compare these combinations with "standard" rates of these two herbicides applied alone on yield of spring wheat and spring barley and on annual weed control. All treatments were replicated four times on plots 3.3 by 10 feet in a randomized complete block design. The soil was a silt loam with 3% organic matter and a pH of 6.0. Spring wheat (cultivar Twin) and spring barley (cultivar Kombar) were planted in a split plot arrangement on April 8, 1982 with a Nordsten grain drill in rows 5 inches apart. The diuron preemergence treatment was applied April 22, 1982; all other treatments (EPOE) were applied May 13, 1982 when wheat and barley were in the 3 to 4 leaf stage of growth and most annual weeds were 1 to 2 inches in height. All herbicides were applied with a compressed air sprayer mounted on an Allis-Chalmers G tractor in 45 gpa. Additional application information is given in the Table. On June 9, 1982 estimates of weed control were made by dropping a grid twice in each plot and counting number of squares containing weeds. Percentage weed cover was calculated from the counts. Both wheat and barley were thrashed with a Vogel plot thrasher on September 9, 1982 and August 26, 1982 respectively. Immediately after thrashing grain was dried to uniform moisture, cleaned and the weight of wheat/barley per plot was recorded.

Statistical analysis of the replicated data is given in the Table.

None of the treatment combinations significantly reduced grain yields of spring wheat and with the exceptions of metribuzin at 0.375 lb/A and the combination of DPX 6376 at 0.75 oz plus metribuzin at 0.25 lb/A none of the treatments caused a significant reduction in yields of spring barley. Best overall control of annual weeds was obtained from treatments which included DPX 6376 at the 0.25 oz/A rate of application, although the combinations of DPX 6376 at 0.125 oz/A with metribuzin also gave acceptable control as did DPX 6376 by itself at 0.5 oz/A. (Northwestern Washington Research and Extension Unit, Washington State University, Mount Vernon, WA 98273-9788).

Yield of spring barley, spring wheat and annual weed cover of herbicide combination field test

Herbicide	Time	Rate ai/A	Wheat yield[1] g/plot	Barley yield[1] g/plot	Weed[2] cover %
diuron	PRE	1.0	1211a	1450a	14a-b
metribuzin	EPOE	.375 lb	1049a	1099c	3b
DPX 6376	EPOE	.125 oz	1206a	1383a-b	21a
DPX 6376	EPOE	.25 oz	1188a	1423a	16a-b
DPX 6376	EPOE	.5 oz	1235a	1333a-c	6a-b
DPX 6376 metribuzin	EPOE EPOE	.125 oz .125 lb	1184a	1296a-c	3b
DPX 6376 metribuzin	EPOE EPOE	.125 oz .25 lb	1274a	1312a-c	9a-b
DPX 6376 diuron	EPOE EPOE	.125 oz .25 lb	1187a	1218a-c	13a-b
DPX 6376 diuron	EPOE EPOE	.125 oz .5 lb	1205a	1406a	22a
DPX 6376 metribuzin	EPOE EPOE	.25 oz .125 lb	1161a	1229a-c	6a-b
DPX 6376 metribuzin	EPOE EPOE	.25 oz .25 lb	1194a	1128b-c	2b
DPX 6376 diuron	EPOE EPOE	.25 oz .25 lb	1179a	1360a-c	5b
DPX 6376 diuron	EPOE EPOE	.25 oz .5 lb	1138a	1223a-c	4b
mean			1185.3	1296.9	0.10
$s_{\bar{x}}$			61.9	81.4	0.05
cv			10%	13%	102%

[1] Means within a column followed by the same letter are not significantly different at the 5% level of probability as determined by Duncan's multiple range test.

[2] Principle weed species present: knotweed, prostrate; bluegrass, annual; lambsquarters, common; smartweed, Pennsylvania.

Broadleaf weed control in spring barley. Schaat B.G., D.C. Thill, and R.H. Callihan. An experiment was initiated to study broadleaf weed control in spring barley (var. Advance) at two locations (Culdesac, Idaho, location 1, June 1, 1982, and Reubens, Idaho, location 2, June 8, 1982). Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. The treatments were broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 187.1 L/ha at 2.8 kg/cm^2 and 5 km/hr. Soil type at location 1 was a silt loam with 3.8% organic matter, pH 5.9, and CEC of 24.2 meq/100 g soil. Soil type at location 2 was also a silt loam with 3.4% organic matter, pH 5.3, and CEC of 19.0 meq/100 g soil. Postemergence applications at location 1 were applied at the 2 to 3 tiller stage of crop growth on June 1, 1982, and June 8, 1982, with an air temperature, soil temperature (15 cm), and relative humidity of 20.0 C and 21.6 C, 14.4 C and 20.0 C, and 38% and 50%, respectively. Postemergence applications at location 2 were applied at the 3 to 4 leaf stage of crop growth on June 8, 1982, and at the 2 to 3 tiller stage of crop growth on June 21, 1982, with an air temperature, soil temperature (15 cm), and relative humidity of 20.0 C and 21.6 C, 14.4 C and 20.0 C, and 38% and 58%, respectively. Visual evaluations for crop injury and control of field penneycress, lambsquarter, henbit, catchweed bedstraw, mayweed, and wild buckwheat at location 1 and lambsquarter, mayweed, field bindweed, henbit, and corn gromwell at location 2 were recorded at both locations June 30, 1982, and July 16, 1982, respectively. The plots at location 1 were harvested August 12, 1982, and those at location 2 August 24, 1982, using a small plot combine.

At location 1 (Table 1) applications of bromoxynil + DNBP at 0.28 + 0.84 kg/ha, bromoxynil and MCPA + chlorsulfuron at 0.14 kg/ha + 2.4 g/ha and 0.28 kg/ha + 2.4 g/ha, and bromoxynil + chlorsulfuron at 0.21 kg/ha + 4.7 g/ha gave good (80%) to excellent (100%) weed control of all the species evaluated. Wild buckwheat control was inconsistent because of a variable population throughout the plots. At location 2 (Table 2) applications of bromoxynil + chlorsulfuron at 0.42 kg/ha + 2.4 g/ha and at 0.21 kg/ha + 4.7 g/ha, respectively, RH-0265 at 0.28 kg/ha, all applications of bromoxynil, and bromoxynil + DNBP at 0.28 + 0.84 kg/ha gave excellent control of all the weed species with the exception of field bindweed which had a variable population throughout the plot location.

Plots at location 1 treated with bromoxynil at 0.21 kg/ha and dicamba + chlorsulfuron at 0.10 kg/ha + 4.7 g/ha produced highest yields. Plots at location 2 treated with bromoxynil and MCPA + chlorsulfuron at 0.28 kg/ha + 2.4 g/ha and dicamba Al salt at 0.14 kg/ha produced highest yields. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Table 1. Broadleaved weed control and yield in spring barley at Culdesac, Idaho

Treatment	Rate	Date of Application	Weed Control								Yield
			Fipe	Laqu		Hebi	Cwbs		Mawe	Wibw	
	(kg/ha)		%								(kg/ha)
			E[3]	E[4]	L	E	E	L	E	E	
check	-	-	0	0	0	0	0	0	0	0	2790
bromoxynil	0.42	6/1/82	94	90	92	94	86	60	78	30	3557
bromoxynil	0.21	6/1/82	91	66	94	74	55	48	95	100	3739
bromoxynil + chlorsulfuron[2]	0.42 + 2.4g[1]	6/1/82	100	98	99	94	89	86	96	80	3562
bromoxynil + chlorsulfuron	0.21 + 2.4g	6/1/82	100	88	80	85	86	56	99	100	3465
bromoxynil + chlorsulfuron	0.21 + 4.7g	6/1/82	99	94	95	89	85	69	100	100	3539
bromoxynil + MCPA	0.28	6/1/82	100	100	96	85	64	34	60	30	2845
bromoxynil + MCPA	0.14	6/1/82	100	99	95	62	48	15	72	60	3148
bromoxynil + MCPA chlorsulfuron	0.28 + 2.4g	6/1/82	100	96	95	95	86	70	99	0	3346
bromoxynil + MCPA chlorsulfuron	0.14 + 4.7g	6/1/82	100	99	98	88	89	70	79	0	3326
chlorsulfuron	4.7g	6/1/82	100	20	20	91	96	84	94	0	3193
chlorsulfuron	2.4g	6/1/82	100	5	10	88	78	29	99	20	2992
DPX-6376	7.1g	6/1/82	100	27	12	98	56	40	100	80	3079
DPX-6376	3.6g	6/1/82	100	7	8	96	31	12	100	15	3073
RH-0265	0.14	6/1/82	92	26	28	92	95	69	99	40	3519
RH-0265	0.28	6/1/82	100	72	36	99	100	96	96	0	3084
dicamba + chlorsulfuron	0.10 + 2.4g	6/1/82	100	50	61	85	76	62	80	100	3203
dicamba + chlorsulfuron	0.10 + 4.7g	6/1/82	100	40	42	89	96	81	99	90	3679
dicamba + metribuzin	0.10 + 0.14	6/1/82	100	72	78	94	86	70	74	10	3431
dicamba + metribuzin	0.10 + 0.07	6/1/82	98	68	66	84	91	71	32	0	2952
dicamba AL salt	0.14	6/1/82	32	2	29	18	65	52	28	50	3066
dicamba	0.14	6/1/82	62	58	39	42	81	55	35	50	2985
2,4-D formula 40	0.84	6/8/82	99	91	96	39	42	45	52	20	3185
bromoxynil	0.56	6/1/82	100	100	79	98	86	72	95	20	3529
bromoxynil + DNBP	0.28 + 0.84	6/1/82	100	96	92	94	88	92	100	100	2722
LSD (0.05)			14	21	29	16	29	37	38	69	660

[1] rate followed with "g" = grams/ha.

[2] all chlorsulfuron treatments included. 1% u/v of surfactant.

[3] E = early evaluation on 6/30/82.

[4] L = late evaluation on 7/16/82.

Table 2. Broadleaved weed control and yield in spring barley at Ruebens, Idaho

Treatment	Rate	Date of Application	Weed Control										Yield
			Laqu		Mawe		Fibw		Hebi				
	(kg/ha)						%						(kg/ha)
			E[3]	L[4]	E	L	E	L	E	L	E	L	
check	-	-	0	0	0	0	0	0	0	0	0	0	2092
bromoxynil	0.42	6/8/82	100	100	79	88	49	71	92	96	100	100	2230
bromoxynil	0.21	6/8/82	90	98	92	84	52	91	86	56	100	100	2378
bromoxynil + chlorsulfuron[2]	0.42 + 2.4g[1]	6/8/82	100	97	99	95	75	72	100	96	100	100	2205
bromoxynil + chlorsulfuron	0.21 + 2.4g	6/8/82	90	95	72	55	65	80	89	76	95	100	2195
bromoxynil + chlorsulfuron	0.21 + 4.7g	6/8/82	100	100	84	91	50	52	89	100	100	100	2218
bromoxynil + MCPA	0.28	6/8/82	100	100	88	82	40	35	72	61	100	100	2392
bromoxynil + MCPA	0.14	6/8/82	100	98	70	40	45	40	68	25	98	73	2391
bromoxynil + MCPA chlorsulfuron	0.28 + 2.4g	6/8/82	100	100	75	81	42	66	94	76	100	100	2538
bromoxynil + MCPA + chlorsulfuron	0.14 + 2.4g	6/8/82	100	77	78	68	30	12	70	96	100	100	2355
bromoxynil + MCPA chlorsulfuron	0.14 + 4.7g	6/8/82	100	100	75	86	38	70	75	98	100	100	2208
chlorsulfuron	4.7g	6/8/82	5	10	75	52	82	39	94	88	50	43	2028
chlorsulfuron	2.4g	6/8/82	35	60	46	34	30	40	75	70	48	73	2063
DPX-6376	7.1g	6/8/82	10	38	46	70	55	52	70	59	50	50	2193
DPX-6376	3.6g	6/8/82	40	10	48	39	10	10	68	55	32	28	2233
RH-0265	0.14	6/8/82	60	78	80	71	25	42	72	74	75	78	1675
RH-0265	0.28	6/8/82	100	73	92	95	28	30	100	94	100	100	1950
dicamba + chlorsulfuron	0.10 + 2.4g	6/8/82	100	98	91	56	74	38	96	95	68	67	2030
dicamba + chlorsulfuron	0.10 + 4.7g	6/8/82	65	98	50	43	51	38	70	65	52	73	1804
dicamba + metribuzin	0.10 + 0.14	6/8/82	100	100	64	52	42	71	98	98	100	100	2150
dicamba + metribuzin	0.10 + 0.07	6/8/82	55	77	38	34	72	85	80	76	60	40	2310
dicamba AL salt	0.14	6/8/82	5	61	0	22	50	47	22	47	28	75	2462
dicamba	0.14	6/8/82	17	78	8	5	72	35	10	35	55	50	2151
2,4-D formula 40	0.84	6/21/82	20	90	2	8	92	72	8	12	75	80	2258
bromoxynil	0.56	6/8/82	95	100	98	95	70	68	100	95	100	100	2263
bromoxynil + DNBP	0.28 + 0.84	6/8/82	100	100	95	91	74	88	92	91	100	95	2289
LSD (0.05)			32	37	40	37	55	46	33	39	45	45	663

[1] rates followed by initial "g" - grams/ha

[2] all chlorsulfuron & DPX-6376 treatments included .1% v/v of DuPont Surfactant

[3] E = early evaluation on 6/30/82

[4] L = late evaluation on 7/21/82

Broadleaf weed control in winter wheat. Schaat, B.G., D.C. Thill, and R.H. Callihan. A study was initiated on March 26, 1982, to evaluate the control of broadleaf weed species in winter wheat (var. Walladay) at Waha, Idaho. Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. The herbicides were broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 187.1 L/ha at 2.8 kg/cm^2 and 5 km/h. Soil type was a silt loam with 3.8% organic matter, pH 4.7, and CEC of 22.1 meq/100 g soil. Early postemergence treatments were applied at the 2 leaf stage of crop growth March 26, 1982, with an air temperature of 14.4 C, soil temperature (15 cm) 8.8 C, and relative humidity 52%. Late postemergence treatments were applied at the 2 to 4 tiller stage of crop growth April 26, 1982, with air temperature of 15.5 C, soil temperature (15 cm) 15.5 C, and relative humidity 48%. Early visual evaluations for crop injury and control of hedge parsley and catchweed bedstraw were recorded April 26, 1982. Late visual evaluations for crop injury, and control of hedge parsley, catchweed bedstraw, flixweed, and fiddleneck were recorded June 10, 1982. Plots were harvested on August 18, 1982, using a small plot combine.

Several herbicide treatments provided good (80%) to excellent (100%) control of all weed species. However, chlorsulfuron + metribuzin at 5.8 g/ha + 0.28 kg/ha and chlorsulfuron + dicamba at 11.6 g/ha + 0.14 kg/ha resulted in the best broadspectrum season long weed control.

Herbicide treatments which resulted in highest yields were chlorsulfuron at 8.7 g/ha and chlorsulfuron + bromoxynil at 5.8 g/ha + 0.28 kg/ha. No herbicides significantly reduced the yields when compared to the check. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Broadleaf weed control and yield in winter wheat at Waha, Idaho

Treatment	Rate	Date of Application	Crop Injury		Weed Control Hepa		Cabe		Flwe	Fine	Yield
	(kg/ha)		E[3]	L[4]	E	L	E	L	L	L	(kg/ha)
			%								
check	-	-	0	0	0	0	0	0	0	0	3208
DPX-6376[2]	5.8g[1]	3/26/82	4	0	95	95	45	51	71	75	4443
DPX-6376	8.7g	3/26/82	1	0	92	100	49	40	75	75	4498
DPX-6376	17.5g	3/26/82	2	1	100	100	79	62	100	75	4998
chlorsulfuron	5.8g	3/26/82	1	0	99	100	70	56	82	50	5111
chlorsulfuron	8.7g	3/26/82	1	0	100	100	74	72	90	75	5928
chlorsulfuron	17.5g	3/26/82	1	1	100	100	85	94	100	75	5502
bromoxynil	.42	3/26/82	4	0	98	65	96	65	64	75	5481
bromoxynil + MCPA	.42+.42	3/26/82	2	5	80	74	90	68	79	75	5257
terbutryne + MCPA	.84+.42	4/26/82	-	3	-	52	-	18	5	100	3614
metribuzin	.28	4/26/82	-	0	-	78	-	9	10	78	2872
metribuzin + bromoxynil	.28+.28	4/26/82	-	0	-	78	-	40	20	100	4177
2,4-D amine	.84	3/26/82	-	1	-	12	-	12	28	32	4390
chlorsulfuron + metribuzin	5.8g+.14	3/26/82	6	1	100	88	68	68	70	100	5463
chlorsulfuron + metribuzin	5.8g+.28	3/26/82	4	0	100	99	96	82	100	100	5466
chlorsulfuron + bromoxynil	5.8g+.28	3/26/82	2	0	100	92	88	78	86	100	5942
chlorsulfuron + dicamba	5.8g+.14	3/26/82	0	0	100	95	82	69	80	54	5585
chlorsulfuron + diuron	5.8g+.67	3/26/82	2	0	98	92	90	90	100	100	5397
diuron + bromoxynil	.67+.28	3/26/82	5	1	100	79	100	86	100	100	5335
RH-0265	.28	3/26/82	5	5	98	66	100	98	100	100	5571
metribuzin + dicamba	.14+.07	3/26/82	4	1	82	88	32	39	25	100	4390
metribuzin + dicamba	.14+.14	3/26/82	4	0	68	85	84	52	30	100	5028
chlorsulfuron + dicamba	11.6g+.14	3/26/82	4	1	98	92	95	92	100	100	5118
dicamba Al salt	.14	3/26/82	2	0	42	14	49	30	0	25	4067
dicamba	.14	3/26/82	0	1	12	12	48	41	28	75	3616
dicamba + VEL5026	.14+.14	3/26/82	0	0	5	0	5	2	0	50	2445
LSD (0.05)			5	3	19	33	32	28	30	47	1268

---

[1] rates followed by initial "g" = grams/ha
[2] all DPX-6376 and chlorsulfuron treatments included .1% v/v DuPont surfactant
[3] E = Early evaluation 4/20/82
[4] L = Late evaluation 6/10/82

Control of wild oat and broadleaf weeds in winter wheat. Schaat, B.G., D.C. Thill, and R.H. Callihan. Two studies were initiated on October 22, 1981 to evaluate the control of wild oat and broadleaf weeds at two locations near Grangeville, Idaho, in winter wheat (var. Hyslop and Dawes). Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. Granular formulations of herbicides were applied with a hand-held fertilizer applicator. All other herbicides were broadcast with a CO_2 pressurized backpack spayer calibrated to deliver 93.5 and 187.1 L/ha at 2.8 kg/cm^2 and 5 km/hr. Soil type at location 1 was a silt loam with 5.5% organic matter, pH 5.3, and CEC of 29.2 meq/100 g soil. Soil type at location 2 was also a silt loam with 4.4% organic matter, pH 5.2 and CEC of 26.6 meq/100 g soil. Postplant incorporated treatments were incorporated twice with a flex-tine harrow at 8 km/hr to a depth of 4 cm October 22, 1981. Preemergence surface treatments were applied on the same date. Air temperature, soil temperature (15cm), and relative humidity were 18.3 C, 5.5 C, and 42%, respectively, at location 1 and 14.4 C, 6.6 C, and 48%, respectively, at location 2. Postemergence treatments were applied at the 2 to 3 and 2 to 5 leaf stages of wild oat on April 29, 1982, and May 13, 1982, respectively. Air temperature, soil temperature (15cm), and relative humidity on April 29, 1982, were 12.7 C, 11.1 C, and 42%, respectively, at location 1 and 12.7 C, 11.6 C, and 44%, respectively, at location 2. On May 13, 1982, air temperature, soil temperature (15cm), and relative humidity were 16.6 C, 10.0 C, and 40%, respectively, at location 1 and 18.3 C, 8.8 C, and 40%, respectively, at location 2. Visual evaluations for crop injury and control of field pennycress at location 1 and for crop injury, mayweed, catchweed bedstraw, and wild buckwheat control at location 2 were recorded on June 9, 1982. On July 14, 1982, evaluations of wild oat, forget-me-not, henbit, field pennycress, shepherdspurse, wild buckwheat, and mayweed control at location 1 and wild oat, mayweed, catchweed bedstraw, henbit, field pennycress, and celeryleaf buttercup control at location 2 were recorded. The plots were harvested on August 19, 1982 using a small plot combine.

The sequential applications of triallate(4EC) at 1.4 kg/ha followed by diclofop at 1.12kg/ha and AC222243 at 0.84 kg/ha resulted in best (90%) wild oat control at location 1 (Table 1). Applications of AC222243 at 0.57 kg/ha, barban at 0.42 kg/ha and chlorsulfuron + barban at 8.75 g/ha + 0.42 kg/ha, respectively, resulted in the best (80 - 90%) wild oat control at location 2 (Table 2). Broadleaf weed species at both locations were best controlled with the sequential application of triallate at 1.4 kg/ha followed by chlorsulfuron at 17.5 g/ha. All chlorsulfuron tank mix combinations as well as R-40244 at 0.57 and R-40244 + barban at 0.57 + 1.12 kg/ha provided good (85%) to excellent (100%) broadleaf weed control at both locations. All rates of SSH-0860 resulted in excellent broadleaf weed control at location 1, however, control was not consistent at location 2.

All but six yields were increased compared to the check at location 1 with chlorsulfuron + barban at 8.75 g/ha + 0.42 kg/ha resulting in the highest yield. At location 2, the SSH-0860 treatment at 1.8 kg/ha produced the highest yield. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Table 1. Wild oat and broadleaf weed control and yield in winter wheat at Grangeville, Idaho

Treatment	Rate	Date of Application	Crop Injury		Weed Control								Yield
					Wioa	Fomn	Hebi	Fipc		Shpu	Wibu	Mawe	
	(kg/ha)				%								(kg/ha)
			E	L	L	L	L	E	L	L	L	L	
check	--	--	0	0	0	0	0	0	0	0	0	0	3382
triallate	1.4	10/22/81	0	0	38	0	4	2	0	0	5	50	3335
triallate	1.2	10/22/81	8	6	12	25	10	5	0	0	22	5	2946
triallate/diclofop	1.4/1.12	10/22/81/5/13/82	2	2	74	0	0	0	0	0	25	0	3499
triallate/chlorsulfuron[1]	1.4/17.5g[2]	10/22/81/5/13/82	8	0	14	100	98	95	100	100	99	100	4362
SSH-0860	1.24	10/22/81	5	0	5	100	75	78	81	99	100	92	4354
SSH-0860	1.8	10/22/81	5	0	0	100	84	90	92	100	74	99	4193
SSH-0860	0.89	10/22/81	6	0	4	100	91	98	98	100	80	100	4551
A.C. 222,243 + DM710	0.57 + .5% v/v	.5/13/82	6	0	89	0	80	74	94	99	95	70	3769
A.C. 222,243 + DM710	0.84 + .5% v/v	5/13/82	4	0	54	0	28	22	38	56	75	22	4100
R-40244	0.57	4/29/82	0	0	5	100	100	100	100	100	96	70	4781
R-0244 + diclofop	0.57 + 1.12	4/29/82	5	0	30	100	100	100	100	100	75	64	4673
chlorsulfuron	8.75g	4/29/82	5	0	20	95	99	100	100	100	60	98	4388
chlorsulfuron + diclofop	8.75g + 1.12	4/29/82	2	0	18	100	96	100	100	100	95	100	4827
chlorsulfuron + difenzoquat	8.75g + 1.12	5/13/82	4	0	59	75	89	86	100	100	62	88	4369
chlorsulfuron + barban	8.75g + 0.42	4/29/82	0	0	82	100	96	98	96	100	99	99	5017
chlorsulfuron + A.C. 222,243	8.75g + 0.70	5/13/82	0	0	71	92	85	84	99	100	100	94	4618
diclofop	1.12	4/29/82	0	0	40	0	0	0	5	0	0	5	4450
difenzoquat + X-77	1.12 + .5% v/v	5/13/82	5	5	65	1	0	0	5	6	28	2	3846
barban	0.42	4/29/82	5	9	84	0	2	1	0	0	0	0	3537
LSD (0.05)			6	5	25	22	16	17	16	16	44	22	784

[1] all chlorsulfuron treatments included .1% v/v DuPont surfactant

[2] rates followed by initial "g" - grams/ha

E = early evaluation 6/9/82

L = late evaluation 7/14/82

Table 2. Wild oat and broadleaf weed control and yield in winter wheat at Grangeville, Idaho

Treatment	Rate	Date of Application	Crop Injury		Weed Control										Yield
					Wioa	Mawe		Cwbs		Hebi	Wibw		Fipc	Clbc	
	(kg/ha)				%										(kg/ha)
			L	E	L	L	E	L	E	L	L	E	L	L	
check	-	-	0	0	0	0	0	0	0	0	0	0	0	0	3025
triallate	1.4	10/22/81	0	0	33	0	0	6	0	0	0	0	0	0	2906
triallate	1.2	10/22/81	0	4	37	7	0	20	0	33	5	0	0	0	2604
triallate/ diclofop	1.4/ 1.12	10/22/81/ 5/13/82	0	1	90	0	0	10	0	25	0	0	0	0	3200
triallate/ chlorsulfuron[1/]	1.4/ 1.75[2/]	10/22/81 5/13/82	0	4	17	99	100	100	98	99	83	100	100	100	3329
SSH-0860	1.24	10/22/81	0	0	27	70	68	85	23	97	75	100	50	30	3035
SSH-0860	1.8	10/22/81	0	0	23	91	80	83	0	75	100	100	100	50	4044
SSH-0860	0.89	10/22/81	2	4	7	71	45	65	0	50	50	25	98	0	2565
A.C. 222,243 + DM710	0.57 + .5% v/v	5/13/82	0	4	68	5	0	6	23	25	15	100	50	33	2692
A.C. 222,243 + DM710	0.84 + .5% v/v	5/13/82	0	2	78	8	0	3	40	50	25	68	50	67	2758
R-40244	0.57	4/29/82	0	4	7	80	75	78	73	100	52	80	100	53	3242
R-40244 + diclofop	0.57 + 1.12	4/29/82	5	0	20	70	65	65	93	100	81	82	100	53	3292
chlorsulfuron	8.75g	4/29/82	0	4	7	92	90	80	83	98	38	95	100	77	3341
chlorsulfuron + diclofop	8.75g + 1.12	4/29/82	2	2	20	78	90	52	50	75	35	42	100	100	3244
chlorsulfuron + difenzoquat	8.75g + 1.12	5/13/82	0	0	13	66	48	30	32	30	8	40	50	43	3092
chlorsulfuron + barban	8.75g + 0.42	4/29/82	0	2	43	84	50	35	13	75	15	32	100	100	3232
chlorsulfuron + A.C. 222,243	8.75g + 0.70	5/13/82	0	2	73	89	86	63	85	74	36	82	98	100	3629
diclofop	1.12	4/29/82	0	2	40	0	0	0	0	0	0	0	0	33	3193
difenzoquat + X-77	1.12 + .5% v/v	5/13/82	0	0	55	0	0	0	0	0	0	0	0	0	3349
barban	0.42	4/29/82	2	2	67	0	0	3	0	0	0	0	0	0	3058
LSD$_{(0.05)}$			4	4	27	31	41	34	31	40	37	37	44	47	815

[1/] all chlorsulfuron treatments included .1% v/v DuPont surfactant.

[2/] rates followed by initial "g" = grams/ha.

E = early evaluation 6/9/82.

L = late evaluation 7/14/82.

Postemergence broadleaf weed control in winter wheat. Schaat, B.G., D.C. Thill and R.H. Callihan. A study was initiated on December 21, 1981, to evaluate the control of broadleaf weed species in winter wheat (var. Stephens) near Genesee, Idaho. Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. The herbicides were broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 187.1 L/ha at 2.8 kg/cm^2 and 5 km/h. Soil type was a silt loam with 3.2% organic matter, pH 5.1, and CEC of 23.4 meq/100 g soil. Early postemergence treatments were applied at the 2 to 3 leaf stage of crop growth December 21, 1981, with an air temperature of 4.4 C, soil temperature (15 cm) 4.4 C, and relative humidity 76%. Early spring postemergence treatments were applied at the 4 to 5 leaf stage of crop growth March 26, 1982, with an air temperature of 17.0 C, soil temperature (15 cm) 8.8 C, and relative humidity 65%. Late postemergence treatments were applied on April 16, 1982 when crop adventitous roots were 7 cm in length Air temperature was 12.7 C, soil temperature (15 cm) 6.6 C, and relative humidity 22%. Early visual evaluations for crop injury and control of henbit, nightflowering catchfly, and fiddleneck were recorded April 20, 1982. Late visual evaluations for crop injury and control of nightflowering catchfly and prickly lettuce were recorded June 1, 1982. Plots were harvested on August 18, 1982, using a small plot combine.

Fall application of chlorsulfuron resulted in excellent (100%) control of all weed species. Tank mix combinations of chlorsulfuron + diuron at 5.8 g/ha + 0.67 kg/ha, chlorsulfuron + bromoxynil at 5.8 g/ha + 0.28 kg/ha, and diuron + bromxynil at 0.67 + 0.28 kg/ha applied in the spring also resulted in good (85%) to excellent (100%) control.

Chlorsulfuron applied at 17.5 g/ha in the spring resulted in the best grain yield. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Broadleaf weed control and yield in winter wheat at Becker farms - Genesee, Idaho

Treatment	Rate	Date of Application	Crop Injury	Weed Control					Yield
				Hebi	Nfcf		Fine	Prle	
	(kg/ha)		E	E	E[3]	L[4]	E	L	(kg/ha)
				%					
check	-	-	0	0	0	0	0	0	7991
chlorsulfuron[2]	5.8g[1]	12/21/82	2	100	95	100	100	100	8655
chlorsulfuron	8.7g	12/21/81	1	100	100	100	100	100	8025
chlorsulfuron	17.5g	12/21/81	0	100	100	100	98	100	7607
chlorsulfuron	5.8g	3/26/82	5	62	72	92	70	40	6635
chlorsulfuron	8.7g	3/26/82	2	88	100	100	100	100	8353
chlorsulfuron	17.5g	3/26/82	0	72	82	100	65	78	9182
bromoxynil	.42	3/26/82	0	10	88	75	100	100	7554
bromoxynil + MCPA	.42+.42	3/26/82	0	25	100	62	100	100	8466
terbutryne + MCPA	.84+.42	4/16/82	-	-	-	25	-	100	8188
metribuzin	.28	4/16/82	-	-	-	5	-	82	8359
metribuzin + bromoxynil	.28&.28	4/16/82	-	-	-	60	-	100	7839
2,4-D amine	.84	4/16/82	-	-	-	0	-	100	8364
chlorsulfuron + metribuzin	5.8g +.14	3/26/82	4	58	69	85	81	100	8126
chlorsulfuron + metribuzin	5.8g +.28	3/26/82	1	72	75	75	96	100	8823
chlorsulfuron + bromozynil	5.8g +.28	3/26/82	2	30	100	100	100	80	8198
chlorsulfuron + dicamba	5.8g +.14	3/26/82	0	42	70	100	56	80	7638
chlorosulfuron + diuron	5.8g +.67	3/26/82	2	85	80	100	98	100	7938
diuron + bromoxynil	.67+.28	3/26/82	2	96	100	100	100	100	7538
RH-0265	.28	3/26/82	2	98	78	65	100	100	7750
metribuzin + dicamba	.14+.07	3/26/82	0	60	34	58	82	100	8721
metribuzin + dicamba	.14+.14	3/26/82	4	12	11	55	58	80	7780
dicamba Al salt	.14	3/26/82	0	38	10	18	12	75	7954
chlorsulfuron +	11.6g+ .14	3/26/82	1	40	76	100	56	100	8088
dicamba	.14	3/26/82	2	10	30	12	12	78	7081
LSD (0.05)			5	31	35	38	31	35	1092

[1] rates followed by initial "g" = grams/ha

[2] all chlorsulfuron treatments included .1% v/v Dupont surfactant

[3] E = early evaluation 4/20/82

[4] L = late evaluation 6/15/82

Wild oat and broadleaf weed control in spring barley Schaat B.G., D.C. Thill, and R.H. Callihan. A study was initiated on May 5, 1982, at Genesee, Idaho to determine the effects of various herbicide applications in spring barley (var. Advance) for the control of wild oat and broadleaf weeds. Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. Granular formulations of herbicides were broadcast with a hand-held lawn fertilizer applicator. All other herbicides were broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 187.1 L/ha at 2.8 kg/cm^2 and 5 km/hr. Soil type was a silt loam with 3.3% organic matter, pH 5.3, and CEC of 21.9 meq/100 g soil. Preplant incorporated treatments were made May 5, 1982, with air an temperature of 11.1 C, soil temperature (15 cm) 7.2 C, and relative humidity 52%. Herbicides were then incorporated with a spring tooth harrow at 8 km/hr to a depth of 7 cm. Preemergence surface applications were made May 19, 1982, with an air temperature of 11.1 C, soil temperature (15 cm) 10.0 C, and relative humidity 74%. Postemergence applications were applied at the 4 to 5 leaf, 2 tiller stage of crop growth with all weed species having first true leaves June 22, 1982, with an air temperature of 23.8 C, soil temperature (15 cm) 22.0 C, and relative humidity 80%. Visual evaluations for weed control and crop injury were recorded June 13, 1982, and July 3, 1982. The plots were harvested on September 2, 1982, using a small plot combine. This study was initiated to evaluate the effects of certain herbicides on the control of wild oat but due to a low wild oat population all treatments not previously applied were changed to evaluate control of lambsquarter and henbit. Applications of DPX-6376 at 8.7 and 17.5 g/ha, bromoxynil and MCPA at 0.42 kg/ha, and all chlorsulfuron treatments resulted in excellent weed control. Postemergence application of R-40244 at 0.57 kg/ha caused significant crop injury. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Weed control and yield in spring barley at Genesee, Idaho

Treatment	Rate	Date of Application	Crop Injury		Weed Control			Yield
					Lagu		Hebi	
	(kg/ha)		E[3]	L[4]	E	L	E	(kg/ha)
			%					
triallate(4EC)	1.4	5/11/82	0	0	5	8	0	3711
triallate(4EC)	1.68	5/11/82	0	0	0	8	0	3431
triallate(10G)	1.4	5/11/82	0	0	5	8	5	3820
triallate(10G)	1.68	5/11/82	0	0	7	25	10	4215
DPX-6376[2]	8.7g[1]	6/22/82	0	0	98	98	99	3557
DPX-6376	17.5g	6/22/82	0	0	100	100	99	3153
chlorsulfuron	8.7g	6/22/82	0	0	100	100	91	2662
chlorsulfuron	17.5g	6/22/82	0	0	99	100	96	3525
SSH-0860	0.84	5/11/82	0	0	38	96	30	3472
SSH-0860	1.68	5/11/82	0	0	62	90	52	3837
triallate(4EC)/ bromoxynil	1.4/ 0.42	5/11/82 6/22/82	0	0	99	94	98	3206
triallate(10G)/ chlorsulfuron	1.4/ 17.5g	5/11/82 6/22/82	0	0	98	100	97	4238
R-40244	0.57	6/22/82	28	18	98	100	100	1655
bromoxynil(2EC)	0.42	6/22/82	10	0	99	100	89	3571
bromoxynil(4EC)	0.42	6/22/82	0	0	100	100	84	3640
bromoxynil(3EC)+ MCPA(3EC)	0.42	6/22/82	3	0	100	100	92	4089
bromoxynil + MCPA	0.42	6/22/82	0	0	100	100	84	3709
MCPA(4EC)	0.84	6/22/82	0	0	99	100	55	3489
check	-	-	0	0	5	5	0	3366
R-40244	.57	5/19/82	0	0	35	38	45	3927
R-40244	.28	5/19/82	0	0	49	24	45	3504
LSD (0.05)			3	4	21	20	26	1112

[1] rates followed by the initial "g" = grams/ha

[2] all DPX-6376 and chlorsulfuron treatments included .1% v/v DuPont surfactant

[3] E = early evaluation 7/13/82

[4] L = late evaluation 8/3/82

Wild oat and broadleaf weed control in spring barley. Schaat B.G., D.C. Thill, and R.H. Callihan. A study was initiated on May 4, 1982, near Potlatch, Idaho to determine the effects of various herbicides and herbicide combinations for controlling wild oat and broadleaf weed species in spring barley (var. Advance). Plots were 3 by 10 m in size with treatments replicated four times in a randomized complete block design. Granular formulations were broadcast with a hand-held lawn fertilizer applicator. All other herbicides were broadcast with a CO_2 pressurized backpack sprayer calibrated to deliver 93.5 and 187.1 L/ha at 2.8 kg/cm^2 and 5 km/h. Soil type was a silt loam with 3.9% organic matter, pH 4.9, and CEC of 18.4 meq/100 g soil. Preplant incorporated treatments were applied May 4, 1982, with an air temperature of 1.1 C, soil temperature (15 cm) 4.4 C, and relative humidity 73%. Treatments were incorporated twice with a spiked tooth harrow at 8 km/hr to a depth of 7 cm. Preemergence surface treatments were applied May 19, 1982, with an air temperature of 10.0 C, soil temperature (15 cm) 8.8 C, and relative humidity 66%. Postemergence treatments were applied at the 1 to 2 leaf stage of wild oat growth May 27, 1982, with an air temperature of 10.0 C, soil temperature (15 cm) 10.5 C, and relative humidity 90%. Later postemergence treatments were applied at the 4 to 6 leaf stage of wild oat growth June 2, 1982, with an air temperature of 12.2 C, soil temperature (15 cm) 11.1 C, and relative humidity 66%. Early visual evaluations for crop injury and control of lambsquarter, shepherdspurse, and mayweed were recorded June 22, 1982. Later visual evaluations for crop injury and control of wild oat, lambsquarter, shepherdspurse, and mayweed were recorded July 13, 1982. Plots were harvested August 31, 1982, using a small plot combine.

All applications of difenzoquat, diclofop, and barban whether tank mixed or alone gave excellent (90% +) control of wild oat. The sequential application of triallate at 1.4 kg/ha and diclofop at 1.12 kg/ha resulted in 100% control of wild oat. Applications of R-40244 at 0.56 kg/ha applied preemergence and postemergence, bromoxynil and MCPA at 0.38 kg/ha, and bromoxynil + diclofop at 0.42 + 1.12 kg/ha gave good (85%) to excellent (100%) broadleaf weed control. Crop injury (chlorosis) was evident in the early evaluation of all R-40244 treatments, but was less apparent at the later evaluation date.

Yield was greatest with bromoxynil + diclofop at 0.42 + 1.12 kg/ha however, crop injury (stunting) was evident. No other herbicide treatments resulted in yields greater than the check. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Weed control and yield in spring barley at Potlatch, Idaho

Treatment	Rate	Date of Application	Crop Injury		Weed Control					Yield
					Wioa	Laqu		Shpu	Mawe	
	(kg/ha)		--------------------			%			--------------------	(kg/ha)
triallate	1.4	5/4/82	11[1/]	0[2/]	39	0	0	0	0	3083
triallate	1.68	5/4/82	5	2	33	0	5	0	0	3026
triallate	1.4	5/4/82	0	0	35	0	0	0	0	3480
triallate	1.68	5/4/82	2	0	36	0	0	0	0	2991
difenzoquat	1.12	6/2/82	12	5	94	0	2	0	25	3275
diclofop	1.12	6/2/82	21	8	94	0	2	0	0	3153
barban	0.42	5/27/82	5	0	95	0	0	2	2	2951
barban	0.28	5/27/82	2	2	90	20	5	30	22	2455
SSH-0860	0.84	5/4/82	6	0	18	5	0	45	42	3170
SSH-0860	1.68	5/4/82	2	0	14	2	5	0	95	3519
triallate/diclofop	1.4 1.12	5/4/82 6/2/82	16	8	100	0	0	5	0	2942
triallate/diclofop	1.4 1.12	5/4/82 6/2/82	24	2	96	0	2	25	18	3006
R-40244	0.56	6/2/82	18	8	5	95	95	100	81	3018
R-40244 + diclofop	0.56 + 1.12	6/2/82	35	15	92	85	80	100	64	3661
R-40244 + difenzoquat	0.56 + 1.12	6/2/82	50	16	90	100	94	100	81	3694
R-40244 + barban	0.56 + 0.42	5/27/82	14	5	94	99	92	100	71	3587
bromoxynil + MCPA	0.38	6/2/82	12	0	5	100	99	100	96	2916
bromoxynil + diclofop	0.42 + 1.12	6/2/82	29	18	95	82	80	100	92	4343
check	-	-	0	0	0	0	0	0	0	2880
R-40244	0.56	5/19/82	20	5	4	96	86	100	91	3303
R-40244	0.28	5/19/82	10	5	8	86	86	100	89	3455
LSD (0.05)			12	7	23	14	9	26	28	1095

[1/] means in left hand column under each heading evaluated 6/22/82

[2/] means in right hand column under each heading evaluated 7/13/82

Control of yellow foxtail in alfalfa with postemergence herbicides. Smith, N.L., C.B. Wilson and L.W. Mitich. Yellow foxtail has become a serious problem in alfalfa grown in many areas of California. Five postemergence herbicides were evaluated in Sutter County for their efficacy in controlling this weed. Treatments were applied July 27, 1982, following the third cutting, to mature flowering foxtail. Herbicides were applied in 30 GPA water carrier with a CO_2 backpack sprayer. Three replications were used and individual plot size was 6 by 10 ft. Surfactant (X-77 @ 0.25% v/v) was included with asulam,fluozifop-butyl, CGA 87725 and HOE 00581; paraffin base oil (Surfel @ 1 qt/A) was added to sethoxydin treatments.

Temporary yellowing of alfalfa was noted three weeks after application on all treatments. Evaluations made following the fourth cutting (September 13) indicated that asulam was given excellent control (96 to 100%) of foxtail at both 1 and 2 lb/A. Sethoxydim at 0.5 lb/A looked good with 85% control. Fluozifop-butyl, CGA 87725 and HOE 00581 appeared weak on foxtail. New seedlings had emerged following the fourth cutting which reduced the control observed on October 7. Asulam appears to be an effective herbicide for foxtail control, however more than one application will be needed for season-long control. (University of California Cooperative Extension, Davis, CA 95616)

Yellow foxtail control in alfalfa

Herbicide	Rate Ai/A (lbs)	% Foxtail control[1/]		
		8/17/82	9/13/82	10/7/82
asulam	1.0	7.0	9.6	8.4
asulam	2.0	6.7	10.0	7.0
fluozifop-butyl	0.25	0.7	2.3	0.3
fluozifop-butyl	0.5	1.0	2.3	2.0
CGA 87725	0.25	0.3	0	0.7
CGA 87725	0.5	1.7	3.0	2.3
sethoxydim	0.25	3.3	2.0	1.0
sethoxydim	0.5	7.3	8.5	5.3
HOE 00581	0.1	1.3	3.0	3.0
HOE 00581	0.2	1.7	2.3	0.7
Control	---	0	0.6	0

1/ control 0 = none 10 = complete

Evaluation of broadleaf herbicides alone and in combination for weed control in Nugaines winter wheat. Stewart, V. R., and T. K. Keener. Five herbicides in various combinations and at varying rates were applied to an established stand of Nugaines winter wheat which contained a high population of blue mustard (*Chorispora tenella*) and corn gromwell (*Lithospermum arvense*). The study was located near Plains, Montana on a silty loam soil, with a neutral pH. Herbicide applications were made April 7, 1982 to plots 3.1 by 7.3 m (22.3 m^2) using a tractor mounted research-type sprayer. Yields were obtained from an area 1.2 by 4.9 m (6.0 m^2) using a Hege 125 B Combine.

Ocular weed control ratings were taken on May 19 and July 9, 1982. At both dates blue mustard was effectively controlled by all herbicides used in the study. Corn gromwell was controlled throughout the season with the combination of bromoxynil + MCP; bromoxynil + MCP + dinoseb; bromoxynil + R40244 and chlorsulfuron at the high rate. Significantly higher yields were obtained from all treatments when compared with the untreated check. The combination of bromoxynil and dinoseb caused a slight reduction in yield in this experiment. (Mont. Agric. Exp. Stn., N. W. Agric. Res. Cnt., Kalispell, MT)

Spring Applied Broadleaf Herbicides on Winter Wheat

				Weed Control[1]					
	Rate	Yield	Test Wt		May 19			July 9	
Treatment	kg ai/ha	q/ha	kg/hl	BM	GW	CG	HB	BM	GW
bromoxynil	.42	58.6a[2]	78.9	8.2	6.0	5.0	2.3	10.0	7.3
bromoxynil MCPA	.42 + .42	59.8a	79.6	8.8	9.7	5.8	6.3	10.0	9.0
bromoxynil + dinoseb	.42 + .42	46.8a	80.0	7.5	6.3	3.3	3.3	10.0	6.0
bromoxynil + MCPA + dinoseb	.42 + .42 + .42	49.7a	78.9	9.5	8.8	9.8	7.0	10.0	10.0
R 40244	.28	55.2a	78.4	6.3	5.7	6.0	9.8	10.0	4.0
R 40244 + bromoxynil	.28 + .28	52.2a	79.5	9.8	9.2	10.0	10.0	9.0	9.0
chlorsulfuron	.004	53.7a	78.5	9.8	5.5	6.7	9.7	10.0	1.0
chlorsulfuron	.009	55.2a	79.2	9.9	9.5	9.5	8.8	10.0	5.3
chlorsulfuron	.018	54.3a	79.8	10.0	8.5	9.2	9.5	10.0	6.3
chlorsulfuron	.035	57.5a	79.5	10.0	9.8	9.2	9.9	10.0	10.0
check	----	29.0	78.3	0.0	0.0	0.0	0.0	0.0	0.0
$\bar{x}$		52.0	79.2						
LSD (.05)		9.96	1.54						

1/ Weed control scale 0-10; 0 = no control; 10 = complete control

2/ Indicates values significantly greater than the check at the .05 level.

Weed codes:
BM = blue mustard (*Chorispora tenella*)
GW = gromwell (*Lithospermum arvense*)
CG = cheatgrass (*Bromus secalinus*)
HB = henbit (*Lamium amplexicaule*)

Application Data:

All treatments Applied July 7	Temps:	Wind (mph)	Relative Humidity
	Air 44°F Soil 40°F	2-4	23%

Weather - Partly cloudy

Control of wild proso millet in field corn with preplant incorporated herbicides. Torell, J. M., C. R. Salhoff, S. A. Dewey and R. H. Callihan. This study was conducted on a grower's field southeast of Nampa. Herbicides were applied on May 5, 1982 with a knapsack sprayer calibrated to deliver 335 l/ha at 2.1 kgkm^2 pressure from a CO$_2$ source. The herbicides were incorporated by two passes with a triple K. The experimental design was a randomized complete block with three replications. Wild proso millet stand reduction and crop vigor reduction were rated on August 30, 1982.

The wild proso millet infestation in the study area was highly variable so evaluation was difficult. Metolachlor and EPTC$^+$/Extender provided the best control of wild proso millet. (Southwest Idaho Research and Extension Center, University of Idaho, Parma, Idaho 83660)

Wild Proso Millet Control in Field Corn

		Visual Evaluation[2/]			
		Wipm[3/]		Other[4/] Grass	
Herbicide[1/]	Rate Kgai/ha	VR	SR	VR	SR
EPTC$^+$	6.7	13	37	27	53
EPTC$^+$/Extender	6.7	37	67	38	63
EPTC$^+$ + Atrazine	6.7 + 1.1	13	62	22	20
Butylate$^+$	6.7	8	48	20	33
Butylate$^+$ + Atrazine	6.7 + 1.1	15	46	43	65
Vernolate$^+$	6.7	12	53	14	43
Vernolate$^+$ + Atrazine	6.7 + 1.1	28	55	42	58
Alachlor	3.4	0	53	3	30
Metolachlor	2.8	28	67	60	75
Metolachlor + Atrazine	1.7 + 1.3	47	60	60	70
Check		0	0	0	0

[1/] "+" following the name of a herbicide indicates that the formulation contained R-25788, a protectant.

[2/] VR = Vigor Reduction, SR = Stand Reduction, evaluated on July 30, 1982.
0-100 Scale

[3/] Wipm - Wild proso millet.

[4/] Mixed stand of barnyardgrass and green foxtail.

Observations on acifluorfen activity on black nightshade in tomato fields in Yolo County, California. Vandepeute, J. Among weed pests distributed throughout the world's agricultural land are members of the *Solanum nigrum* complex. Only four species in this complex seriously interfere with agriculture in the United States. In California, hairy nightshade, *Solanum sarrachoides*, black nightshade, *S. nigrum*, and American black nightshade, *S. americanum*, are problem weeds in the culture of processing tomatoes. Efforts of weed scientists have led to effective chemical control for hairy nightshade. In Yolo County, a 1982 grower questionaire established that the control of the black nightshade complex (BNSC) is a grave problem deserving university research emphasis. The rise to prominence of the BNSC started in the middle 1970's, particularly in locations where optimal weed management practices have been used. Species in the BNSC are capable of creating a literal "population explosion", if allowed to go uncontrolled. Fields are often hand cultivated extra times especially to remove these menacing weeds.

These studies were begun in late February 1982, which ended the rainiest winter in Yolo County during this century. Germination of nightshade was first noted in the Woodland area in early planted tomato fields. In all cases, sites were readily located where essentially solid stands of nightshade were evident. Small plot techniques involved use of a backpack CO2 pressure sprayer hand boom unit to overspray single row 60 inch beds with a Tee Jet 8002 flat fan tip at 40 psi. Gallonage of spray solutions was varied from thirty to sixty gallons per acre, emphasizing good spray coverage. All studies were conducted using commercial processing tomato varieties.

The herbicidal effect of the sodium salt formulation of acifluorfen used in these studies is concentrated mainly on the exposed areas of the foliage that is contacted by the spray solution. It has been suggested that acifluorfen is activated by carotenoid type plant pigments resulting in free radical chain reactions causing membrane perturbations and concommittant loss of the membrane's selective permeability characteristics, thereby leading to cellular death. Eradication of nightshade stands was achieved at ¼ lb. ai./A. Acifluorfen has only limited activity against small hairy nightshade plants. Weeds varied in size from the cotyledonary stage to four to six true leaves. In 1982, weather conditions were not favorable for optimal germination and growth until April, later than normal for this area. Many earlier planted fields succumbed to nightshade competition, disease and cold injury and were replanted. Nightshade germination was still prolific in the second planting, but crop vigor improved greatly. Applications of acifluorfen to these vigorous tomato plants resulted in dramatic differences in crop and weed sensitivities. Weed foliage which was not killed was subject to severe leaf growth restriction at rates up to ¼ lb. ai./A. Some crop injury was observed but there was no reduction in stand. Regrowth of nightshade was visible within one week after treatment. Retreatment with acifluorfen up to ¼ lb. ai./A at this time prevented some further weed growth, especially in the crop row, when crop plant growth was vigorously forming a good canopy.

These studies encourage us to conduct further investigations on the use of acifluorfen as an aid in processing tomato production. Untreated nightshade can easily outgrow tomatoes and control at the time of crop thinning is necessary. This task is made more difficult for the hand hoer because of the similarity in the appearance of tomato and nightshade seedling foliage. Thinning in the presence of heavy weed pressure and heavy weed roguing after thinning are becoming more costly. It appears that nightshade control will be a significant aspect of weed science research in California for several years. (Agrochemical Division of Rhone-Poulenc, P.O. Box 5416, Fresno, CA 93755.)

Wheat variety tolerance to chlorsulfuron. Whitesides, R. E., and T. L. Nagle. Three varieties of soft white winter wheat, Daws, Luke, and Stephens, were planted in the fall of 1981 on a silt loam soil, pH 5.9 and 2.7% organic matter, in Whitman County, Washington. Herbicides were applied to four replications using a compressed air bicycle or backpack plot sprayer depending upon the wheat height. Applications were made when the wheat had 1 to 3 leaves, 4 to 8 tillers, and when the grain was in the soft dough stage.

Wheat tolerance to chlorsulfuron (0.016 lb/A) was evaluated against the "standard" wheat herbicides 2,4-D amine (.75 lb ae/A), MCPA amine (.75 lb ae/A), bromoxynil (.38 lb/A), and bromoxynil + MCPA (.38 + .38 lb/A). No visible differences could be seen among treatments in any variety at heading. At harvest no yield differences between treatments were measured. However, application of 2,4-D at the 1 to 3 leaf stage caused a reduction in wheat height prior to heading. Chlorsulfuron, applied at 0.016 lb/A, was not different from the untreated control or from any treatment on any variety at harvest. Varietal tolerance to chlorsulfuron was as good as tolerance to many commercial herbicides was as good as many herbicides commercially used for broadleaf weed control in wheat, based on yield data from wheat varieties tested, and was not different from the untreated control. (Department of Agronomy and Soils, Washington State University, Pullman 99164-6420).

Winter wheat tolerance to herbicides applied for broadleaf weed control. Whitesides, R. E. and T. L. Nagle. The tolerance of winter wheat (variety Daws) to chlorsulfuron and other broadleaf weed herbicides was evaluated at intervals from tillering through the soft-dough stage of growth. Time of application was defined by counting the number of nodes easily detected in the culm and by measuring the distance of the developing head above the last prominent node. The experimental area was located in Whitman County, Washington on a silt loam soil, pH 5.4 and organic matter 4.1%. Herbicides were applied using a compressed air bicycle or backpack plot sprayer, depending upon the height of the crop. Plots were 7 ft. by 20 ft. and replicated four times.

In almost every case, application of the herbicide after the wheat had three or more nodes resulted in a reduction in yield. Average yield was reduced at every timing, after 3 to 4 tillers, when compared to the untreated control. Wheat treated with chlorsulfuron, however, was not greatly affected at any growth stage. It may be possible to use chlorsulfuron to remove broadleaf weeds at growth stages in wheat that previously have been considered too sensitive for treatment. (Department of Agronomy and Soils, Washington State University, Pullman 99164-6420).

Winter wheat tolerance to herbicides applied for broadleaf weed control

		Wheat Yield bu/A					
Treatment	Rate lb/A	*A* 3-4 tiller	*B* 3 nodes (1cm to the head)	*C* 4 nodes (< 1cm to the head)	*D* 4 nodes (25cm to the head)	*E* 4 nodes (soft dough-29cm to the head)	Av. yield[a] bu/A
Chlorsulfuron	0.016	88	90	87	83	88	87a
MCPA Na salt	1.0	91	76	84	92	85	86ab
Dinoseb amine	1.5	91	75	84	80	81	82bc
MCPA LVE	1.0	93	80	72	81	80	81bc
2,4-D amine	1.0	93	73	70	80	86	80c
Bromoxynil	0.38						
+ MCPA LVE	0.38	91	75	71	74	86	79cd
2,4-D LVE	1.0	91	73	65	71	77	75d
Untreated check							92
Average yield[a]		91a	77cd	76d	80bc	83b	

[a] Means within the same row or column followed by the same letter are not significantly different at the 5% level.

Yellow nutsedge control in chile, cotton and onions. Whitworth, J. W. and Lester Boyse. Yellow nutsedge infestations have increased to the point in New Mexico where they are a serious problem not only in vegetable crops but also in cotton. A multi-crop and -weed screening trial is conducted every year to evaluate herbicides that might have potential for solving this and other weed problems.

The trial was established on a field with a natural infestation of yellow nutsedge. Preplant soil incorporated herbicide treatment were applied on May 10, 1982 and incorporated with a ring-roller cultipacker. Soil type was a clay loam with a pH of 8.1. Flood irrigations were applied as required for emergence and maintenance of the plants. Postemergence treatments were applied on June 8, 1982. All treatments were replicated three times. Stand counts and injury evaluations were made one month after treating.

Herbicide performance data are shown for only 8 of the 54 treatments since they were the only ones showing any promise for controlling nutsedge.

Percentage reduction in stand and injury evaluation of surviving plants[1]

Herbicide	Method	Rate (Kg/ha)	Crops			Weeds[2]		
			Chile	Cotton	Onions	Broad-leaf spp.	Annual grasses	Yellow nutsedge
metolachlor	PPI	2.24	0^b	13^b	0^b	26^b	66	87
DPX-5648	PPI	0.07	16^b	0^c	34^b	51^b	41^c	84
	Post	0.07	0^c	0^c	54^c	71	94	98
glyphosate	Post	4.48	98^c	54^b	81^c	59	97	35
SD-95481	PPI	0.84	52^b	26^b	92^c	46	100	100
	PPI	1.69	45^b	87^b	52^c	38	100	91
SD-96638	PPI	0.84	29^b	33^b	44^c	52	98	91
	PPI	1.69	93^c	80^b	84^b	62	99	86

[1] Percentage reduction in stand based on counts from treated and untreated plots. Superscript b= injured but recovering and c= injured and not recovering.

[2] Broadleaf weed species an average of six species: annual morningglory, Wright groundcherry, jimsonweed, pigweed, spurred anoda and Russian thistle. Annual grasses an average of three species: barnyardgrass, johnsongrass (from seed), and junglerice.

(New Mexico State Agricultural Experiment Station, Las Cruces, N.M. 88003)

Postemergence wild oat control in dryland barley. Wright, S.D., R.S. Nielson, and L.W. Mitich. The performance of several herbicides for wild oat control in dryland barley was evaluated near Porterville, California. Plots were 10 by 30 ft. with four replications arranged in a randomized complete block. Treatments were applied using a CO_2 backpack sprayer with a 5 ft. swath calibrated to deliver 28 GPA of water as a carrier. The treatments were applied on February 24, 1982, when wild oats were in the 3- to 5-leaf stage with the majority in the 4-leaf stage of development. Air temperature was 50 F. Evaluations were made April 27, 1982.

Herbicides that gave effective wild oat control were difenzoquat, difenzoquat + bromoxynil, diclofop, diclofop + barban, AC 222,293, and AC 222,293 + bromoxynil. There were no significant differences between these treatments. There were no significant differences between bromoxynil and the untreated plots. Bromoxynil was included to determine if it would enhance the effectiveness of some of the wild oat herbicides and was not expected to give control when applied alone.

No significant differences were observed between all treatments for plant height, barley injury, or bushel weight. Yield results are not reported because of a poor harvesting job resulting in unreliable data. (University of California Cooperative Extension, Visalia, CA 93291)

Effects of postemergence herbicides on wild oat control, injury, plant height and bushel weight, Porterville, California

Herbicide	Rate lb/A	Wild[1] oat control	No. wild oats sq./ft after treatment	Plant height inches	Barley[1] injury	Bushel weight
diclofop	1.0	7.5	0.8	27.5	3.0	42.1
difenzoquat	1.0	8.8	0.2	31.4	2.6	43.0
diclofop + barban	1.0 0.25	8.6	0.2	29.6	2.8	42.9
222,293	0.5	8.0	0.5	31.0	2.5	43.4
222,293	0.75	9.4	0.4	32.4	1.3	41.3
222,293 + bromoxynil	0.5 + 0.25	6.6	0.7	30.5	3.1	40.4
222,293 + bromoxynil	0.75 + 0.25	7.9	0.4	27.5	3.5	40.6
222,293 + bromoxynil	0.5 + 0.5	5.6	0.8	29.1	3.4	41.8
222,293 + bromoxynil	0.75 0.5	8.9	0.4	31.4	1.9	42.8
bromoxynil	0.25	3.4	2.2	29.3	2.0	40.8
bromoxynil	0.5	4.7	1.6	30.8	2.1	43.3
difenzoquat + bromoxynil	1.0 + 0.5	9.4	0.1	33.9	2.4	43.3
untreated	0	2.2	3.3	31.9	1.5	41.4
untreated	0	2.8	2.2	30.4	1.3	41.3
LSD 0.5		3.01	1.5	NSD	NSD	NSD

[1] Scale: 0 = no injury or weed control: 10 = very severe injury (death) or perfect weed control.

Preemergence wild oat control in dryland barley. Wright, S.D., D.J. Munier and L.W. Mitich. Triallate (granules) was evaluated for wild oat control in dryland barley near Porterville, California. Plots were 16 by 1,250 ft., replicated three times. Soil type was a Ducor Adobe Clay. 'CM 72' barley was planted on January 2, 1982 at 85 lb/A. Seeding depth was 3 inches.

Two days after planting triallate (granular) at 1.5 lb/A was applied using a "Vicon" broadcast spreader. One day following application the herbicide was incorporated one time to a depth of 1 inch with a field cultivator going perpendicular to the direction of treatment.

The triallate gave very good wild oat control even though the broadcast spreader employed for applying the granules was less than ideal. Wild oat numbers were greatly reduced in the treated plots. An increase in yield and bushel weight was also observed but it was not significant. (University of California Cooperative Extension, Visalia, CA 93291)

Evaluation of triallate herbicide

Treatment	Yield lb/A	Bushel wt. (lb/bu)
triallate 1.5 lb/A	2281	44
check	1739	42
LSD .05	NS	NS

Effect of pronamide on winter peas and winter wheat in rotation. Zamora, D. L., Huston, C. H., Callihan, R. H., and D. C. Thill. The effect of pronamide rate and time of application on winter pea yield and its subsequent effect on winter wheat planted as a rotation crop following the peas was examined in comparison with standard herbicide treatments. Austrian winter peas (Pisum sativum L.) (var. Melrose) were planted on September 25, 1980 at 90 kg/ha with a 17.8 cm row spacing. The study was arranged in a randomized complete block design with three replications and individual plot size of 4 m by 9.1 m. The soil was a Palouse-Latahco silt loam with C.E.C. of 22.4 meq/100g, pH of 5.7 and organic matter of 3.4%. Preemergence surface treatments of 0.57, 1.12, and, 2.24 kg/ha pronamide (50% wettable powder), 6.72 kg/ha dinoseb (352 g/L emusifiable concentrate), and 0.57 kg/ha pronamide plus 6.72 kg/ha dinoseb were applied on September 29, 1981. Air temperature was 20.5 C and soil temperature at 12.7 cm was 18 C. Relative humidity was 60%. Postemergence fall applications of 0.28, 0.57, 1.12, and 2.24 kg/ha pronamide were made at the three to four node stage on January 28, 1981. Air and soil surface temperature were 9 C and soil temperature at 12.7 cm was 4 C. Relative humidity was 67%. Postemergence spring treatments of 0.28 kg/ha metribuzin (50% wettable powder) and 0.28 kg/ha pronamide plus 0.57 kg/ha metribuzin were applied on April 27, 1981. At that time the peas were at the six node stage. Air and soil surface temperature were 13 C with soil temperature at 12.7 cm of 15 C. Relative humidity was 55%. All herbicides were applied with a backpack sprayer and handheld boom equiped with 5004 nozzles and calibrated to deliver 374 L/ha.

Peas were harvested in August, 1981 with a Hege plot combine. No yield differences were present among treatments.

Following pea harvest the plot area was disked and four winter wheat (Triticum aestivum L.) cultivars, Nugaines, Stephens, Weston, and Daws were planted in a split plot design on October 19, 1981. Crop injury was visually evaluated and plant stands were measured by counting the number of plants in 2 m of row on May 18, 1982. A second visual evaluation for crop injury was made on June 8, 1982. The entire plot area was treated with broadcast applications of 0.57 kg/ha 2,4-D amine on May 19 and June 1, 1982 to control volunteer peas. Samples were harvested from 4.5 square meters from each split plot with a Hege plot combine on August 19, 1982.

All four wheat cultivars responded similarily to herbicide treatments and there were no significant herbicide by cultivar interactions. Within each cultivar plant stand of the herbicide treatments did not significantly differ from the check. Stephens wheat had a lower stand count than the other cultivars, regardless of treatment. With wheat cultivars analyzed collectively, the fall treatments of 2.24 kg/ha pronamide and pronamide plus dinoseb significantly reduced wheat stand. Fall applied pronamide at 2.24 kg/ha and premergence surface 0.57 kg/ha pronamide plus 6.72 kg/ha dinoseb treatments caused a slight temporary plant stunting when cultivars were analyzed collectively. Stunting in all other treatments was statistically insignificant. No visual differences remained among treaments on June 8, 1982. Response of grain yield to herbicides did not significantly vary among cultivars and yields from herbicide treated plots did not differ from the check. (University of Idaho Experiment Station, Moscow, ID 83843)

Effect of pronamide on winter peas and wheat cultivars in rotation

Treatment	Rate kg/ha	Application[1]	Yield of Winter Peas kg/ha	Winter Wheat[2]		
				Vigor[3] Reduction	Stand[4]	Yield kg/ha
check	-	-	1456 a[5]	0 c[5]	56 a[5]	5163 ab[5]
pronamide	0.57	PES	1154 a	0.5 c	52 ab	6795 ab
pronamide	1.12	PES	1656 a	0 c	52 ab	6252 ab
pronamide	2.24	PES	1566 a	2 c	51 ab	4160 b
pronamide	0.28	Fall	1138 a	3 bc	52 ab	4452 ab
pronamide	0.57	Fall	1586 a	1.7 c	52 ab	4894 ab
pronamide	1.12	Fall	1561 a	8 abc	50 ab	5373 ab
pronamide	2.24	Fall	1530 a	10 ab	44 b	4124 b
pronamide + dinoseb	0.57 + 6.72	PES	1415 a	11 a	43 b	4579 ab
dinoseb	6.72	PES	1594 a	3 bc	53 ab	4200 b
pronamide + metribuzin	0.57 + 0.28	Spring	1653 a	5 abc	52 ab	4266 b
metribuzin	0.28	Spring	1384 a	4 abc	50 ab	4442 ab

[1] PES = Pre emergence surface to peas, Fall = January 28, 1981, and Spring = April 27, 1981. Peas were planted September 25, 1981 and wheat planted October 19, 1981.

[2] Values are means of four cultivars, Nuguines, Daws, Weston, Stephens.

[3] 0 = No growth reduction, 100 = dead plants.

[4] Values are number of plants per 2 m of row.

[5] Means within a column followed by the same letter are not significantly different at the .05 level according to Duncan's New Multiple Range test.

Dicamba and succeeding crops. Zimdahl, R.L. and M.A. Henson[1]. Dicamba effectively controls annual and some perennial broadleaved weedy species in small grains and corn where applied pre- or postemergent to the crop. Its soil half-life is normally longer than that of 2,4-D and damage to succeeding crops has occurred.

We began studies in 1978 with fall applications of 0.6 to 4.4 kg ai/ha[2] and spring applications at rates of 0.1 to 1.1 kg on six different crops. The studies were continued with a fall application in 1980 of 0.6, 1.1, and 2.2 kg for a following crop of wheat or barley. These studies have been reported in detail in the 1981 (pp. 238 to 239) and 1982 (pp. 323 to 325) Research Progress Reports of the Western Society of Weed Science.

The 1982 study utilized four different crops. The cultivar, planting rate and date, and the harvest date are shown in Table 1.

Table 1. Dicamba residue study 1981-1982.

Crop	Cultivar	Planting rate	Planting date	Harvest date (1982)
		kg/ha		
Oats	Cayuse	38	3/10/82	8/12
Alfalfa	AV-32	5.5	4/26/82	9/27
Wheat	Vona	66	9/9/81	7/31
Beans	Olathe	66	5/28/82	10/7

The study was established on the Agronomy Research Farm, Fort Collins, CO on October 12, 1981. The clay loam, a fine, montmorillonitic mesic Aridic Argiustoll, soil had 35% sand, 32% silt, 33% clay, pH 7.6, and 1.3% O.M. All applications were made using a bicycle sprayer that applied a total volume of 140 liters/ha. Environmental conditions on all application dates were normal for the season. Three replicates of rates of 0.6, 1.1, and 2.2 kg were applied in the fall and 0.3 and 0.6 kg were applied at different times in the spring to each 3 by 15 m plot. Wheat was planted in the fall of 1981; the other three crops were planted in the spring of 1982 in the normal manner.

There was no effect of dicamba on oats when 0.5, 1.1, or 2.2 kg were applied approximately 5 months prior to planting or when 0.3 or 0.6 kg were applied 2 to 4 weeks after planting (Table 2). There was no effect of dicamba on oat stand but there was some decrease in height with increasing rate.

Only 2.2 kg of dicamba 6 1/2 months before planting affected the growth of alfalfa (Table 3). Application of 0.3 or 0.6 kg 2 or 4 weeks before planting did not reduce alfalfa yield. There was a good stand of

---

[1] Professor and Research Associate, respectively, Weed Research Lab, Department of Botany and Plant Pathology, Colorado State University, Fort Collins, 80523.

[2] All rates are expressed as kilograms of active ingredient per hectare.

alfalfa and the hay yield was respectable for a first cutting in the year of planting. We concluded that dicamba can be used prior to seeding alfalfa if low rates are used in the spring and perhaps up to 1.1 kg may be used in the preceding fall.

The winter wheat experiment is an exception to the preceding information because it was established on a clay loam soil at Akron, Colorado. The soil had 37% sand, 45% silt, 18% clay, pH 6.2, and 1.3% O.M. and was a fine, silty, mixed (calcareous), mesic, Ustic Torriorthent. The applications of 0.6, 1.1, and 2.2 kg were made on August 11 and August 24, 1981 which were 15 and 30 days prior to planting on September 9, 1981. The wheat was harvested in July of 1982. Dicamba applied at 2.2 kg 30 days prior to planting and 1.1 or 2.2 kg applied 15 days prior to planting reduced wheat yield (Table 4). This indicates that wheat is reasonably resistant to the herbicidal effects of dicamba and that the herbicide can be used for weed control prior to planting the crop if some attention is paid to rate and time of application. These results are consistent with the results obtained from our previous studies of residual effects of dicamba on wheat. It appears that up to 1.1 kg is safe when wheat is planted between 1/2 and 5 months after application.

Pinto beans were the most susceptible crop in the 1982 experiment. When dicamba was applied 7 1/2 months prior to planting, 1.1 and 2.2 kg significantly reduced bean yield (Table 5). There was no effect of 0.3 or 0.6 kg applied 1 month prior to planting, but the same rates applied 2 weeks prior to planting eliminated the crop. We concluded that no rate of dicamba is safe when beans are planted within 6 months of application of dicamba. If the interval is greater than 6 months, it is possible that 1.1 kg could be applied and a successful crop of beans grown. However, this conclusion must be qualified by saying that late fall applications and early spring plantings do not leave sufficient time for degradation in our area.

We conclude that dicamba can be used for weed control prior to growing some crops. The best chances for success are with small grains when application is made the previous fall with 1.1 kg or less. We do not think dicamba should be used prior to planting beans but it may be possible to use it successfully prior to planting alfalfa if close attention is paid to rate and timing of application relative to the planting date of alfalfa.

Table 2. Residual effect of dicamba on oats - 1982.

Rate	Time of application	Oat yield
(kg/ha)		(% of control)
0	-	100 a[1/]
0.6	Oct. 12	124 a
1.1	Oct. 12	108 a
2.2	Oct. 12	110 a
0.3	Mar. 27[2/]	94 a
0.6	Mar. 27[2/]	114 a
0.3	Apr. 9[3/]	104 a
0.6	Apr. 9[3/]	101 a

[1/] Means followed by the same letter are not statistically different (α=0.05) according to LSD.

[2/] Two weeks after planting on March 10.

[3/] Four weeks after planting.

Table 3. Residual effect of dicamba on alfalfa - 1982.

Rate	Time of application	Alfalfa yield
(kg/ha)		(kg/ha)
0	-	2912 a[1/]
0.6	Oct. 12	2218 a
1.1	Oct. 12	2240 a
2.2	Oct. 12	1187 b
0.3	Mar. 27[2/]	3226 a
0.6	Mar. 27[2/]	2688 a
0.3	Apr. 9[3/]	2755 a
0.6	Apr. 9[3/]	2822 a

[1/] Means followed by the same letter are not statistically different (α=0.05) according to LSD.

[2/] Four weeks before planting on April 26.

[3/] Two weeks before planting.

Table 4. Residual effect of dicamba on winter wheat - 1982.

Rate	Time of application	Wheat yield
(kg/ha)		(kg/ha)
0	-	5275 a[1/]
0.6	Aug. 11[2/]	4939 a
1.1	Aug. 11[2/]	4583 a
2.2	Aug. 11[2/]	4516 b
0	-	4738 a
0.6	Aug. 24[3/]	4832 a
1.1	Aug. 24[3/]	4254 b
2.2	Aug. 24[3/]	3837 c

[1/] Means followed by the same letter are not statistically different (α=0.05) according to LSD.

[2/] Thirty days prior to planting on September 9, 1981.

[3/] Fifteen days prior to planting.

Table 5. Residual effect of dicamba on pinto beans - 1982.

Rate	Time of application	Bean yield
(kg/ha)		(kg/ha)
0	-	1344 a[1/]
0.6	Oct. 12	1467 a
1.1	Oct. 12	784 b
2.2	Oct. 12	728 b
0.3	Apr. 19[2/]	1288 a
0.6	Apr. 19[2/]	1355 a
0.3	May 7[3/]	67 c
0.6	May 7[3/]	0 c

[1/] Means followed by the same letter are not statistically different (α=0.05) according to LSD.

[2/] Four weeks before planting on May 28.

[3/] Two weeks before planting.

PROJECT 6.

AQUATIC, DITCHBANK, AND NONCROPLAND WEEDS

Leslie W. Sonder - Project Chairman

Soil active herbicides for annual weed control. McHenry, W.B. and N.L. Smith. A study was initiated on the Davis campus airport to compare non-crop weed control efficacy of Bay Met 1486 and DPX 5648 with atrazine, bromacil, and tebuthiuron. A CO_2 backpack sprayer calibrated to deliver 25 GPA was utilized to apply soil active herbicides to 20 by 20 ft. plots, February 25, 1982. Amitrole (1 lb/A) was applied to one half (10 by 20 ft.) of each plot. Weed spectrum consisted of 10- to 18-inch tall wild mustard, wild radish, and wild oat. Soil is classified as sandy loam with 39% sand, 42% silt and 19% clay with a pH of 7.5. Four replications were employed. Rainfall totalled 12.4 inches when the experiment was evaluated May 4, 1982.

Bromacil and DPX 5648 alone were weak in controlling the overly tall weed population. The addition of amitrole to atrazine (2 and 4 lb ai/A), Bay Met 1486 (2,4, and 8 lb ai/A), and to tebuthiuron (2 and 4 lb ai/A) provided very good weed control. Weed control with amitrole in combination with bromacil and DPX 5648 was less effective. (University of California Cooperative Extension, Davis, CA 95616)

Annual weed control

Herbicide	Rate Ai/A	Weed control (10=100%) 5/11/81 Amitrole -	+
atrazine	2 lb.	5.5	9.9
atrazine	4	8.9	9.7
Bay Met 1486	2 lb.	0	9.0
Bay Met 1486	4	6.3	9.8
Bay Met 1486	8	9.1	10.0
bromacil	1 lb.	0	7.0
bromacil	2	1.5	8.4
DPX 5648	1 oz.	2.8	6.4
DPX 5648	2	4.0	7.0
DPX 5648	4	3.8	6.3
tebuthiuron	2 lb.	8.0	9.0
tebuthiuron	4	9.7	9.9
control	-	0	1.3

Evaluation of non-selective, translocated herbicides for bermudagrass (Cynodon dactylon (L.)Pers.) control in non-cropland. Bell,C.E. Three new herbicides were compared for efficacy against glyphosate for controlling bermudagrass under desert conditions.

Each herbicide was applied at 0.75 and 1.5 lb.a.e. or a.i./A to actively growing bermudagrass. Application was made on 8/14/82 in 23 gal/A of spray volume. There were three replications.

Initial results on 9/15 indicated that Hoe-0661 acted more quickly than the other materials for top-kill of the weed. Later evaluations on 10/1 showed more similarity between the treatments, especially at equal rates. (University of California Cooperative Extension, ImperialCounty, Court House, El Centro, Cal. 92243).

Treatment	rate (lb.a.e. or a.i./A)	percent control 9/15/82	10/1/82
glyphosate	0.75 a.e.	40	60
glyphosate	1.5 a.e.	73	83
SC-0224	0.75 a.e.	50	67
SC-0224	1.5 a.e.	53	80
SC-0545	0.75 a.e.	30	47
SC-0545	1.5 a.e.	70	87
Hoe-0661	0.75 a.i.	97	40
Hoe-0661	1.5 a.i.	100	87
untreated control		0	0

Algae control and seasonal succession. Jordan, Lowell S. and James L. Jordan. Research was conducted to determine the effect of copper sulfate and citric acid on algae blooms at Westlake Lake, California. The major algae species present in the lake were *Anabaena* sp. (a blue-green alga), *Aphanizomenon* sp. (a blue-treen alga), *Chlydomonas* sp. (a green alga), *Microcystis* sp. (a blue-green alga), and *Microspora* sp. (a green alga). *Aphanizomenon* sp. was found to constitute blooms more than any other species. Bloom formation began in late Spring and continued until late Fall.

The lake was treated with 1600 lbs (0.5 ppm w/w Cu ion) copper sulfate and 700 lbs citric acid in April when Aphanizomenon sp. infestations began to become prominent. Chemicals (in bags) were pulled along by boat through the surface 2 ft. of water. The treatment knocked down most of the algae; within a week, the blooms had disappeared.

A new bloom of Aphanizomenon sp. appeared in May. Within two weeks, the prominent bloom-forming algae were *Microspora* sp. and *Anabaena* sp. The infestation was controlled with a treatment of copper sulfate (1600 lbs) and citric acid (700 lbs).

The August bloom of Aphanizomenon sp. was controlled by copper sulfate (2100 lbs) and citric aicd (60 lbs). The October algae bloom was comprised of Chlamydomonas sp. After 16 days, *Aphanizomenon* sp. replaced *Chlamydomonas* sp. Copper sulfate and citric acid were used to suppress the Aphanizomenon sp. bloom. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Growth of Spikerush (Eleocharis Spp.) from seedlings in relation to water temperature. Ashton, F. M. and S. R. Bissell. This study was designed to determine the effect of water temperature on the growth of two species of spikerush under isothermic conditions.

The number of rosettes resulting from eight weeks of growth from nine transplanted seedlings was determined. Experiments were conducted at water temperatures ranging from 13-37°C. Each experiment consisted of placing six plastic dishpans of tap water into a growth chamber providing ca. 12,000 lux of light. A pair of trays were placed into each pan. These trays (13 X 13 X 5 cm) were filled with U.C. potting mix, one planted with nine dwarf spikerush (*E. coloradoensis*) seedlings and the other with nine slender spikerush (*E. acicularis*) seedlings. The water level was maintained at 10 cm above the soil surface, and was changed at weekly intervals. After eight weeks the trays were removed, the planting mix was then washed away, leaving whole plants (roots and shoots) which were then counted; fresh and dry weights were also determined.

Both species appeared to have a zone of optimum growth from ca. 25-32°C. The response also appeared asymmetric with a gradual increase in growth as the optimum temperature zone was reached, with a rapid decrease above this zone. (Department of Botany, University of California, Davis, CA 95616).

Number of rosettes developing in eight weeks from nine seedlings[a]

Water temperature (°C)	E. acicularis (number)	E. coloradoensis (number)
13	90± 12[b]	13± 2
19	596± 83	248± 38
23	1224± 52	812+ 36
25	1967± 85	1398± 49
28	1610±126	1332± 52
30	1504±108	1173± 33
32	1664±113	1306± 44
35	921±200	968+105
37	135± 59	14± 6

---

[a] Fresh and dry weight data showed similar responses at these temperatures

[b] Means plus or minus standard error, n=6

Growth of American pondweed in soil treated with DPX 5648 (Oust™). Dechoretz, N. and L.W.J. Anderson. Previous studies have shown thhat DPX 5648 applied pre-emergence or early postemergence to water was very effective in controlling the growth of American pondweed (*Potamogeton nodosus* Poir.). As a result, a greenhouse study was conducted to evaluate the effect of surface and subsurface soil application of DPX 5648 on the growth of American pondweed. One liter milk cartons containing sandy clay loam soil and American pondweed winterbuds were treated with DPX 5648 at .011, .056, 0.11 and 0.56 kg/ha and then placed in 20L jars containing fresh water. Untreated cartons were also placed in the jars to determine whether or not there was movement of the herbicide from the treated carton into the surrounding water column. Shoot length, fresh weight and dry weight of plants in each carton was determined four weeks after treatment.

Effects of the surface and subsurface application are shown in Table 1 and 2, respectively. On a shoot length basis, DPX 5648 applied as the surface or subsurface treatment at .056 kg/ha or higher significantly reduced the growth of American pondweed. These results correspond well with results from studies evaluating the activity of Oust for terrestrial weed control.

The fresh and dry weight of American pondweed in the cartons treated with a surface application of Oust was reduced by 30 and 50%, respectively. Similar reduction was obtaind in cartons treated with a subsurface application of DPX 5648.

There was a 40 to 50% reduction in the shoot length of plants in untreated cartons placed in jars containing cartons treated with 0.56 kg/ha. As a result there appears to be some movement of the herbicide from the treated soil into the surrounding water column. (USDA Aquatic Weed Control Research, Botany Department, University of California, Davis, CA 95616).

Table 1. Response of American Pondweed 4 weeks after a pre-emergence soil application of DPX 5648

Treatment rate (Kg/ha)	Plant Response[1]					
	Shoot Length (cm)		Fresh Weight (g)		Dry Weight (g)	
	Treated carton	Non-treated carton	Treated carton	Non-treated carton	Treated carton	Non-treated carton
0		27.5±2.1		7.8±1.3		1.1±0.2
0.011	33.1±2.0	33.1±4.5	4.2±0.5	8.5±2.0	0.6±0.1	0.8±0.1
0.056	7.2±2.1	20.1±1.8	2.4±0.1	6.2±0.5	0.5±0.2	0.8±0.1
0.11	2.2±0.2	22.1±1.9	3.0±0.1	5.2±0.5	0.6±0.0	0.7±0.1
0.56	2.2±0.2	16.1±2.8	3.0±0.1	6.3±1.3	0.7±0.1	0.9±0.1

Table 2. Response of American Pondweed 4 weeks after a pre-emergence subsurface soil application of DPX 5648

Treatment rate (Kg/ha	Plant Response[1]					
	Shoot Length (cm)		Fresh Weight (g)		Dry Weight (g)	
	Treated carton	Non-treated carton	Treated carton	Non-treated carton	Treated carton	Non-treated carton
0		29.9±3.4		8.2±0.6		1.0±0.1
0.011	39.0±3.8	30.3±2.3	6.0±0.3	9.1±0.7	0.8±0.1	1.3±0.2
0.056	3.4±0.3	23.8±2.7	2.4±0.1	8.4±0.7	0.5±0.0	1.3±0.2
0.11	3.0±0.5	23.8±3.2	2.1±0.4	8.3±0.8	0.5±0.1	1.0±0.1
0.56	2.3±0.3	16.6±3.0	2.7±0.4	4.2±0.9	0.6±0.1	0.9±0.2

---

[1] Value represents mean ± standard error; fresh weight and dry weight based on 4 replicates; shoot length based on 16 values, 4 per replicate.

Evaluation of hydrogen peroxide alone and in combination with copper sulfate for control of filamentous alga. Dechoretz, N., Ryan, F.J. and L. W. J. Anderson. Greenhouse studies were conducted to evaluate the effects of hydrogen peroxide (H_2O_2) alone and in combination with $CuSO_4$ on Cladophora under static water conditions. Assays were conducted by placing 1 g of damp-dried alga in jars containing 3 l of tap water. Twenty-four hours later, the chemical(s) were added to the jar and then the water was gently stirred to insure even distribution of the chemical. Fresh weight, dry weight and chlorophyll concentration was determined one week after treatment.

Fresh weight and dry weight of untreated alga increased significantly over the one week period. Both $CuSO_4$ at 0.10 ppmwand H_2O_2 at 34 ppmw appeared to be algistatic rather than algicidal. However, there does appear to be a slight increase in phytotoxicity when both compounds were applied to the same treatment vessel. This increase in phytotoxicity also was demonstrated in the chlorophyll concentration of the alga. For example, the chlorophyll concentration of the alga treated with $CuSO_4$ at 0.10 ppmw decreased by 25% while the alga treated with H_2O_2 at 34 ppmw increased by 77%. In contrast, the chlorophyll concentration of alga treated with $CuSO_4$ plus H_2O_2 at 0.10 plus 34 ppmw decreased by 48%.

Although both compounds were algicidal when applied at the high concentration, there does not appear to be any increase in algicidal activity when the compounds were applied in combination. (USDA Aquatic Weed Control Research, Botany Department, University of California, Davis, CA 95616).

Response of filamentous algae (*Cladophora* sp.) to H_2O_2 alone and in combination with $CuSO_4$

		Plant Response[1]			
Chemical	Treatment rate (ppmw)	Fresh Weight (g)	Dry Weight (g)	% Dry Weight	Chlorophyll[2] (mg/g)
Control	0	1.33±0.02	.32±0.01	24.3±0.6	.91±.05
$CuSO_4$	.10	1.13±0.14	.25±0.04	22.4±1.3	.68±.38
	1.0	0.66±0.02	.18+0	27.5±0.8	.55+.26
H_2O_2	34	0.93±0.15	.21±0.03	27.9±0.5	1.56±.63
	170	0.45±0.03	.17±0.01	39.1±1.0	.02±.01
$CuSO_4$+H_2O_2	.10+.34	0.62±0.08	.18±0.02	28.9±2.3	.47±.15
	1.0+ 170	0.49±0.08	.16±0	32.8±2.3	.47±.03
	1.0 + 34	0.54+0.02	.15±0.02	27.0±1.3	.57±.17
	1.0 +170	0.35+0	.15+0.02	42.9±3.9	.05±.02

---

[1] Response determined one week after treatment.

[2] Chlorophyll concentration expressed on dry weight basis.

[3] Values represent mean ± standard error.

[4] Concentrations expressed as ppmw copper.

[5] Initial dry weight of algae = 0.22 ± 02 g.

Effect of temperature on the germination of slender spikerush (Eleocharis acicularis (L.) Roem. & Schult.). Yeo, R. R. and J. R. Thurston, USDA, ARS, U.C. Davis, CA. Two lots of seed of slender spikerush, one lot of seed that had been stored dry at 4C and another lot of seed that had been stored just at 4 C for 8 months, were germinated on a thermogradient table in eight temperature cells ranging from 10.2 to 34.5 C under continuous light (400 micro-Einsteins/m^2/sec). Three replicates, 100 seed per replicate, from each storage treatment were placed in 35 by 10 mm Petri dishes, then put in each cell to incubate. Germination was recorded after 4 days of incubation and at weekly intervals, thereafter, for 5 weeks. A summary of the percentage germination after 5 weeks is shown in Table 1.

Low incubation temperatures were conductive to germinating seed from both storage treatments. Dry-stored seed germinated best at 10.2 C (22.7%). Wet-stored seed incubated at lower temperatures, 10.2 and 14.6 C, gave the best percentage germination (35.3 to 30.3%). Both groups of seed appeared to exhibit lower percentages of germination at median temperatures (18.6 to 29.4 C) and then increased at higher temperatures (32.4 and 34.5 C).

Table 1. Percentage germination of slender spikerush seed stored wet and dry at 4 C and then incubated at different temperatures.

	Mean percentage germination	
Incubation temperature	Storage treatment	
(C)	Dry	Wet
10.2	22.7 b	35.3 d
14.6	11.3 a	30.3 cd
18.6	3.3 a	25.0 bc
23.4	4.3 a	22.7 ab
26.8	4.0 a	16.3 a
29.4	5.7 a	19.0 ab
32.4	10.7 a	23.3 ab
34.5	10.0 a	18.7 ab

1/Numbers followed by different letters are significant at the 5% level according to Duncan's New Multiple Range Test.

The effect of dwarf spikerush and a winter drawdown on four species of rooted submersed aquatic weeds. Yeo, R.R. and J.R. Thurston. Four species of rooted submersed aquatic weeds were grown outdoors under 55% shade cloth in combination with dwarf spikerush plants and alone in 75L tubs filled with water. The experiment was conducted from May 1981 to October 1982. The water in one-half of the tubs containing each treatment was drawn down from September 1981 to May 1982. Shoot counts and dry weights were measured for each aquatic weed at the end of the study. The data are summarized in Table 1.

The numbers of shoots and dry weights of all weeds grown in cultures with dwarf spikerush that were subjected to drawdown were significantly less than in monocultures of weeds continuously submersed. When monocultures of American elodea and Eurasian watermilfoil were drawn down, fewer shoots developed than in monocultures that were continuously submersed. Dry weights of all weeds that were grown with dwarf spikerush and subjected to drawdown, except sago pondweed, were sighificantly less than in monocultures not drawn down. Other significant responses between the different treatments apparently were related to the specific species. (USDA, ARS, U.C. Davis, CA 95616.)

Table 1. Influence of dwarf spikerush and drawdown on the growth of four aquatic weeds

Culture treatment	Plant yields[1]	
	Average number of shoots	Average dry weight(g)
Hydrilla monoculture	42.5 b	96.0 c
Hydrilla + dwarf spikerush	39.8 b	66.6 b
Hydrilla + drawdown	44.0 b	51.6 b
Hydrilla + dwarf spikerush + drawdown	9.7 a	4.9 a
Sago pondweed monoculture	170.5 b	18.0 b
Sago pondweed + dwarf spikerush	66.2 a	5.3 a
Sago pondweed + drawdown	165.7 b	20.5 b
Sago pondweed + dwarf spikerush + drawdown	57.8 a	4.5 a
American elodea monoculture	98.0 c	109.7 b
American elodea + dwarf spikerush	84.8 c	88.0 b
American elodea + drawdown	26.3 b	11.6 a
American elodea + dwarf spikerush + drawdown	4.0 a	0.3 a
Eurasian watermilfoil monoculture	32.5 b	74.9 b
Eurasian watermilfoil + dwarf spikerush	28.3 ab	69.1 b
Eurasian watermilfoil + drawdown	19.2 a	30.6 a
Eurasian watermilfoil + dwarf spikerush +drawdown	18.3 a	17.8 a

---

[1] Numbers followed by different letters are significantly different according to Duncan's multiple range test at the 5% level.

Control of rooted submersed aquatic weeds and filamentous algae in ponds stocked with mirror carp. Yeo, R.R. and J.R. Thurston. Six mosquitofish-holding ponds were stocked with mirror carp (a strain of the common carp (Cyprinus carpio L.) for aquatic weed control. Three ponds, 0.25 A each, containing dense infestations of aquatic weeds were each stocked at a rate of 250 fish/A during March and April 1981. Three additional 0.25 A ponds, similarly infested with aquatic weeds, were stocked with mirror carp at a rate of 150 fish/A during December 1981. The average weights of the fish stocked at 250 and 150 fish/A were 28 and 55 g, respectively. Aquatic weeds in the ponds included, sago pondweed, southern naiad, chara, and filamentous algae. Three weedy ponds were selected for controls. Two ponds stocked with 250 fish/A and 2 control ponds were treated with simazine in April 1981 to facilitate a mosquitofish harvest. Two ponds stocked at 150 fish/A required a similar treatment with simazine in April 1982.

Ponds stocked with 250 fish/A became turbid and remained turbid until the end of the study in September 1982. Weeds did not regrow in the two treated ponds with 250 fish/A. The water in the treated control ponds remained fairly clear throughout the study and one pond had some regrowth of sago pondweed and filamentous algae during 1982. The weed infestation in the pond not treated with simazine, but with 250 fish/A was completely eliminated by May 1982. The untreated control pond continued to have a 100% weed infestation throughout the duration of the study. The 3 ponds stocked at 150 fish/A became turbid by August 1982 and were free of weeds by September 1982. (USDA, ARS, U.C. Davis, CA 95616).

Translocation of Oust^R (DPX5648) in hydrilla and American pondweed using a silicon sealant. L.W.J. Anderson. Previous studies designed to determine the ability of aquatic angiosperms to takeup and mobilize herbicides have relied on the use of low melting point waxes, such as eicosane, as a sealant between the shoot and root. However, heated eicosane can damage the plant tissue and is subject to cracking when cooled which can allow leakage between compartments containing roots and shoots. Several commercially available silicon dental impression materials were tested for possible use as sealants. These types of materials are two-component systems that include a silicon matrix and a hardener, which when mixed with the silicon, causes it to harden but remain pliable. Little or no heat is generated in this process. The main disadvantage is that hardening occurs within 3-5 minutes so it must be used quickly. Previous studies in this laboratory (and others) have demonstrated that Oust significantly reduces growth of hydrilla and pondweed at ca. 0.005 ppmw (5 ppb). This study was undertaken to determine the mobility of Oust in these species.

Of the several types tested, only Xantopren$^{(R)}$ had acceptable pliability, and cohesiveness to form a good seal, and yet was nontoxic to developing plants. This sealant was used in "standard" the root/shoot apparatus which consisted of a small 300 ml wide-mouth jar (root chamber), neoprene stopper, lucite sleeve, sealant, air vent, and 1.5 L beaker or 9 L batter jars (shoot chamber). American pondweed was grown from winterbuds in plastic pots containing ca 8 cm of potting soil. Hydrilla was grown from tubers. Before planting winterbuds and tubers were surface-sterilized in 1% hypochlorite. Plants were maintained in a greenhouse with ca. 14 h. day at 25-28° C. Three-week old plants were carefully removed from the soil, washed free of debris and soil and threaded through the lucite sleeve within the neoprene stopper. While the plants were carefully separated, the silicon sealant was applied alternately to both sides of the lucite sleeve. During these manipulations the plants were kept damp with a fine mist spray or were submerged. The sealing process required 10-20 minutes per plant.

Plants in root/shoot partitioning systems were kept 2-5 days and checked for leaks, which if present, cause fluid from the root chamber to rise in the air vent tube. Plants in non-leaking systems were exposed to ^{14}C-labelled Oust at .005-.006 ppmw for 24 h., 48h. or 6 days via the root or shoot compartment. (Spec. Act. 55.8 mCi/mM). The shoot compartment was sampled daily to detect leaks or changes in the ^{14}C activity concentration. After exposure, plants were carefully removed from the seals, rinsed, freeze-dried and, in a darkroom, placed on Kodak No. Screen X-Ray film (8" X 10") and wrapped in layers of foil. After 10-12 days, films were removed and developed. Plants were partitioned into "shoot" and "root", weighed and ground to a powder in a micro wiley mill. Ground material was subsampled, weighed (ca. 50 mg ea.) and combusted in a Packard Oxidizer. $^{14}CO_2$ evolved from combustion was trapped in an alkaline scintillaton fluid and samples were counted by LSC. The efficiency of oxidation and collection was determined by oxidation of commercial standards and by direct counting of the same batch of standard by liquid scintillation. All counts were corrected for oxidation and counting efficiency.

Table 1 summarizes the levels of ^{14}C Activity found in American pondweed after 24 h. or 6 day exposures. After 24 h. shoot exposure, nearly 80% of the total ^{14}C Activity was in the shoot. The total amount of Oust in the plant was ca. 2 ng. Plants exposed for 6 days had slightly higher proportion in the shoot (ca. 88%), but the total taken up was about 3.4 ng. Following root exposures, the proportion in the roots were 83% and 90% for

24 h. and 6 days respectively. The total amounts of Oust taken up in the plant via roots were ca. 1.3 and 2 ng for 24 h. and 6 days respectively. Table 2 shows results of similar treatments in hydrilla but with exposure of 48 h. and 6 days. The mobility of Oust in hydrilla is similar to that seen in American pondweed. However, after 6 days, hydrilla had taken up, via shoots, about 3 times as much total ^{14}C as did American pondweed. Similarly, more Oust was taken up in hydrilla, via roots, than in American pondweed during six days.

Taken together, these results suggest that Oust moves quite readily acropetally or basipetally in both species. This contrasts sharply with the low mobility of fluridone which is currently marketed as an aquatic herbicide for ponded water. These data also support the results of soil-incorporation tests which clearly demonstrated that Oust is available via the soil. These data, however, demonstrate the direct absorption of Oust via roots and also suggest that the compond may move to the subterranean propagule-forming tissues in these species. (USDA/ARS Aquatic Weed Control Research, University of California, Davis, California 95616)

Table 1. ^{14}C-Activity in <u>Potamogeton</u> <u>nodosus</u> following exposure to ^{14}C- DPX-5648 ("OUST")

		^{14}C-Activity in Plant Parts1/							
		Root				Shoot			
Exposure		DPM/mg	total DPM	ngDPX	%	DPM/mg	total DPM	ng DPX	%
Shoot (24 h)	a	4.0	280	0.82	42.2	6.4	384	1.13	57.8
	b	1.31	108	0.32	20.0	6.53	433	1.27	80.0
	c	0.68	78	0.23	13.2	6.71	512	1.51	86.8
	d	0.94	47	0.14	5.7	9.43	780	2.29	94.3
	$\bar{x}$	1.7± .8	128.3±52.1	0.4±.2	20.3±7.9	7.3±.7	527.3±88.3	1.6±.3	79.7±7.9
Root (24 h)	a	7.4	541	1.59	80.7	2.1	129	0.38	19.2
	b	6.44	297	0.87	92.5	0.44	24	0.07	7.5
	c	7.03	485	1.43	93.3	0.47	35	0.10	6.5
	d	5.86	209	0.61	65.1	2.86	112	0.33	34.9
	$\bar{x}$	6.7±.3	383±78.0	1.1±.2	82.9±6.6	1.5±.6	75±26.6	0.2±.08	17.1±6.6
Shoot (6 day)	a	3.1	243	0.71	10.3	20.1	2107	6.20	89.7
	b	1.73	38	0.11	11.1	8.23	303	0.89	88.9
	c	1.25	44	0.13	9.3	8.84	429	1.26	90.7
	d	4.19	212	0.62	15.9	18.91	1123	3.30	84.1
	$\bar{x}$	2.6±.7	134.3±54.2	0.4±0.2	11.7±1.5	14.0±3.2	990.5±4135	2.9±1.2	88.4±1.5
Root (6 day)	a	12.1	895	2.63	85.5	2.6	152	0.45	14.5
	b	8.26	283	0.83	86.0	1.00	46	0.13	14.0
	c	15.01	400	1.18	95.7	0.34	18	0.05	4.3
	d	14.81	782	2.30	94.1	0.91	49	0.14	5.9
	$\bar{x}$	12.5±1.6	590±147.3	1.7±.4	90.3±2.7	1.2±.5	66.3±29.4	.2±.09	9.7±2.7

1/ Values are from oxidized samples of freeze-dried and ground plants. Concentrations during exposure were: root .005 ppmw, shoot .006 ppmw. Spec. Act = 55.8 mCi/mM. Subscript a, b, c & d designate replicate plants. A was run 7/1/82, b, c & d run on 8/19/82

Table 2. ^{14}C-Activity in Hydrilla verticillata following exposure to ^{14}C-DPX-5648 (OUST")

^{14}C-Activity in Plant Parts[1/]

			Root				Shoot		
Exposure		DPM/mg	total DPM	ngDPX	%	DPM/mg	total DPM	ngDPX	%
Shoot (48 h)	a	11.8	360	1.06	19.3	20.6	1509	4.44	80.7
	b	9.4	295	0.87	27.4	24.2	782	2.30	72.6
	$\bar{x}$	10.6±1.2	327.5±32.5	0.97±4.1	23.4±4.1	22.4±1.4	1145.5±363.5	3.4±1.1	76.7±4.1
Root (48 h)	a	31.4	468	1.38	34.3	8.9	898	2.64	65.7
	b	41.7	1450	4.26	79.7	4.3	369	1.08	20.3
	$\bar{x}$	36.6±5.2	959±491	2.8±1.4	57±22.7	6.6±2.3	633.5±264.5	1.86±0.78	43±22.7
Shoot (6day)	a	41.8	2224	6.54	19.5	33.0	9152	26.90	80.4
	b	12.3	270	0.79	9.3	15.5	2623	7.71	90.7
	c	8.47	185	0.54	20.5	22.24	719	2.11	79.5
	d	2.69	62	0.18	8.3	20.56	689	2.03	91.7
	$\bar{x}$	16.3±8.7	6853±514.7	2.0±1.5	14.4±3.2	15.3±4.4	3295.8±2003.8	9.7±5.9	85.6±3/3
Root (6 day)	a	20.8	421	1.65	56.2	2.8	328	0.96	43.8
	b	43.5	2229	6.56	88.9	4.4	279	0.82	11.1
	c	20.56	206	0.61	84.9	1.003	37	0.11	15.2
	d	19.17	186	0.55	85.3	1.175	32	0.09	14.7
	$\bar{x}$	26.±5.8	760.5±4924	2.3±1.4	78.8±7.6	2.4±.8	169±78.3	.5±.2	21.2±8/6

[1/] Values are from oxidized samples of freeze-dried and ground plants. Concentrations during exposure were: root .005 ppmw, shoot .006 ppmw. Spec. act. = 55.8 mCi/mm. Subscript a, b, c & d designate replicate plants. A & b run on 7/1/82, c & d run 8/26/82

Residues of herbicides in the Sacramento Delta. Following Application for Control of Waterhyacinth. Anderson, L.W.J., C. Tennis and L. Thomas. Waterhyacinth (*Eichhornia crassipes*) has become an economically important pest in the Sacramento Delta waters during the past 2-3 years. The massive summer-to-early winter biomass has caused economic losses to various Delta marina operators and to the United States Bureau of Reclamation at their pumping plant in Tracy, California. Technology for chemical control of waterhyacinth is readily available: 2,4-D and diquat have been used successfully in Florida and other southeastern states to manage the plant. However, prior to 1982, there has been no registration (state label) for use of 2,4-D for control of waterhyacinth in flowing waters in California. The primary concern of state regulatory agencies has been the potential for introduction of excessive levels of 2,4-D in Delta waters. Currently, there is a federal (EPA) potable water tolerance of 0.1 ppmw.

In order to obtain data on 2,4-D residues resulting for control operations, ARS conducted water sampling and 2,4-D analyses in cooperation with the California Department of Boating and Waterways and the United States Bureau of Reclamation (Mid-Pacific Region). All applications were carried out following approvals by appropriate County Agricultural Commissioners. Their cooperation is greatly apppreciated.

Personnel from the following organizations assisted in applications: USBR, California Department of Boating and Waterways, United States Army Corps of Engineers (Waterways Experiment Station), Aquatics Unlimited, Inc. ARS is appreciative of their assistance and cooperation in this project.

Tables 1 and 2 summarize results of 2,4-D analyses in water samples from two locations, Coney Island (on Old River) and Dissappointment Slough. Samples taken inside sprayed mats at the Coney Island site had the highest levels, but 2,4-D in most samples taken outside (adjacent) to the mats was well below the 0.1 ppmw tolerance. Samples taken in Dissappointment Slough did not exceed .014 ppmw outside the treated mats. The lower concentrations there were probably due to the lower application rate and to greater flows in water adjacent to the plants. These and other published data demonstrate that when properly applied, 2,4-D can be used for control of waterhyacinth without exceeding federally established tolerance. (USDA/ARS Aquatic Weed Control Research Laboratory, University of California, Davis; U.S. Bur. Reclamation, Mid-Pacific Region; California Department of Boating and Waterways, respectively.)

Table 1. Levels of 2,4-D in the Sacramento Delta Water following Applications for Control of Waterhyacinth near Coney Island[1/]

Sample Location	Time	2,4-D	(ppmw)
Outside plot	Pre	0	(6)
Inside plot	Pre	0	(3)
Inside, upstream	Post-15 min.	8.420±.29	(8)
"	"	0.530±.11	(6)
"	"	3.800±.22	(4)
Outside, upstream	Post-15 min.	0.059±.08	(4)
"	"	0.020±.01	(5)
"	"	0.017±.01	(5)
"	"	0.547±.02	(4)
"	"	0.168±.02	(4)
"	"	0.107±.01	(4)
Outside plot	Post-30 min.	0.005±.002	(5)
"	"	0.004±.002	(5)
"	"	0.002±.001	(4)
Inside, downstream	Post-60 min.	1.389±.025	(8)
"	"	0.593±.040	(4)
Outside, upstream	Post-1.25 h.	0.050±.04	(3)
"	Post-1.50 h.	0.100±.008	(4)
"	"	0.100±.013	(4)
"	"	0.157±.007	(4)
" , downstream	"	0.003±.004	(4)
"	"	0.004±.004	(4)
"	"	0.023±.008	(4)

[1/] Data are means ± S.E. Number in ( ) is number of anaylses for the given time and location. Treatment rate was 5 lb/acre.

Table 2. Residues of 2,4-D in Water Samples Taken During Applications to Control Water Hyacinths in the Sacramento River Delta at Dissapointment Slough 1/

Sample # (Time) SITE A	PPMW	Sample # (Time) SITE B	PPMW	Sample # (Time) SITE C	PPMW	Sample # (Time) SITE D	PPMW
Pre-treat		Pre-treat		Pre-treat		Pre-treat	
1 A (1650	0	1 A (1210)	0	22 A (1535)	0	1 A (1010)	0
2 B (1652)	0	2 A (1215)	0	23 A (1540)	0	2 B (1020)	0
3 A (1710)	0	3 A (1220)	0	24 A (1545)	0		
Post-treat		Post-treat		Post-treat		Post-treat	
6 A (1803)	0.008	5 A (1240)	0	26 A (1615)	0.006	4 B (1040)	0.0002
7 A (1807)	0.006	6 A (1250)	0	27 A (1615)	0	5 A (1100)	0
8 A (1833)	0	7 A (1315)	0	28 A (1645)	0	6 B (1105)	0
9 A (1834)	0.003	8 A (1318)	0	29 A (1550)	0.004	7 A (1130)	0
10 A (1903)	0	9 A (1330)	0	30 A (1630)	0	8 B (1130)	0
11 A (1905	0	10 A (1330)	0	31 A (1631)	0	9 A (1200)	0.002
12 A (1935)	0	11 A (1341)	0	33 A (1646)	0.0006	10 B (1200)	0
13 A (1936)	0.008	12 A (1415)	0.0005	34 A (1652)	0	11 A (1230)	0.014
14 A (1942)	0.004	13 A (1418)	0			12 B (1230)	0
15 A (1948)	0	14 A (1420)	0.0006			13 A (1300)	0
		16 A (1428)	0			15 A (1330)	0.003
		17 A (1445)	0.013			16 B (1330)	0
		18 A (1447)	0.0008			17 A (1340)	0.0009
		20 A (1515)	0.0005				
		21 A (1520)	0				
		25 A (1600)	0.003				

1/ Samples were taken in duplicate adjacent to the treated waterhyacinth mats. 2, 4-D was analysed by high performance liquid chromatography. Data are means of 3 to 6 analyses. Treatement rate was 4lb/acre.

Advances in Hydrilla verticillata control research in the Imperial Valley, California. Stocker, R.K. *Hydrilla verticillata* continues to present a serious threat to agricultural and domestic water supply in the Imperial Valley (IV). Biomass production by this aquatic plant reduced flow this past summer in main and lateral canals. Mechanical removal of plants resulted in added nuisance to pump-irrigators, and forced the temporary closure of a hydroelectric facility because of plant fragment buildup.

This was the first year's effort of the Hydrilla Control Research Program (HCRP), which is supervised by an eleven-agency cooperative effort, funded by the California Department of Food and Agriculture, United States Department of Agriculture (USDA), and Imperial Irrigation District, and centered at the USDA IV Conservation Research Center, Brawley, CA.

Chemical Control Studies. Two field and four greenhouse studies were conducted during 1982. A field study with acrolein demonstrated that at least 24 hours could be required for dissipation of the herbicide in very slow moving canal water. It would be possible then, to apply acrolein to a section of canal and allow the material to dissipate below toxic levels prior to moving the water into areas with fish or potable water use. Previous (1981) applications of acrolein resulted in complete removal of hydrilla topgrowth, followed by heavy regrowth within several months.

The second field study compared the efficacy of chelated copper (bis(ethylenediamine)copper(II) sulphate) (EDA) with and without adjuvants (Bivert and Nalquatic) on hydrilla in flowing water canals. Chelated copper at 5.0 ppm was ineffective in any combination of herbicide plus adjuvant in flowing water. Very high levels (5% v/v) of Nalquatic were required to produce a mixture that would sink. Similar applications in ponded canal water successfully removed hydrilla topgrowth.

The first greenhouse study demonstrated that 88% of hydrilla topgrowth could be removed with 48 hour contact with 5 ppm chelated copper (EDA complex). A second study showed that there was little to be gained by adding adjuvants (Nalquatic or Bivert) to chelated copper (EDA complex) in very slow moving or ponded water. Under these conditions adjuvants promoted reduction in hydrilla shoot length, but did little to reduce biomass. A third study demonstrated little difference in efficacy between EDA and ethanolamine (ETA) complexed copper. The last greenhouse study, with 3 ppm dipotassium endothall, showed that 24 hour contact time was required to remove 80% of hydrilla topgrowth.

Mechanical Control Studies. Reinforced fabric canal liners and polyethylene sheeting were placed in several canals to determine their resistance to high summer temperatures and their ability to prevent hydrilla growth. The fabric liner study was in conjunction with the Bureau of Reclamation (USDI-BOR) Denver, CO.

A second study with USDI-BOR was an assessment of mechanical removal of hydrilla from the All-American Canal. Telescooping in May provided moderate control of hydrilla throughout most of the growing season. A similar study conducted by HCRP evaluated the effects of discing, chaining, and telescooping on hydrilla growth in a lateral canal. Hydrilla control has been greater than 90% since the October treatments were conducted. Biomass in adjacent control plots continued high through December.

Biological Control Studies. The HCRP has cooperated with the Coachella Valley Water District Hybrid Grass Carp Project's continuing efficacy evaluation of hybrid carp (female grass carp, *Ctenopharyngodon idella* X male bighead carp, *Hypophthalmichthys nobilis* and sterilized grass carp for controlling hydrilla and other aquatic plants in the Coachella and Imperial Valleys.

Samples of decaying hydrilla have been collected and sent to US Army Corps of Engineers Waterways Experiment Station (Vicksburg, MS) for possible isolation and culture of pathogenic bacteria and/or fungi. Several potential candidates for future biocontrol research have been isolated from IV hydrilla.

Survey and Detection. SCUBA and/or canal surveys for hydrilla have been conducted in areas adjacent to the infested portion of the IV, and a brief survey was conducted in part of the Mexicali, Mexico irrigation system. While no hydrilla was found in Mexico, it was found in several sections of the IV Central Main Canal (CMC), including a recently completed temporary storage reservoir. If the CMC system becomes as thoroughly infested as the western part of the IV, it will add about 400 miles of infested canal to the current total of about 300 miles. (Hydrilla Control Research Program; USDA IV Conservation Research Center; 4151 Highway 86; Brawley, CA 92227)

PROJECT 7.

CHEMICAL AND PHYSIOLOGICAL STUDIES

Robert F. Norris - Project Chairman

Summary -

Five reports were submitted for inclusion under this project in the 1983 Research Progress Reports. Two papers reported investigations of dormancy in barnyardgrass seed. Freezing at liquid nitrogen temperatures had little effect on germination. When various glycolysis or citric acid cycle intermediates were included in the germination medium, there were pronounced differences in response between frozen versus non-frozen seed. The data suggested that both glyceraldehyde (and derivatives) in the glycolysis pathway and succinic, fumaric, and malic acids in the citric acid cycle may be involved with dormancy.

Two papers demonstrated toxicity of the surfactants WK and X-77 to *Sesbania exaltata* growth when applied to the roots of seedlings, and how this interacted with either diuron or bromacil. Surfactant WK was more toxic than X-77, and both surfactants showed increasing effects over the rate-range of 0.1 to 1.0% w/w.

A single paper reported on the allelopathic potential of yellow starthistle residues incorporated into the soil. Germination of test species was not inhibited except at higher residue concentrations; shoot height and weight showed progressively greater inhibition with increasing residue concentrations. Residues of foliage or root material caused about the same degree of inhibition. Peat moss used as a control also inhibited growth of some test species.

The role of glycolysis pathway intermediates in barnyardgrass seed dormancy and germination. Jordan, James L. Changes in the germination (from water standards) or barnyardgrass (*Echinochloa crusgalli* (L.) Beauv.) seeds ultrafrozen 0 or 4 times with liquid nitrogen and germinated in the presence of 10^{-4} M glycolysis intermediates were investigated. To distinguish between germination changes resulting primarily from ultrafreezing and those changes resulting primarily from the addition of glycolysis pathway intermediates, student's T-test values were calculated. Negative T-test values correspond to increases in germination resulting from the substrate (intermediate); positive T-test values correspond to increases in germination primarily because of ultrafreezing effects. Fructose and metabolic intermediates at the terminal portion of glycolysis had negative T-test values (table); thus, the glycolysis reactions responsible for the metabolism of fructose, 3-phosphoglycerate, 2-phosphoglycerate, and pyruvic acid may be partially responsible for the innate dormancy of barnyardgrass seeds. The manner in which ultrafreezing stimulates glycolysis pathway reactions has not yet been determined. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Intermediate	Change in germination[a] 0 Freezes	Change in germination[a] 4 Freezes	T-test values
Fructose	19 ± 3	22 ± 3	-3.0
Fructose 6-phosphate (Potassium salt)	35 ± 3	20 ± 4	12.8
Fructose 1,6-diphosphate (Trisodium salt)	36 ± 3	14 ± 3	21.0
Dihydroxy acetone phosphate (DHAP) (Lithium salt)	27 ± 3	16 ± 5	8.0
Glyceraldehyde-3-phosphoric acid	32 ± 5	19 ± 3	9.5
3-Phosphoglycerate (Calcium salt)	-47 ± 4	15 ± 4	-46.5
2-Phosphoglycerate (Sodium salt)	-20 ± 5	18 ± 5	-22.8
Pyruvic acid	-23 ± 4	-5 ± 4	-13.5

[a] Data shown are means ± standard deviations. Change in germination was calculated by comparing the percent germination of seed exposed to intermediate with comparable seed exposed to no intermediate (water standards).

The role of citric acid cycle intermediates in barnyardgrass seed dormancy and germination. Jordan, James L. Changes in the germination (from water standards) of barnyardgrass (*Echinochloa crusgalli* (L.) Beauv.) seeds ultrafrozen 0 or 4 times with liquid nitrogen and germinated in the presence of 10^{-4} M citric acid cycle intermediates were investigated. To distinguish between germination changes resulting primarily from ultrafreezing and those resulting primarily from the addition of citric acid cycle intermediates, student's T-test values were calculated. Negative T-test values correspond to increases in germination resulting from the addition of the substrate (intermediate); positive T-test values correspond to increases in germination primarily because of ultrafreezing effects. Metabolic intermediates in the latter portion of the citric acid cycle had negative T-test values (table); thus, the citric acid cycle reactions responsible for the metabolism of succinic acid, fumaric acid, and malic acid may be partially responsible for the innate dormancy of barnyardgrass seeds. The manner in which ultrafreezing stimulates the citric acid cycle has not yet been determined. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

	Change in germination[a]		
Intermediate	0 Freezes	4 Freezes	T-test
Oxaloacetic acid (OAA)	24 ± 4	19 ± 2	4.7
Acetyl CoA (Lithium salt)	31 ± 4	18 ± 3	11.1
Citric acid	37 ± 5	22 ± 2	11.8
Isocitric acid	34 ± 4	21 ± 3	11.1
Coenzyme A (Lithium salt)	29 ± 7	21 ± 4	4.2
Succinyl CoA (Sodium salt)	30 ± 4	20 ± 4	7.5
Succinic acid	4 ± 5	16 ± 5	-7.2
Fumaric acid	10 ± 6	14 ± 5	-2.1
Malic acid	1 ± 6	8 ± 5	-3.8

[a] Data shown are means ± standard deviations. Change in germination was calculated by comparing the percent germination of seed exposed to intermediate with comparable seed exposed to no intermediate (water standards).

Effects of surfactants WK and X-77 on diuron reduction of *Sesbania exaltata* growth. Jordan, Lowell S. and James L. Jordan. Fifteen *Sesbania exaltata* seeds were placed in growth pouches containing 30 ml Hoagland's solution with 0.1, 0.5, or 1.0% surfactant WK or X-77 and 0.75, 1.5, or 3.0 ppm ai diuron. After 10 days, the plants were harvested and the shoot and root length and wet weight were determined. Four replications were used, and the plants were grown in lighted growth chambers at 24 C. Results are presented in the following table.

Surfactants WK and X-77 combined with diuron reduced *Sesbania exaltata* growth more than did diuron alone. Surfactant WK was more toxic to *Sesbania exaltata* than X-77, and its combination with the diuron resulted in the greatest reduction in plant growth. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Length and weight of roots and shoots of *Sesbania exaltata* grown in nutrient solution containing various concentrations of surfactants WK, X-77, and the herbicide diuron

		Shoot		Root	
Surfactant	Conc. (%)	Length (cm)	Weight (g)	Length (cm)	Weight (g)
Control	0.0	6.0	0.17	13.7	0.03
WK	0.1	5.2	0.10	9.7	0.02
WK	0.5	3.3	0.09	3.3	0.01
WK	1.0	2.5	0.07	2.2	0.01
X-77	0.1	5.2	0.15	13.2	0.04
X-77	0.5	4.8	0.12	11.2	0.03
X-77	1.0	4.8	0.11	11.3	0.03
		---------------- diuron	0.75 ppm	----------------	
None	0.0	5.2	0.14	14.3	0.04
Wk	0.1	3.3	0.08	9.5	0.02
Wk	0.5	2.7	0.08	2.8	0.01
Wk	1.0	1.5	0.08	1.3	0.01
X-77	0.1	4.0	0.11	12.3	0.03
X-77	0.5	4.0	0.09	9.0	0.03
X-77	1.0	3.3	0.06	9.3	0.02
		---------------- diuron	1.5 ppm	----------------	
None	0.0	5.0	0.11	11.5	0.03
Wk	0.1	2.5	0.09	9.5	0.02
Wk	0.5	2.2	0.08	2.7	0.01
Wk	1.0	1.3	0.05	1.3	0.01
X-77	0.1	4.2	0.09	11.8	0.03
X-77	0.5	3.3	0.08	10.7	0.03
X-77	1.0	2.8	0.07	10.7	0.03
		---------------- diuron	3.0 ppm	----------------	
None	0.0	4.0	0.09	11.7	0.03
Wk	0.1	3.0	0.07	10.0	0.02
Wk	0.5	1.7	0.07	2.3	0.01
Wk	1.0	1.3	0.08	2.0	0.01
X-77	0.1	3.3	0.08	11.0	0.03
X-77	0.5	2.8	0.08	9.5	0.03
X-77	1.0	2.3	0.08	8.3	0.02

Effects of surfactants WK and X-77 on bromacil activity. Jordan, Lowell S. and James L. Jordan. *Sesbania exaltata* seeds were placed in growth pouches containing 30 ml 50% Hoagland's solution with 0.1, 0.5, or 1.0% w/w surfactant WK or X77, plus 0.75, 1.5, or 3.0 ppm w/w ai bromacil. Ten days later, the growing plants were harvested and the length and wet weight of the shoots and roots were determined. Cultures were replicated four times in lighted growth chambers at 24 C with 15 seedlings per culture. Results are presented in the following table.

Surfactant WK reduced plant size more than either X-77 alone or bromacil alone. Combination of surfactant WK and bromacil nutrient solution did not result in a greater decrease in plant size than for the more toxic factor in the solution. The combination of X-77 with bromacil decreased growth more than expected from either constituent alone. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521)

Length and weight of roots and shoots of *Sesbania exaltata* grown in nutrient solution containing various concentrations of surfactants WK, X-77, and the herbicide bromacil

		Shoot		Root	
Surfactant	Conc.(%)	Length(cm)	Weight(g)	Length(cm)	Weight (g)
Control	0.0	5.5	0.16	14.0	0.03
WK	0.1	5.2	0.10	9.7	0.02
WK	0.5	3.3	0.09	3.3	0.01
WK	1.0	2.5	0.07	2.2	0.01
X-77	0.1	5.2	0.15	13.2	0.04
X-77	0.5	4.8	0.12	11.2	0.03
X-77	1.0	4.8	0.11	11.3	0.03
		Bromacil 0.75 ppm			
None	0.0	3.5	0.08	11.5	0.03
Wk	0.1	3.6	0.08	9.8	0.01
Wk	0.5	2.7	0.05	2.8	0.01
Wk	1.0	2.5	0.06	1.5	0.01
X-77	0.1	3.7	0.06	10.2	0.01
X-77	0.5	3.3	0.05	10.2	0.01
X-77	1.0	3.2	0.05	8.5	0.01
		Bromacil 1.5 ppm			
None	0.0	3.3	0.08	12.0	0.03
Wk	0.1	2.8	0.07	8.2	0.01
Wk	0.5	2.5	0.06	3.2	0.01
Wk	1.0	2.2	0.05	2.2	0.01
X-77	0.1	3.2	0.05	10.7	0.01
X-77	0.5	3.0	0.06	10.0	0.01
X-77	1.0	2.7	0.05	8.7	0.01
		Bromacil 3.0 ppm			
None	0.0	3.5	0.07	11.2	0.02
Wk	0.1	3.3	0.07	9.2	0.01
Wk	0.5	3.0	0.06	3.0	0.01
Wk	1.0	2.7	0.06	2.1	0.01
X-77	0.1	2.8	0.07	10.3	0.01
X-77	0.5	2.5	0.05	8.8	0.01
X-77	1.0	2.0	0.04	8.7	0.01

The allelopathic potential of yellow starthistle. Zamora, D. L., R. H. Callihan, and D. C. Thill.

ROOT RESIDUE

Roots collected from a dense stand of yellow starthistle (*Centaurea solstitialis* L.) were dried for 48 hours at 46 C, ground to pass a 4 mm screen and stored in airtight plastic containers until needed. Field samples indicated that natural root concentrations to a depth of 15 cm approximated 0.45% with 1.2-1.5 m plants. Treatment residue levels were based on this amount. The root residue and soil were weighed and thoroughly mixed prior to potting. Twenty-five seeds of an indicator species were placed in each pot. The indicator species were yellow starthistle, downy brome (*Bromus tectorum* L.), bluebunch wheatgrass (*Agropyron spicatum* (Pursh) Scribn. and Smith), intermediate wheatgrass (*Agropyron intermedium* (Host) Beauv.), and Idaho fescue (*Festuca idahoensis* Elmer.). The pots were arranged in the greenhouse in a randomized complete block design with six replications. The pots were sub-irrigated to maintain the soil at or near field capacity. Germination was recorded every four days for 17 days, at which time the plants were thinned to the five largest plants per pot and allowed to grow for 4 more weeks. The shoots were then measured, harvested, dried for 48 hours at 57 C and weighed. The soil from pots of one complete replication was analyzed for available nutrients (NO3-N, P, K), electrical conductivity (EC), pH, and organic matter (OM).

The indicator species generally followed a progressive dose-response relationship in height and weight, with the higher residue concentration causing the greatest reduction in weight and height. Shoot biomass was affected more than height or germination. There were no significant effects of root residue on germination of bluebunch wheatgrass, downy brome, and Idaho fescue. Intermediate wheatgrass and yellow starthistle responded to the intermediate levels of root residue with increased germination and to the high level of residue with decreased germination.

Results of the soil analyses at the end of the experiment indicated that available nitrogen, available phosphorous, and EC decreased, while pH increased as the amount of root material incorporated into the pots increased.

FOLIAGE RESIDUE

Foliage residue of yellow starthistle was collected and prepared in the same manner as root residue. Field sampling indicated that foliage to soil w/w percentage to a depth of 15 cm was 1.5% with plants 1.2-1.5 m tall. Treatments selected were based on this value; 1.38% milled peat moss was also included as an additional control. The greenhouse procedure used for the root residue was duplicated for the foliage residue except that pots were suface irrigated. After planting, germination was recorded weekly for 5 weeks; plants were then thinned to the largest 5 plants in each pot and allowed to grow for 2 more weeks. Plant height was measured, and the plants were harvested, dried, and weighed.

The response of indicator species to foliage residue was similar to the response elicited by root residue, with growth inhibition following a dose-response relationship. A notable exception to this relationship was the significantly increased germination of yellow starthistle in soil treated with 0.69% foliage residues. Root residue concentrations of 0.11% and 0.23% caused a similar increase in yellow starthistle germination. 1.38% milled peat moss resulted in inhibition equal to that resulting from 0.69% or 1.38% w/w foliage residue. Peat moss also resulted in reduction of bluebunch wheatgrass weight and height equivalent to reductions caused by 2.75% w/w foliage residue.

Table 1. Effect of yellow starthistle root residue on indicator species.

Growth Parameters	Root Residue Concentration	Indicator species					Means
		Inwg	Bbwg	Dobr	Yest	Idfe	
	%	--------------% of control-----------------					
weight	0	100 a[1]	100 a	100 a	100 a	100 a	100
	.11	99.4 a	71.5 b	83.1 b	91.2 a	95.2 a	88.1
	.23	75 a	55.9 bc	80.7 b	90.1 a	85.7 ab	77.5
	.45	69.2 a	46.9 cd	64.4 a	72.5 b	89.3 ab	68.5
	.90	63.1 a	30.2 d	44.2 d	54.9 c	76.2 b	53.7
height	0	100 a	100 a	100 a	100 a	100 a	100
	.11	96.9 ab	89.1 ab	94 ab	91.2 a	95.2 a	93.3
	.23	83.1 bc	88.4 ab	92.5 ab	90.1 a	85.7 ab	88
	.45	86.9 abc	80.9 bc	91 b	72.5 b	89.3 ab	84.1
	.90	79.4 c	68.3 c	77.4 c	54.9 c	76.2 b	71.2
germination	0	100 b	100 a	100 a	100 b	100 a	100
	.11	116 a	104 a	98.6 a	136 a	112 a	113
	.23	105 ab	105 a	97.3 a	111 ab	93.2 a	102
	.45	117 a	89.2 a	100 a	95.8 b	86.4 a	97.7
	.90	94.9 b	90.2 a	99.3 a	80.6 b	117 a	96.3

[1] For each parameter, means within a column followed by the same letter are not significantly different at the .05 level using Duncan's New Multiple Range Test. Mean separation was conducted on weight and height raw data and arc sine square root conversions of % germination.

Table 2. Soil analyses after incubation with root residue.

Root Residue Concentration	pH	EC	NO -N	P	K	OM
(%)		mmhos cm	(ug/g)	(ug/g)	(ug/g)	%
0	6.81 a[1]	.85 a	29.1 a	18.5 a	427 a	3.78 a
.11	6.97 ab	.76 ab	23.6 ab	17.4 ab	438 a	3.78 a
.23	6.87 a	.72 ab	22.5 ab	16.7 ab	437 a	3.69 a
.45	7.09 bc	.66 b	14.5 b	15.5 ab	374 a	3.74 a
.90	7.19 c	.65 b	17.0 b	14.3 b	467 a	3.71 a

Means within a column followed by the same letter are not significantly different at the .05 level using Duncan's New Multiple Range Test.

Table 3. Effect of yellow starthistle foliage residue on indicator species.

Growth Parameters	Foliage Residue Concentration	Indicator Species					Means
		Inwg	Bbwg	Dobr	Yest	Idfe	
	%	-----------------------% of control----------------					
weight	0	100 a[1]	100 a	100 a	100 a	100 a	100
	Peat	47.4 b	7.0 c	55.9 b	54.3 b	66.7 ab	46.3
	.69	56.8 b	71.9 a	97.6 a	46.5 b	167 a	88
	1.38	7.7 c	32.2 b	15.4 c	12.5 c	73.3 a	28.2
	2.75	3.8 c	1.7 c	4.0 c	3.2 c	0 b	2.5
height	0	100 a	100 a	100 a	100 a	100 a	100
	Peat	68.7 b	10.1 c	74.7 b	82.9 a	70.5 a	61.4
	.69	84.1 b	80 b	95.8 a	79.9 a	121 a	92.2
	1.38	43.4 c	63.9 b	57.7 b	38.7 b	70.5 a	54.8
	2.75	32.0 c	6.1 c	32.5 c	9.2 c	0 b	16
germination	0	100 a	100 a	100 a	100 a	100 a	100
	Peat	53.3 c	11.5 b	109 a	69.8 b	13.8 b	51.5
	.69	94.3 a	112 a	157 a	149 a	89.6 a	120.4
	1.38	73.8 bc	92.3 a	114 a	77.9 b	37.9 ab	79.2
	2.75	73 bc	9.6 a	98.3 a	33.7 c	0 b	42.9

[1] For each parameter, means within a column followed by the same letter are not significantly different at the .05 level using Duncan's New Multiple Range Test; mean separation was conducted on square root, raw data, and arc sine square root conversions of raw data for weight, height, and % germination respectively.

Allelopathic Effects of Crop and Weed Residues. R. M. Menges. Under warm, moist soil conditions and intense sunlight, fall-tilled residues of Palmer amaranth (*Amaranthus palmeri* S. Wats), grain sorghum and johnsongrass [*Sorghum halepense* (L.) Pers.] all inhibited the growth of onion as measured by fresh weight. Amaranth also inhibited growth of carrots. Cotton residues enhanced the early growth of several plants, but the stimulatory effects were temporary. Spring-tilled residues of cabbage, carrot, and onion inhibited the growth of cotton and amaranth. Common sunflower (*Helianthus annuus* L.) restricted the growth of amaranth; residues of amaranth were autotoxic. Allelopathic effects were more persistent in these field experiments than in earlier research under controlled environment with common sunflower residues on cabbage seedlings. Studies continue on the persistence of biological activity of plant residues, the importance of soil fertility in plant growth, and the isolation and identification of biologically active compounds from Palmer amaranth.
(USDA, ARS, OTA, P. O. Box 267, Weslaco, Texas 78596)

AUTHOR INDEX

Alley, H.P. . . . 4, 16, 18, 19, 23, 25, 67, 132, 175, 176, 177, 179, 181
Anderson, J.L. . . . 71, 73, 74, 88
Anderson, L.W.J. . . . 287, 289, 294, 298
Anderson, W.P. . . . 134, 136
Appleby, A.P. . . . 139, 140, 141, 142
Ashton, F.M. . . . 286
Baghott, K. . . . 234
Beaver, G. . . . 75
Beck, K.G. . . . 37
Behrends, D. . . . 80, 81
Bell, C.E. . . . 76, 138, 284
Bissell, S.R. . . . 286
Boyse, L.C. . . . 273
Braun, J.W. . . . 129
Brewster, B.D. . . . 139, 140, 141, 142
Burrill, L.C. . . . 144
Callihan, R.H. . . . 14, 29, 37, 40, 42, 43, 45, 47, 49, 53, 55, 59, 62, 69, 75, 95, 118, 120, 122, 123, 124, 147, 148, 183, 185, 187, 206, 209, 211, 213, 236, 238, 240, 242, 244, 252, 255, 257, 260, 262, 264, 268, 277, 310
Canevari, M.V. . . . 150, 152
Collins, R.L. . . . 78
Crabtree, G. . . . 98, 99
Dechoretz, N. . . . 287, 288, 289
Dewey, S.A. . . . 75, 95, 118, 150, 152, 153, 154, 268
Dickerson, G.W. . . . 65
Dyer, B. . . . 153, 154, 156, 158, 159
Edson, W.D. . . . 82, 83, 84, 85, 86, 87, 102, 103, 104, 106
Evans, J.O. . . . 160, 162, 163, 164, 165, 167, 169
Fay, P.K. . . . 153, 154, 156, 158, 159
Fennimore, S.A. . . . 94, 150, 152, 218, 222, 225
Frate, C.A. . . . 170
Garbacik, C. . . . 98
Gould, W.L. . . . 66
Gunnell, R.W. . . . 160, 162, 163, 164, 165, 167, 169
Haagenson, K.A. . . . 172
Hall, L. . . . 93
Hanson, E.J. . . . 101
Henson, M.A. . . . 279
Howard, S.W. . . . 174
Hoxworth, G. . . . 134, 136
Humburg, N.E. . . . 23, 132, 175, 176, 177, 178, 179, 180, 181
Huston, C.H. . . . 29, 43, 45, 53, 59, 62, 147, 148, 183, 184, 185, 186, 187, 277

Jachetta, J.J. 190
Johnson, W.S. 51
Jordan, J.L. 2, 3, 6, 7, 8, 9, 11, 12, 20, 27, 32, 34, 35, 77, 97, 110, 111, 112, 113, 114, 115, 116, 117, 128, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 285, 304, 306, 308
Jordan, L.S. 2, 3, 6, 7, 8, 9, 11, 12, 20, 27, 32, 34, 35, 77, 97, 110, 111, 112, 113, 114, 115, 116, 117, 128, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 285, 306, 308
Kambitsch, D.L. 14, 47, 49
Kaplan, D. 51
Kenner, T.K. 267
Kloft, P. 78
Krall, J.M. 51
Lange, A.H. 82, 83, 84, 85, 86, 87, 102, 103, 104, 106
Lish, J.M. 3, 43, 206, 207, 208, 209, 210, 211, 212, 213
Maxwell, B.D. 216
McAuliffe, D. 190
McHenry, W.B. 52, 283
Menges, R.M. 313
Mitich, L.W. 21, 94, 150, 152, 170, 218, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 266, 274, 276
Morishita, D.W. 236, 237, 238, 239, 240, 241, 242, 243, 244
Muh, A. 98, 99
Munier, D.J. 276
Nagle, T.L. 269, 270
Nielson, R.S. 274
Osterli, P.P. 94
Peabody, D.V. 90, 108, 248, 250
Poole, A.P. 127
Rackham, R.L. 101
Russell, R.C. 2, 3, 6, 7, 8, 9, 11, 12, 20, 27, 32, 34, 35, 110, 111, 112, 113, 128
Ryan, F.J. 289
Salhoff, C.R. 95, 118, 120, 122, 123, 124, 268
Schaat, B.G. 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264
Sheley, R.L. 40, 42, 43, 45, 53, 55, 59, 62
Sieckert, E.E. 225
Smith, B. 225
Smith, N.L. 21, 52, 227, 228, 229, 230, 231, 232, 233, 234, 266, 283

Stewart, V.R. 267
Stocker, R.K. 301
Stovicek, R.F. 69
Sullivan, E.F. 172
Tennis, C. 298
Thill, D.C. 14, 29, 37, 40, 42, 43, 45, 47, 49, 53, 55, 59, 62, 69, 147, 148, 183, 184, 185, 186, 187, 206, 207, 208, 209, 210, 211, 212, 213, 236, 237, 238, 239, 240, 241, 242, 243, 244, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 277, 310
Thomas, L. 298
Thurston, J.R. 291, 292, 293
Torell, J.M. 75, 95, 118, 120, 122, 123, 124, 268
Vandepeute, J. 269
Veseth, C.B. 216
Vore, R.E. 4, 16, 18
Weeks, M.G. 71, 74, 88
Whitesides, R.E. 174, 270, 271
Whitson, T.D. 16, 18, 19, 25, 67
Whitworth, J.W. 273
William, R.D. 80, 81, 93, 101, 127, 129
Wilson, C.B. 266
Wright, S.D. 274, 276
Yeo, R.R. 291, 292, 293
Zamora, D.L. 29, 43, 45, 62, 147, 148, 183, 184, 185, 186, 187, 277, 310
Zimdahl, R.L. 279
Zimmerman, M. 81

HERBACEOUS WEED INDEX

(alphabetically by scientific name)

Aegilops cylindrica Host. (goatgrass, jointed) 154
Agropyron repens (L.) Beauv. (quackgrass) 124, 141
Amaranthus albus (tumble pigweed) 160, 200
Amaranthus palmeri S. Wats (Palmer Amaranth) 313
Amaranthus powelii (S.) Wats. (Amaranth, powell) 90, 95
Amaranthus retroflexus L. (pigweed, redroot) . . . 71, 74, 88, 95, 164, 169, 172, 187, 200, 203, 228, 231, 273
Ampelamus albidus (Nutt.) Britt. (milkweed, honeyvine) 9
Amsinckia intermedia Fisch. & Mey (fiddleneck, coast) 148, 255, 260
Anabaena spp. (blue-green algae) 285
Anthemis cotula L. (mayweed) 147, 148, 187, 238, 252, 257, 264
Apera spica-venti L. Beauv. (windgrass) 238
Aphanizomenon spp. (blue-green algae). 285
Avena fatua L. (oat, wild) 81, 147, 165, 167, 185, 193, 234 240, 244, 257, 264, 274, 276, 283
Brassica kaber (DC.) L.C. Wheeler var. pinnatifida (Stokes) L.C. Wheeler (mustard, wild) 283
*Brassica nigra*L. Koch (mustard, black) 193
Bromus arvensis L. (brome, field) 139, 140
Bromus rigidus Roth (brome, ripgut) 240
Bromus tectorum L. (brome, downy) 55, 59, 122, 123, 132, 142, 206, 207, 208, 208, 209, 210, 211, 212, 213, 236, 310
Bromus secalinus L. (cheatgrass) 267
Capsella bursa-pastoris (L.) Medic. (shepherdspurse) . . . 84, 88, 90, 102 238, 248, 257, 264
Cardamine pensylvanica (L.) Muhl. (bittercress, pennsylvania). . . . 248
Caucalis microcarpa H & A (parsley, hedge) 255
Centaurea maculosa L. (knapweed, spotted) 40
Centaurea solstitialis L. (starthistle, yellow) 43, 45, 52, 53, 55, 59, 62, 310
Chara spp. (Chara) 74, 84, 88, 90, 95, 102, 104, 285
Chenopodium album L. (lambsquarters, common) 148, 149, 150, 172, 181, 187, 193, 194, 200, 203, 228, 250, 251, 252, 262, 264
Chenopodium spp. (lambsquarters) 176, 177, 178, 179
Chenopodium leptophyllum Nutt. (lambsquarters, slimleaf) 175, 176
Chenopodium murale L. (goosefoot, nettleleaf) 76
Chorispora tenella D.C. (mustard, blue) 73, 267
Chydomonas spp. (green algae) 285
Cirsium arvense (L.) Scop. (thistle, Canada) 14, 20, 21, 37, 153
Cladophora glomorata (Cladophora) 289
Collinsia parviflora Dougl. (collinsia, smallflower). 160
Colvolvulus arvensis L. (bindweed, field) 118, 120, 124, 252
Crupina vulgaris Cass. (crupina) 47, 49
Cuscuta campestris Yunck (dodder, field). 163
Cuscuta indecora Choisy (dodder, largeseed). 86, 87
Cynodon dactylon (L.) Pers. (bermudagrass) 284
Cyperus esculentus L. (nutsedge, yellow). . 7, 8, 150, 151, 152, 162, 273

Cyperus rotundus L. (nutsedge, purple) 2, 3, 6, 11, 12, 27, 32, 34, 35, 112
Datura stamonium (Jimsonweed) 273
Descurania sophia (L.) Webb (flixweed) 255
Dichondra repens Forst. (dichondra, wild) 110
Digitaria sanquinalis (L.) Scop. (crabgrass, large) . . 200, 201, 202, 203
Distichlis stricta (Torr.) Rybd. (saltgrass, desert). 51
Draba, verna L. (whitelowwort, spring) 122
Echinochloa colonum (L.) Link (junglerice) 71, 74, 75, 93, 95, 98,
103, 104, 127, 200, 201, 202, 203, 273
Echinochloa crus-galli (L.) Beauv. (barnyardgrass) 142, 150, 193,
200, 201, 202, 203, 218, 219, 220, 221, 222, 227, 231, 269, 273, 304, 305
Eichornia crassipes (Mart) Solms. (water hyacinth) 298
Eleocharis acicularis (L.) R & S (slender spikerush). 286, 291, 292
Eleocharis coloradoensis (L.) R & S (dwarf spikerush) 286
Elodea canadensis (American elodea) 292
Elymus capit-medusae L. (wildrye, medusa-head) 55
Eragrostis cilianensis (All.) Lutati (Stinkgrass). 74
Echinochloa crus-galli var frumentacea (Roxb.) W.F. Wright (Millet,
Japanese) 195, 197
Eriochloa contracta Hitchc. (cupgrass, prairie) 138
Erodium cicutarium (L.) L'Her. (filaree, redstem). 55, 122
Euphorbia esula L. (spurge, leafy). 16, 216
Galium aparine L. (bedstraw, catchweed) 174, 252, 253,
254, 255, 256, 257
Glycyrrhiza lepidota (Nutl.) Pursh. (licorice, wild). 18
Hibiscus trionum L. (mallow, Venice) 74, 88
Hicracium pratense Tausch (hawkweed, yellow) 42
Helianthus annuus L. (Common sunflower) 313
Hydrilla verticilliata (Royle.) (hydrilla) 292, 294, 301
Ipomoea spp. (morningglory) 273
Juncus bufonius L. (toadrush) 127
Kochia scoparia (L.) Schrad. (kochia). 172, 181
Lactuca serriola L. (lettuce, prickly) . . . 37, 160, 206, 207, 208, 209,
210, 211, 212, 213, 240, 260
Lamium amplexicaule L. (henbit) 37, 90, 238, 248, 252, 257,
258, 259, 260, 261, 262, 267
Leersia oryzoides (L.) Swartz (cutgrass, rice). 127
Lepidium campestro (L.) R. Br. (pepperweed, field) 122, 123, 132
Lepidium perfoliatum L. (pepperweed, clasping). 213, 236
Litospermum arvense L. (gromwell, corn) 37, 252, 267
Lolium multiflorum Lam. (ryegrass, Italian). 139, 140, 142, 193
Lolium perenel (ryegrass, perennial) 129
Malva perviflora L. (mallow, cheeseweed). 193, 200, 203
Microspora spp. (green algae) 285
Myosotis arvensis (L.) Hill (forget-me-not, field) 238, 257
Myriophyllum spicatum (eurasian water milfoil). 285, 292
Najas quadalupensis (Spreng.) Magnus (naiad, southern) 293
Panicum capillare L. (witchgrass) 74, 181
Panicum milliaceum L. (millet, proso). 268
Paspalum dilatatum Poir. (dallisgrass) 110
Phalaris arundinacea L. (canarygrass, reed). 193

HERBACEOUS WEED INDEX (continued)

Phalaris minor Retz. (canarygrass, littleseed). 76
Physalis wrightii Gray (groundcherry, wright) 273
Poa annua L. (bluegrass, annual) 110, 139, 140, 142, 190, 193, 248, 249, 250
Polygonum aviculare L. (knotweed, prostrate) 90, 193, 236, 240, 250
Polygonum convolvulus L. (buckwheat, wild) 148, 175, 252, 257
Polygonum monspeliensis (L.) Desf. (rabbitfoot grass) 76
Polygonum pensylvanicum L. (smartweed, Pennsylvania). 90, 250
Portulaca oleracea L. (purslane, common). 71, 74, 150, 151, 152, 218, 228, 229, 230, 231
Potamogeton nodosus Poir. (American pondweed) 287
Potamogeton pectinatus L. (pondweed, sago) 292, 293
Pteridium aquilinum var. *Pubescens* Underw. (western brackenfern). . . 69
Raphanus raphanistrum L. (radish, wild) 99
Raphanus sativus (radish, wild). 283
Salsola kali L. var. tennifolia Tausch (thistle, Russian) 88, 122, 172, 175, 176, 177, 178, 179, 180, 181, 203, 206, 273
Secale cereale L. (rye, common). 154
Sesbania exaltata (Raf.) Cory (sesbania, hemp). 306, 308
Senecio vulgaris L. (groundsel, common) 90, 104, 248
Ranunculus scleratus L. (buttercup, celeryleaf) 257
Setaria lutescens (Weigel) Hubb. (foxtail, yellow) 266
Setaria viridis (L.) Beauv. (foxtail, green) 71, 75, 95, 142, 164, 169, 172, 269
Silene, noctiflora L. (catchfly, nightflowering) 260
Sisymbrium altissimum L. (mustard, tumble) . . 37, 122, 124, 209, 213, 240
Sisybrium irio L. (London rocket) 82, 83, 94, 95, 103, 106, 193
Solanum americanum Mill. (nightshade, American black) 269
Solanum nigrum L. (nightshade, black). 74, 85, 86, 87, 88, 218, 219, 220, 221, 222, 228, 229, 230, 231, 269
Solanum sarachoides Sendt. (nightshade, hairy). 218, 219, 220, 221, 222, 269
Solanum triflorum Nutt. (nightshade, cutleaf) . . . 19, 25, 104, 110, 179
Sorghum halepense (L.) Pers. (Johnsongrass). 117, 225, 273, 313
Stellaria media (L.) Cyrillo (chickenweed, common) . . 90, 209, 248, 267
Thlaspi arvense L. (pennycress, field) 37, 187, 240, 252, 257
Triticum aestivum (wheat, volunteer) 160, 175, 176, 177, 206, 207, 208, 209, 213
Veronica campylopoda L. (speedwell, snow) 160
Xanthium Pensylvanicum Wall r. (cockleburr, common) 71

HERBACEOUS WEED INDEX

(alphabetically by common name)

Algae, blue-green (Anabaena spp.) (Aphanizomenon spp.) 285
Algae, green (Chydomonas spp.) (Microspora spp.) 285
Amaranth, powell (Amaranthus powellii (S.) Wats) 90, 95
Amaranth, Palmer (Amaranthus palmeri (S.) Wats) 313
Barnyardgrass (Echinochloa crus-galli (L.) Beauv.) 71, 74, 75, 93, 95, 98, 103, 104, 127, 142, 150, 193, 200, 203, 218, 219, 220, 221, 222, 227, 231, 269, 273, 304, 305
Bluegrass, annual (Poa annua) 139, 142, 190, 193, 248, 249, 250
Bedstraw, catchweed (Galium aparine L.) 174, 252, 255, 256, 257
Bermudagrass (Cynodon dactylon (L.) Pers.) . . . 110, 112, 116, 117, 284
Bittercress, Pennsylvania (Cardamine pensylvania Muhl.). 248
Bindweed, field (Convolvulus arvensis L.) 14, 20, 21, 120, 124, 252
Bluegrass, annual (Poa annua L.) 110
Brackenfern, Western (Pteridium aquilinum var. pubescens Underw.) . . . 69
Brome, downy (Bromus tectorum L.) 55, 59, 122, 124, 132, 142, 206, 207, 208, 209, 210, 211, 212, 213, 236, 310
Brome, field (Bromus arvensis L.) 139, 140
Brome, ripgut (Bromus rigidus Roth) 240
Buckwheat, wild (Polygonum convolvulus L.) . . . 148, 175, 176, 252, 257
Buttercup, celeryleaf (Ranunculus scleratus L.) 257
Canarygrass, little seed (Phalaris minor) 76
Canarygrass, reed (Phalaris arundinacea L.). 193
Canada Thistle (Cirsium arvense L.) 4, 19, 23, 25, 37, 153
Catchfly, nightflowering (Silene noctiflora L.) 260
Chara (Chara spp.) 293
Cheatgrass (Bromus secalinus L.) 267
Chickweed, common (Stellaria media (L.) Cyrillo) 90, 209, 248
Cladophora (Cladophora glomorata) 289
Cocklebur, common (Xanthium pensylvanicum Wallr.). 71
Collinsia, smallflower (Collinsia parviflora Dougl.). 160
Crabgrass, large (Digitaria sanguinalis (L.) Scop) 200, 203
Crupina (Crupina vulgaris Cass.) 47, 49
Cupgrass, prairie (Eriochloa contracta Hitchc.) 138
Cutgrass, rice (Leersia oryzoides (L.) Swartz). 127
Dallisgrass (Paspalum dilatatum Poir.) 110
Dichondra, wild (Dichondra repens Forst.) 110
Dodder, field (Cuscuta campestris Yunck). 163
Dodder, largeseed (Cuscuta indecora Choisy). 86, 87
Elodea, American (Elodea canadensis) 292
Fiddleneck, coast (Amsinckia intermedia Fisch. & Mey) 148, 255, 260
Filaree, redstem (Erodium circutarium L.) 55, 122
Flixweed, (Descurania sophia (L.) Webb) 255
Forget-me-not, field (Myosotis arvensis L. Hill) 238, 257
Foxtail, green (Setaria viridis (L.) Beauv.) 71, 75, 95, 142, 164, 165, 169, 170, 171, 172, 269
Foxtail, yellow (Setaria lutescens (Weigel) Hubb). 266
Goatgrass, jointed (Aegilops cylindrica Host.). 154
Goosefoot, Nettleleaf (Chenopodium murale L.) 76

Gromwell, corn (*Lithospermum arvense* L.) . . . 37, 252, 267
Groundcherry, wright (*Physalis wrightii* Gray) . . . 273
Groundsel, common (*Senecio vulgaris* L.) . . . 90, 104, 248
Hawkweed, yellow (*Hieracium pratense* Tausch) . . . 42
Hemp sesbania (*Sesbania exalta* (Raf. Cory) . . . 306, 308
Henbit (*Lamium amplexicaule* L.) . . . 37, 90, 238, 248, 252, 257, 258, 259, 260, 261, 262, 267
Hydrilla (*Hydrilla verticillata* Royle) . . . 292, 294, 301
Jimsonweed (*Datura stamonium*) . . . 273
Johnsongrass (*Sorghum halepense* (L.) Pers.) . . . 117, 225, 273, 313
Jungle rice (*Echinochloa colonum*) . . . 200, 203, 273
Knapweed, spotted (*Centaurea maculosa* I.) . . . 40
Knotweed, prostrate (*Polygonum aviculare* L.) . . . 90, 193, 236, 240, 250
Kochia (*Kochia scoparia* (L.) Schrad.) . . . 172, 181
Lambsquarters, common (*Chenopodium album* L.) . . . 74, 84, 88, 90, 95, 102, 104, 148, 149, 150, 172, 177, 178, 179, 181, 187, 193, 200, 201, 202, 203, 228, 250, 251, 252, 262, 263, 264
Lambsquarters, slimleaf (*Chenopodium leptophyllum* Nutt.) . . . 175, 176
Lettuce, prickly (*Lactuca serriola* L.) . . . 37, 160, 206, 207, 208, 209, 210, 211, 212, 213, 240, 260
Licorice, wild (*Glycyrrhiza lipidota* (Nutt.) Pursh) . . . 18
London rocket (*Sisbymbrium irio* L.) . . . 193
Mallow (cheeseweed) (*Malva perviflora*) . . . 193, 200, 203
Mallow, Venice (*Hibiscus trionum* L.) . . . 74, 88
Mayweed (*Anthemis cotula* L.) . . . 147, 148, 187, 238, 252, 257, 264
Millet, Japanese (*Echinochloa crus-galli* var. frumentacea) . . . 195, 197
Millet, proso (*Panicum milliacum* L.) . . . 268
Milkweed, honeyvine (*Ampelamus albidus* (Nutt.) Britt) . . . 9
Morningglory (*Ipomoea* spp.) . . . 273
Mustard, black (*Brassica nigra* L. Koch) . . . 193
Mustard, blue (*Chorispora tenella* D.C.) . . . 71, 267
Mustard, tumble (*Sisymbrium altissimum* L.) . . . 37, 122, 124, 209, 213, 240
Mustard, wild (*Brassica Kaber* (DC.) L.C. Wheeler var. *pinnatifida* (Stokes) L.C. Wheeler) . . . 283
Naiad, southern (*Najas quadalupensis* (Sprong.) Magnus) . . . 293
Nightshade, American black (*Solanum americum* Mill.) . . . 269
Nightshade, black (*Solanum nigrum* L.) . . . 82, 83, 85, 87, 94, 103, 106, 218, 219, 220, 221, 222, 228, 229, 230, 231, 269
Nightshade, cutleaf (*Solanum triflorum* Nutt.) . . . 19, 25, 179
Nightshade, hairy (*Solanum sarachoides* Sendt.) . . . 74, 88, 95, 218, 219, 220, 221, 222, 269
Nutsedge, purple (*Cyperus rotundus* L.) . . . 2, 3, 6, 11, 12, 27, 32, 34, 35
Nutsedge, yellow (*Cyperus esculentus* L.) . . . 7, 8, 78, 113, 150, 151, 152, 162, 273
Oat, wild (*Avena fatua* L.) 81, 147, 165, 166, 167, 185, 193, 234, 240, 244, 257, 264, 274, 275, 276, 283
Parsley, hedge (*Caucalis microcarpa* H & A) . . . 255
Pennycress, field (*Thilaspi arvense* L.) . 37, 122, 124, 187, 240, 252, 257
Pepperweed, clasping (*Lepidium perfoliatum* L.) . . . 213, 236
Pepperweed, field (*Lepidium campestro* L.) . . . 132

HERBACEOUS WEED INDEX (continued)

Pigweed, redroot (Amaranthus retroflexus L.) 71, 88, 95, 164, 169, 172, 187, 200, 203, 228, 229, 230, 231, 273
Pigweed, tumble (Amaranthus albus). 160, 200
Pondweed, American (Potamogeton nodosus Poir.). 287
Pondweed, sago (Potamogeton pectinatus Poir.) 292, 293
Purslane, common (Portulaca oleracea L.). 71, 74, 150, 151, 152,
Quackgrass (Agropyron repens (L.) Beauv.) 124, 141
Rabbitfoot grass (Polygonum monspeliensis (L.) Desf.) 76
Radish, wild (Raphanus sativus) 99, 283
Rye, common (Secale cereale). 154
Ryegrass, Italian (Lolium multiflorum Lam.). 139, 140, 142, 193
Saltgrass, desert (Distichlis stricta (Torr.) Rybd.). 51
Sesbania, hemp (Sesbania exaltata (Raf.) Cory). 306, 308
Shepherdspurse (Capsella bursa-pastoris (L.) Medic.). . . . 84, 88, 90, 102, 238, 248, 257, 264
Smartweed, Pennsylvania (Polygonum pennsylvanicum) 90, 250
Sowthistle, annual (Sonchus oleraceus L.) 104, 110
Speedwell, snow (Veronica spp.) 160
Spikerush, dwarf (Eleocharis coloradoensis (L.) Roem & Schutt.) 286
Spikerush, slender (Eleocharis acicularis (L.) Roem & Schutt.) 286, 291, 292
Spurge, leafy (Euphorbia esula L.). 16, 216
Starthistle, yellow (Centaurea solstitialis L.) 43, 45, 52, 53, 55, 59, 62, 310
Stinkgrass (Eragrostis cilianensis) 74
Sunflower, common (Helianthus annus L.) 313
Thistle, Canada (Cirsium arvense L.) 153
Thistle, Russian (Salsola kali (L.) var. tennuifolia Tausch.). . 88, 122, 172, 175, 176, 177, 178, 179, 180, 181, 203, 206, 228, 273
Toadrush (Juncus bufonius L.) 127
Water hyacinth (Eichornia crassipes (Mart) Solms.) 298
Watermilfoil, eurasian (Myriophyllum spitacum). 285, 292
Wheat, volunteer (Triticum aestivum) 160, 175, 176, 177, 206, 207, 208, 209, 213
Windgrass, (Apera Spica-venti (L.) Beauv.) 238
Witchgrass (Panicum capillare L.) 74, 181
Wildrye, medusa-head (Elymus caput-medusae L.). 55
Whitlowwort, spring (Draba verna L.) 122

WOODY PLANT INDEX

(alphabetically by scientific name)

Page

Acer glabrum Torr. (Rocky Mountain Maple) 69

Artemisia tridentata Nutt. (Big sagebrush) 67

Ceanothus sanguineus Pursh. (Redstem ceanothus) 69

Ceanothus velutinus Dougl. (Snowbrush ceanothus) 69

Pachistima myrsinites Pursh. (Pachistima) 69

Physocarpus malvaceus (Greene) Kuntze (Ninebark) 69

Prosopis juliflora var. *glandulosa* (Torr.) Cockerell (Mesquite) 66

Rubus parviflorus Nutt. (Thimbleberry) 69

Xanthocephalum sarothrae (Broom snakeweed) 65

WOODY PLANT INDEX

(alphabetically by common name)

Page

Ceanothus, redstem (*Ceanothus sanguineus* Pursh) 69

Ceanothus, snowbrush (*Ceanothus velutinus* Dougl). 69

Maple, Rocky Mountain (*Acer glabrum* Torr) 69

Mesquite (*Prosopis juliflora* var. *glandulosa* (Torr.) Cockerell). 66

Ninebark (*Physocarpus malvaceus* (Greene) Kuntze). 69

Pachistima (*Pachistima myrsinites* Pursh.) 69

Sagebrush, big (*Artemisia tridentata* Nutt.) 67

Snakeweed, broom (*Xanthocephalum sarothrae*) 65

Thimbleberry, western (*Rubus parviflorus* Nutt.) 69

CROP INDEX

	Page
Alfalfa	37, 132, 138, 163, 164, 165, 183, 191, 192, 199, 200, 203, 266, 279
Apple	118, 120, 122
Asparagus	77, 191, 193, 200, 203
Barley	142, 156, 157, 158, 167, 181, 191, 192, 244, 250, 251, 252, 262, 263, 264, 274, 275, 276
Beans, Faba	248
Beans, kidney	150, 151, 152, 225
Beans, lima	218, 219, 220, 221, 222
Beans, pink	218, 219, 220, 221, 222
Beans, pinto	156, 279
Beans, snap	94
Bentgrass	142
Blackberry	129
Bluegrass, Kentucky	142
Bluegrass, Sherman big	55
Broccoli	99, 101, 144, 147, 191, 193
Bulbs, ornamental	108
Cantaloupe	200, 203
Carrot	191, 193
Cherries	124
Chickpea	185, 186, 187
Citrus	8, 110, 111, 112, 113, 114, 115, 116, 117
Corn	142, 143, 144, 156, 162, 169, 199, 200, 203, 228, 229, 230, 231, 268
Corn, sweet	96
Cotton	136, 199, 200, 201, 202, 203, 273
Cowpeas, Blackeye	170
Cranberry	127
Crucifers	99, 101
Cucumber	88, 90, 144
Fescue, fine	142
Fescue, tall	142
Fir, Douglas	69
Garlic	80, 81
Grapes	128
Iris	108
Junegrass, prairie	67
Lentils	147, 148, 185, 186, 187, 191, 193, 200, 203
Lettuce	97
Melon	88
Narcissus	108
Oats	25, 142, 143, 144, 153, 279
Onion	71, 73, 74, 75, 76, 77, 78, 191, 193, 200, 203, 273
Orange	114, 115, 116, 117
Orchardgrass	142
Peas	185, 187, 187, 277

CROP INDEX (continued)

Page

Pepper 134, 273
Peppermint 141
Pine lodgepole 69
Plum 123
Rape 144
Raspberry 129
Rye 142
Ryegrass, Italian 144
Ryegrass, perennial 142
Safflower 156, 157, 158, 200, 203
Sesame 200, 203
Sorghum 142, 199, 200, 203, 227
Soybean 144
Spinach 191, 193, 203
Squash 88
Sugar beet 144, 156, 172, 191, 192, 199, 200
Sunflower 156, 157, 158
Tangelo 112
Tomato 82, 83, 84, 85, 86, 87, 200, 203, 269
Tulip 108
Watermelon 88, 93
Wheat 139, 140, 142, 143, 144, 154, 155, 156, 157, 158, 159, 160, 174, 175, 176, 177, 178, 179, 190, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 250, 255, 256, 257, 258, 259, 260, 267, 270, 271, 277, 278, 279
Wheatgrass, crested 23
Wheatgrass, Greenar intermediate. 55
Wheatgrass, western 67

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 26(6):1978) and WSSA Herbicide Handbook (4th ed.). A herbicide name occupying two or more lines and separated by an equal (=) sign is written as one word when written on one line.

Common Name or Designation	Chemical Name	Page
AC 222,243	Not available	257
AC 222,293	Not available	154, 167, 234, 236
acetochlor	2-chloro-N(ethoxymethyl)-6'-ethyl-o-acetotoluidide	90
acifluorfen	5-(2-choro-4-(trifluoromethyl)phenoxy)-2-nitrobenzoic acid	82, 83, 84, 150, 152, 170, 187, 218, 269
acrolein	2-propenal	301
alachlor	2-chloro-2',6'-diethyl-N-(methoxymethyl) acetanilide	88, 94, 95, 97, 99, 139, 140, 162, 170, 222, 227, 231, 268
amitrole	3-amino-S-triazole	115, 160, 283
asulam	methyl sulfanilycarbamate	266
atrazine	2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine	27, 95, 144, 160, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 209, 213, 228, 268, 283
barban	4-chloro-2butynyl-m-chlorocarbanilate	167, 244, 257, 264, 274
Bay Met 1486	N-(5-(ethylsulfonyl)=1,3,4-thiadiazol-2-yL)-N,N'dimethylurea	283
bensulide	O,O-diisopropyl phosphorodithioate) S-ester with N-(2-mercaptoethyl) benzenesulfonamide	76, 90

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
bentazon	3-isopropyl-1H 2,1,3-benzothiadiazin-4-(3H)-one 2,2,-dioxide	77, 150, 152, 170, 187, 218, 228
bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate	82
bromacil	5-bromo-3-*sec*-6-methyluracil	2, 3, 7, 8, 11, 27, 112, 113, 283, 308
bromoxynil	3,5-dibromo-4-hydroxbenzonitrile	71, 73, 74, 95, 167, 174, 181, 183, 228, 236, 238, 244, 252, 255, 260, 262, 264, 267, 270, 271, 274
butylate	*S*-ethyl diisobutylthiocarbamate	231, 268
CDEC	2-chloroallyl diethyldithiocarbamate	197
CGA-82725	Not available	138, 142, 150, 154, 165, 218, 266
CGA-92194	Not available	227
chloramben	3-amino-2,5-dichlorobenzoic acid	77, 90, 94, 103
chloroxuron	3-(*p*-(p-chlorophenoxy)phenyl)-1, 1 dimethylurea	71, 80, 192
buthidazale	3(5-(1,1-dimethyl-1,3,4-thiadiazol-2-yl)-4-hydroxy-1-methyl-2-imidizolidinone	209
chlorpropham	isopropyl *m*-chlorocarbanilate	154, 163, 170, 195
chlorsulfuron	2-chloro-*N*-(4-methoxy-6-methyl-1-2,5-triazin-2-yl)=aminocarbonyl)-benzenesulfonamide	4, 18, 19, 23, 25, 85, 153, 156, 159, 160, 174, 176, 181, 206, 209, 236, 238, 242, 252, 255, 257, 260, 262, 267, 270, 271
CN-10-43597	Not available	228
cyanazine	2-((4-chloro-6-(ethylamino)-s-triazin-2-yl)amino)-2-methylpropionitrile	160, 177, 206, 213, 228, 231

Common name or Designation	Chemical Name	Page
copper chelate - EDA	bis(ethylenediamine)copper(II)sulphate	301
copper chelate - ETA	ethanolamine copper (II) complex	301
copper sulfate	copper sulfate pentahydrate	285, 289
2,4-D (Amine)	(2,4-dichlorophenoxy)acetic acid	4, 14, 16, 18, 19, 23, 37, 45, 47, 49, 52, 95, 160, 167, 174, 181, 183, 228, 238, 252, 255, 260, 270, 271, 277, 298
2,4-d (SULV amine)	(2,4-dichlorophenoxy)acetic acid dimethylamine salt	4, 18, 19
2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	114
dalapon	2,2-dichloropropionic acid	115
DCPA	dimethyl tetrachloroterephthalate	73, 74, 163, 193
desmedipham	ethyl m-hydroxcarbanilate carbanilate (ester)	172
dicamba	3,6-dichloro-_o_-anisic acid	4, 14, 16, 18, 19, 21, 25, 37, 45, 47, 49, 66, 158, 174, 179, 206, 209, 211, 231, 238, 244, 252, 255, 279
dichlobenil	2,6-dichlorobenzonitrile	2, 112, 118, 120, 124
dichlorprop	2-(2,4-dichorophenoxy)propionic acid	114
diclofop methyl	2-(4-(2,4-dichlorophenoxy) phenoxy) propanoate	71, 73, 81, 142, 154, 167, 181, 242, 244, 257, 264, 274
diethatyl	N-(chloroacetyl)-N-2,6-diethylphenyl) glycine	90, 94, 170

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
difenzoquat	1,2-dimethyl-3,5-diphenyl-1*H*-pyrazolium	167, 242, 244, 257, 264, 274
dinoseb	2-*sec*-butyl-4,6-dinitrophenol	108, 139, 147, 187, 228, 236, 248, 267, 277
DPX-4189	amine and sodium salts	90
DPX-5648	methyl 2-((((4,6-dimethyl-2-pyrimidimyl)amino)car=bonyl)amino) sulfonyl)benzoate	45, 273, 287, 294
DPX-6376	Not available	167, 181, 238, 244, 250, 255, 260, 262
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	8, 27, 115, 118, 120, 139, 140, 181, 206, 209, 238, 250, 255, 260, 306
DNBP	2-sec-butyl-4,6-diphenyl-acetamide	252
Dowco 290 (M-3972)	3,6-dichloropicolinic acid	19, 23, 25, 66
Dowco 453 ME	methyl 2-(4-((3-chloro-5-(trifluromethyl)-2-pridinyl)oxy phenoxy) propanote	142, 144
Dowco 356	2-(3,5-dichlorophenyl-2-(2,2,2-trichloroethyl) oxirane N,N-diallyl-2,2-and dichloroacetamide	95, 228
endothall	7-oxacibyclo(2.2.1)heptane-2,3-dicarboxylic acid	101, 301
EPTC	*S*-ethyl dipropylthiocarbamate	95, 162, 164, 169, 195, 197, 222, 231, 268
ethalfluralin	*N*-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	80, 88, 90, 93, 94, 154, 170, 222
ethofumesate	2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methane sulfonate	172

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
fluozifop butyl	butyl-2-(4-(5-trifluoromethyl-2-pridiloxyphenoxy))-propionate	29, 51, 71, 74, 75, 80, 98, 110, 132, 138, 142, 144, 150, 165, 172, 183, 187, 225, 266
fluridone	1-methyl-3-phenyl-5(3-(trifluoromethyl)phenyl)-4(1H)-pyridinone	136
glyphosate	N-(phosphonomethyl)glycine	51, 86, 87, 108, 120, 124, 129, 136, 159, 175, 176, 177, 179, 206, 209, 2tl, 213, 225, 273, 284
hexazinone	3-cyclohexyl-6-dimethylamino)-1-methyl-1,3,5-triazine-2,2-(1H,3H)-dione	132, 144
HOE 00581	Not available	142, 218, 225, 266
HOE 0661	Not available	51, 144, 175, 209, 284
HOE 583	Not available	142
hydrogen peroxide	hydrogen peroxide	289
linuron	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	191
MBR-23709	Not available	228, 231
MC-10108	Not available	206
MCPA	((4-chloro-o-tolyl)oxy) acetic acid	95, 174, 187, 238, 252, 255, 260, 262, 264, 267, 270, 271
mefluidide	N-(2,4-dimethyl-5- (((trifluoromethyl)-sulfonyl)amino)=phenyl) acetamide	52, 86, 90
metham	sodium methyldithiocarbamate	102, 103, 104, 106
metolachlor	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide	94, 95, 99, 134, 162, 222, 227, 231, 268, 273

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
metribuzin	4-amino-6-*tert*-butyl-3-(methylthio)-as-triazin-5-(4H)one	132, 139, 160, 176, 177, 181, 185, 206, 209, 213, 236, 238, 242, 250, 252, 255, 260, 277
MON 4606	Not available	227
monuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	115
MSMA	monosodium methanearsonate	6, 7, 12, 32, 128
napropamide	2-(a-naphtoxy)-*N*,*N*-diethylpropionamide	86, 93, 108, 118, 122, 124, 127
naptalam	N-1-naphthylpahthalamic acid (2-N-(1-naphthy)amino=carbonyl) benzoic acid	88, 90
norflurazon	4-chloro-5-(methylamino)-2-(a,a,a-trifluoro-*m*-tolyl)-3(2*H*) -pyridazinone	129
oryzalin	3,5-dinitro-N^4,N^4-dipropysulfanilamide	80, 88, 90, 108, 140
oxadiazon	2-*tert*-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)Δ^2-1,3,4-oxadiazonlin-5-one	73, 118, 120, 124
oxyfluorfen	2-chloro-1-(3-3thoxy-4-nitrophenoxy)-4(trifluoromethyl) benzene	71, 74, 80, 82
paraquat	1,1'-diemthyl-4,4'-bipyridinium ion	12, 34, 108, 111, 118, 120, 124, 128, 148, 160, 206, 209
pendimethalin	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	71, 74, 76, 80, 134, 140, 236
phenmedipham	methyl m-hydroxycarbanilate m-methylcarbanilate	172, 203
picloram	4-amino-3,5,6-trichloropicolinic acid	4, 16, 18, 23, 37, 40, 42, 45, 47, 49, 52, 55, 65, 66

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
PPG-603	Not available	88
PPG-844	Not available	95, 152, 218, 222, 231
PPG-1013	Not available	218, 222
PPG-12259	Not available	160, 209, 228
prometryne	2,4-bis(isopropylamino)-6-methylthio)s-triazine	202
pronamide	3,5-dichloro(*N*-1, 1-dimethyl-2-propynyl)benzamide	80, 101, 206, 209, 277
propachlor	2-chlor-N-isopropylacetanilide	74, 99, 140
propham	isopropyl carbanilate	160, 195, 206, 209, 213, 240
pyrazon	5-amino-4-chloro-2-phenyl-3(2*H*)-pyridazinone	200, 203
R-25788	N,N-diallyl-2,2-dichloroacetamide	95, 162, 169, 268
R-33865	Not available	95, 162, 222, 268
R-40244	1-(*m*-trifluoromethylphenyl)-3-chloro-4-chloromethyl-2-pyrrolidone	122, 257, 262, 264, 267
RH 0265	Not available	252, 255, 260
RH 8817	ethyl 5-(2-chloro-4(trifluoromethyl)phenoxy)-2-nitro-benzoate	140
RO-138895	acetone-O-(D-Z(P-a,a,a-trifluoro-P-tolyl)-oxy)phenoxy)propionyl') 'oxime	144
SC-0224	Not available	20, 51, 175, 284
SC-0545	Not available	20, 51, 284
SC-7432	Not available	162
SC-7829	Not available	162

HERBICIDE INDEX (continued)

Common name or Designation	Chemical Name	Page
SD-95481	Not available	187, 273
sethoxydim	2-(1-(ethoxyimino)butyl)-5-(2-(ethylthio)hydroxy-2-cyclohexen-1-one	29, 71, 73, 74, 75, 81, 110, 132, 138, 142, 144, 165, 183, 187, 218, 225, 266
simazine	2-chloro-4,6-bis(ethylamino)-*S*-triazine	101, 118, 120, 122, 124, 248
sodium chlorate	sodium chlorate	147
SSH-0860	1-amino-3-(2,2-dimethylpropyl)-6-(ethylthio)-1,3,5-triazine-2,4(1*H*, 3*H*)-dione	236, 240, 244, 257, 262, 264
2,4,5-T	(2,4,5-trichlorophenoxy) acetic acid	66
tebuthiuron	*N*-(5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl)-*N*-N'-dimethylurea	23, 66, 67, 112, 113, 118, 120, 122, 283
terbacil	3-*tert*-butyl-5-chloro-6-methyluracil	2, 7, 11, 27, 132
terbutryn	2-(*tert*-butylamino)-4-(ethylamino)-6-methylthio)-striazine	177, 236, 238, 255, 260
triallate	*S*-(2,3,3,-trichloroally)diisopropylthiocarbamate	97, 140, 185, 244, 257, 262, 264, 276
triclopyr	((3,5,6-trichloro-2-pyridinyl)oxy) acetic acid	49, 69
trifluralin	a,a,a,-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-p-toluidine	140, 144, 197, 222
T-225E	picloram as the triisopropanolamine salt plus 2,4,-T as the propylene glycol butyl ether ester	66
T-225BE	picloram as the triisopropanolamine salt plus 2,4,5-T as the butoxyethanol ester	66
UBI S734	Not available	222
vernolate	S-propyl dipropylthiocarbamate	95, 162, 169, 268
weed oil		12, 35, 128

ABBREVIATIONS USED IN THIS REPORT

A	acre(s)
a.i.	active ingredient
a.e.	acid equivalent
aehg	acid equivalent/hundred gallons
bu	bushel(s)
C	degrees Centigrade
cm	centimeter(s)
cm^2	square centimeter
cwt	one hundred pounds
F	degrees Fahrenheit
fps	feet per second
ft^2	square feet
gal	gallon(s)
gpa	gallons per acre
gpm	gallons per minute
ha	hectare
hr	hour(s)
in	inch(es)
kg	kilogram(s)
kg/cm^2	kilograms per square centimeter
kg/ha	kilograms per hectare
l	liter(s)
lb	pound(s)
L/ha	liters per hectare
lb/A	pounds per acre
lb ai/A	pounds active ingredient per acre
m	meter(s)
min	minute(s)
ml	milliliter(s)
mph	miles per hour
oz	ounce(s)
pes	preemergence surface
ppb	parts per billion
ppi	preplant incorporated
ppm	parts per million
psi	pounds per square inch
pt	pint
rd	rod

ABBREVIATIONS USED IN THIS REPORT (continued)

sq	square
sq ft	square feet
wt	weight
WA	wetting agent