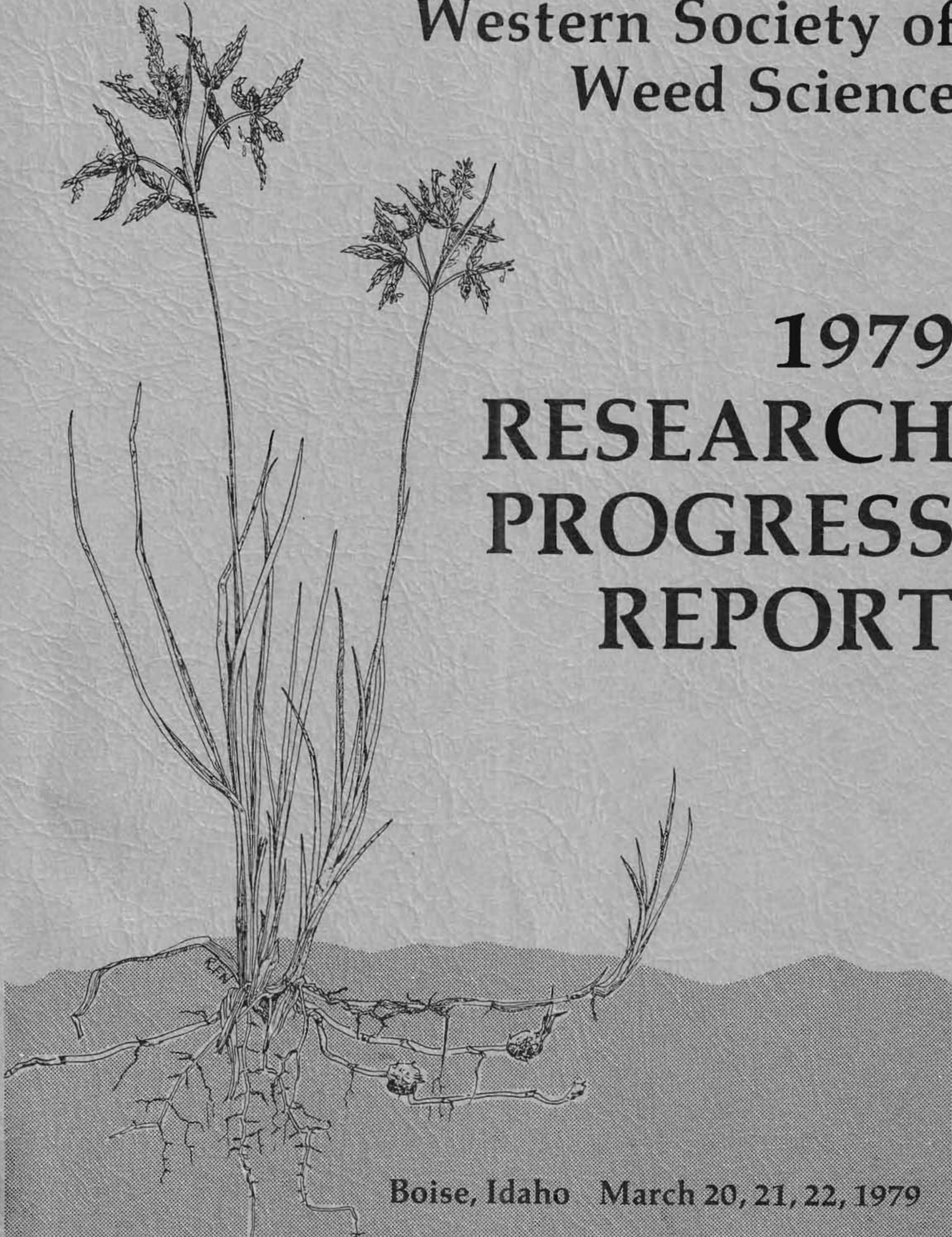
Western Society of Weed Science



1979 RESEARCH PROGRESS REPORT

Boise, Idaho March 20, 21, 22, 1979

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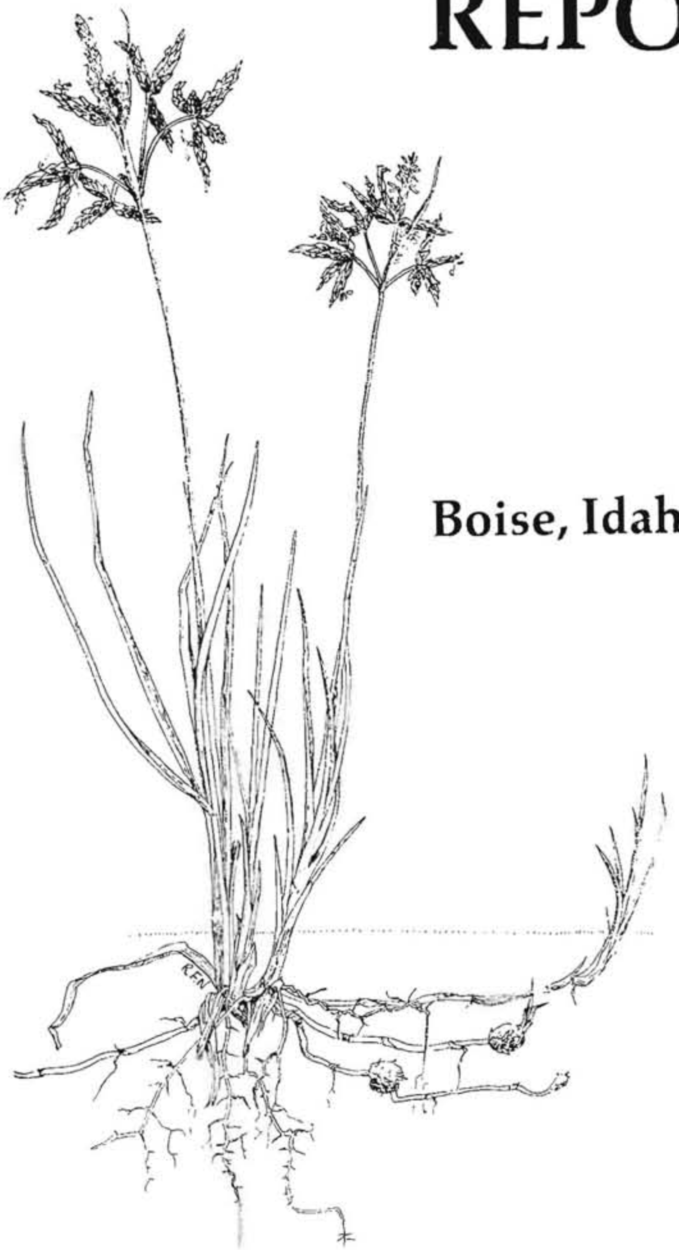

Boise, Idaho March 20, 21, 22, 1979

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ISSN 0090-8142

FOREWARD

The 1979 annual Research Progress Report of the Western Society of Weed Science consists of 137 reports of recent investigations in weed science. This is the largest number of papers ever submitted. All reports were voluntarily submitted by research and extension weed scientists. The report will be complimented by the proceedings from the annual meeting held in March, 1979 in Boise, Idaho.

Unlike previous years the individual papers in the 1979 report were submitted 'camera ready' for reproduction. No papers were retyped prior to publication. Only minor editorial changes could be made on the manuscripts; most papers appear in the report exactly as submitted. It must be emphasized to the reader that the responsibility for the contents and style of the reports in this 1979 report is that of the original author(s). Papers were submitted with many variations in style departing from that outlined in the call for papers, or in recent pevious reports; these papers have, however, been published in order that the information contained therein be made public.

The research committee, consisting of a chairman and seven project chairmen, assembled and summarized the information in their respective areas. Final review was done by the chairman of the research committee and any questions or comments should be directed to him. Information contained in the Research Progress Report should be considered tentative and NOT FOR PUBLICATION. Abstracts should not be reproduced without permission of the authors. Reports printed in the Progress Report do not constitute prior publication.

This report does not contain recommendations for herbicide use, nor does it imply that uses discussed in the text are registered by the Environmental Protection Agency. Registered trade names have been used occasionally for informative purpose only and their use does not imply endorsement by the Society or the author.

The common and botanical names of weeds suggested by the subcommittee on standardization of names of weeds of the Weed Science Society of America have been used (see Weed Science 19:473-476, 1971). The common names of herbicides have followed the report of the terminology committee of the Weed Science Society of America, where possible, and are consistent with the common names reported in Weed Science 26(4), 1978 and the WSSA Herbicide Handbook, 3rd edition. When known, the full chemical name of numbered compounds has been given.

Recognition is due to the research workers in the Western Society of Weed Science whose contributions constitute this report. The efforts of the seven Research Project Chairmen in compiling and summarizing each section are appreciated. Thanks also go to various members of the Botany Department at the University of California, Davis, for their assistance in preparation of this report.

Robert F. Norris
Chairman, Research Section
Western Society of Weed Science
1979

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PROJECT 1

PERENNIAL HERBACEOUS WEEDS

W. S. Belles, Project Chairman

SUMMARY -

Eighteen papers were submitted for publication. Perennial herbaceous weeds included Canada thistle, field bindweed, leafy spurge, orange hawkweed, perennial pepperweed, purple nutsedge, quackgrass, Russian knapweed, swamp smartweed, and tansy.

Canada thistle (5 papers) - Fall applications of the fumigant 1,3-D with an injection shank at 30 gpa gave 97% control of Canada thistle the following spring. Over 80% control was achieved with 1,3-D at 25 and 30 gpa of 1,3-D EC using the noble blade. In a separate trial visual evaluations two years after application of herbicides to mature Canada thistle showed 90% or greater control with Dowco 290 at 1.5 and 3.0 lb ai/A, 2,4-D amine at 40 lb ai/A, picloram +2,4-D at 0.5 + 1.0, 1.0 + 2.0 and 2.0 + 4.0 lb ai/A and picloram 10K at 1.0 and 2.0 lb ai/A. In another study various combinations of dicamba + chlorflurenol. Over 80% control was obtained with several treatments. Single applications of various rates of metribuzin, velpar, metribuzin + velpar and glyphosate + Dowco 290 gave stand reductions of 70% or more at two locations. Fall applications of glyphosate, dicamba, and glyphosate + dicamba resulted in greater than 90% Canada thistle control one year later, + 2,4-D were less effective. Yields of winter wheat were increased by all treatments except dicamba at 6 lb ai/A applied 10 days before seeding. The same treatments applied at a second location were less effective. Eighty percent or greater control was obtained with after frost applications of dicamba at 6 lb ai/A and glyphosate at 4.0 lb ai/A. Alaska pea yields were substantially increased with some treatments.

Field bindweed (3 papers) - Picloram formulations provided the best field bindweed control two years after application in a study conducted with several herbicides. Dicamba, Vel-4207, dicamba + 2,4-D and triclopyr were effective for only one year. In a separate study, combinations of 2,4-D or dicamba with glyphosate did not increase field bindweed control over glyphosate alone. Herbi and knapsack applicators showed comparable field bindweed foliage reduction 8 and 20 days after applications of dicamba, glyphosate and glyphosate + dicamba.

Leafy spurge (2 papers) - Leafy spurge was effectively controlled one year after treatment with various picloram formulations, picloram + 2,4,5-T, dicamba and dicamba + 2,4-D. Grass damage increased when picloram rates increased above 2 lb ai/A. Granular dicamba and glyphosate at 2 and 3 lb ai/A also reduced grass cover. In Idaho glyphosate at 2.3, 3.0 and 4.5 lb ae/A provided adequate control of leafy spurge approximately one year after application. Treatments applied 7 days after frost were superior to 33 days after frost or before frost treatments.

Orange hawkweed - Several herbicides were applied to orange hawkweed stands at two locations. All chemicals except bentazon at 1.0 and 2.0 lb ai/A resulted in some measure of control one year after treatment. Picloram provided the most consistent control at both locations. Complete control resulted from applications of picloram + 2,4-D at 0.25 + 0.50 and 0.50 + 1.0 lb ai/A at both sites and picloram at 0.5 lb ai/A on one location. Forage yields were increased appreciably by most treatments at one location, a dryer upland site.

Perennial pepperweed - Applications of bromacil, terbacil, metribuzin and karbutilate at 4, 8 and 12 lb ai/A to roadside infestations resulted in some activity. Two years after application bromacil at the two higher rates gave the best control.

Purple nutsedge - In an Arizona study purple nutsedge foliage was treated with 2, 4 and 6 lb/A of glyphosate at 2 and 3 month intervals from 1975 to 1978. All treatments resulted in 95% reduction in stems per plant at the end of the first year. After 3 years with both the 2 and 3 month application intervals (9 and 12 applications) the 6 lb/A rate resulted in kill of all nutsedge plants.

Quackgrass - Herbi and conventional plot sprayer comparisons on quackgrass were made with glyphosate at 0.5, 1.0 and 2.0 lb ai/A. Two months after application glyphosate at the 0.5 and 1.0 rates applied with the Herbi was more active than with the conventional sprayer. No difference was found at the high rate.

Russian knapweed (2 papers) - Dowco 290, dicamba, picloram, glyphosate and 2,4-D (40 lb ai/A) reduced stands of Russian knapweed one and two years after application. In New Mexico significant top kill was obtained from 1976 applications of glyphosate and 2,4-D. In 1977 glyphosate, glyphosate + 2,4,-D, 2,4,5-T, 2,4-D, and dicamba + 2,4-D significantly increased Russian knapweed kill compared to the control.

Swamp smartweed - Glyphosate at 0.5 , 1.2 and 4 lb ai/A gave acceptable control of swamp smartweed two years after application. Asulam was not effective in the same treatment.

Tansy - Spring applications of picloram formulations, picloram + 2,4-D, dichlorprop, dicamba and dicamba + 2,4-D all effectively reduced fall tansy growth. Forage yields were increased appreciably with the dicamba + 2,4-D treatments. Decreases in yield of the clover-grass pasture species occurred with some treatments, notably the 2.0 lb ai/A rates of picloram and picloram 5% pellets (M3864).

PAPERS -

Canada thistle control one and two years following application. Alley, H. P. and N. E. Humburg. Plots were established September 2 and 10, 1976 on Canada thistle which was mature with active seed dispersal. The soil was a sandy loam (68.0% sand, 25.6% silt, 6.4% clay, 8.4% organic matter, with a 7.5 pH). All treatments, except the pelleted material, were applied in 40 gpa water to square rod plots with three replications arranged in a randomized complete block design.

Visual vegetative control evaluations were made on May 23, June 26, 1977 and July 19, 1978, approximately 8, 10 and 22 months following application. Although there was considerable variation between rates of application with some of the herbicides, Dowco 290, 2,4-D amine at 40 lb ai/A picloram + 2,4-D and picloram 10K were the only treatments resulting in 90% or greater control two years following treatment. Dicamba, dicamba + 2,4-D, Dowco 290 + 2,4-D and glyphosate maintained control only through the first year. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 907).

Herbicides, Canada thistle control, one and two years following treatment

Herbicide [1/]	Rate lb ai/A	Percent control		
		May 23, 1977	July 26, 1977	July 19, 1978
dicamba	4.0	100	93	25
dicamba	6.0	87	99	5
Vel-4207	4.0	70	45	12
Vel-4207	6.0	72	80	15
dicamba + 2,4-D	2 + 6	97	63	80
dicamba + 2,4-D	4 + 12	90	73	38
Dowco 290 (M-3972)	1.5	100	100	93
Dowco 290 (M-3972)	3.0	100	100	100
DPX 1108	2.0	40	0	43
DPX 1108	4.0	58	0	50
DPX 1108	6.0	82	30	50
DPX 1108	8.0	83	56	58
2,4-D amine	3.0	72	78	60
2,4-D amine	6.0	63	25	70
2,4-D amine	12.0	61	42	45
2,4-D amine	20.0	66	40	8
2,4-D amine	40.0	94	83	100
picloram + 2,4-D	0.5 + 1.0	100	100	100
picloram + 2,4-D	1.0 + 2.0	90	100	100
picloram + 2,4-D	2.0 + 4.0	100	100	98
picloram 10K	1.0	89	97	100
picloram 10K	2.0	97	100	100
glyphosate	1.5	96	77	72
glyphosate	2.25	95	77	60
glyphosate	3.0	94	58	50
Dowco 290 + 2,4-D	0.25 + 1.0	100	75	48
Dowco 290 + 2,4-D	0.5 + 2.0	96	87	38

[1/] Herbicides applied September 2 and 10, 1976.

<u>An evaluation of various rates and application methods of 1,3-D for Canada thistle control</u>. Alley, H. P., G. L. Costel and N. E. Humburg. Previous research utilizing various soil fumigants and methods of soil injection and/or placement have indicated a potential for Canada thistle control. The data reported herein are a follow-up on previous research to more clearly identify rates of application and application techniques.

An area uniformly and heavily infested with Canada thistle was selected for the study site. The land had produced a spring wheat crop in 1976 and was disced twice during 1977 and prior to application of 1,3-D.

The soil was classified as a clay loam (25.6% sand, 38.0% silt, 36.4% clay with 2.7% organic matter and a pH of 7.1). Plots were 15 by 320 ft, replicated four times in a randomized complete block design.

Three methods of injection and/or placement of the chemical were utilized: the Noble blade, injection shank, and plow down. 1,3-D emulsifiable concentrate plus an emulsifier mixed with water was used where the chemical was applied with the Noble blade. 1,3-D was applied, without dilution, with the injection shank and plow down by gravity flow. 1,3-D was placed approximately 10 in deep with the injection shank, 8 in deep with the Noble blade, and 10 to 12 in deep with the plow. A cultipacker was used to compact the soil immediately after application.

Canada thistle shoots in 24 4-sq ft quadrats were counted in each replication to determine percentage Canada thistle control.

The most effective treatment was 30 gpa 1,3-D applied with the injection shank (attached table), however, 10 gpa of 1,3-D EC applied with the Noble blade, was as effective as where 20 gpa 1,3-D was applied with the injection shank or plow down methods. There appeared to be no difference in percentage shoot emergence between 20, 25 and 30 gpa applied by the plow down.

The emerging Canada thistle shoots, most from root segments, could possibly be controlled with other herbicides resulting in further reduction in stand. To evaluate this assumption all 1,3-D plots were cross treated with varying rates of glyphosate, dicamba 2,4-D and picolinic acid. Data will be available next year. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 906).

Canada thistle control resulting from three methods of 1,3-D injection and/or placment

Injection/placment method [1]	Rate gpa	Canada thistle percent control [2]
Noble blade	5 EC	41
Noble blade	10 EC	68
Noble blade	20 EC	84
Shank (0-pressure)	20	73
Shank (0-pressure)	25	78
Shank (0-pressure)	30	97
Plow down (0-pressure)	20	75
Plow down (0-pressure)	25	83
Plow down (0-pressure)	30	83

[1] Treatments applied September 29, 1977.
[2] Percent control evaluations April 23, 1978.

Canada thistle control. Zimdahl, R. L. and P. S. Zorner. Canada thistle continues to be one of the most troublesome weeds in Colorado and the Rocky Mountain West. This is a report of four separate experiments designed to evaluate the effectiveness of several herbicides and herbicide combinations for control of Canada thistle. One objective was to define the optimum ratio of dicamba and chlorflurenol. The second objective was to compare the efficacy of several herbicides which have been tested in the past and some new combinations. Our primary purpose was to determine if a herbicide or herbicide combination could be developed which would consistently give 90% control of Canada thistle. For this reason, the experiments have been evaluated for two years. We were not attempting to determine if the herbicides were selective in crops or if residual effects precluded planting some crops. These are objectives for future experiments.

Experimental procedure.

Four experiments were established at three separate locations in the vicinity of Fort Collins. Each experiment was replicated in a randomized complete block design. No crops were planted and all herbicides were applied postemergence without incorporation. Visual ratings on a scale of 0-100 were made for each experiment. Zero represented no control and 100 complete control of Canada thistle. Stand counts of thistle were made at each location by counting all of the thistles in three 2-square foot quadrats per plot on each counting date. Herbicides were applied with a fixed boom sprayer mounted on a garden tractor using CO_2 as the propellant. Pertinent application data are shown in Table 1.

Results and discussion.

Three herbicides did not provide satisfactory control of Canada thistle under the dryland, non-cropped conditions of these experiments. Triclopyr amine plus surfactant (M-3724) at 0.75, .5 and 3 lb ai/A gave only 30, 45 and 55% control, respectively. Triclopyr ester (M-4021) at the same rates gave 55, 50 and 30% control, respectively. Buthidazole at 1 and 2 lb ai/A controlled only 30% of the thistle and reduced the stand about 40%. Bentazon was applied at 1 lb ai/A on August 30 and at the same rate on September 10, 1977. Thistles were 6 to 15 inches tall and in the prebloom to bloom stage. Visual control averaged 37% but the stand was only reduced 20%.

The optimum ratio and in fact the efficacy of dicamba-chlorflurenol combinations remains elusive. Location C was the primary study to define an optimum ratio. It was complemented by smaller studies at three other locations (Table 2). There was no apparent benefit from chlorflurenol when dicamba was applied at 1 or 2 lb ai/A. Comparison of visual rating or stand count data for all combinations at these rates with dicamba alone at the same rate confirms this observation (Table 2). The data also show that 0.25 and 0.5 lb ai/A dicamba provided control in the range of 30 to 60% and stand reduction of about 40%. The lower rate was about equal to the control from 1.0 lb ai/A 2,4-D at location D. We conclude that the lower rates of dicamba do provide some control but they are not effective enough. These above interpretations are reasonably non-controversial. The elusiveness centers on interpretation of dicamba at 0.25 and 0.5 lb ai/A plus chlorflurenol. Stand count data are more informative than visual ratings and show an average reduction of 62% for the lower rates of dicamba alone. It is reasonable to conclude there is no difference between the rates of chlorflurenol or dicamba performance at 0.25 or 0.5 lb ai/A. The stand reduction averaged 41% from 0.25 lb ai/A dicamba and

37% from 0.5. Thus, we conclude there is no difference between the rates. It is tempting to assume the difference between dicamba alone and with chlorflurenol is due to chlorflurenol but statistical analysis does not support the conclusion. There is a trend toward better control with lower rates of dicamba when combined with chlorflurenol but these data do not define the optimum combination. The question of time of application relative to growth stage is also unanswered.

Other herbicides studied at two locations permit easier interpretation (Table 3). Each of the herbicides shown gave significantly reduced Canada thistle below the check. Metribuzin at location A was not successful but in past studies and at location D it has been. The visual ratings and stand counts are averages obtained by repeated observation throughout the study. Such data do not reflect the fact that final visual control ratings and stand counts for metribuzin, velpar and their combination show nearly complete control. Picloram + 2,4-D was included as a standard and for comparison with Dowco 290 and its combination with 2,4-D. Dowco 290 is not equal to picloram + 2,4-D but was nearly so except when only 0.125 lb ai/A of Dowco 290 was used. Glyphosate performs well and the higher rate preferred. There was no advantage of the combination treatments over the more persistent compound applied alone.

Most of the treatments in these studies with the possible exception of Dowco 290 combined with 2,4-D gave very satisfactory control reducing the stand at the last counting date (Aug. 1978) by 70% or more from one application. It is important to note that nothing is said or implied about the feasibility of using any of these herbicides in a crop or in a crop roation.

Table 1
Plot application data

	Location				
	A	B	C	D	D
Application date	9/29/76	7/7/77	8/29/77	8/30/77	9/10/77
Plot size (ft)	10 x 40	10 x 20		10 x 40	10 x 40
Growth stage	6-8 inch rosette	pre-bud 2-4 inch tall, 7-10 leaves	6-15 inch tall bloom and pre-bloom	6-15 inch tall, bloom and pre-bloom	bloom and pre-bloom
Soil condition	moist to wet	dry	dry	dry	dry
Temperature C					
Air	12-24	26	27	19	22
Soil @ 5cm	9-20	28	28	21	25
Wind (mph)	none	2-5	0-3	0-8 variable	none
GPA	20	23	24	22	2

Table 2
Canada thistle control by combinations of dicamba and chlorflurenol

		Location							
		Visual rating of Canada thistle control a/				Number of Canada thistle plants/sq ft b/			
Herbicide	Rate lb ai/A	A	B	C	D	A	B	C	D
2,4-D ester	1.0				38				4.0
Dicamba	0.25			30				4.5	
Dicamba	0.5			60				4.3	
Dicamba	1.0	78		63		2.8		0.9	
Dicamba	2.0	80		86		1.2		0.8	
Dicamba + 2,4-D	0.5 2.0		28	53	51		7.1	2.1	3.4
Dicamba + 2,4-D	.25 .75				46				4.7
Dicamba + 2,4-D	.5 1.5				53				3.5
Dicamba + chlorflurenol	0.25 0.25		63	72			3.8	2.0	
Dicamba + chlorflurenol	0.25 0.5		66	59			5.5	2.1	
Dicamba + chlorflurenol	0.25 1.0			57				4.2	
Dicamba + chlorflurenol	0.25 2.0			72				3.3	
Dicamba + chlorflurenol	0.5 0.25		61	68			5.4	3.0	
Dicamba + chlorflurenol	0.5 0.5		75	70			3.1	2.6	
Dicamba + chlorflurenol	0.5 1.0			57				2.8	
Dicamba + chlorflurenol	0.5 2.0			70				2.0	
Dicamba + chlorflurenol	1.0 0.25			88				1.1	
Dicamba + chlorflurenol	1.0 0.5			62				2.2	
Dicamba + chlorflurenol	1.0 1.0			81				1.0	
Dicamba + chlorflurenol	1.0 2.0	80		88		1.0		0.5	
Dicamba + chlorflurenol	2.0 0.25			83				1.1	
Dicamba + chlorflurenol	2.0 0.5			73				0.5	
Dicamba + chlorflurenol	2.0 1.0			86				1.3	
Dicamba + chlorflurenol	2.0 2.0	78		97		2.3		0.3	
Control - no herbicide		0	0	0	0	8.7	8.2	7.1	5.3

a/ b/ see Table 3

Table 3
Canada thistle control by several herbicides and combinations

Herbicide	Rate lb ai/A	Visual rating of Canada thistle control[a/] A	Visual rating of Canada thistle control[a/] D	Number of Canada thistle plants/sq ft[b/] A	Number of Canada thistle plants/sq ft[b/] D
Metribuzin	1.5	18	83	8.6	1.5
Metribuzin	2.0	23	92	13.3	1.8
Metribuzin	1.0 + 1.0 10 days later		87		1.9
Velpar	3.0		90		2.3
Velpar	4.0	73	93	2.8	1.3
Metribuzin + Velpar	0.5 + 3	80	93	3.2	1.3
Metribuzin + Velpar	0.25 + 4	70	83	0.9	2.1
Metribuzin + Velpar	0.5 + 4	68	79	2.6	1.5
Picloram + 2,4-D	0.5 + 1		80		0.9
Dowco-290	0.25	80	86	1.5	1.5
Dowco-290	0.5	83	91	0.3	0.7
Dowco-290 + 2,4-D	0.25 + 1.0	55	80	5.1	1.7
Dowco-290 + 2,4-D	0.125 + 0.5	55	53	3.9	2.2
Glyphosate	2.0	83	74	0.3	3.3
Glyphosate	3.0	83	71	0.7	1.5
Glyphosate + Velpar 10 days later	2.0 + 3.0	87	87		1.7
Glyphosate + Metribuzin 10 days later	2.0 + 1.0		88		0.6
Glyphosate + Dowco-290 10 days later	2.0 + 0.25		82		1.0
Control - no herbicide	---	0	0	8.7	5.3

a/ 0 = no control, 100 = complete control. Summary of at least two observations at each location.

b/ All live thistle plants in 2 sq ft areas per plot were counted. Results are expressed as an average of at least three counts per plot.

Canada thistle control in spring peas. Belles, W. S., D. W. Wattenbarger and G. A. Lee. Before and after frost applications of glyphosate, dicamba and 2,4-D plus combinations of glyphosate with dicamba and 2,4-D were applied in the fall of 1977 to a heavy stand (14 plants/sq ft) of Canada thistle. Alaska spring peas were planted on May 20, 1978. The 9 by 30 ft. plots were replicated three times and arranged in a randomized complete block design. Treatments were applied with a knapsack sprayer at 40 gpa. The peas were harvested in late August of 1978. Percent control of thistle was recorded by visual observation in April before planting and in September after harvest.

Canada thistle control in spring peas

Herbicide[1]	Rate lb ai/A	% Thistle Control 4/27/78	% Thistle Control 9/11/78	Alaska Pea Yield (lb/A)
Check	0	0	0	418
Glyphosate before frost	2.0	73	52	673
Glyphosate after frost	2.0	75	79	777
Glyphosate before frost	4.0	82	77	865
Glyphosate after frost	4.0	77	86	843
Dicamba before frost	6.0	88	54	870
Dicamba after frost	6.0	99	80	668
2,4-D Amine before frost	2.0	0	67	702
2,4-D Amine after frost	2.0	7	25	474
Glyphosate + Dicamba before frost	2.0 + .25	58	42	372
Glyphosate + Dicamba before frost	2.0 + .5	82	65	727
Glyphosate + Dicamba before frost	2.0 + .75	98	68	626
Glyphosate + Dicamba before frost	2.0 + 1.0	93	72	555
Glyphosate + 2,4-D Amine before frost	2.0 + .5	95	67	549
Glyphosate + 2,4-D Amine before frost	2.0 + .75	73	50	596
Glyphosate + 2,4-D Amine before frost	2.0 + 1.0	55	30	499

[1]Herbicides applied fall 1977

Ninety percent control or better of thistle was achieved at the April evaluation by 6.0 lb ai/A of dicamba after frost, a combination of glyphosate at 2.0 lb ai/A plus dicamba at .75 or 1.0 lb ai/A, or plus 2,4-D at 0.5 lb ai/A before frost. The September evaluation indicated a general decrease in thistle control for both before and after frost applications of 2,4-D. After frost applications of glyphosate alone also indicated an increase in thistle control from the earlier evaluation. After frost treatments of glyphosate and dicamba alone gave better control one year after treatment than before frost treatments. The reverse was true for 2,4-D applications. Before frost applications of dicamba at all but the .25 lb ai/A rate plus glyphosate were superior to glyphosate alone at 2.0 lb ai/A. Comparable 2,4-D combinations resulted in decreasing control with increasing 2,4-D rates. Only the lowest rate of 2,4-D (0.5 lb ai/A) plus glyphosate gave better control than the glyphosate treatment alone.

Pea yields were increased above the control with all treatments except glyphosate at 2.0 lb ai/A plus dicamba at .25 lb ai/A. Yield increases could also reflect a decrease in population of winter annual weeds present. Winter annuals had germinated after the before frost application and were controlled by the after frost applications.

Some slight injury symptoms were observed on the peas from the after frost treatment of dicamba but no symptoms were observed at harvest. The yield difference shown between the before and after frost applications might be attributed to minor injury differences. (Idaho Agriculture Experiment Station, Moscow, ID 83843).

Canada thistle control in winter wheat. Wattenbarger, D. W., W. S. Belles and G. A. Lee. Applications of glyphosate, dicamba and 2,4-D amine and combinations of glyphosate with dicamba and 2,4-D amine were applied in the fall of 1977 to a heavy stand of Canada thistle on cropland. Canada thistles ranged in growth stage from rosette to full bloom at treatment. Before frost applications of glyphosate, dicamba, 2,4-D and combinations were applied on September 8. After frost applications of glyphosate, dicamba and 2,4-D were applied on October 4. Nugaines winter wheat was planted across the treated area on October 14. The 13.5 by 30 ft plots were arranged in a randomized complete block design with three replications. Visual estimates of thistle control were taken on April 26 and September 20, 1978. The plots were harvested on September 14, 1978.

Canada thistle control in winter wheat

Herbicide	Rate lb ai/A	% Control 4/26/78	% Control 9/20/78	Yield (bu/A) 9/14/78
Check	0	0	0	56.3
Glyphosate Before Frost	2.0	92	94	66.9
Glyphosate After Frost	2.0	95	100	66.6
Glyphosate Before Frost	4.0	87	98	70.7
Glyphosate After Frost	4.0	87	90	69.7
Dicamba Before Frost	6.0	100	93	58.4
Dicamba After Frost	6.0	99	100	17.5
2,4-D Amine Before Frost	2.0	16	85	71.5
2,4-D Amine After Frost	2.0	13	45	58.1
Glyphosate + Dicamba Before Frost	2.0 + .25	91	99	79.9
Glyphosate + Dicamba Before Frost	2.0 + .5	95	100	71.8
Glyphosate + Dicamba Before Frost	2.0 + .75	92	93	76.2
Glyphosate + Dicamba	2.0 + 1.0	92	100	77.4
Glyphosate + 2,4-D Amine Before Frost	2.0 + .5	88	63	75.6
Glyphosate + 2,4-D Amine Before Frost	2.0 + .75	93	78	67.7
Glyphosate + 2,4-D Amine Before Frost	2.0 + 1.0	96	90	65.9

A 90% or better control of thistle was maintained one year after application by all treatments except 2,4-D and combinations of glyphosate and 2,4-D. Thistle control generally increased for all treatments from April to September except combinations of glyphosate and 2,4-D which decreased in control. Little difference in control was observed between before and after frost applications of glyphosate and dicamba. The before frost 2,4-D application gave better control than the 2,4-D after frost treatment. Yields of winter wheat were increased by all herbicide treatments except the after frost application of dicamba which reduced yield appreciably. (Idaho Agriculture Experiment Station, Moscow, ID 83843).

Evaluation of several herbicides for control of field bindweed on uncultivated farmland. Humburg, N. E. and H. P. Alley. Plots were established August 20, 1976 on field bindweed growing on a field which had been seeded to sudangrass in the spring of 1976. At time of treatment the sudangrass had been green-chopped with regrowth of 10 to 12 in height. Field bindweed was the dominant weed species of uniform density with 90% flowering completed at time of treatment. The soil was classified as a sandy loam (72.2% sand, 21.0% silt, 6.8% clay, 2.2% organic matter, with a pH of 6.8). All liquid treatments were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa total volume of water carrier. Plots were 1 sq rd, replicated three times in a randomized complete block design.

Evaluation made on June 22, 1977 and July 19, 1978 indicated the first year's control as well as longevity of control. Dicamba, Vel-4207, dicamba + 2,4-D, and triclopyr were effective for only one growing season, after two years the field bindweed had recovered and/or reinfested the treated plots. Formulations of picloram were the only treatments maintaining control two years after treatment. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 910).

Herbicides and field bindweed control

Herbicide [1/]	Rate lb ai/A	Percent control June 1977	Percent control July 1978
glyphosate	4	60	10
glyphosate	6	50	40
glyphosate	8	30	50
glyphosate	10	50	40
dicamba	4	95	40
dicamba	6	70	60
Vel-4207	4	90	30
Vel-4207	8	80	0
dicamba + 2,4-D	2 + 6	80	30
dicamba + 2,4-D	4 + 12	95	60
Dowco 290 (M-3972)	1.5	70	40
Dowco 290 (M-3972)	3	40	10
triclopyr (ester)	1.5	40	40
triclopyr (ester)	3	90	50
DPX-1108	2	20	30
DPX-1108	4	50	40
DPX-1108	6	50	60
2,4-D amine	20	30	10
2,4-D amine	40	30	50
picloram + 2,4-D	1 + 2	100	90
picloram + 2,4-D	2 + 4	100	100
picloram 10% pellets	1	50	80
picloram 10% pellets	2	60	80
picloram 2% gran.	1	100	100
picloram 2% gran.	2	95	100

[1/] Herbicides applied August 20, 1976; evaluated June 22, 1977 and July 19, 1978.

Field bindweed control obtained with glyphosate, with and without 2,4-D and dicamba added. Humburg, N. E. and H. P. Alley. There have been reports that the addition of light rates of 2,4-D and/or dicamba has enhanced the control of certain perennial weeds obtained with glyphosate. To evaluate this assumption a series of plots were established to evaluate glyphosate applied alone and in combination with 2,4-D and dicamba for control of field bindweed. The soil at the test site was classified as a sandy loam (72.2% sand, 21.0% silt, 6.8% clay, with 2.2% organic matter and a 6.8 pH). Treatments were applied with a three-nozzle knapsack sprayer calibrated to deliver 40 gpa total volume of water carrier. Plots were 13.5 by 20 ft, replicated three times in a randomized complete block design. Three dates of application were included in the study.

At treatment on July 26, 1977 the field bindweed was succulent and in the bud-stage of growth. Less than 0.10 in precipitation was received approximately 2 hours after application. On the July 6, 1977 treatment date the field bindweed was in full-bloom and on August 26, 1977 the only bindweed plants present were those resulting from mid-July precipitation.

At evaluation, July 19, 1978, the July 6 treatment date appeared to be the most effective date of three, this was when the field bindweed was in full-bloom. The addition of dicamba or 2,4-D to glyphosate did not enhance the control of bindweed obtained with glyphosate. Glyphosate applied July 6 was more effective at the 2.25 lb ai/A than the same rate with 2,4-D or dicamba added at 0.25 or 0.5 lb ai/A. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 911).

Field bindweed control

Herbicide [1/]	Rate lb ai/A	Percent control Treatment dates, 1977 May 26	July 6	Aug. 26
glyphosate + 2,4-D amine	1.5 + 0.25	43	53	33
glyphosate + 2,4-D amine	2.25 + 0.25	17	60	17
glyphosate + 2,4-D amine	1.5 + 0.5	57	62	30
glyphosate + 2,4-D amine	2.25 + 0.5	50	60	23
glyphosate + dicamba	1.5 + 0.25	7	30	13
glyphosate + dicamba	2.25 + 0.5	30	67	27
glyphosate	1.5	10	48	13
glyphosate	2.25	57	83	17
glyphosate	3.0	60	82	30
2,4-D amine	0.5	10	20	0
dicamba	0.5	3	6	17

[1/]Evaluated July 19, 1978.

Response of Field bindweed to herbicides applied with a Herbi applicator and a knapsack applicator. Kambitsch, D. L., G. A. Lee, G. A. Mundt and W. S. Belles. A field experiment was established near Moscow, Idaho, to compare the effectiveness of a Herbi Applicator to a knapsack applicator. The plant specie which was used for the comparison of the applicators was field bindweed. The plots were treated October 4, 1978, when the field bindweed plants were in a mature stage of growth. The knapsack sprayer was equipped with a three nozzle boom and was used to apply herbicides in a total volume of 20 gpa Flat fan 8002 TeeJet stainless steel nozzles were used at 40 psi boom pressure and 3 mph ground speed to attain delivery rate. The Herbi applied herbicides in ultra-low-volume droplets and is capable of being calibrated. It also was used to apply herbicides in a total volume of .51 gpa. with a 3 mph ground speed as the delivery rate. The individual plots were 9 ft by 45 ft. The field bindweed had not undergone any moisture stress, but there had been some frost at the time of herbicide application. Ambient temperature at the time of application was 53 F, soil temperature 55 F at 4: and 51 F at 6:, relative humidty was 51%, and the wind was calm. The soil at the site is Palouse silt loam with 3.0% O.M. and a pH of 6.0.

The percent bindweed stand reduction was obtained by visual evaluation of each plot. The percent stand reduction of the treated plots were determined by comparing them to the untreated check plot. The data is based on initial symptoms and not on actual kill of the weed specie.

The Herbi and the knapsack applicators did not show any significance in differentiation as herbicide application sprayers. Based on plant response to the herbicide treatments, they both tend to give the same results. The only problem that existed was the inability to see the micron droplets coming out of the sprayer. This made it difficult to determine completeness of coverage that was obtained. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Comparison of ultra low volume and conventional gallonage carrier for control of field bindweed at Moscow, Idaho.

Treatment	Rate lb a.i./A	Bindweed 8 days stand reduction %	Bindweed Foliage reduction % (20 days)
Check		-0-	60
Glyphosate-(Conven.)	2	-0-	90
Glyphosate-(Herbi)	2	-0-	90
Glyphosate-(Conven.)	4	20	95
Glyphosate-(Herbi)	4	20	97
Dicamba-(Conven.)	2	15	75
Dicamba-(Herbi)	2	10	50
Dicamba-(Conven.)	4	35	75
Dicamba-(Herbi)	4	35	50
(Conven.)			
Glyphosate + Dicamba (Herbi)	2 + .5	10	85
Glyphosate + Dicamba (Conven.)	2 + .5	10	85
Glyphosate + Dicamba (Conven.)	2 + 1	25	95
Glyphosate + Dicamba (Herbi)	2 + 1	25	95

Response of leafy spurge to several herbicide treatments. Alley, H. P. and N. E. Humburg. The plots were established July 12, 1977 on a dense stand of leafy spurge growing in an irrigated pasture. The leafy spurge was in full bloom. Plots were 2 sq rd, with one replication. All liquid treatments were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa total volume of water carrier.

Visual evaluations made July 14, 1978, one year following treatments, indicate that picloram, picloram + 2,4-D, picloram 2% beads, picloram 10% pellets, picloram + 2,4,5-T, dicamba and dicamba + 2,4-D were all effective treatments and gave effective initial control of established leafy spurge. As rates of picloram increased above the 2 lb ai/A rate of application damage to the grass increased. The granular formulations of picloram and dicamba appeared to be the most damaging to the grass, resulting in bare areas within the treated plots. The bare areas may have been a result of non-uniform coverage of the granular materials. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 908).

Herbicides and resulting leafy spurge control

Herbicide [1/]	Rate lb ai/A	Percent control	Observations
picloram	2	100	30% reduction of grass
picloram	3	100	50% reduction of grass
picloram	4	100	70% reduction of grass
picloram + 2,4-D	2 + 4	100	30% reduction of grass
picloram + 2,4-D	3 + 6	100	50% reduction of grass
picloram 2% beads	2	100	20% reduction of grass
picloram 2% beads	3	100	50% reduction of grass
picloram 10% pellets	2	95	Bare spots within plots
picloram 10% pellets	3	100	Bare spots within plots
picloram + 2,4,5-T	2 + 4	98	Some grass damage
picloram + 2,4,5-T	3 + 6	100	Some grass damage
dicamba	6	95	Good grass cover
dicamba	8	99	Good grass cover
dicamba 10% gran.	6	80	Bare spots-poor coverage
dicamba 10% gran.	8	90	Bare spots-poor coverage
dicamba + 2,4-D	4 + 12	90	Good grass cover
dicamba + 2,4-D	6 + 18	90	Good grass cover
Dowco 290 (M-3972)	2	50	Good grass cover
Dowco 290 (M-3972)	3	50	Good grass cover
glyphosate + dicamba	1 + 2	50	Good grass cover
glyphosate + dicamba	1 + 3	50	Good grass cover
glyphosate	2	50	30% reduction of grass
glyphosate	3	80	50% reduction of grass
DPX-1108	4	0	
DPX-1108	6	40	
R-40244	2	0	

[1/] Application made July 12, 1977; evaluated July 14, 1978.

Leafy spurge control with postemergence herbicides. Blank, S. E. In late summer and fall of 1977 postemergence herbicide treatments were applied to a uniform stand of leafy spurge on July 21 (before frost), September 7 (after frost), and October 3 (after frost). Chemicals were applied with a 6 ft boom calibrated to deliver 25 gpa. At each time of application, 10 ft by 20 ft plots were replicated three times in a randomized complete block design. The leafy spurge was in full bloom when treated in July and beyond bloom to seed set and maturity when treated in September and October. The onset of freezing temperatures in the fall of 1977 occurred on August 31. The air temperature at herbicide application time was 80 F in July, 80 F in September, and 55 F in October. All treatments were visually evaluated on June 12, 1978 for percent weed control when compared to an untreated check plot.

The commercial formulation containing the isopropylamine salt of glyphosate (IPA glyphosate) provided superior control of leafy spurge from July and September applications. Based upon mid-July applications, 2.3 lb ae/A or more of IPA glyphosate was needed to achieve adequate control. Herbicide treatments performed in early September (seven days after frost) were superior to treatments made in mid-July (before frost) or early October (33 days after frost). None of the chemicals evaluated were effective in controlling leafy spurge when applied in October. (Monsanto Agricultural Products Company, Twin Falls, Idaho 83301)

Leafy spurge control with postemergence herbicides applied at three times during 1977

Herbicide	Rate 2/ lb/A	Percent control 1/ Date of application July 21	September 7	October 3
IPA glyphosate	1.5	58	95	12
IPA glyphosate	2.3	83	-	-
IPA glyphosate	3.0	85	96	42
IPA glyphosate	4.5	95	-	-
Dicamba	4.0	18	-	-
2,4-D amine+dicamba	3.0+1.0	20	57	20

1/ Values are averages of three replications; treatments evaluated June 12, 1978.

2/ IPA glyphosate rates expressed as lb ae/A; 2,4-D amine and dicamba rates expressed as lb ai/A.

<u>Control of orange hawkweed in grass pastures</u>. Wattenbarger, D. W., W. S. Belles and G. A. Lee. Plots were established on an improved pasture site where the orange hawkweed population averaged 15 plants/sq ft. The 9 by 20 ft plots were replicated three times in a randomized complete block design in each of two sites. Upland and lowland sites were treated to compensate for differences in slope, moisture, exposure and soil. Plots were treated in June of 1977 with a knapsack sprayer at 40 gpa when the plants were in full bloom. Visual estimates of control to determine herbicide effectiveness and forage yields were taken on August 10, 1978.

Control of Orange Hawkweed with herbicides and yield of forage on two locations.

Herbicide	Rate lb ai/A	Lowland %Control 1/	Lowland Yield lb/A 2/	Upland %Control 1/	Upland Yield lb/A 2/
Picloram + 2,4-D	.125 + .25	87	1240	94	772
Picloram + 2,4-D	.25 + .50	100	1324	100	1205
Picloram + 2,4-D	.50+1.0	100	1369	100	1562
Picloram	.125	63	1195	76	1009
Picloram	.25	94	1578	99	1919
Picloram	.50	87	1474	100	1116
2,4-D + X-77	1.0 + .5% v/v	67	1892	48	951
2,4-D + X-77	2.0 + .5% v/v	88	1359	65	1027
Dicamba	1.0	47	1324	50	1276
Dicamba	2.0	84	1289	71	1397
Dicamba + 2,4-D	.50 + 1.5	52	1589	24	2008
Dicamba + 2,4-D	1.0 + 3.0	66	1265	97	893
Dichlorprop	2.0	24	1380	25	268
Silvex	1.0	60	1428	14	848
Bentazon	1.0	33	1474	0	0
Bentazon	2.0	2	1404	0	0
Check	0	0	1380	0	116

1/ % Control 8/78
2/ Harvested: 8/10/78

Over 80% control at both sites was achieved with .25 and .5 lb ai/A of picloram and picloram + 2,4-D at .125 + .25, .25 + .5 and .5 + 1.0 lb ai/A. Dicamba at 2.0 lb ai/A and two pounds of 2,4-D plus X-77 surfactant at 5% v/v gave good control of hawkweed at the lowland site. Dicamba + 2,4-D at 1.0 + 3.0 lb ai/A resulted in 97% control at the upland site but was less effective on the wetter lowland site.

Yields of forage under upland conditions were increased appreciably by all treatments except bentazon and 2,4-DP. Lowland forage yields were generally increased by herbicide applications. Some variation in yield data at the lowland site was attributed to irregular hawkweed populations and lack of uniformity of forage stand. (Idaho Agriculture Experiment Station, Moscow, ID 83843)

Control of perennial pepperweed with several soil-active herbicides. McHenry, W. B. and N. L. Smith. A roadside heavily infested with perennial pepperweed was selected to test this weeds response to bromacil, terbacil, metribuzin and karbutilate each applied at 4, 8 and 12 lbs ai/A. Treatments were made February 15, 1972, using a knapsack sprayer in a spray volume of 72 gpa. Four replications were employed with a plot size of 15 by 20 ft. Readings were taken each year until the spring of 1974. All plots were treated in February, 1973, with simazine at 4 lb ai/A for annual weed control. Rainfall the first year following application was less than 3 inches, however, amounts of 27 inches and 23 inches respectively were recorded in the 1973 and 1974 seasons.

Perennial pepperweed response to soil-active herbicides

Herbicide	Rate ai/A	control (10=100%) 5/11/72	7/25/72	5/14/73	4/16/74
bromacil	4 lb	1.5	2.8	5.3	6.0
bromacil	8	3.3	2.3	8.2	9.4
bromacil	12	4.3	2.8	7.7	9.5
terbacil	4	1.0	1.8	3.5	4.5
terbacil	8	2.3	2.5	4.5	8.1
terbacil	12	3.8	4.0	6.6	8.5
metribuzin	4	3.3	3.8	7.5	9.1
metribuzin	8	4.8	5.5	5.9	6.3
metribuzin	12	6.0	6.2	9.5	8.6
karbutilate	4	2.0	3.5	4.3	3.8
karbutilate	8	2.3	4.8	8.9	9.0
karbutilate	12	3.0	4.8	8.2	6.3
control	-	0.0	0.3	1.3	2.3

All herbicides tested exhibited some degree of activity, with bromacil at the 8 and 12 lb ai/A providing the best control two years following application. (Cooperative Extension, University of California, Botany Department, Davis, CA 95616).

Response of purple nutsedge to applications of glyphosate for three years. Hamilton, K. C. Response of purple nutsedge to repeated foliar applications of glyphosate was studied at Tucson, Arizona from 1975 to 1978. Ninety-six plants spaced 10 by 15 feet were established from tubers from the same parent plant in 1973. During the first 2 years, seed heads were removed by mowing. Each year, low rates of trifluralin and diuron or simazine were applied to the soil to control annual weeds. Irrigation was similar to that given cotton. Plants averaged 210 stems when treatments started in 1975. Starting May 27, 1975, April 22, 1976, and May 3, 1977, 2, 4, or 6 lb/A of glyphosate in 25 gpa of water were applied at 2 and 3-month intervals until fall. The same plots received the same treatment each year. Most plots contained four plants and treatments were replicated four times. The number of stems per plant was estimated before each treatment.

At the end of the first year, all treatments reduced the number of stem per plant by 95% and the number of plants with topgrowth were reduced by the 4 and 6 lb/A rates (table). There was no difference between the 2 and 3-month intervals. Continuing applications of glyphosate for the second and third year produced little improvement in purple nutsedge control except at the 6 lb/A rate. After 3 years of repeated applications only the 6 lb/A rate of glyphosate killed all purple nutsedge plants. Plants surviving 9 to 12 applications of 2 or 4 lb/A averaged 2 to 19 aerial stems. (Plant Sciences Dept., University of Arizona, Tucson, AZ 85721).

Purple nutsedge plants with topgrowth after applications of glyphosate for three years

Treatments		Plants with topgrowth			
Months between	Glyphosate lb/A	Nov. 1975	Oct. 1976	Oct. 1977	May 1978
2	2	11	12	11	10
2	4	8	9	5	4
2	6	3	1	1	0
3	2	10	8	4	4
3	4	7	7	4	5
3	6	2	6	0	0

Quackgrass control with glyphosate applied with a controlled droplet applicator. Eberlein, Charlotte and L. C. Burrill. A hand held, spinning disk, herbicide applicator called the "HERBI" is being marketed in the United States and other areas of the world. A trial was conducted near Independence, Oregon in 1978 to compare the control of quackgrass with glyphosate when applied with the "HERBI" or with a conventional plot sprayer.

In July, a commercial formulation of glyphosate was applied at 0.5, 1.0, and 2.0 lb ae/A to an established sod of quackgrass. Plots were 8 by 20 ft with a 4 ft swath sprayed in each plot. The treatments were replicated three times. The total volume of output by the "HERBI" was .71 gpa. The output of the bicycle plot sprayer using teejet 8002 flat fan nozzles was 41 gpa.

Visual evaluations of quackgrass control two months after application showed glyphosate to be more active at the low rates when applied with the "HERBI." (International Plant Protection Center, Oregon State University, Corvallis, OR 97331).

Quackgrass control with glyphosate when applied with a "HERBI" or conventional sprayer

Treatment	Rate lb/A	Percent quackgrass control			
		RI	RII	RIII	Avg.
glyphosate	.5 HERBI	50	40	40	43
glyphosate	.5 conventional	0	0	0	0
glyphosate	1.0 HERBI	70	70	40	60
glyphosate	1.0 conventional	30	40	20	30
glyphosate	2.0 HERBI	85	85	90	87
glyphosate	2.0 conventional	85	90	80	85
check	-	0	0	0	0

Russian knapweed control one and two years following treatment. Alley, H. P. and N. E. Humburg. The plots were established August 6, 1976 to compare the effectiveness of Dowco 290 (M-3972) with dicamba, picloram, heavy rates of 2,4-D amine, and glyphosate for Russian knapweed control. The experimental site was on undisturbed non-cropland area heavily infested with Russian knapweed with a minor infestation of hoarycress. Plots were 2 sq rd, with one replication. All treatments were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa total volume of water carrier. The Russian knapweed was in full to past bloom at time of treatment.

Visual evaluations made on August 9, 1977 and August 29, 1978 approximately one and two years following treatment indicated that all herbicides included in the trial have potential of reducing Russian knapweed stands. Dowco 290 (M-3972) appears to be an outstanding herbicide for Russian knapweed control. Evaluation two years following treatment show complete elimination with no apparent phytotoxicity to the associated grass species. Picloram and dicamba were also effective treatments but picloram caused considerable prostrate growth of the grass. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 909).

Herbicides, Russian knapweed control, and observations

Herbicide 1/	Rate lb ai/A	Percent control 1977	1978	Observations
Dowco 290 (M-3972)	1	100	100	No annual weed control
Dowco 290 (M-3972)	1.5	100	100	and no apparent
Dowco 290 (M-3972)	2.0	100	100	damage to grass
Dowco 290 (M-3972)	2.5	100	100	
dicamba	4	100	85	No hoarycress control
dicamba	6	98	90	no damage to grass
dicamba	8	100	99	
picloram	0.5	98	95	No grass damage
picloram	1.0	100	100	Grass prostrate
2,4-D amine	40	60	80	Annual weeds present
glyphosate	2	75	50	Annual weeds common
glyphosate	4	85	70	on treated areas
glyphosate	6	85	80	

1/ Applications made August 6, 1976; evaluated August 9, 1977 and August 29, 1978.

Effects of glyphosate and other herbicides on Russian Knapweed in northern New Mexico. Dickerson, George. Russian Knapweed has been found to be one of the most difficult weeds to control in northern New Mexico. As this perennial weed often borders cropping areas, chemicals such as 2,4-D and 2,4,5-T may often cause some problems through drift or runoff. Glyphosate, a herbicide found effective in combating perennial weeds such as bindweed and Johnsongrass, has been found to be somewhat less hazardous in use around crops as it tends to be deactivated when it comes in contact with the soil. These experiments were conducted to compare the effects of glyphosate, mixtures of glyphosate and 2,4-D, and other herbicides on Russian Knapweed.

Two experiments were set up in 1976 near La Plata and Abiquiu in northwest New Mexico. Plots were located along roadside fences on sandy loam soils. A completely random block design with three replications was used at each site with plots averaging 3.6 m^2. Chemicals were applied on August 24 and 25, 1976, with a backpack sprayer thoroughly wetting the foliage of the plants. Plants were in the late bloom stage. Exact rates of chemical per hectare varied as only the foliage was sprayed and the density of the stands varied. Chemicals included various rates of 2,4-D (ester), glyphosate and a mixture of both (Table 1). Plots were ranked two months after application according to visual evaluations of top kill. A Chi Square analysis was run on the data using Friedman's procedure (Steel and Torrie, 1960, Prin. and Proc. of Statistics, p. 403).

Table 1 Effects of various rates of herbicides on top kill of Russian Knapweed in northwest New Mexico, 1976.

		Top kill			
		Abiquiu		La Plata	
Chemical	kg ai/190 l H_2O	Rank[1/]	% kill	Rank[1/]	% kill
Glyphosate	0.90	23a[2/]	83	13e[2/]	92
2,4 D	0.90	22ab	68	---	
2,4-D	0.45	16abc	8	---	
2,4-D+ Glyphosate	0.22+ 0.11	13abc	8	14e	98
2,4-D	0.22	11bc	4	9ef	52
Glyphosate	0.45	11bc	12	---	
Glyphosate	0.11	9c	1	7ef	19
Check	----	5c	0	3f	0

1/ Highest numbers in a column represent best top kills (Total rank of three blocks).

2/ Numbers followed by the same letter in a column are not significantly different ($LSD_{.05}$).

A completely random block design was set up for the experiment in 1977 across three counties in northern New Mexico (Taos, Rio Arriba, and San Juan), with one replication per county. Soils were sandy loam in nature. Plots averaged 45 m^2 in size. Chemicals were applied with a small, gasoline-powered sprayer and handgun, thoroughly wetting the foliage. Plants were in the late bloom stage. Chemicals included various rates of

2,4-D (ester), glyphosate and their mixtures, a mixture of 2,4-D (amine) and dicamba, and 2,4,5-T (LVE)(Table 2). Plots were ranked according to visual evaluations of top kill (1977) and total kill (1978). A Chi Square analysis was run on the data using Friedman's procedure.

Table 2 Effects of various rates of herbicides on top and total kill of Russian Knapweed in northern New Mexico, 1977-1978.

	Rate	Top kill (1977)		Total kill (1978)	
Chemical	kg ai/190 l H_2O	Rank[1]	% kill	Rank[1]	% kill
Glyphosate	0.90	32a[2]	100	37e[2]	90
Dicamba+ 2,4-D	0.11+ 0.34	32a	100	35ef	83
Glyphosate	0.45	32a	100	32efg	75
2,4,5-T	0.90	32a	100	28efg	50
2,4-D	0.90	29ab	97	24efg	40
2,4-D+ Glyphosate	0.22+ 0.11	25abc	90	22efg	37
2,4-D+ Glyphosate	0.11+ 0.11	22abcd	88	14gh	7
2,4-D	0.45	21abcd	88	18gh	13
Glyphosate	0.22	14abcd	78	20efgh	32
2,4-D	0.22	14abcd	80	14gh	7
2,4-D	0.11	12bcd	73	14gh	7
Glyphosate	0.11	8cd	52	14gh	7
Check	----	3d	0	3h	0

1/ Highest numbers in each column represent best kills (Total rank of three blocks).

2/ Numbers followed by the same letter in a column are not significantly different ($LSD_{.05}$).

A significantly better top kill (LSD.05) of Russian Knapweed was obtained at Abiquiu in 1976 using glyphosate at 0.90 kg ai/190 l H_2O (4 lb ai/100 gal H_2O) than glyphosate at 0.45 or 0.11 kg or 2,4-D at 0.22 kg (Table 1). No significant differences were noted in top kill between glyphosate at 0.90 kg and 2,4-D at the same rate, half the rate, or the mixture of 2,4-D and glyphosate. Glyphosate at 0.90 kg and the 2,4-D+glyphosate mixture showed a significantly (LSD.05) better top kill than the check at La Plata.

The highest rate of glyphosate and dicamba+2,4-D tended to give the best top and total kills in 1977 and 1978, though there were no significant (LSD.05) differences between them and the highest rates of 2,4-D, 2,4,5-T, or glyphosate at 0.45 kg (Table 2). The mixtures of 2,4-D+glyphosate showed no significant differences in kills over either of the chemicals alone at the same rates.

Treatments tended to vary with location. The glyphosate treatments tended to be more sensitive to location effects, possibly due to soil moisture conditions. The dicamba treatment seemed to be the most consistent. More work needs to be done on studying the effects of treating Russian Knapweed at various stages of development and under different soil moisture conditions. (Dept. of Agricultural Services, New Mexico State University, Las Cruces, New Mexico 88003).

Swamp smartweed response to glyphosate and asulam. Smith, N. L., W. B. McHenry, and L. L. Buschmann. Swamp smartweed, a difficult to control perennial weed, has shown little response to soil and foliage-active herbicides tested previously. A ditchbank heavily infested with swamp smartweed was chosen to evaluate the efficacy of glyphosate and asulam. Materials were applied September 28, 1973, in 40 gpa of water using a knapsack sprayer and three nozzle boom. Swamp smartweed had just completed flowering and was 12 to 24 inches in height. Four replications were employed using 15 by 20 ft. plot size. A non-phytotoxic oil (Mor Act) at 1% and surfactant (Surfax) at .25% was added to the asulam treatments. No additional surfactant was added to glyphosate. Results obtained are shown in the following table.

Glyphosate exhibited near eradication at 4 lb ai/A; acceptable control was achieved at all rates for two years after application. Asulam was not effective for the control of swamp smartweed. (Cooperative Extension, University of California, Botany Department, Davis, CA 95616 and P.O. Box 628, Yuba City, CA 95991.

Swamp smartweed control[1]

Herbicide	rate ai/A	6/6/74	7/15/75	11/13/75
glyphosate	0.5 lb	8.6	6.8	7.6
glyphosate	1	8.8	7.3	7.3
glyphosate	2	9.0	7.9	7.6
glyphosate	4	9.3	8.8	9.0
asulam + oil + surfactant	6 + 1% + 1/4%	2.5	0.0	0.0
control	-	1.0	0.0	0.3

Data is average of four replications

[1] 0 = no control, 10 = complete control

Evaluation of spring applied herbicide control on Tansy. Belles, W. S., D. W. Wattenbarger, W. O. Noel and G. A. Lee. Field trials were initiated on May 18, 1978 in Bonner County, Idaho, in a field seeded the previous year to a clover-grass pasture mix. Plots were 9 by 30 ft replicated three times in a randomized complete block design. Visual evaluations were taken on September 5, 1978 to determine % control of Tansy. Dry weights of Tansy and forage were determined from plots harvest on July 25. Liquid herbicide treatments were applied with a knapsack sprayer equipped with a three-nozzled boom. Water was used as a carrier at a 40 gpa rate. Bead and pellet formulations were distributed by hand.

Effect of herbicides on tansy control and forage yields in Bonner County, Idaho in 1978.

Herbicide	Rate lb ai/A	Yield (lb/A)[1] Forage	Tansy	% Control (September 5)
Check	0	1163	707	0
Picloram 2% beads	1.0	1116	24	91
Picloram 2% beads	2.0	1214	141	76
Picloram 2% pellets (M4301)	1.0	1002	53	75
Picloram 2% pellets (M4301)	2.0	989	0	98
Picloram 5% pellets (M3864)	1.0	894	96	85
Picloram 5% pellets (M3864)	2.0	661	0	95
Picloram	0.5	1010	4	96
Picloram	1.0	1095	0	99
Picloram	2.0	596	0	100
Picloram + 2,4-D	.25 + .50	1365	6	92
Picloram + 2,4-D	.50 + 1.0	1175	0	99
Picloram + 2,4-D	1.0 + 2.0	1038	0	100
Dichlorprop	4.0	1244	88	82
Dicamba	2.0	1311	1	66
Dicamba	4.0	1206	7	95
Dicamba + 2,4-D[1]	1.0 + 3.0	1587	0	68
Dicamba + 2,4-D	2.0 + 6.0	2275	0	78

[1]Harvested July 25, 1978.

All treatments resulted in significant reductions in Tansy yield at harvest on July 25. Visual evaluations on September 5 showed 95% or better control with picloram 2 and 5% pellets at 2.0 lb ai/A, picloram at .5, 1.0 and 2.0 lb ai/A, picloram + 2,4-D combinations of 0.5 + 1.0 and 1.0 + 2.0 lb ai/A, and dicamba at 4.0 lb/A. The highest forage yield increases were from the dicamba + 2,4-D combinations. Decreases in forage yields occurred with some treatments apparently from picloram injury to legume species. (Idaho Agriculture Experiment Station, Moscow, ID 83843).

PROJECT 2

HERBACEOUS WEEDS OF RANGE AND FOREST

P. M. Ritty, Project Chairman

SUMMARY -

Only one report was submitted. Five herbicides were compared, alone and in combination, and applied as single and/or repeat treatments on dry land pastures for the control of artichoke thistle. Results indicated only picloram at 0.5 to 1.0 lb ai/A and the LVE formulation of 2,4-D at 4.0 lb ai/A applied at early flower bud stage can give excellent control of artichoke thistle for 3 years.

PAPERS -

Herbicides for the control of artichoke thistle on dryland pasture. McHenry, W. B., P. W. Lamborn and N. L. Smith. The response of artichoke thistle to 2,4-D (isooctyl ester), picloram, fosamine, triclopyr, and Dowco 290 was tested at two locations on rangeland in Contra Costa County. Early treatments of 2 and 4 lb ai/A of 2,4-D were initially applied at both sites March 8, 1974 in 108 gpa. Growth stage of thistle at this time ranged from seedlings to mature perennial plants 30 inches in height at location A and seedlings to mature 24 inch plants at location B. Flower buds had not yet formed at time of treatment. Later treatments included reapplication of 2,4-D plus an initial application of the other herbicides tested. These were applied April 7 to 8, 1974, to location A in 200 gpa of water. At this time one-third of plants treated were in late flower bud stage of growth. At location B, late applications were made May 14, 1974. A spray volume of 108 gpa was used when the thistle ranged between early to late bud stage. Surfactant (Surfax) was added to all applications of picloram (except granules), fosamine, Dowco 290, and triclopyr. Plot size at both locations was 25 ft by 25 ft. Four replications were utilized at site A and three at site B. Rainfall totals following late applications ranged from approximately 1 inch at site A to .33 inches at location B in 1974. Evaluations made in 1974 and early 1975 indicated that an early application of 2,4-D at the 2 and 4 lb level provided excellent control and was superior to application made during the bud stage. Control with picloram was excellent at location A (table 1) but was considerably less at location B (table 2) possibly due to rainfall differences. Both triclopyr and Dowco 290 provided some degree of control but could not be considered acceptable at this time. No effects were noted from fosamine applications. In 1975 both sites were retreated on April 9 (early 2,4-D) and July 1 (late 2,4-D and others except liquid picloram at 1 lb ai/A). Evaluations were made at site A through spring of 1977. At 4 lb ai/A, 2,4-D applied at the earlier stage gave excellent control of artichoke thistle. Picloram at 0.5 lb ai/A treated twice and 1 lb ai/A applied once exhibited excellent control. Fosamine at 2 lb ai/A gave acceptable control, but did not give control of seedling plants which reinfestated the plot. Site B was not evaluated following the retreatment in July, 1975, when picloram again was exhibiting excellent control along with Dowco 290. The results of this study indicate that picloram at 0.5 to 1 lb ai/A and 4 lb ai/A 2,4-D LVE applied at early bud stage can give excellent control of artichoke thistle. (Cooperative Extension, University of California, Botany Department, Davis, CA 95616 and Contra Costa County (P.O. Box 351), Pittsburg, CA 94565

Table 1. Artichoke thistle control (site A)

Herbicide	rate ai/A	7/26/74	12/20/74	control[1] 1/29/75	7/1/75	6/18/76	3/23/77
early							
2,4-D LVE	1 lb	-	-	-	-	-	-
2,4-D LVE	2	9.3	4.5	4.9	8.5	9.9	0.5
2,4-D LVE	4	10.0	7.4	6.8	9.9	9.9	9.9
late							
2,4-D LVE	1	4.9	5.2	2.3	5.0	0.8	0.0
2,4-D LVE	2	4.5	8.8	6.8	4.0	2.0	0.8
2,4-D LVE	4	9.1	9.7	9.8	6.3	7.0	2.7
picloram	0.25	8.9	9.9	10.0	9.5	9.3	8.3
picloram	0.5	9.5	9.9	10.0	9.9	10.0	10.0
picloram	1	9.6	10.0	10.0	10.0	10.0	9.0
fosamine	1	0.0	7.4	8.2	1.0	0.5	0.0
fosamine	2	0.0	9.2	9.0	7.0	2.3	0.0
triclopyr	1	-	-	-	-	-	-
triclopyr	2	-	-	-	-	-	-
Dowco 290	1	-	-	-	-	-	-
Dowco 290	2	-	-	-	-	-	-
picloram	1	10.0	9.9	10.0	9.5	10.0	9.9
control	-	0.0	3.5	0.8	1.0	0.3	0.0

data is average of four replications

[1] 0 = no control, 10 = complete control

Table 2. Artichoke thistle control (site B)

Herbicide	rate ai/A	control[1] 7/16/74	control[1] 1/29/75
early			
2,4-D LVE	1 lb	1.3	0.0
2,4-D LVE	2	9.6	3.8
2,4-D LVE	4	10.0	3.3
late			
2,4-D LVE	1	3.7	4.8
2,4-D LVE	2	3.7	4.3
2,4-D LVE	4	7.0	1.7
picloram	0.25	2.7	9.9
picloram	0.5	4.8	9.9
fosamine	1	6.3	9.9
fosamine	2	-	-
triclopyr	1	5.7	6.6
triclopyr	2	2.3	6.9
Dowco 290	1	3.7	9.8
Dowco 290	2	5.0	9.9
picloram (beads)	1	-	-
control	-	0.0	1.7

data is average of three replications

[1] 0 = no control, 10 = complete control

PROJECT 3

UNDESIRABLE WOODY PLANTS

Walter L. Gould, Project Chairman

SUMMARY -

In a comparison of several herbicides as foliar sprays on Pacific poison oak in California, glyphosate at 5 or more lb/A gave quite effective control. Silvex, amitrole and 2,4-D plus dichlorprop gave marginal control, while asulam was slightly effective.

Poor to good brush control resulted four years after treatment of chaparral in Arizona with karbutilate brush balls. Shrub live oak was the most severely affected species, while Wright silktassel and skunkbush sumac were the least affected. The injury response of woody species was slow in appearing. Bioassay tests of the treated area indicate that high concentrations of karbutilate remain in th soil, so further toxicity to woody plants is expected. The native grass cover increased as brush density declined.

Small plot treatments on Utah juniper and shrub live oak in central Arizona with tebuthiuron pellets or tablets resulted in complete control three years after application of 2 or more lb ai/A. Preliminary results from aerial application of tebuthiuron at 2 or 4 lb/A show good toxicity to these species, but damage from 1 lb/A is slight except on small trees. Native grasses were damaged by 2 or more lb/A, but the surviving plants were more vigorous than in untreated areas.

Rabbitbrush and horsebrush treated with picloram, tebuthiuron and triclopyr at three growth states, i.e., dormant, early regrowth and flowering, were killed at all stages by tebuthiuron at 4 kg ai/ha. Picloram killed horsebrush, but the results on rabbitbrush were widely variable. A poor response to triclopyr was noted for both species. Grasses were damaged by tebuthiuron at 4 kg ai/ha.

Broom snakeweed treated with several rates of picloram, tebuthiuron or triclopyr during the dormant, early regrowth or flowering growth stages was effectively controlled by tebuthiuron at two or more kg ai/ha. Picloram at 1/2 to kg ae/ha gave good control from treatments during the dormant or early regrowth stage, but not during the flowering stage. Triclopyr was ineffective except at the highest rate, and results at this rate were variable. Tebuthiuron damage to native grasses was least from the dormant treatments.

In a greenhouse study broom snakewood was found to be highly competitive to sideoats grama, fourwing saltbush and western wheatgrass, but not to Luna pubescent wheatgrass. The wheatgrasses and sideoats grama reduced broom snakeweed growth, but fourwing saltbush had no effect.

PAPERS -

Evaluation of six foliage-applied herbicides for the control of Pacific poison oak. McHenry, W. B.[1], E. J. Johnson[2], W. D. Hamilton[3], and N. L. Smith[1]. Six herbicides were tested at two locations to compare their effectiveness for the control of pacific poison oak. Three replications were employed in San Mateo County, May 10, 1973, and a fourth replication in Alameda County, May 31, 1973. Amitrole, silvex (isooctyl ester), and 2,4-D (butoxyethanol ester) + dichlorprop (butoxyethanol ester) were applied in 200 gpa water. Diesel oil at 1/2% by volume was included in all applications of phenoxy herbicides. Asulam and glyphosate were applied in 40 gpa. Plot size was 12 ft by 20 ft. All herbicides were applied when poison oak was in full bloom using a knapsack sprayer and single nozzle wand. Treatments were evaluated visually for control (see following table). Glyphosate at 5.3 and 10.6 lb ai/A exhibited the best over-all control. Response from amitrole, silvex, and 2,4-D plus dichlorprop was marginal. Asulam gave some degree of control but was the weakest of the herbicides tested. (Cooperative Extension, University of California, Davis, CA 95616[1], formerly of San Mateo County[2], Alameda County, 224 West Winton Avenue, Hayward, CA 94544[3].

Poison oak control[1]

Herbicide	Rate ai/A	San Mateo County 5/14/74	San Mateo County 6/18/74	San Mateo County 9/16/74	San Mateo County 5/21/75	Alameda County 5/14/74	average 5/14/74
amitrole	4 lb	7.3	2.7	2.7	5.3	9.0	7.8
amitrole	8	9.0	6.6	6.0	6.7	9.9	9.2
amitrole	12	7.5	3.7	3.7	5.7	9.9	8.1
silvex + diesel	4	9.6	8.2	5.7	5.7	6.0	8.7
silvex + diesel	8	9.7	9.2	6.3	7.5	9.5	9.6
2,4-D + dichlorprop + diesel	4	9.3	4.0	3.0	7.0	9.9	9.5
2,4-D + dichlorprop + diesel	8	9.5	5.0	3.3	6.0	3.0	7.9
asulam	4	3.2	1.0	2.3	4.3	5.0	3.6
asulam	8	5.0	5.0	3.3	5.0	8.0	5.8
asulam	12	5.0	2.7	2.0	4.0	9.9	6.2
glyphosate	2.7	7.6	3.0	5.0	5.0	9.9	8.2
glyphosate	5.3	9.0	7.7	7.0	8.3	9.9	9.2
glyphosate	10.6	9.9	9.3	9.3	9.3	9.9	9.9
control	-	0.0	0.0	0.0	1.0	0.0	0.0

[1] control 0 = no control, 10 = complete control

Chaparral control with aerially applied karbutilate brush balls. Davis, Edwin A. Success in controlling Arizona chaparral has been greater with soil-applied herbicides than with foliage sprays. But because some of the most effective soil-applied herbicides are nonselective and persistent it is not possible to establish grass cover for several years following broadcast applications of granular or pellet formulations. We need a method of applying nonselective and persistent herbicides that will provide acceptable brush control and allow seeding of grasses within a few months of the herbicide application.

Karbutilate is an effective soil-applied herbicide against chaparral shrubs, but is nonselective and persistent. It is more persistent in neutral or acidic soils than in alkaline soils. With slightly acidic soils it has been necessary to delay seeding of grasses for several years, depending on the rate of karbutilate applied; seeding of a chaparral watershed treated with a broadcast application of karbutilate granules at 20 lb a.i./A had to be delayed for three years.

A possible approach with nonselective and persistent herbicides is a broadcast application of high-potency "brush balls" randomly spaced three to six feet apart. By concentrating the herbicide in widely spaced spots it is possible that acceptable brush control can be combined with minimal loss of existing grass cover or of reseeded grasses. A side benefit of such a treatment may be that application rates can be reduced. This may be possible because of greater herbicide persistence at the spots of concentrated herbicide than in soil treated uniformly with granular or pellet formulations in less concentrated form.

The degree of success in controlling chaparral with brush balls will depend partly on the nature of the root systems of the various shrubs. Species with extensively spreading root systems should be more susceptible to this type of treatment than those with laterally restricted roots. It is known that shrub live oak (Quercus turbinella), a dominant species of chaparral in Arizona, has an extensive lateral root system as well as many deeply penetrating roots. Information concerning the root systems of other Arizona chaparral shrubs is lacking, however.

Results of a small plot experiment indicated that 3-foot and 6-foot spot applications of karbutilate applied in a grid pattern at rates of 5.6 to 8.4 lb a.i./A can effectively control chaparral without causing serious damage to seeded grasses. Excellent grass cover developed rapidly in the grid plots in contrast to broadcast plots, treated with a 10% granular formulation at comparable rates, which remained barren of grass for a year.

These results led to the treatment of a 66-acre chaparral watershed (Mingus B) with karbutilate brush balls applied by helicopter at the rate of 4 lb a.i./A. The balls were 9/16th-inch in diameter, 50% active, and contained 0.75 g of karbutilate. Theoritically, the brush balls were randomly spaced about four feet apart. Because of inadequate precipitation during the first two posttreatment years injury to the brush was minor. Soil bioassay tests on soil from staked sites, where brush balls had been placed, indicated that highly phytotoxic karbutilate residues were present. Also, partially disintegrated "brush balls" were observed. After four years, injury to the chaparral shrubs has gradually increased due to more adequate rainfall conditions. Bioassay tests indicate that high concentrations of karbutilate residues remain in the soil, and partially intact "brush balls" are still evident. Brush control on the watershed ranges from poor to good. The variable response is probably caused by an uneven distribution of brush balls. The unusually slow injury response was probably caused by inadequate rainfall and the slow disintegration of the brush balls.

Shrub live oak is the most severely injured species, followed by hairy mountainmahogany (Cercocarpus breviflorus). Wright silktassel (Garrya wrightii) and skunk bush sumac (Rhus trilobata) are the least affected species. Because high concentrations of karbutilate are still present in the soil it is anticipated that injury to the brush will continue to increase in severity.

Although the watershed was not seeded, the native grass cover is increasing as brush density declines. Thus far the concept of applying a nonselective and persistent herbicide in widely spaced spots by means of a brush ball formulation appears promising. A brush ball that disintegrates and releases the herbicide more rapidly, however, is needed. (Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, Arizona State University, Tempe, AZ 85281).

Aerial application of tebuthiuron for control of Utah juniper and shrub live oak. Johnsen, T. N. and H. L. Morton. Small plots treated with tebuthiuron in 1975 in central Arizona have shown Utah juniper and shrub live oak are controlled at rates of 2 or more lb a.i./A. In these studies tebuthiuron formulated as large tablets were applied onto 45 by 45 ft plots at Mullican Place and onto 54 by 54 ft plots at Drake at the rates of 0, 2, 4, and 6 lb a.i/A. Pelleted tebuthiuron was also applied at 4 lb a.i./A at Mullican Place.

Percent of shrub live oak and Utah juniper killed by tebuthiuron applied spring, 1975 at indicated years after application.

		Mullican Place						Drake		
Formu-	Rate	Shrub live oak			Utah juniper			Utah juniper		
lation	lb a.i./A	1 yr	2 yr	3 yr	1 yr	2 yr	3 yr	1 yr	2 yr	3 yr
None	0	0	0	0	0	0	0	0	0	0
Tablet	2	5	60	100	5	60	100	5	85	100
	4	0	95	100	0	60	100	5	80	100
	6	15	60	100	15	70	100	15	90	100
Pellets	4	85	100	100	85	100	100	-	-	-

At the end of three years all the junipers and oaks were dead.

Aerial applications were applied on November 10, 1977 to determine response variations, develop treatment recommendations, and demonstrate practicality of the treatment. Tebuthiuron as a 20% pellet formulation was applied at the Rio Verde Ranch near Paulden, Arizona, onto a mixed stand of Utah juniper and shrub live oak with other woody species representing a minor component of the overstory.

Applications of 1, 2, and 4 lb a.i./A were made onto plots seven acres in size. The following winter was very wet with a dry spring and summer. Preliminary results during the first year after treatment are similar to those of the small plot studies but foliage damage appeared more quickly. Utah junipers are dead or severely damaged, shrub live oaks are defoliated and regrowth is dying, and pinyons defoliated and regrowing on the 2 and 4 lb a.i./A plots. Plant damage from the 1 lb a.i./A rate is slight but the smaller trees are severely damaged. In the fall blue grama and black grama were damaged with the 2 and 4 lb a.i./A rates. Surviving grasses were green, growing, and markedly larger than the same species on untreated areas where they were dry and dormant due to drouthy conditions. Soils on the 4 lb a.i./A treatment were moist from 3 to at least 18 in deep, soils of untreated area were dry down to at least the 18-in depth. (U.S. Dept. Agriculture, SEA-AR, 2000 East Allen Road, Tucson, AZ 85719.)

Control of rabbitbrush and horsebrush with picloram, tebuthiuron and triclopyr in Arizona. Johnsen, T. N., Jr. and R. M. Madrigal. Rabbitbrush and horsebrush are widely distributed, difficult to control, undesirable shrubby plants in much of the western United States. Horsebrush is poisonous to livestock. Picloram, tebuthiuron, and triclopyr were evaluated for control of these plants at two Arizona locations, Red Mountain and Indian Flats, at three different growth stages: dormant in late October, 1976; 3 to 5 inch long regrowth in late April and mid May 1977; and flowering plants in August, 1977. Treatments were: tebuthiuron as 20% pellets broadcast at 4 kg a.i./ha; potassium salt of picloram sprayed at 3/4 kg a.e./ha; ethylene glycol butyl ether ester of triclopyr sprayed at ½, 1, and 2 kg a.e./ha; triethylamine salt of triclopyr sprayed at ½, 1, and 2 kg a.e./ha; and untreated checks. Sprays were all applied with a hand-held boom at 160 l/ha with a water carrier. Plots, 10 by 30 m, were in a randomized block design replicated twice. Observations through October, 1978, indicate a poor response to the triclopyr formulations. Rabbitbrush responses to picloram varied widely between replications, times and locations, but horsebrush was killed uniformly by all treatments. Tebuthiuron killed all the plants of both rabbitbrush and horsebrush regardless of timing or locations. Tebuthiuron damaged grasses, especially blue grama, more heavily with the spring and summer applications than with the fall application. Grasses were damaged more heavily at Red Mountain, the drier site, than at Indian Flats. Snakeweed mixed in the stands was killed by both tebuthiuron and picloram. (U.S. Dept. Agriculture. 2000 East Allen Road, Tucson, AZ 85719.)

Control of broom snakeweed with picloram, tebuthiuron, and triclopyr. Johnsen, T. N., Jr. and R. M. Madrigal. Broom snakeweed is a widespread, hard to control poisonous plant in much of the western United States. Three herbicides were evaluated at Drake, Arizona, to determine the most effective rate and stage of growth. Plants were treated at three growth stages: dormant plants in late September, 1976; 3 to 5 in regrowth in late April, 1977; and flowering plants in late August, 1977. Treatments were: tebuthiuron as 20% pellets broadcast at 2 and 4 kg a.i./ha; potassium salt of picloram sprayed at ½, 3/4, and 1 kg a.e./ha; triethylamine salt of triclopyr sprayed at ½, 1, and 2 kg a.e./ha; and untreated control plots. Sprays were applied in water with a hand-held boom at 160 l/ha. Plots, 10 by 30 m, were in a randomized block design replicated twice. Evaluations in October, 1978, indicated that the 2 kg a.e./ha rate of triclopyr controlled snakeweed, but responses varied from 0 to 100% plants killed, between replications and times. The lower rates of triclopyr did not damage broom snakeweed. Tebuthiuron killed all the snakeweed plants at all dates and both rates. Tebuthiuron damaged grasses, especially blue grama and black grama, but did the least damage with the late September treatments. Sideoats grama was not damaged except for the 4 kg a.i./ha tebuthiuron rate applied in late September. All three rates of picloram killed broom snakeweed when applied in the spring and summer, but responses to the late September application were variable at the ½ and 3/4 kg a.e./ha rates. (U.S. Dept. Agriculture, SEA-AR, 2000 East Allen Road, Tucson, AZ 85719.)

Broom snakeweed competition with grasses and a shrub in the greenhouse.

Johnsen, T. N., Jr. and R. M. Madrigal. Broom snakeweed is a widespread, difficult to control, poisonous plant which occurs on many western United States ranges. It often invades and dominates disturbed sites, preventing establishment of many forage species. A study was done in the greenhouse at Flagstaff, Arizona, to determine the effects of snakeweed seedlings on the growth of seedlings of several common forage species used to replant Southwestern pinyon-juniper ranges. The species tested were: fourwing saltbush, a forage shrub, and three forages grasses: luna pubsecent wheatgrass, western wheatgrass, and sideoats grama. Seeds were planted in 1-gal cans filled with Springerville clay loam. Each species was grown alone and with broom snakeweed. There were eight replications of the nine species combinations. The study was begun February 3, 1978 and ended on July 1, 1978. General observations and height measurements were done weekly; and the oven dry weight of each species in each treatment was determined at the end. Broom snakeweed markedly reduced the growth of all species but luna pubescent wheatgrass. Broom snakeweed itself was effected by all but fourwing saltbush. It was eliminated by luna pubescent wheatgrass and almost so by western wheatgrass. Fourwing saltbush did not affect broom snakeweed growth.

Oven dry weight of snakeweed and forage plants after growing five months alone or with snakeweed.[1/]

	Plant weight (grams)		
Species	Alone	Forage plant with snakeweed	Snakeweed with forage plant
Broom snakeweed	4.1	--	--
Sideoats grama	4.4	1.7	1.9
Fourwing saltbush	4.6	1.2	3.4
Luna pubescent wheatgrass	3.3	3.4	0.0
Western wheatgrass	3.4	2.7	0.4

1/ Average of 8 replications

(U.S. Dept. Agriculture, SEA-AR, 2000 East Allen Road, Tucson, AZ 85719.)

PROJECT 4

WEEDS IN HORTICULTURAL CROPS

P. D. Olson - Project Chairman

SUMMARY -

Thirty research reports were submitted for the horticultural section from herbicide trials in California, Idaho, Washington, and Utah.

Tomatoes (17 papers) - Preplant incorporated EPTC and pebulate did not reduce stand in the drilled plantings. All herbicides combined with napropamide gave excellent weed control with the exception of MBR - 18337 on plug planted tomatoes. The best treatments were CDEC + napropamide and perfluidone + napropamide. Depth of incorporation studies indicated that direct-seeded and plug planted tomatoes were adversely affected by deeper herbicide incorporation. The effect of incorporation depth on weed control varied by planting method. In direct-seeded rows the best weed control was obtained with shallow incorporation. Preplant incorporated herbicide treatments gave good nightshade control. Plug planting gave good protection from herbicides compared to the fluid drill. In plug and direct-seeded cannery tomatoes results were similar to where metolachlor, ethalfluralin and pebulate gave good control to hairy nightshade. Tomatoes had the best tolerance to pebulate. For alachlor, metolachlor, and Dowco 295 the tomato tolerance was insufficient even in the plug treatments. No clear differences between the plugs containing hydrogel and those without were observed. Chlorpropham gave the best black nightshade control, but severely injured the direct-seeded tomatoes. Only slight injury was observed from chlorpropham in the plug planted tomatoes. Supporting data from CDEC, napropamide and pebulate indicated once again that the plug planted tomatoes were much more vigorous than the direct-seeded regardless of the herbicide rate used. Trifluralin and the high rate of chlorpropham resulted in the best broomrape control. The latter also gave the best nightshade control at 12 lbs./A rate. In a separate study, findings showed that the addition of 2.5% activated carbon by weight to the mixes improved tomato tolerance to alachlor, napropamide, and pebulate. Increasing the amount of carbon added to the mix from 2.5% to 10% by weight did not result in further increases in crop tolerance. Among the fumigants tested metham gave excellent weed control of nightshade in tomatoes. Sodium azide was also effective on hairy nightshade, but was more phytotoxic to tomatoes. In another study complete nightshade control was not achieved by telone and methyl bromide but weed competition was significantly reduced. Gibberellic acid at low concentrations seems to stimulate nightshade germination. The tomato seed germination was inhibited by increasing rates of gibberellic acid.

Pistachios (3 papers) - Preemergence treatments of simazine in combination with oryzalin, oxyfluorfen, and prodiamine and methazole + oryzalin were 100% effective on herbaceous weeds with the exception of turkey mullein in established pistachios. Among the preemergence herbicides tested in young pistachios, oryzalin gave the best weed control with the greatest crop safety. Studies conducted with glyphosate, MSMA and 2,4-D amine to simulate herbicide drift on the dormant buds of pistachios indicate slight adverse effects from low rates of herbicides. The high rate of 2,4-D was most injurous to the treated tissue.

Sweetcorn and Melon (3 papers) - EPTC plus R-25788 caused no yield reduction but did produce some early deformity. Unlike EPTC, corn was not protected against dalapon by addition of R-25788. Vernolate + R-40246 plots were essentially free from ear deformity. R-40246 was very phytotoxic to sweet corn in the seedling stage and excellent early season weed control was observed. Studies conducted on the effect of plug composition on germination of melon seed in chlorpropham treated soil indicates no advantage of adding hydrogel where high irrigation was used. The results also showed a better melon stand in the plug than direct seeding. Sodium azide phytotoxicity to melons was substantially eliminated by soil acidification where popcorn sulfur or sulfuric acid were used.

Orchard, raspberries and baby's breath (3 papers) - Napropamide has shown promise as an effective herbicide for orchard weed control in Utah. Napropamide WP and EC formulations alone and in combinations with other soil applied herbicides were safe on orchards. Early season weed control with terbacil, diuron and simazine increased and extended the weed control. In raspberry, napropamide + simazine has been particularly impressive. Terbacil gave early weed season control with some toxicity to young canes. Pronamide at high rates gave good grass control but caused some phytotoxicity in raspberries. Based on harvest totals, *G. paniculata* showed good tolerance to oxyfluorfen, oxadiazon, and nitrofen at all tested rates and formulations. Slightly reduced yields were obtained in the alachlor treated plots.

Glyphosate (2 papers) - The effect of spray additive to glyphosate in citrus indicated that addition of 2,4-D, ammonium sulphate, and X-77 to glyphosate at lower rates produced earlier and greater field bindweed control. Ethephon, ammonium sulfate and nonphytotoxic oil with glyphosate increased glyphosate performance on purple nutsedge at 2 lbs/A rate. Glyphosate at all rates completely controlled the tall dalligrass. Studies conducted to compare the effectiveness of the rope wick and controlled droplet applicators to a conventional sprayer for the application of glyphosate indicated 100% wheat control with conventional sprayer at the lowest rate. Wheat responded more slowly to glyphosate applied by the controlled droplet applicator than by the conventional sprayer. Wheat responded less and more slowly to glyphosate applied with the rope wick applicator than with the conventional sprayer.

Prostrate spurge and volunteer wheat (2 papers) - At Palm Desert, little difference between early and late appliations of preemergence herbicides was found. DCPA with fertilizer gave best control followed by DCPA and oxadiazon. Preemergence/postemergence sequential treatments gave more promising results. Bromoxynil removed all established weeds with little damage to turf. At the South Coast Field Station pre-emergence treatments gave varied results. The postemergence/preemergence treatments were more effective than the pre-emergence treatments. Dalapon and pronamide treatments supressed volunteer wheat in fall seeded turnips but none killed it. In treated plots, turnip leaves were chlorotic and leaf margins were necrotic.

PAPERS -

Effectiveness of napropamide combinations in orchard weed control. Anderson, J. L. Much of Utah's orchard acreage is located in the foothills of the Wasatch mountains. The soil typically has good drainage and low organic matter. Field sandbur and puncture vine infest much of the area. Season-long weed control is difficult with soil applied herbicides. If high rates of soil applied herbicides are used, some phytotoxicity can be observed on the foliage of treated trees especially stone fruits. In tart cherry orchards a more serious response to herbicide treatment is often encountered. High rates of soil applied herbicides delay fruit maturity especially in areas of low organic matter. Trees so affected cannot be harvested mechanically without excessive shaker injury. In extreme cases fruit will not mature until after processing plants have closed for the season.

Napropamide has shown promise as an effective herbicide for orchard weed control in Utah. Trials were set up in an orchard having a sandy soil of 0.8% organic matter to evaluate weed control of napropamide, both wettable powder and emulsion formulations, alone and in combination with other soil applied herbicides. No foliar symptoms of herbicide injury were observed from any treatment. A late spring frost eliminated the crop in the test site so effects on fruit quality could not be determined.

Treatments were applied March 7, 1978. Three weeks later all plots were treated with 1.1 kg/ha paraquat plus surfactant to eliminate existing weed cover. Terbacil had sufficient foliar activity to kill existing weeds but the terbacil plots were treated with paraquat also for uniformity nevertheless.

Early season weed control in the terbacil was impressive but by July grasses began to become established in the 1.1 kg/ha plots without napropamid and by the end of the season were completely covered with grasses. Split plot applications of terbacil may give effective season long control. The addition of napropamide to the 1.1 kg/ha treatments of terbacil, diuron or simazine increased and extended their effective control. However very few plots were free from sandbur at the end of the season. A late season treatment of terbacil or a contact herbicide may be necessary to control sandbur for the harvest season. (Plant Science Department, Utah State University, Logan, UT 84322).

Effects of napropamide combinations on weed control in 'Topred' apples

Treatment	Rate (kg/ha)	Weed control (percent) June 11, 1978	Weed control (percent) October 13, 1978	Weed present
napropamide (WP)	4.5	60	35	green foxtail, field sandbur, cocklebur redstem filaree, horseweed
napropamide (EC)	4.5	80	65	green foxtail, sandbur heartleaf cocklebur
napropamide (WP) + diuron	4.5 1.1	55	40	green foxtail, filaree sandbur, puncture vine heartleaf cocklebur
napropamide (EC) + diuron	4.5 1.1	50	30	(same as above)
diuron	1.1	15	5	(same as above + horseweed, barnyardgrass, dandelion)
napropamide (WP) + simazine	4.5 1.1	70	55	green foxtail, field sandbur, cocklebur
napropamide (EC) + simazine	4.5 1.1	65	60	(same as above)
simazine	1.1	50	20	(same as above)
napropamide (WP) + terbacil	4.5 1.1	95	90	green foxtail, field sandbur
napropamide (EC) + terbacil	4.5 1.1	85	45	green foxtail, field sandbur, cocklebur
terbacil	1.1	60	10	primarily green foxtail field sandbur
napropamide (WP) + terbacil	4.5 2.2	90	55	green foxtail, field sandbur
napropamide (EC) + terbacil	4.5 2.2	85	60	green foxtail, field sandbur
terbacil	2.2	95	65	green foxtail, field sandbur
untreated control		0	0	green foxtail, field sandbur, barnyardgrass common dandelion, common mallow, common purslane hairy nightshade, heartleaf cocklebur, horseweed, puncture vine, redstem filaree

Response of avocado trees to glyphosate. Jordan, L. S., D. L. Shaner and R. C. Russell. In practical spray programs with glyphosate for weed control in avocado culture, there is risk of some exposure of tree surfaces to accidental spraying or drift of the herbicide. Field tests were run to determine the type and extent of injury resulting from deliberate spraying of tree parts. The experiment was conducted in an avocado seedling variety planting on the University of California at Riverside campus. Trees were 6 years old and under sprinkler irrigation. Treatments were applied in the fall and spring to duplicate trees. The glyphosate used was the formulated material "Roundup" which was either diluted to a 1% solution with water for spraying directly onto the tree, or applied at 4 lb/A of glyphosate in 50 gallons of water to the soil and tree roots. The first treatments were made in December and a second set of similar treatments were made to other trees in late June. A description of treatments and results is given in the table. A summary of observations for each treatment describes the replicate tree expressing the maximum of injury symptoms. Typical leaf injury was characterized by a tip and marginal burn followed by desiccation and defoliation when injury was more severe. Symptoms appeared on both older and newer foliage about equally. Observations were continued for over a year after treatment and all injury symptoms had disappeared. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

A summary of treatments and observations
of injury on avocado trees exposed to glyphosate

Type of treatment	Trmt. date	Description of injury
Trunk trmt. 1. A section of bark on trunk area was removed exposing the cambium. Injured area was immediately sprayed with 1% glyphosate.	12/4	No injury to tree.
	6/28	No injury to tree.
Trunk trmt. 2. Same treatment as above except injured area was sprayed 2 weeks after.	12/4	No injury to tree.
	6/28	No injury to tree.
Root trmt. A heavy leaf mulch was removed from soil under tree and exposed feeder roots on surface were sprayed with glyphosate at 4 lb/A and mulch replaced.	12/4	No injury to tree.
	6/28	No injury to tree.
Branch trmt. An outer section of tree limb 30 inches in length was isolated from rest of tree with plastic shield and sprayed with 1% glyphosate to complete wetting of foliage.	12/4	Moderate to severe chlorosis followed by 75% defoliation. New growth malformed with multiple shoot development. No evidence of translocation of herbicide to other parts of tree. New growth normal after 1 year.
	6/28	Severe chlorosis followed by heavy defoliation and death of wood tissue. No evidence of glyphosate movement beyond sprayed area.
Lower skirt trmt. Full perimeter of tree skirt sprayed with 1% glyphosate from ground to 30 inches.	12/4	Moderate chlorosis over sprayed area with no defoliation. No movement to unsprayed areas. Some new growth with multiple shoot development. Growth normal after 1 year.
	6/28	Severe chlorosis followed by defoliation. No evidence of translocation. New growth showed multiple shoot development. Recovery to normal by 1 year.
Complete tree canopy trmt. Full outer foliage wet with 1% solution of glyphosate.	12/4	Moderate to severe chlorosis with heaviest injury on south side of tree. Complete abscission of all fruit and 50% defoliation of upper branches. New growth with multiple shoot development. Blossom set and new crop normal. No symptoms after 1 year.

Preemergence weed control trial in newly established planting of baby's breath (*Gypsophila paniculata* var. "Bristol Fairy"). Elmore, C.L., A. Lansing, D. Hanson and T. Kretchun. A field experiment was conducted to evaluate the selectivity of preemergence herbicide treatments in new plantings of *Gypsophila paniculata*. Rooted *G. paniculata* liners were transplanted into clay loam soil (O.M. 3.2%) on the Santa Clara Field Station on May 17, 1978. The planting was divided into 1.5 by 3.7 m plots with three 5 cm tall *G. paniculata* plants per plot. On May 24, 1978, each of the herbicide treatments listed in Table 1 were applied topically over 5 replicate plots. The herbicides were applied with a CO_2 pressure sprayer in 375 l/ha water carrier. Following treatment, the plots received 2 cm of water through overhead irrigation.

On July 21, 1978, the number of flower stocks on each of the Gypsophila plants was counted and the height per plant was recorded. Between July 21 and August 13, 1978, the commercially harvestable stocks were counted and harvested at weekly intervals (Table 1). Based on harvest totals, *G. paniculata* showed good tolerance to oxyfluorfen, oxadiazon and nitrofen at all tested rates and formulations. Slightly reduced yields were obtained in the alachlor treated plots. The napropamide treatments were clearly injurious, resulting in 60% to 90% reduction in harvestable flower stocks. All treatments resulted in good to excellent weed control for the early *G. paniculata* growth period (Table 2). (University of California, Cooperative Extension, Davis, CA 95616; Half Moon Bay, CA 94019; and Superintendent, Santa Clara Field Station, San Jose, CA 95128).

Table 1. Effect of preemergence herbicides on the growth and harvest of *Gypsophila paniculata* var "Bristol Fairy"

Herbicide	rate kg/ha	formulation	height[1] 7/21	average number of flower stocks[1] 7/21	total number of harvested flower stocks[2] 7/21-9/13
oxadiazon	2.2	75 WP	57.6 a-c[3]	1.5 ab	320 ab
oxadiazon	4.5		56.2 a-c	2.0 a	352 a
oxadiazon	2.2	2 EC	53.1 a-e	0.7 b-f	306 ab
oxadiazon	4.5		54.4 a-d	1.5 ab	353 a
nitrofen	4.5	2 EC	52.9 a-e	1.2 a-e	272 abc
nitrofen	9.0		56.9 a-c	1.9 a	306 ab
nitrofen	4.5	50 WP	60.8 a	2.1 a	262 abc
nitrofen	9.0		57.0 a-c	1.4 a-c	279 ab
napropamide	4.5	2 EC	40.8 ef	0.8 b-f	97 de
napropamide	9.0		20.9 h	0.1 f	26 e
oxyfluorfen	1.1	25 WP	53.8 a-e	1.4 ab	324 ab
oxyfluorfen	1.1	2 G	49.2 a-f	0.3 df	319 ab
oxyfluorfen	2.2		44.0 c-f	0.1 f	265 abc
alachlor	4.5	4 EC	46.7 b-f	0.4 c-f	195 bcd
alachlor	9.0		52.5 a-e	1.2 a-e	225 abc
untreated	-	-	59.0 ab	1.3 a-d	218 bcd
hand weeded	-	-	26.8 gh	0.1 f	13 e

[1]Average of three plants per each of five replications.
[2]Average of five replications. Total yield per plot for period July 21 to September 13.
[3]Means in a column followed by the same letter are not significantly different at the 5% level. Duncan's multiple range test.

Table 2. Weed control with preemergence herbicide treatments in field grown *Gypsophila paniculata* var "Bristol Fairy"

Herbicide	rate kg/ha	formulation	large crabgrass		redroot pigweed		common purslane		field bindweed	hairy nightshade
			6-2-78	6-16-78	6-2-78	6-16-78	6-2-78	6-16-78	6-2-78	6-2-78
oxadiazon	2.2	75 WP	10.0	9.9	10.0	9.8	10.0	10.0	10.0	10.0
oxadiazon	4.5		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
oxadiazon	2.2	2 EC	10.0	10.0	9.8	10.0	10.0	10.0	9.6	10.0
oxadiazon	4.5		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
nitrofen	4.5	2 EC	10.0	10.0	10.0	9.7	10.0	10.0	8.8	10.0
nitrofen	9.0		10.0	9.4	9.8	9.5	10.0	10.0	9.2	10.0
nitrofen	4.5	50 WP	10.0	9.0	10.0	9.3	10.0	9.6	9.2	10.0
nitrofen	9.0		10.0	10.0	10.0	10.0	10.0	10.0	9.6	10.0
napropamide	4.5	2 EC	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
napropamide	9.0		10.0	10.0	10.0	10.0	10.0	10.0	9.8	10.0
oxyfluorfen	1.1	25 WP	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
oxyfluorfen	1.1	2 G	10.0	10.0	9.0	6.8	9.8	9.0	8.4	10.0
oxyfluorfen	2.2		10.0	10.0	8.6	7.6	8.8	5.6	6.6	10.0
alachlor	4.5	4 EC	10.0	10.0	8.7	8.8	9.6	8.6	7.8	10.0
alachlor	9.0		10.0	10.0	9.6	10.0	10.0	10.0	7.8	10.0
unweeded check	-	-	6.0	5.6	2.4	1.6	0.8	0.4	8.0	3.8
weeded check	-	-	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

[1] weed control ratings are the average of five replications based on a 0 to 10 scale - 0 = no control; 10 = 100% control.

Additives to glyphosate sprays. Jordan, L. S., D. L. Shaner and R. C. Russell. Research was performed to evaluate the effect of additives to glyphosate applications to field bindweed, purple nutsedge and dallisgrass. Spray additives evaluated varied between trials but included ammonium sulphate, X-77, 2,4-D thriethanol amine, ethephon, and nonphytotoxic oil.

Field bindweed. Test plots (660 ft^2, 3 reps) were established between the tree rows of a young lemon orchard heavily infested with field bindweed. Drip irrigation supported growth of the bindweed in the tree rows throughout the growing season. During the summer the surface soil in the non-irrigated area between the rows became dry but there was enough deeper soil moisture for bindweed in this area to continue growth under stressed conditions. Ethephon was applied either as a pretreatment on May 12 combined with glyphosate on May 26 when all plots were treated. Ratings, (Table 1) for June and July, are averages of bindweed control in moist and dry areas. In August and September separate ratings were made for each area because control from glyphosate treatments become different.

Addition of 2,4-D, ammonium sulphate and X-77 to 1.5 lb/A glyphosate produced earlier and greater control of field bindweed, while at 3 lb/A effects were slight. Ethephon had little effect on the activity of glyphosate. Greater control was obtained when 2,4-D was applied with glyphosate.

Purple nutsedge. Plots (300 ft^2, 3 reps) were established in a basin irrigated grapefruit orchard with a solid stand of purple nutsedge (8 to 12 inches) in full seed head. Additives included ethephon, ammonium sulfate, and nonphytotoxic oil with glyphosate. Pretreatment with ethephon was made on May 2 and all glyphosate treatments were applied on May 15. Observations were made up to the end of June. Information and ratings are given in Table 2.

All 3 additives increased the performance of glyphosate at the 2 lb/A rate. Control at 4 lb/A of glyphosate was not increased by ethephon or ammonium sulfate and was slightly increased by the nonphytotoxic oil.

Dallisgrass. Research was conducted in a Valencia orange orchard with nearly a solid cover of dallisgrass which had been mowed between the tree rows for over a month preceding treatment.

Regrowth in the mowed area was 8 to 12 inches and the grass in the tree rows was 3 to 4 feet high and in full seed head. Plots containing tall and mowed grass were treated on June 22 and ratings were made through August. On August 18, the entire plot area was mowed and regrowth was rated on September 21. Glyphosate was applied (4 reps) at 1 and 2 lb/A with ammonium sulfate or X-77, and alone at 1, 2, and 4 lb/A. Treatments and control ratings are shown in Table 3.

Glyphosate at all rates completely controlled the tall dallisgrass. Response of the short regrowth was delayed and variable with respect to rate. The X-77 had little effect after the first 2 weeks while ammonium sulfate caused an increased response to glyphosate. Glyphosate at 4 lb/A was the most effective treatment. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

Table 1. The effect of three additives to glyphosate on control of field bindweed

Herbicide	Type of treatment	Rate lb/A	Control of bindweed[1] 6/5	6/27	8/4 BR[3]	8/4 TR[3]	10/26 BR	10/26 TR
Glyphosate		1.5	2.0	5.8	8.8	6.0	8.5	4.0
"		3.0	2.0	9.4	9.7	9.0	9.3	7.5
2,4-D amine		2.0	6.3	9.6	9.3	6.2	8.2	4.6
Glyphosate + ethephon	comb.	1.5+1	2.3	6.7	8.0	5.7	7.2	3.0
" "	pre.	1.5+1	3.0	6.3	7.8	5.7	7.0	3.7
" "	comb.	3.0+1	4.7	9.3	9.7	9.2	9.5	8.2
" "	pre.	3.0+1	3.7	9.6	9.6	5.7	8.7	5.5
Glyphosate + 2,4-D	comb.	1.5+1	7.0	9.9	9.6	7.8	9.2	5.0
" + A.S.[2]	comb.	1.5+5	2.7	8.0	9.2	8.2	8.8	7.7
" + "	comb.	3.0+5	3.0	9.5	9.7	8.2	9.0	6.3
" + X-77	comb.	1.5+1/4-%	2.3	8.0	9.2	7.2	9.0	6.6
" + "	comb.	1.5+1/2-%	2.3	7.7	9.3	7.5	8.8	5.3

[1] 0 = no control, 10 = complete kill
[2] Ammonium Sulfate
[3] BR = between rows, TR = tree row

Table 2. The effect of three additives to glyphosate on the control of purple nutsedge

Herbicide	Type of treatment	Rate lb/A	Control of nutsedge[1] 5/22	6/2	6/26
Glyphosate		2	3.0	5.0	3.0
"		4	5.3	8.8	5.0
" + ethephon	pre.	2 + 1	5.3	5.7	3.0
" + "	pre.	4 + 1	5.7	8.2	4.3
" + "	comb.	2 + 1	4.7	5.5	3.7
" + "	comb.	4 + 1	5.0	8.2	4.3
" + A.S.[2]	comb.	2 + 5	4.3	7.8	4.0
" + "	comb.	4 + 5	5.3	8.7	5.0
" + oil	comb.	2 + 1/2-%	4.0	6.0	3.0
" + "	comb.	4 + 1/2-%	6.0	9.0	6.3

[1] 0 = no control, 10 = complete kill
[2] Ammonium Sulfate

Table 3. The effect of ammonium sulfate and X-77 on glyphosate control of dallisgrass

Herbicide		Rate lb/A	Control of dallisgrass[1]						
			T	S[3]	T	S	T	S	All regrowth
Glyphosate		1	7.3	4.3	10	6.3	9.8	4.7	0.7
"	+ A.S.[2]	1+5	8.6	5.3	10	7.7	10	6.3	2.0
"	+ X-77	1+1/2-%	9.3	7.0	10	6.0	10	4.6	2.0
"		2	9.3	6.6	10	9.0	10	7.3	4.3
"	+ A.S.	2+5	9.5	7.7	10	8.7	10	8.3	6.0
"	+ X-77	2+1/2-%	9.0	6.0	10	9.6	10	7.3	5.3
"		4	8.3	4.0	10	10	10	9.8	9.3

[1] 0 = no control, 10 = complete kill
[2] Ammonium Sulfate
[3] T = tall grass, S = short grass

The effect of plug composition on germination of melon seed in chlorpropham treated Delhi loamy sand. Lange, A. H. and J. T. Schlesselman. Chlorpropham at two rates was sprayed on newly prepared beds on August 15, 1978 in a randomized block design. Different mixtures were plug planted with a mechanical transplanter with a plug attachment. The plug mixtures were plug planted with a mechanical transplanter with a plug attachment. The plug mixtures were either a 50:50 peat-vermiculite or a 50% sterilized Yolo sandy loam and 25% peat and 25% vermiculite (by volume) with varying rates of hydrogel. The Persian melon seed was dropped into each cup as it came into position. Six replications were sprinkler irrigated August 16 for 2 hours. On August 18, three replications were irrigated with 3-1/2 hours, and three replications were irrigated with seven hours.

On August 26, 1978, a vigor rating of melons was made. On August 30, 1978, five feet of melon plugs were harvested and weighed. On September 20, 1978, the vigor of the melons was rated where 0 = no stand or no vigor, and 10 = best stand and vigor.

The results showed a much better melon stand in the plug than when direct seeded, plus more safety. The results showed no advantage of adding hydrogel where high irrigation was used, but under limited irrigation, the hydrogel gave a better stand, vigor and fresh weight. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Table 1. A comparison of CIPC in high irrigation and low irrigation as measured by weight and number of melon plants.

				Average[1/]			
				High Irrigation		Low Irrigation	
Herbicide	lb/A	Plug[2/]	Viterra (lb/ft^2)	Weight/ 5 Plugs	# Plants /5 Plugs	Weight/ 5 Plugs	# Plants /5 Plugs
CIPC	2	PV	0.2	7.3	21.3	2.4	7.3
CIPC	4	PV	0.2	5.9	13.7	3.6	10.0
CIPC	2	PV	0.4	8.5	20.0	5.6	14.7
CIPC	4	PV	0.4	6.6	18.3	4.8	11.3
CIPC	4	PV-D	0	4.3	16.3	1.6	7.0
CIPC	4	PV-D	0	3.6	12.3	2.4	8.3
Check	-	PV	0	9.0	19.7	5.0	8.0
Check	-	PV-D	0	6.7	20.7	3.3	6.7

1/ Average of 3 replications. Weight measured in grams. Treated 8/15/78. Evaluated 8/30/78.

2/ Plug type: PV = Standard Peat-vermiculite plug mix.
PV-D = Peat-vermiculite 50% + UC Davis soil 50%.

Table 2. A comparison of high irrigation vs. low irrigation as measured by melon vigor and weed control in direct planted and plug planted melons.

				Average[1/]					
				High Irrigation			Low Irrigation		
Herbicide	lb/A	Plug[2/]	Viterra (lb/ft^2)	D.S.	Plug	W/C	D.S.	Plug	W/C
CIPC	2	PV-D	0.2	1.7	8.7	8.0	0.3	6.7	9.7
CIPC	4	PV-D	0.2	0.0	8.7	10.0	0.0	6.7	10.0
CIPC	2	PV-D	0.4	1.0	9.7	9.7	0.0	8.7	9.7
CIPC	4	PV-D	0.4	0.3	8.0	9.8	0.0	7.7	10.0
CIPC	2	PV-D	0	0.3	8.7	9.7	0.3	6.7	10.0
CIPC	4	PV-D	0	0.7	8.7	10.0	0.0	6.3	10.0
Check	-	PV	0	7.0	8.7	1.7	7.7	9.3	6.3
Check	-	PV-D	0	6.0	8.7	2.3	7.0	7.0	6.0

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = dead plant and 10 = best vigor. Treated 8/15/78. Evaluated 9/7/78.

2/ Plug type: PV = Standard peat-vermiculite plug mix.
PV-D = Peat-vermiculite 50% + UC Davis soil 50%.

The effect of soil acidification on the activity of Sodium Azide for weed control and crop tolerance. Lange, A., S. Young, and J. Schlesselman. According to the literature, sodium azide is more active moving further in the soil under acid soil conditions than higher pH's. The object of this experiment was to see if the weed control would be acceptable and the residual activity (effect on tomatoes and melons) could be reduced by adding acidifying agents at the time of sodium azide application. Five foot tomato beds were prepared and treated with three rates of granular sodium azide and one level of technical grade powder on August 10, 1978 to the entire bed top. Popcorn sulfur at four rates and sulfuric acid at two rates was added to a 1 ft band down the center of the bed. Popcorn sulfur was spread evenly at 500 lb/A to 4,000 lb/A. Sulfuric acid was applied to 100 lb/A by diluting in water and sprinkling it on with a plastic sprinkling can. The giant beds were then thrown up with large border disks.

These beds were knocked off August 18, 1978 and seeded to Variety UC82 processing tomatoes and Persian melon. On September 5, 1978, the plots were rated for stand and vigor. The 12-1/2 to 25 lbs. of sodium produced less crop phytotoxicity than trials done earlier in the year in cooler heavier soils. The weed control at the 25 and 50 lb/A rates in this experiment was excellent.

The crop phytotoxicity was excessive at the 50 lb/A sodium azide. The effects due to popcorn sulfur were more apparent in the tomato response to sodium azide at 12-1/2 lb/A of the granular and 25 lb/A of the technical.

The reaction to sulfuric acid was outstanding. The decrease in phytotoxicity of sodium azide on subsequently planted crops was spectacular without loss of weed control where sulfuric acid was used.

These results suggest fall applied sulfuric acid or possibly sulfur, will eliminate the detrimental effects of sodium azide to spring planted tomatoes. The results need to be evaluated this fall in many different soil types. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Table 1. The effect of acidification on the activity of Sodium Azide as measured by fresh weight of tomatoes.

			Average Fresh Weight[1/] lb/A					
			Sulfur				Sulfuric	Check
Treatment	Form.	lb/A	500	1000	2000	4000	100	0
Sodium Azide	Gr	12½	106.4	290.8	92.2	276.6	198.6	163.2
Sodium Azide	Gr	25	702.3	759.0	539.1	759.0	688.1	893.8
Sodium Azide	Gr	50	156.1	524.9	283.8	340.5	574.6	354.7
Sodium Azide	T	25	297.9	574.6	659.6	659.7	652.6	546.2
Check	-	-	127.7	42.6	63.8	78.0	163.2	177.3

1/ Average of 4 replications. Fresh weight measured in grams. Treated 8/10/78. Evaluated 10/20/78.

Table 2. The effect of acidification on the activity of Sodium Azide as measured by fresh weight of melons.

			Average Fresh Weight[1/] lb/A					
			Sulfur				Sulfuric	Check
Treatment	Form.	lb/A	500	1000	2000	4000	100	0
Sodium Azide	Gr	12½	1071.2	872.5	1354.9	1496.8	943.5	844.2
Sodium Azide	Gr	25	1553.5	1213.0	1440.0	1071.2	1319.4	1156.3
Sodium Azide	Gr	50	695.2	376.0	766.1	305.0	1099.5	822.9
Sodium Azide	T	25	1305.2	1220.1	1000.2	822.9	1170.5	1071.2
Check	-	-	503.7	659.1	361.8	340.0	524.9	454.0

1/ Average of 4 replications. Fresh weight measured in grams. Treated 8/10/78. Evaluated 10/20/78.

The effect of preemergence herbicides on weed control in established pistachios. Fischer, B. B. and A. H. Lange. On January 23, 1974, eight herbicides were applied alone and in combination in 1300 cc of water per plot with a CO_2 sprayer to 2-year-old *P. atlantica* pistachios. The soil was a San Joaquin loam under drip irrigation.

The trial was retreated November 13, 1974, November 20, 1975, November 18, 1976, and November 12, 1977.

The 1978 evaluations were taken on April 1, 1978 and June 24, 1978. The best weed control was obtained from the combinations of simazine plus oryzalin (2+8 lb/A), simazine plus oxyfluorfen (2+4 lb/A), simazine plus prodiamine (2+4 lb/A), and methazole plus oryzalin (4+4 lb/A), which were 100% effective on all weed species except turkey mullein. No herbicide was very effective on turkey mullein. The overall activity of all treatments was, for the most part, well above commercial acceptability with only napropamide falling below this level at the most recent evaluation. (University of California, Cooperative Extension, 1720 South Maple Avenue, Fresno, CA 93702)

A comparison of herbicide combinations for weed control in pistachio.

Herbicide	lb/A	Weed Control 1/ 4/17/78	6/24/78	Weeds 2/ Present
Oxyfluorfen+Napropamide	2+4	9.1	7.7	G,M,T,V,W
Napropamide	8	8.1	6.7	B,G,H,J,M,N,T,V,W
Simazine+Napropamide	1/2+4	9.0	7.7	F,G,H,M,T,V,W
Simazine+Napropamide	1+8	9.0	7.2	B,G,M,R,T,V,W
Oxyfluorfen	1+1/2	9.5	8.2	C,G,H,M,T,V
Oxyfluorfen	3	9.6	9.3	M,T,V
Simazine+Oryzalin	1+4	9.4	8.2	B,D,G,M,T,V,W
Simazine+Oryzalin	2+4	10.0	9.5	T
Simazine+Oxyfluorfen	1+2	9.9	9.8	M,T,V,
Simazine+Oxyfluorfen	2+4	10.0	9.8	T
Oxadiazon+Napropamide	2+2	9.6	7.7	C,F,G,H,M,T,V,W
Oxadiazon+Napropamide	4+4	10.0	9.3	C,T,V
Simazine+Prodiamine	1+2	9.6	9.1	F,G,M,T,V,W
Simazine+Prodiamine	2+4	10.0	9.9	T
Oryzalin	4	9.8	7.8	T,V
Oryzalin	8	9.1	7.8	F,M,T,V
Methazole+Oryzalin	2+2	9.8	9.6	T,V
Methazole+Oryzalin	4+4	10.0	9.6	T
Check	-	1.8	1.7	B,C,D,F,G,M,O,P, Q,R,S,T,V,W

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no effect, 10 = complete weed control. Treated 1/23/74, 11/13/74, 11/20/75, 11/18/76, and 12/12/77. Evaluated 4/17/78 and 6/24/78.

2/ Weeds present: B = grasses, C = hemazonia, D = cudweed, F = filaree, G = grass poly, H = tarweed, J = nightshade, M = marestail, N = popcorn flower, O - owls clover, P = pigweed, Q = lambsquarter, R = red maids, S = groundsel, T = turkey mullein, V = vinegar weed, and W = wild radish.

Effect of using preemergence herbicides in young pistachios in a Hanford sandy loam. Schlesselman, J. T., A. H. Lange, and L. J. Nygren. On December 16, 1976, a trial was established at the Kearney Field Station, Parlier, on young Terebinthus pistachio rootstocks under furrow irrigation in a Hanford sandy loam (59% sand, 33% silt, 8% clay, 0.75% O.M.) to determine the effectiveness and safety of 6 preemergence herbicides. The single tree plots were 20 ft by 5 ft, replicated 4 times. Retreatment occurred on December 22, 1977.

There were 3 treatments of the napropamide wettable powder at 4 lb ai/A. One treatment was raked clean of leaf litter prior to herbicide application. The litter from those plots were then spread evenly over another set of napropamide WP plots. This resulted in 3 sets of plots with varying degrees of leaf litter; no trash (litter), a normal amount of trash and a series of plots with twice the amount of trash. The object of this portion of the experiment was to determine to what degree leaf litter played in the activity of napropamide.

An evaluation made on May 24, 1978 showed some interesting results
All herbicides except napropamide gave commercially acceptable weed control (about 7.0). Oryzalin was the only herbicide to be 100% effective on marestail. Even though napropamide's activity was considerably less than the other herbicides, there was a marked increase in its activity with a decrease in the amount of trash or leaf litter remaining on the orchard floor.

Some phytotoxicity was observed with all 3 rates of norflurazon, as well as the high rate of EL-171. This phytotoxicity resulted from a combination of the high rates along with the significant amount of rainfall this past season (21.75 inches), which carried the herbicides further down into the root zone of these pistachio trees than was previously observed.

In this experiment, oryzalin gave the best weed control with the greatest amount of safety. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Table 1. Comparison of 6 preemergence herbicides in controlling weeds in a young pistachio orchard.

Herbicide	lb/A	Weed Control 1/	Weeds Remaining 2/	Phyto. 1/
Napropamide (4F)	4	3.9	M,G,FB,B	0.0
Napropamide (WP) No trash	4	6.1	M,N,FB,G	0.0
Napropamide (WP) Normal "	4	4.8	G,M	0.0
Napropamide (WP) 2X "	4	2.9	M,G,N,NB	0.0
Oryzalin	4	8.2	N,FB	0.0
Prodiamine	4	7.8	M,G,N,	0.0
Oxyfluorfen	4	7.6	M,G,FB,N,P	0.0
Norflurazon	2	6.8	N,G,M	0.2
Norflurazon	4	8.2	M,P	0.4
Norflurazon	8	9.7	M,P,G	1.5
Fluridone	1	7.5	M,N,B,G	0.0
Fluridone	2	8.6	M,N,G	0.3
Check	-	0.6	G,N,S,FB,B,LQ	0.0

1/ Average of 6 replications where 0 = no control or effect, 10= complete control or kill.
2/ Weeds remaining: M = marestail, N - nutsedge, G = summer annual grasses, FB = flaxleaf fleabane, B - bermudagrass, P = pigweed, S = sowthistle, LQ - lambsquarter.
Treated 12/16/76, 12/22/77. Evaluated 5/24/78.

Effect of simulating herbicide drift on the dormant buds of pistachios. Schlesselman, J. T. and A. H. Lange. Four-year-old *P. terebinthus* pistaachios were used to determine what injury might occur if a few dormant buds were treated with systemic herbicides. In this experiment, glyphosate, MSMA and 2,4-D amine were used in concentrations up to 3000 ppm. Only 2 branches (each with a different treatment) per tree were used to avoid contamination and to reduce the effect if significant herbicide movement occurred in the treated limb. On March 7, 1978, about 4 inches of the flagged branch was treated using a small atomizer to treat several buds which had not begun to swell. The estimated volume was 50 GPA. A cardboard shield was placed behind each treated branch at the time of application to eliminate contamination that might occur to adjacent branches.

An initial evaluation was made on March 31, 1978, about 3-1/2 weeks after application. By this time, bud break had commenced and injury, if any, to the young shoots was quite obvious. Injury to the sprayed area by the 2,4-D was showing at 3.0 ppm and increased slightly to 300.0 ppm. By 3000.0 ppm, there was a considerable amount of damage to the shoots, some of which didn't even emerge. There was only a slight amount of injury with glyphosate at 3000.0 ppm and relatively no effect on the pistachio shoots by MSMA.

By 7 months, the effects of the herbicides to the area sprayed were, for the most part, amplified from what they were initially. There was some stunting of the shoots, but generally the injured tissue had died, leaving a branch partially void of shoot growth. Even the areas treated with MSMA and the low rates of glyphosate and 2,4-D were showing some effects, however slight. The high rate of 2,4-D was still by far the most injurious. There appeared to be some movement of the herbicidal effects up and down the branch from the area treated but was not always consistent with the rates; nor was it definite as to the predominant direction when compared to the check, but if any direction of movement could be ascertained, the trend would be towards the trunk as opposed to the branch tips. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

The effect of dilute sprays of 3 herbicides on the buds of pistachios as shown by injury to emerging shoots.

		Phyto. to Sprayed Area 1/		Movement of Herbi. Effect (cm) - 7 months	
Herbicide	PPM	3 Weeks	7 Months	Proximal	Distal
2,4-D Amine	0.3	0.0	1.9	4.0	0.0
2,4-D Amine	3.0	1.0	4.9	3.2	3.5
2,4-D Amine	30.0	1.5	0.9	1.5	2.0
2,4-D Amine	300.0	1.8	5.4	8.0	0.0
2,4-D Amine	3000.0	6.0	8.1	5.5	5.8
Glyphosate	300.0	0.0	2.8	8.2	3.0
Glyphosate	3000.0	1.3	3.2	3.2	3.2
MSMA	300.0	0.3	1.1	3.8	0.0
MSMA	3000.0	0.0	3.1	11.5	1.8
Check	--	0.3	0.6	4.5	0.0

1/ Average of 4 replications where 0 = no effect, 10 = complete bud kill.

Treated 3/7/78. Evaluated 3/31/78 and 9/28/78.

Annual weed control in raspberries. Weeks, M. G. and J. L. Anderson. Early developing annual weeds are effective competitors of raspberry primocane growth. Field trials of soil applied herbicides have been conducted at the Farmington, Utah Field Station and in two commercial raspberry plantings since 1976, all with similar results. Treatments were applied to the soil surface in November preceeding predicted precipitation to be activated by melting snow.

Napropamide plus simazine has been particularly impressive. One grower with a wild buckwheat problem reported not only excellent weed control but also increased yield and improved can growth. Yield data was not recorded. Terbacil gave excellent weed control early in the season but allowed late germinating weeds to develop. A split application of terbacil could correct this situation. Terbacil caused some phytotoxicity to young primocanes.

Pronamide was applied at 2.2 and 4.5 kg/ha to an area infested with quackgrass. The lighter rate gave inconsistent control; the higher rate good control but caused some phytotoxicity. Developing primocanes were severely injured, crop the following season greatly reduced and the planting generally weakened. (Plant Science Department, Utah State University, Logan, UT 84322)

Effects of fall herbicide treatment on weed control in Canby raspberries, Paradise, Utah

Treatment[1]	Rate (kg/ha)	Weed control (percent)	Weeds not controlled
napropamide (E.C.)	5.1	82	western salsify, wild mustard Russian thistle (few)
napropamide (W.P.)	4.5	80	western salsify, wild mustard Russian thistle
napropamide (W.P.) + simazine	4.5 1.1	90	western salsify, wild mustard Russian thistle
terbacil	1.8	78	redroot pigweed Russian thistle (few)
USB-3153	1.7	65	western salsify, wild mustard Russian thistle
USB-3153	2.2	82	western salsify wild mustard
untreated control	--	0	birdseye speedwell, wild mustard western salsigy, Russian thistle prickley lettuce, redroot pigweed

[1]Herbicides applied November 18, 1977 over the top of raspberries planted in spring of 1977. One inch of snow fell day after treatment.

Effects of preplant soil incorporated herbicides on sweet corn yield and weed control. Anderson, J. L. and M. G. Weeks. In a continued sweet corn weed control program herbicide plots were established May 23, 1978 at the Farmington Field Station in a sandy loam soil having 1.2% organic matter. Treatments replicated three times were incorporated 5 cm deep with a Howard Rotovator immediately after applications. Eight sweet corn varieties of varying herbicide tolerance were drilled across the plots May 25.

Because of observed similarity between EPTC and dalapon injury to sweet corn dalapon was included in the trials with and without the safener R-25788 commonly used with EPTC. Similar varietal response to EPTC and dalapon was observed; 'Reliance' and 'Iochief' sweet corn varieties were quite tolerant of the herbicides whereas 'Jubilee' and 'NK 199' showed considerable injury. Unlike EPTC, however, corn was not protected against dalapon by addition of the safener. EPTC plus safener plots had no yield reduction but did have some ear deformity, more so than observed in previous years. Vernolate plus safener plots were essentially free from ear deformity.

R-40244, especially at the higher rate, was very phytotoxic to sweet corn in the seedling stage. Leaves were bleached white and many seedlings killed. More plants were killed than yield data would suggest as surviving plants tillered well and compensated for much of the plant loss. Weed control was excellent in the R-40244 plots early in the season, but lack of crop competition allowed late germinating weeds to become established. Similarly EPTC plots contained many more late germinating weeds than EPTC plus safener due to poor crop competition. (Plant Science Department, Utah State University, Logan, UT 84322)

Effects of preplant soil incorporated herbicides on sweet corn yield and weed control

Treatment	Rate (kg/ha)	Phytotoxicity[1]	Yield[2]	Weed control (percent)	Weeds present
atrazine	2.2	0.7	67.7	98	
atrazine + metolachlor	1.3 1.7	1.5	67.6	98	
dalapon	6.7	5.0	55.3	23	common lambsquarters stinkgrass, witchgrass purslane, hairy nightshade
dalapon + R-25788	6.7 0.56	5.3	41.9	18	(same as above)
EPTC	6.7	6.0	34.5	58	witchgrass, pigweed spp. common lambsquarters purslane, common mallow, hairy nightsahde
EPTC + R-25788	6.7	1.3	66.7	93	witchgrass, purslane common mallow
metolachlor	2.2	1.3	61.8	77	purslane, witchgrass mallow, pigweed spp.
metolachlor + cyanazine	1.7 1.7	1.0	67.4	93	common mallow, hairy nightshade, witchgrass
R-40244	0.56	5.7	57.7	87	witchgrass, hairy nightshade
R-40244	1.1	8.7	27.6	78	witchgrass, stinkgrass hairy nightshade common purslane
R-40244 + EPTC + R-25788	0.56 3.3	5.3	50.2	83	witchgrass, stinkgrass common purslane
vernolate + R-25788	6.7	0.7	61.4	98	
untreated control		0.0	63.5	0	witchgrass, stinkgrass hiary nightshade, mallow, pigweed spp. common purslane

[1]rated 0 to 10, 10 = complete kill

[2]total yield (kg) of unhusked ears from three replications of each of eight varieties

A comparison of preplant incorporated herbicide treatments on plug planted and direct seeded canning tomato phytotoxicity. Orr, J.P., C. Elmore, F. Ashton and H. Carlson. Hairy nightshade and dodder are common problems in tomato fields. It is essential to make a three way combination of napropamide, CDEC for control of dodder and pebulate for hairy nightshade control. At times moderate phytotoxicity to the tomatoes can reduce yields. This trial was established to determine if the phytotoxicity could be reduced from plug planting.

The herbicides listed in the following table were applied preplant incorporated 1.75 inches deep in a clay soil on April 24, 1978. All herbicides were applied with a CO_2 sprayer in a total volume of 50 gallons per acre. The plots were single row, 50 feet long, randomized with 3 replications. Incorporation was done with an L-shaped power tiller. The trial was furrow irrigated.

The phytotoxicity in the plug plantings was considerably less than in the drilled plantings. (Cooperative Extension, University of California, Sacramento 95827.)

A comparison of preplant incorporated herbicide treatments on plug planted and direct canning tomato phytotoxicity on a clay soil

Herbicides	lb/A	Formulation	Average ratings 1/ Tomatoes (plug) stand reduction	Tomatoes (plug) vigor reduction	Tomatoes (drill) stand reduction	Tomatoes (drill) vigor reduction
pebulate + CDEC + napropamide	6+6+2	(6E) (4E) (2E)	0.3	1.7	1.3	2.9
pebulate + CDEC + napropamide	8+6+2		0.7	3.0	1.0	3.7
pebulate + CDEC + napropamide	10+6+2		0.0	1.2	0.7	3.9
pebulate + CDEC + napropamide	8+8+2		0.0	2.5	1.3	4.7
pebulate + napropamide	6+2		0.0	1.5	0.3	2.0
pebulate + napropamide	12+2		0.0	1.7	0.3	3.0
napropamide	2		0.2	1.3	0.8	3.2
Control	-		0.0	0.0	0.0	0.0

1/ Average of three replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Planted and treated April 24, 1978. Evaluated June 1978. Incorporated 1.75 inches.

A comparison of preplant incorporated herbicide treatments for control of hairy nightshade in plug and direct seeded canning tomatoes. Orr, J.P., C. Elmore, F. Ashton, and H. Carlson. The herbicides listed in the following table were applied preplant incorporated 1.75 inches deep in a sandy loam soil on March 29, 1978.

All herbicides were applied with a CO_2 sprayer in a total volume of 50 gpa. The plots were single row, 50 feet long, randomized with 4 replications. Incorporation was done with an L-shaped power tiller. The trial was furrow irrigated.

Metolachlor, ethalfluralin, and pebulate gave good control of hairy nightshade. R-40244 gave fair control.

Tomato phytotoxicity was considerably less in the plug treatments compared to the drilled where phytotoxicity was moderate to severe. (Cooperative Extension, University of California, Sacramento, 95827.)

A comparison of preplant incorporated herbicide treatments for control of hairy nightshade in plug planted and direct seeded canning tomatoes on a sandy loam soil

			Average ratings 1/				
			Tomatoes (plug)		Tomatoes (drill)		Control
Herbicides	lb/A	Formulation	stand reduction	vigor reduction	stand reduction	vigor reduction	hairy nightshade
metolachlor	2.0	8E	1.3	1.0	2.0	3.0	8.1
metolachlor	4.0		1.0	1.3	5.6	6.0	8.8
metolachlor	8.0		1.6	2.0	7.6	7.4	9.5
ethalfluralin	0.75	3E	1.4	1.0	5.0	6.6	9.0
ethalfluralin	1.5		0.4	0.0	8.6	8.7	8.1
ethalfluralin	3.0		0.0	0.6	9.6	9.0	9.9
R-40244	0.25	2E	0.7	0.0	0.6	1.4	9.0
R-40244	0.50		0.0	1.0	0.3	2.0	6.5
R-40244	1.0		0.0	1.0	0.3	2.4	7.3
control	-	-	0.0	0.0	0.0	0.0	0.0
pebulate + napropamide	6+2	(6E)(2E)	0.50	1.0	0.50	2.5	7.5
pebulate + napropamide	8+2		0.75	1.0	0.75	3.0	8.7
pebulate + napropamide	16+2		1.2	1.5	0.75	3.0	9.7
pebulate + CDEC + napropamide	6+6+2	(6E)(4E)(2E)	0.25	1.0	4.2	5.7	9.2
pebulate + CDEC + napropamide	8+8+2		0.75	2.0	3.5	5.5	9.6
pebulate + CDEC + napropamide	16+16+2		1.5	3.0	9.7	9.5	10.0
napropamide	2	2E	0.5	0.75	0.0	1.0	0.0

1/ Average of three replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Planted and treated March 29, 1978. Evaluated April 27, 1978. Incorporated 1.75 inches.

A comparison of preplant incorporated herbicide treatments for control of hairy nightshade in plug planted and direct seeded canning tomatoes. Orr, J.P., C. Elmore, F. Ashton, H. Carlson. The herbicides listed in the following table were applied preplant incorporated 2 inches deep on May 3, 1978. Applications were made on a clay loam soil.

All herbicides were applied with a CO_2 sprayer in a total volume of 50 gpa. The plots were double row by 20 feet, randomized with 3 replications. Incorporation was done with an L-shaped power tiller. The trial was furrow irrigated.

In general, less phytotoxicity occurred in the plug planted tomatoes from the herbicides compared to the drilled in the early growth of the plants. However, at harvest time the vegetative growth in the plugs was about 20 percent less than in the drilled treatments. This resulted in more exposed fruit resulting in sunburn.

Hairy nightshade control was good in most treatments. (Cooperative Extension, University of California, Sacramento 95827.)

A comparison of preplant incorporated herbicide treatments for control of hairy nightshade in plug planted and direct seeded canning tomatoes on a clay loam soil

			Average ratings 1/				Vegetative reduction 2/		
			Tomatoes (plug)		Tomatoes (drill)				Control
			stand	vigor	stand	vigor	Tomatoes	Tomatoes	hairy
Herbicides	lb/A	Formulation	reduction	reduction	reduction	reduction	plug	drill	nightshade
pebulate + napropamide	6+2	(6E)(2E)	0.3	0.0	0.3	0.0	1.4	0.0	5.6
pebulate + napropamide	8+2		2.0	0.3	2.3	1.0	2.0	0.4	8.0
pebulate + napropamide	10+2		0.7	0.0	0.0	0.5	1.7	0.0	9.3
napropamide	2.0	(2E)	1.3	0.0	0.0	0.0	1.7	0.0	3.3
pebulate + diphenamid	6+6	(6E)(80W)	0.0	0.0	1.0	0.5	1.7	0.4	9.3
pebulate + diphenamid	8+8		2.0	1.0	0.0	0.0	2.4	0.4	7.5
pebulate + CDEC	6+6	(6E)(4E)	2.3	0.7	0.7	0.3	0.4	0.4	9.3
pebulate + CDEC	8+6		0.5	0.0	0.0	0.0	1.0	0.4	4.0
control	-	-	0.0	0.0	0.0	0.0	2.0	0.0	0.0
diphenamid	6.0	(80W)	1.6	1.3	1.0	1.6	2.0	0.0	10.0
diphenamid	8.0		1.6	1.6	0.3	0.3	2.7	0.0	3.0
diphenamid + napropamide	6+2	(80W)(2E)	1.3	0.0	3.6	3.3	1.7	0.0	8.0
EPTC	3.0	(7E)	1.3	0.0	0.6	0.6	1.4	0.4	7.0
EPTC	6.0		2.0	2.3	1.6	2.0	2.4	0.0	9.0
R-40244	0.5	(2E)	0.0	0.0	1.0	0.5	1.0	0.0	9.0
R-40244	1.0		1.6	1.0	0.6	0.6	0.7	0.4	8.3
R-40244	1.5		0.3	0.0	0.3	0.0	2.0	0.0	9.3
metolachlor	1.5	(8E)	1.6	0.3	0.6	0.6	2.0	0.7	10.0
metolachlor	3.0		1.6	1.3	2.0	3.0	2.0	0.7	10.0
metolachlor	6.0		2.7	1.5	0.3	1.0	3.0	0.7	9.7
pebulate	16.0	(6E)	1.0	0.0	0.3	1.3	0.4	0.0	9.3
alachlor	2.0	(4E)	1.3	2.0	0.0	0.0	2.4	0.0	10.0
alachlor	4.0		2.6	3.3	3.3	2.6	0.7	0.0	10.0
alachlor	8.0		1.6	3.3	2.3	3.0	1.7	0.0	10.0

1/ Average of four replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Planted and treated May 3, 1978. Evaluated June 15, 1978 and September 14, 1978. Incorporated 2 inches.

2/ Evaluated September 12, 1978 at harvest.

Comparison of preplant incorporated herbicide treatments on plug planted hydrogel and direct seeded canning tomatoes. Orr, J.P., C. Elmore, F. Ashton, and H. Carlson. Herbicides were applied preplant incorporated on June 1, 1978 to a clay soil with less than 1% organic matter.

Pebulate and EPTC were applied with a CO_2 spraying unit in a total volume of 25 gpa water. The plots were single beds, 25 feet long, 30 inch row spacing, randomized with 4 replications and furrow irrigated. Treatments were incorporated to a depth of 1.75 inches by means of a power tiller with L-shaped knives.

Plug hydrogel treatments consisted of tomato seed, peat moss, vermiculite and 5% carbon, compared to plug without hydrogel.

Stand reduction was greatest in the plug hydrogel treatments. No stand reduction was obtained in the drilled plantings. Vigor reduction was about equal among the three treatments. (Cooperative Extension, University of California, Sacramento, 95827.)

A comparison of preplant incorporated herbicide treatments on plug planted, plug planted hydrogel and direct seeded canning tomato phytotoxicity on a clay soil

			Average ratings 1/						
			Plug hydrogel		Plug		Drill		Control
Herbicides	lb/A	Formulation	stand reduction	vigor reduction	stand reduction	vigor reduction	stand reduction	vigor reduction	redroot pigweed
pebulate	6	6E	3.5	1.7	1.0	1.2	0.0	2.0	9.5
pebulate	8		3.5	2.0	3.0	2.5	0.0	2.5	9.5
EPTC	3	7E	3.5	3.5	1.2	1.5	0.0	3.7	8.2
EPTC	6		2.0	2.0	0.75	0.75	0.0	1.7	8.2
Control	-	-	2.7	1.2	1.7	1.2	0.0	0.5	0.0

1/ Average of four replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Planted and treated June 1, 1978 and evaluated July 7, 1978. Incorporated 1.75 inches.

A comparison of preplant incorporated herbicide treatments on plug planted and direct seeded canning tomato phytotoxicity. Orr, J.P., C. Elmore, F. Ashton, and H. Carlson. The herbicides listed in the following table were applied preplant incorporated on a sandy loam soil April 18, 1978. All herbicides were applied with a CO_2 spraying unit in a total volume of 50 gpa. The plots were single row by 15 feet, randomized with 3 replications. Incorporation was done at 2 inches with an L-shaped power tiller. The trial was furrow irrigated.

In all cases the plug planted tomatoes had better tolerance to the herbicides than the drilled. Tomatoes had the best tolerance to pebulate. In alachlor, metolachlor, and Dowco 295 the tomato tolerance was insufficient even in the plug treatments. (Cooperative Extension, University of California, Sacramento 95827.)

A comparison of preplant incorporated herbicide treatments on plug planted and direct seeded canning tomato phytotoxicity on a sandy loam soil

			Average ratings 1/			
			Tomatoes (plug)		Tomatoes (drill) 2/	
Herbicides	lb/A	Formulation	stand reduction	vigor reduction	stand reduction	vigor reduction
pebulate	6.0	6E	2.0	0.0	4.7	4.7
pebulate	8.0		0.0	0.3	3.0	4.4
pebulate	10.0		0.0	1.3	4.0	3.4
pebulate	16.0		0.0	0.0	4.7	6.0
alachlor	2.0	4E	0.3	0.3	5.4	5.7
alachlor	4.0		0.0	3.3	7.0	7.0
alachlor	8.0		1.8	4.9	9.0	9.0
metolachlor	1.5	6E	0.0	0.0	5.4	6.0
metolachlor	3.0		0.4	1.0	6.4	7.3
metolachlor	6.0		0.0	0.6	7.4	7.7
Dowco 295	1.5	2E	0.4	0.0	4.0	4.4
Dowco 295	3.0		0.7	1.0	5.7	5.7
Dowco 295	6.0		0.0	2.0	4.7	6.4
napropamide	2.0	2E	1.4	0.3	5.4	5.0
control	-	-	0.0	0.0	1.0	4.0

1/ Average of three replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Planted and treated April 18, 1978. Hard crust 2 weeks after planting.

2/ Evaluated May 30, 1978.

Effects of depth of incorporation with preplant soil applied herbicides in direct-seeded and plug planted tomatoes. Carlson, H.L., C.L. Elmore, F.M. Ashton, R.K. Glenn and A.H. Lange. A field study was conducted to evaluate the relative tolerances of direct-seeded and plug planted tomatoes to preplant soil incorporated herbicides at two incorporation depths. The experiment was established April 21, 1978, on Yolo fine sandy loam soil on the U.C. Davis Campus. Treatments of alachlor, ethalfluralin pebulate and napropamide were applied to 8 replicate 1.5 by 6.1 m plots with a CO_2 pressure sprayer. The herbicides were then incorporated into the soil with a power tiller. The herbicides on half of the plots were incorporated 5 cm deep while the incorporation depth on the remaining plots was 10 cm deep. Each of the plots was planted with 2 rows of tomatoes. One row was direct-seeded and the second row was plug planted. Tomato variety VF-145 - 7879 was used. The plug mix consisted of a 1:1 mixture of fine vermiculite and sphagnum peat with 5% activated carbon added by weight. Approximately 120 ml of planting mix was used per planting site or hill, yielding a relatively cylindrical plug about 5 cm in diameter, 7 cm deep and flush with the soil surface. The plots were furrow irrigated following planting.

The experiment was evaluated for crop vigor approximately one month after planting (Table 1). The plug planted tomatoes were significantly more vigorous than the corresponding direct-seeded tomatoes. Marked differences occurred between plug planted and direct-seeded tomatoes in the treatments of alachlor at 4.5 kg/ha, ethafluralin at 1.1 and 2.2 kg/ha and pebulate at 13.4 kg/ha. Both the direct-seeded and plug planted tomatoes were adversely affected by deeper herbicide incorporation. Within the plug planted plots, incorporation below the level of the plug resulted in a decrease in the crop protection afforded by the plug planted medium. This was most apparent with the relatively nonselective treatment of ethalfluralin at 2.2 kg/ha.

The plots were evaluated for control of redroot and prostrate pigweed on June 8, 1978, (Table 2). Due to the presence of occasional escape weeds growing out of the plug planted sites, pigweed control was poorer in the plug planted rows than in the corresponding direct-seeded rows. Apparently weeds germinating in the proximity of the plugs also benefited from the herbicide protection of the planting medium. The effect of incorporation depth on weed control varied by planting method. In the direct-seeded rows the best weed control was attained with shallow (5 cm deep), incorporation. However, in the plug planted rows, weed control was slightly better with deep incorporation due to a reduction in the number of escape weeds in the plugs. In soils with severe weed seed infestations, escape weeds in the plug planted sites may be a significant problem as evidenced by the poor vigor of plug planted tomatoes in the 6.7 kg/ha pebulate treatments. In these plots reduced crop vigor was primarily due to weed competition in the plug planted sites. (University of California, Cooperative Extension and Botany Department, Davis, CA 95616 and Parlier, CA 93648)

Table 1 Tomato vigor attained with preplant soil incorporated herbicides using 2 incorporation depths and 2 planting methods UCD (425-513-186-60-2-78)[1]

		Tomato vigor[2]			
		Direct seeded		Plug planted	
Herbicide	Rate kg/ha	5 cm incorp.	10 cm incorp.	5 cm incorp.	10 cm incorp.
alachlor	2.2	6.5	6.0	7.5	6.5
alachlor	4.5	4.0	2.3	7.3	6.3
ethalfluralin	1.1	3.5	2.5	7.5	6.7
ethalfluralin	2.2	1.3	0.0	8.8	5.5
pebulate	6.7	9.0	8.0	7.3[3]	7.3[3]
pebulate	13.4	7.0	5.3	8.3	7.5
napropamide[3]	2.2	6.3	5.0	6.0	5.5
Untreated[3]	-	2.3	2.0	2.0	2.3
Overall trial averages for each planting method[4] (LSD=0.54)		5.0	3.9	6.8	5.9

1/ Treatments applied April 21, 1978, evaluated May 25, 1978

2/ Tomato vigor ratings are the average of four replications based on a 0 to 10 scale. 0 = all tomatoes dead; 10 = no injury

3/ Low vigor values in indicated treatments primarily due to heavy weed competition

4/ The differences between overall vigor means for each planting method are statistically significant at the 5% level

Table 2 Pigweed control with preplant soil incorporated herbicide using 2 incorporation depths and 2 planting methods UCD (425-513-186-60-2-78)

		Pigweed control 2/			
		Direct seeded		Plug planted	
Herbicide	Rate kg/ha	5 cm incorp.	10 cm incorp.	5 cm incorp.	10 cm incorp.
alachlor	2.0	10.0	7.0	7.5	6.8
alachlor	4.5	10.0	10.0	9.0	8.5
ethalfluralin	1.1	9.7	9.5	8.3	9.3
ethalfluralin	2.2	10.0	10.0	7.5	9.5
pebulate	6.7	9.5	7.3	5.5	6.5
pebulate	13.4	9.8	9.5	3.5	7.3
napropamide	2.2	7.8	4.8	3.8	4.0
Untreated	-	0	0	0	0
Overall trial averages for each planting method 3/ (LSD=0.75)		8.3	7.3	5.6	6.5

1/ Treatments applied April 21, 1978, evaluated June 8, 1978.

2/ Redroot and prostrate pigweed control ratings are the average of four replications and are based on a 0 to 10 scale, 0 = no control, 10 = 100% control.

3/ Differences between overall weed control means for each planting method are statistically significant at the 5% level.

Effects of varying the percent carbon and planting volume of plug plant mixtures on the tolerance of the tomatoes to preplant soil incorporated herbicides. Carlson, H. L., C. L. Elmore, F. M. Ashton, R. K. Glenn, A. H. Lange. In studies conducted in 1977, plug planting significantly improved tomato tolerance to marginally selective preplant soil-applied herbicides. In most of these studies a standard planting mixture containing 5% activated carbon was used at a rate of 120 ml per planted site or hill. A field study was conducted on the U.C. Davis Campus to determine whether the improved tolerance with the plug planting method could be attained using a smaller, more economical plug mix planting volume of 60 ml per hill. The effect of varying the amount of carbon added to the mixture was also evaluated. Two basic mixtures were made. The first mix to be used at the rate of 120 ml per hill while the second mix was used at a rate of 60 ml per hill. Both mixes consisted of a 1:1 mixture of fine vermiculite and sphagnum peat. The amount of seed added to the mixes was adjusted to insure an average of 5 to 7 seeds would be planted per hill with either planting volume. The two basic mixtures were divided into four lots to which activated carbon (Gro-Safe) was added at rates of 0%, 2.5%, 5% and 10% by dry mix weight. Each of the resulting eight mixes were used to plant replicated preplant soil incorporated plots which were treated with alachlor at 2.2, 4.5, and 9.0 kg/ha, pebulate at 6.7, 13.4 and 26.9 kg/ha, ethalfluralin at 0.8, 1.7, and 3.4 kg/ha and napropamide at 2.2 kg/ha. Note that most herbicides were applied at rates in excess of direct-seeded tomato tolerance. The herbicide treated plots were 3.0 by 6.1 m and were replicated four times. Herbicides were incorporated with a power tiller 5 cm deep into a dry Yolo fine sandy loam soil. The plots were furrow irrigated following planting.

On June 8, 1978, one month after planting, the plots were evaluated for tomato vigor and stand establishment. The stand and vigor ratings are listed by herbicide treatment in Table 1 and are summarized by planting method in Table 2. Based on the over-all trial averages for tomato vigor, the addition of 2.5% activated carbon by dry weight to the mixes significantly improved tomato tolerance to the herbicide treatments. Increasing the amount of carbon added to the mix from 2.5% to 10% by weight did not result in further increases in crop tolerance. The 60 ml volume plugs without carbon provided less crop protection than the 120 ml plugs without carbon. When carbon was added to the mixture the reduction in plug size had little effect on crop response to the herbicides.

The plots were evaluated for weed control on July 12, 1978. The predominate weeds present were redroot and prostrate pigweed, barnyardgrass, and common lambsquarters. As with previous plug plant studies, virtually all of the weeds that escaped the herbicide treatments were growing out of the plug planted sites. Apparently, these occasional escape weeds had benefited from the herbicide protection of the plug planted mixtures. Significantly more escape weeds were found in the 120 ml plugs with 10% carbon than were found with the other planting methods (Table 2). With each of the herbicides tested the number of escape weeds decreased as treatment rates increased. (University of California, Cooperative Extension and Botany Department, Davis, CA 95616 and Parlier, CA 93648).

Table 1: Effect of varying the percent carbon and planting volume of plug mix on the vigor of tomatoes grown in preplant herbicide treated soil 1/.

		Tomato vigor 2/							
% Carbon in plug mix 3/:		0 %		2.5%		5.0%		10.0%	
Volume of mix per planting site 4/:		60 ml	120 ml	60 ml	120 ml	60 ml	120 ml	60 ml	120 ml
Herbicide 5/	Rate (kg/ha)								
pebulate	6.7	6.8	6.5	9.5	9.0	8.8	8.5	7.5	8.8
pebulate	13.4	7.3	6.3	9.5	9.2	10.0	9.8	9.3	8.8
pebulate	26.9	5.5	6.8	8.3	8.5	8.8	8.8	9.3	8.8
alachlor	2.2	6.8	8.3	8.5	9.3	8.5	8.5	9.5	8.3
alachlor	4.5	5.0	8.0	9.8	8.3	8.8	8.8	8.8	9.0
alachlor	9.0	5.0	5.8	6.8	8.0	8.3	8.3	8.0	7.8
ethalfluralin	0.8	7.8	8.5	8.5	9.8	7.8	9.5	8.0	10.0
ethalfluralin	1.7	7.8	7.8	9.0	8.3	8.3	8.8	8.0	8.0
ethalfluralin	3.4	5.3	7.8	8.3	9.8	8.5	8.5	9.0	9.0
napropamide	2.2	9.3	8.8	9.5	9.5	8.3	9.5	9.5	9.3

1/ Treatments applied and planted May 8, 1978, evaluated June 8, 1978.

2/ Tomato vigor ratings are the average of 4 replications, based on a 0 to 10 scale. 0 = all tomatoes dead, 10 = most vigorous tomatoes.

3/ Plug mix consisted of 50% fine vermiculite and 50% sphagnum peat w/indicated amount of activated carbon (Gro-Safe) added by weight.

4/ Indicates the amount of mix used per planting site (plug or hill). Plugs were spaced 25 cm apart down seed row. Seed/plug was the same for both volumes.

5/ LSD for comparing vigor averages within a given herbicide treatment (i.e. across row) = 1.8.

Table 2: The effect of plug plant mixtures and volume on tomato stand, tomato vigor and number of escape weeds in the herbicide treatments list on Table 1

Plug planting method		Tomato	Tomato	Escape weeds
Plug volume	% Carbon	stand[1/]	vigor[1/]	per plot[1/]
60 ml	0 %	8.1 c[2/]	6.7 c	0.9 ab
120 ml	0	8.4 c	7.4 b	0.9 ab
60 ml	2.5	8.7 bc	8.7 a	0.5 a
120 ml	2.5	9.1 ab	8.9 a	0.7 ab
60 ml	5.0	9.1 ab	8.6 a	0.8 ab
120 ml	5.0	9.3 a	8.9 a	1.1 b
60 ml	10.0	8.9 ab	8.7 a	1.0 b
120 ml	10.0	9.4 a	8.8 a	1.6 c

1/ The overall trial averages broken down by planting method for the herbicide treatments listed in Table 1.

2/ Means in a column followed by the same letter are not significantly different at the 0.05 level. Duncan's Range Multiple Test.

Effect of 3 preemergence herbicides on direct seeded vs. plug planted tomatoes. Brendler, R. A., A. H. Lange, J. T. Schlesselman, and L. J. Nygren. On May 26, 1978, three preemergence herbicides were applied to preformed beds in a clay loam soil with 30% sand, 49% silt, 21% clay, and 0.93% organic matter. The field has a heavy infestation of black nightshade. The objective of this trial was to determine if nightshade could be controlled and still yield a good stand of plug planted processing tomatoes (UC82). Along with the plugs, each treated row was direct seeded by the grower with UC134 processing tomatoes. Plot size was 20 ft by 5 ft with 6 replications. Sprinkler irrigation commenced on May 27, 1978 and was continued to bring up the tomatoes, followed by furrow irrigation for the remainder of the season.

Chlorpropham gave the best black nightshade control in an evaluation made two weeks after application, but severely injured the direct seeded tomatoes. At this time, only the high rate of chlorpropham affected the plug planted tomatoes, but this effect was slight.

After three weeks, the results of the herbicides appeared about the same, with chlorpropham giving the best nightshade control, and causing severe injury to the direct seeded tomatoes as well as a slight reduction in vigor to the plug planted tomatoes.

By the time one month had lapsed, the nightshade competition in the pebulate plots significantly reduced the tomato vigor in the plugs compared to the relatively nightshade-free plots with chlorpropham. This was demonstrated by the fresh weights of plug planted tomatoes which were taken from 5 plugs in each plot. The reduction of fresh weights taken from the chloramben plots was also a result of nightshade competition along with some slight injury to the tomatoes at the high rate.

An evaluation made on July 7, 1978 continued to show the protection that plugs offer tomatoes when using chloramben and chlorpropham. The plug planted tomatoes in the pebulate plots were also doing fairly well, but this was mainly attributed to the ineffectiveness of pebulate on tomatoes, as shown by the good stand of direct seeded tomatoes, as well as its inability to control black nightshade. The plug mixture at time of planting did not contain nightshade seed. The nightshade found growing in the plugs resulted from contaminated soil being splashed over the plug surface by the sprinkler irrigation which followed herbicide treatment. The difference in the number of nightshade plants in the plugs is a result of the herbicide also being washed onto the plug affecting the germination of the nightshade. The decreased amount of nightshade in the check plugs is probably due to the nightshade competition around the plug which caused the plugs to become drier and, therefore, reduced the nightshade germination in the soil on top of the plugs.

The final evaluation was made on October 13, 1978 by harvesting all the fruit in the center 10 ft of each plot where chlorpropham was used, as well as the check and six 10 ft samples out of the growers field where the combination of pebulate and napropamide was used, in addition to hand weeding. The tomato yields from the chlorpropham treatments were significantly higher than the check plots, but were not higher than the adjacent grower's field where the weeds were removed by hand. (University of California, Cooperative Extension, 800 S. Victoria Avenue, Ventura, CA 93009)

Effect of 3 preemergence herbicides on the growth of direct seeded vs. plug planted tomatoes and black nightshade.

		Average 1/			
		Black	Tomato Vigor		Thinning
		nightshade	Direct	Plug	weights
Herbicide	lb/A	control	seeded	planted	plug only
Pebulate	6	2.5 bc	7.5 a	7.8 ab	68.4
Pebulate	12	3.0 b	7.3 a	7.8 ab	86.3
Chloramben	3	1.5 cd	8.0 a	8.2 a	83.6
Chloramben	6	3.3 b	7.7 a	7.3 bc	37.2
Chlorpropham	1-1/2	5.5 a	2.2 b	7.5 b	172.8
Chlorpropham	3	4.8 a	1.3 c	6.8 c	209.7
Check	-	0.8 d	8.5 a	7.8 ab	46.6

1/ Average of 6 replications where 0 = no effect or all tomatoes dead, 10 = complete control or most vigorous tomatoes.
Average with the same letter do not differ at the 95% level of confidence.
Treated 5/26/78. Evaluated 6/8/78.

The effect of planting method on the response of processing tomatoes to 2 preemergence herbicides. Lange, A. H., D. May, B. B. Fischer, and R. Goertzen. Pebulate and CDEC were applied preemergence to 100 ft by 5 ft plots, replicated 6 times on March 3, 1978 in a Panoche clay loam soil. All plots were plug planted or direct seeded with VF145-B7879 processing tomatoes. Rain began falling prior to completion of seeding and continued throughout the night, totalling 1.40 inches. Sprinkler irrigation was then used until the tomatoes had germinated, when furrow irrigation commenced and continued throughout the remainder of the season.

The plug planted tomatoes were much more vigorous than the direct seeded, irregardless of the herbicide or rate used. This further supports earlier findings of the protection from phytotoxicity from pebulate and CDEC in these soils.

The tomatoes were mechanically harvested on August 17, 1978. Fresh weights were recorded. With all treatments, the plug planted tomatoes yielded more than the direct seeded, an average of 16% more. There was no apparent difference with degree of fruit ripeness between plug planted vs. direct seeded tomatoes, except a possible increase in green fruit with the high rate of CDEC direct seeded, or with the herbicide treatments. The high yield in the check plots resulted from napropamide at 1 lb/A being incorporated the day this trial was established and sufficiently controlling the weeds. No tolerant weeds such as nightshade were present in the field to reduce the effectiveness of napropamide. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Table 1. The effect of planting method on the response of processing tomatoes to pebulate and CDEC.

		Average 1/			
		Vigor		Stand	
Herbicide	Lb/A	Plug	Direct seeded	Plug	Stand seeded
Pebulate	4	9.8	7.3	10.0	9.8
Pebulate	8	10.0	6.3	10.0	9.6
CDEC	4	9.8	7.3	10.0	9.8
CDEC	8	9.6	4.5	9.7	7.8
Check	-	8.3	8.5	10.0	10.0

1/ Average of 6 replications where 0 = no effect, 10 = most vigorous.
Treated 3/30/78; evaluated 5/18/78.

Table 2. The effect of planting method and herbicide treatment on the yield of VF145-B7879 processing tomatoes.

		Plug				Direct seeded			
		Total 1/ weight	Percent			Total 1/ weight	Percent		
Herbicide	Lb/A		Red	Green	Rot		Red	Green	Rot
Pebulate	4	426	92	5	3	356	90	7	3
Pebulate	8	387	89	9	2	330	90	8	2
CDEC	4	400	91	5	4	397	89	8	3
CDEC	8	399	92	7	1	311	85	14	1
Check	-	420	89	8	3	387	90	7	3

1/ Average of 6 replications of tomato fruit (in pounds).
Treated 3/30/78. Weights taken 8/17/78.

A comparison of mini mulches in giant bed fumigation on black nightshade and tomatoes. Lange, A., H. Kempen, and J. Woods. On November 17, 1977, three fumigants were single shank injected to a depth of 4-5 inches in giant beds of 100 feet in a loam soil (73% sand, 13% silt, 14% clay, 0.8% organic matter). Each fumigant was then divided into 4 sub-plots with each sub-plot being covered with one of three mini mulches. The fourth was left uncovered. The mini mulches were white laminated plastic paper, black polyethylene and clear high density plastic.

The soil temperature at that time was 59° F at 6 inches and 64° F at 3 inches. The air temperature was 75° F. The soil moisture was 74-80 centibars.

On March 15, 1978, the beds were knocked down to about 1 inch lower than the original bed. All the plastic was removed and beds knocked off with a "V" shaped soil scraper blade. On March 16, the beds were seeded with Variety UC82 tomato seed with a starter fertilizer being used. The tomatoes were sprinkler irrigated up.

Weed control ratings were taken on March 30, 1978, and April 11, 1978, with a plant number rating taken on April 11, 1978, for both tomatoes and nightshade.

The results clearly show that excellent nightshade control was achieved with the highest rate of Telone, all rates of methyl bromide get and the higher rates of Vorlex. The inclusion of a "mini" mulch inside the giant bed greatly increased the fumigant effectiveness of Telone and methyl bromide. The tomato vigor and stand was poor because of crusting. There was no apparent adverse effect of fumigation on tomato stand or vigor.

Complete nightshade eradication was not achieved, but competition was reduced significantly. (University of California, Cooperative Extension, 9240 South Riverbend Avenue, Parlier, CA 93648)

Tomato vigor and hairy nightshade control with 3 fumigants as affected by type of "mini-mulch" in giant beds.

		Average[1/] counts/ft^2							
		No cover		White laminated plastic paper		Black poly-ethylene		Clear high density plastic	
Herbicide	GPA	N.S.	Tomato	N.S.	Tomato	N.S.	Tomato	N.S.	Tomato
Telone	8	25.3	0.33	26.7	1.7	28.3	1.0	14.7	2.3
Telone	16	24.3	0.33	27.0	0.7	23.3	2.3	5.0	1.0
Telone	32	10.0	1.3	2.0	1.7	1.7	1.0	1.7	1.0
Methyl bromide	40	12.7	2.0	5.0	1.0	2.0	0.7	0.0	1.7
Methyl bromide	80	17.0	1.3	0.7	0.7	0.7	0.7	0.0	1.3
Methyl bromide	160	4.3	2.7	1.3	1.7	0.7	0.7	0.7	1.7
Vorlex	8	20.3	1.3	20.7	1.0	21.3	0.7	12.7	1.0
Vorlex	16	4.3	0.7	13.3	1.7	1.0	1.7	2.3	2.0
Vorlex	32	11.0	1.7	0.7	2.0	3.0	2.0	0.3	0.3
Check	-	49.0	2.7						

1/ Average number of plants from 3 replications.
Trial established 11/11/77; evaluated 4/11/78.

The effect of fumigant type materials on the growth of processing tomatoes and on hairy nightshade control. Bendixen, W., A. Lange, J. Schlesselman, and L. Nygren. On May 2, 1978, three fumigant type materials were applied with a granular applicator and a spray blade with K5 flooding nozzles. Processing tomatoes (UC82) were plug planted on May 9, 1978. They were sprinkler irrigated that night. Evaluations were made on June 1, 1978, and June 29, 1978, for nightshade control and tomato stand.

The spray blade application of 40-80 gpa of metham gave excellent nightshade control. Whereas Vorlex, usually more effective as an injected fumigant than metham, was considerably less effective applied through a spray blade.

Sodium azide was also effective against hairy nightshade at the earlier reading, but was more phytotoxic to tomatoes. (University of California, Cooperative Extension, P. O. Box 697, Santa Maria, CA 93454)

The effect of fumigant type materials on the control of hairy nightshade in direct seeded processing tomatoes.

		Average[1/]	
Treatment	Rate	Tomato Vigor	Hairy Nightshade Control
Sodium Azide	12.5 lb/A	7.0	5.0
Sodium Azide	25.0 lb/A	7.0	6.7
Sodium Azide	50.0 lb/A	5.5	7.2
Metham[2/]	20 gpa	6.2	4.0
Metham[2/]	40 gpa	7.7	6.2
Metham[2/]	80 gpa	9.2	7.6
Vorlex[2/]	20 gpa	6.7	5.3
Vorlex[2/]	40 gpa	6.2	3.0
Agramine	40 gpa	3.6	3.0
Agramine	80 gpa	8.2	3.0
Check	---	5.5	0.0
Check	---	6.5	0.0

1/ Average of 3 replications where 0 = no effect, 10 = complete weed control or most vigorous tomato.

2/ Spray blade layered.

Treated 5/2/78. Evaluated 6/29/78

Effect of method of incorporation on the activity of several herbicides on plug planted and direct seeded processing tomatoes. Lange, A. H., B. B. Fischer, and J. T. Schlesselman. Several herbicides were applied either preplant incorporated (2 to 3 inch depth) or preemergence, most in combination with napropamide to paired 30 inch beds infested with dodder on May 18, 1978. The plots were 30 ft long with 3 replications. This trial was established in a Panoche clay loam soil (24% sand, 36% silt, 40% clay, 1.0% O.M.). The plots were then planted; one row plugged and one row direct seeded with UC82 processing tomatoes. Six hours of sprinkler irrigation (about 1.2 inches) immediately followed planting, and irrigation was continued until June 4, 1978, when furrow irrigation replaced sprinklers for the remainder of the growing season.

The first evaluation was made about 3 weeks after application and resulted in the plug planted tomatoes to be almost completely protected from all treatments when compared to the direct seeded tomatoes. All herbicides gave excellent weed control, with the exception of MBR-18337, which was the only herbicide not combined with napropamide. The treatments resulting in the best plug planted tomato vigor, as well as excellent weed control, were CDEC plus napropamide at 3 + 2 lb/A PRE, and perfluidone plus napropamide at 1-1/2 + 2 lb/A PRE.

A later evaluation showed the tomato vigor with the plugs was still showing considerable safety with all herbicides except MBR-18337. After two months, many of the herbicides had begun to break down. The most lasting treatments on lambsquarter and barnyardgrass were oxyfluorfen plus napropamide at 1-1/2 + 1 lb/A PPI, DCPA plus napropamide at 12 + 1 lb/A PPI, and pebulate plus napropamide at 6 + 1 lb/A PPI.

Although the soil had previously been infested with dodder, none germinated. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Comparison of 2 herbicides alone and in combination with napropamide and their effect on plug planted vs. direct seeded tomatoes as well as annual weeds.

Herbicide	Lb/A	Incrop. Method	Average[1/] Tomato Vigor Plug	Direct Seeded	Weed Control
CDEC+Napropamide	6+1	PPI	9.3	4.3	9.0
Pebulate+Napropamide	6+1	PPI	7.0	3.0	10.0
Pebulate+CDEC+Napropamide	4+4+1	PPI	7.3	3.0	9.0
Chlorpropham+Napropamide	1-1/2+1	PPI	8.7	0.7	9.7
Chlorpropham+Napropamide	3+1	PPI	7.7	0.0	9.3
DCPA+Napropamide	12+1	PPI	8.7	3.7	9.7
DCPA+Napropamide	12+2	PRE	7.3	3.7	9.7
Oxyfluorfen+Napropamide	3/8+1	PPI	7.3	1.7	10.0
Oxyfluorfen+Napropamide	1-1/2+1	PPI	6.7	0.0	10.0
Chlorpropham+Napropamide	1-1/2+2	PRE	7.3	1.3	9.0
Chlorpropham+Napropamide	3+2	PRE	9.3	0.0	9.0
Nitrofen+Napropamide	1-1/2+2	PRE	8.0	1.3	9.0
Perfluidone+Napropamide	1-1/2+2	PRE	9.3	2.3	8.7
MBR 18337	3/8	PRE	7.7	4.7	2.7
MBR 18337	3/4	PRE	9.0	4.7	6.3
Check	-	-	10.0	7.3	0.0

1/ Average of 3 replications where 0 = no effect, all plants dead; 10 = complete weed control, best tomato vigor. Weeds present: lambsquarter, barnyardgrass.

Treated 5/18/78. Evaluated 6/6/78.

A comparison of fluid and plug planting of tomato seed. Lange, A. H., J. Schlesselman, and P. King. Tomato seeds were planted by four methods with chitted seed in a hydrogel with activated carbon; chitted seed in hydrogel using an English fluid drill experimental planter, plug planted with a peat-vermiculite mix with 5% carbon and hydrogel and direct seeded. The soil was a Delhi loamy sand (0.3% organic matter, 82% sand, 10% silt, and 8% clay). The five herbicides, each at 2 rates, were applied to the soil surface on April 17, 1978 over the planted seed and sprinkled in.

The tomatoes in the plugs were up well ahead of the other methods of planting by April 22, 1978. By April 24, 1978, the fluid drilled tomatoes were up still ahead of the direct seeded. The safety presented by the plug planting was very apparent visually by the early rating on April 28, 1978 as well as the later, May 9, 1978. The value of protection was apparent also in the fresh weights. Because of the weed competition in the untreated check, there was less fresh weight than several of the better treatments, which gave excellent weed control and adequate safety. The fluid drill showed only slight protection as shown by the fresh weight, whereas all treatments were protected by the plug, except where nitrofen was applied over the plug (post). When plugging was done, the layer of nitrofen, there was a higher fresh weight. Chlorpropham at 4 lb/A was also a little phytotoxic in the plug at the high rate. The degree of safety over the direct seeded is most spectacular with chlorpropham. The most impressive increase in fresh weight over the check was ethalfluralin, followed by chloramben. Ethalfluralin was more phytotoxic to direct seeded tomatoes than was chloramben or metolachlor in this light sandy soil, probably because the latter two herbicides have been shown to be quite mobile in light sandy soils under sprinkler irrigation and the main front of phytotoxicity may have moved below the root zone or was diluted sufficiently to lose activity. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Comparison of 5 herbicides and their effect on the growth of tomatoes planted by 4 different methods.

Herbicide	lb/A	U.C. Fluid Drill #Plants	U.C. Fluid Drill Wt.	English Fluid Drill #Plants	English Fluid Drill Wt.	Plug Plant #Plants	Plug Plant Wt.	Direct Seeded #Plants	Direct Seeded Wt.
Nitrofen (Pre)[2/]	2	2.0	13.5	3.0	25.0	29.0	233.3	65.6	112.6
Nitrofen (Post)[3/]	2	8.0	34.0	1.6	10.0	7.0	71.6	17.0	74.0
Chlorpropham	2	9.0	3.0	6.0	5.0	42.6	400.0	1.0	0.5
Chlorpropham	4	3.0	1.0	5.0	1.0	28.0	215.3	0.0	0.0
Ethalfluralin	1	16.6	28.3	4.0	9.8	45.0	467.0	11.0	8.3
Ethalfluralin	2	11.6	24.0	3.0	15.0	49.0	396.6	6.0	16.0
Metolachlor	2	21.3	28.0	25.6	50.0	57.6	250.6	119.0	49.3
Metolachlor	4	15.6	10.0	15.0	42.0	61.3	228.0	88.3	18.6
Chloramben	4	16.3	45.3	75.0	90.0	63.0	339.6	98.3	119.6
Chloramben	8	21.6	32.3	18.3	53.6	61.0	373.6	81.0	55.3
Check	-	17.0	45.3	25.0	108.3	54.0	283.0	112.6	145.3
Average	-	12.9	24.1	16.5	37.2	45.2	296.2	54.5	54.5

1/ Average of 3 replications. Weights recorded in gm/5 ft of plot.
Treated 4/17/78. Evaluated 6/9/78.
2/ Nitrofen was applied pre-plug planting.
3/ Nitrofen was applied post-plug planting.

A comparison of ethalfluralin and metolachlor with 4 herbicides applied on weed control in processing tomatoes. Kempen, H., A. Lange, and J. Woods. On March 30, 1978, four herbicides were incorporated 2 inches in a sandy loam soil consisting of 72.8% sand, 17.0% silt, 14.2% clay, and 0.8% organic matter. Each herbicide was applied with ethalfluralin plus napropamide. The four herbicides were also applied with metolachlor plus napropamide. It rained the day of application.

On April 3, 1978, Variety 7879 processing tomatoes were plug planted. Activated carbon, a mixture of complete fertilizer and hydrogel were in the plug media with the tomato seed.

Evaluations for tomato phytotoxicity and nightshade control were taken on April 21 and May 5, 1978.

The resulting nightshade control was outstanding in all treatments. The phytotoxicity was only slightly apparent in the nitrofen treatments. The injury from nitrofen may have been less than in former trials because the plugs were planted through the layer of herbicide instead of being sprayed over the plug.

The combinations were better than metolachlor or ethalfluralin alone. (University of California, Cooperative Extension, P. O. Box 2509, Bakersfield, CA 93303)

The effect of plug planting into PPI ethalfluralin vs. metolachlor with and without 4 herbicides applied preemergence and sprinkled in on nightshade control in processing tomatoes.

		Average[1/]			
		Ethalfluralin + Napropamide 1 + 2		Metolachlor + Napropamide + 2	
Herbicide	Lb/A	N.S.	Tomato	N.S.	Tomato
Chloramben	2	10.0	0.3	10.0	0.0
Chloramben	4	10.0	3.3	10.0	3.0
Nitrofen	2	9.7	0.7	10.0	0.3
Nitrofen	4	9.7	3.0	10.0	3.0
Chlorpropham	2	9.0	0.0	9.0	0.0
Chlorpropham	4	9.0	1.3	9.0	0.0
Metolachlor	2	10.0	0.0	9.0	0.0
Metolachlor	4	10.0	1.0	10.0	0.7
Main plot trtmt.	-	6.7	0.0	7.3	0.3
Sub-plot	-	0.0	0.0	0.0	0.0

1/ Average of 3 replications where 0 = no effect, 10 = complete control of nightshade or kill of tomatoes.
Evaluated 5/5/78.
Black and hairy nightshade control.

Effect of gibberellic acid on nightshade and tomato seed germination. Lange, A. H. and R. Goertzen. The plant growth regulator, gibberellic acid was evaluated for stimulation on two species of nightshade: black (Kearney), black (Arvin) and hairy. These were also compared with VF-145-B7879 tomato seed. The objective of this trial was to find out if nightshade could be stimulated to germinate earlier than under natural conditions, so that the nightshade seedlings down the ultimate seed line could be burned out with contact herbicides before seeding tomatoes. The three nightshades were incorporated into a sterilized Delhi loamy sand on January 25. The gibberellic acid was leached into the soil using a 50 ml dilution per 6 oz. cup of soil. Each cup contained one species and was replicated six times. The cups were on heating pads to maintain a 27 C soil temperature. The rates of gibberellic acid were based on weight of soil in each cup. Dates of emergence were recorded for each cup. Records were taken up to twenty days, with no emergence recorded as twenty days or greater.

The tomato seed was inhibited by increasing rates of gibberellic acid. Black nightshade was stimulated by 125 to 500 ppm with gibberellic acid, but was inhibited by 2000 ppm. Arvin black nightshade (ABN) and hairy nightshade were stimulated by 125 to 500 ppm gibberellic acid. The 125 ppm rate was most effective in stimulating nightshade, whereas 2000 ppm completely inhibited germination. The low rate of gibberellic acid suggest that stimulation of germination could be economically feasible if growers would be willing to bed up, spray on the gibberellic acid, burn down the nightshade and seed tomato, i.e., delaying tomato planting a week to ten days. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, Ca 93648)

Effect of gibberellic acid on nightshade and tomato seed germination as measured by days to emergence.

GA_3	Average Days to Emergence After Treatment			
ppm w	Tomato	BNS	ABN	HNS
0	5.7	15.2	16.0	17.3
125	5.8	7.7	8.2	11.0
250	7.5	10.3	12.7	14.2
500	9.8	8.2	9.8	14.0
1000	14.2	12.7	18.3	18.5
2000	20.0	20.0	20.0	20.0

Treated and planted 1/25/78.
Average of 6 replications.

The effect of preemergence herbicides on the growth of plug planted tomatoes with and without hydrogel. Agamalian, H., and A. Lange. On May 10, 1978, Pacesetter tomatoes were plug planted in a clay loam soil. Half the plugs had hydrogel and half did not. Another series of plots were plug planted and fluid drilled with a mixture that included a second hydrogel. Plots were treated on May 11, 1978, with 5 preemergence herbicides alone and in combination followed by sprinkler irrigation. The plots which were fluid drilled and plug planted with hydrogel were only treated with individual applications of chlorpropham, metribuzin and chloramben.

The first evaluation on vigor and weed control made after one month showed no real difference between the plugs containing hydrogel and those without. Tomato vigor was excellent with all treatments except chloramben, where there was a slight reduction in plant growth. Weed control was very good with most treatments. However, chlorpropham alone and in combination with napropamide was weak on goosefoot. The results in the second table showed the safety the plug has in protecting the tomato when compared to fluid drilling. (University of California, Cooperative Extension, 118 Wilgart Way, Salinas, CA 93901)

Table 1. The effect of preemergence herbicides on the growth of plug planted tomatoes with or without hydrogel and on weed control.

		Average ratings 1/			
		Vigor		Weed control	
		Plus	Minus	Plus	Minus
Herbicides	Lb/A	Hydrogel	Hydrogel	Hydrogel	Hydrogel
Chlorpropham	2	9.0	9.3	5.0	4.7
Metribuzin	¼	8.0	8.7	9.0	9.7
Metribuzin	½	8.3	8.7	9.7	9.7
Chloramben	2	7.7	7.7	9.0	9.3
Napropamide + Chlorpropham	2+2	9.7	9.3	5.3	6.0
Napropamide + Chloramben	2+2	8.0	7.7	8.3	9.7
Napropamide + Metribuzin	2+¼	8.0	9.7	8.0	9.7
Napropamide + Metribuzin	2+½	7.7	9.3	9.3	9.3
Napropamide + CDAA	2+½	8.7	9.3	8.7	6.3
CDAA	2	8.0	8.3	7.3	7.0
CDAA	4	8.0	9.0	8.0	8.7
Check	-	9.3	9.7	4.0	2.7

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete weed control or most vigorous tomato.
Treated 5/11/78. Evaluated 6/10/78.

Weeds present: Goosefoot 60%, Russian thistle 30%, cheeseweed 8%, and hairy nightshade 2%.

Table 2. Comparison of fluid drill vs. plug planted tomatoes and their response to herbicides.

		Average ratings 1/			
		Fluid drill		Plus + hydrogel	
Herbicides	Lb/A	Vigor	Weed control	Vigor	Weed control
Chlorpropham	2	7.3	9.3	9.7	3.0
Metribuzin	½	6.0	9.3	9.7	9.3
Chloramben	2	8.3	9.3	9.3	9.0
Check	-	10.0	3.3	10.0	1.7

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete weed control or most vigorous tomato.
Treated 6/11/78. Evaluated 6/10/78.

Weeds present: Goosefoot 60%, Russian thistle 30%, cheeseweed 8%, and hairy nightshade 2%.

Control of broomrape with preplant incorporated herbicides in tomatoes. Schlesselman, J. T. and A. H. Lange. On June 13, 1978, three herbicides were preplant incorporated to a depth of 3 to 4 inches in an attempt to control branched broomrape (Orobanche ramosa) which had infested tomatoes at the Patterson Ranch, Alameda County. Napropamide at 1 lb ai/A was also incorporated in all plots to control many of the annual weeds. Following herbicide incorporation, all plots were planted with peat-vermiculite plugs containing UC82 processing tomato seeds. Six inch tall UC82 tomato transplants were also planted. Sprinkler irrigation followed with about 1 inch of water. Drip irrigation was then used for the remainder of the season.

The first evaluation made July 19, 1978 resulted in no difference in weed control with any treatment including the check, which indicated that napropamide alone was doing a fairly adequate job of controlling the annual weeds. The transplants appeared to be more affected than the plugs with trifluralin and MBR-18337.

Weed control with all treatments was considerably better than the check which contained only napropamide. Chlorpropham at 12 lb/A resulted in the best nightshade control.

Fresh weights of the tomatoes were taken on October 20, 1978 showing only a slightly higher yield with the plug planted tomatoes. Trifluralin and the high rate of chlorpropham resulted in the best broomrape control. The plug planted tomatoes with the MBR-18337 had five broomrape strikes, whereas the transplanted tomatoes were free of broomrape. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

Table 1. Effect of 3 preplant incorporated herbicides on the growth of transplanted vs. plug planted tomatoes and weed control.

		Average[1/]		
		Weed	Tomato Vigor	
Treatment*	lb/A	Control	Transplants	Plug
Trifluralin	3	6.5	1.0	4.5
Chlorpropham	3	6.5	4.0	4.3
Chlorpropham	12	6.8	4.0	5.5
MBR 18337	1-1/2	5.3	2.3	4.0
MBR 18337	6	5.3	1.5	5.5
Check	-	6.0	4.5	6.3

[1/] Average of 4 replications where 0 = no weed control and death of crop; 10 = complete weed control and most vigorous crop growth.
Treated 6/13/78. Evaluated 7/19/78.
*Napropamide at 1 lb. ai/acre incorporated into all plots.

Table 2. Effect of 3 PPI herbicides on the fresh weights of plug planted vs. transplanted tomatoes and the incidence of broomrape.

Herbicide	lb/A	Wt.(kg)/ Plug[1/]	Total Number Broomrape	Wt.(kg)/ Trans-plant[1/]	Total Number Broomrape
Trifluralin	3	3.19	0	1.26	0
Chlorpropham	3	1.90	1	2.15	1
Chlorpropham	12	3.78	0	0.41	0
MBR 18337	1-1/2	1.63	2	1.74	0
MBR 18337	6	2.37	3	0.77	0
Check	-	2.78	1	1.85	2

[1/] Average weight/plot of all plants in each plot replicated 4 times.
Treated 6/13/78. Evaluated 10/20/78.
*Napropamide at 1 lb. ai/acre incorporated into all plots.

<u>Evaluation of pre-emerge and post-emerge/pre-emerge herbicide treatments for control of prostrate spurge in turf</u>. Shaner, D. L. and R. Krueger. The studies were initiated to determine the relative efficacies of several pre-emerge herbicides, used both alone and in combination with a post-emerge herbicide. Trials were carried out in two locations. South Coast Field Station, Santa Ana, California, is located near the Pacific Coast and has a mild climate. The soil type is sandy-loam. Trials were done on bluegrass, rye grass and alta fescue. Spurge was seeded March 17 and June 2. Pre-emerge treatments were applied March 23, 1978. A post-emerge treatment of Bromoxynil and pre-emerge treatments (applied immediately afterwards) were applied August 2, 1978. Eisenhower Medical Center, Palm Desert, California, has a sandy soil planted with bermuda grass, overseeded with annual rye grass. Spurge infestation is natural. The climate is typical of desert areas, and during the time of the study (summer 1978) temperatures were generally quite high (day and night). Pre-emerge treatments were applied twice, either on February 22 and April 27, 1978, or on March 29 and May 25, 1978. A post-emerge treatment (Bromoxynil) was applied July 28, 1978, and pre-emerge treatments were made immediately afterwards. All treatments at both sites were made with a backpack CO_2 sprayer with a triple nozzle boom. The plots were randomized blocks with four replications.

At Palm Desert, little difference between February/April and March/May applications of pre-emerge herbicides was found (Table 1). In all cases, control could be described as fair at best. DCPA with 20.0.0 fertilizer seemed to give the best control, followed by DCPA without fertilizer, and Oxadiazon. In all three cases, the higher rate gave better control. Prosulfalin gave little or no control, and almost seemed to increase weediness. In all cases, control was gradually lost. By July 26, the control was greatly reduced and by September 19, it was essentially lost.

Palm Desert plots treated post-emerge/pre-emerge gave more promising results (Table 2). This was a split plot design: half of each pre-emerge treatment was treated with Bromoxynil, and half was not. In plots without Bromoxynil, no control was achieved. Bromoxynil removed all established weeds with little damage to the turf. Pre-emergence treatments applied after the Bromoxynil resulted in substantial control, better than was achieved in the pre-emerge trials. Unfortunately, control after September 19 could not be evaulated as the trial had to be terminated.

At South Coast Field Station, pre-emerge treatments gave varied results (Table 3). In no case was good control found, although there were substantial improvements compared to the check. In this situation, Oxadiazon was the most effective treatment, followed by DCPA/fertilizer, and DCPA. Prosulfalin again was ineffective. Early in the season, more effective control was found in rye grass as compared to bluegrass. Later, however, results were similar. Control appeared to be lost at about the same rate as in Palm Desert. Alta fescue was present at SCFS, but was not treated with herbicides as the seeded spurge did not become established in it, probably due to vigorous competition by the alta fescue.

The post-emerge/pre-emerge treatments at SCFS were more effective than the pre-emerge treatments (Table 4). In this case, better control was obtained in bluegrass, at least through September 13. Pre-emerge herbicides applied after Bromoxynil did not improve control as compared to Bromoxynil alone. There was still some control on October 19, when ratings were discontinued.

Bromoxynil did not give as good control at SCFS as at Palm Desert. This is possibly due to environmental, cultural, or climatic factors. At SCFS, the post-emerge/pre-emerge treatments could be considered more effective as there was still activity when the weather turned cold (diminishing spurge germination). Spurge was still able to germinate at Palm Desert when the study was terminated. At both sites, pre-emerge control in spring was less than in summer. This could be due to climatic factors or to more vigorous spurge germination in the spring. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

Table 1. Pre-emerge control of spotted spurge in bermuda grass at Eisenhower Medical Center, Palm Desert, California

Treatment	lb/A	appl[1]	Spotted spurge control[2,3] 4-20	5-25	6-6	7-26	9-19
Prosulfalin	2	1	4.3a-e	1.3a-d	1.0ab	1.5ab	1.5a-c
Prosulfalin	4	1	3.0ab	1.3ab	0.8ab	0.8a	0.0a
Oxadiazon	5	1	4.8a-e	3.3a-d	3.0c-g	2.8a-d	1.8a-c
Oxadiazon	10	1	5.5b-e	4.8b-d	4.0c-g	4.8b-d	3.8c
DCPA	12.5	1	5.3a-e	4.0a-d	3.3a-g	1.8a-c	0.8a-c
DCPA	25	1	6.0c-e	6.5d	5.5f-h	2.8a-d	2.3a-c
DCPA+fert	12.5	1	5.5b-e	2.8a-c	4.3d-g	4.3b-d	2.8a-c
DCPA+fert	25	1	6.3de	5.3cd	5.8gh	5.5d	2.5a-c
Prosulfalin	2	2	3.3ab	0.8a	1.8a-d	2.0a-c	0.5ab
Prosulfalin	4	2	4.0a-e	0.5a	0.5a	0.8a	0.5ab
Oxadiazon	5	2	3.8a-d	1.5ab	2.8a-f	3.8a-d	2.8a-c
Oxadiazon	10	2	3.5a-c	1.5ab	1.3a-c	5.0cd	3.3bc
DCPA	12.5	2	4.5a-e	3.3a-d	4.8e-g	4.8b-d	0.5ab
DCPA	25	2	6.5e	4.8b-d	7.5h	5.4d	0.5ab
DCPA+fert	12.5	2	4.8a-e	2.3a-c	2.8a-f	2.9a-d	2.3a-c
DCPA+fert	25	2	4.3a-e	4.0a-d	3.5b-g	4.6b-d	2.0a-c
Check	-	-	2.8a	1.1ab	2.5a-e	2.4a-d	0.5ab

[1] 1 = applied February 22 and April 27; 2 = applied March 29 and May 25.
[2] 0 = no control; 10 = complete control
[3] Means in a column followed by same letter do not differ significantly at the 5% level using Duncan's Multiple Range Test

Table 2. Post-emerge/pre-emerge control of spotted spurge in bermuda grass at Eisenhower Medical Center, Palm Desert, California

Treatment and rate[1]	Spotted spurge control[2,3] 8-10[4]	9-19[5]
Bromoxynil (2 lb/A) + Prosulfalin (2/3 lb/A)	2.3a,b	7.8b
Bromoxynil (2 lb/A) + Oxadiazon (5 lb/A)	8.3c,d	6.3b
Bromoxynil (2 lb/A) + DCPA (12.5 lb/A)	5.4b,c	7.8b
Bromoxynil (2 lb/A) + DCPA/fert. (12.5 lb/A)	5.3b,c	7.0b
Bromoxynil (2 lb/A) + DCPA (25 lb/A)	8.8d	7.5b
Bromoxynil (2 lb/A)	-	6.5b
Check	0.5a	0.0a

[1] Treatments included subtreatments with and without Bromoxynil (see text)
[2] 0 = no control; 10 = complete control
[3] Means in a column followed by same letter do not differ significantly at the 5% level using Duncan's Multiple Range Test
[4] Ratings are for new growth only (seedlings); established growth completely killed by Bromoxynil
[5] Overall rating, but this is mostly all new growth

Table 3. Pre-emergence control of spotted spurge in turf at South Coast Field Station, Santa Ana, California

Treatment	lb/A	Spotted spurge control[1,2] 6-29 blue	6-29 rye	7-26 blue	7-26 rye	9-13 blue	9-13 rye	10-19 blue	10-19 rye
Prosulfalin	2	0.5a	2.0a	0.0a	0.3a	0.0a	0.5	1.8a	0.8
Oxadiazon	5	5.0c	7.0b	5.0a	4.0b	3.0a	3.0	1.8a	2.8
DCPA	12.5	2.0ab	7.0b	2.3a	3.0ab	3.3a	0.5	2.0a	1.8
DCPA/fert.	12.5	3.0bc	6.0b	3.5a	2.8ab	0.5a	0.5	1.3a	1.8
Check	-	3.3bc	1.3a	1.0a	1.5ab	2.0a	2.3	0.0a	1.5

[1] 0 = no control; 10 = complete control
[2] Means in a column followed by same letter do not differ significantly at the 5% level using Duncan's Multiple Range Test

Table 4. Post-emergence/pre-emergence control of spotted spurge in turf at SCFS, Santa Ana, California

Treatment and rate	Spotted spurge control[1,2] 8-29 blue	8-29 rye	9-13 blue	9-13 rye	10-19 blue	10-19 rye
Bromoxynil (2 lb/A)	7.3b	5.3bc	6.0b	3.8ab	5.0b	3.5b
Bromoxynil (2 lb/A) + Prosulfalin (2 lb/A)	6.3b	3.0ab	4.3b	4.5b	3.7b	4.3b
Bromoxynil (2 lb/A) + DCPA (12.5 lb/A)	6.7b	7.0c	5.0b	2.0ab	4.7b	4.3b
Check	0.0a	0.8a	0.0a	0.8a	0.7a	0.5a

[1] 0 = no control; 10 = complete control
[2] Means in a column followed by same letter do not differ significantly at the 5% level using Duncan's Multiple Range Test

Control of volunteer wheat in fall seeded turnips. Ogg, A. G., Jr. and R. Parker. On September 13, 1978, a field study was initiated to evaluate pronamide and dalapon applied postemergence for the control of volunteer wheat in fall seeded turnips. Turnips were seeded on August 20, 1978, into wheat stubble that had been disked and packed. Soon after planting, we irrigated the field with sprinklers. On September 13, a dense stand of volunteer wheat, mostly 10 to 11 inches tall with three to five leaves and just beginning to tiller, was growing in the plot area. Turnips were mostly 3 to 4 inches tall with three true leaves. Plots were 6 feet by 20 feet and each treatment was replicated three times in a randomized complete-block design. Pronamide was applied on September 13, followed the same day by 1.0 inch of water applied by sprinklers. Dalapon treatments were applied on September 19. All herbicides were applied in 30 gallons of water per acre. Soil was a Warden fine sandy loam with about 1% organic matter.

On October 20, 1978, crop injury and wheat control were determined for each treatment by visual comparison with untreated controls.

All herbicide treatments suppressed the wheat, but none killed it. In all treated plots, turnip leaves were chlorotic and some leaf margins were necrotic. Soil nitrogen levels in the plot area were low and turnips in all plots appeared nitrogen deficient. In an adjacent field outside the experimental area where soil nitrogen levels were higher, pronamide applied at 1.0 lb/A suppressed wheat growth by about 65% and did not injure the turnips. Turnip growth was several times greater in this field than in the plot area. This may indicate an interaction between turnip tolerance to pronamide and soil nitrogen levels. (USDA-SEA/AR and Washington State University, Irr. Agri. Res. and Ext. Center, Prosser, WA 99350).

Control of volunteer wheat in fall-seeded turnips

at Prosser, Washington, October 20, 1978

Herbicide	Rate lbs ai/A	Wheat control (%)	Turnip injury (%)
Pronamide[a/]	0.5	57	27
	1.0	60	25
	2.0	65	37
Dalapon[b/]	2.2	73	40
	4.4	79	42
Untreated control	--	0	0

a/ Applied 9-13-78

b/ Applied 9-19-78

Comparison of herbicide applicators. Ogg, A. G., Jr. and R. Parker. On September 19, 1978, a field study was initiated to compare the effectiveness of the rope wick and controlled droplet applicators to a conventional sprayer for the application of glyphosate. Treatments were applied in triplicate plots 6 feet wide by 20 feet long in a dense, uniform stand of volunteer wheat 10 to 15 inches tall. For the conventional sprayer application, glyphosate was applied in 30 gallons of water per acre using 8004 flat-fan nozzles operated at 25 psi and 3 mph. The controlled droplet applicator was hand-held 4 inches above the wheat, and forward speed was about 3 mph. Volumes of spray and rates of glyphosate applied were varied by changing the orifice or the concentration of glyphosate in the spray. The rope wick applicator was mounted on a bicycle sprayer frame and operated in such a manner so as to contact either the top 2 inches or the top 4 inches of the wheat. Forward speed was either 1 or 4 mph. The herbicide solution was drawn into the rope by wick action and was wiped onto the wheat as the rope brushed against the plants. The amount of herbicide applied per acre depended on the number of plants contacted and not on the area covered. Because the amount of solution used on these plots was very small, the amount of herbicides used could not be determined. Concentration of glyphosate in the rope wick and controlled droplet applicator was varied from 1 qt of commercial product and 3 qts of water (25%) up to 2 qts of commercial product and 2 qts of water (50%).

On October 20, 1978, wheat control was determined for each treatment by visual comparison with untreated controls.

Glyphosate applied with a conventional sprayer controlled nearly 100% of the wheat at the lowest rate tested (0.25 lb ae/A).

Wheat responded more slowly to glyphosate applied by the controlled droplet applicator than by the conventional sprayer. However, final control of wheat with glyphosate at 0.20 lb ae/A applied as a 25% solution was similar to the conventional sprayer. Increasing the concentration of glyphosate to 33% appeared to decrease control when applied with the controlled droplet applicator.

Wheat responded less and more slowly to glyphosate applied with the rope wick applicator than with the conventional sprayer. Control of wheat with the rope wick applicator in this test was improved by (1) increasing the speed from 1 to 4 mph, (2) increasing the amount of plant contact from 2 to 4 inches, and (3) decreasing the concentration of glyphosate from 50 and 33% to 25%. Because the dense stand of wheat may have interfered with the rope contacting plant, this was probably not the best test to demonstrate the potential of this application method. (USDA-SEA/AR and Washington State University, Irr. Agri. Res. and Ext. Center, Prosser, WA 99350).

Comparison of herbicide applicators

	Treatment (9-19-78)			% Wheat control 10-20-78
	Rope wick applicator			
1.	Glyphosate	25%	4 inches, 1 mph	83
2.	Glyphosate	33%	4 inches, 1 mph	62
3.	Glyphosate	33%	4 inches, 4 mph	79
4.	Glyphosate	33%	2 inches, 1 mph	47
5.	Glyphosate	50%	4 inches, 1 mph	67
	Controlled droplet applicator			
6.	Glyphosate	25%	0.25 gal/acre (0.20 lb ae/A)	93
7.	Glyphosate	33%	0.25 gal/acre (0.25 lb ae/A)	84
8.	Glyphosate	33%	1.2 gal/acre (1.20 lb ae/A)	97
	Conventional sprayer (30 gpa)			
9.	Glyphosate	0.25 lb ae/A		99+
10.	Glyphosate	0.50 lb ae/A		100
11.	Glyphosate	1.00 lb ae/A		100
12.	Untreated control			0

PROJECT 5

WEEDS IN AGRONOMIC CROPS

J. Wayne Whitworth - Project Chairman

SUMMARY -

Sixty one reports covering sixteen agronomic crops and chemical fallow or no-till were submitted.

Alfalfa (5 papers) - EPTC, vernolate, profluralin, and vernolate + R-25788 gave excellent control of pigweed, lambsquarters, and green foxtail with adequate tolerance and high yields in newly seeded alfalfa. In another test in newly seeded alfalfa, profluralin + EPTC was outstanding in the control of green foxtail and yield of alfalfa. Downy brome was controlled 100% in established alfalfa with terbacil and metribuzin with greater season yields from these herbicide treatments than others tested. Asulam applied in February to alfalfa gave excellent control of broadleaf dock. Quackgrass in established alfalfa was most effectively controlled by early season applications of buthidazole.

Barley (5 papers) - Ethephon did not reduce lodging in barley but when applied with a surfactant reduced yields. Of the three trials on wild oats, barban was less than satisfactory, and diclofop gave nearly 90% control in the two trials in which it was included. Diclofop, difenzoquat, and barban applied alone or in combination with 2,4-D, dicamba, and bromoxynil to 4 inch barley did not reduce yields of barley but all treatments containing dicamba caused stem bending.

Beans (2 papers) - Alachlor + trifluralin applied preemergence on dry beans gave 100% control of common lambsquarters, hairy nightshade, and pigweed but only 90% control of kochia and green foxtail. Preplant incorporated treatments of alachlor + trifluralin and metolachlor + EPTC gave the best control of hairy nightshade, pigweed, and barnyardgrass and the highest yields of pinto beans.

Bluegrass Seed Field (1 paper) - Buthidazole applied postemergence controlled windgrass (58%) more effectively than the other herbicides without reducing bluegrass seed production.

Corn (5 papers) - A preemergence application of metolachlor + atrazine in sprinkler-irrigated corn gave nearly 90% control of sandbur. Under a similar set-up, green foxtail was controlled better than 90% by metolachlor or alachlor combinations with atrazine or cyanazine, and CP-55097 and metolachlor alone. None of these treatments adversely affected the stand of corn. The same herbicides and herbicide combinations, along with R-40244, butylate, and EPTC, effectively controlled kochia, hairy nightshade, pigweed, and green foxtail when applied preplant incorporated. Highest grain and forage yields with 100% control of pigweed, barnyardgrass, and hairy nightshade resulted from preplant incorporated treatments of alachlor of alachlor + atrazine in another experiment. In yet another experiment, pigweed and barnyardgrass were effectively controlled by alachlor and alachlor or metolachlor combinations with cyanazine with no reduction in the stand of corn. R-40244 was also effective but caused serious visual injury to the corn.

Cotton (2 papers) - An initial irrigation of one inch proved satisfactory for activating oxyfluorfen as measured by the response of cotton, sorghum and sugarbeets. Fluridone gave acceptable control of purple nutsedge at 0.8 to 1.0 lb/A without reducing the yield of cotton although moderate stunting of the cotton plants was noted.

Fallow, chemical or zero-till (7 papers) - Very good weed control was indicated in most of the test with various combinations of herbicides, and the resultant yields of barley or wheat approximately equal to what one would expect from convential tillage. While 100% weed control was obtained in some cases, less than complete control was achieved in others even with a vast array of herbicides. The escapes must then surely be dealt with in succeeding years with what other means except cultivation.

Guayule (2 papers) - Guayule transplants demonstrated good tolerance to pre-transplant applications of soil incorporated trifluralin and napropamide, but were less tolerant to alachlor or DCPA. Nitrofen, oryzalin, oxyfluorfen, and simazine applied to guayule four days after transplanting (over the top), but premergence to the weeds, also gave good weed control and selectivity on guayule.

Lentils (1 paper) - Applied as a preplant in corporated treatment, ethalfluralin gave the best control of the 21 herbicide or herbicide combinations tested. While it was somewhat less effective on pigweed and henbit than on barnyardgrass, the highest yield of lentils were produced on plots treated with ethalfluralin.

Potatoes (2 papers) - Vernolate gave excellent control of kochia, pigweed, and lambsquarters while metribuzin gave complete control. Plots receiving either of these treatments produced the highest yields of potatoes. In another test, metribuzin gave complete control of all weeds including yellow nutsedge.

Peppermint (3 papers) - Early season postemergence applications of paraquat proved safe and effective for the control of terbacil-resistant winter annual weeds in established peppermint fields. Where Russian thistle was a problem, bromoxynil, bentazon, and paraquat gave nearly complete control. A split application of paraquat in the early spring gave better than 80% control of Kentucky bluegrass without causing serious crop injury.

Safflower (1 paper) - A preplant incorporated application of dinitramine gave very effective control of pigweed, field pennycress, and henbit and along with trifluralin resulted in some of the highest yields of safflower. A postemergence application of R-40244 at .25 lb/A gave excellent control of weeds and relatively high safflower yields.

Sorghum (3 papers) - A safening compound, CGA-43089, when applied to sorghum seed protected against stand and vigor reduction in sorghum as the rates of alachlor and metolachor were increased. Propachlor and propachlor plus bifenox gave good control of barnyardgrass with some early vigor reduction of grain sorghum. R-40244 at 1 lb/A gave good control but grain sorghum vigor was reduced. Competition from only one barnyardgrass plant per meter reduced grain sorghum yields by 8.6% and this yield loss increased to 51.6% with 175 barnyardgrass plants.

Soybeans (1 paper) - Metribuzin and bentazon treatments resulted in excellent control of Wright groundcherry and common purslane. Bentazon caused about a 20% reduction in the stand of soybeans.

Sugarbeets (7 papers) - Accumulationof NO_3^- in sugarbeet roots was neither increased nor reduced by mechanical or chemical manipulation of the shoot apex. An application of mefluidide eight weeks before harvest increased sucrose percent. A preplant application of diclofop + ethofumesate completely controlled pigweed, barnyardgrass and lambsquarters and resulted in a high yield of sugarbeets. In other preplant experiments, ethofumesate gave excellent control of all weed species except kochia. When applied preemergence, an ethofumesate + diclofop combination resulted in nearly 90% control of purslane, lambsquarters, and barnyardgrass with a high yield of sugar. This same combination applied postemergence in one test controlled pigweed and barnyardgrass 90% or better but only 78% control of lambsquarters was achieved. In another test, this combination was ineffective on pigweed, 62% effective on lambsquarters and wild buckwheat, and 78% on black nightshade. Sugarbeets exhibited adequate tolerance to this combination. A tank mix of phenmedipham, desmedipham, and ethofumesate applied post to a preplant treatment of ethofumesate gave nearly 100% control of all weeds except kochia which was controlled about 85%. In another text, various combinations of herbicides applied postemergence failed to adequately control kochia, lambsquarters or pigweed. Diclofop, dichlofop + desmedipham, HOE-23408B, and BAS-9052 OH gave very good control when applied postemergence to barnyardgrass at all stages of growth--4 to 33 cm in height.

Sunflower (1 paper) - Dinitramine applied preplant incorporated or R-40244 as a postemergence treatment gave good control of pigweed and highest crop yields of the six treatments tested.

Wheat (15 papers) - In the 6 papers on the control of wild oats in wheat, the treatments giving best control and highest yields of wheat usually included diclofop or a diclofop combination with control ranging from 54 to 99%. In some tests, barban gave better than 90% control of wild oats and higher yields of wheat than the diclofop treatments, and in others, difenzoquat singly or in combinations was very effective with adequate selectivity on wheat showed 100% control of downy brome with metribuzin and 90% with diclofop + R-40244 with both showing adequate selectivity on wheat. In three other tests, vernolate, R-40244, and diclofop gave control ranging from 60 to 93% of ripgut brome with wheat yields essentially equal to the check. Redstem filaree as controlled 100% in one test with 2,4-D LV ester with wheat yields higher than the check. Metribuzin + bromoxynil did the same in this test and also in one other. The metribuzin combination was slightly less effective in two no-till tests for the control of redstem filaree. Metribuzin gave nearly 100% control of Jacobs ladder, wild buckwheat, common chickweed, dog fennel, and shepherdspurse and a yield of wheat slightly higher than the check. Dicamba effectively controlled lambsquarters and resulted in a considerable increase in yield of wheat over the check. Barban gave 90% control of canarygrass and yields of wheat markedly above the check. Barban applied to wheat in which no wild oats emerged did not act as a growth regulator.

PAPERS -

Asulam timing for broadleaf dock control in alfalfa. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. A field trial was conducted to evaluate time of asulam application for broadleaf dock control in alfalfa. Since the first alfalfa cutting usually occurs in late May in western Oregon, hay quality would be improved if the dock was controlled prior to this date.

The experimental design was a randomized block with three replications. Individual plots were 2.5 by 6.0 m.

Asulam was applied on February 28, April 13, and April 27, 1978. The dock was in the rosette stage during the first two applications, and had just begun to bolt at the third application.

Visual evaluations were made on May 19, July 17, and September 20, 1978. No alfalfa injury was noted with any of the treatments.

The broadleaf dock control ratings are summarized in the table below. The February application was more effective than the later timings in controlling the dock before the first cutting, and was at least as good as the other two timings in producing season-long control. (Crop Science Department, Oregon State University, Corvallis 97331)

Percent broadleaf dock control with three timings of asulam

Rate	Date evaluated		
kg a.i./ha	May 19, 1978	July 17, 1978	September 20, 1978
	% Dock control		
	Applied February 28, 1978		
1.5	99	99	83
2.0	99	98	95
2.5	98	88	90
	Applied April 13, 1978		
1.5	90	85	57
2.0	88	93	78
2.5	90	93	87
	Applied April 27, 1978		
1.5	50	95	68
2.0	50	97	85
2.5	50	95	90
0	0	0	0

Green foxtail control in spring-seeded alfalfa. Humburg, N. E. and H. P. Alley. Herbicides were applied as preplant incorporated and preemergence treatments on May 26 and May 31, 1978, respectively. Herbicides were applied with a three-nozzle knapsack sprayer in a total volume of 40 gpa water. Plots were 1 sq rd in size, with three replications in a randomized complete block design. Soil was sandy loam (66.0% sand, 23.8% silt and 10.2% clay) with 1.4% organic matter and a pH of 7.1. The plots were seeded with variety Jirdon 100 on May 26. The area was irrigated by a surface-line sprinkler system.

Visual estimates of weed control and alfalfa stand, and harvested yields of green foxtail and alfalfa were obtained August 31, 1978. Total plant matter production was greater where weed control was poor. However, the production of alfalfa was 3 to 4 times that of the untreated plots where effective control of green foxtail was obtained. Plots with profluralin plus EPTC at 0.5 + 2.0 lb ai/A as a preplant incorporated treatment produced 4320 lb ai/A of oven-dry alfalfa; this was the outstanding treatment in the study. This treatment was visually evaluated as controlling 99% of the green foxtail; clipping weight comparisons with the untreated plots also showed 99% control. Other outstanding treatments were EPTC at 4.0 lb ai/A and vernolate at 3.0 lb ai/A. R-40244 and buthidazole caused substantial reduction of alfalfa stand at all rates tested. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 918).

Spring-seeded alfalfa stand and production, and green foxtail control and yield. Torrington, Wyoming

Herbicide [1/]	Rate lb ai/A	Alfalfa [2/] Stand %	Alfalfa [2/] Yield lb/A	Green foxtail [2/] Control %	Green foxtail [2/] Yield lb/A
Preplant Incorporated					
profluralin	0.75	92	2770	93	610
profluralin + EPTC	0.5 + 2.0	97	4320	99	30
EPTC	3.0	95	3020	96	800
EPTC	4.0	90	3940	99	110
vernolate	3.0	92	3300	98	690
R-40244	0.25	37	3340	63	2980
R-40244	0.5	19	1740	77	2020
R-40244	1.0	4	1880	95	1100
R-40244 + EPTC	0.25 + 3.0	60	2700	94	830
R-40244 + EPTC	0.5 + 3.0	11	2740	94	1180
Preemergence					
R-40244	0.25	3	1620	90	2990
R-40244	0.5	4	660	97	1110
R-40244	1.0	1	0	99	750
buthidazole	0.125	23	1910	88	520
buthidazole	0.25	6	1420	93	680
buthidazole	0.75	1	810	96	660
Check			940	0	3330

1/ Herbicide applications: preplant May 26 and preemergence May 31, 1978.
2/ Visual evaluations and harvest on August 31, 1978. Yields are lb/A of oven-dry foliage.

Downy brome control in established, irrigated alfalfa. Humburg, N. E. and H. P. Alley. Individual herbicides and combinations were applied March 23, 1978, to established alfalfa that had approximately 1-in of leaf growth; downy brome was in the 2- to 4-tiller stages of growth with 2 to 12 leaves. Herbicides were applied with a six-nozzle knapsack sprayer in a total volume of 40 gpa water solution. Each treatment was replicated three times with 1 sq rd plots arranged in a randomized complete block design. The soil was sandy loam (83.2% sand, 8.4% silt and 8.4% clay) with 1.0% organic matter and pH 8.2. Plots were flood irrigated. Broadleaf weeds present but of minor importance at the time of treatment included kochia, tansy mustard and dandelion.

Plots were harvested three times when alfalfa was at 1/10th to 1/4th bloom stages. Downy brome occurred only at the first harvest, June 7-8, 1978. Ten treatments provided 100% control of downy brome; another seven treatments gave better than 90% control as determined by dry weight of foliage. Ten of the 17 treatments that gave better than 90% control of downy brome resulted in first harvest alfalfa yields that exceeded that of the check plots. These included propham, oxyfluorfen + pronamide, pronamide, terbacil, metribuzin, and buthidazole. The amount of downy brome from plots treated with R-40244 at 0.5 lb ai/A and oryzalin at 1.5 lb ai/A exceeded that of the check plots. Buthidazole at 4.0 lb ai/A controlled downy brome but markedly reduced alfalfa production for the first cutting.

Plots treated with oryzalin at 1.0 lb ai/A produced a total of 11,260 lb/A of forage; also, plots treated with terbacil at 1.0 lb ai/A and metribuzin at 0.5 lb ai/A had a greater seasonal yield than that of the check plots. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 919).

Downy brome control in established, irrigated alfalfa. Torrington, Wyoming

Herbicide [1/]	Rate lb ai/A	Downy brome [2/] lb/A oven-dry June	Alfalfa [2/] lb/A oven-dry June	July	Sept.	Total
propham	3.0	0	3020	3110	2690	8820
oxyfluorfen + WA	0.5	370	2520	2930	2530	7980
oxyfluorfen + WA	1.0	310	2730	2850	3150	8730
oxyfluorfen + pronamide + WA	0.25 + 0.25	100	2710	3120	3800	9630
oxyfluorfen + pronamide + WA	0.25 + 0.5	270	2450	3050	3020	8520
oxyfluorfen + pronamide + WA	0.375 + 0.5	70	2980	3120	2390	8490
oxyfluorfen + pronamide + WA	0.5 + 0.5	20	2560	2740	2550	7850
oxyfluorfen + paraquat + WA	0.25 + 0.25	290	2760	3350	2560	8670
paraquat + WA	0.5	60	2800	3450	2890	9140
pronamide	0.75	20	2810	3500	2180	8490
pronamide	1.0	0	3040	2850	2480	8370
RH-6201 + pronamide + WA	0.5 + 0.5	490	2720	2970	2400	8090
R-40244	0.5	610	2630	2500	3330	8460
R-40244	1.0	500	3040	2530	3940	9510
R-40244	2.0	390	2570	2470	2030	7070
terbacil	0.5	30	3280	3720	2020	9020
terbacil	1.0	0	3210	4290	3320	10820
terbacil + hexazinone (90SP)	0.5 + 0.5	0	2900	3160	3250	9310
metribuzin	0.5	0	3140	3520	3500	10160
metribuzin	0.75	10	3110	3560	3410	10080
buthidazole (50WP)	1.5	0	3830	2300	3600	9730
buthidazole (50WP)	2.0	0	3200	2700	3000	8900
buthidazole (50WP)	4.0	0	2170	2770	3310	8250
buthidazole (5G)	1.5	0	3180	3560	3140	9880
buthidazole (5G)	2.0	10	2650	2600	1890	7140
buthidazole (5G)	4.0	0	1380	2100	3720	7200
oryzalin	1.0	410	3660	4140	3460	11260
oryzalin	1.5	1700	2470	2670	2480	7620
oryzalin	2.0	460	4030	2990	2770	9790
Check	---	750	2960	3430	3720	10110

[1/] Herbicides applied March 23, 1978. WA = Triton AG-98 at 0.5% v/v. [2/] Harvest dates: June 7-8, July 27 and September 20, 1978.

Effect of herbicide application timing on quackgrass control in established alfalfa. Lee, G. A., G. A. Mundt and W. S. Belles. Buthidazole was applied to established alfalfa at three stages of growth to determine proper treatment time to provide maximum quackgrass control. In the same trial, R-40244 was applied on April 7, 1978 to evaluate effect on perennial grasses growing in alfalfa stands. The study was conducted at Bonner Ferry, Idaho on a site where the soil is classified as silt loam. Buthidazole was applied on April 7, 1978, May 17, 1978 and June 12, 1978 when the alfalfa was dormant, actually growing and after first cutting, respectively. Soil moisture was adequate for active crop and weed growth at all dates of treatment. A knapsack sprayer equipped with a three nozzle boom was used to apply the herbicide in a total volume of 40 gpa. Flat fan 8004 Tee Jet stainless steel nozzles, 40 psi boom pressure and 3 mph ground speed were used to attain delivery rate. Each plot was 9 ft. by 30 ft. and replicated three times in a completely randomized block design. Alfalfa yield and quackgrass control were determined by clipping biomass from two locations within each plot and calculating production on an acre basis.

R-40244 at rates up to 4.0 lb/A, applied when the alfalfa was dormant did not provide adequate control of quackgrass (accompanying table). At higher rates, R-40244 stimulated some leaf chlorosis of the quackgrass plants and severe bleaching of alfalfa leaves early in the growing season. Both the crop and quackgrass exhibited no symptoms at the time of the first cutting. Alfalfa yields were, however, suppressed in plots treated with R-40244 at 2.5 and 4.0 lb/A. There appears to be no potential for this compound as a perennial grass control material in established alfalfa.

Buthidazole -50WP at 1.5 and 2.0 lb a.i./A applied on April 7, 1978 resulted in 92 and 87 percent quackgrass control. Alfalfa tolerance to the herbicide was quite good and yields were substantially greater than yields from nontreated check plots. Rates of .5 and .75 lb a.i./A did not provide commercially acceptable control of quackgrass. In comparing timing-of-application, buthidazole gave better quackgrass control when applied at an earlier date. This may be attributed to adequate precipitation after application necessary to carry the herbicide into the soil profile for root absorption. No buthidazole treatment regardless of formulation or rate of application gave adequate quackgrass control when applied in late spring (5/17/78) or after first cutting (6/12/78). Evaluation of these treatments in the 1979 growing season may determine the residual perennial grass control but initial control was not adequate. Alfalfa yields were increased in plots treated with 10 different rates or formulations of buthidazole. (Idaho Agric. Exp. Sta., Moscow).

Effect of time of application of herbicides on quackgrass control in established alfalfa at Bonners Ferry, Idaho.

Treatment	Rate lb/A	Time of Application	Vigor Reduction[1] Alfalfa	Quackgrass	Yield Alf. lb/A	Quack. lb/A	% Quackgrass Control
Check			0	0	2207	1300	-0-
R-40244	1.0	4/7/78	10	10	1973	1593	3e[2]
R-40244	2.0	4/7/78	25	25	1700	1527	0e
R-40244	2.5	4/7/78	35	35	967	2633	0e
R-40244	4.0	4/7/78	70	40	1193	2047	16de
Buthidazole-50WP	.5	4/7/78	0	0	1940	793	32b-e
Buthidazole-50WP	.75	4/7/78	0	10	2693	393	59a-d
Buthidazole-50WP	1.5	4/7/78	10	50	4633	273	92a
Buthidazole-50WP	2.0	4/7/78	15	80	2560	180	87ab
Buthidazole-2G	.75	4/7/78	0	5	3207	527	46a-e
Buthidazole-5G	1.0	4/7/78	10	50	2467	360	55a-e
Buthidazole-50WP	.75	5/17/78			1187	673	37a-e
Buthidazole-50WP	1.0	5/17/78			713	1080	31b-e
Buthidazole-50WP	1.5	5/17/78			1280	533	60a-d
Buthidazole-50WP	2.0	5/17/78			722	980	32b-e
Buthidazole-2G	1.0	5/17/78			2893	613	59a-d
Buthidazole-5G	1.0	5/17/78			5793	253	74a-c
Buthidazole-50WP	1.0	6/12/78			3867	1153	17c-e
Buthidazole-50WP	1.5	6/12/78			2307	1260	6de
Buthidazole-2G	1.5	6/12/78			2973	1980	26c-e

1/ visual evaluations taken May 17, 1978 only on treatments applied in the fall of 1977.

2/ columns containing means with the same letters are not significantly different at the .05 level.

Evaluation of several herbicides for weed control and crop tolerance in newly seeded alfalfa. Coleman-Harrell, M. E., G. A. Lee, and E. P. Eldredge. A field study was established at Caldwell, Idaho, to determine the effectiveness of several herbicides for control of redroot pigweed, common lambsquarters, and green foxtail, and to determine the tolerance of newly spring-seeded forage alfalfa (variety Lahonton) to the herbicide treatments. Preplant incorporated and preemergence surface applied herbicide treatments were broadcast applied in water on June 19, 1978, with a knapsack sprayer, calibrated to deliver 40 gpa. The ambient temperature at the time of application was 76 F. The soil was moist and the soil temperature at 4 inches was 60 F. Preplant herbicides were incorporated to a depth of 2 inches with a disk and spike-tooth harrow operated at 3 mph, in one direction, once over the treated plots. Alfalfa was broadcast seeded at a rate of 14 lb/A and shallowly incorporated into the soil, on June 19, 1978. Preemergence surface treatments were applied on June 19, 1978, prior to corrugation. The alfalfa was furrow irrigated on 24 inch beds. Postemergence treatments were broadcast applied in water on July 18, 1978, with a knapsack sprayer, calibrated to deliver 40 gpa. The ambient temperature at the time of application was 78 F, the relative humidity was 72%, and the soil temperature at 4 inches was 67 F. Treatments were replicated 3 times in a randomized complete block design. The soil at the study site is a Purdam silt loam.

Percentage weed control and crop stand were determined from species counts within two 2.5 ft. diameter quadrats per plot, on August 2, 1978. Numbers of plants obtained by this count were compared to similar counts taken in the untreated check plots. Dry alfalfa forage yields were determined from weights of air-dried forage samples cut from two 2.5 ft. diameter quadrats per plot on August 14, 1978. Dry weed foliage biomass was determined in the same manner.

Alfalfa seedlings tolerated preplant incorporated treatments of EPTC at 5 lb ai/A which resulted in 94% or better weed control and high alfalfa forage yields. A tank-mix treatment of R-40244 plus EPTC at 0.5 plus 3 lb ai/A resulted in 100% control of all three weed species, along with good crop tolerance and alfalfa forage yield. Treatments of buthidazole at 0.125 and 0.25 applied preplant incorporated resulted in high levels of crop thinning and stunting as determined by stand counts and visual observations. (SW Idaho Research and Extension Center, Parma, ID 83660).

Percent weed control, crop stand, and alfalfa forage yield resulting from preplant incorporated, preemergence surface, and postemergence applications of several herbicides

Treatment	Rate lb ai/A	Percentage weed control: redroot pigweed	Percentage weed control: common lambs-quarters	Percentage weed control: green foxtail	Percent crop stand	Air-dry weights lb/A: alfalfa forage	Air-dry weights lb/A: weeds	Alfalfa yield percent of check
*Triallate	1.5	49	47	27	148	656	871	216
*Triallate	2.0	27	56	51	127	583	529	159
*Alachlor	2.0	100	67	100	64	375	519	134
*Alachlor	2.5	89	83	89	63	551	179	174
*EPTC	3.0	86	74	100	180	747	98	194
*EPTC	5.0	94	100	100	190	1008	613	283
*EPTC + R-25788[1/]	4.0	95	100	100	123	636	362	163
*R-40244 + EPTC	0.5+3.0	100	100	100	106	865	320	224
*R-40244	0.5	100	100	71	121	770	277	278
*Vernolate	3.0	100	89	87	264	1005	297	290
*Vernolate	4.0	92	60	98	92	574	349	165
*Vernolate + R-25788[2/]	2.5	100	95	98	334	1130	104	367
*EPTC + Trifluralin	2.0+0.5	94	100	100	152	884	52	265
*EPTC + Profluralin	2.0+0.5	62	89	100	164	705	46	229
*EPTC + Dinitramine	3.0+0.33	100	100	100	134	865	42	265
*Buthidazole	0.125	83	100	58	36	741	170	238
*Buthidazole	0.25	100	100	99	7	440	522	99
*Prodiamine	0.33	100	100	100	108	754	49	216

Percent weed control, crop stand, and alfalfa forage yield resulting from preplant incorporated, preemergence surface, and postemergence applications of several herbicides (cont)

Treatment	Rate lb ai/A	Percentage weed control: redroot pigweed	Percentage weed control: common lambs-quarters	Percentage weed control: green foxtail	Percent crop stand	Air-dry weights lb/A: alfalfa forage	Air-dry weights lb/A: weeds	Alfalfa yield percent of check
*Prodiamine	0.5	100	100	95	68	806	3	270
*Prodiamine	0.67	100	100	100	72	630	72	168
*Dinitramine	0.75	100	100	100	165	698	29	212
*Profluralin	1.0	100	100	100	335	943	29	222
*Pendimethalin	1.0	91	72	68	315	913	183	336
*Benefin	1.125	100	100	94	158	871	85	265
#R-40244	0.25	82	89	18	187	724	975	214
#R-40244	0.5	87	100	24	166	920	489	353
#R-40244	0.75	95	100	44	71	694	222	212
#R-40244	1.0	99	100	71	117	939	281	335
Δ2,4-DB	0.375	61	86	9	159	825	532	233
Δ2,4-DB	0.5	42	94	32	104	528	633	152
Δ2,4-DB + Bromoxynil	0.375+0.25	99	100	24	139	506	509	123
ΔBromoxynil	0.375	83	100	26	140	591	571	197
ΔBromoxynil	0.5	62	100	9	106	349	910	95
ΔPropham + 2,4-DB	3.0+0.375	59	100	4	176	427	728	115
ΔPropham + Bromoxynil	3.0+0.375	46	100	25	110	421	949	133
Untreated check	--	--	--	--	100	437	1700	100

1/ "Eradicane" as formulated by Stauffer Chemical Co.;
2/ "Vernam +" as formulated by Stauffer Chemical Co.;

* Applied preplant incorporated
\# Applied preemergence surface
Δ Applied postemergence

<u>Effect of ethephon on lodging and yield in barley and wheat.</u> Shaner, D. L. and W. H. Isom. Lodging is a serious problem in barley and some of the taller varieties of wheat. Ethephon shows promise of being used as an anti-lodging agent by shortening and stiffening the seed stalk. Experiments were conducted in 1977 and 1978 on barley (UC 566) and wheat (Anza, 1977; MP 54, 1978) to determine the effect of ethephon on lodging resistance and yield. Five by 20 ft. plots were set up in a random block design and replicated 4 or 6 times. All plots were sprinkler irrigated. In 1977 the barley and wheat were treated at the heading stage, while in 1978 both crops were sprayed when the heads were just being initiated. At the rates used, there was no apparent lodging resistance developed in the barley since all plots were lodged at harvesting. On the other hand, since none of the wheat trials lodged, no evaluation of lodging resistance could be made. In 1977 there was no effect of ethephon on yield in either the barley or the wheat, and in 1978 ethephon did not affect wheat yield. However, there was a significant reduction in the yield of barley at both rates of ethephon when it was combined with a surfactant (PACE). This affect could be due either to the ethephon or the surfactant. Since no plots were sprayed with surfactant alone, the two possibilities cannot be separated. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

Effects of ethephon on lodging and yield in barley and wheat[1]

Crop	Ethephon (Kg/ha)	PACE (0.5%)	Lodging (%)	Yield (Kg/ha)
		1977		
Barley (UC 566)	0.56	-	100	4997a
	0.56	+	100	4914a
	0.84	-	100	5440a
	0	-	100	5978a
Wheat (Anza)	0.56	-	0	3984a
	0.56	+	0	4040a
	0.84	-	0	3814a
	0	-	0	3904a
		1978		
Barley (UC 566)	0.56	-	100	4157a
	0.56	+	100	3652b
	0.84	-	100	4058a
	0.84	+	100	3690b
	0	-	100	4072a
Wheat (MP 54)	0.56	-	0	3098a
	0.56	+	0	3411a
	0.84	-	0	3124a
	0.84	+	0	2981a
	0	-	0	3154a

[1] Figures within a column followed by the same letter are not significantly different from the control for each crop at the 5% level using the Duncan Multiple Range Test.

Wild oat control in dryland barley resulting from preplant, postemergence, and preplant/postemergence complementary treatments. Alley, H. P., G. L. Costel and N. E. Humburg. Preplant, early postemergence, and complementary preplant/postemergence treatments were established for the evaluation of wild oat control in dryland barley.

The soil classified as clay loam (25.6% sand, 38.0% silt, 36.4% clay with 3.7% organic matter and a 7.1 pH) was prepared with triallate applied and incorporated with a Triple K unit to a soil depth of 2-in April 4, 1978. Barley (variety Steptoe) was seeded the following day. All postemergence treatments were applied with a six-nozzle knapsack sprayer calibrated to deliver 40 gpa total volume of water carrier. Plots were 9 by 30 ft with three replications arranged in a complete block design.

The early postemergence and complementary postemergence treatments were applied on May 22, 1978 when the majority of wild oat were in the 1.5 to 2-leaf stage-of-growth. The late postemergence treatments were applied June 4, 1978 when the majority of wild oat were in the 3 to 5-leaf stage of growth. Wild oat control and barley stand evaluations were made on June 20 and 21, 1978 by counting 1 sq ft in each treatment replication.

Triallate applied and incorporated preplant resulted in 92% wild oat control with difenzoquat, barban and diclofop applied postemergence over the triallate treated plots giving 99.7, 97 and 99.9% wild oat control, respectively. Hoe-23408 Plus and diclofop applied early post were the outstanding postemergence treatments resulting in 87 to 88% control. None of the other postemergence treatments gave satisfactory wild oat control.

It would seem, that from this study and others of similar nature over the past four years, the first practice would be to use triallate with a postemergence treatment of any of the three chemicals, barban, difenzoquat or diclofop, over the preplant if necessary. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 912).

Wild oat control resulting from preplant, postemergence and preplant/postemergence treatments

Herbicide	Rate lb ai/A	Wild oat [1/] % control	Barley % stand
	Preplant		
triallate	1.25	92	93
	Early post [2/]		
Hoe-23408 Plus	0.63	88	107
Hoe-23408 Plus	0.75	88	113
diclofop	0.63	87	100
diclofop	0.75	88	140
diclofop	1.0	87	147
barban	0.375	11	133
barban	0.5	11	107
barban + MCPA	0.375 + 0.5	23	100
barban + bromoxynil	0.375 + 0.5	30	93
barban + bromoxynil + MCPA	0.375 + 0.25 + 0.5	22	113
barban + MSMA	0.375 + 2.0	18	120
MSMA	2.0	12	107
MSMA	3.0	37	133
	Late post [3/]		
difenzoquat	0.75	35	93
difenzoquat	1.0	32	93
difenzoquat + 2,4-D amine	1.0 + 0.5	22	100
difenzoquat + 2,4-D ester	1.0 + 0.5	27	100
barban	0.375	11	113
MSMA + difenzoquat	2.0 + 0.375	50	127
	Sequential [4/]		
barban	0.375 + 0.375	49	100
	Complementary [2/]		
triallate + difenzoquat	1.25 + 1.0	99.7	113
triallate + diclofop	1.25 + 0.75	99.9	73
triallate + barban	1.25 + 0.375	97.0	53
Check	---	--	100

[1/] Evaluations made June 20 and 21, 1978.
[2/] Postemergence treatments applied May 22, 1978; wild oat 1.5 to 2 leaf.
[3/] Treatments applied June 4, 1978; wild oat 3 to 5 leaf.
[4/] Sequential treatments applied May 22 and June 4, 1978.

Postemergence applications of herbicides in barley. Hamilton, K. C. The effects of herbicide combinations on barley were studied during 1977-1978 at Mesa, Arizona. Gus barley was planted in November, 1977, in rows spaced 12 inches apart. Seed was planted in moist soil under a dry mulch. Dichlofop, difenzoquat, and barban were applied alone or in combination with 2,4-D, amine, dicamba, and bromoxynil on December 24, 1977, when barley was 4 inches high. Applications of diclofop, difenzoquat, and barban on December 24 were also followed by applications of 2,4-D on January 4, 1978 when barley was 8 inches high. Herbicides were applied in 20 gpa of water. Treatments were replicated four times on 6 by 30 foot plots. Development of wheat was noted every few weeks and plots were harvested by combine in June.

All herbicide treatments that contained dicamba caused stem bending for about 2 months. No herbicide combination or sequence reduced yield of barley grain (table). (Plant Sciences Dept., University of Arizona, Tucson, AZ 85721).

Barley yield after postemergence applications of herbicides

Treatment						Yield of
Date	Herbicide	lb/A	Date	Herbicide	lb/A	grain lb/A 1/
Untreated						4,560 a
Dec. 24	diclofop	1.0				4,360 a
Dec. 24	diclofop	1.0	and	dicamba	0.25	4,390 a
Dec. 24	diclofop	1.0	and	bromoxynil	0.25	4,350 a
Dec. 24	difenzoquat	1.0				4,790 a
Dec. 24	difenzoquat	1.0	and	2,4-D	0.50	4,560 a
Dec. 24	difenzoquat	1.0	and	dicamba	0.25	4,920 a
Dec. 24	difenzoquat	1.0	and	bromoxynil	0.25	4,820 a
Dec. 24	barban	0.4				4,720 a
Dec. 24	barban	0.4	and	2,4-D	0.50	4,540 a
Dec. 24	barban	0.4	and	dicamba	0.25	4,240 a
Dec. 24	barban	0.4	and	bromoxynil	0.25	4,560 a
Dec. 24	diclofop	1.0	Jan. 4	2,4-D	0.50	4,490 a
Dec. 24	difenzoquat	1.0	Jan. 4	2,4-D	0.50	4,290 a
Dec. 24	barban	0.4	Jan. 4	2,4-D	0.50	4,530 a

1/ Values followed by the same letter are not significantly different.

Evaluation of postemergence herbicides for wild oat control in spring barley. Lee, G. A., G. A. Mundt, D. L. Kambitsch and M. E. Coleman-Harrell. A field experiment was established at Reubens, Idaho, to compare the effectiveness of several herbicides for postemergence control of wild oats in spring barley (cultivar Steptoe). The plots were treated May 22, 1978, when the wild oat plants were in the 3 to 4-leaf and 2-tiller stage, and again May 29, 1978, when the weed species were in the 5-leaf and 2-tiller stage of growth. A knapsack sprayer equipped with a three-nozzle boom was used to apply herbicides in volumes of 5 and 20 GPA. Flat fan 80067 and 8002 TeeJet stainless steel nozzles were used respectively at 40 psi. boom pressure and 3 mph ground speed was the delivery rate. Individual plots were 9x30 ft. Treatments were replicated three times in a randomized complete block design. The spring barley was under some moisture stress at the time of the first application. Prior to the second herbicide treatment rain had reduced the drought stress condition. Ambient temperature was 74 and 61 F, soil temperature at 4" was 64 and 62 F, and the wind was 0-3 and calm for the two application dates respectively. The soil at the study site is Southwick silt loam and slightly acidic. Crop vigor reduction, crop stand reduction, and percent wild oat control was obtained by usual observations. Yield data was obtained on September 25, 1978 with a Hege small plot combine. The sample area harvested was 119.25 sq. ft.

Difenzoquat alone gave the highest yield of all the compounds tested (accompanying table). Difenzoquat tank mixed with R-40244 resulted in decreased crop tolerance and a decline in yield. This combination indicates a synergistic responce in relation to increased activity of difenzoquat. Diclofop + W.A. resulted in a significant reduction of yield when compared to diclofop. The addition of surfactant reduced crop tolerance of spring barley to diclofop. R-40244 indicates good compatability with all the wild oat herbicides and may in some combinations increase the wild oat activity of these herbicides. (Idaho Agricultural Experiment Station, Moscow, Idaho.)

Effect of postemergence wild oats and broadleaf herbicide combinations

Treatment	Rate lb a.e./A	Percent Crop vigor reduction	Percent Wild oat control	Yield Bu/A	Percent yield Increase
Check	0	0	0	53bc	0
diclofop	.63	2ef[1/]	80ac	70ab	37a
diclofop	.75	10bf	92ab	69ab	37a
R-40244	.5	8bf	10f	59ac	12ac
R-40244	1.0	17bc	15ef	57ac	12ac
barban +	.5				
R-40244	.5	7cf	60ad	70ab	33ab
diclofop +	1.0				
R-40244	.5	18bc	93ab	70ab	37a
difenzoquat +	1.0				
R-40244	.5	32a	97a	67ac	28ac
diclofop +	.5				
SN-533	.5	8bf	80ac	65ac	28ac
barban +	.5				
GCP 6305	.5	10bf	63ad	64ac	22ac
barban 12.5E	.5	10bf	65ad	61ac	18ac
barban 25E	.5	7cf	57ad	55ac	6ac
barban	.5	13be	65ad	62ac	16ac
difenzoquat	1.0	20b	72ad	71a	22ac
diclofop plus (W.A.)	.63	10bf	88ac	59ac	9ac
diclofop plus (W.A.)	.75	15bd	82ac	52c	-3c
diclofop	1.0	13be	53bd	60ac	16ac
FC 92040	.5	3df	35df	66ac	22ac
FC 92040	1.0	3df	50ce	62ac	20ac
FC 92040	2.0	10bf	60ad	52c	0bc

[1/] Means followed by the same letter are not significantly different at the .05 level.

Herbicide combinations for wild oat and broadleaf weed control in spring barley. Lee, G. A., G. A. Mundt, and W. S. Belles. The study was initiated at Reubens, Idaho to determine the potential of barban in combination with bromoxynil, bromoxynil + MCPA and MCPA for wild oat and broadleaf weed control in spring barley. An objective of the study was to measure any antagonistic influence of the herbicides included for broadleaf control on the activity of barban for wild oat control. Herbicide treatments were applied when the wild oat plants were in the 1- to 2-leaf stage and in the 3- to 4-leaf stage of growth.

Each plot was 9 ft by 30 ft and replicated three times in a completely randomized block design. A knapsack sprayer equipped with a three nozzle boom was used to apply the herbicide in a total volume of 5 gpa. Flat-fan 8001 Teejet stainless steel nozzles, 40 psi boom pressure, and 5 mph ground speed were used to attain delivery rate. At the time of the early herbicide application on June 22, the wild oat plants were in the 1- to 2-leaf stage of growth and the lambsquarter plants were in the 1-1½" stage of growth. The wild oat plants were in the 3- to 4-leaf stage of growth and the lambsquarter plants were in the 2-3" stage of growth at the late treatment data on June 28. The barley (Cultivar Steptoe) was in the 3 leaf and 2 tiller and 5 leaf and 2 tiller stage of growth at the time of the early and late application dates, respectively. Split applications of barban were made at a 14 day interval. Herbicide treatments for only broadleaf weed control were applied on May 21, 1978. The air temperatures were 74 F and 80 F and the soil temperatures were 74 F and 77 F at the first and second application dates respectively. The soil at the study site is classified as a Southwick silt loam.

Barban + MCPA (ester) at .5 + .5 lb/A and barban + bromoxynil + MCPA (butyrate) at .5 + .25 + .25 lb/A resulted in the greatest phytotoxic symptoms to the barley crop. Most herbicide treatments did not cause measurable affects on the crop. Only three herbicide treatments gave 94 percent or better control of common lambsquarter. The later applications of herbicides for broadleaf weed control was more effective than the early applications because the weed population had fully emerged by the later treatment date. Although no treatment gave outstanding wild oat kill, the split applications of barban or early applications of barban resulted in the best overall control. The wild oat data is based on actual kill and does not reflect the number of plants severely stunted but alive. (Idaho Agriculture Exp. Station, Moscow).

Effect of Herbicide Combinations for Wild Oat and Broadleaf Control on Spring Barley

Treatment	Rate (lb/A)	% Crop Vigor Reduction	% lambsquarter Control	% Wild Oat Control	Bu/A	% yield increase of check
Check	-0-	-0-	-0-	-0-	15.5	-0-
barban	.375	0.0	43	65	18.6	28
barban	.5	1.7	28	45	16.7	14
barban + bromoxynil	.375 + .5	3.3	78	62	19.3	30
barban/barban*	.375 + .375	0.0	35	67	18.3	25
barban + bromoxynil/barban*	.375 + .5/.375	0.0	38	57	19.8	35
barban/barban + bromoxynil	.375/.375 + .5	5.0	98	65	19.9	35
barban/barban + bromoxynil	.375/.375 + .5	3.3	96	70	20.5	38
barban*	.375	1.7	4	33	19.6	32
barban*	.5	1.7	8	32	18.8	29
barban + bromoxynil*	.5 + .5	3.3	71	58	19.9	35
barban + bromoxynil + MCPA*	.5 + .5	1.7	76	55	18.0	23
barban + MCPA (ester)*	.5 + .5	10.0	73	51	20.1	3
bromoxynil*	.5	3.3	83	0	17.7	19
bromoxynil + MCPA*	.5	1.7	73	0	17.9	21
MCPA (ester)*	.5	1.7	94	0	19.4	34
barban + bromoxynil + MCPA (butyrate)*	.5 + .5	8.3	68	68	17.8	21

*treatments at the 3-4 leaf stage of wild oats.

Effect of preemergence herbicide treatments on weed control in sprinkler-irrigated dry beans. Humburg, N. E. and H. P. Alley. Plots for the study of preemergence applications of herbicides for weed control in dry beans were planted on May 11, 1978. Herbicides were applied May 12 with a six-nozzle knapsack sprayer; the herbicide-water solution was applied at a rate of 40 gpa. The surface 0.5 in of soil was dry at the time of application. The soil was a sandy loam (66.0% sand, 23.8% silt and 10.2% clay) with 1.4% organic matter and pH 7.1. Plots were sprinkler irrigated the day of herbicide application.

Plant counts for weed control determinations were made on June 26, 1978. Green foxtail was the principal weed; all herbicide treatments provided 90% or better control. Redroot pigweed was totally controlled. Alachlor combinations with trifluralin or linuron gave better control of kochia than metolachlor and combinations of metolachlor with chloramben or dinoseb. No treatment gave complete control of all weed species. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 920).

Effect of preemergence herbicide treatments on weed control in sprinkler-irrigated dry beans. Torrington, Wyoming

Herbicide 1/	Rate lb ai/A	Percent weed control 2/				
		KOCZ	Colq	Hans	Rrpw	Grft
metolachlor	2.0	20	90	100	100	100
metolachlor	2.5	5	90	100	100	100
metolachlor + chloramben	1.25 + 1.5	80	90	85	100	95
metolachlor + chloramben	1.25 + 2.0	45	100	100	100	100
metolachlor + dinoseb	1.25 + 4.0	30	90	100	100	95
alachlor + trifluralin	2.25 + 0.33	90	100	100	100	90
alachlor + trifluralin	2.0 + 0.5	80	90	100	100	95
alachlor + linuron	1.5 + 0.5	80	100	100	100	90
alachlor + linuron	2.0 + 0.67	80	90	100	100	95
Check	---	0	0	0	0	0
plants/linear ft of row, 6-in band		*2.5*	*1.7*	*1.1*	*1.5*	*17.7*

1/Herbicides applied May 12, 1978.

2/Plant counts June 26, 1978. Abbreviations: KOCZ = kochia; Colq = common lambsquarters; Hans = hairy nightshade; Rrpw = redroot pigweed; Grft = green foxtail.

Comparison of several preplant incorporated and postemergence applied herbicides for weed control in pinto beans. Coleman-Harrell, M. E., G. A. Lee, and E. P. Eldredge. A field study was established at Parma, Idaho, to determine the effectiveness of several herbicides for weed control in pinto beans (variety UI 114) and to determine crop tolerance to the herbicide treatments. Preplant incorporated herbicides were broadcast applied in water on June 8, 1978, with a knapsack sprayer calibrated to deliver 40 gpa. The ambient temperature at the time of application was 75 F, the relative humidity was 57%, and the soil temperature at 4 inches was 64 F. The soil had been preirrigated. Herbicides were incorporated by operating a disk at 3 mph and 5 inches deep once across the direction of herbicide application, and then by operating a Lely roterra once with the direction of application. Pinto bean seeds were planted 2 inches deep on 30 inch rows with 2.5 inch intra-row spacing, on June 14, 1978. Beans were furrow irrigated from gated pipe. Postemergence treatments were broadcast applied in water on July 7 and on July 24, 1978. Herbicides were applied with a knapsack sprayer calibrated to deliver 40 gpa. The ambient temperature at the time of application on July 7 was 62 F, the relative humidity was 60%, and the soil temperature at 4 inches was 68 F. On July 24 the ambient temperature was 65 F, the relative humidity was 60%, and the soil temperature at 4 inches was 72 F. The soil at the study site is a Greenleaf-Owyhee silt loam with 1% OM and a pH of 7.5. Treatments were replicated 4 times in a randomized complete block design.

Percent weed control and crop stand were determined from species counts taken within two 5 by 1 ft. quadrats per plot on August 3, 1978. Numbers of plants obtained by this count were compared to similar counts taken in the untreated check plots. Dry bean yield was determined from weights of dry beans harvested from 15 ft. sections of 2 rows per plot on October 20, 1978.

Preplant incorporated treatments of alachlor at 2.5 and 3 lb ai/A and alachlor plus trifluralin or dinitramine at 2.5 plus 0.5 or 2.5 plus 0.33 lb ai/A, respectively, resulted in 91% or better control of hairy nightshade, 100% control of redroot pigweed, and 98% or better control of barnyardgrass, with correspondingly high bean yields. Single postemergence applications of bentazon at 1 lb ai/A, alone or with a wetting agent, resulted in poor control of broadleaf weed species, and poor control of barnyardgrass as expected. Split applications of bentazon, each at 1 lb ai/A, alone or with a wetting agent, resulted in 83% or better control of hairy nightshade and redroot pigweed, but did not increase control of barnyardgrass over that control obtained from single applications of bentazon. Treatments of R-40244 at 0.25, 0.5, and 1 lb ai/A resulted in high levels of crop phytotoxicity and substantially low bean yields. Hand-weeding did not result in bean yields that were substantially greater than yields obtained as results of several preplant incorporated herbicide treatments. This is strong evidence in support of the fact that early preemergence weed control is important for high bean yield production. (SW Idaho Research and Extension Center, Parma, ID 83660).

Effects of several preplant incorporated and postemergence herbicides on weed control in pinto beans

Treatment	Rate lb ai/A	Percentage weed control: hairy nightshade	Percentage weed control: redroot pigweed	Percentage weed control: barnyard-grass	Percent crop stand	Dry bean yield: lb/A	Dry bean yield: Percent of check
Alachlor	2.5	100	100	100	93	2656	119
Alachlor	3.0	93	100	98	78	2770	120
Alachlor + Trifluralin	2.5+0.5	91	100	100	68	3054	139
Alachlor + Dinitramine	2.5+0.33	93	100	100	78	2725	126
R-40244	0.25	38	82	48	70	2281	103
R-40244	0.5	18	94	70	51	2302	107
R-40244	1.0	51	97	88	30	2093	96
EPTC + Trifluralin	2.0+0.5	76	75	100	56	2731	120
EPTC + Dinitramine	2.0+0.33	75	100	100	69	2868	129
EPTC + Dinitramine	2.0+0.5	68	100	100	90	2774	125
EPTC + Pendimethalin	2.0+1.0	56	100	100	86	2868	129
Pendimethalin	1.0	69	97	100	94	3128	144
EPTC + Profluralin	2.0+1.0	83	100	100	81	2522	113

Effects of several preplant incorporated and postemergence herbicides on weed control in pinto beans (cont.)

		Percentage weed control				Dry bean yield	
Treatment	Rate lb ai/A	hairy nightshade	redroot pigweed	barnyard-grass	Percent crop stand	lb/A	Percent of check
Profluralin	1.0	83	100	100	86	2690	118
Vernolate	3.0	69	100	100	87	2900	129
Vernolate + Dinitramine	2.0+0.33	95	100	100	85	2535	114
Vernolate + Trifluralin	2.0+0.5	88	100	100	78	2422	111
Metolachlor	2.0	72	94	89	85	2625	117
Metolachlor + EPTC	1.5+3.0	92	96	100	81	3148	143
Cycloate	3.0	75	63	78	79	2868	128
*Bentazon	1.0	48	12	20	84	2179	102
*Bentazon + WA 1/	1.0	26	3	42	87	2542	115
*Bentazon/ Bentazon 2/	1.0/1.0	83	98	38	83	2544	102
*Bentazon + WA/ Bentazon + WA	1.0/1.0	86	84	26	79	2233	116
hand-weeded check	--	100	100	100	86	2953	135
untreated check	--	--	--	--	100	2267	100

* postemergence applied

1/ wetting agent = Citowett Plus @ 0.25% v/v

2/ split applications, 17 days apart; once on July 7, next on July 24, 1978

Windgrass control in bluegrass seed fields. Lee, G. A., G. A. Mundt, and W. S. Belles. Windgrass is becoming a major problem in bluegrass seed production fields in northern Idaho. This study was conducted to determine the feasibility of applying herbicides in late spring for windgrass control. The study was initiated at Tensed, Idaho, when the windgrass was 1 to 2 inches tall and the bluegrass was starting into the early boot stage on May 1, 1978. Each plot was 9 ft. by 30 ft. in size and each treatment was replicated three times in a randomized complete block design. The herbicides were applied with a knapsack sprayer equipped with a three nozzle boom and calibrated to deliver 40 gpa total carrier. At the time of herbicide application, the air temperature was 59 F, soil temperature was 56 F and the relative humidity was 65 percent. The soil type at the location is a Taney silt loam.

Although the herbicide treatments were applied when the crop was in a susceptible stage of growth, there was not an extreme level of crop vigor reduction. MSMA at 4.0 and 6.0 lb/A and buthidazole at .375 lb/A resulted in the most effective control of windgrass. Higher rates of MSMA did suppress the bluegrass seed production. The highest yield was recorded in areas treated with buthidazole (Idaho Agric. Exp. Sta., Moscow).

Effect of Windgrass Control in Bluegrass Seed Fields

Treatment	Rate	% Crop Vigor Reduction	% Windgrass Control	lb/A
MSMA	3.0	6.7	6.7 c	383
MSMA	4.0	0.0	56.7 ab	381
MSMA	6.0	10.0	66.7 a	232.3
MSMA	9.0	3.3	36.7 b	132.7
diclofop	1.0	6.7	30.0 bc	423.3
diclofop	1.5	13.3	36.7 b	387.3
buthidazole	.375	10.0	58.3 ab	522
R-40244	.75	10.0	6.7 c	238.3
Check	0	-		482.3

Preemergence herbicide treatments for control of field sandbur in sprinkler-irrigated corn. Humburg, N. E. and H. P. Alley. Preemergence applications of herbicides for control of field sandbur in center-pivot irrigated corn were made on May 25, 1978, near Lusk, Wyoming. Three replications of 9 by 25 ft plots were arranged in a randomized complete block design. Herbicides were applied to the dry surface of sand soil (89.6% sand, 7.0% silt, and 3.4% clay) of 1.0% organic matter and pH 7.2. Soil temperatures were 110 and 80 F for the surface and 1-in depth, respectively. Corn was planted May 22 in 30-in rows.

Plant counts were made June 22 for determination of weed control. Principal weed species were field sandbur, prostrate pigweed and redroot pigweed with respective populations of 31.0, 2.7 and 0.6 plants per ft of row in a 6-in band centered over the corn row. Pigweed was totally controlled by all herbicide treatments. Control of field sandbur ranged from 2 to 43% and sandbur was competitive with corn in all plots.

Visual evaluations of field sandbur control were made on September 7, 1978. Rating averages in September were more consistent with rate of herbicide applications than were the count averages of June 22. CP-55097 and combinations containing atrazine were more effective than most single-herbicide treatments. Corn height at the time of observation in September was influenced primarily by degree of field sandbur control. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 915).

Preemergence herbicide treatments for control of field sandbur in sprinkler-irrigated corn. Lusk, Wyoming

Herbicide [1/]	Rate lb ai/A	Sandbur control [2/] June 22 %	Sandbur control [2/] Sept. 7 %	Corn [3/] Stand %	Corn [3/] Injury 0-10	Corn [3/] Height ft
alachlor	3.0	22	50	100	0.3	6.5
alachlor	4.0	21	40	90	1.0	6.3
alachlor + atrazine (4L)	2.0 + 1.0	29	62	86	0.0	6.8
alachlor + atrazine (4)	2.0 + 1.0	41	67	95	0.3	6.8
metolachlor	2.0	41	33	95	0.0	5.8
metolachlor	4.0	21	50	100	0.6	6.3
metolachlor	6.0	2	80	95	2.0	6.5
metolachlor/atrazine	1.25 + 1.0	12	82	100	1.0	6.5
metolachlor/atrazine	1.5 + 1.2	18	83	90	1.3	7.0
metolachlor/atrazine	1.75 + 1.4	43	82	95	0.3	6.7
metolachlor/atrazine	2.0 + 1.6	4	93	90	1.3	6.7
CP-55097	2.5	11	77	86	2.0	6.5
CP-55097	3.0	6	80	81	2.3	6.3
Check		0	0	100		3.8
plants/ft of row, 6-in band		*31.0*		*1.4*		

1/ Herbicides applied May 25, 1978.
2/ Plant counts June 22, 1978. Visual evaluation September 7, 1978.
3/ Stand counts June 22, 1978. Visual injury evaluations June 22, 1978; 0 = none, 10 = complete kill. Height as visual average September 7, 1978; corn in early milk stage.

Preemergence herbicide treatments for green foxtail control in sprinkler-irrigated corn. Humburg, N. E. and H. P. Alley. Research plots for evaluating preemergence herbicide treatments were under surface-line sprinkler irrigation at the Torrington Agricultural Substation. The 9 by 25 ft plots were replicated three times in a randomized complete block design. Corn was planted in 36-in rows on May 11, 1978. The soil was sandy loam (68.0% sand, 23.8% silt, 8.2% clay, 1.6% organic matter and pH 7.2). Herbicides were applied May 12 to soil that was dry to 0.5-in depth. A knapsack sprayer with a six-nozzle boom was used to apply herbicides full coverage in 40 gpa water solution.

Weed and corn stand counts were made June 26, 1978. The principal weed species was green foxtail. Six of the 24 herbicide treatments gave complete control of foxtail. The lowest application rates of buthidazole, 0.062 and 0.125 lb ai/A, and cyanazine at 1.5 lb ai/A gave markedly less control of green foxtail than other treatments. Buthidazole at rates of 0.187, 0.25 and 0.375 lb ai/A and buthidazole at 0.125 and 0.187 lb ai/A in combination with alachlor severely damaged corn stands.

Plots were visually evaluated on October 12, 1978. Treatments that gave less than average control of green foxtail included metolachlor at 1.5 lb ai/A, cyanazine at 1.5 lb ai/A and buthidazole at all rates applied. Where corn stands were greatly reduced late summer foxtail control was poor, although control might have been good when weeds were counted in June. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 916).

Preemergence herbicide treatments for green foxtail control in sprinkler-irrigation corn. Torrington, Wyoming

Herbicide[1/]	Rate lb ai/A	Green foxtail % control[2/] June 26	Green foxtail % control[2/] October 12	Corn stand[3/] %
metolachlor	1.5	95	57	100
metolachlor	2.0	100	90	91
metolachlor + atrazine (4L)	1.25 + 1.0	97	93	100
metolachlor + atrazine (4L)	1.5 + 1.2	100	98	91
metolachlor + cyanazine (4L)	1.25 + 1.25	97	92	100
metolachlor + cyanazine (4L)	1.5 + 1.5	85	85	91
alachlor + atrazine (4L)	2.2 + 1.3	94	93	82
alachlor + atrazine (4L)	2.5 + 1.5	100	99	100
alachlor + cyanazine (4L)	2.0 + 0.75	95	83	91
cyanazine (4L) + atrazine (4L)	1.0 + 0.5	74	83	91
cyanazine (4L)	1.5	40	57	68
buthidazole (50WP)	0.062	23	17	64
buthidazole (50WP)	0.125	60	17	64
buthidazole (50WP)	0.187	82	53	36
buthidazole (50WP)	0.25	89	27	9
buthidazole (50WP)	0.375	94	43	5
buthidazole (50WP) + alachlor	0.062 + 1.5	82	63	82
buthidazole (50WP) + alachlor	0.125 + 1.5	98	63	36
buthidazole (50WP) + alachlor	0.187 + 1.5	100	73	23
atrazine (4L)	1.0	100	96	95
atrazine (4L)	1.5	95	98	95
CP-55097	2.25	91	83	86
CP-55097	2.5	97	95	86
CP-55097	3.0	100	92	86
Check	---	0	0	100
plants/ft of row, 6-in band		*4.3*		*1.5*

[1/]Herbicides applied May 12, 1978. [2/]Weed counts June 26, 1978. Visual evaluations October 12, 1978. [3/]Corn stand counts June 26, 1978.

Preplant incorporated herbicide treatments in furrow-irrigated corn. Humburg, N. E. and H. P. Alley. Herbicides were applied May 11, 1977, at the Torrington Agricultural Substation for evaluation as preplant incorporated treatments. Incorporation with a finger-tine harrow occurred between 0.3 and 0.7 hr after application. Herbicides were applied in 40 gpa of water solution with a six-nozzle knapsack sprayer. The 9 by 30 ft plots were replicated three times in a randomized complete block design. The soil was sandy loam (64.0% sand, 26.8% silt and 9.2% clay) with 1.6% organic matter and pH 7.0. Corn was planted May 12, 1978, in 36-in rows.

Corn stand and weed populations were determined on June 27, 1978. Marked stand reduction resulted from treatments of R-40244 at 1.0 lb ai/A and CP-55097 at 3.0 lb ai/A. Stunting of corn was observed in all plots treated with R-40244, but recovery was complete. Kochia was controlled by all treatments but cyanazine + atrazine at 1.0 + 0.5 lb ai/A and metolachlor at 1.5 lb ai/A. Control of hairy nightshade, the predominant weed species, ranged from 86 to 100%; no herbicide or herbicide combination showed a distinct lack of activity against nightshade. All but two treatments provided greater than 90% control of green foxtail; R-40244 at 1.0 lb ai/A and EPTC + atrazine at 4.0 + 1.0 lb ai/A controlled 73 and 82% of the green foxtail, respectively. All treatments gave 90% or better control of green foxtail at the end of the growing season. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 917).

Weed control and corn stand resulting from preplant incorporated herbicide treatments. Torrington, Wyoming

Herbicide [1/]	Rate lb ai/A	Percent control [2/]				Corn stand [3/]
		kochia	hairy nightshade	redroot pigweed	green foxtail	%
cyanazine (4L)	1.75	100	100	100	100	86
cyanazine (4L) + atrazine (4L)	1.0 + 0.5	80	97	100	91	92
cyanazine (4L) + alachlor	0.75 + 2.0	100	100	100	100	96
cyanazine (4L) + butylate	1.0 + 3.33	100	100	100	100	100
cyanazine (4L) + EPTC	1.0 + 3.33	100	100	100	100	92
metolachlor	1.5	80	94	63	100	96
metolachlor	2.0	100	86	100	100	92
metolachlor + atrazine (4L)	1.25 + 1.0	100	100	100	100	100
metolachlor + atrazone (4L)	1.5 + 1.2	100	100	100	100	86
metolachlor + cyanazine (4L)	1.25 + 1.25	100	100	100	100	96
metolachlor + cyanazine (4L)	1.5 + 1.5	100	100	100	100	100
alachlor + atrazine (4L)	2.2 + 1.3	100	100	100	100	96
alachlor + atrazine (4L)	2.25 + 1.5	100	100	100	100	92
R-40244	0.5	100	94	100	100	92
R-40244	1.0	100	100	100	73	45
R-40244 + EPTC	0.5 + 4.0	100	97	100	91	96
EPTC	4.0	100	100	63	91	73
EPTC + atrazine (4L)	4.0 + 1.0	100	89	100	82	100
butylate	4.0	100	100	100	100	100
butylate + atrazine (4L)	4.0 + 1.0	100	81	100	91	82
CP-55097	2.25	100	97	100	100	78
CP-55097	2.5	100	97	100	100	96
CP-55097	3.0	100	100	100	100	55
Check	---	0	0	0	0	100
plants/ft of row, 6-in band		*0.3*	*2.4*	*0.2*	*0.7*	*1.5*

[1/] Herbicides applied May 11, 1978. [2/] Weed counts June 27, 1978. [3/] Corn stand counts June 27, 1978.

Weed control and field corn tolerance with preplant incorporated herbicides. Orr, J.P. The herbicides listed in the following table were applied preplant incorporated June 2, 1978. Applications were made on a clay soil with less than 1 percent organic matter at Consumnes City College.

All herbicides were applied with a double nozzle CO_2 sprayer in a total volume of 25 gpa. The plots were 2 rows by 25 feet, randomized with four replications. Treatments were incorporated with a power tiller, L-shaped knives 1.75 inches deep. The trial was planted on beds and furrow irrigated.

All herbicides tested gave good to excellent barnyardgrass control. AC-206784 gave poor control of redroot pigweed at rates of 3.0 to 6.0 lbs per acre. Metolachlor was weak on pigweed at 2.5 lbs per acre.

The field corn showed good tolerance to most of the treatments except for R-40244 which gave a moderate vigor reduction plus bleaching of the lower leaves at rates of 0.5 to 1.0 lbs per acre. (Cooperative Extension, University of California, Sacramento, 95827.)

Weed control and field corn tolerance with preplant incorporated herbicides

Treatments	lb/A	Weed control 1/ Redroot pigweed	Barnyardgrass	Field corn stand reduction	Field corn vigor reduction
AC-206784 4E	3.0	3.3	10.0	0.0	0.6
AC-206784 4E	4.0	3.3	10.0	0.3	0.3
AC-206784 4E	5.0	0.0	10.0	1.0	1.3
AC-206784 4E	6.0	5.0	9.9	0.3	0.6
metolachlor 8E	2.5	7.0	10.0	0.3	0.0
metolachlor + atrazine	3.6	10.0	10.0	1.0	1.0
metalachlor + atrazine A90	2+1.6	10.0	10.0	1.6	1.6
alachlor 4E + atrazine A90	2.5+1.6	9.3	10.0	1.6	1.3
metolachlor + cyanazine	2+2	10.0	10.0	0.0	1.3
alachlor + cyanazine	3+2	10.0	10.0	0.0	1.0
R-40244 2E	0.5	9.9	10.0	0.0	2.3*
R-40244	0.75	6.0	9.3	1.6	2.0**
R-40244	1.0	10.0	9.9	1.6	2.3**
alachlor 4E	3.0	10.0	10.0	0.0	0.0
control	---	0.0	0.0	0.0	0.0
EPTC 6.7E	3.0	8.3	8.3	0.0	0.0

1/ Evaluated July 7, 1978.

* Lower leaves of corn bleached moderately

** Lower leaves of corn bleached severely

Evaluation of seven herbicides, alone and in combination, for weed control and crop tolerance in field corn. Coleman-Harrell, M. E., G. A. Lee, and E. P. Eldredge. A field study was established at Parma, Idaho, to determine the effectiveness of seven preplant incorporated herbicides for control of redroot pigweed, hairy nightshade, and barnyardgrass, and to determine the tolerance of field corn to the herbicide treatments. Herbicides were broadcast applied in water on a preirrigated field, on June 13, 1978, with a knapsack sprayer, calibrated to deliver 40 gpa. The ambient temperature at the time of application was 64 F, the relative humidity was 56%, and the soil temperature at 4 inches was 64 F. Herbicides were incorporated by operating a disk at 4 mph and 6 inches deep, across the direction of herbicide application, and then by operating a Lely roterra with the direction of application. Corn was planted 2 inches deep on 30 inch rows, with an intrarow spacing of 2.5 inches, on June 15, 1978. The corn was furrow irrigated from gated pipe. Treatments were replicated 3 times in a randomized complete block design. The soil at the study site is a Greenleaf-Owyhee silt loam with 1% OM and a pH of 7.5.

Percentage weed control and crop stand were determined from species counts within two 5 by 1 ft. quadrats per plot, taken on July 31, 1978. Numbers of plants obtained by this count were compared to similar counts taken in the untreated check plots. Corn foliage biomass yield was determined from green weights of foliage biomass harvested from 1 m of row per plot, on August 1, 1978. Grain yield was determined from weights of cobs and kernels, harvested from 15 ft. of row per plot, on October 23, 1978.

Several herbicide treatments resulted in 90% or better weed control with adequate crop tolerance. Treatments of alachlor plus atrazine at 2 plus 1 lb ai/A resulted in 100% weed control of all 3 species, and displayed a high degree of crop selectivity as substantiated by crop stand counts, foliage biomass, and grain yield. Treatments of metolachlor plus cyanazine at 1.5 plus 1.5 lb ai/A and metolachlor plus atrazine at 2 plus 1 lb ai/A resulted in substantially better weed control than treatments of metolachlor at 2 lb ai/A alone, but crop tolerance to the tank-mix treatments decreased markedly. Applications of butylate and R-25788 plus atrazine at 4 plus 1.25 lb ai/A provided 100% control of redroot pigweed, 95% control of barnyardgrass, and 98% control of hairy nightshade, with correspondingly high foliage biomass and grain yields. (SW Idaho Research and Extension Center, Parma, ID 83660).

Percentage weed control and corn yield as a result of preplant incorporated herbicide treatments

Treatment	Rate lb ai/A	Percentage weed control: redroot pigweed	barnyard grass	hairy nightshade	Percent crop stand	Foliage biomass: lb/A	percent of check	Yield: lb/A	percent of check
Alachlor	2.5	100	100	100	93	19,963	107	3,586	222
Alachlor	3.0	100	100	100	101	22,554	122	3,360	202
Alachlor + Atrazine	2.0+1.0	100	100	100	110	20,336	110	3,624	214
Alachlor + Cyanazine	1.5+1.5	93	91	96	88	24,763	133	3,263	196
EPTC + R-25788 1/	3.5	47	72	91	94	21,953	118	2,489	154
Metolachlor	2.0	66	100	90	99	22,589	123	3,016	183
Metolachlor + Cyanazine	1.5+1.5	100	100	100	94	20,283	110	2,575	161
Metolachlor + Atrazine	2.0+1.0	100	100	100	98	21,602	117	2,642	165
Butylate + R-25788 2/	3.5	83	95	56	108	20,162	109	1,821	112
Butylate + R-25788 + Atrazine	4.0+1.25	100	95	98	104	19,849	108	2,704	169
Vernolate	3.5	99	98	89	100	20,450	111	2,446	145
Untreated check	--	--	--	--	100	18,573	100	1,628	100

1/ "Eradicane" as formulated by Stauffer Chemical Co.

2/ "Sutan +" as formulated by Stauffer Chemical Co.

The effect of initial irrigation on the activity of oxyfluorfen. Schlesselman, J., and A. H. Lange. The initial activity and subsequent residual activity of preemergence herbicides is often determined by the amount and timing of the initial irrigation. The objective of this field experiment was to determine the optimum amount of water to activate oxyfluorfen. The herbicide was applied in 100 gals/A to a hot dry prepared soil surface July 18, 1978. The main plots were 5 ft by 20 ft and the subplots 5 ft by 5 ft. Each treatment was replicated 3 times. The soil was a Hanford fine sandy loam (O.M. 0.7%, sand 42%, silt 49%, and clay 9%). The varying amounts of water (1/8, 1/2 and 2 inches) were applied immediately after herbicide application. No water was added for one month. On August 18, 1978, the plots were seeded to cotton and sorghum and sprinkler irrigated uniformly.

On August 27, 1978, the crops were rated for vigor. The lowest level of water (1/8 inch) appeared to cause the least amount of phytotoxicity and the most vigorous cotton plants. However, the crusting effect from higher amounts of water seen with cotton (check) plots probably masked any difference due to initial irrigation. However, the sorghum (milo) in the checks was not affected by the amount of water and, therefore, suggested greater injury (less vigorous plants) at the lower amount of water. These results would suggest that 1/8 inch of initial irrigation was satisfactory for activating oxyfluorfen on this soil type. (University of California, Cooperative Extension, 9240 S. Riverbend Avenue, Parlier, CA 93648)

The effect of initial irrigation on the activity of oxyfluorfen in a Hanford fine sandy loam as measured with cotton, milo, and sugar beets.

		Average Vigor Ratings[1/]								
		1/8"			1/2"			2"		
Herbicides	lb/A	Cotton	Milo	Sugar Beet	Cotton	Milo	Sugar Beet	Cotton	Milo	Sugar Beet
Oxyfluorfen	1	9.7	4.3	3.3	7.7	5.7	0.7	8.7	6.3	1.0
Oxyfluorfen	2	7.7	2.3	0.3	7.0	1.7	0.0	8.0	3.7	0.3
Oxyfluorfen	4	5.0	0.3	0.0	3.7	0.0	0.0	4.0	0.3	0.0
Check	-	9.0	9.3	9.3	9.0	9.3	7.7	8.7	10.0	8.3

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = no stand and 10 = largest plants and best stand. Treated and initial irrigation - 7/18/78. Seeded and uniform irrigation - 8/18/78. Evaluated 10/13/78.

The effect of initial irrigation on the activity of oxyfluorfen in a Hanford fine sandy loam as measured by weed control.

		Average Weed Control Ratings[1/]					
		1/8"		1/2"		2"	
Herbicides	lb/A	Fiddle neck	All Other weeds	Fiddle neck	All Other weeds	Fiddle neck	All Other weeds
Oxyfluorfen	1	9.7	9.3	10.0	10.0	9.3	9.7
Oxyfluorfen	2	9.3	9.7	10.0	10.0	10.0	10.0
Oxyfluorfen	4	10.0	9.7	10.0	10.0	6.0	10.0
Check	-	2.7	4.0	4.7	5.0	10.0	7.0

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete weed control. Treated and initial irrigation - 7/18/78. Seeded and uniform irrigation - 8/18/78. Evaluated 10/13/78.

Fluridone for control of purple nutsedge in cotton. Heathman, E. S. This test evaluated Fluridone for the control of purple nutsedge and its selectivity to cotton. This test was established on the Yuma Valley Experiment Station on a clay loam soil. The herbicides were applied to the soil with a compressed air sprayer in 30 gpa water full coverage. The herbicides were applied April 5, 1978 after the soil was plowed and disced. The treated area was double disced again, furrowed out, preirrigated, mulched and planted about April 15. The DPL 16 cotton was planted in moisture 1 row on each 40 in. bed. The beds were 5 in. high and the herbicide was mixed into about 8 in. of soil. Plot size was 4 beds 25 ft. long with 4 replications.

The purple nutsedge infestation covered about 75% of the test area. The cotton was planted at a latter date then normal for this area. The cotton grew faster than the nutsedge so competition was not a problem. Fluridone controlled purple nutsedge after the shoots emerged. New shoots emerged until the cotton shaded the rows and middles. Evaluation of purple nutsedge control was difficult due to the constant emergence of new shoots as the old plants died. Cotton stand evaluations were made May 19 when the cotton had 2 to 4 leaves.

Harvest was October 18 with a 2 row picker for the center 2 beds of each plot. One replication was lost for harvest due to heavy foot traffic passing through the test area from the U.S.-Mexican border. Fluridone gave acceptable control of purple nutsedge at 0.8 ai/A or more. The stand of cotton was not effected by any treatment. Fluridone at 2.0 ai lb/A severely stunted cotton early in the season and reduced yields. (Plant Sciences Department, University of Arizona, Tucson, AZ 85721).

Cotton seedlings per ft. of row, % cotton stunt May 19, % control of purple nutsedge August 10 and yield of seed cotton in pounds per acre October 18

Treatment	lb/A	Cotton seedlings per ft. of row	% Cotton stunt	% Control purple nutsedge	Yield of* seed cotton
Fluridone	0.2	2.7	0	0	2744 a
Fluridone	0.4	3.8	0	77	2816 a
Fluridone	0.8	3.3	15	90	2772 a
Fluridone	1.0	2.7	20	85	2706 a
Fluridone	2.0	2.6	42	95	2156 b
Trifluralin	.75	3.3	15	0	2794 a
Trifluralin + Fluridone	0.75 + 0.2	3.3	15	15	2816 a
Check		3.6	0	0	2684 a

* Means in the same column followed by the same letter are not significantly different at the 5% level of probability.

Weed control systems for zero-til planted spring grain. Schirman, Roland and Donn Thill. Continued testing of weed control systems that might enable increased annual cropping in regions with long term precipitation records of 35 - 45 cm were conducted in 1978. The objective of this study is to reduce the number of times fallow occurs in a crop rotation by use of spring cereals direct planted into the previous crop residue. Earlier trials had indicated such systems superior to tillage through more efficient moisture storage and increased versatility of the spring planting operation.

Pre-plant herbicides were applied to undisturbed winter wheat stubble (Ewan site) or spring wheat stubble (Dusty site) on March 21 or 17, 1978. Spring wheat (Fielder) and spring barley (Steptoe) were seeded March 23 and 24. Post emergence treatments were applied May 5, 1978. Starter fertilizer was placed with the seed and additional nitrogen was surface applied as ANS at seeding. Visual rating of weed control and crop injury was made during the growing season and yield estimates taken at maturity with a small plot combine and are shown in the following table.

Weed growth at the time of treatment at the Ewan site had a 90% ground cover of tillered downy brome and scattered plants of tansy mustard and volunteer wheat. The Dusty site had limited volunteer wheat but a moderate stand of broadleaves including miners lettuce, jagged chickweed, prickly lettuce and prostrate knotweed. The only weed of significance to emerge post planting was Russian thistle at the Dusty site.

All pre-plant treatments except the glyphosate - metribuzin combination at the Ewan site gave total control of existing vegetation. The possibility of partial inactivation of the glyphosate by the metribuzin carrier is suggested. Acceptable control of broadleaf weeds emerging post plant was attained by both pre-plant metribuzin and post-plant bromoxynil. Inadequate stands developed in either location to evaluate efficacy of treatments designed for wild oat control. The only crop injury noted was a cosmetic effect on barley of the treatments containing diclofop. (USDA-SEA-AR, Western Region, Pullman, WA 99164.)

1978 grain yields for zero-til spring wheat and barley at two Washington locations

Herbicide	Rate kg/ha	Wheat		Barley	
		Dusty	Ewan	Dusty	Ewan
Glyphosate (PP)[1/]	0.56	3215 a[2/]	2213 a	3302 ab	2432 a
Glyphosate + metribuzin (PP)	0.43 + 0.56	3179 a	1281 b	3501 ab	1561 bc
Glyphosate + metribuzin (PP) difenzoquat (Post)	0.43 + 0.56 1.12	2844 a	1233 b	3379 ab	1203 c
Glyphosate (PP) bromoxynil (Post)	0.56 + 0.43	3279 a	2090 a	3458 ab	2354 a
Glyphosate (PP) bromoxynil + diclofop (Post)	0.56 0.43 + 1.68	3051 a	2024 a	3115 ab	1939 ab
Glyphosate (PP) bromoxynil + diclofop + barban (Post)	0.56 0.43 + 1.12 + 0.28	3066 a	2111 a	3212 ab	2327 a
Glyphosate (PP) bromoxynil + difenzoquat (Post)	0.56 0.43 + 1.12	2929 a	1986 a	3158 ab	2464 a
Glyphosate (PP) bromoxynil + difenzoquat + barban (Post)	0.56 0.46 + 0.84 + 0.28	2911 a	2060 a	3518 a	2602 a
Glyphosate (PP) buthidazole (Post)	0.56 0.21	3069 a	1995 a	3405 ab	2478 a
Glyphosate (PP) buthidazole (Post)	0.56 0.43	3043 a	1886 a	3072 b	2453 a
Glyphosate + oxyfluorfen (PP)	0.43 + 0.56	2929 a	1988 a	3469 ab	2240 a

[1/] PP = pre-plant; Post = post-emergence to crop and weeds.

[2/] Treatments within columns, followed by like letters, are not significantly different at the 5% level of probability according to Student-Newman-Keul's Multiple Range Test.

Full season versus integrated herbicide-tillage fallow. Schirman, Roland and Donn Thill. Under northwest climatic conditions the use of fallow to store adequate amounts of soil moisture for the production of winter wheat is a standard practice in regions receiving less than 40 cm annual precipitation. When vegetation is controlled totally by tillage the maintenance of adequate surface residue to reduce the erosion potential is difficult. It has also been demonstrated that the water storage efficiency is often improved if the initial tillage is delayed until after the major winter precipitation has occurred. This trial was designed to evaluate selected herbicides as potential tools for delayed tillage or full season fallow.

A site in the 30 to 36 cm precipitation zone of eastern Washington (near Starbuck) was treated with selected herbicides in November 1976, January and March 1977. Tillage was initiated on one half of each plot on April 19, 1977 by disking. Weed control during the remainder of the fallow period was maintained by rodweeding the tilled block and with blanket treatment of the non tilled area with 0.84 Kg/ha glyphosate. Visual estimates of weed control were made throughout the season.

Vegetation at the time of the November treatment was in the cotyledon to 2 leaf stage of growth. Precipitation during the winter months was only 6 cm compared to a normal year of 20 to 25 cm. The growth of vegetation was minimal prior to the April tillage. Nugaines winter wheat was planted September 23, 1977 following rains that occurred in early September. Yield estimates were taken with a small plot combine.

Under the drought conditions that limited growth during the winter months no differences between herbicide treatments as measured by grain yield were observed. Although not statistically significant the trend for higher yield on the tilled area did occur. In years that early rain does not occur, these differences have been greater. Buthidazole is the only herbicide that approached season long vegetation control without crop injury. This trial demonstrates that tillage can be both delayed and the number of operations reduced by the use of the proper herbicide. (USDA-SEA-AR, Western Region, Pullman, WA 99164.)

Table 1. Winter wheat grain yields for full herbicide versus integrated herbicide-tillage fallow.

Herbicide Treatment	Rate kg ha^{-1}	Grain yields, kg ha^{-1} 1/ no-till	tilled
Atrazine	0.56	3134 ab	3646 a
Cyanazine granules	2.69	3537 ab	3642 a
Atrazine	0.29+		
cyanazine	2.24	3353 ab	3458 ab
Buthidazole	0.84	3292 ab	3420 ab
Buthidazole	1.68	3379 ab	3847 a
Metribuzin	0.56	2939 ab	3520 ab
Napropamide	1.12	3090 ab	3447 ab
Napropamide	2.24	3285 ab	3599 ab
Oxyfluorfen	0.43	2721 ab	3265 ab
Oxyfluorfen	0.84	2984 ab	3366 ab
Amitrol	0.56+		
2,4-D (ester)	1.12	2956 ab	2788 b
Amitrol	0.56+		
Atrazine	0.56	3775 a	3479 ab
PPG-135	3.36	2613 b	3231 ab
Paraquat	0.56	3333 ab	3677 a
Glyphosate (early)	0.43	3297 ab	3262 ab
Glyphosate (late)	0.43	3397 ab	3099 ab

1/ Means within columns followed by like letters are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test.

Table 2. Weed control ratings for full herbicide versus integrated herbicide-tillage fallow.

Herbicide treatment	Rate Kg ha^{-1}	April 19, 1977 1/		June 6, 1977 2/		Sept. 16, 1977 2/	
		Downy brome	Vol. winter wheat	Tillage needed	Herbicide needed	Tillage needed	Herbicide needed
Atrazine	0.56	6.0	5.3	1.00	0.50	1.00	0.75
Cyanazine granules	2.69	5.3	4.5	1.00	0.75	0.75	0.75
Atrazine cyanazine	0.29+ 2.24	8.8	7.0	1.00	0.25	1.00	1.00
Buthidazole	0.84	7.5	7.5	1.00	1.00	0.75	0.75
Buthidazole	1.68	9.5	8.8	0	0.25	0.25	0
Metribuzin	0.56	8.5	7.3	0.75	0.75	1.00	1.00
Napropamide	1.12	2.8	3.8	1.00	1.00	0.75	0.75
Napropamide	2.24	0.5	0.5	1.00	1.00	0.50	0.25
Oxyfluorfen	0.43	2.8	2.8	1.00	1.00	1.00	1.00
Oxyfluorfen	0.84	5.5	5.5	1.00	0.75	1.00	1.00
Amitrol 2,4-D (ester)	0.56+ 1.12	7.8	7.3	1.00	0.75	1.00	1.00
Amitrol atrazine	0.56+ 0.56	7.5	6.5	1.00	1.00	1.00	1.00
PPG-135	3.36	7.5	7.8	1.00	1.00	1.00	1.00
Paraquat	0.56	8.5	8.3	1.00	1.00	1.00	1.00
Glyphosate (early)	0.43	10.0	9.8	1.00	0.50	1.00	1.00
Glyphosate (late)	0.43	10.0	10.0	0.25	0	1.00	1.00
LSD 0.05		4.7	5.2				

1/ Weed control evaluation: o = no weed control; 5 = 50% weed control, 10 = weed free.

2/ Tillage needed is for cultivated plots; herbicide needed is for no-till plots. 1 = all 4 replication needed retreatment; 0 = all replicates vegetation free.

Weed control in zero-tillage winter barley. Schirman, Roland and D. C. Thill. In the annual cropping region of southeastern Washington and adjacent areas, alternate management systems, such as zero-tillage planting of winter wheat and barley, are being developed to reduce soil losses and to improve water quality. The control of winter annual grass and broadleaf weeds are a major problem in zero-tillage fall plantings. The purpose of these studies was to evaluate the efficacy of several herbicides or herbicide mixtures applied at various stages of crop and weed development in zero-tillage winter barley.

Two experiments were established in cooperator fields. One, located 27 kilometers north of Pullman, Washington, was designed to study the influence of post-emergence herbicide applications on weed control in winter barley (Table 1). 'Kamiak' barley was planted in mid-August into undisturbed spring barley stubble with a commercial double-disk, no-till drill. Prior to planting, no preplant herbicide application was made. On October 12, 1977, fall herbicide applications were made broadcast, post-emergence to the crop and weeds with a backpack sprayer. The barley was in the 2 to 3 leaf growth stage. Weed species present and their growth stage were, respectively, volunteer spring barley (2 to 3 tillers), henbit (seedling), and flixweed (seedling). Spring herbicide treatments were applied on March 10, 1978, when the crop had 3 to 6 tillers. Weed species present and their growth stage or size were, respectively, henbit (flowering), gromwell (5 to 8-cm diameter rosettes), and flixweed (5 to 8-cm diameter rosettes).

The other experiment, located approximately 25 kilometers south of Pullman, was designed to study the efficacy of preplant and post-emergence herbicide treatments on weed control in winter barley (Table 2). 'Boyer' barley was planted on October 20, 1978, with a commercial double-disk, no-till drill. Prior to planting, the entire field was commercially treated with a tank mix of 0.56 kg ha^{-1} paraquat plus 1.12 kg ha^{-1} 2,4-D. On October 17, 1977, all preplant herbicide treatments were applied. Weed species present and their growth stage or size were, respectively, volunteer spring barley (2 to 3 tillers), henbit (2 true leaves), and common chickweed (4 to 6 leaves). At the time of application, all weed species were showing various signs of chlorosis and neucrosis from the paraquat plus 2,4-D application. Spring herbicide treatments were applied on March 10, 1978, when only about 5% of the crop was emerged and in the 1 to 2 leaf stage. Weed species and their stage of growth or size were, respectively, volunteer spring barley (4 to 6 tillers, 31 cm tall), common chickweed (stems 5 to 10 cm long), and henbit (bud).

In both experiments, each treatment was replicated 4 times with 3 by 8-m plots. Visual observations of weed control and crop injury were made throughout the growing season. Grain yields were determined by harvesting individual plots with a small plot combine.

All post-emergence herbicide treatments on Kamiak barley resulted in increased grain yields in comparison to the untreated check (Table 1). All fall-applied treatments generally gave good season-long weed control and little visual crop injury. Likewise, the spring-applied treatments, except metribuzin which was notably weak on flixweed, resulted in good control of the species present.

Late planting, slope aspect, and heavy crop residues, which resulted in adversely cold soil temperatures, delayed emergence of Boyer winter barley until mid-March to early-April. Where herbicides were fall applied, weed control was generally adequate over the winter period and yields superior in comparison to spring-applied treatments (Table 2). Where spring herbicide treatments were applied, the weed populations were dense and their growth rank, which resulted in poor weed control and reduced yields at the rates tested. Oxyfluorfen applied preplant was the only treatment that showed noticeable crop injury. In this case, stands were reduced 80 to 90% compared with the untreated check.

Overall, fall applications of metribuzin, applied either preplant or post-emergent, resulted in superior grain yields. Where flixweed was a major weed problem, tank mix combinations of metribuzin plus terbutryn or linuron resulted in better weed control than metribuzin alone. (Western Region, Science and Education Administration, USDA-AR, Pullman, WA 99164.)

Table 1. Grain yield, crop injury, and selective, post-emergence broadleaf weed control in no-till winter barley

Herbicide treatment	Rate kg ha^{-1}	Grain[1/] yield kg ha^{-1}	March 10, 1978 Crop injury	March 10, 1978 Henbit control	March 10, 1978 Gromwell control	May 2, 1978 flixweed control
Metribuzin (F)[2/]	0.43	7619 a	1.0[3/]	9.0	8.8	7.8
Buthidazole (F)	0.43	7072 ab	1.5	8.8	6.5	8.3
Buthidazole MCPA (F)	0.21 + 0.56	6651 b	1.3	9.0	9.0	9.0
Bromoxynil (F)	0.43	6609 bc	1.3	6.5	8.8	8.8
Linuron metribuzin (F)	0.84 + 0.22	6525 bc	1.3	9.0	9.0	9.0
Diuron metribuzin (F)	0.90 + 0.22	6441 bc	1.5	9.0	9.0	8.8
Terbutryn metribuzin (F)	1.12 + 0.22	6441 bc	2.0	9.0	9.0	6.0
Bromoxynil MCPA (S)	0.21 + 0.21	6441 bc	1.0	1.0	3.0	9.0
Diuron metribuzin (S)	0.45 + 0.11	6398 bc	1.5	3.0	7.0	9.0
Linuron metribuzin (S)	0.28+ 0.11	6230 bc	1.0	3.0	3.8	8.5
Untreated	-	5809 c	1.0	1.0	1.0	1.0

[1/]Means followed by like letters are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test.

[2/]F = Fall-applied; S = Spring-applied herbicide treatments.

[3/]Efficacy rating technique: 1 = 0 to 10% crop injury or weed control; 9 = 90 to 100% crop injury or weed control.

Table 2. Grain yields, and pre- and post-emergence weed control in no-till winter barley

Herbicide treatment	Rate kg ha^{-1}	Grain[1/] yield kg ha^{-1}	Volunteer spring barley control	Common chickweed control	Henbit control
PREPLANT					
metribuzin	0.43	2878 a	6.8[2/]	9.0	9.0
Terbutryn + metribuzin	0.90 + 0.22	2898 a	8.0	9.0	9.0
Linuron + metribuzin	0.84 + 0.22	2585 a-c	8.0	9.0	9.0
Oxyfluorfen	0.56	647 e	9.0	7.3	9.0
Buthidazole	0.43	2713 ab	3.3	5.8	9.0
POST-EMERGENCE					
Terbutryn + metribuzin	0.45 + 0.11	1748 d	3.0	1.0	1.0
Linuron + metribuzin	0.37 + 0.11	1961 a-d	1.5	1.3	2.3
Bromoxynil (Spr)	0.21	2314 a-d	1.3	2.8	3.8
Bromoxynil + MCPA (Spr)	0.21 + 0.21	1577 d	1.8	1.3	2.3
Untreated	-	1915 b-d	1.0	1.0	1.0

[1/]Means followed by like letters are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test.

[2/]Efficacy rating technique: 1 = 0 to 10% weed control; 9 = 90 to 100% weed control.

Weed control in zero-tillage winter wheat planted into dry pea and spring wheat stubble. Schirman, Roland and D. C. Thill. A combination of climatic, edaphic, and topographical conditions in the annual cropping region of southeastern Washington and adjacent areas makes the region extremely susceptible to water-induced soil erosion. Most soil losses occur during the late winter and spring when precipitation falls on bare, frozen soils resulting in excessive sediment loads in local streams and rivers. Alternate management systems, such as zero-tillage planting of winter wheat, are being developed to reduce soil losses and to improve water quality. A major problem in zero-tillage winter wheat production systems is the control of winter annual grass weeds, primarily downy brome, and winter annual broadleaf weeds such as catchweed bedstraw, mustards, and coast fiddleneck. The objective of this study was to test the weed control efficacy of several contact and residual herbicides, alone and in combination with each other, in zero-tillage annual winter wheat management systems.

'Daws' winter wheat was planted at Pullman, Washington, on October 12, 1977, into undisturbed dry pea and spring wheat stubble with a double disk, no-till drill. Fall herbicide applications were made broadcast, post-plant, but preemergent to the crop with a backpack sprayer on October 13, 1978. An unusually moist August and September (12.5 cm) resulted in substantial weed seed germination and emergence prior to planting. Weed species present at the planting time and growth stage or size, respectively, were henbit (well branched), field pennycress (10 or more leaves), prickly lettuce (10 or more leaves), wild oat (3 to 5 tillers), downy brome (3 to 5 tillers), and some mayweed (flowering to mature). Downy brome was the predominate weed species throughout the test site. Spring treatments were applied on March 10, 1978, when the crop had 2 to 3 tillers and good secondary roots. Weed species present at this time and their growth stage or size, respectively, were henbit (flowering), gromwell (5 to 8 cm rosettes), mustard complex (5 to 13 cm rosettes), prickly lettuce (5 cm rosettes), coast fiddleneck (13 to 16 rosettes), and downy brome (7 or more tillers) which was confined to the check plots. Each treatment was replicated 4 times with 3 by 7 meter plots. Visual observations of weed control and crop injury were made throughout the growing season. Grain yields were determined by harvesting individual plots with a small plot combine. Grain yields, and crop injury and weed control ratings, are given in Tables 1 and 2, respectively.

Herbicide performance varied little between the types of crop residue. All treatments except the untreated check generally provided from 70 to 90% control of downy brome, and most of the control could be accounted for by the glyphosate alone treatment. Of the broadleaf weeds, catchweed bedstraw was the most difficult to control, particularly in the pea stubble planting. No herbicide treatment tested consistently gave good control of bedstraw except oxyfluorfen, which also severely injured the wheat. Several herbicide treatments gave good to excellent control of the mustard complex and coast fiddleneck.

All significant reductions in grain yield, except the untreated check and a glyphosate treatment where extreme winter annual broadleaf weed populations existed, could be related to crop injury. Grain yields were usually greater for the wheat planted in the dry pea stubble than the spring wheat stubble. This was probably due to better moisture and nitrogen reserves in the pea stubble block. When average grain yields of each treatment for the dry pea and spring wheat stubble blocks were combined, a trend for higher yield was with the spring-applied herbicide treatments. (Western Region, Science and Education Administration, U.S. Department of Agriculture, Agricultural Research, Pullman, WA 99164.)

Table 1. Grain yields from zero-tillage winter wheat planted into dry pea and spring wheat stubble

Herbicide treatment	Rate kg ha^{-1}	Grain yield, kg ha^{-1} [1/] Dry pea stubble	Spring wheat stubble
Glyphosate metribuzin (PE)	0.56 + 0.43	6070 a	5725 ab
Glyphosate diuron metribuzin (PE)	0.56 + 1.12 + 0.22	6035 a	5131 abc
Glyphosate linuron metribuzin (PE)	0.56 + 0.84 + 0.22	5819 ab	5469 ab
Glyphosate terbutryn metribuzin (PE)	0.56 + 0.84 + 0.22	6238 a	5651 ab
Glyphosate oxyfluorfen (PE)	0.56 + 0.56	1302 c	1135 d
Glyphosate buthidazole (PE)	0.56 + 0.56	5310 ab	5043 bc
Glyphosate (PE) bromoxynil	0.56 + 0.21	5780 ab	6048 a
Glyphosate (PE) metribuzin (Spr)	0.56 + 0.21	5624 ab	6002 ab
Glyphosate (PE) bromoxynil MCPA (Spr)	0.56 + 0.21 + 0.21	6477 a	5330 abc
Glyphosate (PE) bromoxynil metribuzin (Spr)	0.56 + 0.21 + 0.11	6541 a	5536 ab
Glyphosate (PE) buthidazole (Spr)	0.56 + 0.13	6070 a	5768 ab
Glyphosate (PE)	0.56	5422 ab	5252 abc
Glyphosate (PE)	0.56	4513 b	4438 c
Glyphosate (PE)	0.56	6052 a	5812 ab
Untreated	-	1393 c	803 d

[1/] Treatments within columns followed by like letters are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test. ($S_{\bar{x}}$ = 418.6 and 292.8 for pea and wheat stubble, respectively.) PE = post-plant, pre-emergent application. Spr = spring post-emergent application.

Table 2. Average crop injury and downy brome and catchweed bedstraw control in zero-tillage winter wheat planted in dry pea and spring wheat stubble

Herbicide treatment	Rate kg ha^{-1}	Dry pea stubble[1/] Crop injury	Dry pea stubble[1/] Downy brome control	Dry pea stubble[1/] Bedstraw control	Spring wheat stubble Crop injury	Spring wheat stubble Downy brome control	Spring wheat stubble Bedstraw control
Glyphosate metribuzin (PE)	0.56 + 0.43	1.3	8.5	5.0	1.3	8.5	6.5
Glyphosate diuron metribuzin (PE)	0.56 + 1.12 + 0.22	1.0	8.0	4.0	1.3	8.3	5.3
Glyphosate linuron metribuzin (PE)	0.56 + 0.84 + 0.22	1.0	8.0	3.0	1.0	8.3	7.3
Glyphosate terbutryn metribuzin (PE)	0.56 + 0.84 + 0.22	1.0	8.3	1.3	1.0	8.3	3.8
Glyphosate oxyfluorfen (PE)	0.56 + 0.56	8.5	8.8	7.3	8.5	8.8	8.8
Glyphosate buthidazole (PE)	0.56 + 0.56	1.0	8.0	6.3	2.0	7.5	7.8
Glyphosate (PE) bromoxynil(Spr)	0.56 + 0.21	1.8	7.8	4.5	1.8	8.0	7.8
Glyphosate (PE) metribuzin(Spr)	0.56 + 0.21	1.0	8.3	3.0	1.3	8.5	6.0
Glyphosate (PE) bromoxynil MCPA (Spr)	0.56 + 0.21 + 0.21	1.3	8.3	7.3	1.5	8.0	6.8
Glyphosate (PE) bromoxynil metribuzin(Spr)	0.56 + 0.21 + 0.11	1.3	8.5	6.5	1.3	8.3	9.0
Glyphosate (PE) buthidazole(Spr)	0.56 + 0.13	1.3	8.0	3.3	1.5	7.5	5.8
Glyphosate (PE)	0.56	1.3	6.3	2.3	1.8	7.3	5.0
Glyphosate (PE)	0.56	1.0	8.0	5.5	1.5	8.3	3.8
Glyphosate (PE)	0.56	1.0	7.8	1.0	1.3	7.0	3.3
Untreated	-	1.0	1.0	1.0	1.0	1.0	1.0

[1/] Efficacy evaluation technique: 1 = 0 to 10% crop injury or weed control; 9 = 90 to 100% crop injury or weed control. PE = post-plant, pre-emergent application. Spr = spring post-emergent application.

Chemical fallow treatments for weed control and moisture conservation. Eldredge, E. P., G. A. Lee, and G. A. Mundt. Treatments of atrazine alone and in combination with dalapon and cyanazine were applied to barley stubble near Hollister, Idaho on October 25, 1977. A motorized plot sprayer with 15 ft. boom was used to apply herbicide treatments of 90 ft. by 630 ft. plots in 22 gpa of water carrier. Air temperature was 65 F, relative humidity was 30% soil temperature at 6-inch depth was 66 F and wind speed was 1 to 3 mph. The soil had a pH of 7.63 and a CEC of 23.6 meq.

On June 6, 1978 the plots were evaluated visually for percentage weed control and soil samples were taken to measure soil moisture. Soil moisture in the area treated with atrazine + cyanazine at .27 + 2.4 lb ai/A was 13% at the 0 to 6 inch depth and 17.1% at the 6 to 12 inch depth (see table). All herbicide treatments resulted in increased soil moisture compared to the untreated check. Atrazine + cyanazine at .27 + 2.4 lb ai/A gave the highest percentage control of volunteer barley and tansy mustard. No treatment gave adequate control of Russian thistle and common mallow was controlled only by treatments with .4 lb ai/A or more of atrazine. (Idaho Agric. Exp. Sta., Moscow).

Chemical fallow treatments for weed control and moisture conservation.

		Percentage						
Treatment	Rate lb ai/A	Volunteer barley	Tansy mustard	Tumble mustard	Russian thistle	Common mallow	Soil Moisture 0-6"	6-12"
Untreated Check	-	0	0	0	0	0	9.9	11.5
atrazine	.4	85	95	80	0	100	12.3	15.0
atrazine + cyanazine	.16 + 1.6	70	65	55	10	0	10.3	14.7
atrazine + cyanazine	.27 + 2.4	90	97	70	0	0	13.0	17.1
atrazine + dalapon	.5 + 2.25	90	80	80	0	100	13.4	16.7

Effect of preemergence herbicides on weed control and the growth of newly transplanted guayule (*Parthenium argentatum*). Elmore, C.L. and N. Elder. A field experiment was conducted on Hanford sandy loam soil (organic matter 1.2%) at the South Coast Field Station to evaluate preemergence herbicide treatments in newly established guayule (*Parthenium argentatum*). On May 16, 1978, each of the herbicide treatments listed in Table 1 were applied to four replicate 1.5 by 6.1 m plots with a CO_2 pressure sprayer and 375 l/ha water carrier. The plots had been planted with rooted guayule transplants four days prior to treatment. Following herbicide application the plots were sprinkler irrigated with approximately 2.5 cm of water.

The growth of the guayule was evaluated on July 25, 1978. Height and crown diameter were measured on 6 plants in each replicate. Growth indices were attained by multiplying the height by the diameter of each plant and dividing by two (Table 1). Based on these indices, guayule appeared tolerant to the high rates of nitrofen, oryzalin, oxyfluorfen, and simazine. It was not clear whether the relatively poor guayule growth in the other herbicide treatments was the result of weed competition or of herbicide injury. Weed control evaluations were made on June 9, 22 and July 25, 1978. The results are summarized in Table 2. (University of California, Cooperative Extension, Davis, CA 95616 and Department of Arboreta and Botanic Gardens, Los Angeles County, Arcadia, CA 91006).

Table 1. Effect of preemergence herbicide treatments on the growth of newly established guayule 1/

Herbicide	Rate (kg/ha)	Height 2/ (cm)	Crown diameter 2/ (cm)	Growth index 3/
alachlor	4.5	16.6	0.8	7.1 c-e
alachlor	9.0	17.4	0.9	7.8 b-e
napropamide	4.5	15.1	0.8	6.4 de
napropamide	9.0	16.3	0.8	6.6 de
oryzalin	2.2	17.6	0.9	7.9 b-e
oryzalin	4.5	19.7	1.1	10.4 ab
simazine	1.1	19.1	1.0	10.3 a-c
simazine	2.2	19.8	1.0	10.5 ab
DCPA	11.2	18.1	1.0	9.0 ab
nitrofen	4.5	19.8	1.0	10.4 ab
nitrofen	9.0	19.3	1.0	10.0 a-c
oxyfluorfen	2.2	16.1	0.8	7.8 b-e
oxyfluorfen	4.5	20.1	1.1	11.3 a
handweeded	-	16.9	0.9	8.8 a-d
untreated	-	14.3	0.7	5.1 e

1/ Guayule transplanted May 12, 1978: Herbicides applied May 16, 1978.

2/ Values are the average of measurements attained from six plants per replicate in each treatment.

3/ Growth index = Height x diameter divided by two.

Table 2. Weed control attained with preemergence herbicide treatments in field grown guayule[1/]

Herbicide	Rate (kg/ha)	Barnyardgrass 6/9	Barnyardgrass 6/22	Barnyardgrass 7/25	Rough pigweed 6/9	Rough pigweed 6/22	Rough pigweed 7/25	Purslane 6/22	Purslane 7/25	Field bindweed 6/22	Field bindweed 7/25
alachlor	4.5	9.8	9.2	8.8	10.0	8.8	8.8	5.5	6.0	1.5	0.0
alachlor	8.9	10.0	10.0	10.0	10.0	9.8	10.0	9.2	9.2	1.5	0.5
napropamide	4.5	6.2	6.0	6.8	7.8	4.5	3.0	2.5	1.8	2.0	3.2
napropamide	8.9	9.5	7.2	9.0	8.0	6.0	5.5	3.0	5.2	0.2	2.0
oryzalin	2.2	7.8	6.2	7.2	9.5	7.5	7.8	4.0	3.0	5.5	5.0
oryzalin	4.5	8.2	8.8	9.0	9.5	9.5	9.8	7.0	5.8	6.2	4.5
simazine	1.1	9.5	8.8	7.2	10.0	9.8	10.0	10.0	10.0	6.8	3.8
simazine	2.2	10.0	9.0	8.5	10.0	9.5	9.8	10.0	9.8	8.0	6.2
DCPA	11.2	8.0	7.2	5.2	9.2	9.2	7.8	7.8	7.5	7.2	6.0
nitrofen	4.5	9.5	8.0	5.0	10.0	8.0	9.2	8.5	8.0	7.0	5.0
nitrofen	8.9	9.8	8.8	6.2	9.8	8.8	9.8	10.0	9.5	8.0	5.5
oxyfluorfen	2.2	9.2	7.8	4.2	10.0	9.0	9.8	9.5	10.0	8.2	6.0
oxyfluorfen	4.5	9.8	9.8	9.5	10.0	10.0	10.0	10.0	10.0	9.5	8.2
control, handweeded	-	0.5	10.0	8.2	1.8	10.0	9.2	10.0	10.0	10.0	8.2
control, unweeded	-	1.2	0.0	0.0	1.0	1.0	1.5	0.5	3.0	1.2	5.0

1/ Weed control ratings are the average of 4 replications based on a 0 to 10 scale. 0 = no control; 10 = 100% control.

Preplant soil incorporated herbicides for weed control in transplanted guayule (*Parthenium argentatum*). Elmore, C.L. and N. Elder. A field experiment was conducted on the South Coast Field Station to evaluate the effect of preplant soil incorporated herbicides on the growth of young transplanted guayule. On May 11, 1978, herbicide treatments of alachlor, DCPA, ETPC, napropamide and trifluralin were applied to dry Hanford sandy loam soil using a CO_2 pressure backpack sprayer. Each treatment was applied to four replicated 1.5 by 6.1 m plots and were then incorporated 6 cm deep into the soil with a power-driven rototiller. On May 12, 1978, the plots were planted with 5 cm tall guayule transplants. Immediately following transplanting the plots received 1.5 cm of water through overhead irrigation.

Measurements of quayule growth were made on July 27, 1978. Height and crown diameter measurements were taken on 6 plants in each herbicide treatment. A growth index for each plant was attained by multiplying the height by the diameter and dividing by two (Table 1). Based on these measurements guayule appears to have good tolerance to pre-transplant applications of trifluralin and napropamide. Guayule appeared less tolerant to alachlor and DCPA. The EPTC treatments resulted in marked stunting. The herbicide treatments were evaluated for weed control throughout the early guayule growth period (Table 2). The relatively poor growth of the untreated guayule was probably the result of weed competition. (University of California, Cooperative Extension, Davis, CA 95616 and Department of Arboreta and Botanic Gardens, Los Angeles County, Arcadia, CA 91006).

Table 1. Effect of preplant soil incorporated herbicide treatments on the growth of transplanted guayule.

Herbicide	(kg/ha)	Height (cm)1/	Crown diameter (cm)1/	Growth index2/	Foliage dry weight(gm)4/
EPTC	3.4	15.6 bc3/	0.8 bc	6.6 cd	102.1 def
EPTC	6.7	13.7 c	0.7 c	4.8 d	92.7 ef
trifluralin	1.1	18.5 ab	1.0 ab	10.5 ab	176.8 b
trifluralin	2.2	21.8 a	1.2 a	13.3 a	210.7 a
alachlor	4.5	16.5 bc	0.9 b	7.7 bcd	104.3 def
alachlor	9.0	16.3 bc	0.8 bc	7.3 cd	109.1 de
napropamide	4.5	18.8 ab	1.0 ab	9.3 bc	133.3 cd
napropamide	9.0	18.4 ab	1.0 ab	10.0 b	129.6 cd
DCPA	11.2	16.4 bc	0.9 b	7.8 bcd	147.5 bc
control	-	15.1 b	0.8 bc	6.1 cd	71.2 f

1/ Values are the average measurements of 6 plants per replication.

2/ Growth index = height x crown diameter in cm divided by 2.

3/ Means followed by the same letter are not significantly different at the 5% level.

4/ Dry weight values are the average of 4 plants per replication.

Table 2. Weed control with preplant soil incorporated herbicides in field grown guayule.

Herbicide	Rate (kg/ha)	Barnyardgrass[1/] 6/9	Barnyardgrass[1/] 6/22	Barnyardgrass[1/] 7/25	Purslane 6/22	Pigweed 6/22	Lovegrass 7/25	Field bindweed 7/25
EPTC	3.4	10.0	9.0	9.0	8.5	7.8	7.2	7.8
EPTC	6.7	10.0	9.8	9.2	9.8	9.5	8.5	9.0
trifluralin	1.1	10.0	10.0	10.0	10.0	9.8	10.0	9.8
trifluralin	2.2	10.0	9.8	9.5	10.0	10.0	10.0	10.0
alachlor	4.5	6.0	5.5	3.0	5.2	6.5	2.0	5.8
alachlor	9.0	9.8	8.5	5.0	8.5	9.5	6.0	4.8
napropamide	4.5	10.0	10.0	9.8	10.0	9.8	10.0	4.0
napropamide	9.0	10.0	9.5	8.8	9.8	9.8	7.5	3.2
DCPA	11.2	10.0	9.8	8.8	9.0	9.2	7.8	8.8
control	-	2.2	2.2	0.0	2.8	2.0	0.0	6.0

1/ Weed ratings are the average of 4 replications based on a 0 to 10 scale. 0 = no control; 10 = 100% control.

Evaluation of preplant incorporated herbicide treatments for broadleaf weed control in Lentils. Baysinger, O. K., G. A. Lee, and G. A. Mundt. Plots were established at the Plant Science Farm in Moscow, Idaho to determine the effectiveness of various preplant incorporated herbicides on broadleaf weed control in lentils (Cultivar: Chilean). Plots were treated May 26, 1978. Herbicides were applied with a knapsack sprayer, equipped with a three-nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 ft. by 30 ft. Treatments were replicated three times in a randomized complete block design. The herbicides were incorporated twice prior to planting with a flex-tine harrow traveling at 6 mph at alternate diagonals to planting direction at a depth of 1.5 inches. The sky was clear with a 3-7 mph wind at right angles to the planting. Air temperature and relative humidity were 46 F and 85%, respectively. Soil temperature at 4 inches was 48 F, with no trash cover, but with 2" clods on the surface. The soil at the study site was a Palouse silt loam with a 3.5% O.M. and a ph of 6.5, with a high moisture content. Cold wet conditions continued until the early part of June, at which time it became extremely dry. This dry condition persisted through to harvest. Percent lentil stand, and percent weed control were obtained by actual species count within the area of 6 inch by 5 ft. There were 2 quadrat counts taken per plot. Numbers of plants in treated plots were compared to numbers in the non-treated check plots. Yield determinations for lentils were made by hand pulling all lentils within 2 ft. by 5 ft. quadrat, drying the lentils for two weeks and thrashing. Calculations of production were figured on pounds of dry lentils per acre.

Ethalfluralin at.5 lb/A gave the best control of barnyardgrass, with alachlor and trifluralin at 2.0 and .5 lb/A, alachlor and dinitramine at 2.0 and .33 lb/A, alachlor and profluralin at 2.0 and .5 lb/A all gave better than 95% control (attached table). Alachlor at 3.0 lb/A gave the best control of redroot pigweed at 93.7%, with a slight reduction to 89% control at the 2.0 lb/A rate. Dinitramine at .33 lb/A and metribuzin at .5 lb/A gave excellent control of henbit, as did R-40244 and diallate at the .5 and 1.25 lb/A rate, and alachlor and profluralin using 2.0 and .5 lb/A. These were followed closely by alachlor in combination with dinitramine at 2.0 and .33 lb/A. Three chemicals in combination with alachlor at 2.0 lb/A gave over 90% control of lambsquarters. They were profluralin at .5 lb/A, trifluralin at .5 lb/A, and dinitramine at .33 lb/A. (Idaho Agric. Exper. Sta., Moscow, Idado 83843).

Effect of preplant incorporated herbicide treatments on broadleaf weeds and lentil yields.

Treatment	Rate lb/acre	% Crop Stand	% Barnyard grass Control	% Pigweed Control	% Henbit Control	% Lambsquarters Control	Yield lb/A
Check	0	-	-	-	-	-	224.0
diethatyl-ethyl	3.0	79.7	79.0	86.0	80.0	12.7d[1/]	158.3
diethatyl-ethyl	4.0	103.0	89.3	69.3	79.3	50.3bc	240.3
diethatyl-ethyl + ethofumesate	2.0	90.3	81.3	73.3	58.0	40.3cd	352.0
dinitramine	.33	87.3	92.0	77.7	99.0	70.7ac	309.7
ethalfluralin	.33	83.7	79.3	73.7	59.7	83.7ab	279.3
ethalfluralin	.5	80.3	98.0	78.0	95.7	72.7ac	447.0
alachlor	2.0	68.7	89.3	89.3	94.0	62.3ac	322.7
alachlor	3.0	76.0	93.7	93.7	97.7	62.3ac	234.0
alachlor + trifluralin	2.0+ .5	55.0	96.7	63.3	66.0	96.7a	223.3
alachlor + dinitramine	2.0+ .33	59.7	95.7	67.3	97.7	96.0a	348.0
alachlor + profluralin	2.0+ .5	77.3	97.0	81.3	99.0	99.0a	244.3
ethofumesate	2.0	81.7	62.0	64.0	61.0	61.7ac	186.7
ethofumesate	3.0	76.0	87.7	75.7	84.3	81.0ac	187.7
R-40244	.5	84.3	84.3	84.3	89.3	68.7ac	197.3
R-40244 + diallate	.5+ 1.25	91.3	91.3	81.7	99.0	74.0ac	308.
metribuzin	.25	81.0	81.0	77.3	81.0	88.7ab	191.7
metribuzin	.5	89.7	89.7	77.7	99.0	82.0ab	284.7

1/ Means with the same letter(s) are not significantly different at the .05 level.

Evaluation of preemergence incorporated and surface applied herbicides for control of yellow nutsedge in potatoes. Coleman-Harrell, M. E., G. A. Lee, E. P. Eldredge, and R. H. Callihan. A field study was established at Parma, Idaho, to determine the effectiveness of several preemergence incorporated and surface applied herbicide treatments for control of yellow nutsedge and other weed species in potatoes (variety Russett Burbank). Treatments were broadcast applied in water with a knapsack sprayer calibrated to deliver 40 gpa. S-734, EPTC, vernolate, cycloate, dinitramine, and pendimethalin were applied when approximately 25% of the weed population had already emerged and were 2 inches tall, and after potato plants had emerged and were 2 to 4 inches tall, on May 25, 1978. The herbicides were incorporated to a depth of 2 inches with a Lilliston operated at 5 mph twice over the treated areas, in the direction of herbicide application. Metolachlor, metribuzin, and oryzalin were surface applied, also on May 25, 1978. The ambient temperature at the time of application was 41 F, the relative humidity was 83%, and the soil temperature at 4 inches was 55 F. Potatoes were planted 3 inches deep and 9 inches apart on April 11, 1978, on 36 inch beds. Potatoes were irrigated with solid-set sprinklers. Treatments were replicated 3 times in a randomized complete block design. The soil at the study site is a Greenleaf-Owyhee silt loam with 1% OM and a pH of 7.5.

Percent weed control was determined from species counts within 2 5 by 1 ft. quadrats per plot. Numbers of plants obtained by this count were compared to numbers obtained from similar counts in the untreated check plots.

Treatments of S-734 at 1 and 2 lb ai/A resulted in 90% or better control of yellow nutsedge, and 98% or better control of barnyardgrass, but poor control of common purslane and other weed species. Applications of metribuzin at 1.5 lb ai/A provided 96% or better control of all weed species indicated. Tank-mix applications of metolachlor plus metribuzin at 1.5 plus 0.375 lb ai/A resulted in 97% or better control of all weed species indicated. Treatments of oryzalin plus metribuzin at 1.0 plus 0.5 lb ai/A provided 92% or better control of yellow nutsedge, and 100% control of other weed species. (SW Idaho Research and Extension Center, Parma, ID 83660).

Comparison of several preemergence incorporated and surface applied herbicide treatments for weed control in potatoes

Treatment	Rate lb ai/A	Percentage weed control: yellow nutsedge	barnyard-grass	common purslane	misc. weeds[1/]
S-734	0.5	78	92	53	21
S-734	1.0	90	98	63	43
S-734	2.0	94	100	38	27
EPTC	3.0	87	82	80	26
EPTC	6.0	52	83	96	40
Vernolate	3.0	66	77	100	68
Vernolate	6.0	79	69	100	64
Cycloate	3.0	85	60	96	100
Cycloate	6.0	75	48	97	94
Dinitramine	0.5	70	100	100	94
Pendimethalin	1.0	45	96	100	91
Metolachlor	2.0	62	94	100	58
Metolachlor + metribuzin[2/]	1.5+0.375	97	100	100	100
Metribuzin[3/]	1.5	100	100	100	100
Metribuzin[2/]	1.5	96	100	100	100
Oryzalin[4/]	1.33	47	61	100	69
Oryzalin[5/]	1.33	59	64	95	59
Oryzalin[5/] + Metribuzin[2/]	1+0.5	92	100	100	100
Oryzalin[4/] + Metribuzin[3/]	1+0.5	92	100	100	100
Untreated check	--	--	--	--	--

1/ Miscellaneous weeds = redroot pigweed, common mallow, and common lambsquarters

2/ 4 FL formulation of metribuzin

3/ 50 WP formulation of metribuzin

4/ 75 WP formulation of oryzalin

5/ 4 FL formulation of oryzalin

Evaluation of four herbicides for weed control in potatoes. Coleman-Harrell, M. E., G. A. Lee, and E. P. Eldredge. A field study was established at Parma, Idaho, to compare the effectiveness of candidate and labeled herbicides for the control of kochia, common lambsquarters, and redroot pigweed in potatoes (variety Russett Burbank). EPTC, vernolate, and cycloate were applied preplant incorporated on April 20, 1978. The ambient temperature at the time of application was 47 F, and the relative humidity was 80%. The soil was moist to 6 inches and the soil temperature at 4 inches was 51 F. Herbicides were thoroughly incorporated to a depth of 4 inches with a rototiller operated once in the direction of herbicide application. Potato seed pieces were planted 5 to 6 inches deep on April 24, 1978. Metribuzin was applied on May 24, 1978, when potato plants were 2 to 3 inches tall, with 4 to 5 leaves. The ambient temperature at the time of application was 42 F, and the relative humidity was 80%. The soil was moist, and the soil temperature at 4 inches was 55 F. All herbicides were applied broadcast in water with a knapsack sprayer, calibrated to deliver 40 gpa. The soil at the study site is a Greenleaf-Owyhee silt loam with 1% OM and a pH of 7.5. Treatments were replicated 4 times in a randomized complete block design. Potato plants were irrigated with solid-set sprinklers.

Percentage weed control was obtained from species counts taken along one row of each plot, on July 12, 1978. Numbers of plants obtained by this count were compared to similar counts taken in the untreated check plots. Visual evaluations for percentage stand reduction and percentage vigor reduction for the crop and each weed species were obtained on August 17, 1978. Potato yields were determined from weights of potatoes dug from 10 ft. sections of 2 rows per plot, on September 21, 1978.

Applications of both the flowable and wettable-powder formulations of metribuzin, at 1.5 lb ai/A, provided 100% control of kochia, redroot pigweed, and common lambsquarters, and displayed a high degree of crop selectivity, as substantiated by both stand counts and visual ratings, and corresponding potato yields. Applications of vernolate at 4 and 6 lb ai/A resulted in excellent control of all 3 weed species with correspondingly high potato yields. The 2 lb ai/A treatment of vernolate resulted in 88% control of kochia, but poor control of redroot pigweed and common lambsquarters; yet potato yields were substantially high. These results are due to the fact that kochia was the most dominant weed species, with a density of approximately 3 plants per square yard. Even though common lambsquarters occurred in a slightly greater density (3½ plants per square yard), it was not as dominant or as competitive as kochia. Similar results were obtained from treatments of EPTC at 4 lb ai/A. Applications of EPTC at 2 lb ai/A resulted in 100% control of common lambsquarters, but control of kochia was not great enough to result in relatively high potato yields. Treatments of all rates of cycloate resulted in substantially high reductions of crop stand and vigor and correspondingly low potato yields. (SW Idaho Research and Extension Center, Parma, ID 83660).

Table 1, Potato yields and percent weed control, by counts, resulting from broadcast applications of EPTC, vernolate, cycloate, and two formulations of metribuzin

Treatment	Rate lb ai/A	Percentage weed control by counts: kochia	redroot pigweed	common lambsquarters	Yield: lb/A	percent of check
EPTC	2	80	61	100	28,394	138
EPTC	4	95	43	83	35,581	173
EPTC	6	89	85	65	29,937	146
vernolate	2	88	50	76	34,596	169
vernolate	4	96	88	100	32,895	160
vernolate	6	92	96	100	37,505	183
cycloate	1.7	89	77	100	28,430	139
cycloate	3.5	90	56	73	31,147	152
cycloate	6	98	100	100	27,922	136
metribuzin 50WP	1.5	100	100	100	35,727	174
metribuzin 4F	1.5	100	100	100	37,578	183
untreated check	--	--	--	--	20,517	100

Table 2, Visual ratings for percent stand reduction and percent vigor reduction for crop and weed species, as influenced by herbicide treatments in potatoes

		Average percent stand reduction and vigor reduction							
	Rate	potato		kochia		redroot pigweed		common lambsquarters	
Treatment	lb ai/A	SR	VR	SR	VR	SR	VR	SR	VR
EPTC	2	14	23	61	15	60	48	47	50
EPTC	4	18	20	66	8	75	60	38	45
EPTC	6	18	30	69	33	73	48	38	23
vernolate	2	8	23	69	45	69	80	74	63
vernolate	4	11	23	59	28	94	75	95	53
vernolate	6	10	23	74	39	96	65	90	61
cycloate	1.7	25	26	35	5	48	35	44	33
cycloate	3.5	28	38	56	40	75	49	60	53
cycloate	6	15	30	75	38	83	40	93	71
metribuzin 50WP	1.5	0	5	100	100	99	90	100	100
metribuzin 4Fl	1.5	3	6	100	100	100	100	100	100
untreated check	--	38	33	24	3	50	55	21	25

Peppermint tolerance to early postemergence herbicide applications. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. Terbacil-resistant winter annual weeds are a major problem in central Oregon mint production. Paraquat and 2,4-DB can control many of these resistant weeds, provided adequate crop tolerance exists. Two field trials were conducted to evaluate peppermint tolerance to March applications of these herbicides.

The trials were arranged in randomized block designs with three replications. Individual plots were 2.0 by 6.0 m.

A summary of the visual evaluations made on April 19 and May 11 are listed in the table below.

Symptoms from the late March paraquat applications were still evident on April 19, but by May 11 nearly all injury had been outgrown.

All of the applications at these two locations appeared safe enough for commercial use. However, later paraquat applications appeared capable of reducing yields in a weak mint stand. (Crop Science Department, Oregon State University, Corvallis 97331)

Peppermint tolerance to March applications
of herbicides at two central Oregon locations

Herbicide(s)	Rate kg/ha	% Peppermint injury					
		April 19, 1978			May 11, 1978		
		Loc. 1	Loc. 2	Avg	Loc. 1	Loc. 2	Avg
	Applied March 2, 1978						
terbacil	0.8	0	0	0	0	0	0
terbacil	1.1	0	0	0	0	0	0
paraquat	0.4	0	0	0	0	0	0
paraquat	0.6	0	0	0	0	0	0
paraquat	0.8	0	0	0	0	0	0
2,4-DB ester	0.6	0	0	0	0	0	0
2,4-DB ester + terbacil	0.6 + 0.8	5	0	2	0	0	0
paraquat + terbacil	0.4 + 0.8	0	0	0	0	0	0
paraquat + terbacil	0.8 + 0.8	0	0	0	0	0	0
	Applied March 2/March 31, 1978						
paraquat/paraquat	0.4/0.4	22	15	18	0	0	0
paraquat/paraquat	0.6/0.3	10	15	12	0	0	0
paraquat + terbacil/paraquat	0.4 + 0.8/0.4	18	15	16	0	0	0
paraquat/paraquat + terbacil	0.4/0.4 + 0.8	18	15	16	0	0	0
	Applied March 31, 1978						
terbacil	0.8	0	0	0	0	0	0
paraquat + terbacil	0.4 + 0.8	17	15	16	0	0	0
paraquat + terbacil	0.8 + 0.8	20	18	19	0	0	0
paraquat	0.4	17	17	17	0	0	0
paraquat	0.8	32	18	25	3	0	2
Check	0	0	0	0	0	0	0

Russian thistle control in peppermint. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. A field trial was conducted to evaluate several herbicide treatments for crop tolerance and Russian thistle control in a central Oregon peppermint field.

The trial was conducted as a randomized block design with three replications. Individual plots were 2.5 m by 6.0 m. Herbicides were applied in 230 l/ha with a bicycle-wheel plot sprayer. The soil was a sandy loam with a pH of 6.5 and an organic matter content of 4.1%.

Preemergence treatments were made on February 3, 1978 and postemergence treatment on May 25, 1978.

The results of visual evaluations made on June 7 and June 29, 1978 are summarized in the table below. Napropamide and norflurazon were not effective in this trial, while the other preemergence treatments did provide partial control. The postemergence treatments were all more effective than the preemergence treatments.

Bromoxynil, bentazon, and paraquat all provided acceptable Russian thistle control. These materials are also desirable because they do not pose a soil residue problem for rotational crops.

None of the crop injury seen on June 7 could be detected on June 29, 1978.

Although diclofop is not active on Russian thistle, the addition of this herbicide to bentazon or bromoxynil did not cause a serious reduction in crop tolerance. (Crop Science Department, Oregon State University, Corvallis 97331)

Effect of preemergence and postemergence herbicide applications on peppermint and Russian thistle

Herbicide(s)	Rate kg a.i./ha	% Mint injury June 7	% Mint injury June 29	% Russian thistle control June 2	% Russian thistle control June 29
Preemergence					
oxyfluorfen	0.5	0	0	78	58
napropamide	4.5	0	0	20	13
oryzalin	2.0	0	0	73	60
norflurazon	4.5	0	0	23	20
terbacil	1.5	0	0	70	58
Postemergence					
bromoxynil	1.0	10	0	99	88
paraquat + W.A.[a]	0.8	23	0	96	90
bentazon + W.A.[a]	1.0	0	0	95	87
terbacil + W.A.[b]	1.0	20	88	72	
paraquat + bentazon + W.A.[a]	0.4 + 1.0	27	0	99	95
paraquat + terbacil + W.A.[a]	0.4 + 1.0	18	0	99	95
paraquat + bentazon + terbacil + W.A.[a]	0.4 + 1.0 + 0.5	17	0	99	96
diclofop + bentazon + W.A.[a]	1.0 + 1.0	2	0	88	83
diclofop + bromoxynil	1.0 + 1.0	10	0	93	93
diclofop + bentazon + bromoxynil + W.A.[a]	1.0 + 1.0 + 1.0	8	0	100	93
Check	0	0	0	0	0

[a]W.A. = Triton AG 98 applied at 1/2% v/v

[b]W.A. = Triton AG 98 applied at 5% v/v

Kentucky bluegrass control in peppermint. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. Several varieties of Kentucky bluegrass are grown for seed production in central Oregon. When these fields are rotated to mint production, volunteer bluegrass often becomes a weed problem.

A trial was established in the spring of 1978 to evaluate paraquat applications for selective bluegrass control in a field of Todd's Mitcham peppermint. The experimental design was a randomized block with three replications. Individual plots were 2.5 by 6.0 m.

Visual evaluations of percent bluegrass control were made on May 25 and June 29, 1978. The results are summarized in the table below. Spring applications of paraquat provided season-long Kentucky bluegrass control.

The split applications were more effective than the single paraquat application or the paraquat plus terbacil tank mix. None of the applications caused serious crop injury. (Crop Science Department, Oregon State University, Corvallis 97331)

Peppermint injury and Kentucky bluegrass control
with spring applications of paraquat

Herbicide(s)	Rate kg/ha	% Peppermint injury May 25	% Peppermint injury June 29	% Kentucky bluegrass control May 25	% Kentucky bluegrass control June 29
	Applied April 20, 1978				
paraquat	0.8	0	0	75	73
paraquat + terbacil	0.8 + 0.9	0	0	68	67
	Applied April 20/March 31, 1978				
paraquat/paraquat	0.4/0.4	10	0	85	83
paraquat/paraquat	0.6/0.2	3	0	87	88
Check	0	0	0	0	0

Evaluation of preplant incorporated, and postemergence applied herbicides for broadleaf weed control in Safflower. Baysinger, O. K., G. A. Lee, D. L. Auld, and G. A. Mundt. Plots were established on the Plant Science Farm in Moscow, Idaho to determine the effectiveness of various herbicides on broadleaf weed control in Safflower. (Cultivar - Chilian). Plots were treated with preplant herbicides and planted May 28, 1978. The sky was clear, air temperature, and relative humidity were 48 F and 80%, respectively. Wind velocity was 2 to 6 mph. The soil temperature at 4 inches was 48 F. The soil at the study site was a Palouse silt loam with 3.5% OM, and a pH of 6.5. Chemicals were incorporated 1.5 inches deep using a flextine harrow traveling at 6 mph diagonally to planting direction. There were 2 inch diameter clods present on the surface of the soil. Postemergence herbicides were applied June 16, 1978. The sky was clear with air temperature and relative humidity at 72 F and 84%, respectively. Wind velocity was 3 to 6 mph. Soil temperature at 6 inches was 66 F. All herbicides were applied with a knapsack sprayer equipped with a 3-nozzle boom, calibrated to deliver 40 gpa. Safflower seeds were planted in four rows on 7 inch centers 15 ft long. Treatment were replicated three times in a randomized split block design. Late planting and drought conditions caused a depression in crop yields and somewhat erratic weed control. Percent safflower stand and percent weed control were obtained from actual species counts within the complete plot. Numbers of plants in the treated plots were compared to numbers in the nontreated check plots. Yield determination of safflowers were made by combining all four rows of safflower in each plot the entire length of the plots. Calculations of production were figured on pounds of safflower seeds per acre.

Redroot pigweed was controlled at the 90% level and above by dinitramine at the .66 lb/A rate, trifluralin at the .75 lb/A rate, applied pre-plant incroporated and by all rates of R-40244 applied postemergence (attached Table). Dinitramine at .5 lb/A and all rates of R-40244 gave 100% control of field pennycress. Dinitramine at .661b/A and all levels of R-40244 gave 100% control of henbit. EPTC at 3.0 lb/A rate, trifluralin at .75 lb/A and vernolate at 3.0 lb/B gave 92% control of henbit. It is also of interest to note that while R-40244 gave excellent control of all weed species present as a postemergence herbicide, it severely reduced crop stand and yield. This is possible due to prolonged bleaching of the plants beginning 3 days following treatment and continuing for a period of 5 weeks. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Effect of preplant-incorporated and postemergence herbicide treatments on broadleaf weeds and safflower yields.

Treatment	Rate lb/A.	% CROP STAND	% Pigweed Control	% Field Pennycress Control	% Henbit Control	Yield lb/A.
Triallate	1.25	82	26	0	58	360
Dinitramine	.5	100	84	100	83	482
Dinitramine	.66	91	90	50	100	437
EPTC	3.0	91	48	0	92	404
Trifluralin	.5	82	53	50	75	330
Trifluralin	.75	91	91	50	92	521
Vernolate	3.0	91	50	50	92	303
R-40244 (Post)	.25	91	90	100	100	407
R-40244 (Post)	.5	91	91	100	100	282
R-40244 (Post	1.0	64	98	100	100	82
R-40244 (Post)	2.0	54	100	100	100	76
Barban (Post)	1.25	100	36	50	42	354
Check	0.0	100	-	-	-	393

The effect of a safener on the selectivity of two acetanilide herbicides in grain sorghum. Norris, R.F., J.E. Hill, N.L. Smith, and R.A. Lardelli. Barnyardgrass is one of the major weed pests in grain sorghum grown in California. Alachlor and metolachlor are effective herbicides for barnyardgrass control, but lack of selectivity has precluded their use in grain sorghum. An experiment was conducted on the University of California at Davis research farm to determine the effectiveness of CGA-43089 as a safening agent to increase the selectivity of alachlor and metolachlor to grain sorghum. The plot area was preseeded to barnyardgrass. Alachlor and metolachlor were applied to dry Reiff very fine sandy loam soil at 2.0, 4.0, 6.0, and 8.0 lb/A and incorporated to a depth of three inches with a Marvin Rowmaster incorporator on June 8, 1978. Each plot, 2 beds by 55 ft., was divided in half; one half was planted with untreated seed, the other half was planted with seed that had been treated with CGA-43089 at 1.25 grams/kg of seed. The variety was Funks G251. The plot was furrow irrigated up June 13. An excellent stand of barnyardgrass was obtained in the untreated plots. Enough redroot pigweed and purslane germinated to warrant their evaluation. Grain sorghum vigor was also noted. Barnyardgrass and pigweed control from alachlor and metolachlor was excellent at the rates tested. Metolachlor showed less activity against purslane than alachlor at the 2.0 lb/A rate. Vigor, and stand, of the grain sorghum was progressively reduced as the herbicide rates were increased with the untreated seed. No stand or vigor reduction was noted where the seed were treated with CGA-43089. The grain sorghum yield from seed without the safener also decreased as the herbicide rates increased; yield from seed treated with CGA-43089 showed no change as the herbicide rate increased and was substantially higher than for the appropriate untreated checks. This experiment also showed that the low level of injury to the sorghum was more than offset by the gain from weed control when the 2.0 or 4.0 lb/A rates of either herbicide was used; these plots outyielded the respective untreated checks. CGA-43089 appeared to decrease the vigor of the sorghum; sorghum from treated seed yielded less than that from untreated seed in the absence of weed control. (Botany Department, University of California, Davis, CA 95616).

Grain sorghum: Acetanilide vs. safener

		Grain sorghum			Weed control[2/]				Yield lb/A
		Vigor[1/]		Stand	Barnyardgrass		Pigweed	Purslane	
Herbicide	Lbs ai/A	7/3	7/25	11/17	7/3	7/25	7/3	7/3	11/6
alachlor	2	8.5	8.0	16.2 cd	10.0	9.5	10.0	10.0	4780 d
alachlor + CGA-43089	2	10.0	9.7	18.8	10.0	10.0	10.0	10.0	5180
alachlor	4	6.0	6.2	13.0 bc	9.9	9.8	10.0	10.0	4810 d
alachlor + CGA-43089	4	10.0	10.0	20.2	10.0	9.9	10.0	10.0	5530
alachlor	6	4.5	3.5	9.0 ab	10.0	9.8	10.0	10.0	3170 ab
alachlor + CGA-43089	6	10.0	10.0	19.2	10.0	10.0	10.0	10.0	6190
alachlor	8	4.3	3.5	8.5 ab	9.8	10.0	10.0	10.0	3100 ab
alachlor + CGA-43089	8	10.0	10.0	18.8	10.0	9.9	10.0	10.0	5420
metolachlor	2	9.3	9.5	19.5 d	10.0	10.0	8.9	7.3	5110 d
metolachlor + CGA-43089	2	10.0	10.0	20.5	9.8	10.0	9.8	7.8	5480
metolachlor	4	6.8	6.2	12.2 abc	10.0	10.0	10.0	9.9	4490 cd
metolachlor + CGA-43089	4	10.0	10.0	21.0	10.0	10.0	10.0	10.0	5890
metolachlor	6	5.8	5.2	10.5 ab	10.0	10.0	10.0	10.0	3890 bcd
metolachlor + CGA-43089	6	9.8	10.0	19.0	10.0	10.0	10.0	10.0	4310
metolachlor	8	2.8	2.4	7.5 a	10.0	10.0	10.0	10.0	2410 a
metolachlor + CGA-43089	8	10.0	10.0	22.0	10.0	10.0	10.0	10.0	5720
control	-	10.0	10.0	18.0 d	0	0	0	0	3280 abc
control + CGA-43089	-	10.0	10.0	20.2	0	0	0	0	2140

Data are average of 4 replications; data with a column followed by different letters differ significantly at the 5% level.

1/ 10 = normal vigor, 0 = no live plants

2/ 10 = complete control, 0 = no control

Barnyardgrass control in grain sorghum under sprinkler irrigation with preemergence surface (PES) application. Hill, J.E. and N.L. Smith. Preirrigation and shallow tillage to remove germinated seedling weeds prior to planting can reduce barnyardgrass infestations in grain sorghum. When grain sorghum is planted later under a system of double-cropping this practice can delay fall harvest critically. By planting into dry soil and irrigating to germinate the crop considerable time can be gained, however, weed competition is increased. Propazine, terbutryn, propachlor, bifenox, R-40244 and combinations of propachlor and bifenox were tested on the University of California, Davis, research farm for their effectiveness in barnyardgrass control under sprinkler irrigation. Barnyardgrass was broadcast seeded and power incorporated into preformed beds. Grain sorghum (Variety-NC 55X) was planted into dry sandy loam on June 12, 1978. Herbicides were surface applied on June 15 and approximately one inch of water was immediately applied by sprinkler. An excellent stand of grain sorghum and barnyardgrass (in the untreated plots) was attained. Propachlor and propachlor plus bifenox achieved good control of barnyardgrass with some early vigor reduction of grain sorghum. R-40244 at 1 lb ai/A gave good barnyardgrass control but grain sorghum vigor was reduced. Propazine, terbutryn, and bifenox were less effective for barnyardgrass control. (Cooperative extension, Botany Department, University of California, Davis, CA 95616).

Weed control in grain sorghum

Herbicide	ai/A	Barnyardgrass control 1/ 7/10/78	Barnyardgrass control 1/ 7/25/78	Sorghum vigor 2/ 7/10/78	Sorghum vigor 2/ 7/25/78
propazine	0.5	3.5	5.3	9.9	10.0
propazine	1	5.3	6.3	9.8	10.0
terbutryn	1	4.1	3.5	9.4	10.0
terbutryn	2	7.8	7.0	10.0	10.0
propachlor	2	8.3	6.5	9.8	10.0
propachlor	4	8.9	8.0	9.6	10.0
propachlor	8	9.9	9.4	8.0	8.8
bifenox	1	3.0	1.5	9.3	9.3
bifenox	2	4.5	4.5	8.1	9.3
propachlor + bifenox	2 + 1	9.0	3.5	8.8	9.8
propachlor + bifenox	2 + 2	9.4	8.4	7.5	9.8
propachlor + bifenox	4 + 1	9.5	8.4	7.4	9.0
propachlor + bifenox	4 + 2	10.0	9.4	7.5	9.3
R-40244	0.5	4.5	2.3	10.0	10.0
R-40244	1	9.5	9.2	7.0	8.8
control	-	0.5	0.3	10.0	10.0

Average of four replications

1/ Control 0 = none, 10 = complete

2/ Vigor 0 = all dead, 10 = normal plants

Barnyardgrass competition in grain sorghum. Norris, R. F. and R. A. Lardelli. Barnyardgrass is one of the major weed problems in grain sorghum in California. The competitive relationships, and population dynamics, of the weed are poorly understood in this crop. We undertook an experiment to evaluate competition in relation to weed density and to investigate barnyardgrass seed production when in competition with grain sorghum.

Grain sorghum (var Pawnee) was sowed on beds on July 14 in a Rieff very fine sandy loam. Row spacing was 76 cm, plot length was 10 m, and all treatments were replicated 5 times. Barnyardgrass seed was broadcast at appropriate densities and mixed into the soil surface. Initial irrigation was on July 14; subsequent irrigations, and fertilizer, were provided to maintain good sorghum growth. The whole experiment was twice cultivated along the furrows such that a 25 cm band on the top of the beds was left undisturbed. The barnyardgrass densities were finally established by hand weeding and hoeing; all broadleaved weeds were removed during the hand thinning. Growth of the sorghum was visibly reduced at the higher weed densities, but no visible differences were noted for the two lowest weed populations. Grain sorghum head emergence was delayed at the higher weed densities. Grain sorghum yield decreased as the barnyardgrass population increased; one barnyardgrass per meter of row caused a signficant (at 5% level) reduction of 8.6% in yield, increasing to a 51.6% yield loss when 175 barnyardgrass plants per meter were present. Total barnyardgrass seed production was estimated by counting the number of inflorescences per plot, and by counting the number of seed locations (nodes) on representative samples of the inflorescences. Seed production by the weed increased as population increased, although production per plant declined sharply as density increased. The number of seed per inflorescence showed no major difference between density levels; the decrease in seed production per plant was thus a manifestation of the decreasing number of inflorescences produced per plant. The 569 seeds produced per m^2 by a single plant per meter of row clearly demonstrated why most weed control programs do not show any long term gain; 99.8% percent of the seeds produced from a single plant per meter of row must die due to either natural causes or be controlled by man in order to maintain 'status quo'. (Botany Department, University of California, Davis, CA 95616).

Barnyardgrass competition and seed production in grain sorghum.

Barnyardgrass No/m	Sorghum % head emergence 9/9	Sorghum Yield g/plot[1/]	Barnyardgrass seeds/head	Barnyardgrass seeds/plant	Barnyardgrass seeds/m^2
0	9.4 c	7,943 e	0	0	0 a
1	9.5 c	7,260 d	116	433	569 a
5	9.1 c	7,084 cd	120	328	2,154 a
20	8.7 bc	6,614 c	149	208	5,467 a
86	6.2 b	5,856 b	156	194	19,068 b
175	2.4 a	3,844 a	130	148	33,967 c

All data are means of 5 replications, data within a column followed by a different letter differ significantly at the 5% level.

1/ 2 rows by 10 m.

Broadleaf weed control in Bragg soybeans, Howell, D. R., E. S. Heathman, Jr., and Steven D. Watkins. Twelve herbicides were evaluated for control of broadleaf weeds and safety to the soybeans. The soil type was a silt clay loam. Plot size was 15 feet wide by 30 feet long. Alachlor, dinitramine, metham, pendimethalin, profluralin, and R-40244 were applied pre-plant on July 7, 1978 and double incorporated with a disc to the approximate depth of 3 inches. Six rows of soybeans, 30 inches apart, were sown through each plot with flex-type planters on July 13. DCPA, metribuzin and oryzalin were applied pre-emergence to the soybeans on July 14. The area was then sprinkle irrigated as needed until September 10, at which time they were flood irrigated for the remainder of the season. Post-emergence applications of bentazon and chloroxuron were made to the soybean and weed foliage on August 2. Wright groundcherry was in the 4 to 8 leaf stage with 6 leaves being predominate. Common purslane plants were 2 to 6 inches in diameter, with most 3 inch. Soybean plants were mostly in the first trifoliate leaf stage when the post-emergence applications were made. All herbicides were applied with a knapsack compressed air sprayer in 20 gallons of water per acre. Population of Wright groundcherry and common purslane in check plots were dense enough to provide a complete canopy on September 28. Soybeans were almost completely crowded out. Weed control and percent stand evaluations were made on September 28. Metribuzin and bentazon treatments resulted in excellent control of Wright groundcherry. Pendimethalin and metham gave good Wright groundcherry control. All herbicides tested gave good to excellent control of common purslane, except chloroxuron. Dinitramine and R-40244 reduced soybean stands to unacceptable levels at the rates tested. Bentazon controlled weeds, but some stand loss was apparent. Untreated check stand loss was due to extreme weed competition. (University of Arizona, Cooperative Extension Service, 1047 Fourth Avenue, Yuma, Arizona 85364, Plant Sciences Department, Tucson, Arizona 85721, and Agronomist, Barkley Company of Arizona, Somerton, Arizona 85350).

Broadleaf weed control in Bragg soybeans with 12 herbicides at Somerton, Arizona.

Treatment	Rate lb/acre	Percent weed control* Wright groundcherry	Percent weed control* Common purslane	Soybean % stand*
alachlor	4.00	73 abc	59 bc	94 ab
dinitramine	0.50	70 abc	93 a	48 c
trifluralin	0.75	45 bcd	95 a	89 ab
pendimethalin	1.00	80 ab	83 ab	93 ab
profluralin	0.75	41 bcd	80 ab	88 ab
metham	3.00	88 a	91 a	90 ab
R-40244	0.75	40 bcd	85 a	5 d
DCPA	10.00	67 abc	99 a	100 a
metribuzin	0.50	90 a	97 a	94 ab
oryzalin	1.00	33 cd	96 a	80 ab
bentazon	1.00	91 a	90 a	73 b
chloroxuron	1.50	71 abc	39 c	78 ab
Untreated check	-	13 d	0 d	90 ab

*Means in the same column followed by the same letter are not significantly different at the 5% level of probability.

<u>Sugarbeet response to mechanical and chemical manipulation of the shoot apical meristem.</u> Eberlein, C. V., J. H. Dawson, and A. P. Appleby. Sugarbeets respond to excess late-season N with the production of new foliage at the expense of stored sucrose. Preliminary studies suggested that destroying the shoot apex of sugarbeets could increase sugar yields by limiting the plant's capacity to respond vegetatively to excess late-season N. In a 2-year study, the shoot apical meristem was mechanically removed or chemically suppressed with the growth regulator, mefluidide (N-[2,4 dimethyl-5-[[(trifluoromethyl)sulfonyl]amino]phenyl]acetamide), to test the effects on root yield, percent sucrose, sugar yield, and accumulation of NO_3^- in the sugarbeet root.

Mechanical removal of the shoot apex in late August resulted in the release of dormant lateral buds. This treatment did not increase root yield, percent sucrose, or sugar yield.

During the first year of study, a late August application of mefluidide at .55 or 1.1 kg/ha stunted or destroyed the shoot apical meristem of sugarbeets, but had no visible effect on mature leaves. Root yield, percent sucrose, and sugar yield were not significantly increased. In the second year of study, mefluidide at 1.1 kg/ha applied 8 weeks prior to harvest significantly increased percent sucrose, but root yield and sugar yield were not significantly increased. Applications of mefluidide 10, 6, or 4 weeks prior to harvest had no significant effect on sucrose accumulation, root yield, or sugar yield. Trends toward lower root yield, percent sucrose, and sugar yield were observed for mefluidide applications made 10 weeks prior to harvest (Table 1).

When sucrose concentration was measured at weekly intervals following an August 29 application of mefluidide, no significant effects from the treatment were observed (Table 2).

Accumulation of NO_3^- in sugarbeet roots was neither increased nor reduced by mechanical or chemical manipulation of the shoot apex. (Crop Science Department, Oregon State University, Corvallis, OR 97331; USDA-SEA/AR, Irr. Agri. Res. and Ext. Center, Prosser, WA 99350).

Table 1 Sugarbeet response to different dates of mefluidide application (1977)

Treatment	Root yield (t/ha)	Sucrose content (%)	Sugar yield (t/ha)
	Treatment averages		
Check	78.4	15.31	12.1
Mefluidide, 1.1 kg/ha (8/18)	75.7	15.21	11.4
Mefluidide, 1.1 kg/ha (9/1)	78.2	15.82*	12.3
Mefluidide, 1.1 kg/ha (9/17)	78.8	15.71	12.3
Mefluidide, 1.1 kg/ha (9/29)	79.5	15.55	12.3
L.S.D.$_{.05}$	N.S.	.45	N.S.

Table 2 Effect of an August 29, 1977 application of mefluidide at 1.1 kg/ha on sucrose accumulation during the remainder of the season

Harvest date	Sucrose content: Untreated check	Sucrose content: Mefluidide treatment
	%	%
Aug. 29, 1977	12.73	12.93
Sept. 8, 1977	14.52	14.87
Sept. 19, 1977	15.32	15.60
Sept. 28, 1977	15.00	15.15
Oct. 7, 1977	16.03	16.71*
Oct. 18, 1977	17.15	17.47
Nov. 3, 1977	17.41	17.21

* Significantly different from the check at the 5% level.

Evaluation of postemergence mixtures of diclofop, desmedipham, and phenmedipham for selective weed control in sugarbeets. Schild, L. D. and E. E. Schweizer. Herbicidal activity of mixtures of diclofop, desmedipham, and phenmedipham when applied alone, as tank mixtures, with BioVeg, or as repeat (split) applications were compared for selective control of kochia, redroot pigweed, common lambsquarters, and foxtail in sugarbeets.

Sugarbeets were planted on a loam soil with a pH of 7.8 and 2.1% organic matter. Herbicide treatments were replicated three times in a randomized complete block design. Herbicides were applied broadcast in water on June 9 (first application) and on June 16 (second application) with a bicycle sprayer at a total volume of 30 gpa. Stages of growth at application were: sugarbeets 2 true leaves; kochia 1 to 3 inches in diam, ½ to 3 inches in ht; redroot pigweed 2 to 4 leaves, 1 inch in ht; common lambsquarters 6 to 8 leaves, 1 inch in ht; and foxtail 2 to 5 leaves with a ht of 2 to 3 inches. Precipitation one week prior to the first application totaled 1.26 inches.

The response of weeds and sugarbeets to the herbicide mixtures was determined by counting the number of weeds and by visually assessing crop vigor. Weeds were counted in two quadrates, each 3½ inches by 10 ft, per treatment from each of two replications. The stand of weeds in the treated plots has been expressed as a percentage of those weeds present in the untreated plots.

Sugarbeet tolerance was 82% or more for all treatments (see table). The most effective herbicide treatments for grass control (93 to 97%) were diclofop or diclofop Plus applied at 1½ or 2 lb ai/A, followed 3 days later with desmedipham plus phenmedipham at ½ + ½ lb ai/A. Further evaluations of these treatments are warranted. Diclofop Plus did not control grasses better than diclofop. When desmedipham and phenmedipham were applied as a tank-mix with diclofop or diclofop Plus grass control was reduced 14 to 20% due to herbicide antagonism. Broadleaf weed stands were not effectively reduced by any treatment although our visual ratings indicated that the growth of broadleaf weeds was suppressed most with repeat tank-mix treatments. (Western Region, Science and Education Administration, U.S. Department of Agriculture, Fort Collins, Colorado 80523.)

Response of sugarbeets and weeds to mixtures of diclofop (H), desmedipham (D), and phenmedipham (P) applied with or without BioVeg (B) and as single or split applications (Fort Collins, Colorado)

Treatments		Rate		Sugarbeet		Weed control						
						Stand reduction					Control ratings[d]	
Herbicide	No. applications	Application #1[a]	Application #2[b]	Stand injury	Tolerance[c] rating	KO[e]	PG	LQ	Avg	SE	Grass	Broadleaf
		(lb ai/A)	(lb ai/A)	(%)		(%)						
H + D + P	1	½ + ¼ + ¼	-	19	98	40	51	50	47	28	30	42
H + D + P	1	1 + ½ + ½	-	0	93	61	44	83	63	67	70	73
H + D + P	2	½ + ¼ + ¼	½ + ¼ + ¼	10	83	39	64	67	57	74	78	83
H + D + P + B	2	½ + ¼ + ¼ + 1[f]	½ + ¼ + ¼	9	83	38	61	100	66	86	82	80
H + D + P + B	2	½ + ¼ + ¼	½ + ¼ + ¼ + 1	0	87	59	50	100	70	77	83	83
H + D + P + B	2	½ + ¼ + ¼ + 1	½ + ¼ + ¼ + 1	10	82	42	43	83	56	75	87	83
H + D + P	1	1½ + ½ + ½	-	2	93	49	53	92	65	74	65	57
H + D + P	2	1½	½ + ½[g]	6	92	48	31	92	57	93	93	72
H Plus + D + P	1	1½ + ½ + ½	-	0	90	36	56	92	61	75	70	63
H Plus + D + P	2	1½	½ + ½[g]	0	90	23	17	92	44	95	94	57
H + D + P	1	2 + ½ + ½	-	8	95	41	32	83	52	76	62	47
H + D + P	2	2	½ + ½[g]	4	87	46	40	83	56	96	90	68
H Plus + D + P	1	2 + ½ + ½	-	20	82	46	54	50	50	83	75	68
H Plus + D + P	2	2	½ + ½[g]	0	92	47	40	83	57	97	96	63

[a]First application applied June 9; sugarbeets had 2-true leaves.

[b]Second application applied June 16; sugarbeets had 4-true leaves.

[c]Evaluations - June 30. Ratings of 0 = all plants were killed and 100 = no sugarbeet injury.

[d]Evaluations - June 30. Ratings of 0 = no weed control and 100 = all plants were killed.

[e]KO = kochia; PG = redroot pigweed; LQ = common lambsquarters; Avg = broadleaf average; SE = grasses.

[f]Equals one quart per acre of BioVeg.

[g]Desmedipham plus phenmedipham applied 3 days after first application.

Preplant and preemergence treatments for weed control in sugarbeets. Schild, L. D. and E. E. Schweizer. Three experimental herbicides were compared to ethofumesate for the selective control of kochia, redroot pigweed, common lambsquarters, and foxtail in sugarbeets.

The experiment was conducted on a loam soil with 2.1% organic matter and a pH of 7.8. All herbicide treatments were replicated three times in a randomized complete block design. Weed seeds were applied as a mixture on a 7-inch band at 20 lb ai/A and incorporated into the seed bed on April 12. The preplant herbicides were sprayed broadcast with water at a total volume of 40 gpa and incorporated 1½ inches deep with a rolling cultivator on April 13. Following herbicide incorporation, pelleted 'GW Mono-Hy D2' sugarbeet seeds were planted at 3 seeds per row foot. Immediately following planting, the preemergence herbicide (glyphosate) was applied. Sprinkle irrigation of 1.14 inches was provided on April 20 to promote germination. Natural precipitation (snow) of 2.49 inches from April 29 to May 2 reduced initial sugarbeet stands 25%.

The response of sugarbeets and weeds to the herbicides was determined by counting the number of weeds and sugarbeets present in four quadrates, each 3½ inches by 10 ft, per treatment. The stand of weeds and sugarbeets in the treated plots is expressed as a percentage of those species present in the untreated plots.

VEL 5026 applied alone or as a mixture with diclofop or ethofumesate reduced the stand of sugarbeets 99 to 100% (see table) and broadleaf weeds by an average of 97 to 100%. Glyphosate reduced the stand of sugarbeets 8 and 11% when applied preplant and preemergence, respectively. Further investigations of residual glyphosate damage are warranted.

Ethofumesate did not control kochia and common lambsquarters satisfactorily, but it did control 90% of the redroot pigweed and 93% of the foxtail without affecting the stand of sugarbeets. (Western Region, Science and Education Administration, U.S. Department of Agriculture, Fort Collins, Colorado 80523.)

Response of sugarbeets and weeds to herbicides applied preplant and preemergence
(Fort Collins, Colorado)

Treatments		Sugarbeet[a]	Weed stand reduction[a]					
Herbicides	Rate	stand reduction	Kochia	Redroot pigweed	Common lambsquarters	Broadleaf average	Foxtail	Avg
	(lb ai/A)	(%)			(%)			
VEL 5026	1/8	100	98	95	99	97	75	92
VEL 5026	1/4	100	100	99	99	99	90	97
VEL 5026	1/2	100	100	100	100	100	94	99
VEL 5026 + diclofop	1/8 + 1	99	99	93	99	97	90	95
VEL 5026 + diclofop	1/4 + 1	100	99	99	100	99	93	98
VEL 5026 + ethofumesate	1/8 + 2	100	99	98	98	98	95	98
VEL 5026 + ethofumesate	1/4 + 2	100	99	99	100	99	97	99
ethofumesate	2	0	51	90	78	73	93	78
glyphosate[b]	3	11	–	–	–	–	–	–
glyphosate	3	8	–	–	–	–	–	–

[a]Evaluations – June 5. Ratings of 0 = no sugarbeet injury or weed control and 100 = all plants were killed.
[b]Applied preemergence.

Postemergence herbicide treatments for weed control in sugarbeets. H. P. Alley, N. E. Humburg and A. F. Gale. Postemergence treatments were made June 1, 1978 at which time the sugarbeets were in the 2 to 6-leaf stage. Common lambsquarters, wild buckwheat, redroot pigweed and black nightshade were 1.0, 1.0, 0.5 and 1.0 in tall, respectively. Herbicides were applied full-coverage at 40 gpa of water solution with a three-nozzle knapsack sprayer. Environmental conditions at time of treatment were: overcast, air temperature 48 F, relative humidity 66%, and soil surface temperature 58 F. Plots were 5.5 by 30 ft with three replications arranged in a randomized complete block design. The soil was clay loam (41.8% sand, 29.8% silt and 28.4% clay) with 2.3% organic matter and pH of 7.6.

Sugarbeet stand and weed counts were made on June 15. Four treatments, diclofop + phenmedipham + desmedipham at 2.0 + 0.5 + 0.5 lb ai/A, phenmedipham + desmedipham at 0.5 + 0.5 lb ai/A, and ethofumesate + desmedipham at 0.5 + 1.0 and 1.0 + 1.0 lb ai/A, gave the most consistent control of the weeds present. Compared to other treatments in this study, buthidazole gave relatively poor weed control and greater loss of sugarbeet stands. Loss of sugarbeet plants resulted from treatments of desmedipham or herbicide treatments that included desmedipham; however, stand reductions were not great enough to adversely affect crop production. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 913).

Postemergence herbicide treatments for weed control in sugarbeets. Powell, Wyoming

Herbicide[1/]	Rate lb ai/A	Sugarbeets[2/] % stand	Percent weed control[2/] common lambsquarters	wild buckwheat	redroot pigweed	black nightshade
metolachlor	3.0	85	16	0	0	65
metolachlor	4.5	100	31	13	67	70
metolachlor	6.0	88	26	0	0	26
metolachlor[3/]	3.0	95	7	0	0	74
metolachlor[3/]	4.5	100	6	0	22	65
metolachlor[3/]	6.0	100	18	19	9	48
buthidazole	0.062	76	34	0	19	4
buthidazole	0.125	69	6	0	89	52
diclofop	1.5	96	0	0	0	48
diclofop	2.0	100	9	0	44	22
diclofop + phenmedipham + desmedipham	1.5 + 0.5 + 0.5	85	23	4	74	91
diclofop + phenmedipham + desmedipham	2.0 + 0.5 + 0.5	94	72	59	93	91
phenmedipham	1.0	100	30	48	11	65
desmedipham	1.0	82	34	14	100	26
phenmedipham + desmedipham	0.5 + 0.5	100	61	80	93	74
ethofumesate + desmedipham	0.5 + 1.0	89	76	80	93	70
ethofumesate + desmedipham	1.0 + 1.0	76	69	84	93	65
ethofumesate + diclofop	1.0 + 1.5	100	62	62	0	78
Check	---	100	0	0	0	0
plants/ft of row, 3-in band		*1.3*	*2.3*	*1.2*	*0.5*	*0.4*

1/ Herbicides applied June 1, 1978.
2/ Stand and weed counts June 15, 1978.
3/ Lightly incorporated.

Influence of growth stage at spraying on postemergence barnyardgrass control in sugarbeets. Norris, R. F. and R. A. Lardelli. Barnyardgrass is still one of the major weeds in spring sown sugarbeets in the central valley of California. There is currently no satisfactory postemergence herbicide for selective control of this weed. This experiment was conducted to evaluate new postemergence herbicides for barnyardgrass control in relation to growth stage at treating.

Sugarbeets and barnyardgrass were drilled (one row each) into beds (30 inches on center) of Rieff very fine sandy loam soil at the University of California farm at Davis. Sowing date was June 30, 1978. Various plots, on a randomized basis, were sequentially irrigated to establish three growth stages at spraying; initial furrow irrigations were on June 30, on July 5, and on July 14. The height of these plants at spraying on July 25 is indicated in the table; the growth stages correspond approximately to 1- to 2-leaf, 4- to 5-leaf, and showing tillering. Desmedipham was applied on July 28, such that there was a three day delay between its application and that of diclofop. Herbicides were applied in 40 gal/A of water with a CO_2 backpack sprayer. All treatments were replicated 5 times in a randomized split-plot design.

Evaluations were made on Aug. 8; later evaluations indicated no changes in overall response and are therefore not presented. The herbicides tested did not affect the sugarbeets; vigor and growth was excellent, especially in plots where the grass was well controlled. A light population of lambsquarters and redroot pigweed emerged; none of the herbicides, except desmedipham, provided any control of these broadleaved weeds. Activity of diclofop increased as the rate was increased and as the age of the weeds decreased. Addition of desmedipham marginally increased the grass control, especially at the lowest rate of diclofop. No antagonism of diclofop activity was noted. Hoe-23408 B was more active than diclofop, and at the 1.5 lb/A rate provided effective control of even the oldest grass. BAS-9052 OH demonstrated excellent control of barnyardgrass coupled with complete selectivity to sugarbeets (also to the redroot pigweed and lambsquarters); 0.75 lb/A killed all grass plants treated, regardless of age at treatment. New germination of barnyardgrass was noted for all plots sprayed at the youngest growth stage, indicating that the herbicides were providing little soil activity under the conditions of this test; BAS-9052 OH appeared weakest in this respect. The combination of 1.5 lb/A of diclofop sprayed on young grass followed by desmedipham would have provided commercially acceptable weed control in this trial. (Botany Department, University of California, Davis, CA 95616).

Postemergence barnyardgrass control

Herbicide treatment	Rate lb/A	Barnyardgrass control (height at treatment) 4-9 cm	20-26 cm	23-33 cm
diclofop	0.75	5.6	2.8	5.2
	1.5	9.2	7.1	7.9
	3.0	9.8	9.2	9.0
desmedipham	1.3	2.2	2.0	2.0
diclofop + desmedipham[1/]	0.75 + 1.3	7.2	5.9	4.7
	1.5 + 1.3	9.5	8.1	7.1
	3.0 + 1.3	10.0	9.1	9.0
Hoe-23408B	0.75	8.7	6.4	6.4
	1.5	9.9	9.3	9.2
BAS-9052 OH[2/]	0.25	9.6	9.1	9.5
	0.75	9.7	10.0	10.0

All data are means of 5 replications; rated on scale of 0 = no control to 10 = complete control.

1/ Applied as a split treatment, see text.

2/ Applied with 0.25 gal/A of non-phytotoxic oil (supplied by BASF).

Evaluation of herbicides for preemergence use in spring sown sugarbeets. Norris, R.F., R.A.Lardelli, and E. Holst. Controlling weeds in spring sown sugarbeets in California when sprinkler irrigated for emergence has been less than desirable. Many fields have required either postemergence treatments, and/or hand hoeing. Recent developments in herbicides for sugarbeets have indicated that improved weed control under initial sprinkler irrigation may now be feasible; a trial was established to assess this possibility.

Sugarbeets were planted to a stand in a sandy loam soil at the Spreckels Sugar Co. factory farm at Woodland on May 1. Herbicides were sprayed on the soil surface, either as bands or broadcast, using a backpack CO_2 sprayer applying 40 gal/A; 8002 nozzles were used for the broadcast application, with 8002 E nozzles used for the band spraying. The band sprayed plots were 4 beds by 50 ft employing a 12 inch wide band; the broadcast plots were 10 ft wide (4 beds on 30 inch centers) by 50 ft. All treatments were applied May 2, and were replicated 4 times. A single irrigation of between 0.5 and 0.75 inches of water was applied on May 4 and May 5; all other irrigation was by furrow. Only the plots with band applications were cultivated at the first cultivation; all plots were cultivated at two later cultivations. The hand weeded checks were not weeded until late June; time for weeding was recorded. The beets were not thinned, but late emerging weeds were removed from all plots by hand in early August.

A good stand of beets emerged, with a moderate population of barnyardgrass, lambsquarters, and purslane; other weed species were present only in low numbers. No herbicide, or combination, provided complete control of all weed species, although several combinations provided very good control. Diethatyl ethyl alone would not be adequate to control all weeds present in this field; in combination with ethofumesate control was good. An evaluation of weeds remaining at harvest indicated that all treated plots had less weeds than the hand weeded plots. No major differences were noted in weed control, or yield, between broadcast or band application; broadcast treating thus reduced the cultivation needed but could probably not have been justified economically. All herbicide treated plots outyielded the hand weeded check; this was attributed to the delay in carrying out the hand weeding. The band application of 2.0 lb/A of diethatyl-ethyl yielded less than the check; this was considered to reflect the poor weed control plus the lack of hand weeding (except late). The cost of hand weeding was estimated at $57/A; herbicides reduced this to an estimated $11/A. (Botany Department, University of California, Davis, CA 95616, and Spreckels Sugar Co., Woodland, CA).

Preemergence herbicides for spring sown sugarbeets.

Herbicide treatment	Rate lb/A		Sugarbeets Stand	Vigor	Weed control PU	LQ	BY	Yield, t/A Roots	Sugar
			-----------		6/1/78	------		10/11/78	
diethatyl-ethyl	2.0	A	9.0	9.4	4.9	7.3	7.8	24.3	2.96
		B	9.0	8.8	3.5	6.3	9.3	27.4	3.61
pyrazon + diclofop	4.0 +	A	9.4	9.8	8.9	9.9	8.8	27.0	3.38
	1.5	B	9.0	8.5	8.9	10.0	9.2	26.0	3.31
pyrazon + diethatyl-ethyl	3.0 +	A	8.8	7.9	7.9	9.8	8.9	26.6	3.29
	2.0	B	8.9	9.3	7.9	10.0	9.1	26.6	3.33
ethofumesate + diclofop	1.5 +	A	9.1	9.4	8.9	8.3	9.5	29.0	3.57
	1.5	B	9.3	9.4	8.6	9.1	9.3	28.8	3.65
ethofumesate + diethatyl-ethyl	1.5 +	A	9.6	9.3	8.6	9.6	9.1	28.2	3.59
	2.0	B	9.1	9.4	9.6	9.5	8.9	27.1	3.55
handweeded check	-	A	9.1	9.8	0.0	0.0	0.0	26.4	3.22
	-	B	9.6	9.8	0.0	0.0	0.0	25.1	3.22

All data are means of 4 replications. Stand: 0 = none, 10 = normal. Vigor: 0 = all dead, 10 = normal. Control: 0 = none, 10 = complete.

A = band application, B = broadcast application.

PU = purslane, LQ = lambsquarters, BY = barnyardgrass.

Evaluations of postemergence sugarbeet herbicides with or without ethofumesate as a preplant treatment. Evans, J. O. and F. Francom. Two experimental trials were initiated in 1978 to determine the interaction of postemergence herbicides used alone or in combination with ethofumesate as a preplant treatment. Frank Anderson's farm in eastern Box Elder County, Utah was selected since it contained a variety of broadleaved annual weeds and represented a large area of sandy loam soils of the area that warm quickly and are burdened with high weed populations emerging with or slightly before the sugarbeets. Preplant treatments were made April 21, 1978 and incorporated immediately with a flextime harrow going over the field twice. Postemergence herbicides were applied May 27 when the sugarbeets were between the two-leaf and four-leaf growth stage and the broadleaved weeds were approximately one inch in diameter. Evaluations were made on June 6.

A second field, on the Brad Christensen farm in central Box Elder County, Utah, was also chosen for study due to the presence of kochia as a primary weed. It also represents an area of heavier soil that tends to delay crop emergence and lengthens the period required for an active preplant herbicide. Preplant herbicides were applied April 29, postemergence treatments were applied June 5 and evaluated on June 10, 1978. This soil is a clay loam. A significant improvement was observed when the foliar sprays followed a preplant treatment. These two trials demonstrated the need for weed control at planting time and shortly thereafter in order for the postemergence herbicides to perform satisfactorily. The two outstanding treatments were the three herbicide tank mix consisting of phenmedipham, desmedipham, and ethofumesate applied foliarly, in either of the two combinations tested, and used subsequent to a preplant ethofumesate treatment. Care must be taken in selecting this combination however since it exhibited the greatest potential for sugarbeet injury. Kochia was satisfactorily controlled with either of these treatments. (Utah Ag. Exp. Station, Logan, Utah 84322.)

Evaluation of postemergence sugarbeet herbicides with or without preplant treatments on Anderson farm

Treatment	Rate (lb ai/A)	Sugarbeet response (Inj. ind.)*	Weed response (inj. ind.)* Redroot pigweed	Lambs-quarter	Night-shade	Shepards-purse
			Without preplant herbicide treatment			
desmedipham	1.00	0.8	5.4	3.8	3.4	4.0
phenmedipham + desmedipham	0.50 + 0.50	0.8	2.7	6.4	4.8	6.0
phenmedipham + desmedipham + diclofop	0.50 + 0.50 + 1.00	0.8	2.3	6.0	4.2	4.8
phenmedipham + desmedipham + ethofumesate	0.38 + 0.38 + 1.00	1.0	7.0	7.6	6.8	6.4
phenmedipham + desmedipham + ethofumesate	0.50 + 0.50 + 0.50	1.2	6.8	7.2	6.0	6.6
ethofumesate + diclofop	1.00 + 1.00	1.0	5.4	2.8	4.8	5.4
			With 2.5 lb/A ethofumesate preplant			
desmedipham	1.00	0.8	5.6	6.2	8.2	6.8
phenmedipham + desmedipham	0.50 + 0.50	1.0	6.4	7.4	8.8	8.0
phenmedipham + desmedipham + diclofop	0.50 + 0.50 + 1.00	0.8	8.8	8.2	9.0	7.6
phenmedipham + desmedipham + ethofumesate	0.38 + 0.38 + 1.00	1.5	9.2	9.0	9.6	9.4
phenmedipham + desmedipham + ethofumesate	0.50 + 0.50 + 0.50	1.2	9.6	9.6	9.4	9.4
ethofumesate + diclofop	1.00 + 1.00	1.0	7.8	4.8	9.2	7.8

Injury index -- 0 = no injury or control, 10 = complete kill

Evaluation of postemergence sugarbeet herbicides with or without preplant treatments on Christensen farm

		Sugarbeet response	Weed response (Inj. ind.)*		
Treatment	Rate (lb ai/A)	(Inj. ind.)*	Redroot pigweed	Kochia	Lambs-quarter
		Without preplant herbicide treatment			
desmedipham	1.00	1.0	4.0	1.0	3.0
phenmedipham + desmedipham	0.50 + 0.50	1.0	2.5	2.5	6.5
phenmedipham + desmedipham + diclofop	0.50 + 0.50 + 1.00	1.5	3.5	1.0	6.0
phenmedipham + desmedipham + ethofumesate	0.38 + 0.38 + 1.00	2.0	7.0	6.5	7.5
phenmedipham + desmedipham + ethofumesate	0.50 + 0.50 + 0.50	1.5	5.5	6.0	6.0
ethofumesate + diclofop	1.00 + 1.00	0.5	3.0	4.0	2.5
		With 2.5 lb/A ethofumesate preplant			
desmedipham	1.00	1.0	8.0	4.0	7.5
phenmedipham + desmedipham	0.50 + 0.50	1.0	7.0	6.5	8.5
phenmedipham + desmedipham + diclofop	0.50 + 0.50 + 1.00	1.0	6.5	6.0	9.0
phenmedipham + desmedipham + ethofumesate	0.38 + 0.38 + 1.00	2.5	9.5	8.5	9.5
phenmedipham + desmedipham + ethofumesate	0.50 + 0.50 + 0.50	1.0	9.0	7.5	9.0
ethofumesate + diclofop	1.00 + 1.00	0	7.5	5.5	8.0

Injury index -- 0 = no injury or control, 10 = complete kill

Evaluation of preplant incorporated, and postemergence applied herbicides for redroot pigweed control in sunflower. Baysinger, O. K., G. A. Lee, D. L. Auld, and G. A. Mundt. Plots were established on the Plant Science Farm near Moscow, Idaho to determine the effectiveness of various herbicides on redroot pigweed control in sunflowers, (Cultivar - Hybrid 894). Plots were treated with preplant herbicides, incorporated and planted May 26, 1978. The sky was clear, air temperature, and relative humidity were 48 F and 80% respectively. Wind velocity was 2 to 6 mph. The soil temperature at 4 inches was 48 F. The soil at the study site was a Palouse silt loam with 3.5 % OM. and a pH of 6.5. Herbicides were incorporated to a depth of 1.5 inches using a flex-tine harrow traveling at 6 mph. Postemergence herbicides were applied June 15, 1978. The sky was clear, with air temperature and relative humidity at 72 F and 84%, respectively. Wind velocity was 3 to 6 mph. Soil temperature at 6 inches was 66 F. All herbicides were applied with a knapsack sprayer equipped with a 3-nozzle boom, calibrated to deliver 40 gpa. Individual plots were established in four rows on 24 inche centers 15 feet long. All treatments were replicated three times in a randomized split plot design. Percent sunflower stand, and percent weed control were obtained from actual species counts within the complete plot. Numbers of plants in the treated plots were compared to numbers in the non-treated check plots. Yield determination on sunflowers were made by harvesting the heads from the center two rows of each plot 15 ft. long. Calculations of production were figured on pounds of sunflower seeds per acre.

Dinitramine at .5 and .66 lb/A rates, trifluralin at .5 and .75 lb/A rates, and R-40244 at rates of .25, .50, 1.0, and 2.0 lb/A resulted in greater than 80% control of redroot pigweed, (attached table). All rates of R-40244 resulted in severe bleaching of the sunflower plants beginning 3 days following postemergence treatments. Recovery of the sunflower plants from the effect of R-40244 at the lower rates occurred within a 3 week period. Complete recovery from the effects of R-40244 treatments at 2.0 lb/A did not occur until 6 weeks after postemergence treatments of the sunflowers. (Idaho Agricultural Experiment Station Moscow, Idaho 83843.)

Effect of preplant incorporated and postemergence herbicide treatments on redroot pigweed and sunflower yields.

Treatment	Rate lb/A	% Crop Stand	% Pigweed Control	Yield lb/A
Dinitramine	.5	105	87	880
Dinitramine	.66	77	89	793
EPTC	3.0	103	65	684
EPTC	4.0	91	72	
Dinitramine	.33			
+EPTC	2.0	107	69	508
Profluralin	.5	85	49	552
Profluralin	1.0	100	75	757
Trifluralin	.5	89	87	588
Trifluralin	.75	94	93	750
R-40244 (Post)	.25	93	87	1148
R-40244 (Post)	.50	91	92	897
R-40244 (Post)	1.0	74	98	489
R-40244 (Post)	2.0	89	98	152
Check	0.0	100	-	419

Effects of two formulations of dicamba on weed control and yield in wheat. Shaner, D. L. and W. H. Isom. In light of the concern over the levels of nitrosamines in herbicides, two formulations of dicamba, 2S and 4S, in which the former contains much lower levels of nitrosamines than the latter, were compared to determine if there were any differences between them on either weed control or phytotoxicity to wheat (WS3) as measured by yield. Five feet by 20 ft. plots were drilled on February 22, 1978, and plots were treated on April 3, 1978 with a CO_2 backpack sprayer. Two rates of the two formulations of dicamba were sprayed, 0.14 and 0.28 Kg/ha. The treatments were in a random block design and replicated four times. There were no differences between the two formulations on either weed control or yield. (Department of Botany and Plant Sciences, University of California, Riverside, CA 92521).

Effects of two formulation of dicamba on weed control and yield in wheat[1]

Treatment	Concentration (Kg/ha)	Weed control[2] (5/5/78)	Yield (Kg/ha)
Dicamba 2S	.14	7.6b	3335b
Dicamba 2S	.28	9.1c	3147b
Dicamba 4S	.14	7.5b	3414b
Dicamba 4S	.28	9.4c	3405b
Control	-	0a	2775a

[1] Numbers within a column followed by the same letter are not significantly different at the 5% level using Duncan's Multiple Range Test.
[2] 0 = No control; 10 = Complete control

Evaluation of postemergence herbicides for wild oat control in spring wheat. Schumacher, W. J., G. A. Lee, G. A. Mundt and W. S. Belles. Plots were established at Moscow, Idaho to determine the effectiveness of postemergence herbicides for wild oat control in spring wheat (cultivar Fielder). Plots were treated in June and July, 1978. Herbicides were applied with a conventional knapsack sprayer. Plots were 9 ft. by 30 ft. Barban was applied at 5 gpa, GCP-6305 was applied at 5 gpa, and diclofop and diclofop + W.A. were applied at 20 gpa, when wild oat plants were in the 1 to 3 leaf stage.

Barban was also applied at 5 gpa when wild oat plants were in the 3 leaf stage. NC-21439, difenzoquat, and MSMA were applied at 10 gpa when wild oat plants were in the 3 to 5 leaf stage. Treatments were replicated three times in a randomized complete block design. The soil at the study site was a Palouse silt loam. Percent crop vigor reduction and percent wild oat control was obtained by visual observation of each plot. (accompanying table).

Barban at .42 kg/ha applied at the 1-3 leaf stage and barban 12.5E at .56 kg/ha applied at the 3 leaf stage gave the least percent crop vigor reduction in comparison to combination of MSMA (2.24 kg/ha) and difenzoquat (.84 kg/ha) applied at the 3-5 leaf stage gave the best percent wild oat control in comparison to the other treatments.

Barban when applied at .42 kg/ha at the 1-3 leaf stage offered the best percent yield increase; least percent crop vigor reduction along with a fairly high percent wild oat control, however the higher rate of barban increased the percent crop vigor reduction and lowered the percent wild oat control and percent yield increase when applied at the same stage of the wild oat plants. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Spring Wheat Stand and Wild Oat Control Resulting
from Foliar Applications of Wild Oat Herbicides at Moscow, Idaho.

Treatment	Rate kg/ha	% Crop Vigor Reduction	% Wild Oat Control	Bu/A	% Yield Increase over untreated Check
1-3 leaf stage					
Barban	.42	.7f[1/]	90.0a,b	33a	29a
Barban 12.5E	.42	8.3c,f	85.0a,b	28.7a,f	12a,d
Barban 25E	.42	16.7b,d	90.7a,b	30.4a,b	19a,b
Barban + GCP-6305	.42 + .56	3.3e,f	66.7a,b	29.3a,f	15a,d
Diclofop	.70	3.3e,f	73.3a,b	24.4f	3d
Diclofop	.84	3.3e,f	81.7a,b	30.2a,c	18a,c
Diclofop	1.12	13.3b,e	71.7a,b	25.3d,f	-1c,d
Diclofop+	.70	6.7d,f	85.0a,b	30.0a,d	19a,b
Diclofop+	.84	11.7c,f	83.3a,b	28.7a,f	13a,d
GCP-6305	.56	5.0e,f	23.3c	25.2e,f	-1c,d
3 leaf stage					
Barban	.56	3.3e,f	8.3c	24.9e,f	-4d
Barban 12.5E	.56	1.7f	21.7c	25.5c,f	0b,d
Barban 25E	.56	3.3e,f	25.0c	25.0e,f	-2d
3-5 leaf stage					
NC-21439 + Agro W	.56 + .5% v/v	5.0e,f	15.0c	26.0b,f	2b,d
NC-21439 + Agro W	1.12 + 5% v/v	8.3c,f	16.7c	24.8e,f	-4d
Difenzoquat	.84	3.3e,f	65.0b	27.1b,f	6b,d
Difenzoquat	1.12	35.0a	86.3a,b	12.1h	-53f
MSMA	2.24	18.3b,c	90.0a,b	18.0g	-29e
MSMA	3.36	11.7c,f	92.3a,b	26.0b,f	2b,d
MSMA + Difenzoquat	2.24 + .84	21.7b	94.7a	16.2g,h	-37e,f

1/Means with same letter are not significantly different according to Duncan's Multiple Range Tests. Alpha level = .05

Evaluation of Barban as a growth regulator in spring wheat. Schumacher, W. J., G. A. Lee, G. A. Mundt, W. S. Belles. A field experiment was established at Moscow, Idaho to study barban as a growth regulator applied postemergence for control of wild oats in spring wheat (variety Fielder). The plots were treated when wheat plants were in the 2-leaf stage of growth. They were also treated at 3 day, 6 day, and 9 day after first application. These applications were on June 20, 23, 26 & 29, respectively. Barban was applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 5 gpa. Individual plots were 9 ft by 30 ft. Treatments were replicated three times in a randomized complete block design. Ambient temperature at times of application were 50, 52, 57, and 56 F, soil temperatures were 45, 52, 61 and 65 at 4", relative humidity was 62, 69, 63 and 73%, and the wind was between 0 and 4 mph on the four dates of application, respectively. The soil at the study site is a Palouse silt loam.

Bushels per acre were obtained from the treated areas to compare with untreated check plots by harvesting 119 sq. ft with a Hege plot combine.

In this study barban appeared to have no effect as a growth regulator in spring wheat as no significant differences were obtained.

(Idaho Agricultural Experiment Station, Moscow, Idaho)

Bushels per acre resulting from Foliar Applications of Barban.

Treatment	Rate lb/A	Yield Bu/A
Barban (0) day	.125	22.3 a[1/]
Barban (0) day	.25	21.3 a
Barban (3) day	.125	22.3 a
Barban (3) day	.25	19.7 a
Barban (6) day	.125	21.2 a
Barban (6) day	.25	19.3 a
Barban (9) day	.125	18 a
Barban (9) day	.25	19.8 a
Untreated Check	0	22 a

Note: No growth by wild oats resulted in no data for control in the test plot.

[1/] Means with the same letter are not significantly different according to Duncan's Multiple Range Test. Alpha level = .05

Weed control in wheat. Heathman E. S., D. R. Howell. This test was a comparison of barban, nitrofen and diclofop for the control of oat and canarygrass in red spring wheat (Cajeme). The test was at the Yuma Valley Experiment Station. The soil was a silt loam with less than 1% organic matter. Wheat was drilled on the flat at 100 lb/A and border irrigated for stand establishment December 22, 1977. Plot size was 30 by 15 ft. replicated 4 times. Herbicides were applied with a back pack sprayer, full coverage. Canarygrass was abundant. A few wild oat were present. Pittis, a tame oat, was seeded at 30 lb/A and cultipacked into the soil prior to planting. Canarygrass populations varied from 5 to 1500 per sq. ft. mostly 30 per sq. ft. Oat populations were about 5 per sq. ft.

The nitrofen was applied at 3 or 4 lbai/A in 25 gpa of water December 12, 1977 as a preemergence treatment prior to irrigation. Barban was applied at .25, .375 and .5 lbai/A in 7 gpa of water January 18, 1978, when the wheat was tillering, the oat 6 to 7 leaf and canarygrass in the 3 leaf stage. A second application of barban at .25 lbai/A followed the first application of the same rate of barban, 10 days later. Diclofop was applied at 1.0 or 1.5 lbai/A in 20 gpa of water January 18, 1978. The weeds and wheat were at the same stage as the first applications of barban. The barban application was to have been applied at an earlier growth stage but rain and mud prevented this. Harvest was June 5 with a 10 ft. combine harvesting the center 10 ft. of the plot. All check areas were lodged due to canarygrass. Yield of wheat was significantly increased by all rates of diclofop and barban at .375 and .5 lbai/A. The high rate of diclofop and 2 applications of barban stunted wheat through April but did not decrease yield. Nitrofen controlled canarygrass but not oat. Even though oat populations were relatively low, 5 per sq. ft., control of canarygrass alone did not significantly increase yields. (Plant Science Department, University of Arizona, Tucson, AZ 85721).

Yield of wheat in pounds per acre, percent control of weeds at harvest and percent stunting of wheat, April 4.

Treatment	lb/A	Yield lb/A	% Control Oat	% Control Canarygrass	% Stunt wheat
Diclofop	1.0	2830ab*	98a	61a	6ab
Diclofop	1.5	3050a	99a	92a	14b
Barban	.375	3270a	95a	85a	7ab
Barban	.25+.25	2620ab	86b	93a	13b
Barban	.5	3050a	88ab	79a	13b
Nitrofen	3.0	1740b	10d	91a	0a
Nitrofen	4.0	2400ab	30c	97a	0a
Check		1530b	0e	0c	0a

* Means in the same column followed by the same letter are not significantly different at the 0.5% level of probability.

Italian ryegrass and wild oat control in winter wheat. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. Diclofop has effectively controlled Italian ryegrass and wild oats in western Oregon winter wheat research plots. However, since diclofop does not control broadleaf weeds, combinations of diclofop with herbicides that are effective on broadleaf weeds will be necessary for broad-spectrum control.

Two field trials were conducted to compare tank-mix combinations and split application of broadleaf herbicides and diclofop with diclofop alone. An estimate of the degree of antagonism on wild oat control was a primary objective of these trials.

The trials were arranged in randomized block designs with five replications at each location. Individual plots were 2.5 by 7.5 m.

The wheat cultivars were Hyslop at location 1 and Yamhill at location 2.

Weed control ratings and crop yields are summarized in the table below. All of the combination applications produced grass control ratings in excess of 90%. The tank-mix combinations of diclofop with diuron or metribuzin appeared to cause some slight antagonism on wild oat control at location 2.

The relatively high yields with the split applications were due largely to better broadleaf control. (Crop Science Department, Oregon State University, Corvallis 97331)

The effect of diclofop combinations on wheat yield
and Italian ryegrass and wild oat control

Herbicide(s)	Rate kg a.i./ha	% Italian ryegrass control Loc. 1	% Italian ryegrass control Loc. 2	% Wild oat control Loc. 1	% Wild oat control Loc. 2	Wheat yield t/ha Loc. 1	Wheat yield t/ha Loc. 2
		Early postemergence					
diclofop + metribuzin	1.0 + 0.2	100	97	100	93	5.13	4.80
diclofop + metribuzin	1.0 + 0.4	100	99	100	96	5.20	4.38
diclofop + diuron	1.0 + 0.7	100	99	100	98	4.42	4.69
diclofop + diuron	1.0 + 1.4	98	99	100	96	4.13	4.72
diclofop + terbutryn	1.0 + 1.0	100	99	100	98	4.09	4.74
diclofop + terbutryn	1.0 + 2.0	100	100	100	98	4.63	5.09
diclofop	1.0	100	100	100	99	3.82	4.63
metribuzin	0.4	28	79	66	40	4.15	4.54
diuron	1.8	34	55	20	0	3.21	3.92
terbutryn	2.0	0	30	0	14	2.55	3.92
		Early postemergence/late postemergence					
diclofop/ 2,4-D amine	1.0/ 0.6	100	99	100	99	5.32	4.97
diclofop/ metribuzin	1.0/ 0.6	100	100	100	99	5.28	4.42
diclofop/ terbutryn	1.0/ 2.5	100	100	100	99	5.26	4.99
Check	0	0	0	0	0	1.86	2.72
				L.S.D.$_{.05}$		0.71	0.57
				L.S.D.$_{.01}$		0.94	0.76

Fall-applied herbicide treatments for weed control in a winter wheat fallow system. Humburg, N. E. and H. P. Alley. Plots were established on sandy loam soil at the Archer Agricultural Substation near Cheyenne, Wyoming. Herbicides were applied September 13, 1976, with the exception of FMC-23486 which was applied October 8. A knapsack sprayer with a three-nozzle boom applied 40 gpa of herbicide-water solution. The soil was 62.4% sand, 28% silt and 9.6% clay, with 2.4% organic matter and pH 6.1.

Weed counts were made on check plots, and herbicide-treated plots were visually evaluated for weed control on June 28, 1977, and June 28, 1978. In the fallow period of 1977 infestations of downy brome and Russian thistle were the same. However, in the wheat crop in the summer of 1978 Russian thistle was the predominant weed species. Metribuzin, hexazinone and FMC-23486 treatments provided 100% control of downy brome in 1977; downy brome infestation was negligible in 1978. Control of Russian thistle was evident 21 months after treatment, vis., in plots treated with triazine herbicides. The 1.0 and 2.0 lb ai/A applications of FMC-19873 and FMC-23486 and the 0.5 lb ai/A rate of buthidazole were relatively low in persistence. Wheat stands were markedly reduced by hexazinone and FMC-23486 and all rates of FMC-19873. (Wyoming Agric. Exp. Sta., Laramie 82071, SR 914).

Fall-applied herbicide treatments for weed control in a winter wheat fallow system. Cheyenne, Wyoming

Herbicide [1/]	Rate lb ai/A	Percent control [2/] 1977 Downy brome	1977 Russian thistle	1978 Russian thistle	Wheat [3/] stand %
atrazine	0.5	83	97	70	97
atrazine	0.6	82	98	60	95
atrazine	0.75	90	93	60	95
atrazine	1.0	83	100	60	100
hexazinone + WA	1.0	100	98	90	45
metribuzin	0.5	100	98	60	98
metribuzin	0.75	100	100	60	58
metribuzin	1.0	100	98	60	88
metribuzin	1.25	100	100	60	93
FMC-19873	1.0	63	87	40	82
FMC-19873	2.0	93	60	30	37
FMC-19873	4.0	88	92	90	1
FMC-23486	1.0	100	92	10	10
FMC-23486	2.0	100	100	30	1
FMC-23486	4.0	100	100	70	0
buthidazole	0.5	87	92	40	87
buthidazole	1.0	100	100	70	92
buthidazole	1.5	98	100	70	77
buthidazole	2.0	100	100	70	57
buthidazole	4.0	100	100	90	18
Check		0	0	0	100
plants/sq ft		*0.5*	*0.5*	*5.7*	

1/ Herbicides applied September 13, 1976, except FMC-19873 which was applied October 8, 1976. Surfactant WK added at 0.25% v/v.
2/ Visual evaluations June 28, 1977, and June 28, 1978.
3/ Visual evaluation July 28, 1978.

Evaluation of herbicides for wild oat control in winter wheat. Collins,R. Buthidazole 50% WP and 1 lb per gal water dispersible concentrate (1 WDC) at 0.25, 0.37, and 0.50 lb ai/A, dichlofop-methyl 3 lb per gal EC at 0.75 and 1.0 lb ai/A, metribuzin 50% WP at 0.25, 0.37, and 0.50 lb ai/A, were evaluated for wild oat control in winter wheat near North Plains, Oregon.

All herbicides were applied March 25, 1978 as a post emergence broadcast spray to Hyslop dryland winter wheat planted November 3, 1977. The wheat was 12 to 14 inches tall with two tillers. The wild oats averaged 5.4 per sq ft, were four inches tall, and had 4 to 7 leaves at application time. Plot size was 1/2 sq rod (6.5 ft by 21 ft) replicated four times in a randomized block design experiment. The herbicides were applied with a CO_2 back pack sprayer using 40 gpa water. The slightly acid silt loam soil was moist on the surface at application. The plot area received 7.92 inches of rain between treatment and harvest, which was August 9, 1978. The plots were harvested with a Heggie plot combine 4.87 ft wide by 21 ft long swath.

Buthidazole at the highest rates gave acceptable wild oat control but unacceptable damage to the wheat. There was a noticable difference of performance between the buthidazole formulations. Diclofop-methyl at 0.75 and 1.0 lb ai/A, metribuzin at 0.37 and 0.5 lb ai/A gave good control of wild oats with increased yields over the untreated check. Buthidazole and metribuzin caused a noticable greening response to the wheat on the first evaluation date. (Consultant, Rt 2, Box 81c, Hillsboro, Oregon 97123).

Wild oat control in winter wheat, North Plains, Oregon.

Treatment	Rate lb/A	wild oat control 1/ 4/27/78	7/26/78	crop injury 4/27/78	7/26/78	yield bu/A
buthidazole 1WDC	0.25	2.7	5.5	0.5	0	34
buthidazole 1WDC	0.37	4.5	7.5	0.5	0.5	31
buthidazole 1WDC	0.5	9.1	9.7	0.9	5.5	12
metribuzin 50% WP	0.25	4.7	6.5	0.4	0	38
metribuzin 50% WP	0.37	8.1	8.2	0.5	0	52
metribuzin 50% WP	0.5	9.0	9.2	0.5	0	53
check	-	0	0	0	0	36
buthidazole 50% WP	0.25	8.1	8.2	0.5	2.7	28
buthidazole 50% WP	0.37	8.0	9.1	0.5	4.7	16
buthidazole 50% WP	0.5	9.1	9.7	0.9	7.2	10
diclofop -methyl 3 EC	0.75	9.4	9.5	0.5	0	64
diclofop -methyl 3 EC	1.0	8.9	9.7	0.8	0	55

1/ Visual ratings of foliar damage where 0 = no effect 10 = complete kill

Postemergence control of ripgut brome in winter wheat. Lee, G. A., G. A. Mundt, T. M. Cheney. A study was established at Waha, Idaho to determine the effect of various registered and experimental herbicides on winter wheat (cultivar: Peck) stand and ripgut brome control. Plots were sprayed on March 28, 1978. Herbicides were applied postemergence with a knapsack sprayer equipped with a three-nozzle boom, calibrated to deliver 40 gpa. Ripgut brome and winter wheat plants were both in the 4 to 5 leaf stage with 3 to 4 tillers. Individual plots were 9 ft by 20 ft and treatments were replicated three times in a randomized complete block design. Soil conditions were as follows: 37.5 C.E.C., 23.6% sand, 50.4% silt, and 26% clay. Sky conditions were with high clouds at the time of application. Air temperature and relative humidty were 64 F and 52%, respectively. A 4.0 mph wind prevailed at the time of herbicide application. Soil temperature at 4 inches was 60 F. Dry, warm conditions prevailed in early spring, followed by normal early summer precipitation. A hail storm damaged 35% of the crop on July 28, 1978. Percent crop vigor reduction was determined by visual evaluation while brome control was obtained by actual plant counts. Harvest data was obtained the first and second of August with a Hege small plot combine with a sample area of 90 sq. ft.

Metribuzin gave excellent control of ripgut brome, but substantially reduced the crop vigor. Similar results were shown with Paraquat. Diclofop in combination with SN-533 resulted in poor control of ripgut brome. Similar results were obtained with R-40244. GCP-6305 did not give good control of ripgut brome when applied postemergence. Metribuzin and paraquat greatly reduced the crop stand at the higher rates. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Effect of postemergence herbicide treatments on wheat vigor and yield and ripgut brome control at Waha Idaho.

Treatment	Rate lb a.i./A	% Crop Vigor reduction	% Ripgut Brome control	Yield Bu/A	%Yield Increase
Check	-0-	-	-	20ab	-0-
SN-533	.5	3d[1/]	12b	20ab	-1ac
paraquat	.5	87a	0b	11cd	-45ce
paraquat	.375	63b	93a	10cd	-54de
metribuzin	.5	82a	0b	9cd	-57de
GCP-6305	.5	12d	0b	21ab	1ac
GCP-6305	1.0	0d	0b	15bc	-28cd
GCP-6305	2.0	8d	17b	25a	25ab
diclofop	1.0	10d	17b	22ab	7ac
diclofop + SN-533	.75 + .5	3d	13b	27a	33a
diclofop + SN-533	1.0 + 2.5	3d	8b	28a	35a
metribuzin	.25	88a	96a	3d	-85e
R-40244	1.0	30d	10b	15bc	-26bd

1/ Means followed by the same letter are not significantly different at the .05 level

Broadleaf weed control screening trial in winter wheat. Mundt, G. A., G. A. Lee, and W. S. Belles. A study was initiated near Greencreek, Idaho to determine the potential of several herbicides used for broadleaf weed control in winter wheat (variety NuGaines). The treatments were made May 8, 1978 with the following weather conditions, ambient temperature, 48 F soil temperature at 4 inches 55 F, relative humidity 51% and the sky was clear. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa. The treatments were replicated three times in a complete randomized block design.

Visual evaluations were made June 28, 1978 to determine percent weed control. Harvest data was taken October 6, 1978 with a Hege small plot combine. The area harvested was 119 sq. ft.

Bromoxynil and terbutryn + 2,4-D resulted in the highest yield (accompanying table). The higher rates of metribuzin flowable and wettable powder increased crop damage and resulted in a significant reduction in yield. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Effect of postemergence herbicides on winter wheat yields and broadleaf weed control at Greencreek, Idaho.

		Percent Control					
Treatment	Rate lb a.i./A	Jacobs ladder	Wild buckwheat	Common Chickweed	Dog Fennel	Shepherds Purse	Yield Bu/A
Check	0						63
metribuzin[1/] (4L)	.5	99	68ad[3/]	96a	95a	99a	63
metribuzin(4L)	.75	99	98a	99a	99a	99a	66
metribuzin(4L)	1.0	99	99a	99a	99a	99a	46
metribuzin[2/]	.5	99	27d	98a	88a	99a	55
metribuzin	.75	99	83ac	99a	99a	99a	65
metribuzin	1.0	99	99a	99a	99a	99a	52
diuron	.4	99	81ac	23cd	13c	50b	52
bromoxynil	.375	63	99a	7d	62ab	99a	70
diuron + bromoxynil	.4 + .375	99	68ad	13d	48b	99a	69
MSMA	2.0	96	61ad	7d	87a	96a	66
MSMA	3.0	99	36cd	2d	93a	96a	67
terbutryn + MCPA	.8 + .5	99	40bd	50bc	69ab	99a	59
terbutryn + 2,4-D	.8 + .5	99	83ac	23cd	99a	99a	70
diuron + MCPA	.4 + .5	99	90a	27cd	35bd	98a	62
diuron + 2,4-D	.4 + .5	99	91ab	60b	99a	99a	67

1/ 4 lb active ingredient/gallon flowable

2/ 50% wettable powder

3/ means followed by the same letter are not significantly different at the .05 level

Evaluation of preemergence incorporated herbicide treatments for ripgut brome control in winter wheat. Lee, G. A., G. A. Mundt, T. M. Cheney. A study was established at Waha, Idaho to determine the effect of various registered and experimental herbicides on winter wheat (cultivar peck) stand and ripgut brome control. Plots were sprayed on October 28, 1977. Individual plots measured 9 ft. by 20 ft. Herbicides were applied preemergence with incorporation accomplished by a flextine harrow crossing the field twice at opposing angles at 5 mph. Depth incorporation was 2 inches. Herbicide application was with a knapsack sprayer equipped with a three nozzle boom, calibrated to deliver 40 gpa. Treatments were replicated three times in a randomized complete block design. Soil conditions were as follows: 37.5 C.E.C., 23.6% sand, 50.4% silt, and 26% clay. Sky conditions were cloudy at the time of application. Air temperature and relative humidity were 42 F and 37% respectively. There was no wind at the time of herbicide application. Soil temperature at 4 inches was 51 F. Drought conditions prevailed throughout early autumn with intermittent rains increasing soil moisture in late autumn. A hail storm destroyed 35% of the crop on July 28, 1978. Percent crop vigor reduction and percent ripgut brome control were obtained by visual evaluations per plot. Evaluations of crop vigor reduction and ripgut brome stand reduction in the treated plots were compared to the untreated check plots. Harvest data was obtained August 1 and 2 with a Hege small plot combine sampling an area of 90 sq. ft.

Vernolate 10G at 2.0 lb a.i./A showed fair weed control while reducing crop vigor significantly. GCP-6305 at the high rate resulted in fair control of ripgut brome while reducing crop vigor substantially, while Cycloate 10G did not give good control of ripgut brome. GCP 6305 at the low rate did not show any significant control of ripgut brome (Idaho Agricultural Experiment Station, Moscow, Idaho).

Effect of preemergence Incorporated herbicide treatments on winter wheat and ripgut brome control.

Treatment	Rate lb a.i./A	% Crop vigor Reduction	% ripgut Brome Control	Bu/A	%Yield
Check	-0-	-	-	23	-
cycloate 10G	2.0	23bc 1/	27cb	18	78
cycloate 10G	3.0	27b	40ab	18	77
vernolate 10G	2.0	37ab	70a	19	85
vernolate 10G	3.0	57a	60a	14	60
GCP-6305	1.0	3c	13bc	41	178
GCP-6305	2.0	33ab	7c	16	69
GCP-6305	4.0	53a	60a	10	43

1/ Means followed by the same letter are not significantly different at the .05 level

Evaluation of herbicide combinations for wild oat and broadleaf weed control in winter wheat. Mundt, G. A., G. A. Lee and W. J. Schumacher. A field experiment was established at Greencreek, Idaho, to compare labelled post emergence wild oat herbicides tank mixed with broadleaf herbicides in winter wheat (variety Nugaines). The plots were treated May 9, 1978 when wild oats were in the 1- to 3-leaf stage with barban and diclofop tank mixes, difenzoquat tank mixes were applied May 19, 1978 when the wild oat plants were in the 3- to 4-leaf stage. One-half inch rain was received six hours after application on May 9, 1978. Herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 5, 10, and 40 gpa for barban, difenzoquat and diclofop, respectively. Individual plots were 9 ft. by 30 ft. Treatments were replicated three times in a randomized complete block design. Ambient temperature at time of application May 9 and May 19 was, 57 F and 54 F, soil temperature 52 F and 50 F at 4 inches, relative humidy 62% and 73%, respectively. Wild oat denisty in the experimental area was approximately 50 plants per sq. ft.

Percent winter wheat stand and percent weed control were obtained by visual evaluations on June 28, 1978. Yield data was obtained on October 6, 1978 with a hege small plot combine. The sample area harvested was 119.25 sq. ft.

No significant differences were obtained in crop vigor reduction by application of the herbicide combinations. Difenzoquat + 2, 4-D amine resulted in poor wild oat control compared to the tank mix of difenzoquat + 2, 4-D ester. These data and other studies indicate there is an antagonistic response when difenzoquat and 2, 4-D amine are applied as a tank mix. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Herbicide combinations for wild oat and broadleaf weed control in winter wheat.

Treatment	Rate lb ai/A	Percent Crop vigor reduction	Percent Weed Control: Wild oat	Percent Weed Control: Jacobs Ladder	Percent Weed Control: Wild buckwheat	Yield bu/A
check	0	0	0	0	0	23d
barban	.5	10	0c[1]	43be	3e	57ac
diclofop	1.0	10	90a	45ae	35ce	54bc
difenzoquat	1.0	7	72a	40be	57ad	68ab
barban +	.5					
MCPA	.5	3	0c	12de	17de	60ac
barban +	.5					
2, 4-D amine	.5	3	3c	17ce	80ab	63ac
barban +	.5					
2, 4-D ester	.5	12	0c	62ad	75ac	67ac
barban +	.5					
bromoxynil	.5	3.0	3c	99a	85ab	73a
barban +	.5					
dicamba	.375	13	0	50ce	99a	62ac
diclofop +	1.0					
MCPA	.5	3	87a	52ae	62ac	60ac
diclofop +	1.0					
2, 4-D amine	.5	7	92a	0e	18de	48ac
diclofop +	1.0					
2, 4-D ester	.5	7	90a	67ad	55bd	64ac
diclofop +	1.0					
bromoxynil	.5	7	72a	99a	83ab	54ac
diclofop +	1.0					
dicamba	.375	10	3c	42be	98a	55ac
difenzoquat +	1.0					
MCPA	.5	10	20cd	13de	55bd	65ac
difenzoquat +	1.0					
2, 4-D amine	.5	7	10cd	70ac	63ac	48c
difenzoquat +	1.0					
2, 4-D ester	.5	0	83a	81ab	62ac	57ac
difenzoquat +	1.0					
bromoxynil	.5	5	70a	83ab	96ab	63ac
difenzoquat +	1.0					
dicamba	.375	10	28b	37be	94ab	60ac

[1] Means followed by the same letter are not significantly different at the .05 level

Evaluation of postemergence herbicide treatments for wild oat control in winter wheat. Mundt, G. A., G. A. Lee, T. M. Cheney, and W. S. Belles. A study was initiated near Ferdinand, Idaho to evaluate candidates and labelled wild oat herbicides alone and in combination with a new experimental broadleaf herbicide in winter wheat (var. Nugaines). Barban and diclofop alone and in combination with R-40244 were applied May 8, 1978 when the wild oat plants were in the 1-to-3-leaf stage of growth. Difenzoquat was applied May 19, 1978 when the wild oats were to the 3-to 5-leaf stage of growth. At the time of application on May 8 and May 19, ambient temperatures were 62 F and 42 F, soil temperatures were 59 F and 47 F at 4 inches and percent relative humidity readings were 51% and 75% respectively. There was a heavy dew on foliage during the difenzoquat application. The wild oat density at the experimental site was greater than 50 plants per sq. ft. Evaluations of the herbicidal response were made June 6 and June 29, 1978. Harvest data was not taken because of total crop damage from hail.

Herbicides were applied with a knapsack sprayer calibrated to deliver 5, 10 and 40 gpa for barban, difenzoquat and diclofop respectively. Treatments were replicated three times in a complete block design.

Diclofop + W.A. resulted in quicker burndown of the wild oat plant but also had less crop tolerance as shown by crop biomass (accompanying table). Reduction in crop tolerance by diclofop + W.A. as compared to diclofop could remove a degree of the potential of this new herbicide in grass cropping systems. R-40244 is an excellent potential herbicide for broadleaf control in cereal grain crops in the Pacific Northwest. Tank-mixed with wild oat herbicides results in increased activity of the wild oat herbicide with a corresponding reduction in crop tolerance as shown by the biomass evaluations. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Effect of postemergence herbicide treatments on crop stand and vigor and wild oat control at Ferdinand, Idaho.

		June 6, 1978 Percent				June 29, 1978 Percent			
	Rate	Crop		Wild Oat		Crop stand		Wild Oat Control	
Treatment	lb a.i./A	VR[1/]	SR[2/]	VR	SR	count	Biomass	Biomass	visual
diclofop	.63	0	0	62	18	129	176	96	97
diclofop	.75	0	0	72	22	124	184	97	99
diclofop	1.0	0	0	85	28	153	170	100	99
diclofop plus	.63	3	0	90	42	135	168	99	99
diclofop plus	.75	2	0	82	48	116	153	100	100
barban	.50	8	8	30	2	108	133	42	42
difenzoquat	.75	2	0	45	5	122	160	92	89
difenzoquat	1.0	3	0	35	17	144	163	86	85
R-40244	.50	7	0	3	0	97	95	18	7
R-40244	1.0	8	0	7	0	110	111	30	17
Barban + R-40244	.5 + 1.0	13	2	32	3	106	128	66	35
diclofop + R-40244	1.0 + .5	10	0	83	25	123	183	100	98
diclofop + R-40244	1.0 + 1.0	10	0	85	25	107	126	99	99
difenzoquat + R-40244	1.0 + 1.0	32	0	43	15	121	101	92	72

1/ vigor reduction

2/ stand reduction

Herbicide combinations for wild oat and broadleaf weed control in winter wheat. Lee, G. A., G. A. Mundt and W. S. Belles. The study was in combination with bromoxynil, bromoxynil + MCPA and MCPA for wild oat and broadleaf weed control in winter wheat. An objective of the investigation was to measure any antagonistic influence of the herbicides included for broadleaf control on the activity of barban for wild oat control. Herbicide treatments were applied when the wild oat plants were in the 1- to 2-leaf stage and in the 3- to 4-leaf stage of growth.

Each plot was 9 ft. by 30 ft. and replicated three times in a completely randomized block design. A knapsack sprayer equipped with a three nozzle boom was used to apply the herbicide in a total volume of 5 gpa. Flat fan 8001 teejet stainless steel nozzles, 40 psi boom pressure, and 5 mph ground speed were used to attain delivery rate. At the time of herbicide application, field pennycress, gromwell and henbit were in the early bloom stage of growth. Nugaines winter wheat was in the 5-tiller stage at the first treatment date on May 1, 1978 and in the early-boot stage at the second date of herbicide application on May 21, 1978. The air temperatures were 62 F and 62 F and the soil temperatures at 4 inches were 61 F and 59 F at the first and second application dates, respectively. The soil at the study location is classified as a Palouse silt loam. Split applications of barban were made at a 14-day interval. Herbicide treatments for only broadleaf weed control were applied on May 21, 1978.

Split applications of barban with bromoxynil included in either the first or second application resulted in the best wild oat control in the study. No treatment resulted in over 63 percent wild oat control. This may be attributed to the dense stand of winter wheat intercepting the spray droplets before reaching the wild oat plants below the canopy. Comparison of wild oat control obtained with barban alone or in combination with herbicides for broadleaf weed control indicates that there was no antagonism resulting from tank mixing the two types of herbicides. In general, better broadleaf weed control was obtained with the later applications. The foliage of the broadleaf weeds had extended to the height of the wheat canopy and better spray coverage and contact was achieved. Barban as a single application alone or in combination with the herbicides for broadleaf control did not give adequate control of the wild oat population when plants reached the 3- to 4-leaf stage of growth. MCPA (ester), bromoxynil + MCPA and barban + bromoxynil + MCPA (butyrate) applied when the winter wheat was in the early boot stage resulted in the greatest crop phytotoxicity. Yields from all herbicide-treated plots except those treated with barban/barban + bromoxynil were higher than yields from the nontreated check (Idaho Agric. Exp. Sta., Moscow).

Effect of herbicide combinations on wild oat and broadleaf weed populations at Tensed, Idaho.

Treatment Treatment	Rate lb/A	% Vigor Reduction Wheat	Percentage Control: Wild Oat	Percentage Control: Grom-well	Percentage Control: Field Pennycress	Percentage Control: Henbit	Wheat Yield bu/A
Check	-	0	-	-	-	-	38.7
<u>Applications Made 5/1/78</u>							
barban	.375	7 c[2]	7 c	0 b	0 d	0 d	45.9
barban	.5	17 bc	30 ac	0 b	7 d	10 cd	45.3
barban + bromoxynil	.375+.5	10 bc	33 ac	99 a	90 ab	96 a	46.2
barban/barban	.375/.375	7 c	33 ac	0 b	3 d	0 d	49.8
barban+bromoxynil/barban	.375+.5/.375	20 bc	62 a	99 a	50 bc	50 bc	45.6
barban/barban+bromoxynil	.375/.375+.5	20 bc	63 a	79 a	66 ab	66 ab	36.7
barban/barban+bromoxynil+MCPA	.375/.375+.25+.25	7 c	47 ab	99 a	96 a	96 a	39.8
barban/barban+MCPA (ester)	.375/.375+.5	20 bc	48 ab	33 b	93 a	57 ab	41.9
<u>Applications Made 5/21/78</u>							
barban	.375	7 c	37 ac	0 b	0 d	3 d	48.3
barban	.5	15 bc	32 ac	7 b	15 cd	11 cd	50.1
barban+bromoxynil	.5+.5	10 bc	33 ac	89 a	89 ab	89 ab	39.8
barban+bromoxynil+MCPA	.5+.25+.25	10 bc	53 ab	99 a	99 a	99 a	47.6
barban+MCPA (ester)	.5+.5	17 bc	47 ab	83 a	83 ab	83 ab	52.1
bromoxynil	.5	22 bc	0 c	99 a	99 a	99 a	45.2
brmoxynil+MCPA	.25+.25	27 b	0 c	99 a	99 a	99 a	51.5
MCPA (ester)	.5	23 bc	0 c	66 a	66 ab	66 ab	50.1
barban+bromoxynil+MCPA[1]	.5+.25+.25	33 a	60 a	99 a	99 a	99 a	43.4

[1] Mixture of bromoxynil + MCPA is butyrate formulation.

[2] Means within the same column with the same letter are not significantly different at the .01 level.

Effect of preplant incorporated herbicides on downy brome control in winter wheat. Mundt, G. A., G. A. Lee, T. M. Cheney. A study was initiated near Moscow, Idaho to determine the potential of several candidate herbicides for downy brome control in winter wheat (variety Nugaines). Diclofop and R-40244 were applied preplant incorporated on October 13, 1977. Cycloate, vernolate and triallate granular were applied preemergence surface on November 8, 1977. A knapsack sprayer equipped with a three-nozzle boom was used to apply the herbicides in a total volume of 40 gpa. Flat fan 8004 TeeJet stainless steel nozzles, 40 psi boom pressure and 3 mph ground speed were used to attain delivery rate. Each plot was 9 by 30 ft. and replicated three times in a randomized complete block design. Visual evaluations were taken June 8, 1978 comparing crop and weed counts in the treated plots to the untreated check plots. Counts were obtained using a 6 inch x 5 ft. quadrate subsample of the breakdown.

Diclofop in combination with R-40244 at rates of .25, .50, .75 and 1.0 lb a.i./acre showed the greatest control of downy brome while increasing the percent yield significantly. Vernolate 10G at 3.0 lb a.i./acre showed a slight increase in yield while failing to control the downy brome. By comparison, diclofop in combination with R-40244 provided the most commercially acceptable control of downy brome and an economic increase in yield. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Effect of preplant incorporated herbicides on winter wheat and downy brome at Moscow, Idaho.

Treatment	rate #/acre	% Crop Ht.	% Downy Brome Ht.	% Crop Stand	% Downy Brome Stand	Bu/A	% Yield
diclofop(PPI)	1.0	113	28	128a,e[1/]	66ad	30	107
diclofop(PPI)	2.0	119	80	128a,e	80a,c	28	108
diclofop + R-40244(PPI)	1.0 + .25	117	52	125a,e	93a	29	112
diclofop + R-40244(PPI)	1.0 + .5	111	43	150a,b	87ab	26	134
diclofop + R-40244(PPI)	1.0 + .75	120	42	120b,e	92a	31	119
diclofop + R-40244(PPI)	1.0 + 1.0	112	62	134a,d	90a	34	129
R-40244(PPI)	.5	115	107	133a,e	40b,e	29	109
cycloate 10G(PES)	2.0	111	66	134a,d	74a,c	30	113
cycloate 10G(PES)	3.0	91	128	136a,c	35c,e	26	98
cycloate SL(PES)	2.0	108	54	159a	34c,e	28	103
cycloate SL(PES)	3.0	130	131	131a,e	40b,e	28	104
vernolate(PES)	2.0	122	91	134a,e	41b,e	26	95
vernolate(PES)	3.0	119	115	142a,b	23d,e	32	119
triallate(G)	1.25	110	141	126a,e	58a,e	29	107
check	0					27	

1/ Means followed by the same letter are not significantly different at the .05 level by Duncan's mean separation.

Canarygrass control in Crane 56M durum wheat. Howell, Don R., E. Stanley Heathman, Jr., and Steven D. Watkins. Three herbicides and one combination of herbicides were evaluated for control of canarygrass in Crane 56M durum wheat drilled on the flat and border irrigated. The soil was silt loam. Canarygrass was the only weed present and the population ranged from 3 to 7 plants per square foot at application time. Most were in the 3-leaf stage and were beginning to tiller. The herbicides were applied to the foliage of the 7 inch tall wheat and canarygrass on January 27, 1978. The wheat was planted and irrigated up on December 14, 1977. All herbicides were applied with a knapsack compressed air sprayer. Plot size was 30 by 30 feet in a latin square design with 5 replications. Diclofop and metribuzin were applied in 20 gallons per acre of water, while barban and the barban plus difenzoquat tank mix were applied in 6 gallons per acre of water. Harvest was by hand on May 24th by sampling each plot with a 1/10,000 acre quadrant. The number of canarygrass seed heads was counted at this time also. A Vogel thresher was used to thresh the samples. The resulting grain was weighed and used to compute yield per acre. A composite sample, which included all replications for each treatment, was submitted to a commercial lab for quality determinations. The barban plus difenzoquat treatment reduced yields, bushel weight and caused considerable stunting and delayed maturity as compared to the treatment of barban alone. Difenzoquat alone affected Crane 56M wheat similarly in other trials. Barban provided the highest yield of wheat and excellent control of canarygrass. (University of Arizona, Cooperative Extension Service, 1047 Fourth Avenue, Yuma, Arizona 85364, Plant Sciences Department, Tucson, Arizona 85721, and Agronomist, Barkley Company of Arizona, Somerton, Arizona 85350).

Percent stunting, bushel weight and yield of Crane 56M durum wheat and percent control of canarygrass with post-emergence herbicides at San Luis, Az.

		Wheat			Canarygrass	
Treatment	Rate lb/A	Composite bushel wt. in lbs.	Avg. % stunting April 24	Yield lb/A	Number seedheads[1/]	Percent control
barban	0.375	62.7	0	6,759 a[2/]	3.2 a[2/]	98
barban + difenzoquat (tank mix)	0.375 1.000	60.9	27	4,362 b	8.4 a	96
diclofop	1.500	63.2	0	5,581 ab	5.0 a	96
metribuzin	0.188	63.4	0	5,506 ab	14.8 a	89
Untreated check	-	63.0	0	4,486 b	137.4 b	0

1/ Counts from quadrants at harvest.

2/ Means in the same column followed by the same letter are not significantly different at the 5% level of probability.

PROJECT 6

AQUATIC AND DITCHBANK WEEDS

D. E. Seaman - Project Chairman

SUMMARY -

Water analyses after a copper sulfate application to a California aqueduct showed that most of the copper became unavailable for algae control. Only about 1% of the applied copper remained in the algicidal ionic form 13 miles from the application site. Aerial applications of copper sulfate controlled filamentous algae without copper accumulation in Lake Solano, California, and about 50% of the applied copper concentration was found in effluent canal water 5.6 miles from the lake's outlet.

An ethylenediamine complex of copper (KOMEEN) killed elodea in jar tests at 1, 2 or 4 ppmw copper ion with corresponding minimum exposure times of 8, 4 and 4 hours, respectively. In 4-week jar tests, elodea was killed at 1 ppmw copper ion or more, while at least 4 ppmw was required for acceptable control of pondweeds and watermilfoil. KOMEEN treatments of small California ponds at 1 or 2 ppmw copper ion gave poor to complete control of pondweeds and complete control of elodea, coontail, southern naiad and eurasian watermilfoil.

Jar tests in California showed that fluridone controlled American and sago pondweeds best when applied shortly before or soon after these weeds emerged from winter buds or tubers in the hydrosoil. Experiments in Colorado showed that growth of these weeds was stunted severely by fluridone in the light but not in the dark, and that the uptake of fluridone was not dependent on light nor was it translocated from roots or shoots of American pondweed.

Reports on the aquatic weed competitor dwarf spikerush provided information on the morphology and germination of its seeds and tubers and showed that these reproductive structures survived temperature extremes better when damp-dried than when wet. Another biological control agent, mirror carp, was found to control American and leafy pondweeds in a California pond by increasing water turbidity rather than by feeding or uprooting.

Laboratory experiments in Colorado showed that low concentrations of copper sulfate increased the movement of dichlobenil, diquat, silvex and 2,4-D through isolated epidermal tissue of American pondweed. Submersed leaves of this weed were found to permit greater penetration of 2,4-D, fluridone and hexazinone than did its floating leaves, but atrazine and simazine penetrated floating leaves nearly as well as submersed leaves. Abscisic acid inhibited sprouting of American pondweed winter buds at 2×10^{-5}M or higher and induced floating leaf formation at lower concentrations, but these effects were reversed by addition of either gibberellic acid or cytokinins.

Hexazinone at 1 ppmw killed American and sago pondweeds rapidly in a small Colorado pond, but chara and elodea took longer to succumb. Hydrosoil bioassays indicated that hexazinone did not persist in phytotoxic amounts as long as 15 months after treatment.

Experimental simazine applications to canal banks for controlof annual weeds resulted in canal-water residues within established tolerances for potable water, and crop tolerance studies indicated that several crops would not be affected adversely by such residues of simazine in irrigation water.

Reed canarygrass competed severely with the establishment of desirable creeping red fescue and redtop on ditchbanks, but glyphosate controlled reed canarygrass selectively in mixed stands of these perennial grasses at Prosser, Washington. Among 62 varieties of creeping red fescue, several showed greater resistance to glyphosate than variety Boreal.

PAPERS -

Chemical states of copper used to control algae. Frank, P.A. and N. Dechoretz. Copper sulfate is used widely for control of algae in domestic and irrigation water. The effectiveness of copper treatments is influenced strongly by pH, alkalinity, suspended sediments, and chelating capacity of dissolved substances in the water. There is broad agreement that the efficacy of copper treatment for control of algae is wholly dependent upon the fraction of copper that remains in the ionic state. Consequently, application rates required and the efficacy of copper as an algicide may be predicted for water of known characteristics. This report summarizes preliminary studies carried out to establish these relationships in water diverted from the Sacramento River Delta into the concrete-lined South Bay Aqueduct for irrigation and municipal uses.

Copper sulfate pentahydrate was applied continuously over a period of several hr. near the diversion site. The quantity of copper sulfate applied was calculated to produce a concentration of 1 ppmw ionic copper. Samples of the treated water were taken at regular intervals at sites 0.65, 6.23, and 13.12 miles downstream from the site of application. Analyses for copper were made by specific ion electrode and atomic absorption spectrophotometer. The various fractions of copper determined for the different sampling locations are given in the accompanying table.

The concentration of total copper at the first sampling site was 0.84 ppmw. This was reduced to 0.58 ppmw by the time the water reached the final sampling site. About 50% of this was in the form of particulate copper (attached to sediment) that could be filtered from solution. This fraction was the most stable and was reduced very little as water flowed down the aqueduct. The largest fraction of soluble copper was in the form of carbonate. Initially, the particulate and carbonate states represented 89% of the total copper. At the final sampling site, about 12.5 miles downstream, the sum of these fractions still amounted to 83% of the total copper. This is significant because these fractions of copper are not phytotoxic to algae. The copper complexes formed with organic ligands are also reported to be nontoxic.

The phytotoxic copper, that in the ionic state, was the smallest fraction of all. At the first sampling site, it represented 3.6% of the total copper, and at the final sampling site, only slightly more than 1%. Of the total copper applied, only a very small portion was in a state that was effective for control of algae. This was somewhat surprising because, at the time the copper treatment was made, the quality of water was considered to be good with a pH of 7 and bicarbonate concentration of 48 ppmw. (U.S. Department of Agriculture, Science and Education Department, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Maximum concentration of various states of copper in South Bay Aqueduct after an application of copper sulfate

	Copper concentrations (ppmw)[1/]				
Sampling sites miles downstream	Total copper		Soluble copper fractions		
	Particulate copper	Soluble copper	Copper ion	Copper carbonate	Organic ligands and other
0.65	0.41	0.43	0.03	0.34	0.06
6.23	0.36	0.37	0.022	0.32	0.028
13.12	0.35	0.23	0.007	0.13	0.093

1/ Average of three replicates.

Residues of copper in South Putah Canal following the application of copper sulfate for control of algae. Dechoretz, N. and P. A. Frank. Aerial applications of copper sulfate were used to control filamentous algae in Lake Solano. The procedure followed was to apply 1.0 ppmw of copper sulfate (0.25 ppmw copper ion) in the form of granules to one half of the lake about 6:00 A.M. A second application of copper sulfate at the same rate was made to the other half of the lake about 2:00 P.M. on the same day. This procedure was followed for a period of 4 days. After 4 days the entire lake was treated with 4 ppmw of copper sulfate (1.0 ppmw copper ion).

A study covering a period of several days was made to determine the concentrations of copper in water entering the canal at the diversion dam and at distances of 3.77 and 5.6 miles downstream from the diversion dam.

Sampling at locations 0.18 and 3.77 miles began at 0.5 and 1.0 hr after treatment, respectively. Sampling at each of these two locations continued at 0.5 hr intervals for 8 hr. Sampling at the location 5.6 miles downstream from the diversion dam began 3 hr after the copper application was completed and continued at hourly intervals for 8 hr. Water samples were taken in duplicate, acidified immediately with HNO_3 and taken to the laboratory for analysis by atomic absorption spectrophotometry.

The highest level of copper in the water entering South Putah Canal from Lake Solano was approximately 70% of the concentration applied to the lake (see accompanying table). The dissipation rate of copper in the South Putah Canal was quite low. Residues of copper at the 5.6 mile location were still approximately 50% of the concentration applied to Lake Solano.

This procedure was very effective in controlling filamentous algae. There was no evidence of buildup of copper in Lake Solano. In the series of treatments, the concentration of copper in the water following one treatment always reached the normal background prior to the next application of copper sulfate. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Maximum copper concentration at several sampling sites in Putah South Canal

	Copper concentration in ppmw[1/]		
	Miles downstream from diversion dam		
Time of treatment	0.18	3.77	5.60
6:00 A.M.	.17	.16	.14
2:00 P.M.	.18	.14	.12

1/ Averages of 4 highest concentrations.

Response of elodea to various concentrations and exposure periods of Komeen. Frank, P.A. and N. Dechoretz. These experiments were carried out to determine the optimum concentrations and exposure times required for control of elodéa with Komeen. Tests were made using standardized procedures for static water assays. Four-week-old transplants of elodea were placed in glass jars containing 20 l of water. Komeen was thoroughly dispersed in the water in quantities to provide treatment rates of 1.0, 2.0, and 4.0 ppmw of ionic copper. Contact or exposure periods established were 1, 2, 4, 8, 12, and 24 hr. At the end of each exposure period, the plants were removed from the treated water, rinsed for 30 min in running water, and then held for observation in 75-l tanks of fresh water. Ratings for efficacy of Komeen were made weekly for 4 weeks.

The criteria for successful treatment were complete or near complete control within a period not exceeding 2 weeks. The minimum period of exposure for acceptable control (93%) in the 1 ppmw treatment was 8 hr. In treatments employing 2 ppmw of copper ion, only 4 hr of contact time were required to obtain control of elodea. These results suggested that a concentration x exposure time factor may be involved. However, this was not confirmed in the treatments made with 4 ppmw of copper ion. Although substantial control (70%) was obtained by 2 hr of contact, satisfactory control (93%) required 4 hr of exposure to 4 ppmw of copper.

The pattern of phytotoxicity was leaf discoloration and defoliation followed by destruction of the stem tissues. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Effect of three concentrations of Komeen and four exposure periods on control of elodea

Rates of Komeen (ppmw copper ion)	Exposure time (hr)	Percent control: Weeks after treatment 1	2	3	4
Control		0	0	0	0
1.0	1	20	50	50	57
	2	27	47	50	50
	4	40	67	70	70
	8	40	93	93	100
	12	53	87	87	97
	24	83	100	100	100
2.0	1	33	50	60	70
	2	40	63	70	90
	4	70	97	100	100
	8	80	97	97	93
	12	93	97	100	100
	24	100	100	100	100
4.0	1	40	53	80	80
	2	73	70	87	87
	4	93	100	100	100
	8	100	100	100	100
	12	100	100	100	100
	24	100	100	100	100

Evaluation of Komeen for herbicidal activity on vascular aquatic weeds. Dechoretz, N. and P.A. Frank. Laboratory tests were conducted to determine the herbicidal activity of Komeen on elodea, American pondweed, sago pondweed and Eurasian watermilfoil. Assays for phytotoxicity were made by placing one pot of each of the rooted plants into 20 l of water containing the herbicide. The concentrations of Komeen used in this experiment ranged from 0.25 to 4.0 ppm of copper ion. Each treatment was replicated three times. The degree of phytotoxicity was based on visual observations of the plant response made at weekly intervals for 4 weeks. A rating scale of 0 to 10 was used in which 0 = no injury and 10 = dead plants.

Komeen was very toxic to elodea. Although acceptable control was attained at 0.25 ppmw, a significant amount of regrowth (greater than 50% of original biomass) was observed after 4 weeks. Slight elodea regrowth (less than 10% of original biomass) was observed in containers treated at 0.50 ppmw, and no regrowth was observed in containers treated at concentrations of 1.0 ppmw or greater. Komeen at 1.0 and 2.0 ppmw was only moderately toxic to the other test species. Concentrations of 4.0 ppmw copper ion were necessary to obtain acceptable control of pondweeds and watermilfoil. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Evaluation of Komeen for herbicidal activity

	Weed response 1/			
Treatment rate ppmw copper ion	Elodea	American pondweed	Sago pondweed	Eurasian watermilfoil
0.25	7.7(7.3) 2/	2.0(1.3)	1.7(0.8)	2.3(1.3)
0.50	10(9.4)	2.7(2.5)	3.3(2.8)	4.0(3.5)
1.0	10(9.9)	4.0(3.8)	7.0(4.2)	6.7(4.4)
2.0	10(9.9)	5.7(4.9)	6.7(4.5)	7.3(4.7)
4.0	10(9.9)	8.0(6.1)	9.0(5.8)	8.0(6.5)

1/ Response of weeds based on 0 to 10 scale - 0 = no response, 10 = dead.

2/ Figures within parentheses are averages of 4 weekly ratings. Figures not in parentheses are final ratings made at the end of 4 weeks.

Evaluation of Komeen for aquatic weed control in small ponds. Dechoretz, N. and P.A. Frank. Komeen was applied to 4 small ponds to determine the effectiveness of the herbicide on aquatic weeds. Pond size, treatment rates and weeds present prior to treatment are shown in the accompanying table.

Kerkham pond. Weed growth infested 100% of the pond surface. Elodea and sago pondweed were completely controlled 1 and 2 weeks after treatment, respectively. After 4 weeks, approximately 50% of the original American pondweed infestation was slumped to the bottom of the pond. Komeen did not effect fish in the pond.

Facility pond NO. 1. Sago pondweed infested 95% of the pond surface while the remaining 5% was comprised of other species listed in the table. Within 10 days after treatment with Komeen all the plant material was slumped to the bottom. After 14 days the plants were in an advanced state of decay. Sago pondweed regrowth was observed by the 28th day after treatment and retreatment was necessary after 42 days. The other plant species present when the pond was treated did not recover.

Facility pond NO. 2. Poor weed control was obtained in this pond. The only noticeable herbicidal activity on the pondweed occurred 10 days after treatment when the pondweed growth had turned brown. The plants did not slump to the bottom and new growth was observed within 28 days after treatment.

Riverbend pond. Curlyleaf and horned pondweeds infested approximately 50 and 10% of the pond, respectively. Less than 5% of the pond was infested with coontail and watermilfoil. Maximum curlyleaf pondweed control occurred 8 days after the treatment and was estimated to be 80%. Fourteen days after treatment, all the watermilfoil and coontail was slumped to the bottom. Komeen had no noticeable effect on horned pondweed in this situation. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Small ponds treated with Komeen for the control of aquatic weeds

Pond	Surface area of pond in acres	Average depth in ft.	Treatment rate ppmw of copper	Weed species present
Kirkham	0.37	4.0	1.0	Sago pondweed American pondweed Elodea
Facility Pond NO. 1	0.39	3.0	2.0	Sago pondweed Horned pondweed Curlyleaf pond-weed Southern naiad Eurasian water-milfoil
Facility Pond NO. 2	0.39	3.0	1.0	Sago pondweed
Riverbend	0.16	1.0	1.0	Curlyleaf pond-weed Horned pondweed Coontail Eurasian water-milfoil

Relationships of stage of growth of American and sago pondweeds to phytotoxicity of fluridone. Frank, P.A. and N. Dechoretz. Greenhouse and field studies have shown fluridone to be an effective aquatic herbicide; however, periods of 6 to 8 weeks are sometimes required for complete weed control. This work was carried out under greenhouse conditions to establish some of the factors responsible for the extended periods required for control of certain aquatic weeds with fluridone.

Four sago pondweed tubers and four American pondweed winterbuds were planted in 20 liter glass jars containing 7.5 cm of silty clay loam soil. The jars were filled with water and fluridone added to produce treatment rates of 1 ppmw. Some containers were treated immediately after planting the pondweeds. The remaining containers were treated at 2, 7, 14, or 21 days after emergence of the pondweeds from the soil.

Fluridone was observed to be very effective on pondweeds when applied to water as a preemergence treatment. The observed phytotoxic effects were emergence of chlorotic plants, severe retardation of growth, and eventual death of the plants.

Two and 7-day-old plants became chlorotic 4 days after treatment. Plant growth ceased and the plants decomposed about 7 days after treatment.

Fourteen and 21-day-old plants were more tolerant of fluridone than 2 or 7-day-old plants. Except for chlorosis of the leaf tips, the older plants appeared normal 4 weeks after treatment. For best results with fluridone for control of pondweeds, treatments should be made shortly before, or soon after, emergence of the plants. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Morphological development and germination of the reproductive structures of the aquatic weed competitor, dwarf spikerush. Yeo, R.R. The morphology of seed and tubers of dwarf spikerush was examined at the light and scanning electron microscope levels. The inflorescence was found to bear 3 to 12 florets that matured acropetally. The average number of achenes that matured on inflorescences having this range of florets was four. The pericarp of seed was made up largely of rows of annulated cells covered with a water-soluble wax-like substance that leached away when stored in water at 4 to 6 C. The seed coat consisted of three layers. Each layer contained lipids, giving evidence that they were composed of cutin. When the seed germinated the cotyledonary sheath emerged first, followed by the culms. Tubers formed and matured in about 30 days. The shoot apices of tubers each had two buds that were protected by five to seven overlapping membraneous leaf scales. When tubers sprouted, the longest bud grew first. The second bud contained the leaf primordia. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Survival of seed and tubers of the aquatic weed competitor, dwarf spikerush, after exposure to extreme temperatures. Yeo, R.R. and J.R. Thurston. Seed and tubers of dwarf spikerush were studied to determine their ability to survive extreme temperatures. Both types of propagules were exposed to a broad range of temperatures while either wet or damp-dried. They survived extreme cold and hot temperatures if damp-dried during exposure. Damp-dried seed survived 14 days exposure to -196 C or 21 days exposure to 72 C and then germinated 59 and 24%, respectively. Seed exposed to extreme temperatures while submersed in water germinated 20% when exposed to -15 C for 30 days and 4% when exposed to 60 C for 3 days. Germination of damp-dried seed was nearly twice that of wet seed that were warmed at 37 C for 21 days. Tubers that were damp-dried before exposure survived -196 C for 14 days and 49 C for 21 days and germinated 20 and 49%, respectively. Tubers that were exposed wet to both hot and cold temperatures were killed at less extreme temperatures than seed. Only 2 and 97% of the tubers exposed wet survived -10 C for 30 days and 37 C for 21 days, respectively. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Control of rooted submersed aquatic weeds with omnivorous fish: mirror carp. Yeo, R.R. and J.R. Thurston. Mirror carp, 3 cm long, were stocked at 741 fish/ha in a farm pond infested with leafy and American pondweeds to evaluate their efficacy on these weeds. The weeds persisted for the remainder of 1977. The water became increasingly turbid during the winter months and continued to be turbid throughout 1978. Some stunted growth of leafy pondweed was observed in March and April of 1978, but disappeared shortly thereafter. Lack of weeds in exclosures that were maintained to keep out the fish indicated control was due to turbidity rather than feeding or uprooting. (U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Botany Department, University of California, Davis, CA 95616)

Simazine residues in canal water and crops resulting from experimental application for ditchbank weed control. Pringle, J. C., L. W. J. Anderson, N. E. Otto, R. W. Raines, and U. T. Jackson. Field studies determined the quantities of simazine found in irrigation water after experimental ditchbank treatment for weed control. Simazine applications to watered and dewatered canal banks were made at 2.25 and 4.5 kg/ha to provide selective control of annual weeds. Simazine levels in flowing canal water immediately following herbicide application did not exceed 60 µg/L. First flow water samples taken in the spring from canals treated when dewatered the previous fall showed a peak concentration of 250 µg/L within the treated reach, which was diluted to $<$ 5 µg/L immediately downstream. To determine residues that might accumulate in crops from canal waters containing low levels of simazine, a field study was initiated in which six crops representing nine commodity groupings were sprinkler and furrow irrigated with water containing 0.01 and 0.1 mg/L simazine. Crops harvested at 7 and 30 days after treatment revealed no detectable simazine residues in corn grain, pinto bean pods and foliage, or in cucumbers. Trace amounts ranging from 0.5 to 2.9 µg/L were found in sugar beets, corn foliage and tomatoes. Sugar beet foliage sprinkler irrigated with simazine at both rates contained 5 µg/L at 7 days after treatment. Alfalfa sprinkler irrigated with 0.1 mg/L simazine contained 6.4 µg/L, which was the largest residue found in crop samples. Water residue levels resulting from our applications of simazine to inside slopes of canals were within established tolerances for potable water and probably would not impact adversely on crops and nontarget aquatic organisms. (USDA, USBR, FWS Cooperative Res. Lab., Denver, CO.: REC-ERC-78-1).

Conditions affecting phytotoxicity of fluridone on American pondweed and sago pondweed: duration of exposure, requirement for light, uptake and translocation. Anderson, Lars W. J. Germinating winterbuds of American pondweed and sago pondweed were exposed to the pyridinone herbicide fluridone at 1.0 ppmw for varying lengths of time under light or dark conditions in hydroponic culture, and effects on chlorophyll content and stunting of growth also were assessed. Significant stunting was not observed until about four to five weeks after treatment. Exposure to 1.0 ppmw fluridone in the dark for 14 days did not result in stunting, while light-exposed plants were severely stunted. The amount of ^{14}C-fluridone retained by germinating winterbuds was not significantly different in plants exposed in the light or dark for 1, 2, or 14 days. Results suggest that light dependency is not related to uptake of fluridone, but rather to other light-dependent responses, probably involving biosynthesis of pigment systems. Roots and shoots of mature American pondweed plants also were exposed to ^{14}C-fluridone separately using a root/shoot compartmentation apparatus. After 10 days exposure to labeled fluridone, autoradiograms showed that little or no translocation of fluridone occurred from shoot or root applications. Uptake and retention were localized where the fluridone contacted the plant tissue. (USDA, SEA-AR, Aquatic Weed Research, Denver, CO).

Movement of herbicides through isolated American pondweed epidermal tissue and whole leaf sections. Pringle, J. C. Jr., and L. W. J. Anderson. Enzymatically isolated American pondweed epidermal tissues were exposed to ^{14}C-labeled dichlobenil, diquat, silvex, and 2,4-D at concentrations of 5×10^{-4}, 5×10^{-5}, and 5×10^{-6} M and the amount of herbicide crossing the tissue layer was measured. Rates of herbicide movement were compared to those found when copper in the form of copper sulfate was added as a synergist at concentrations of 5×10^{-5}, 5×10^{-6}, and 5×10^{-7} M. One notable example of the almost universal increase in herbicide penetration following the addition of copper was that of diquat at a concentration of 5×10^{-6} M. Without copper, only 0.31 nM of an equilibrium potential of 2nM of ^{14}C diquat had penetrated the membrane within 48 hours, compared to 1.4 nM following the addition of 5×10^{-7} M of copper.

Exposure of submersed and floating leaf-sections of American pondweed to 5×10^{-6} M concentrations of ^{14}C-labeled simazine, atrazine, 2,4-D, hexazinone and fluridone showed marked differences in herbicide penetrability between the leaf types. Floating leaf sections permitted only 1.6, 3.04 and 2.5 percent, respectively, of the total 2,4-D, hexazinone and fluridone to pass through their adaxial surfaces, while 25.9, 25.6 and 8.96 percent of these herbicides, respectively, passed through adaxial surfaces of submersed leaf-sections in 24 hours. The difference was less evident with simazine and atrazine. After 24 hours, 9.0 and 20.25 percent, respectively, of the total simazine and atrazine had passed through the adaxial surfaces of floating leaf sections, while only 12.7 and 21.8 percent, respectively, passed through the adaxial surfaces of submersed leaves. (USDA, SEA-AR, Aquatic Weed Research, Denver, CO).

Studies on the effects of various plant growth regulators on the development and leaf morphology of American pondweed. Anderson, L. W. J. Effects of gibberellic acid, abscisic acid (ABA), and some cytokinins on sprouting and leaf development of American pondweed winterbuds were investigated. ABA at concentrations of 2×10^{-5} M or higher prevented sprouting of cold-stored winterbuds. ABA at lower concentrations (5×10^{-6} to 5×10^{-5} M) did not completely inhibit sprouting, but sprouting plants were induced to form floating-type leaves, which normally are only found on mature plants. The addition of gibberellic acid or cytokinins to ABA at the lower concentrations counteracted this ABA-induced floating leaf formation. When ABA was applied at concentrations that normally inhibit sprouting in combination with either gibberellic acid or cytokinins, inhibition of sprouting was counteracted. Efforts are underway to isolate and quantify levels of abscisic acid and other hormones in American pondweed during various developmental stages. (USDA, SEA-AR, Aquatic Weed Research, Denver, CO. See Science, Vol. 201, No. 4361, p.1135-1138, 22 September 1978).

Small pond application of hexazinone (Velpar^{R}), a triazine herbicide, for control of submersed aquatic weeds. Anderson, L. W. J. Two 0.2-acre (0.08 ha) ponds each with a mean depth of 1.22 meters, were used to study the efficacy of hexazinone in the control of submersed aquatic weeds. The aquatic weeds present were cattail, elodea, American pondweed, sago pondweed, *Chara* sp. and *Spirogyra* sp. An identical pond containing the same species' distribution was used as an untreated control. Hexazinone was applied at 1 ppmw as a 90% soluble powder formulation and delivered by a rotary gear pump through a 1.22 m spray boom held 0.3 m below the surface of the water. Efficacy was evaluated by (1) visual ratings of damage to the weeds present before the trial, and (2) visual ratings of damage to introduced American and sago pondweeds. The introduced plants were germinated from winterbuds in 0.3 by 0.3 by 0.15 m wood flats containing soil. Flats were maintained submersed in a greenhouse for two weeks following planting of winterbuds. One flat of each species was placed in four randomly selected 9 by 9 m grids in the control and treated ponds. Treatment with hexazinone was made 7 days after flat placement. The flats were observed at two-week intervals and photographed at the end of the 100-day observation period, and the number of winterbuds produced in each flat was determined.

For visual observations, a code system was used to describe the condition of each species. This system was used instead of a typical "one to ten" rating in order to better record the symptomatic responses of the various weeds to the action of hexazinone.

Water quality measurements. A portable instrument was used to make bi-weekly analysis of pH, dissolved oxygen (D.O.), temperature and conductivity (Hydrolab Surveyor 6D). Bi-weekly water samples were taken in duplicate for determination of hardness, alkalinity, and nitrates, phosphates, silicate levels. Nitrate and phosphate levels were determined by an autoanalyzer (Technicon Auto Analyzer II); a Hach-kit was used for the other analyses. At the time of treatment, the following conditions existed in the treated pond: pH 7.8, D.O. 8.0 ppm, total hardness 90 mg/l and temperature 21.5 C. Conditions in the control pond were: pH 8.6, D.O. 9.5 ppm, total hardness 86 mg/l and temperature 21.5 C. (Results of nutrient analyses will be reported elsewhere).

Bioassay for persistence of hexazinone. Samples of hydrosoil and water were taken from the hexazinone-treated pond 15 months after treatment. The following combinations of exposures were made to winterbuds of American pondweed and sago pondweed: "hexazinone-treated" hydrosoil plus tap water, "hexazinone-treated" water plus potting soil, and potting soil plus tap water. Two replicates (5 winterbuds each) for each exposure were planted in clay pots held in 19 l (5 gal) pickle jars in a greenhouse and observed for four weeks.

Results of the treatment are presented in the accompanying table. The two species of pondweed showed the earliest phytotoxicity symptoms followed by Chara. Elodea exhibited the greatest tolerance to hexazinone, but it was completely controlled within three months after treatment. The D.O. concentration in the treated pond dropped from 8.0 ppm to 0.2 ppm 6 days after the hexazinone treatment. This precipitous reduction in D.O. accompanied a fish kill observed four days after treatment. Species killed included rainbow trout and suckers. However, small (1 to 2 cm) minnows appeared to survive the lower D.O. No phytotoxicity was evident in either species following the bioassay for hexazinone persistence in the water or hydrosoil. This indicates that no residue phytotoxic to the two species of pondweed persisted in the water or hydrosoil 15 months after treatment. Root to shoot translocation of hexazinone was indicated by the phytotoxic effects on some cattails growing along the shoreline and by the complete kill of two Russian Olive trees also growing out of the water near the shore. (USDA, SEA-AR, Aquatic Weed Research, Denver, CO).

Summary of Effects of 1.0 ppm Hexazinone on Aquatic Weeds

	POST TREATMENT[1,2]									
	6/30/77									
	7 days		14 days		28 days		45 days		100 days	
	CON	VEL	CON	VEL	CON	VEL	CON	VEL	CON	VEL
Cattail	NC	NC	NC	BRN	NC	BRN, DEC	NC	DEC	NC	NC
American pondweed	NC	DEC	FL	DEC	FL	DEAD	FLO	DEAD	FLO	NC
Sago pondweed	NC	BRN, DEC	GRO	DEC	GRO	DEAD	FLO	DEAD	FLO	NC
Chara sp.	NC	PUR, FLT	NC	DEC	NC	DEAD	NC	DEAD	NC	NC
Elodea	-	NC	-	FLT, DEC	-	DEC	-	DEAD	-	NC
Filamentous algae (Spirogyra sp.)	NC	BRN	NC	DEC	GRO	DEAD	GRO	DEAD	NC	NC
Needle spikerush	-	BRN	-	DEC	-	DEAD	-	DEAD	-	NC

[1]Since effects on individual species did not differ between plots, effects are given by species and not by plot #.

[2]Codes for conditions of weeds:

NC - no change from previous observation
PUR - purple coating present (probably bacterial)
BRN - browning/burning of foliage
DEC - foliage decomposing
GRO - biomass increased
DEAD - complete control
FLT - vegetation now floating, detached
FLO - flowers formed
FL - floating leaves formed

Control of reed canarygrass seedlings in mixed stands of perennial grass seedlings. Comes, R. D. and A. D. Kelley. Seedlings of reed canarygrass are a serious problem when attempting to revegetate denuded ditchbanks in the Pacific Northwest with desirable grasses after a perennial stand has been killed. Previous studies showed that creeping red fescue seedlings grown in a pure stand were moderately tolerant of glyphosate. The objective of this study was to determine the combined effects of competition and glyphosate on the stands of three perennial grass species grown in mixed stands.

The experiment was conducted on arable land to eliminate the hazards associated with experimental plots on ditchbanks. Reed canarygrass was seeded in combination with creeping red fescue, redtop, or a mixture of the two grasses on April 14, 1978. Approximately 8 weeks after emergence (June 23), 1 lb/A of glyphosate was applied to all plant combinations in 30 and 60 gallons of water per acre. Reed canarygrass, creeping red fescue, and redtop averaged 15, 8, and 7 inches tall and had 3.1, 7.8, and 1.5 tillers, respectively, at the time of treatment. Plots were 12 feet by 32 feet and each treatment was replicated four times in a randomized complete-block design. Plots were sprinkler irrigated throughout the season at 1 week intervals.

Within 1 month after application, most foliage of all species was dead or severely injured. By late July, creeping red fescue, and to a lesser extent redtop, began to recover. Because there were no differences between 30 and 60 gallons of diluent per acre, these data are combined in the table. Data recorded on October 31 show that creeping red fescue stands were not reduced appreciably by the treatment. On treated plots, when redtop was combined with reed canarygrass, the stand of redtop was reduced more than 50 percent; when grown in combination with reed canarygrass and creeping red fescue, competition and the herbicide reduced the stand of redtop to only 4 percent. No more than three reed canarygrass plants per plot survived the treatment. Reed canarygrass dominated the untreated plots and nearly eliminated stands of creeping red fescue. No redtop plants survived in untreated plots. (USDA-SEA/AR and Washington State University, Irr. Agri. Res. and Ext. Center, Prosser, WA 99350).

Effect of glyphosate at 1 lb/A and competition on the stands and heights of three perennial grasses

Grass species	Stand (%)	Height (%)
	Treated	
Reed canarygrass +	<1	3
Creeping red fescue	89	12
Reed canarygrass +	<1	6
Redtop	43	8
Reed canarygrass +	<1	11
Creeping red fescue +	91	12
Redtop	4	8
	Untreated	
Reed canarygrass +	91	37
Creeping red fescue	2	9
Reed canarygrass +	84	38
Redtop	0	0
Reed canarygrass +	87	35
Creeping red fescue +	<1	5
Redtop	0	0

Differential response of established creeping red fescue selections to glyphosate. Comes, R. D. and A. D. Kelley. Established creeping red fescue (Boreal variety), a desirable ditchbank grass, is more susceptible to glyphosate than are seedlings. In an attempt to find a selection of this species that is more tolerant of glyphosate than the Boreal variety, 62 plant introductions and four varieties of creeping red fescue were screened for glyphosate tolerance.

Seedlings of each selection were established in the greenhouse. After hardening-off in a lath-house, the seedlings were space planted on 9 inch centers within rows spaced 3 feet apart. Plants were grown in the field for 13 months before any treatments were applied. Treatments were 1 and 2 lb/A of glyphosate applied in mid-May of 1977 and again to the same plots in 1978 or 2 lb/A of glyphosate applied in October of 1977 only. All treatments were applied in 60 gallons of water per acre with a constant pressure knapsack sprayer. In mid-May all selections were one-half to fully headed. Plants were vegetative and had a normal green color in October.

Response of the 62 selections to glyphosate varied widely and data from one or two selections from each country or state where seed was obtained are given in the table. Most selections became established and made vigorous growth at Prosser. After two repeated applications of glyphosate at 1 lb/A, the stand of the various selections ranged from 3 to 93 percent. Selections from Spain, The Netherlands, Yugoslavia and Denmark were most tolerant of this treatment. At the 2 lb/A rate, stands of most selections were reduced more by a single application in October than by two repeated applications in May. Of the commercial varieties tested, Fortress was the most resistant and Pennlawn was the most susceptible to glyphosate. (USDA-SEA/AR and Washington State University, Irr. Agri. Res. and Ext. Center, Prosser, WA 99350).

Response of 21 creeping red fescue selections to glyphosate at Prosser, Washington

Plant introduction or variety	Stand on 10-3-78 (%)			
	Control	1 lb/A	2 lb/A	
		May	May	Oct.
Alaska 349090	100	53	3	0
U.S. 300969	100	70	18	13
Switzerland 234901	88	3	0	0
Poland 287547	100	80	35	15
Sweden 302998	100	60	20	3
Spain 237802	100	93	20	25
Iran 230240	100	28	23	3
Yugoslavia 255428	100	90	38	33
Finland 189285	100	55	8	10
U.S.S.R. 251687	98	83	20	13
Netherlands 237181	100	93	20	23
Denmark 217418	100	88	23	58
Czechoslovakia 182856	100	63	20	10
Germany 235087	78	10	0	0
Germany 234778	100	75	25	25
Canada 303006	100	75	38	23
Canada 236844	75	13	0	0
Boreal	100	48	23	8
Fortress	98	63	13	23
Novaruba	100	48	25	5
Pennlawn	98	30	0	3

PROJECT 7

CHEMICAL AND PHYSIOLOGICAL STUDIES

Howard L. Morton - Project Chairman

SUMMARY -

Eight authors submitted four papers reporting results of research on the non-selective control of annual weeds, seed germination, herbicide residue analysis and interspecific competition of shrubs and grasses.

Velpar gave outstanding non-selective control of an annual weed complex growing at the time of treatment and one year after treatment in Yolo County, California.

Germination of witchgrass was increased by subjecting seeds to 5 weeks of stratification at 5 C, alternate germination temperatures of 25 and 15 C and alternate light and dark periods.

Thin layer chromatography was effective in removing interferring substances extracted from half-shrubs being analyzed for herbicide residues.

Broom snakeweed reduced the growth of sideoats grama, fourwing saltbush and western wheatgrass but not luna pubescent wheatgrass, when grown with these species in the greenhouse.

PAPERS -

Nonselective control of annual weeds with three soil-active herbicides. Smith, N. L. and W. B. McHenry. An abandoned road in Yolo County was chosen to evaluate the effectiveness of oxyfluorfen and 3-cyclohexyl-6-(dimethyl-amino)-1-methyl-S-triazine-2,4(1H,3H)-dione (Velpar) for the control of annual weeds on the roadside. Simazine plus paraquat was also included. Three replications were employed with a plot size of 15 by 15 feet. Treatments were applied April 4, 1974, using a spray volume of 100 gpa. Surfactant at 0.5% by volume was added to all treatments. Weeds present at time of application included ripgut brome, wild oat, wild radish, yellow starthistle, foxtail barley, mustard, California burclover and rattail fescue. Due to the application timing all species, with the exception of yellow starthistle, were in an advanced stage of development. Evaluations the first season were made on the basis of topkill of existing vegetation. Additional evaluations were made following the next rainfall season. Results are shown in the following table. Oxyfluorfen exhibited a much faster but less complete kill of existing vegetation than did Velpar following application. Evaluations made in 1975 following winter rainfall indicate that Velpar at 2 and 4 lb ai/A has considerable residual soil activity. Oxyfluorfen and simazine at the rates tested had little effect on winter annual weeds one year after application. (Cooperative Extension, University of California, Botany Department, Davis, CA 95616).

Control of annual weeds

Herbicide	Rate ai/A	topkill[1] 4/16/74	topkill[1] 5/1/74	seedling control[1] 1/7/75	seedling control[1] 4/15/75
oxyfluorfen	0.25	5.0	6.0	0.7	0.0
oxyfluorfen	0.5	5.3	6.8	0.7	0.7
oxyfluorfen	1	8.0	8.3	0.3	0.7
Velpar	1	3.0	8.0	8.2	4.7
Velpar	2	3.0	9.3	9.8	9.3
Velpar	4	3.0	9.6	9.8	9.8
simazine + paraquat	2 + 1	9.6	9.5	3.3	1.3
control	-	0.0	0.0	0.0	0.0

Data is average of four replications

[1] 0 = no control, 10 = complete control, all plants dead

Seed germination of witchgrass as affected by age, temperature, light, and stratification. Robocker, W. C. and C. L. Canode. When witchgrass is present during establishment of Kentucky bluegrass seed fields, it is usually the dominant plant. After the first year, plants may be absent, although seeds are present, until the field is broken up and replanted. Factors of age, temperature, stratification, and necessity for light that are likely to influence the life span and germination of witchgrass were studied in the laboratory.

In 1977, newly harvested 1977 seeds of witchgrass were stored and germinated at ambient laboratory temperatures with no stratification and with stratification at 5 C for 2 weeks. After dry storage for 1, 3, 6, and 10 months, the nonstratified seed germinated 0.3, 1, 13, and 50%, and the stratified seed germinated 2, 4, 34, and 58%, respectively. These data indicated the degree of postharvest dormancy in witchgrass.

Germination of seeds produced in 1970, 1972, and 1974 was compared in a combined trial in May, 1977. The tabulated data show stratification for 5 weeks and alternating light and dark periods significantly increased germination. A temperature of 20 C appeared to be optimum for 3- and 5-year-old seed. Differences in response to specific temperatures decreased in the 7-year-old seed.

In another trial in November, 1977, seeds from 1970, 1972, and 1974 harvest were stratified for 10 weeks and subjected to 16-hr light at 25 C and 8-hr dark at 15 C (25 and 15 C) vs. the same light and dark periods at a constant 20 C. The alternating temperatures significantly increased germination with an average of 3 years of 50% at 20 C and 82% at 25 and 15 C. (Contribution from the Agricultural Research, USDA, and Wash. Agr. Expt. Sta., Pullman, cooperating.)

Percentage germination of witchgrass seed matured in three different years as affected by stratification at 5 C for 5 weeks, three germination temperatures, and two light regimes

Treatment	Year seed produced[1/]			
	1970	1972	1974	Average[2/]
	1977 germination (%)			
Stratification:				
5 weeks at 5 C	76.6 a	89.4 a	90.5 a	82.5 a
None	51.3 b	58.2 b	49.5 b	51.5 b
Germination temperature (C):				
15	55.8 n	72.4 n	54.4 o	60.7 n
20	60.6 mn	84.4 m	66.2 m	70.4 m
25	62.0 m	64.4 o	58.2 n	61.5 n
Light regimes:[3/]				
No light	55.6 y	69.2 y	54.8 y	59.9 y
16-hr light/8-hr dark	63.4 x	78.4 x	64.0 x	68.6 x
Average[4/]	59.5 b	78.3 a	59.4 b	-

[1/] Numbers in each column, within each group, except averages, not followed by the same letter are significantly different at the 5% level.

[2/] Averages compared over years in respective groups.

[3/] Averages compared over temperature regimes.

[4/] Averages of years compared over other factors.

Cleanup Procedure for Analysis of Herbicides Extracted from Broom Snakeweed, Burroweed, and Creosotebush. Martin, R. D. and H. L. Morton. We extract the herbicides 2,4-D, 2,4,5-T, dicamba and picloram from grasses with acidic acetone and assay the methylated extracts with a gas-liquid chromatograph (GLC) using minimal cleanup. However extracts of burroweed, broom snakeweed, creosotebush and other half-shrubs contain compounds which interfere with the GLC assay. To remove the interferring compounds from extracts of these plants, we use thin layer chromatography plates. After acidic acetone extraction and methylation, the methyl ester derivatives are streaked on a 500-micron-thick silica gel-g plate and developed in benzene. Dicamba, 2,4-D and 2,4,5-T travel about 10 cm from the application area, but picloram moves less than 1 cm. Areas of the plate containing the herbicides are scraped from the plate and eluted from the silica gel with benzene. The eluate is then assayed with the GLC. Recovery rates vary from 80 to 100% depending on concentration and type of herbicide. (U.S. Department of Agriculture, SEA-AR, 2000 East Allen Road, Tucson, AZ 85719)

Broom Snakeweed Competition With Grasses and a Shrub in the Greenhouse. Johnsen, T. N., Jr. and R. M. Madrigal. Broom snakeweed is a widespread, difficult to control, poisonous plant which occurs on many western United States ranges. It often invades and dominates disturbed sites, preventing establishment of many forage species. A study was done in the greenhouse at Flagstaff, Arizona, to determine the effects of snakeweed seedlings on the growth of seedlings of several common forage species used to replant Southwestern pinyon-juniper ranges. The species tested were: fourwing saltbush, a forage shrub, and three forage grasses: luna pubescent wheatgrass, western wheatgrass, and sideoats grama. Seeds were planted in 1-gal cans filled with Springerville clay loam. Each species was grown alone and with broom snakeweed. There were eight replications of the nine species combinations. The study was begun February 3, 1978 and ended on July 1, 1978. General observations and height measurements were done weekly; and the oven dry weight of each species in each treatment was determined at the end. Broom snakeweed markedly reduced the growth of all species but luna pubescent wheatgrass. Broom snakeweed itself was effected by all but fourwing saltbush. It was eliminated by luna pubescent wheatgrass and almost so by western wheatgrass. Fourwing saltbush did not affect broom snakeweed growth. (U.S. Department of Agriculture, SEA-AR, 2000 East Allen Road, Tucson, AZ 85719)

Oven dry weight of snakeweed and forage plants after growing five months alone or with snakeweed.[1/]

Species	Plant weight (grams)		
	Alone	Forage plant with snakeweed	Snakeweed with forage plant
Broom snakeweed	4.1	--	--
Sideoats grama	4.4	1.7	1.9
Fourwing saltbush	4.6	1.2	3.4
Luna pubescent wheatgrass	3.3	3.4	0.0
Western wheatgrass	3.4	2.7	0.4

[1/] Average of 8 replications

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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 3rd ed.). Page refers to the page where a report about the herbicide begins, actual mention may be on a following page. A herbicide name occupying two or more lines and separated by an equal (=) sign is written as one word if written on one line.

Common Name or Designation	Chemical Name	Page
abscisic acid	-	231
AC-206784	unavailable	133
alachlor	2-chloro-2',6'-diethyl-N -(methoxymethyl)acetanilide	47,68,72,73,76, 110,122,123,127, 129,131,133,135, 154,157,159,173, 178
amitrole	3-amino-s-triazole	35,142
asulam	methyl sulfanilycarbamate	28,35,103
atrazine	2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine	63,127,129,131, 133,135,142,153, 203,230
barban	4-chloro-2-butynyl-m-chlorocar= banilate	115,117,118,120, 140,171,197,199, 200,211,213,215, 219
BASF 9052 OH	unavailable	188
benefin	N-butyl-N-ethyl-α,α,α-trifluoro-2,6-dinitro-p-toluidine	110
bentazon	3-isopropyl-1H-2,1,3-benzo= thiadiazin-4-(3H)-one 2,2,-dioxide	7,21,123,168,178
bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate	175
bromacil	5-bromo-3-sec-butyl-6-methyluracil	22
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile	93,110,115,117, 120,140,145,149, 168,208,211,215

Common Name or Designation	Chemical Name	Page
buthidazole	3,[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxyl-1-methyl-2-imidazolidinone	7,104,106,108,110,126,129,140,142,145,149,186,203,205
butylate	S-ethyl diisobutylthiocarbamate	131,135
CDAA	N-N-diallyl-2-chloroacetamide	89
CDEC	2-chloroallyl diethyldithiocarbamate	65,66,80,84
CGA-43089	α-(cyanomethoximino)-benzacetonitrile	173
CP-55097	unavailable	129,131
chloramben	3-amino-2,5-dichlorobenzoic acid	79,86,87,89,122
chlorflurenol	-	7
chloroxuron	3-[p-(p-chlorophenoxy)phenyl]-1,1-dimethylurea	178
chlorpropham	isopropyl m-chlorocarbanilate	52,79,84,86,87,89,91
copper	ethylenediamine complex	224,225,226
copper sulfate	copper sulfate pentahydrate	222,223
cyanazine	2-[[4-chloro-6-(ethylamino)-s-triazin-2-yl]amino]-2-methyl=propionitrile	63,129,131,133,135,142,153
cycloate	S-ethyl N-ethylthiocyclohexane=carbamate	123,161,163,210,217
cytokinin	-	231
1,3-D (Telone II)	1,3-dichloropropene	5,82
2,4-D	(2,4-dichlorophenoxy)acetic acid	3,7,11,13,14,16,18,20,21,25,26,29,31,35,50,60,117,142,145,201,208,211,230,241
2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	110,166

Common Name or Designation	Chemical Name	Page
dalapon	2,2-dichloropropionic acid	63,97,153,157
DCPA	dimethyl tetrachloroterephthalate	84,93,154,178
desmedipham	ethyl _m_-hydroxycarbanilate carbanilate (ester)	182,186,188,192
diallate	_S_-(2,3-dichloroallyl) diisopropyl= thiocarbamate	159
dicamba	3,6-dichloro-_o_-anisic acid	3,7,11,13,14,16, 17,18,20,21,25, 26,29,117,196, 211,241
dichlobenil	2,6-dichlorobenzonitrile	230
dichlorprop	2-(2,4-dichlorophenoxy)propionic acid	21,29,35
diclofop	methyl 2-[4-(2,4-dichlorophenoxy)= phenoxy]propanoate	115,117,118,126, 140,168,182,184, 186,188,190,192, 197,200,201,205, 206,211,213,217, 219
diethatyl	_N_-(chloroacetyl)-N-(2,6-diethyl= phenyl)glycine	159,190
difenzoquat	1,2-dimethyl-3,5-diphenyl-1_H_-pyrazolium	115,117,118,140, 197,211,213,219
dinitramine	$\underline{N}^4,\underline{N}^4$-diethyl-α,α,α-trifluoro-3,5-dinitrotoluene-2,4-diamine	110,123,159,161, 171,178,195
dinoseb	2-_sec_-butyl-4,6-dinitrophenol	122
diphenamid	_N_,_N_-dimethyl-2,2-diphenylacetamide	68
diquat	6,7-dihydrodipyrido[1,2-α:2',1'-_c_] pyrazinediium ion	230
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	23,43,145,149, 201,208
Dowco 290	3,6-dichloropicolinic acid	3,7,14,18,25,31
Dowco 295	chemistry unavailable	72

Common Name or Designation	Chemical Name	Page
EPTC	S-ethyl dipropylthiocarbamate	63,68,70,104,110, 123,131,133,135, 157,161,163,171, 195
ethalfluralin	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl)= benzenamine	66,73,76,86,87, 159
ethephon	(2-chloroethyl)phosphonic acid	50,113
ethofumesate	(+)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methane sulfonate	159,184,186,190 192
FC-9024	unavailable	118
fluridone	1-methyl-3-phenyl-5[3-(trifluoro= methyl)phenyl]-4(1H)-pyridinone	58,139,228,230
fosamine	ethyl hydrogen (aminocarbonyl)= phosphonate	3,14,18,31
GCP-6305	unavailable	197,206,210
gibberellic acid	-	88,231
glyphosate	N-(phosphonomethyl)glycine	3,7,11,13,14,16, 17,18,20,23,24, 25,26,28,35,45, 50,60,98,140, 142,149,184,234, 236
hexazinone	3-cyclohexyl-6-dimethylamino)-1-methyl-1,3,5-triazine-2,4-(1H,3H)-dione	7,106,203,230, 231,239
HOE-23408 plus	unavailable	115,188
karbutilate	tert-butylcarbamic acid ester with 3(m-hydroxyphenyl)-1,1-dimethylurea	22,37
Krenite	(See fosamine)	
linuron	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	122,145,149

Common Name or Designation	Chemical Name	Page
MBR-18337	unavailable	84,91
MCPA	[(4-chloro-o-tolyl)oxy]acetic acid	120,145,149,208, 211,215
mefluidide	N-[2,4-dimethyl-5-[[(trifluoro=methyl)sulfonyl]amino]phenyl]=acetamide	180
metham	sodium methyldithiocarbamate	83,178
methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	56
methyl bromide	bromoethane	82
metolachlor	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	63,66,68,72,86, 87,122,123,127, 129,131,133,135, 161,173,186
metribuzin	4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5-(4H)one	7,22,89,106,140, 142,145,149,159, 161,163,178,201, 203,205,206,208, 217,219
MSMA	monosodium methanearsonate	60,115,126,197, 208
Na Azide	Sodium azide	54,83
napropamide	2-(α-naphthoxy)-N,N-diethylpropion=amide	43,47,56,58,62, 65,66,68,72,73, 76,80,84,87,89, 91,142,154,157, 168
NC-21439	unavailable	197
nitrofen	2,4-dichlorophenyl-p-nitrophenyl ether	47,84,86,87,154, 200
norflurazon	4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-m-tolyl)-3(2H)-pyri=dazinone	58,168
oryzalin	3,5-dinitro-N^4,N^4-dipropysulfanil=amide	56,58,106,154, 161,168,178

Common Name or Designation	Chemical Name	Page
oxadiazon	2-*tert*-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)Δ^2-1,3,4-oxadiazonlin-5-one	47,56,93
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	47,56,58,84,106,137,140,142,145,149,154,168,239
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion	43,106,142,145,166,168,170,206,239
pebulate	*S*-propyl butylethylthiocarbamate	65,66,68,70,72,73,76,79,80,84
pendimethalin	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	110,123,161,178
perfluidone	1,1,1-trifluoro-*N*-[2-methyl-4-(phenylsulfonyl)phenyl]methanesulfonamide	84
phenmedipham	methyl *m*-hydroxycarbanilate *m*-methylcarbanilate	182,186,192
picloram	4-amino-3,5,6-trichloropicolinic acid	3,7,14,21,25,29,31,40,241
prodiamine	N^3,N^3-di-n-propyl-2,4-dinitro-6-trifluoromethyl-*m*-phenylenediamine	56,58,110
profluralin	*N*-(cyclopropylmethyl)-α,α,α-trifluoro-2,6-dinitro-*N*-propyl-*o*-toluidine	104,110,123,159,178,195
pronamide	3,5-dichloro(*N*-1,1-dimethyl-2-propynyl)benzamide	62,97,106
propachlor	2-chlor-*N*-isopropylacetanilide	175
propazine	2-chloro-4,6-bis(isopropylamino)-*s*-triazine	175
propham	isopropyl carbanilate	106,110,142
prosulfalin	*N*[[4-(dipropylamino)-3,5-dinitrophenyl]sulfonyl]-*S*,*S*-dimethylsulfilimine	93
pyrazon	5-amino-4-chloro-2-phenyl-3(2*H*)-pyridazinone	190

Common Name or Designation	Chemical Name	Page
R-25788	N,N-diallyl-2,2-dichloroacetamide	63,110,135
R-40244	1-(m-trifluoromethylphenyl)-3-chloro-4-chloromethyl-2-pyrrolidone	18,63,66,68,104,106,108,110,118,123,126,131,133,159,171,175,178,195,206,213,217,
RH-6201	unavailable	106
silvex	2-(2,4,5-trichlorophenoxy)propionic acid	35,230
simazine	2-chloro-4,6-bis(ethylamino)-s-triazine	23,43,56,62,154,230,239
S-734	2-[1-(2,5-dimethylphenyl)ethyl=sulfonyl]pyridine N-oxide	161
SN-533	N-ethyl-N-propyl-3-(propysulfonyl)-1H-1,2,4-triazole-1-carboxamide	118,206
tebuthiuron	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea	39,40
Telone II	(See 1,3-D)	
terbacil	3-tert-butyl-5-chloro-6-methyluracil	22,43,62,106,166,168,170
terbutryn	2-(tert-butylamino)-4-(ethylamino)-6-(methylthio)-s-triazine	145,149,175,201,208,217
triallate	S-(2,3,3,-trichloroally)diisopropyl=thiocarbamate	110,115,171,217
triclopyr	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	7,14,31,40
trifluralin	α,α,α,-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	23,91,110,122,123,139,157,159,171,178,195
2,4,5-T	(2,4,5-trichlorophenoxy)acetic acid	26,241
USB-3153	unavailable	62
Velpar	(See hexazinone)	
VEL-4207	unavailable	3,14

Common Name or Designation	Chemical Name	Page
VEL-5026	3-[5-(1,-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone	184
vernolate	S-propyl dipropylthiocarbamate	63,104,110,123,135,161,163,171,210,217

ABBREVIATIONS USED IN THIS REPORT

A	acre(s)
a.i.	active ingredient
a.e.	acid equivalent
aehg.	acid equivalent/ hundred gallons
bu	bushels
C	degrees Centigrade
cm	centimeter(s)
cwt	100 pounds
F	degrees Fahrenheit
fps	feet per second
gal	gallon(s)
gpa	gallons per acre
gpm	gallons per minute
ha	hectare
hr	hour(s)
in	inch(es)
kg	kilogram(s)
l	liter(s)
lb	pound(s)
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
sq	square
sq ft	square feet
rd	rod
wt	weight
WA	wetting agent