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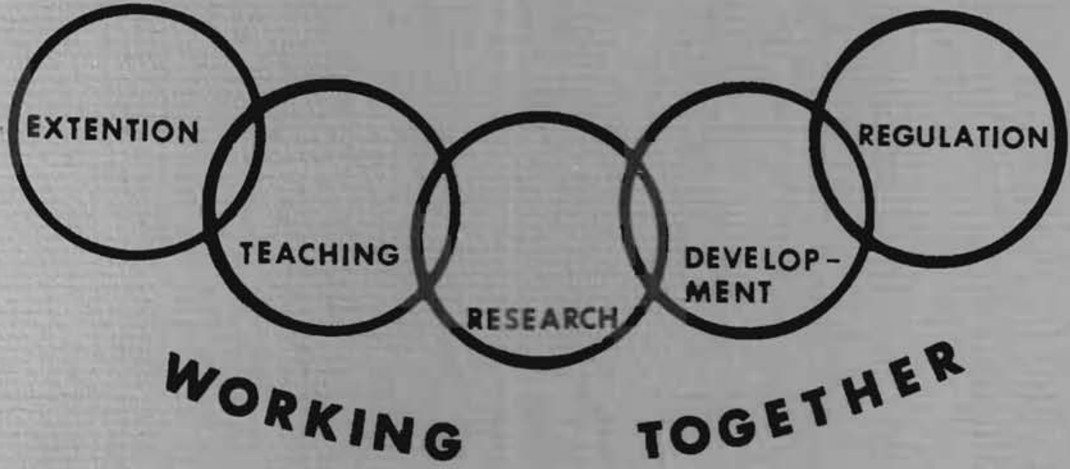

RESEARCH PROGRESS REPORT

MARCH 14, 15, & 16, 1978

SPARKS, NV.

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WESTERN SOCIETY OF WEED SCIENCE

SPARKS, NEVADA

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FOREWARD

The 1978 annual Research Progress Report of the Western Society of Weed Science consists of 134 reports of recent investigations in weed science. This is the highest 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, 1978 in Sparks, Nevada. The research committee consists of a chairman and seven project chairmen who assemble and summarize the information in their respective areas. All reports have been edited for conformity to chemical and weed nomenclature and for correction of obvious errors. Final editing 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 Information contained in the Research Progress Report should be considered tentative and NOT FOR PUBLICATION.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 24(5), 1976 and the WSSA Herbicide Handbook, 3rd edition. When known, the full chemical name of numbered compounds has been given.

The research committee extends its gratitude to those who have contributed reports. The Chairman extends his thanks to each research project chairman for his work and for meeting the deadlines imposed upon him.

Alex G. Ogg, Jr.
Chairman of the Research Committee
Western Society of Weed Science
1978

ACKNOWLEDGEMENT

Special thanks to Larry Burrill and his secretarial staff for final typing of the reports and assistance in publishing the Report.

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PROJECT 1

PERENNIAL HERBACEOUS WEEDS

S.L. Kimball, Project Chairman

SUMMARY -

Eight papers were submitted for publication. These papers discussed the control of Canada thistle, field bindweed, Russian knapweed, silverleaf nightshade, and yellow nutsedge.

Canada thistle - Glyphosate applied at 2, 3, and 4 lb ai/A to Canada thistle with vigorous regrowth before and following non-killing frosts gave good control at all rates and at both treatment dates. Similar treatments to less vigorous stands at another location gave poorer overall control, with 4 lb ai/A treatment giving the best control. Prefrost was better than post-frost control. At both locations the after frost treatments were sufficiently effective to warrant further study.

Field bindweed - Glyphosate treatments of 3, 4.5, and 6 lb ai/A gave an average 93% control when applied before frost, and 79% control if applied following frost. All rates showed the same trend, indicating an advantage of treatment before frost. Preemergence applications of prodiamine at 8 lb/A gave 87% control of bindweed, with oryzalin at 8 lb/A and fluridone at 2 lb/A giving partial control (50 and 57%, respectively).

Russian knapweed - Picloram at 1 and 2 lb/A, picloram + 2,4-D at 1 + 2 and 2 + 4 lb/A, and Dowco 290 at 1 and 2 lb ai/A gave 100% control two years following treatment. Triclopyr gave no control at the rates tested.

Silverleaf nightshade - Three herbicides and their combinations were applied to silverleaf nightshade. 2,4-D at 3 lb/A appeared most effective at 21 DAT, but at 156 DAT glyphosate + DPX-1108 at 3 + 3 lb/A gave the best control while glyphosate + 2,4-D at 3 + 1 lb/A had decreased considerably.

Yellow nutsedge - Two directed spray applications per year of glyphosate at 1 lb ae/A were applied to yellow nutsedge in cotton from 1972 to 1975. Tuber production in treated areas was reduced 66%, and only 22% sprouted as compared to 61% sprouting in tubers from control plots. Plants grown from uniform tubers and treated with 0.5 lb ae/A glyphosate were not distinguishable from those of untreated plants. However, the control tubers had 68% resprouts compared to 23% for tubers from the glyphosate treated plants. In one study where preplant incorporated herbicides were applied Dowco 295 at 2 to 4 lb ai/A gave excellent control with 6 inch incorporation. HER 26910 at 4 to 8 lb ai/A and pebulate at 8 lb ai/A also gave good control. In another study the soil fumigant 1,3-dichloropropene (1,3-D) at 234 to 624 lb/A failed to control the spring flush of nutsedge. However, after discing there were significant stand reductions in the second flush at 312 to 624 lb/A. The optimum depth of injection for control was 8 to 12 inches.

PAPERS -

Effects of glyphosate and after frost applications of glyphosate on Canada thistle. Belles, W.S., D.W. Wattenbarger, and G.A. Lee. Research has indicated that control of long-lived perennial weeds may be enhanced by treatment with translocated herbicides after nonkilling frost(s) in the fall. Experiments were established at two locations near Moscow, Idaho in the fall of 1976 to compare the effectiveness of glyphosate applied to Canada thistle just prior to and after nonkilling frosts. Location One was on a west-facing slope cropped to barley in 1976. The second location was on a north-west-facing slope with an understory of bluegrass sod in 1976. Soil was a Palouse silt loam at both locations.

At location one the before frost treatments were applied on October 7, 1976 and the after frost treatments October 15, 1976. The Canada thistle regrowth was approximately 4-6 inches tall following removal of the barley crop as silage. Air temperature on October 7, 1976 was 70 F and 54 F on October 18, 1976. The soil was dry to 6 inches at the time of treatment. The plots were 20 by 75 ft. Treatments were replicated three times in a randomized complete block design. Herbicide treatments were applied with a bicycle sprayer equipped with a 10-foot boom calibrated to deliver 20 gpa water carrier.

The before frost treatments were applied on October 14, 1976 and the after frost treatments on October 18, 1976 at location one. Canada thistle were at various stages of growth following an earlier summer clipping. Plants were not as vigorous as those at location one. Air temperature was 64 F on October 14, 1976 and 54 F on October 18, 1976. Soil moisture was 25% at both treatment dates in contrast to the first location. Plots were 10 by 15 ft. Each treatment was replicated three times in a randomized complete block design. Applications were made with the bicycle sprayer as at location one.

Glyphosate gave excellent control at all rates and at both dates of application at location one (Table 1). Percent control of the after frost treatments was slightly better than the before frost treatments. Control at location two was less than at location one (Table 2). Somewhat better control was obtained with the before frost treatment at this location, the reverse of the results at location one. Although moisture conditions at location two were higher, thistle growth and appearance was poorer than at location one. This may have been caused by poorer fertility or ecotype differences which could have detrimentally influenced the glyphosate activity.

At both locations the after frost treatments were sufficiently effective in comparison to the before frost and warrant further study. Light nonkilling frosts are common in the Palouse area. Effective control of Canada thistle with glyphosate after the occurrence of these frosts could significantly increase the length of time in which applications can be made in this area. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Table 1 Effects of three rates of glyphosate before and after frost on Canada thistle at location one

Rate of glyphosate lb ai/A	% Control[1/] Before frost	 After frost
2.0	94	98
3.0	93	89
4.0	85	96
Average	90	94

[1/] Values are averages of three replications.

Table 2 Effects of three rates of glyphosate before and after frost on Canada thistle at location two

Rate of glyphosate lb ai/A	% Control[1/] Before frost	 After frost
2	59	60
3	80	64
4	85	80
Average	74	67

[1/] Values are averages of three replications.

Effect of rate and time of application of glyphosate on control of field bindweed. Belles, W.S., D.W. Wattenbarger and G.A. Lee. Some researchers have indicated increased activity from glyphosate when plants are treated at the time of the first fall frost. On October 7, 1976, a before-frost treatment was applied and on October 18, 1976, an after-frost treatment was applied. Treatments were applied with a bicycle sprayer equipped with a 10-ft boom calibrated to deliver 20 gpa water carrier. The plots were replicated three times in a randomized complete block design and were 20 by 75 ft. The field bindweed plants were in a stage of regrowth (about 6 inches in length) following earlier removal of the barley and alfalfa crop as silage. Air temperature at the time of the before-frost treatment was 70 F and at the after-frost treatment, 54 F. The soil was dry to six inches at application. The soil type is Palouse silt loam. Percent control was determined by counting remaining field bindweed plants and comparing the results to a nontreated check.

Gylphosate treatments applied before frost gave a 93% control of field bindweed for all rates and a 79% control after plants were subjected to frost conditions. This trend was evident at all rates, indicating a slight advantage of treatment before frost compared to treatment after frost. Severe drought conditions in the 1977 growing season could have contributed to the results. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Effect of three rates of glyphosate applied before and after frost on field bindweed

Rate of glyphosate lb ai/A	% Control[1/] Before frost	 After frost
3	96	75
4.5	94	88
6	90	74
Average	93	79

[1/] Values are averages of three replications.

Perennial bindweed control with repeat applications of preemergence herbicides. Lange, A.H., J. Foott, J. Schlesselman, and L. Nygren. A heavy infestation of perennial bindweed was divided up into plots and several herbicide treatments were applied to worked soil May 20, 1976 and retreated again the following spring on February 17, 1977. The trial was sprinkler irrigated immediately after herbicide application.

Evaluation the following spring showed the excellent results with prodiamine and oryzalin. The delay and subsequent commercial control with prodiamine was outstandingly better than either oryzalin or oxadiazon both of which have shown good results in other trials. Fluridone also showed some effects on bindweed. (University of California Cooperative Extension, 9240 S. Riverbend Ave., Parlier, CA 93648)

A comparison of preemergence herbicide treatments for perennial bindweed control in a heavy soil with sprinkler irrigation

Herbicides	lb ai/A	Average[1/] bindweed control 5/23/77	 9/2/77
oryzalin	8	8.3	5.0
oxadiazon	8	5.0	3.7
fluridone	2	8.0	5.7
fluridone	1	3.6	3.7
prodiamine	8	9.3	8.7
oxadiazon + oryzalin	4 + 4	7.3	4.3
fluridone + oryzalin	1 + 4	7.3	6.0
check	-	1.0	0.3

[1/] Average of three replications. Based on 0 to 10 scale where 0 = no effect, 3 = prominent symptoms and 10 = perfect bindweed control. Treated 5/20/76 and 2/17/77. Evaluated 5/23/77 and 9/2/77.

Russian knapweed control one and two years following application. Alley, H.P. and N.E. Humburg. The experimental site was on undisturbed rangeland, heavily infested with Russian knapweed that was in the pre-bud stage with 12 to 18 inches of growth at time of treatment.

All herbicides were applied with a three-nozzle knapsack spray unit in 40 gpa water as carrier.

Visual observations made approximately one and two years following treatment showed that picloram at 1 and 2 lb/A, picloram + 2,4-D at 1 + 2 and 2 + 4 lb/A and Dowco 290 at 1 and 2 lb ai/A gave 100% control of Russian knapweed. Triclopyr gave no control at the rates applied.

Dowco 290 did not cause any apparent damage to the associated grass species, whereas picloram caused prostrate growth and some height reduction. (Wyoming Agric. Exp. Sta., Laramie 82070, SR 843)

Russian knapweed control

Herbicide[1]	Rate lb ai/A	Percent control 1976	 1977	Observations
picloram	1.0	100	100	No damage to grass.
picloram	2.0	100	100	Grass prostrate.
picloram + 2,4-D	1.0 + 2.0	100	100	Killed silver sagebrush.
picloram + 2,4-D	2.0 + 4.0	100	100	
triclopyr	1.5	0	0	
triclopyr	2.5	0	0	
Dowco 290	1.0	100	100	No damage to grass.
Dowco 290	2.0	100	100	Killed silver sagebrush.
2,4-DA	20.0	30	30	
dicamba + 2,4-DA	2.0 + 6.0	50	50	
triclopyr + 2,4-DA	1.5 + 1.0	0	0	
triclopyr + 2,4-DA	3 + 1.0	0	0	

[1] Treated June 12, 1975; evaluated June 22, 1976 and June 16, 1977.

The effect of herbicide combinations on silverleaf nightshade. Lange, A.H. and L. Nygren. A uniform stand of silverleaf nightshade was divided into 5 ft by 16 ft plots. Three herbicides and their combinations were applied to the plots and replicated 4 times. All treatments were applied at 50 gpa. Application took place on June 8, 1977; the temperature was approximately 95 F. All the treatments were evaluated on June 29, 1977 and November 11, 1977 for effective weed control. Glyphosate, 2,4-D (OSA), and their combinations appeared to give good results. Of the individually applied herbicides, 2,4-D at 3 lb ai/A was most promising. This was closely matched by the 6 lb ai/A rate of glyphosate.

The combination of glyphosate at 3 lb ai/A and 2,4-D at 1 lb ai/A was better than glyphosate alone. DPX-1108 alone provided only marginal effects. However, glyphosate and DPX-1108 appeared more promising than either compound alone. Increasing the DPX-1108 rate in the glyphosate combination did not increase the initial activity. (University of California, Cooperative Extension, 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of herbicide combinations on the control of silverleaf nightshade.

Herbicides	Rate lb ai/A	Average silverleaf nightshade 6/29	11/11
glyphosate	3	7.7	5.7
glyphosate	6	9.3	7.3
2,4-D	3	9.7	6.7
DPX-1108	6	5.3	4.3
glyphosate + 2,4-D	3 + 1	9.7	7.7
glyphosate + DPX-1108	3 + 3	8.0	9.7
glyphosate + DPX-1108	3 + 6	8.0	7.0
check	-	0.0	1.7

[1/] Average of three replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete (apparent) control. Treated 6/8/77. Evaluated 6/29/77. No phytotoxicity to grapes.

The effect of glyphosate on the sproutability of parent tubers of yellow nutsedge. Carter, D.H., P.E. Keeley, R.J. Thullen and J.H. Miller. From 1972 to 1975, two applications per year of glyphosate at 1 lb/A were applied as directed sprays to yellow nutsedge and cotton. Randomly collected tubers after treatment showed that glyphosate reduced tuber production 66%. The control tubers sprouted 61% compared to 22% for tubers from treated plants. During 1975 and 1976, non-cropped field plots following barley were treated annually with 6 lb/A of glyphosate in three applications. Tubers, randomly collected in late fall, were refrigerated for one month and then planted in the greenhouse. Data, collected over three months, showed that tubers from control plots sprouted 60 and 68%, respectively, compared to 21 and 15% for tubers collected from glyphosate treated plots. Some of the tubers from the glyphosate treated plots initiated sprouts but they were malformed and failed to emerge.

Since the tubers in the above studies were collected at random, parent tubers were not identifiable from other tubers. Five greenhouse experiments, using glyphosate at 0.5 lb/A, were conducted in 1976 and 1977 to determine whether parent tuber sproutability was influenced by treatment (data shown in table). For these experiments, nutsedge tubers 7 to 8 mm in diameter and 300 to 400 mg in weight were planted 0.5 inches deep in vermiculite. Glyphosate treatments were applied to plants which had emerged 2, 3 or 4 weeks. Even though the plants usually showed only slight visual symptoms, they were harvested at 10 to 14 days after treatment and the parent tubers (tubers from which the plants arose) were recovered to determine their sproutability. The tubers from glyphosate treated plants were not distinguishable from those of the control plants with regard to firmness, internal color, or decay resistance. As an average of the five experiments, the data showed that control tubers resprouted 68% compared to 23% for tubers from glyphosate treated plants. Suppression of resprouting was more evident in plants treated at younger stages of growth. Also, malformed sprouts were observed on parent tubers of glyphosate treated plants. Since our research with carbon labeled materials suggests that little if any herbicidal activity would be transmitted to the parent tuber, we believe the effect of glyphosate on parent tubers of yellow nutsedge is unique. (ARS-WR, US Department of Agriculture, Shafter, CA 93263)

Sprouting of parent tubers of yellow nutsedge after glyphosate treatment

		Stage of plant when treated Emerged for:					
		3 wk	2 wk		4 wk		
Herbicide	Rate lb ae/A	Expt 1 (%)	Expt 2 (%)	Expt 3 (%)	Expt 4 (%)	Expt 5 (%)	Avg. (%)
glyphosate	0.5	12	23	2	28	50	23
none	-	86	70	75	52	57	68

Effect of four preplant incorporated herbicides on yellow nutsedge and bindweed control. Lange, A., R. Goertzen, and R. Mullen. Four herbicides were preplant power incorporated into a loam soil north of Tracy, San Joaquin County, California, to evaluate nutsedge and bindweed control. Treatments were applied on September 9, 1977. Chemicals were applied with three 8004 nozzles using a CO_2 backpack sprayer. Plot size was 10 ft by 10 ft, replicated three times. Two depths of incorporation, 3 and 6 inches, were also compared. The soil is somewhat alkalai and had been flood irrigated approximately 3 weeks earlier. Shoot counts of nutsedge and bindweed were made October 1, 1977.

Dowco-295 at 2 to 4 lbs ai/A gave excellent nutsedge control with deep incorporation being slightly better than shallow incorporation. HER-26910 at 4 to 8 lbs ai/A gave good nutsedge control with shallow incorporation being better than deep incorporation. Pebulate at 8 lbs/A also gave good nutsedge control with deep incorporation better than shallow, which is consistent with earlier findings.

All treatments appeared to affect bindweed growth when incorporated shallow and slightly poorer activity when deeply incorporated, however, the bindweed stand was light. (University of California, Cooperative Extension, 9240 S. Riverbend Ave., Parlier, CA 93648)

Effect of four preplant incorporated herbicides on yellow nutsedge and bindweed control using two incorporation depths

		Average counts[1/]			
	Rate	Yellow nutsedge		Bindweed	
Herbicides	lb ai/A	3 inch	6 inch	3 inch	6 inch
pebulate	4	10.0	3.7	0.0	4.0
pebulate	8	2.3	1.3	0.0	1.0
Dowco-295	2	0.7	0.0	0.0	0.7
Dowco-295	4	0.7	0.3	0.0	0.3
HER-26910	4	0.7	3.0	0.0	0.3
HER-26910	8	0.3	1.3	0.3	0.7
EL-171	1	7.6	7.3	0.7	6.0
EL-171	2	2.3	7.0	0.3	3.7
check	-	3.0	8.7	1.7	4.0

[1/] Average of three replications. Counts from 10 ft by 10 ft plots. Treated 9/9/77. Evaluated 10/21/77.

Deep injection of 1,3-D soil fumigant for the control of yellow nutsedge. Geronimo, J. 1,3-dichloropropene (1,3-D) soil fumigant was evaluated for its herbicidal effect on yellow nutsedge. The experimental site was located near Davis, California. The fumigant was injected into Yolo clay loam soil at depths of 8, 12 and 18 inches using a "V" shaped subsoiler with 5 curved chisels spaced 16 inches apart. Treatments were made in twice replicated plots 20 ft wide by 85 ft long on October 10 and 11, 1973 when soil temperature at one foot depth was 64 F, soil moisture was 11.2%, and soil air space was 34%. Sealing was accomplished immediately after fumigation by rotary harrowing and cultipacking twice. Control was evaluated in the spring and summer of the following season by taking stand counts in all treated and control plots.

Rates applied were 234, 312, 390, 468 and 624 lb/A. 1,3-D at rates up to 624 lb/A failed to significantly reduce the initial spring flush of nutsedge (Table 1). Only data for the two highest rates applied are shown since no significant differences in stand, decreased or increased, occurred at any rate. This initial stand was removed by discing, and the field was bedded, planted to melons, and irrigated during the first week in May. Significant reductions in stand of the second flush of nutsedge occurred at 312 lb/A and above at all three injection depths (Table 2) when evaluated in June. Control at this rate was significantly better at the 12 inch depth than at the 18 inch depth. Control at the 12 inch depth decreased as time progressed and by August significant reductions in stand occurred only with 468 and 624 lb/A.

These results show that under the conditions of the trial deep injections of 1,3-D in the fall at depths of 8 to 18 inches without tarping did not control initial spring growth of nutsedge at rates up to 624 lb/A. This early flush was probably composed primarily of reproductive structures in the top few inches of soil which escaped a lethal dose of fumigant. Significant stand reductions of the second flush at 312 lb/A and above indicates that kill and/or suppression of reproductive structures at lower levels in the soil near the points of injection occurred. In this study the optimum depth of injection for the control of nutsedge was 8 to 12 inches and the lowest rate producing significant stand reduction was 312 lb/A. (Dow Quimica Mexicana S.A. de C.V., Paseo de las Palmas 555, Mexico 10, D.F., Mexico)

Table 1 Stand of initial spring flush of yellow nutsedge six months after deep injection of 1,3-D in the fall

Lb/A[1]	Shank width X depth, in		Yellow nutsedge stand as % of untreated control
468	16 X 8		120 ab
468	16 X 12		120 ab
468	16 X 18		141 b
624	16 X 8		72 a
624	16 X 12		82 a
624	16 X 18		78 a
Untreated	16 X 18	(12.3)[2]	100 ab

[1] Fumigant applied October 10, 1973. Rates correspond to 60 and 80 gallons per acre of Telone soil fumigant respectively. Telone soil fumigant containing 78% 1,3-D was applied.

[2] Evaluated April 16, 1974. Twenty percent (340 ft^2) of each plot was counted. Value in parentheses is the average number of yellow nutsedge plants per ft^2 in two replicates. Values followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

Table 2 Stand reduction of second flush of yellow nutsedge 8, 9 and 10 months after deep injection of 1,3-D. Initial flush disced down six months after treatment

			Reduction of yellow nutsedge stand as % of untreated control				
Lb/A[1]	Shank width X depth, in		June 6, 1974		July 10, 1974		August 9, 1974
234	16 X 8	(6.6)[2]	0 a				
312	16 X 8		51 b-d				
390	16 X 8		74 c-e				
468	16 X 8		57 b-e				
624	16 X 8		80 e				
234	16 X 12	(6.7)[2]	0 a		-		-
312	16 X 12		64 c-e		51 b		30 ab
390	16 X 12		79 d-e		65 b		36 ab
468	16 X 12		74 c-e		70 b		55 b
624	16 X 12		74 c-e		72 b		62 b
234	16 X 18	(7.1)[2]	0 a				
312	16 X 18		34 b				
390	16 X 18		51 b-d				
468	16 X 18		57 b-e				
624	16 X 18		70 c-e				
Untreated	16 X 18	(6.1)[2]	0 a	(4.3)[2]	0 a	(4.7)[2]	0 a

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[1] Fumigant applied October 10, 1973. Rates correspond to 30, 40, 50, 60 and 80 gallons per acre of Telone soil fumigant respectively. Telone soil fumigant containing 78% 1,3-D was applied.

[2] Evaluated on dates shown. Twenty percent (340 ft^2) of each plot was counted. Values in parentheses are the average number of yellow nutsedge plants per ft^2 in two replicates. Values within columns followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

PROJECT 2

HERBACEOUS WEEDS OF RANGE AND FOREST

T.R. Plumb, Project Chairman

SUMMARY -

Eleven reports were submitted which described the effect of 17 herbicides on 11 plant species. 2,4-D was evaluated in 9 of the studies followed by picloram and glyphosate each in 6 studies.

Russian knapweed - Plant counts were reduced 10- to 15-fold within 1 year after a June application of picloram; glyphosate gave a comparable control at double the picloram rates. No advantage was obtained when 2,4-D was added to picloram.

Broom snakeweed - Two or more pounds of tebuthiuron gave almost total control of broom snakeweed, but this treatment also damaged associated grass species. Picloram plus 2,4-D gave 100 percent control with no reduction in grass cover.

Filaree - Paraquat at 1/4 and 1/2 lb/ a.e./A and oxyfluorfen at all rates effectively controlled filaree. X-77 increased the effectiveness of paraquat but not glyphosate or oxyfluorfen. In another test, glyphosate was also effective but slower acting that paraquat. Amitrol, 2,4-D, and bromoxynil did not give satisfactory results.

Field bindweed - The growth regulator ethephon did not enhance and possibly reduced the effect of 2,4-D and glyphosate on field bindweed.

Rush skeletonweed - Foliage application of picloram and picloram plus 2,4-D gave 85 percent or better control of rush skeletonweed, but results with picloram beads were variable. Most formulations and rates of 2,4-D alone gave poor results.

Spotted knapweed - Liquid application of picloram, picloram plus 2,4-D, dicamba, and dicamba plus 2,4-D gave 86 to 100 percent control of spotted knapweed. Asulam, bentazon, and glyphosate were not effective.

Yellow starthistle - Yellow starthistle seed stalk development was completely prevented by liquid application of picloram, 2,4-D, and dicamba; less control was obtained with 5 percent picloram beads. Except for 2,4-D, fall herbicide treatment in 1976 also resulted in fewer plants in fall 1977.

Western bracken - Foliage sprays containing 2 lb a.e. of picloram gave first season topkill and complete kill within a year. Dowco 290 gave fair control at 4 lb a.e., while triclopyr was ineffective.

Hoary cress - Foliage application of 2 or 4 lb a.e./A of LVE and amine salt formulations of triclopyr and 2,4-D at the bud stage all gave excellent control of hoary cress.

Perennial pepperweed - Excellent control of perennial pepperweed was obtained with postemergence sprays containing 4 lb a.e. of either triclopyr or 2,4-D. Control was much lower when plants were treated during the flowering stage.

PAPERS -

Herbicidal control of Russian knapweed. Cords, H.P. Five herbicides were compared for control of Russian knapweed at Lovelock, Nevada. Applications were made June 24, 1976. Evaluations were made in June, 1977 by counting the plants intercepted by a 22 foot line transect stretched diagonally across the 10 foot by 25 foot plots. Each main stem was counted as a plant. The data are given in the table.

Picloram was the most effective herbicide. The picloram-2,4-D mixture was no more effective per unit of picloram than was the picloram alone. (Division of Plant, Soil and Water Science, University of Nevada-Reno, Reno, NV 89557)

Response of Russian knapweed to several herbicides

Herbicide	Rate lb/A	Mean Plant Count
Picloram	1.0	1.5
Picloram	2.0	1.0
Picloram + 2,4-D	0.5 + 1.0	11.0
Picloram + 2,4-D	1.0 + 2.0	1.0
Picloram + 2,4-D	2.0 + 4.0	2.2
Glyphosate	2.0	1.5
Glyphosate	4.0	2.0
Triclopyr	1.0	27.2
Triclopyr	2.0	18.2
Dowco 290	1.0	5.5
Dowco 290	2.0	2.0
Check	-	14.5

Broom snakeweed control and grass response to herbicide treatments. Alley, H.P. and N.E. Humburg. A replicated series of plots were established June 19, 1974 to compare the effectiveness of new compounds tebuthiuron, dicamba + 2,4-DA combination and triclopyr to silvex, 2,4-D and picloram + 2,4-D combination.

Tebuthiuron did not show activity on snakeweed until two years after application at which time the 2, 3 and 4 lb ai/A rates of application gave near-complete control. At the rates applied, tebuthiuron was very damaging to the associated grass species, reducing the stand 50 to 85%. Picloram + 2,4-D at 0.5 + 1.0 lb ai/A was the outstanding treatment resulting in 100% control with no apparent reduction in grass stand.

Silvex, 2,4-D amine or ester formulations or triclopyr were not effective treatments. Dicamba + 2,4-DA applied at 1.0 + 3.0 lb ai/A approached the effectiveness of the picloram + 2,4-D treatment. (Wyoming Agric. Exp. Sta., Laramie, WY 82071)

Broom snakeweed control and vegetative response

Herbicide[1/]	Rate lb/A	Percent control 1975	Percent control 1977	Observations
Tebuthiuron	1.0	10	25	Took out 50% of grass
Tebuthiuron	2.0	15	100	Took out 60% of grass
Tebuthiuron	3.0	15	99	Took out 60% of grass
Tebuthiuron	4.0	20	100	Took out 85% of grass
Dicamba + 2,4-DA	0.5 + 1.5	30	30	No damage to grass
Dicamba + 2,4-DA	1.0 + 3.0	97	94	No damage to grass
Picloram + 2,4-D	0.25 + 0.5	90	60	No damage to grass
Picloram + 2,4-D	0.5 + 1.0	100	100	No damage to grass
Silvex	2.0	30	10	
2,4-DA	2.0	40	10	GOOD
Triclopyr	1.5	10	0	GRASS
Triclopyr	3.0	65	40	
2,4-D LVE	2.0	50	40	COVER

[1/] Treated June 19, 1974; evaluated July 1, 1975 and July 5, 1977.

The effect of surfactant on the activity of low rates of 3 postemergence herbicides on filaree. Lange, A., J. Schlesselman and L. Nygren. October 26, 1977 a trial was established to evaluate the effectiveness of 3 herbicides, with or without the addition of a surfactant, on the control of redstem filaree.

A uniform stand of filaree was divided into 5 ft by 10 ft plots. Treatments were applied at 100 gpa with a constant pressure CO_2 backpack sprayer and replicated 3 times. Each compound was applied at 3 rates with a surfactant (X-77 @ 0.5% by volume) and 3 rates without.

Weed control evaluation on November 1 and November 13, 1977 showed that paraquat and oxyfluorfen were effective herbicides for the control of filaree. Paraquat was effective at the 2 higher rates (¼ and ½ lb ai/A) and oxyfluorfen was effective at all rates examined. The addition of X-77 to the paraquat treatments increased the activity of this compound as indicated on both evaluation dates. Oxyfluorfen plus X-77 appeared slightly more active than oxyfluorfen alone on the earlier evaluation date. However, by the last evaluation date, all treatments were giving complete control. Glyphosate gave control at ½ lb ai/A but was slower developing the paraquat or oxyfluorfen. The addition of X-77 to glyphosate was not beneficial, which substantiates earlier results. (University of Calif. Coop. Extension, Parlier, CA 93648)

The effect of surfactant on the activity of low rates of 3 postemergence herbicides on filaree

Herbicide	Rate lb/A	Weed control 11/1	 11/13
Glyphosate	1/8	3.0	5.3
Glyphosate	1/8 + X-77	3.0	4.0
Glyphosate	1/4	3.7	7.7
Glyphosate	1/4 + X-77	3.7	5.3
Glyphosate	1/2	5.0	8.3
Glyphosate	1/2 + X-77	3.7	7.0
Paraquat	1/8	5.0	4.7
Paraquat	1/8 + X-77	6.3	7.7
Paraquat	1/4	7.7	8.0
Paraquat	1/4 + X-77	9.3	9.3
Paraquat	1/2	9.3	9.7
Paraquat	1/2 + X-77	9.3	10.0
Oxyfluorfen	1/8	8.0	10.0
Oxyfluorfen	1/8 + X-77	9.3	10.0
Oxyfluorfen	1/4	9.3	10.0
Oxyfluorfen	1/4 + X-77	10.0	10.0
Oxyfluorfen	1/2	8.7	10.0
Oxyfluorfen	1/2 + X-77	9.7	10.0
Check	-	0.0	1.3
Check	- + X-77	1.7	2.7

Average of 3 replications where 0 = no effect, 10 = complete kill. Weeds 3-5 inches across when treated. Applied 10/26/77 in 100 gal/A. Rated 11/1 and 11/13/77.

A comparison of several herbicide treatments on the control of a mixed population of filaree and ripgut bromegrass. Lange, A.H., L. Nygren, and J. Schlesselman. Five herbicides and several combinations of herbicides at various rates were compared for effective control of filaree. All treatments were applied postemergence to the filaree on November 24, 1976. All treatments were applied at 50 gpa with the exception of two glyphosate treatments at 25 gpa and 100 gpa. The treatments were replicated four times and evaluated on three different dates.

The earliest evaluation, on December 5, 1976, showed paraquat at rates of 1/8, 1/4, and 1/2 lb ai/A plus X-77 at 0.5% to give the quickest and most complete control of filaree and grass. Glyphosate at 1/8 lb ai/A plus paraquat at 1/8 lb ai/A were comparable to the lowest rate of paraquat alone. All other treatments gave only marginal indications of control when compared to the untreated check. Glyphosate appeared to give better control at 25 gpa than the 100 gpa rate on all three evaluation dates. The addition of a surfactant to glyphosate did not appear to enhance its control at the rates applied.

Later evaluations on January 1, 1977 and February 2, 1977 showed increased control in all treatments containing glyphosate. Paraquat at the 1/2 lb ai/A rate gave the best control up to and including the last evaluation. Glyphosate at 1/2 lb ai/A gave the next best long-term control. Amitrole, 2,4-D, and bromoxynil gave only marginal control. However, when these chemicals were in combination with glyphosate, there appeared to be an additive effect. These combination treatments gave better control than either herbicide alone.

The effect of combination sprays on the control of filaree and ripgut bromegrass

				Average[1]		
	Rate	12/5/76		1/1/77		2/3/77
Herbicide	lb/A	Filaree	Grass	Filaree	Grass	W/C
Glyphosate (50 GPA)	1/8	4.8	3.5	6.0	8.5	6.8
Glyphosate (50 GPA)	1/4	5.2	4.0	8.5	10.0	8.8
Glyphosate (50 GPA)	1/2	4.8	3.5	10.0	10.0	9.3
Glyphosate (25 GPA)	1/4	6.0	5.2	9.5	10.0	9.5
Glyphosate (100 GPA)	1/4	3.2	4.2	7.2	9.5	7.2
Glyphosate + X-77	1/8+.25%	2.2	2.5	5.8	8.5	3.8
Glyphosate + X-77	1/8+.5%	4.8	5.0	5.2	9.5	4.5
Glyphosate + X-77	1/8+ 1%	6.2	5.5	6.2	8.8	5.8
Paraquat + X-77	1/8+.5%	7.2	10.0	8.0	10.0	6.8
Paraquat + X-77	1/4+.5%	9.0	10.0	8.8	10.0	8.5
Paraquat + X-77	1/2+.5%	9.2	10.0	10.0	10.0	9.8
Glyphosate + Paraquat	1/8+1/8	7.8	9.2	8.2	10.0	7.8
Glyphosate + 2,4-D	1/8+1/8	5.2	3.2	9.0	8.8	8.8
Glyphosate + Amitrole	1/8+1/2	4.2	4.8	8.0	9.8	8.8
Glyphosate + Bromoxynil	1/8+1/2	4.8	4.5	8.2	9.8	8.2
2,4-D	1/8	5.5	1.5	4.0	2.5	3.2
Amitrole	1/2	3.2	3.8	6.2	6.5	5.5
Bromoxynil	1/4	2.0	3.8	2.5	3.8	0.5
Bromoxynil	1/2	4.5	5.0	2.0	4.8	1.0
Check	-	0.0	0.0	0.0	3.0	0.0

[1] Average of 4 replications where 0 = no effect, 10 = complete control. Treated 11/24/76. All treatments = 50 GPA except where designated.

The effect of a plant growth regulator on the activity of postemergence herbicides. Lange, A., L. Nygren, J. Schlesselman, and L. Hendricks. A uniform stand of field bindweed was divided into 24 ft by 20 ft plots. Treatments were sprayed at 100 gpa and replicated 3 times. Ethephon at 10,000 ppm was superimposed over the easternmost 5 ft of each plot. The ambient temperature was 90 F on the day of application. Bindweed control on July 22, 1977 showed that ethephon substantially increased the effectiveness of DPX-1108 at 12 lb ai/A. No other treatments revealed marked increases with ethephon. In fact, the combination of ethephon and glyphosate may have lowered the effectiveness of the glyphosate treatment. Glyphosate, when in combination with 2,4-D or DPX-1108 tended to produce better weed control results when compared with equivalent rates of individual herbicide applications. This has also been indicated in some of the earlier work done with herbicide combinations.

The effect of a plant growth regulator on the activity of postemergence herbicides

Herbicides	Rate lb/A	Bindweed control[1/] no ethephon	10,000 ppm ethephon[2/]
Glyphosate	3	7.3	6.3
Glyphosate	6	8.7	7.8
2,4-D (OSA)	3	7.7	7.5
Glyphosate + 2,4-D	1½ + 1½	8.0	8.0
DPX-1108	6	2.7	3.0
DPX-1108	12	2.3	7.0
Glyphosate + DPX-1108	3 + 3	8.0	7.3
Glyphosate + DPX-1108	3 + 6	8.0	7.5
Ethephon	10,000 ppm	-	2.0
Check	-	1.3	4.0

[1/] Average of 3 replications based on 0 to 10 scale where 0 = no control and 10 = complete control. Treated 6/24/77. Evaluated 7/22/77.

[2/] Ethephon applied at 10,000 ppm @ 100 gpa. 6/24/77.

Rush skeletonweed control. Belles, W.S., D.W. Wattenbarger, O.K. Baysinger, and G.A. Lee. Rush skeletonweed presently infests large areas of rangeland in Idaho, Washington, and Oregon and threatens to invade cultivated areas of these states. Plots were established on May 9, 1977 near Banks, Idaho on a rangeland site to determine the effectiveness of spring applied herbicides for the control of rush skeletonweed. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa of water carrier. A randomized complete block design with three replications was used with 9 by 30 ft plots. When treated, the rush skeletonweed was in the rosette stage and about 4 inches in diameter. Soil moisture was 50%, soil temperature was 55 F, air temperature 70 F and relative humidity was 80%. A shower fell on the site within 24 hours of application. Counts were made on August 19, 1977 to determine an early population of rosettes. After several rains, rosettes were again counted at 2 random locations in each plot on October 5, 1977, using 2.5 sq ft quadrats.

Only picloram and picloram + 2,4-D gave rush skeletonweed control of 85% or better. Picloram granular in the 2% formulation gave erratic results possibly due to variability of application on a small plot area. Picloram granular in the 5% formulation did not give as good control as the 2% granular due to the large size of 5% granules affecting distribution. Poor control resulted from the 2,4-D amine and 2,4-D LVE treatments at both rates and 2,4-DP gave poor control at the 1.0 lb rate. Dicamba alone gave fair control at the 1.0 and 2.0 lb rates. When counts were taken on August 19, 1977, plots treated with dicamba and dicamba + 2,4-D were shown to have an abundance of rosettes, indicating a stimulation of bud growth by dicamba. However by October 5, 1977, other treatments equaled or exceeded the rosette population of the dicamba plots. Drought conditions in the 1977 growing season could have contributed to the results. (Idaho Agricultural Experimental Station, Moscow, ID 83843)

Effect of spring applied herbicides on rush skeletonweed at Banks, Idaho in 1977

Treatments	Rate lb/A	Number of rosettes 8/19/77	& control 10/5/77
Picloram, 2% beads	.25	0	87
Picloram, 2% beads	.50	0	76
Picloram, 5% beads	.25	0	48
Picloram, 5% beads	.50	0	51
Glyphosate	2.25	0	18
Glyphosate	3.0	0	35
Picloram + 2,4-D[1/]	0.125 + 0.25	0	89
Picloram + 2,4-D	0.25 + 0.50	0	92
Picloram	.25	0	91
Picloram	.50	1	72
2,4-D amine	1.0	0	32
2,4-D amine	2.0	0	9
2,4-D LVE	1.0	2	13
2,4-D LVE	2.0	1	10
Dicamba	1.0	40	58
Dicamba	2.0	26	76
Dicamba + 2,4-D[2/]	0.5 + 1.5	18	30
Dicamba + 2,4-D	1.0 + 3.0	8	41
Picloram + 2,4-D	.25 + 1.0	0	85
Picloram + 2,4-D	.50 + 2.0	0	92
2,4-DP	1.0	0	31
2,4-DP	2.0	0	74

[1/] Dow's Tordon-212 - 1 lb picloram + 2 lb 2,4-D/gal

[2/] Velsicol's Weedmaster - 1 lb dicamba + 3 lb 2,4-D/gal

Spotted knapweed control. Belles, W.S., D.W. Wattenbarger and G.A. Lee. Spotted knapweed is characteristically a biennial or short-lived perennial in pastures and rangelands of northern Idaho. This study was initiated to determine the effectiveness of various spring applied herbicides on the control of spotted knapweed at two stages of growth. Plots were established at two locations; in Kootenai County on May 25, 1977 and in Bonner County on June 14, 1977. All but the late bloom glyphosate treatments were applied in the rosette stage at the Kootenai location and in the late rosette (5 leaf) to early bolting stage with 12 inch flower stalks at the Bonner location. The late bloom glyphosate treatments were applied on July 25. A knapsack sprayer equipped with a three nozzle boom was used to apply the herbicides in 40 gpa of water carrier. Treatments were replicated three times in a randomized complete block design. Plots were 9 by 30 ft in size.

Plots located in Kootenai County were established on an untilled site on Garrison loam soil. Soil temperature was 55 F, air temperature was 60 F and soil moisture was 70%. The plots located in Bonners County were established on an abandoned pasture. Air temperature was 80 F, soil temperature was 67 F, relative humidity was 35% and soil moisture was 30%. Percentage control was obtained by counting living plants in a 2.5 square foot quadrat at two random locations in each plot and comparing plant numbers in treated areas to those from the nontreated check plots. Evaluations were made October 26, 1977. Drought conditions prevailed at both locations in 1977.

Liquid formulations of picloram and picloram + 2,4-D gave 90% or better control at all rates of application. Dicamba plus 2,4-D gave excellent control at both locations. Picloram and dicamba resulted in little or no visual damage to the grass species in the treated areas. Buthidazole at 8 and 16 lb/A gave over 95% control of spotted knapweed but resulted in severe phytotoxicity to the associated grass species. Bentazon at 1.0 and 2.0 lb/A gave poor results as did granular formulations of picloram. Moisture conditions at the time of application and throughout the growing season were low and contributed to the lack of control realized from the picloram granular formulations. Glyphosate and asulam did not provide adequate control of spotted knapweed at either location. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Herbicides, rates and percent spotted knapweed control

Herbicide	Rate lb/A	% control**	
		Kootenai Co.	Bonner Co.
Picloram, 2% beads	0.25	46	27
Picloram, 2% beads	0.50	48	28
Picloram, 5% beads	0.25	33	32
Picloram, 5% beads	0.50	30	26
Picloram	0.25	93	98
Picloram	0.50	100	100
Picloram + 2,4-D[1/]	0.125 + 0.25	98	100
Picloram + 2,4-D	0.25 + 0.50	100	98
2,4-D LVE	1.0	84	*
2,4-D P	1.0	45	*
2,4-D P	2.0	87	*
Bentazon	1.0	21	12
Bentazon	2.0	25	26
Buthidazole	4.0	89	86
Buthidazole	8.0	100	96
Buthidazole	16.0	100	*
Glyphosate	1.5	48	27
Glyphosate	3.0	56	25
Dicamba + 2,4-D[2/]	0.5 + 1.5	100	100
Dicamba + 2,4-D	1.0 + 3.0	100	100
Glyphosate[3/]	1.5	65	28
Glyphosate	3.0	51	17
Asulam	2.0	*	19
Asulam	4.0	*	14

[1/] Dow's Tordon-212 - 1 lb picloram + 2 lb 2,4-D/gal

[2/] Velsicol's Weedmaster - 1 lb dicamba + 3 lb 2,4-D/gal

[3/] Late bloom

*Treatment not applied.

**Average of 3 replications.

Yellow starthistle control. Belles, W.S., D.W. Wattenbarger, and G.A. Lee. Plots were established on rangeland in NezPerce County, Idaho on November 1, 1976 to determine the effectiveness of fall applied herbicides for the control of yellow starthistle. The herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa of water carrier. The 9 by 30 ft plots were replicated three times in a randomized complete block design. The yellow starthistle plants were in the rosette stage of growth and 5 to 6 inches in diameter at the time of application. The air temperature was 59 F and soil temperature was 55 F with a relative humidity of 70%. The plots were evaluated at two stages of growth; on August 15, 1977 for seed stalk counts and on November 1, 1977 for new fall rosettes. The seed stalk count was obtained by determining the total number of flowering stalks in each plot. Fall rosette infestation was determined by counting the number of rosettes in a 2.5 square foot area at 2 locations in each plot.

Severe drought conditions during the 1977 growing season may have contributed to the results of the herbicide treatments. All treatments gave a reduction in seed stalk numbers compared to the nontreated check plots. Seed stalk production was eliminated by 15 of the 20 treatments applied. Since yellow starthistle is an annual species, effective elimination of the seed source will provide an effective control measure. The 5% granular formulation of picloram gave the least percent control of yellow starthistle. The 5% granules are large and poor distribution coupled with limited moisture contributed to the poorer results of that compound. All other compounds gave adequate control of seed production. Picloram and picloram + 2,4-D were the only treatments resulting in 90% or better control of fall rosettes. Dicamba and dicamba + 2,4-D at the higher rates gave slightly less effective results. 2,4-D LVE gave good control of seed stalk production but, as evidenced by the lower percent control of fall rosettes, had little or no soil residual activity. (Idaho Agriculture Experiment Station, Moscow, ID 83843)

The effect of fall applied herbicides on yellowstar thistle in NezPerce County, Idaho in 1977

Herbicide	Rate lb/A	Percent control[1/] # seed heads[4/]	# fall rosettes[5/]
Picloram 2% beads	.25	80	100
Picloram 2% beads	.50	98	92
Picloram 5% beads	.25	48	63
Picloram 5% beads	.50	82	97
Picloram	.25	100	84
Picloram	.50	100	75
Picloram + 2,4-D[2/]	0.125 + 0.25	100	100
Picloram + 2,4-D[2/]	0.25 + 0.50	100	99
2,4-D amine	1.0	100	62
2,4-D amine	2.0	100	72
2,4-D LVE	1.0	100	24
2,4-D LVE	2.0	100	45
Dicamba + 2,4-D[3/]	0.5 + 1.5	100	67
Dicamba + 2,4-D[3/]	1.0 + 3.0	100	88
Dicamba	1.0	100	76
Dicamba	2.0	100	88
Picloram + 2,4-D	.25 + 1.0	100	100
Picloram + 2,4-D	.50 + 2.0	100	78
2,4-DP	1.0	97	70
2,4-DP	2.0	100	74

[1/] Values are averages of three replications

[2/] Dow's Tordon 212 - 1 lb picloram + 2 lb 2,4-D/gal

[3/] Velsicol's Weedmaster - 1 lb dicamba + 3 lb 2,4-D/gal

[4/] Evaluated 8/15/77

[5/] Evaluated 11/1/77

Response of western bracken to sprays containing triclopyr, Dowco 290 and picloram. Geronimo, J. Triclopyr and Dowco 290, formulated as water soluble amine salts (WSA), were compared with picloram K salt for the control of western bracken. Postemergence sprays of the herbicides were applied on June 13, 1974 after the fronds had expanded fully. Plots were 10 ft wide by 20 ft long, replicated three times per treatment, and total spray volume was 100 gallons per acre. Control was evaluated three months after treatment by visual estimation of topkill and 14 months after treatment by visual estimation of stand reduction.

Topkill during the season of treatment was greatest with picloram followed by triclopyr and Dowco 290. Control as estimated by stand reduction during the season following treatment was greatest with picloram followed by Dowco 290 and triclopyr. Picloram produced excellent control at 2 lb ae/A, Dowco 290 gave adequate control at 4 lb ae/A, and triclopyr produced poor control at 4 lb ae/A.

The results indicate that picloram is the most active of the three herbicides on western bracken and that Dowco 290 is more efficacious than triclopyr. Triclopyr produced significant topkill during the season of treatment, but appears to be relatively ineffective in controlling this species. (Dow Quimica Mexicana S.A. de C.V., Paseo de las Palmas 555, Mexico 10, D.F., Mexico)

Control of western bracken with sprays containing triclopyr, Dowco 290 and picloram applied after fronds fully expanded

Herbicide	Rate lb/A	Percent topkill Sept. 18, 1974	Percent control Aug. 25, 1975
Triclopyr	2	66	15
Triclopyr	4	74	27
Dowco 290	2	21	53
Dowco 290	4	27	70
Picloram	2	80	93
Untreated	-	0	0

Treated June 13, 1974.
Dynawet surfactant added to all spray mixes at a final concentration of 0.5%.

Control of hoary cress with triclopyr and 2,4-D. Geronimo, J. Triclopyr, formulated as a water soluble amine salt (WSA) and as an LV ester, was evaluated against hoary cress in comparison with 2,4-D. Postemergence sprays of the triclopyr formulations as well as 2,4-D WSA and 2,4-D LV ester were applied to a uniform stand of hoary cress in the bud stage. The experimental site was an ungrazed pasture. Plots were 10 ft wide by 20 ft long, replicated three times per treatment, and total spray volume was 50 gallons per acre. Sprays were applied April 3, 1976 and control was evaluated 13 months later on May 18, 1977 by visual estimation of stand reduction.

At 2 and 4 lb ae/A, the control obtained with both formulations of triclopyr was essentially equivalent. Triclopyr WSA appeared to be slightly less efficacious than 2,4-D WSA at 2 lb ae/A, but the triclopyr and 2,4-D LV esters produced essentially equivalent control at the rates tested. Combinations of the triclopyr and 2,4-D herbicides were also effective. The results indicate that at 2 to 4 lb ae/A triclopyr WSA and LV ester performed essentially the same as 2,4-D WSA and LV ester in controlling hoary cress. (Dow Quimica Mexicana S.A. de C.V., Paseo de las Palmas 555, Mexico 10, D.F., Mexico)

Control of hoary cress with triclopyr and 2,4-D 13 months after postemergence treatment

Herbicide	lb/A	Percent control
Triclopyr WSA	2	87
Triclopyr WSA	4	92
Triclopyr LVE	2	91
Triclopyr LVE	4	95
2,4-D WSA	2	98
2,4-D WSA	4	96
2,4-D LVE	2	91
2,4-D LVE	4	97
Triclopyr WSA +	1 + 1	95
2,4-D WSA	2 + 2	85
Triclopyr LVE +	1 + 1	97
2,4-D LVE	2 + 2	91
Untreated	- (60.7)[1]	0

X-77 surfactant added to all WSA spray mixes at a final concentration of 0.25%.

[1] Percent of plot area infested with hoary cress. Average of 3 replicates.

Control of perennial pepperweed with triclopyr and 2,4-D. Geronimo, J. Triclopyr, formulated as a water soluble amine salt (WSA) and as an LV ester, was evaluated for control of perennial pepperweed in comparison with 2,4-D. In one trial postemergence sprays of the triclopyr herbicides and 2,4-D LV ester were applied on May 10, 1974 to a uniform stand of perennial pepperweed that was flowering. Plots were 10 ft wide by 20 ft long, replicated three times per treatment, and total spray volume was 100 gallons per acre. Control was evaluated 12 months later on May 9, 1975 by visual estimation of stand reduction. In a second trial the triclopyr herbicides as well as 2,4-D WSA and LV ester were applied postemergence on May 6, 1975 to a uniform stand in the bud stage. Plot size, replicates and total spray volume were as described above. Control was evaluated 12 months later on May 26, 1976 by visual estimation of stand reduction.

With the two triclopyr herbicides, 8 lb ae/A was required to provide adequate control of perennial pepperweed when treated in the flowering stage (Table 1). Both amine and ester formulations provided essentially equivalent control. 2,4-D LV ester produced excellent control at 4 lb ae/A and was better than the two triclopyr herbicides. When applied in the bud stage all triclopyr and 2,4-D herbicides provided excellent and essentially equivalent control at 4 lb ae/A (Table 2). Combinations of triclopyr and 2,4-D also provided excellent control.

The results indicate that excellent control of perennial pepperweed can be obtained with sprays containing 4 lb ae/A of triclopyr LV ester or WSA fortified with surfactant when applied in the bud stage. When applied after flower initiation, 2,4-D LV ester produced better control than either triclopyr herbicide. Timing of application appears to be more critical with triclopyr than with 2,4-D since neither triclopyr herbicide produced adequate control at the 4 lb ae/A rate when applied after initiation of flowering. The differences in control observed with 2,4-D LVE applied after flowering versus during the bud stage were not as great as with triclopyr. (Dow Quimica Mexicana S.A. de C.V., Paseo de las Palmas, Mexico 10, D.F., Mexico)

Table 1 Control of perennial pepperweed with sprays of triclopyr and 2,4-D applied after initiation of flowering

Herbicide	lb/A	Percent control
Triclopyr WSA	2	37
Triclopyr WSA	4	47
Triclopyr WSA	8	75
Triclopyr LV ester	2	43
Triclopyr LV ester	4	50
Triclopyr LV ester	8	79
2,4-D ester	2	60
2,4-D ester	4	89
Untreated	- (80.0)[1/]	0

Treated May 10, 1974. Evaluated May 9, 1975.
Dynawet surfactant added to triclopyr WSA spray mix at a final concentration of 0.5%.

[1/] Percent of plot area infested with perennial pepperweed. Average of 3 replicates.

Table 2 Control of perennial pepperweed with sprays of triclopyr and 2,4-D applied during the bud stage

Herbicide	lb/A	Percent control
Triclopyr WSA	4	94
Triclopyr LV ester	4	95
2,4-D WSA	4	98
2,4-D LV ester	4	99
Triclopyr WSA + 2,4-D WSA	2 + 2	96
Triclopyr LV ester + 2,4-D LV ester	2 + 2	97
Untreated	- (91.0)[1/]	0

Treated May 6, 1975. Evaluated May 26, 1976.
X-77 surfactant and to all WSA spray mixes at a final concentration of 0.25%.

[1/] Percent of plot area infested with perennial pepperweed. Average of 3 replicates.

PROJECT 3

UNDESIRABLE WOODY PLANTS

L.E. (Jack) Warren - Chairman

SUMMARY -

Comparison of several herbicides as sprays or solid formulations in Christmas cholla cactus in New Mexico in May and July indicated that picloram 10% pellets and a 2,4,5-T ester spray provided 100% control; other treatments were less effective.

Big sagebrush and two species of rabbitbrush were well controlled with applications of 2,4-D ester with oil-water carrier. Triclopyr alone or with 2,4-D or 2,4,5-T ester were no more effective.

Six forest conifer species were treated with 8 different foliar herbicides before budbreak and during growth. The treatments made during growth caused more injury than before budbreak; response to chemicals varied.

Several foliar and soil active herbicide treatments gave fair to good control of herbaceous vegetation in newly planted conifers in Oregon.

Site preparation treatments with several foliar herbicides alone or in combinations in late summer provided good control of selected species. Some of the more promising were glyphosate and picloram + 2,4,5-T.

Tanoak resprouts were treated with several foliar herbicides during growth with a technique to deduce degrees of translocation from treated young or mature sprouts to the new growth. Translocation of Krenite or glyphosate was about equal from both mature and young shoots but was better from mature shoots with triclopyr, 2,4,5-T and picloram.

Several species of dormant brush were controlled with topical applications of triclopyr either in oil or water plus oil carrier in forest sites or on roadsides. Applications were made before budbreak of the hardwood brush.

Several species of hardwoods and conifers were controlled with low concentrations of triclopyr ester in oil carrier applied to the basal twelve inches of the stems during fall dormancy, good growth and summer drought.

Repeat sprays of picloram at 0.5 lb a.i. per acre reduced transpiration of live oak plants about 36% for 10 to 14 days with 13% leaf injury. Higher rates of picloram caused more reduction in transpiration for several weeks but with greater leaf injury. Benefits from this treatment in saving soil moisture are likely to be small.

PAPERS -

Effects of herbicides on Christmas cholla cactus. Dickerson, George W. and J.W. Whitworth. Because of extremely long spines (2.5 to 5 cm), Christmas cholla is a particularly difficult problem on some of the rangeland areas in New Mexico. Sheep may completely ignore areas of rangeland infested with this cactus because of these spines. While mechanical control has been successful with some of the other chollas, it has not been successful with this species. It is almost impossible to clean up each of the very small, pencil-like joints which scatter very easily and root where they fall.

A three-year study was initiated on the Roman Nunez Ranch just east of Sunset, New Mexico, on Highway 70, to evaluate both soil and foliar applied herbicides for the control of Christmas cholla. The ranch is an extremely rocky area devoted to sheep. Rainfall approximates 30 to 35 cm per year.

On May 23, 1975, individual plants were treated with dry formulations of picloram (granular), bromacil and hexaflurate at the rate of one gm ai/plant for the first two herbicides and one-half gram of the hexaflurate. Sufficient rain fell in June of 1975 to place the cactus in a good growing condition and other treatments of 2,4-D + dichlorprop and 2,4,5-T were applied at the rate of 480 gm ai/100 L of water. The herbicide solutions were applied with a backpack sprayer to the point of runoff. Data taken in the fall of 1975, 1976 and 1977 are shown in Table 1. Picloram at 1 gm/plant and 2,4,5-T at 480 gm/100 l of water as a foliage spray gave 100% control. The other treatments were less effective.

Another experiment was initiated on July 7, 1976, with two rates of 2,4,5-T (480 and 240 gm ai/100 L of water), glyphosate at 720 gm of the salt/100 L of water, and a dicamba + 2,4-D combination (1 + 3) at 480 gm total ai/100 L of water. Again the plants were sprayed with the backpack to the point of runoff. Data taken in the fall of 1976 and 1977 are reported in Table 2. The 2,4,5-T treatment was only 77 to 82% effective the year after treatment. Glyphosate and the dicamba + 2,4-D combination were ineffective. (Agricultural Services and Agronomy Department, New Mexico State University, Las Cruces, NM 88003)

Table 1 Percent kill of Christmas cholla in the fall of the year

Herbicide	Rate	Method	Date applied	% kill by year 1975	1976	1977
Picloram (10K)	1.0 gm/plant	Soil	5/23/75	100	100	100
Bromacil (50%W)	1.0 gm/plant	Soil	5/23/75	10	50	72
Hexaflurate	0.5 gm/plant	Soil	5/23/75	60	25	67
2,4,5-T (LVE)	480 gm/100L H_2O	Foliage	7/1/75	98	100	100
2,4-D + dichlorprop (LVE)	240 + 240 gm/ 100L H_2)	Foliage	7/1/75	85	100	50

Table 2 Percent kill of Christmas cholla from foliar sprays

Herbicide	Rate gm/100 L of water	% kill by the fall of the year 1976	% kill by the fall of the year 1977
2,4,5-T (LVE)	480	66	82*
2,4,5-T (LVE)	240	86	77*
Glyphosate	720	14	9
Dicamba + 2,4-D (amine)	120 + 359	11	11

*Significantly different at 0.05 (Chi square test)

Control of sagebrush and rabbitbrush with dormant applications of 2,4-D and triclopyr. Warren, L.E. Big sagebrush is controlled easily with foliar application of 2,4-D ester at 2 lb a.e. per acre during periods of good growth. Dry periods frequently prevail during this growth stage and control is reduced; consequently, only 2 to 3 weeks are suitable for spraying.

Rabbitbrush can be controlled moderately with 3 lb of 2,4-D ester per acre if growing conditions are good, but the optimum time if usually later than for sagebrush.

There is a possibility that application of certain systemic herbicides could give more reliable control and extend the spraying season. This report gives results of treatments made in late dormancy.

Applications of several herbicides alone and combined were made to big sagebrush and green and rubber rabbitbrush in Butte Valley, California on April 20, 1976 using a hand boom covering a 5 ft swath to give 20 gpa. The brush was 1 to 5 feet tall and the stand of sagebrush was uniform; rabbitbrush was more sparse but some plants were present in all plots. Some of the rabbitbrush was just breaking bud; sagebrush was dormant. The plots were 15 ft by 30 ft and treatments were triplicated. Soil temperature at 6 inches was 44.5 F; maximum air temperature was 62 F. Amounts of oil were varied from 1 to 4 gpa and niacin was added at 50 to 100 mg/A. A polyglycol surfactant was added to the mix with 1 gal oil. The active ingredients were 2,4-D, 2,4,5-T and triclopyr, all as low volatile esters. The treatments and results after the second growing season are shown in the table.

Control of big sagebrush and green rabbitbrush was excellent with all treatments. It is difficult to discern true differences between treatments of rubber rabbitbrush from these data, although control was apparently poorer than on big sagebrush and green rabbitbrush. 2,4-D at 2 or 3 lb/A was very effective on these species and would be the least expensive treatment. Addition of oil or niacin may be of value but did not show benefits in this experiment; they should be evaluated further. These results encourage further research to develop a late dormant spraying program for control of these woody plants. In future studies the addition of small amounts of picloram is suggested to improve control of rabbitbrush. (Dow Chemical USA., Rt. 1, Box 1313, Davis, CA 95616)

Control of big sagebrush with dormant applications of phenoxy herbicides

					Percent control		
	a.e.	Oil	Surf.	Niacin	Big	Rabbitbrush	
Herbicide	kg/ha	L/ha	L/ha	mg/ha	sage	Rubber	Green
2,4-D[1]	2.2	9.3			95	96	100
2,4-D	3.3	9.3			98	98	100
2,4,5-T[2]	2.2	9.3			100	63	100
Triclopyr[3]	2.2	9.3			100	75	-
Triclopyr + 2,4-D	1.1 1.1	9.3			100	73	-
Triclopyr + 2,4-D	1.1 1.1	37			100	93	100
Triclopyr	3.3	37			97	97	100
2,4-D	3.3	37			100	78	100
2,4-D	2.2	37			99	93	100
2,4,5-T	2.2	37			100	--	--
2,4-D	2.2	9.3	2.5		99	77	100
2,4,5-T	2.2	9.3	2.5		100	78	100
2,4-D	2.2	9.3	2.5	110	93	70	100
2,4-D	2.2	9.3	2.5	220	100	77	100
Untreated	-	-	-	-	0	0	0

[1] As ESTERON* 99 Concentrate herbicide (PGBE ester)

[2] As ESTERON 245 herbicide (PGBE ester)

[3] As M-4021 (emulsifiable LV ester) (ethylene glycol butyl ether ester)
*Trademark of The Dow Chemical Company

Conifer tolerance to eight postemergence herbicides. Roncoroni, E.J., S.R. Radosevich and W.B. McHenry. A study was initiated at the Blodgett Experimental Forest, El Dorado County, California to determine the effects of several herbicides to six conifer species. Species were red fir, white fir, Douglas-fir, ponderosa pine, sugar pine and Jeffrey pine.

Approximately 3 acres were mechanically cleared of all brush and the six conifer species were planted during the spring of 1976.

On April 13, 1977, July 5, 1977, and October 21, 1977, herbicide applications were made to 400 sq ft plots. Herbicides and rates applied are presented in the following tables. Each plot contained 10 trees of each species. The experiment was conducted as a split-plot design with herbicides being the main plots and time of application being subplots. It was replicated 5 times. A visual evaluation of conifer phytotoxicity was made 90 days after the first and second application. An evaluation following the October 21 application was not possible because of snow.

Initial observations indicate differential conifer tolerance between conifer species and herbicide applied. However, greatest phytotoxicity was observed when herbicides were applied in July (after growth was initiated) than in April (before growth had begun). (Botany Dept., Univ. of Calif., Davis, CA 95616)

Table 1 Fir tolerance to foliage-active herbicides

Herbicide	Rate lb/A	Phytotoxicity (%) Red fir 4-13	Red fir 7-5	White fir 4-13	White fir 7-5	Douglas fir 4-13	Douglas fir 7-5
2,4-D ester	4	74	98	50	90	12	53
2,4,5-T ester	4	50	99	25	92	6	28
Silvex ester	4	52	97	16	76	23	35
2,4-DP ester	4	58	98	44	89	19	48
Triclopyr ester	2	58	98	18	74	10	44
Triclopyr ester	4	86	96	29	94	19	44
Triclopyr amine[1]	2	28	89	6	72	14	34
Triclopyr amine[1]	4	60	98	22	90	16	56
DPX-1108	4	8	12	4	17	24	46
DPX-1108	8	26	34	23	24	37	46
Glyphosate	2	53	58	20	4	50	70
Glyphosate	4	56	92	56	42	52	68
Glyphosate[2]	2	76	55	46	18	52	42
Asulam	4	21	20	3	3	4	22
Asulam	4	16	18	12	4	2	7
Control	-	2	13	2	6	2	10

[1] Surfactant X-77 applied at 0.5% (v/v)

[2] Monsanto surfactant 0818 at 0.5% (v/v)

Table 2 Pine tolerance to foliage-active herbicides

Herbicide	Rate lb/A	Phytotoxicity (%) Ponderosa pine 4-13	Ponderosa pine 7-5	Jeffrey pine 4-13	Jeffrey pine 7-5	Sugar pine 4-13	Sugar pine 7-5
2,4-D ester	4	48	79	42	76	60	22
2,4,5-T ester	4	16	60	1	54	6	9
Silvex ester	4	20	24	22	28	26	1
2,4-DP ester	4	0	24	2	40	8	1
Triclopyr ester	2	32	42	12	68	14	11
Triclopyr ester	4	56	75	35	76	52	14
Triclopyr amine[1]	2	6	57	8	54	2	4
Triclopyr amine[1]	4	11	76	7	60	4	11
DPX-1108	4	44	64	42	70	16	3
DPX-1108	8	70	82	55	75	37	48
Glyphosate	2	4	14	12	5	29	0
Glyphosate	4	6	24	14	6	52	35
Glyphosate[2]	2	2	64	2	30	20	16
Asulam	4	0	10	0	2	2	4
Asulam[1]	4	4	30	4	11	4	15
Control	-	0	1	2	2	2	0

[1] Surfactant X-77 applied at 0.5% (v/v)

[2] Monsanto surfactant 0818 applied at 0.5% (v/v)

Effectiveness of several reforestation weed control treatments on atrazine-resistant herbaceous weed communities. Newton, Michael. Resistance to atrazine has been a problem in perennial grass, bracken fern and grapeleaf blackberry communities of the Pacific Northwest. Failure to control weeds has consistently led to loss of investments in reforestation and failure to meet legal reforestation requirements. This report describes several experiments established to increase weed control flexibility in such areas.

A series of tests were established in which individual and combined herbicides were applied by ground and helicopter over recently planted Douglas-fir and true firs. All were applied in late March and early April. Ground rig plots were established in two locations; aerial plots were also in two locations, but there were some differences in treatments between areas. All soils were clay loams with more than 5 percent organic content. Ground rig plots applied the herbicides shown in the table, with accompanying results.

Among the ground rig plots, any rate of Velpar provided adequate control with safety; addition of Mor-Act enhanced control slightly at low rates without producing injury. In view of informal reports of injury with combinations of Mor-Act and Velpar elsewhere, this needs further evaluation. Velpar effects lasted longer than those of other herbicides. Second-year control was 70 percent or more with 1.8 lb active or more per acre, however, even 3.6 pounds did not cause injury to Douglas-fir and grand fir. Noble fir was not affected by 1.8 pounds, but was not treated with higher rates.

Mixtures of triazines with glyphosate were very effective. These offer an option of using low rates of triazines, hence relatively short residue times, for development of cover crops during periods of winter rains. They also give broad spectrum control of all herbs. Glyphosate alone provided no control over germination, and green-up followed within 3 weeks.

Addition of Mor-Act to atrazine provided satisfactory control, even at marginal rates of application. Without Mor-Act, the use of 60 percent above registered use rates of atrazine provided poor control.

Aerial applications of 3.2 lb atrazine plus 0.375 or 0.75 lb active glyphosate per acre showed little difference between the rates of glyphosate. Both rates were effective. Aerial application of Velpar at 1.35 lb/A gave erratic results. Cold water solubility limitations apparently caused crystal formation in nozzles that caused erratic application. One of the best treatments, however, was 1.0 lb per acre with one quart of Mor-Act.

Resistance to atrazine and procyazine were similar.

Aerial application generally appeared to require slightly higher dosage rates than ground rig needed for comparable degree of control. (Oregon State University, School of Forestry, Corvallis, OR 97331)

Ground applications over recently planted forest sites

Herbicide	Rate active lb/A	Percent grass control	Percent forb control	Remarks
Atrazine	2.4	0	0	Conifers show stress
Atrazine	4.0	33	0	Conifers show stress
Atrazine	6.4	50	22	No injury, no stress
Atrazine + Mor-Act [1]	2.4 + 1 quart	70	40	No injury, no stress
Atrazine + Glyphosate	2.4 + 0.56	87	67	Good treatment
Atrazine + Glyphosate	4.0 + 0.75	100	99	Total control, no injury
Simazine + Glyphosate	4.0 + 0.75	95	72	Excellent
Velpar	0.68	92	63	Good treatment
Velpar	0.9	87	55	Good treatment
Velpar	1.35	100	96	Excellent
Velpar	1.8	100	95	Excellent
Velpar	2.7	100	95	Excellent
Velpar	3.6	100	100	Clean, no injury to conifers
Velpar + Mor-Act	0.68 + 1 quart	87	82	Good treatment
Velpar + Mor-Act	0.9 + 1 quart	97	65	Excellent
Procyazine	1.6	50	0	No injury, poor control
Procyazine	2.4	40	0	No injury, poor control
Glyphosate	0.75	92	92	Quick green-up

[1] Surfactant plus oil mixture (Wilbur-Ellis Company)

Effects of glyphosate on Pacific Northwest conifers and associated weed species. Newton, Michael. Glyphosate was applied experimentally for herbaceous weed control and brush control in seven experimental areas in the Oregon Coast Range. The objective was to determine application rates at which the herbicide was effective on major weed species, upper limits tolerated by conifers, and seasons of maximum selectivity.

Application of all plots was done by helicopter, delivering 10 gallons per acre as a water spray. Surfactant was added in some treatments. Seasons of treatment included April, August and September. Replicated treatments were applied in successive years in two areas. A total of 34 aerial spray plots of 5 to 10 acres each was treated. Range of application rates was from .56 lb per acre (.61 kg/ha) to 3.0 lbs/acre (3.3 kg/ha) active glyphosate.

Salmonberry was extremely sensitive to August and September treatments. The lowest rate of application, .56 lb/acre gave a range of 80-90 percent control in either late August or September. Control was 90 to 99 percent with 0.75 lb/acre, with higher rates producing near eradication. Sprouting is negligible after two years.

Cascara, bitter cherry, ocean spray, thimbleberry, California hazelnut, red elderberry and vine maple were also sensitive. At 0.75 lb/acre, control ranged from 70 to 95 percent, and control was 90-99 percent at 1.125 lbs/acre.

Red alder, bigleaf maple and poison oak are variable in response. One location showed that alder can consistently tolerate up to 1.5 lbs/acre with little injury, but all other locations demonstrated satisfactory (80 percent plus) control at 1.125 lbs/acre. Bigleaf maple was variable within plots even at 1.5 lbs/acre, with some mortality and some showing little effect. These results were consistent through two years of testing, on numerous plots. Poison oak tolerated 1.125 lbs/acre in a late September aerial test, but was sensitive at comparable rates in early August.

Herbaceous vegetation in active growth was highly sensitive. Grasses and numerous forbs were nearly eradicated by 0.75 lb/acre in April and September. Bracken control by 1.125 lbs/acre was consistently above 80 percent, but eradication was not achieved by 1.5 lbs/acre.

Effects on conifers and other evergreen species was less than that observed on deciduous shrubs and herbs. Douglas-fir, noble fir, grand fir and Sitka spruce showed no visible effect from 0.75 lb/acre, and only minor tip injury to a small percentage of trees at 1.125 lbs/acre. No mortality to Douglas-fir and Sitka spruce occurred at rates up to 3 lbs/acre, although Douglas-fir lost 1-4 feet of terminal growth at this high rate. Western hemlock was the most sensitive conifer observed, with slight tip injury at 0.75 lb/acre and consistent dieback of 3-12 inches of terminal at 1.5 lbs/acre. Tolerance of conifers was limited to periods of bud dormancy. Evergreen shrubs, greenleaf manzanita, Pacific madrone, salal and evergreen huckleberry were not severely affected at rates causing damage to conifers.

Mixtures of glyphosate with s-triazine herbicides were evaluated for spring herb control in plantations of Douglas-fir. Perennial grasses, orchard grass and alta fescue were treated with mixtures of .375 and .75 lbs glyphosate with 4 lbs atrazine per acre. Both provided satisfactory control of the perennial grasses for plantation establishment where control with atrazine alone was inadequate. Neither eradicated the grasses nor grapeleaf blackberry at these low rates.

These experiments demonstrate the general effectiveness of fall applications of glyphosate for control of deciduous brush, either for site preparation or release. Control of shrubs and hardwoods is accompanied by herb control to a major degree. Spring application was effective on herbs but not on shrubs. These treatments are not effective on evergreen species in these test areas. (School of Forestry, Oregon State University, Corvallis, OR 97331)

A comparison of triclopyr, picloram-2,4,5-T mixtures, and 2,4,5-T for spring and fall forest brush control in the Oregon Coast Range. Newton, Michael. Three herbicides were compared for spring dormant and late fall applications to be used in forest site preparation and release. Results were evaluated in terms of damage to both crop and target species.

Spring tests included triclopyr ester at rates of 2 and 4 pounds active per acre, 2,4,5-T PGBE ester at 2 lbs/acre and a mixture of isooctyl esters of picloram and 2,4,5-T at the rate of 1/2 and 2 lbs of the respective ingredients per acre. All were applied in diesel fuel at the rate of 10 gallons per acre total. Conifers in the project area included Douglas-fir and western hemlock. Shrubs included vine maple, salal, thimbleberry, red huckleberry, ocean spray, Ribes species, and others of spotty distribution. Time of application was at bud-swell for conifers; some shrubs had opened buds slightly.

All herbicides demonstrated 90-percent-plus control of vine maple. Top-kill was virtually complete. Sprouting was less vigorous with triclopyr and the picloram mixture than with 2,4,5-T alone. Salal was variable, with 2,4,5-T, the picloram mixture and triclopyr at 2 lbs/acre producing damage in the range of 0-80 percent, with some plant kill. Triclopyr at 4 lbs/acre gave 90-plus percent control. Triclopyr at 2 lbs/acre killed completely all observed specimens of Oregon grape, Ribes spp., red huckleberry and wild rose. These species were damaged by the other herbicides but sprouted. Conifers were uninjured by 2,4,5-T, were uninjured to severely injured by triclopyr at 2 lbs/acre, and were severely injured by the picloram mixture or 4 lbs/acre triclopyr. Selectivity of 2,4,5-T was consistent. That of triclopyr was consistent enough to suggest that there is a range of dosage at which triclopyr can be used selectively, but that range is narrow. Picloram injury was too severe for release. Based on this limited test, spring appears a very desirable time for use of all three herbicides. Triclopyr ester, in particular, demonstrates unprecedented effects on certain evergreen shrubs at this season.

Fall applications included triclopyr ester and amine formulations at 3 and 6 lbs/acre, 2,4,5-T at 2 and 4 lbs/acre and mixtures of picloram and 2,4,5-T esters at 1/2 plus 2 lbs/acre and 1 plus 4 lbs/acre. Also evaluated were picloram as the potassium salt and 2,4,5-T ester at a 1 plus 2 lbs/acre rate. Treatments were applied as water-based sprays in late September to a salmonberry community containing thimbleberry, red elderberry, salal and alder, with scattered Douglas-fir, western hemlock and Sitka spruce regeneration. This season is two months later than customary treatment with phenoxy herbicides.

The table compares the results of the treatments on the major plant species, shrubs expressed as percent control, conifers according to degree.

Among these ratings it was noteworthy that salal treated with picloram as the potassium salt is continuing to die, whereas recovery is being observed elsewhere. Control 1 1/2 years after application has increased to the point of allowing reforestation with large coniferous seedlings. This treatment left a higher percentage of the area ready for planting than others compared here. Adding phenoxy herbicides, or picloram plus 2,4-D, (not shown) did not add to the activity of triclopyr amine or ester measureably. (Oregon State University, School of Forestry, Corvallis, OR 97331)

Herbicide and pounds per acre[1]

	Tric. E		Tric. A		Picloram E plus 2,4,5-T		Picloram K plus 2,4,5-T	2,4,5-T	
	3	6	3	6	½+2	2+4	1+2		
Red alder	88	100	80	99	75	71	99	78	63
Salmonberry	45	71	62	66	43	39	79	9	29
Salal	25	32	21	7	11	15	22	0	16
Thimbleberry	40	90	78	86	28	40	20	21	30
Red elderberry	--	S	100	90	--	82	100	--	--
Douglas-fir	M[2]	S	M	S	S	S	S	N	N
Spruce	N	S	N	S	M	S	S	N	N
Hemlock	M	S	M	S	M	S	S	N	N

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[1] Tric. E is triclopyr EGBE ester. Tric. A is triclopyr amine salt. Picloram E + 2,4,5-T is Picloram isooctyl ester plus 2,4,5-T PGBE ester plus emulsifiers. Picloram K + 2,4,5-T is Picloram, potassium salt, plus 2,4,5-T PGBE ester. 2,4,5-T is the PGBE ester.

[2] For conifer injury N = negligible; M = minor, tolerable; S = severe, intolerable.

<u>Responses of several conifers and woody associates to aerial applications of ammonium ethyl carbamoyl phosphonate</u>. Newton, Michael. The growth regulator, ammonium ethyl carbamoyl phosphonate, (Krenite®) was evaluated for forest brushfield site preparation and releases in the Oregon Coast Range.

Twelve aerial spray plots were established in 6 to 25-year-old coastal salmonberry-salal and Willamette Valley foothill communities containing scattered Douglas-fir, Sitka spruce and western hemlock. Krenite was applied by helicopter in late September, 1975 and 1976 at rates of 2 to 5 lbs/acre in water, at 10 gallons per acre.

Vegetation was evaluated in July, 1977 to determine effects on conifers, shrubs and herbs. Herbs other than bracken fern were not visibly affected, and abundance and diversity were greater one year after treatment than beforehand. Bracken sustained some injury, but of marginal importance. Hemlocks were slightly affected by 2 lbs/acre with 1 percent X-77 surfactant. Negligible injury to conifers was observed at 3 lbs/acre without surfactant, but terminal injury to hemlock was observed with or without surfactant at 5 lbs/acre.

Salmonberry and Himalaya blackberry were the most sensitive shrubs. At 2 lbs/acre, 80 percent control was achieved, with 88 percent control at 3 and 5 lbs/acre rates. Salal was not affected the first year, but 5 lbs/acre produced 61 percent control the second year and 3 lbs/acre gave 28 percent control and loss of vigor. Vine maple control was 80 percent with 3 or 5 lbs/acre, but 53 percent at 2 lbs. Elderberry and thimbleberry control ranged from zero to 80 percent at 3 lbs/acre. Red alder control ranged from 16-73 percent at 3 to 5 lbs/acre, with much variability. Cascara, California hazel and ocean spray control were moderately sensitive, with 3 lbs/acre producing 70 to 80 percent control. Sprouting vigor was low for all species with 50 percent control or greater, and recovery was not observed the second year. Poison oak was not controlled.

These tests demonstrated that Krenite has the potential for release without causing brown-out or reduction in herb abundance. Nearby tests in 1974 gave evidence that application as late as October 9 produces poorer results than treatments in late August or September. Rates above 3 lbs/acre cause frequent injury to hemlock, but injury levels to all conifers at 3 lbs/acre are negligible. For release purposes, degree of control did not differ measurably between 3 and 5 lbs/acre.

Krenite effects on deciduous species closely resemble those of glyphosate applied at about one-third the rate of active ingredient. Glyphosate differs in controlling many herbaceous species, thimbleberry and elderberry. The two herbicides may therefore be selected on the basis of spectrum of activity on shrubs or desire to retain herb cover, whether site preparation or release is desired. Krenite's long-term effect on salal is unique, but requires at least 5 lbs/acre to achieve it. (Oregon State University, School of Forestry, Corvallis, OR 97331)

Effectiveness of various foliar applied herbicides on tanoak resprouts. King, M.G. and S.R. Radosevich. A study was initiated in September, 1976 near Laytonville, Mendocino County, California, to determine the effectiveness of several foliar applied herbicides on tanoak resprouts. Contact injury and translocation were evaluated as a function of leaf age.

Five to seven year old resprouting stumps were pruned back to one resprout per stump. The experiment was set up as a completely random design, four repetitions per treatment. On May 30, 1977, after new growth had started, the plots were treated. To maintain equivalent concentrations between herbicides, molar (.1 and .2 M) concentrations were used. These rates are unusually high for normal field use. However, as the treated area was small and evaluating herbicide movement was our primary concern, the high rates were necessary to assure observable effects. The herbicides (Krenite, glyphosate, picloram, triclopyr, and 2,4,5-T) were applied with a constant flow backpack sprayer. Treated areas of each resprout were either young foliage (one year old) or mature (greater than one year old) foliage. Spray was prevented from impinging on the untreated area of each shrub by shielding it with a tarp or plastic lined box. Treatments were made until run-off occurred.

On November 4, 1977 the plots were visually rated. Two evaluations, contact injury (injury on treated portion) and injury resulting from translocation (injury on non-treated area), were made for each plant.

Results are presented in the table. As regards initial contact injury, glyphosate at the high rate on young foliage and at both rates on mature foliage was effective. Triclopyr was effective on the young foliage at the low concentration and at both concentrations on the mature foliage. All picloram and 2,4,5-T treatments gave excellent results. Krenite results were variable, but the higher rates also seem effective. Movement was determined by assessing injury on the non-treated areas of the plant. Picloram at the high rate was transported well when applied on the old foliage. Triclopyr and 2,4,5-T at both rates on the mature foliage were also transported.

The best treatments over all appear to be triclopyr and 2,4,5-T (both rates, mature foliage) and picloram at the high concentration on the mature foliage. (Botany Dept., Univ. of Calif., Davis, CA 95616)

Visual ratings of injury on tanoak resprouts resulting from several herbicides

Herbicide	Portion sprayed	Concentration (M)	Percent injury Treated portion	Percent injury Non-treated portion
Krenite	young	.1	50	35
Krenite	young	.2	83	25
Krenite	mature	.1	48	15
Krenite	mature	.2	83	15
Glyphosate	young	.1	68	20
Glyphosate	young	.2	85	43
Glyphosate	mature	.1	98	38
Glyphosate	mature	.2	100	28
Picloram K salt	young	.1	98	18
Picloram K salt	young	.2	98	38
Picloram K salt	mature	.1	100	10
Picloram K salt	mature	.2	95	83
Triclopyr LV ester	young	.1	100	55
Triclopyr LV ester	young	.2	78	13
Triclopyr LV ester	mature	.1	100	100
Triclopyr LV ester	mature	.2	100	85
2,4,5-T LV ester	young	.1	100	43
2,4,5-T LV ester	young	.2	100	58
2,4,5-T LV ester	mature	.1	100	90
2,4,5-T LV ester	mature	.2	100	88
Control			10	10
L.S.D.$_{.05}$			30	40

Control of dormant brush with topical applications of triclopyr. Warren, L.E. Brush on forest sites in California, Oregon and Washington was treated topically during late dormancy with a low volatile ester of triclopyr at 2.2 to 8 kg/ha (a.e.) compared to 2,4,5-T at 4 to 9 kg/ha and picloram plus 2,4,5-T at 3.1 to 7.8 kg/ha. Carrier was mostly diesel oil, but invert emulsions and excess surfactants (5 to 10 l/ha) were used with some treatments. Based on second season evaluations, control with triclopyr at 4.4 kg/ha was complete on buckbrush (Ceanothus cuneatus); good on blackberries (Rubus spp.), cherry (Prunus spp.), willow (Salix spp.), red alder (Alnus rubra), ocean spray (Holodiscus discolor), cascara (Rhamnus purshiana), maples (Acer spp.) and Douglas fir (Pseudotsuga menziesii). Control was fair on salmonberry (Rubus spectabilis), live oak (Quercus wislizenii), and manzanita (Arctostaphylos patula). Control of poison oak (Rhus diversiloba) and coffeeberry (Rhamnus californica) was poor. Control of most species with triclopyr at 2.2 kg/ha was generally only slightly less than with 4.4 kg/ha. Generally, oil carrier gave the best results but water carrier with surfactants were nearly as effective. 2,4,5-T was nearly equal to triclopyr in effectiveness on most species except on Douglas fir, poison oak, ocean spray and salmonberry. Generally triclopyr was about as effective as picloram + 2,4,5-T at equal rates. Triclopyr in diesel oil carrier or water plus excess surfactants as a dormant topical application is promising for brush control on forest sites and rights-of-way. (Dow Chemical USA, Rt. 1, Box 1313, Davis, CA 95616)

Control of unwanted trees with basal applications of triclopyr. Warren, L.E. Experiments were established in California, Oregon and Washington to compare low-volatile esters of triclopyr, silvex, 2,4,5-T and picloram plus 2,4,5-T (1 to 4 a.i. ratio) in diesel oil as basal applications to control several woody plants. Applications were made during early and late dormancy and during early and late (dry) growing periods. The various species responded as follows: California black oak (Quercus kelloggii) and tanoak (Lithocarpus densiflorus) - before budbreak, triclopyr at 0.96 a.e. kg/100 l (kph), 2,4,5-T at 1.44 kph and picloram + 2,4,5-T at 0.9 kph all provided excellent control. Response was slightly poorer in early winter but much better during early growth. Triclopyr was more effective on stems over 8 cm diameter than were the other herbicides. Ponderosa pine (Pinus ponderosa) - before budbreak in spring and during growth, triclopyr at 0.48 kph, picloram + 2,4,5-T at 0.6 kph and 2,4,5-T at 0.72 kph were very effective but in early winter (December) response was less to all treatments. Bigleaf maple (Acer macrophyllum) resprouted stems up to 30 cm dia. were controlled with spring applications of triclopyr at 0.96 to 1.44 kph; smaller stems were more easily controlled. Control was less with 2,4,5-T at 1.44 to 1.06 kph and picloram + 2,4,5-T at 0.9 kph. Seasonal effects were minimal. Cottonwood (Populus fremontii) and willow (Salix lasiandra) - late dormant applications of triclopyr at 0.48 kph or 2,4,5-T at 0.48 kph to stems up to 10 cm dia. gave 100% kill. Triclopyr at 0.5 to 1 kph in oil as a basal application is very promising for control of many species of hardwoods and pines. (Dow Chemical USA, Rt. 1, Box 1313, Davis, CA 95616)

Table 1 Control of black oak with basal applications of triclopyr in oil carrier

Application date:		April 2		May 27		Sept. 5		Dec. 5	
Chemical	kg a.e./ 100 l.	Stem Diam[1]	% Control[2]	Stem Diam.	% Control[2]	Stem Diam.	% Control[2]	Stem Diam.	% Control[2]
2,4,5-T[3]	0.96	>10	100						
(LVE)	1.44			>12	100	>10	86	>12	100
2,4,5-T + picloram[4] (LVE)	1.92 + 0.48	>12	95	>12	100	>12	95	>12	100
triclopyr	0.48	>12	99	>12	100			>12	100
(LVE)	0.96	>12	98	>12	100	>12	100	>12	96
Untreated	-		0		0		0		0

[1] Stem diameter in centimeters.

[2] Evaluations 20 to 30 months after application.

[3] PGBE ester.

[4] Isooctyl and PGBE esters, respectively.

Table 2 Control of bigleaf maple with basal applications of triclopyr in oil carrier

Application date:		Feb. 1976		June 1976	
Chemical	kg a.e./ 100 l.	Stem dia.[1]	% Control	Stem dia.[1]	% Control
2,4,5-T[2] (LVE)	0.96	>8	100		
2,4,5-T[2] (LVE)	1.44			>8	100
2,4,5-T[3] + picloram	1.92 + 0.48	>10	100	>10	100
Triclopyr	0.48	>10	100	>10	100
Triclopyr	0.96	>10	100	>10	100
Untreated	--		0		0

[1] Diameter in centimeters.

[2] PGBE ester.

[3] Isooctyl and PGBE esters, respectively.

<u>Effects of picloram sprays on transpiration of shrub live oak.</u> Davis, Edwin A. Measures to reduce transpiration losses on chapparral watersheds are not subject to as many plant-related constraints as those on agricultural lands. A reduction in yield of watershed vegetation, for example, is not a significant consideration. Thus, herbicides become possible antitranspirant candidates where growth inhibition and some injurious effects can be tolerated. Substantial and enduring reductions in transpiration, however, would be essential. Since treatments that do not provide a high level of woody plant control would require costly repeat applications, their usefulness would be restricted to areas with vegetation of high wildlife or aesthetic value that consumes much water. It is possible that some herbicides can serve dual roles as vegetation control agents and as antitranspirants.

A study was conducted to determine the influence of foliage sprays of picloram on transpiration of shrub live oak using a subirrigation volumetric technique with potted plants. The effects of sublethal applications, and sequential sprays of increasing toxicity, were investigated to determine the full range of transpiration and toxicity responses. The treatments proceeded from low-dosage and low-volume sprays to high-volume sprays in which the soil was shielded to prevent root uptake. A single spray of 0.5 lb/A in 10 gal temporarily reduced transpiration approximately 20%, without visible leaf injury. Two additional treatments at the same dosage reduced initial transpiration 36% and caused 13% leaf injury. The effects of the three low-volume sprays were slight and of relatively short duration (10 to 14 days). Maximum reduction of transpiration not attributable to visible leaf injury was about 20%.

A fourth treatment of 2 lb/A in 40 gal reduced initial transpiration 51% accompanied by 27% leaf injury. Consistent with the preceding treatments, the added effect of this treatment was short-lived, and by the twenty-fourth day of the treatment period transpiration reduction was only

37%, while leaf injury was 36%. A final wetting spray with the same mixture caused rapid and complete reduction in transpiration, but killed all leaves. Nine months after the transpiration phase of the experiment, mean stem dieback of the treated plants was 72%. All plants were alive, and had developed malformed regrowth shoots from the bottom half of the plants.

Picloram is more toxic to several other chaparral shrub species than to shrub live oak. It is likely that the margin of safety between inhibition of transpiration and leaf injury for these species would be no greater than for shrub live oak. Thus it appears that the antitranspirant effect of picloram at sublethal dosages is too slight and too transitory to be hydrologically significant. The principal value of picloram in water conservation projects, of course, is as a brush killer. (Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, Arizona State University, Tempe, AZ 85281)

PROJECT 4

WEEDS IN HORTICULTURAL CROPS

L.K. Hiller, Project Chairman

SUMMARY -

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

Tomatoes (11 papers) - Six preplant herbicide treatments on direct-seeded tomatoes controlled one or two nightshade species, but gave phytotoxicity on tomatoes in two trials. Various herbicide combinations on a clay, loam gave good control of grass, lambsquarters and pigweed without significant tomato stand reduction. CDEC, alachlor and metolachlor provided moderate to good nightshade control and were safened by use of a band of activated carbon over the seeded row. Dowco 295 was safe on tomatoes on two trials and provided control of grass and pigweed, but was weak on lambsquarters and nightshade. Pre- and post-emergence treatments of metribuzin provided good to excellent nightshade control, but was severely phytotoxic to the crop in two trials and was not effective on nightshade in another test. Good control of black nightshade with no reduction in tomato vigor was achieved with fall fumigation treatments of Telone II, but not with methyl bromide.

Tomato tolerance to alachlor and chloramben treatments was increased by using pelleted seed as compared with direct-seeding bare seed. Black nightshade control was fair to excellent depending on the rate of chemical applied. However, in a low organic matter sandy soil, activated carbon had little, if any, safening effect on these materials.

Irrigation and Soil Moisture (4 papers) - An initial irrigation of 1/8 inch of water was sufficient to activate chloramben in a sandy soil, however, an irrigation of 2 inches greatly reduced the herbicidal activity on crops and weeds, apparently due to the leaching from the root zone. Decreased phytotoxicity was observed in tomato transplants which had been root-dipped in a carbon slurry treated with chloramben, alachlor, pebulate and grown under sprinkler irrigation. Increased phytotoxicity resulted with EPTC treatments in the carbon-dipped tomato transplants. Tomato yields were decreased under furrow irrigation and the chemical treatments of CDEC and pebulate as compared to untreated checks; however, furrow-irrigated checks were significantly lower than any treatment in drip-irrigated plots. Significant differences were not found among the chemical treatments and the untreated check in drip-irrigation plots. Napropamide reduced tomato transplant vigor in furrow-sprinkler plots, but did not affect yields when injected in drip irrigation system.

Dodder and Broomrape (3 papers) - Acceptable dodder control and tomato tolerance resulted from 6 lb/A application of CDEC based on a summary of six years' trials. Pebulate was somewhat less effective and possibly more erratic in controlling dodder than CDEC; however, pebulate + CDEC combination has been found to be very effective, and in many cases has provided better dodder control than either material used alone. The slightly higher rates necessary for adequate dodder control caused noticeable reduction in the vigor of young tomatoes. Glyphosate and maleic hydrazide appear to result in fewer broomrape strikes, but also showed slight phytotoxicity and reduced vigor with lower fruit yields in tomatoes. Sodium azide provided good control of the broomrape, but was severely phytotoxic to tomatoes; broomrape strikes were reduced or delayed by the chemical treatments trifluralin, R-37878, Dowco 295 and MV-687 with some selectivity on tomatoes.

Potatoes, Spinach, Sweet Corn, Strawberry (4 papers) - Several herbicide treatments and combinations provided good to excellent control of redroot pigweed and no visual phytotoxicity to potato plant in a sandy, loam soil on Russet Burbank potatoes grown under center-pivot irrigation. Two treatments which consistently provided good weed control and high yields of processing spinach and spinach seed were H 22234 + chlorpropham and H 22234 + lenacil. Various other herbicide treatments did not cause yield reductions, however, annual weed control was not considered to be adequate. Various sweet corn cultivars differed in relative susceptibility to carbamate phytotoxicity. Conflicting results were reported concerning the tolerance of Jubilee sweetcorn to treatments of EPTC + R-25788 and the insecticide fonofos.

Stone Fruits, Nuts and Grapes (11 papers) - Several herbicidal compounds were found to have good potential for annual weed control in sprinkler-irrigated grapes. Prodiamine and the combination norflurazon + oxadiazon were particularly effective. Several herbicide combinations were observed to have good to excellent post-emergence weed control activity with no injury in non-bearing almonds for annual, broadleaved and winter weed control. Multiple applications of various combinations including simazine, oryzalin, napropamide, oxadiazon, norflurazon and oxyflurofen provided good to excellent weed control and no detrimental effects to the growth of almond trees when compared to complete tillage plots. A thin layering method of herbicide incorporation was found to give a slight increase in herbicide activity with compounds napropamide, oryzalin and norflurazon but not oxyflurofen nor prodiamine. No injury to almonds resulted from this method of herbicide incorporation.

Ornamentals (4 papers) - The effect of repetitive herbicide treatments with pronamide, simazine, atrazine and napronamide is presently being evaluated in the survival and growth of Scotch pine. After one year's treatment, these materials do not appear to be harmful to Scotch pine survival and growth. Another study in process has indicated the possible use of glyphosate as a selective herbicide for Canada thistle and other weed control in selected evergreen species growing as container stock. Preplant treatments of paraquat and glyphosate gave no injury to two shrub and two groundcover species, however, post-emergent applications of paraquat reduced the vigor of young Chinese juniper and St. Johnswort. Four lbs/A of either oxadiazon or oxyflurofen provided approximately 70% control of liverwort in several container-grown ornamental species. Visual evaluation on phytotoxicity made at 2 weeks, 1, 4 and 7 months after application indicated that injury was observed only at the 1 month evaluation.

PAPERS -

Preplant soil incorporation of herbicides for the control of nightshade. Ashton, F.M., H.L. Carlson, R.K. Glenn and M.P. Zobel. A field experiment was conducted in Yolo County to evaluate the use of several preplant herbicide treatments for control of two nightshade species in tomatoes. The herbicide treatments listed on the following table were applied February 12, 1977 using a CO_2 pressure sprayer and 470 l/ha water carrier. Each treatment was applied to 3 replicate 0.6 by 6.1 m plots. Within one hour of herbicide application, a rolling cultivator was used to incorporate the herbicides 5 cm deep into the moist fine sandy loam soil. The plot area was seeded with tomatoes on March 2, 1977, eighteen days after herbicide application.

The treatments were evaluated for tomato stand and vigor on April 20 and June 13, 1977. With the exception of pebulate at 4.5 kg/ha and metolachlor at 1.1 kg/ha, all treatments resulted in significant tomato injury on the first evaluation date. Tomato injury ranged from moderate vigor loss to severe stand reductions. By the second evaluation date, tomatoes treated with alachlor at 1.1 kg/ha and pebulate at 9.0 kg/ha had grown out of the initial stunting. On April 27, 1977 counts were made of the hairy nightshade and black nightshade plants present in the plots. Although significant control of one or both nightshade species was obtained with several of the treatments, none of the treatments provided commercial nightshade control (greater than 70%) without objectionable tomato injury (See Table). (Botany Dept., Univ. of Calif., Davis 95616)

Tomato stand and vigor and nightshade control resulting from preplant soil incorporated herbicide treatments; Yolo County (T-7-77)[1]

Herbicide	Rate[2] kg/ha	Tomato[3] stand 4/20	Tomato[3] vigor 4/20		Hairy nightshade[4] counts	% control	Black nightshade[4] counts	% control
			4/20	5/13				
Pebulate	4.5	9.7	9.3	9.3	25	43	22	20
Pebulate	9.0	9.3	8.0	9.0	19	57	26	10
EPTC	2.2	6.7	6.7	8.7	30	32	35	17
EPTC	4.5	5.0	6.7	7.3	13	71	20	34
Cycloate	2.2	9.0	8.0	8.7	13	71	25	17
Cycloate	4.5	4.3	6.0	8.0	1	98	17	37
Metribuzin	0.56	6.7	9.0	9.0	19	50	3	90
Metribuzin	1.1	4.3	6.0	7.3	8	82	1	97
Metolachlor	1.1	8.3	9.0	9.0	17	64	11	64
Metolachlor	2.2	6.3	8.0	8.0	8	82	4	87
Alachlor	1.1	8.3	8.0	9.0	19	57	9	70
Alachlor	2.2	3.3	6.7	8.0	8	82	1	97
Control	-	9.7	9.7	9.6	44	0	30	0
LSD:		1.8	1.4	0.8	6.3	14	4.0	13

[1] Treatments applied 2/12/77

[2] To convert kg/ha to lb/A multiply by 0.9

[3] Stand and vigor ratings are based on 0 to 10 scale where 0 = all plants dead, 10 = no injury

[4] Nightshade counts are the total number of nightshade plants found in 3 replicate 0.6 by 6.1 m plots. Counts taken 4/27/77.

A tomato preplant incorporation trial on a Panoche clay loam. Fischer, B., A. Lange, and G. McMullin. A preplant power incorporated trial was established at the West Side Field Station, Five Points, California on a Panoche clay loam. Herbicides were applied and VF-145-B7879 tomatoes direct seeded April 6, 1977. Plot size was 40 ft long on two 30 inch beds with the top 12 inches of each bed incorporated. Four replications were used. All plots were furrow irrigated. Chemicals were applied in a 32 gpa volume.

Stand counts were made on May 3 of tomatoes, millet, lambsquarter, pigweed, and cabbage. Stand counts of tomatoes were significantly reduced by CDEC, R-12001, R-40244 and HER-26910. Good control of millet grass, lambsquarter, pigweed, and Chinese cabbage without significant tomato stand reduction was obtained by most of the combination treatments, bensulide plus diphenamid. Dowco-295 was safe on tomatoes and controlled grass and pigweed but was weak on lambsquarter and cabbage. (Univ. of Calif., Coop. Ext., 1720 S. Maple Ave., Fresno, CA 93702)

Effect of preplant incorporation on tomato vigor and weed control on a Panoche clay loam

		Average[1]					
				May 27, 1977			
		Tomato vigor		Grass	Lambs-	Pig-	Chinese
Herbicides	lb/A	5/13	5/27	millet	quarter	weed	cabbage
Napropamide	1	9.0	10.0	10.0	9.5	10.0	3.0
Napropamide	2	9.2	10.0	10.0	9.5	10.0	3.7
Diphenamid	6	9.5	10.0	9.7	6.5	8.2	0.7
Diphenamid	6	9.7	10.0	10.0	6.0	7.7	1.0
Bensulide + Diphenamid	4 4	10.0	10.0	10.0	9.7	10.0	1.0
Bensulide + Diphenamid	4 4	8.7	10.0	10.0	9.5	10.0	3.0
Napropamide + CDEC	1 4	8.0	9.0	10.0	9.0	10.0	4.5
Napropamide + CDEC + Pebulate	1 3 3	7.7	9.5	10.0	9.0	10.0	8.7
Napropamide + Pebulate	1 4	9.7	9.5	10.0	9.0	10.0	8.5
Trifluralin + Diphenamid	¼ 6	9.7	9.0	10.0	10.0	10.0	2.0
Butralin + Diphenamid	1 6	9.5	9.5	10.0	9.7	9.5	0.0
Trifluralin + Diphenamid	¼ 4	9.2	9.0	10.0	9.2	9.7	0.0
Dowco-295	½	10.0	9.0	4.2	2.2	2.7	1.5
Dowco-295	1	9.5	8.2	9.2	2.7	7.0	0.0
R-12001	3	3.5	5.0	9.2	2.2	3.5	3.7
R-12001	6	3.0	4.0	10.0	0.0	4.0	3.5
R-40244	½	7.0	8.0	10.0	10.0	9.7	10.0
R-40244	1	2.5	1.7	10.0	10.0	10.0	10.0
Bifenox	2	9.5	8.2	0.0	0.0	0.0	2.0
bifenox	4	8.7	8.7	0.0	4.5	1.5	0.0
HER-26910	2	8.0	8.0	10.0	3.2	8.0	0.0
HER-26910	4	7.0	6.7	10.0	0.7	4.3	1.3
Check	-	9.2	9.2	0.0	0.0	0.0	0.0

[1] Ratings are based on a 0 to 10 scale where 0 = no weed control. As a vigor rating 0 = very poor vigor. 10 = perfect weed control or vigorously growing tomato seedling.

<u>Herbicides applied preemergence for nightshade control in processing tomatoes.</u> Kempen, H. and J. Woods. Seven herbicides or herbicide combinations were evaluated in Kern County, California, on a Traver fine sandy loam for preemergence control of American black nightshade in processing tomatoes. The crop was direct-seeded on February 9, 1977 with half of the test plots receiving a 1½ inch band of carbon (activated charcoal) over the seedline. The carbon was applied at the rate of 300 lbs in 300 gallons of water per treated acre. Herbicide treatments were put on the same day followed by two 3-inch sprinkler irrigations on

February 12 and 26, 1977. Plot size was 5 ft by 10 ft with 4 replications. Evaluations were made on March 31, 1977 and April 12, 1977.

Three treatments which showed moderate to good nightshade control were alachlor (2 lbs/A), metolachlor (2 lbs/A) and the butralin plus pebulate (2 + 12 lbs/A) combination. Severe crop injury resulted with this last treatment, but it was safened considerably by the addition of carbon. Some tomato injury was noted with the 2 lb rate of alachlor and metolachlor; but in the case of alachlor, carbon seemed to be beneficial. Metribuzin, pebulate, and Dowco 295 (a promising nutsedge herbicide in cotton) all appeared safe in this trial but none gave nightshade control. Chloramben probably was leached from the soil. (UC Cooperative Extension, Bakersfield, CA 93303)

Herbicides applied preemergence for nightshade control in tomatoes

		Tomato vigor[1]				A.B. nightshade control[2]			
	Rate	+ carbon		- carbon		+ carbon		- carbon	
Treatment	lb/A	3/31/77	4/12/77	3/31/77	4/12/77	3/31/77	4/12/77	3/31/77	4/12/77
Alachlor	1.0	7.8	8.0	6.8	8.0	2.8	3.5	3.0	4.5
Alachlor	2.0	7.3	8.0	5.8	6.8	5.8	6.3	5.5	6.0
Metolachlor	1.0	8.8	9.0	7.5	6.8	1.8	4.8	2.0	4.8
Metolachlor	2.0	6.5	7.3	6.5	6.3	5.3	6.8	5.8	7.0
Metribuzin	0.25	8.8	9.0	8.3	8.5	0.5	2.5	1.0	2.3
Metribuzin	0.5	7.3	8.8	8.8	8.3	1.3	3.0	1.0	3.3
Dowco 295	1.0	9.3	8.8	8.5	8.8	0.5	2.0	0.5	1.8
Dowco 295	2.0	7.5	8.8	7.3	8.8	2.3	2.5	1.5	2.5
Pebulate	6.0	8.8	9.3	8.5	8.3	0.5	1.0	0	0.8
Pebulate	12.0	7.8	8.3	7.0	8.0	0.5	1.5	1.0	1.3
Chloramben	3.0	9.3	8.8	7.0	8.8	1.3	3.3	0.8	2.5
Chloramben	6.0	9.3	9.0	7.8	9.0	1.0	2.3	1.0	2.0
Butralin + Pebu.	1.0 + 6.0	9.0	8.5	5.8	5.8	3.5	4.8	3.3	4.8
Butralin + Pebu.	2.0 + 12.0	6.3	6.8	2.5	2.0	7.3	8.0	7.5	8.0
Untreated	-	7.5	8.0	8.0	8.3	1.3	1.5	0.8	1.3
Untreated	-	8.5	8.3	7.0	8.5	0.5	0.8	0.5	1.0

[1] 0-10 Rating: 10 = vigorous

[2] 0-10 Rating: 10 = complete kill

Evaluation of preemergence herbicides and carbon for the control of American black nightshade in processing tomatoes. Kempen, H. and J. Woods. Five herbicides were applied preemergence in Kern County, CA for the control of American black nightshade in processing tomatoes. The tomatoes were planted on February 9, 1977 and sprinkled with three inches of water on February 11, 1977. Carbon (activated charcoal in water) was applied at planting over the seed at the rate of 300 pounds per actual acreage. All plots were sprayed with paraquat on February 25, 1977 just before the herbicide applications in order to kill emerged tomatoes and nightshade. Herbicide application was followed by three inches of sprinkler irrigation on February 26, 1977. Plots were 5 ft by 10 ft with 3 replications on a Traver fine sandy loam.

CDEC (3 and 6 lbs/A), metolachlor (1 and 2 lbs/A), and alachlor (1 and 2 lbs/A) all provided moderate to good control of nightshade. All these materials, especially alachlor, decreased the vigor and stand of the tomatoes. CDEC was somewhat safened by the carbon application. Pebulate at 6 and 12 lbs/A showed neither promise in tomato tolerance nor nightshade control. Chloramben showed neither tomato injury nor nightshade control, possibly due to leaching. (UC Cooperative Extension, Bakersfield, CA 93303).

Nightshade control and tomato vigor with preemergent herbicides

	Rate	Tomato vigor[1/]		American black nightshade control[2/]	
Treatment	lb/A	3/31/77	4/12/77	3/31/77	4/12/77
CDEC & carbon	3	4.0	6.7	5.0	5.3
CDEC	3	3.7	5.0	4.7	5.0
CDEC & carbon	6	3.0	5.3	8.5	7.3
CDEC	6	2.5	3.7	8.3	7.3
Chloramben & carbon	3	6.3	6.3	0.7	1.7
Chloramben	3	7.7	8.0	0	1.7
Chloramben & carbon	6	6.7	6.0	1.7	3.3
Chloramben	6	6.7	7.0	1.0	3.3
Pebulate	6	5.0	5.0	2.7	4.0
Pebulate	12	2.7	2.7	5.0	4.7
Metolachlor	1	5.0	4.0	7.7	8.0
Metolachlor	2	2.0	3.0	9.7	9.0
Alachlor	1	3.3	3.7	8.5	7.7
Alachlor	2	1.0	1.7	9.3	8.3
Check	-	6.0	7.0	0.3	0.7
Check	-	4.7	6.3	0	0.7

[1/] 0-10 rating: 10 = vigorous

[2/] 0-10 rating: 10 = complete kill

Preemergence and postemergence control of hairy nightshade in tomatoes. Ashton, F.M., H.L. Carlson, R.K. Glenn, and M.P. Zobel. An experiment was conducted in a direct seeded tomato field in Yolo County to evaluate the effectiveness of preemergence and postemergence herbicide treatments in controlling hairy nightshade. The field had a

Sacramento silty clay loam soil and was seeded to tomatoes, variety VF-145-7879, prior to herbicide application. The herbicide treatments were applied on three separate dates. The treatments and corresponding treatment dates appear on the following table. Each treatment was sprayed over 4 replicate 1.5 by 6.1 m plots using a CO_2 pressure sprayer and 430 l/ha water carrier. The first herbicide applications were made March 13, 1977. The soil was dry and neither the tomatoes or nightshade had germinated. The first sprinkler irrigation of approximately 5 cm of water was initiated 30 minutes after the first herbicide application. The second herbicide applications were made on March 30, 1977. The soil was moist 1 cm below the surface and many nightshade seedlings had emerged. The tomatoes were in the hook stage just prior to emergence. The plots received a second sprinkler irrigation on April 4, 1977. On the third application date, April 15, 1977, only chloramben treatments were applied. By this time the emerged nightshade seedlings were 2-5 cm tall and most tomatoes had one true leaf. The plots received a third sprinkler irrigation April 19, 1977. For a summary of spray dates, irrigation dates, and plant growth stages, see footnotes on the following table.

On April 25, 1977 the plots were evaluated for hairy nightshade control and tomato vigor. The only treatments that resulted in commercial hairy nightshade control (70% or better) without significant tomato injury were pebulate at 9.0 kg/ha and alachlor at 1.1 kg/ha applied on the first treatment date, and chloramben at 2.2 kg/ha applied on the second treatment date. The first alachlor treatments (applied pre tomato and nightshade germination) were safer on tomatoes and provided better weed control than the later alachlor applications. Conversely, the chloramben treatments provided the best weed control applied on the second application date (after some nightshade plants had emerged). The third applications of chloramben were not effective in controlling nightshade. Tomato response to chloramben treatments was virtually the same for all three application dates. All the metribuzin treatments resulted in good to excellent nightshade control but produced severe tomato injury (see table). (Botany Dept., Univ. of Calif., Davis, CA 95616)

Effect of preemergence and postemergence herbicide treatments and date of application on tomato vigor and hairy nightshade control; Yolo County (T-10-77)

Herbicide	Rate (kg/ha)[1]	Date applied[2]	Tomato vigor[3]	Hairy nightshade control[3]
Pebulate	4.5	3/13	9.8 a	5.5 f-h
Pebulate	9.0	3/13	8.8 a-c	7.3 d-f
Pebulate + Chloramben	4.5 + 2.2	3/13	8.8 a-c	5.8 d-g
Pebulate + Chloramben	4.5 + 4.5	3/13	8.3 b-d	8.5 a-d
Chloramben	2.2	3/13	10.0 a	4.8 g-h
Chloramben	2.2	3/30	9.8 a	7.5 c-f
Chloramben	2.2	4/15	9.8 a	4.0 g-h
Chloramben	4.5	3/13	8.3 b-d	7.3 d-f
Chloramben	4.5	3/30	8.3 b-d	9.0 a-d
Chloramben	4.5	4/15	8.3 b-d	3.5 h-i
Chloramben	9.0	3/30	6.8 d-e	9.8 a-b
Metribuzin	0.6	3/13	6.0 d-e	8.5 a-d
Metribuzin	1.1	3/13	0.8 g	10.0 a
Metribuzin	1.1	3/30	1.75 g	9.5 a-b
Metribuzin	2.2	3/30	0.5 g	10.0 a
Alachlor	1.1	3/13	9.0 a-c	7.5 c-f
Alachlor	1.1	3/30	7.0 d-e	4.3 g-h
Alachlor	2.2	3/13	7.8 c-d	9.3 a-d
Alachlor	2.2	3/30	5.3 f	4.8 g-h
Alachlor	4.5	3/30	1.5 g	8.8 b-e
Control	-	-	10.0 a	0.5 j
Control	-	-	9.5 a-b	1.8 i-j
Control	-	-	10.0 a	1.25 j
Control	-	-	10.0 a	0.8 j

[1] To convert kg/ha to lb/A multiply by 0.9

[2] Application dates, irrigation dates, and plant growth stages:
3/13/77: soil dry, pregermination to both tomatoes and nightshade. First irrigation 3/13/77.
3/30/77: tomatoes in hook stage prior to emergence. Many emerged nightshade seedlings. Second irrigation 4/3/77.
4/15/77: tomatoes, 1 true leaf. Nightshade 2-5 cm tall. Third irrigation 4/19/77.

[3] Tomato vigor and nightshade control ratings were made on 4/25/77 and are the average of 4 replications. Tomato ratings 0 = all dead tomatoes, 10 = no injury. Nightshade control ratings 0 = no control, 10 = 100% control.

A comparison of herbicide treatments for postemergence control of American black nightshade in processing tomatoes. Lange, A., L. Nygren, and R. Goertzen. Several herbicides, some in combinations and with surfactants, were evaluated for selective postemergence control of American black nightshade control in processing tomatoes. Tomatoes were 1 inch tall and with 2 to 3 true leaves and the American black nightshade was 1.5 inches with 3 to 4 true leaves. Three 8008 nozzles were used at

30 psi to give 100 gpa. Plot size was 5 ft long on 60 inch beds replicated 4 times. Treatments were made April 11, 1977 with maximum and minimum temperature of 77 F and 44 F.

Complete nightshade control was obtained by Dowco-233 at 1 lb ai/A. Bentazon at 1 lb/A, RH-6201 at 1 lb ai/A and chloramben plus bentazon at 1 plus 0.5 lbs/A gave commercial control of nightshade and tomato vigor was highest. Tomato vigor was reduced by weed competition with chloramben at 1, 2 and 4 lbs/A, chloramben at 1 lb/A plus all surfactants, bentazon at 1/4 lb/A and MV-687 at 1/8 and 0.5 lb ai/A. Reduced tomato vigor due to phytotoxicity was observed with Dowco-233 at 1/4 lb ai/A, DPX-1108 at 0.5 and 1 lb ai/A, and chloramben plus DPX-1108 at 1 plus 1/4 and 1 plus 0.5 lb ai/A. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of postemergence herbicide sprays on the control of American black nightshade and phytotoxicity of young tomatoes

		Average[1/]			
		Nightshade control		Tomato	
				phyto	vigor
Herbicides	lb/A	4/20	5/20	4/20	5/20
Chloramben	1	1.2	2.8	0.0	4.8
Chloramben	2	0.5	3.8	0.0	5.3
Chloramben	4	1.5	4.8	0.0	4.5
Chloramben + Tween 20	1 + ½%	2.2	2.5	0.0	3.5
Chloramben + Vatsol	1 + ½%	1.0	2.8	0.0	3.3
Chloramben + Crop Oil	1 + 1%	0.5	3.3	0.0	4.8
Bentazon	¼	5.5	4.5	1.0	7.5
Bentazon	1	6.8	7.5*	3.5	9.8
MV-687	1/8	0.5	6.0	0.0	7.5
MV-687	½	1.5	5.0*	0.0	5.5
Dowco-233	¼	2.0	4.5*	0.0	3.3
Dowco-233	1	2.5	10.0	0.0	0.0
DPX-1108	½	0.5	2.5	0.0	4.5
DPX-1108	1	0.5	3.0*	0.0	4.8
RH-6201	½	5.5	6.0*	0.0	9.5
RH-6201	1	4.5	8.0	1.5	8.3
Chloramben + DPX-1108	1 + ¼	2.5	5.0	0.0	3.8
Chloramben + DPX-1108	1 + ½	1.2	6.5	0.0	5.0
Chloramben + Bentazon	1 + ¼	5.8	6.8	0.5	5.8
Chloramben + Bentazon	1 + ½	5.8	7.3	1.5	7.3
Check	-	0.2	0.0	0.0	2.5**

[1/] Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete control, most vigorous tomato or complete kill of plant. Treated 4/11/77. Evaluated 4/20 and 5/20/77.

*Newly germinated nightshade.

**Poor vigor due to nightshade competition.

The effect of fall fumigation in giant beds on the control of American black nightshade. Kempen, H., A. Lange, B. Montgomery, and B. McKeand. Two preplant fumigants were evaluated for American black nightshade control on the Chase and Harmon Ranch, Arvin, California. Soil was a Hesperia fine sandy loam of 77% sand, 14% silt, 9% clay, and 1% organic matter. Soil moisture was 20 to 30 centibars at 62 F. Treatments were applied November 3 by a single shank with injection point positioned 15 inches below peaked beds, i.e., 3 to 4 inches below the top of shaped beds. Planting was done approximately January 20, 1977. Plot size was 5 ft by 100 ft.

Tomato vigor was not reduced by any treatment. American black nightshade vigor was slightly affected by the methyl bromide-chloropicrin mixture, but no control was obtained. Good nightshade control was obtained with Telone II at 18 and 36 gpa. Some control was obtained at 9 gpa, more so than any methyl bromide treatment.

Total plant weight (fruit and vegetation) was harvested from each plot. Higher yields were obtained from Telone II at 18 and 36 gpa plots. Plots were not harvested from the methyl bromide treatments due to extreme competition from the nightshade. (Univ. of Calif., Coop. Ext., P.O. Box 2509, Bakersfield, CA 93303)

The effect of fall fumigation in giant beds on the control of American black nightshade on a moist Hesperia fine sandy loam.

Herbicides	Rate	American black nightshade control	Average[1] tomato vigor	Plant wt. (kg/plot)
Telone II	9 GPA	5.2	9.8	149
Telone II	18 GPA	7.8	8.8	237
Telone II	36 GPA	10.0	9.2	253
Brom 70-30	40 lb/A	2.8	9.5	-
Brom 70-30	80 lb/A	2.2	8.8	-
Brom 70-30	160 lb/A	3.5	8.2	-
Check	-	0.8	9.0	100

[1] Average of 4 replications. Based on 0 to 10 scale where 0 = no control, 10 = most vigorous or complete control. Treated 11/3/76; planted 1/20/77; evaluated 3/31/77.

Seed pelleted in planting media to increase the tolerance of direct seeded tomatoes to soil applied herbicides. Ashton, F.M., R.K. Glenn, H.L. Carlson. A field experiment was conducted to determine whether the tolerance of direct seeded tomatoes to soil applied herbicides could be increased by planting tomato seed encapsulated in pellets made from a mixture of peat, clay, carbon and vermiculite. The experiment was established June 17, 1977 on the U.C. Davis campus. Alachlor and chloramben treatments were applied to replicate 1.5 by 3.7 m plots. The herbicides were applied with a CO_2 pressure sprayer and were immediately incorporated 5 cm deep into the dry soil with a power driven rototiller. Two rows of tomatoes were planted in each plot. One row was direct seeded while the second row was hand planted with the encapsulated pellets. The pellets consisted of 40% bentonite clay, 30% sphagnum peat, 25% fine vermiculite, and 5% activated carbon by weight. The pellets were prepared by blending the components with a small amount of water to make a thick paste. The paste was compressed into cylindrical shaped pellets 3 cm tall and 2 cm in diameter. Six tomato seeds were inserted into each moist pellet. The pellets were then dried in a 50 C oven for 8 hours. The resulting dry pellets were quite hard and durable and weighed approximately 2.7 gm each. At planting, the pellets were buried just below the soil surface and spaced 25 cm apart down the seed row. Tomato variety VF-145-7879 was used for this experiment. All treatments were replicated three times. The plot area had a Yolo fine sandy loam soil and was furrow irrigated.

The experiment was evaluated for black nightshade control and tomato stand and vigor on July 5, 1977. The 5.6 kg/ha application of chloramben resulted in fair nightshade control, while good to excellent control was achieved with chloramben at 10.2 kg/ha, and with alachlor at 2.2 and 4.5 kg/ha. Tomato tolerance to each of the herbicide treatments was significantly increased by the pellet planting method. Within each herbicide treatment, the stand and vigor of tomatoes in the pellet planted rows was significantly better than the tomato stand and vigor in the corresponding direct seeded rows (See Table). (Botany Dept., Univ. of Calif., Davis, CA 95616)

Nightshade control and a comparison of tomato stand and vigor in preplant herbicide treated plots which were alternately direct seeded or planted with tomato seed encapsulated in peat-clay-vermiculite-carbon pellets[1]

		Tomato stand[3]		Tomato vigor		Black
	Rate[2]	Direct	Hard	Direct	Hard	nightshade[4]
Herbicide	kg/ha	seed	plug	seed	plug	control
Alachlor	2.2	6.3	9.3*[5]	6.7	9.0*	9.7
Alachlor	4.5	3.3	8.0*	3.0	7.3*	9.8
Chloramben	5.6	6.0	9.0*	5.7	8.7*	7.0
Chloramben	10.2	1.3	7.3*	1.7	6.3*	9.0
Control	-	7.7	8.7	9.0	10.0	1.3
LSD		2.1		1.5		1.9

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[1] Treatments applied 6/17/77; evaluated 7/5/77.

[2] To convert kg/ha to lb/A multiply by 0.9.

[3] Tomato stand and vigor ratings are the average of 3 replications based on a 0 to 10 scale. 0 = all dead plants; 10 = 100% stand or no vigor reduction.

[4] Nightshade control ratings are the average of 3 replications based on a 0 to 10 scale where 0 = no control; 10 = 100% control.

[5] Means followed by asterisk(*) indicate significantly better tomato stand or vigor in plug planting vs. direct seeding in the same herbicide treatment (0.05 level of significance).

Effect of plug planting on the tolerance of tomatoes to soil applied chloramben treatments. Ashton, F.M. and H.L. Carlson. A greenhouse study was conducted to evaluate plug planting as a method of increasing direct seeded tomato tolerance to preplant soil applied chloramben treatments. On March 18, 1977 the chloramben treatments listed on Table 1 were applied to dry Yolo fine sandy loam soil in rectangular plastic containers, 35 by 25 by 15 cm deep. The herbicide treatments were applied over the soil surface with air-pressure-belt sprayers and were moved approximately 5 to 8 cm deep into the soil with 1.5 cm of water through sprinkler irrigation. Two days after application the soil surface of each container was divided into four quadrants. The first quadrant of each container was direct seeded 0.7 cm deep with six to eight tomato seeds. The remaining quadrants were planted respectively with plug mix, with plug mix combined with 1% activated carbon by weight, and with plug mix combined with 5% activated carbon by weight. The plug mix consisted of tomato seed and a mixture of 50% fine vermiculite and 50% sphagnum peat. At each plug planted site, a depression in the soil surface approximately 6 cm deep and 6 cm wide was filled with approximately 120 ml of the appropriate planting mix. Sufficient seed was combined with the mix prior to planting to insure the presence of six to eight seeds at each plug planted site. Each treatment was replicated four times. Tomato variety was VF-145-7879. The soil-filled containers were sub-irrigated as required following the initial sprinkler irrigation.

The tomatoes established at each planting site were counted and harvested one month after planting. Fresh weights of the tomatoes were recorded. The planting method, specifically the addition of carbon to the plug planting medium, greatly affected the response of the tomatoes to the chloramben treatments (Tables 1 and 2). The stand and vigor of tomatoes which were either direct seeded or plug planted without carbon was greatly reduced by the chloramben treatments. At the low chloramben rates, tomato stand and vigor was increased with the addition of 1% carbon to the plug planting mix. The addition of 5% carbon to the plug mix significantly increased tomato tolerance to all of the chloramben rates tested. (Botany Dept., Univ. of Calif., Davis, CA 95616)

Table 1 Comparison of direct seeded and plug planted tomato stands and vigor in chloramben treated soil. U.C.D. (T-12-77)[1]

Herbicide	Rate (kg/ha)[2]	Tomato stand[3]				Tomato vigor (fresh wt. (gm))[4]			
		Direct seed	Plug	Plug + 1% carbon	Plug + 5% carbon	Direct seed	Plug	Plug + 1% carbon	Plug + 5% carbon
Chloramben	4	0.8	1.5	5.5	4.8	0.4	1.3	8.6	21.4
Chloramben	8	0.5	0	1.3	5.0	2.0	0	5.1	15.4
Chloramben	12	0	0	0.8	3.8	0	0	0.5	11.9
Chloramben	16	1.0	0	0	3.5	1.3	0	0	14.15
Control	-	6.8	6.8	6.8	6.0	22.3	12.8	21.8	20.4
LSD (5%)[5]		2.1				7.7			

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[1] Treatments applied 3/18/77; evaluated 4/18/77.

[2] To convert kg/ha to lb/A multiply by 0.9.

[3] Tomato stand is an average of the actual number of tomatoes established in four replications.

[4] Tomato vigor is the average tomato fresh weight in gm over four replications.

[5] LSD's for comparing all stand means or all vigor means.

Table 2 Comparison of direct seeded and plug planted tomato stands and vigor in chloramben treated soil. U.C.D. (T-12-77)

Planting method	Tomato[1] stand	Tomato vigor[2] fresh wt. (gm)
Direct seeded	1.8	5.2
Plug	1.7	2.8
Plug + 1% carbon	2.9	7.2
Plug + 5% carbon	4.6	16.7
LSD:	0.9	3.2

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[1] Stand and vigor values are the average values obtained from 20 replications applied over the five treatments listed on Table 1. Stand is the average number of plants established. Vigor is the average fresh weight in gm.

The effect of planting method on the activity of herbicide combinations for hairy nightshade control in tomatoes. Goertzen, R., W. Bendixen, A. Lange, and L. Nygren. Four herbicides in several combinations were evaluated as either preplant incorporated or preemergence herbicides near Los Alamos, California. Two methods of seeding were used, direct seeding and plug mix of 1:1 by volume #3 vermiculite plus Vita-Peat with 10% by weight activated carbon. Plug volume was 5 oz with approximately 10 seeds per plug. In the preemergence plots, treatments were applied after plugs were planted. Six plugs one foot apart were planted per plot. Method of herbicide application was CO$_2$ backpack using three 8004 nozzles at 50 gpa. Incorporation was by power tiller approximately 2 inches deep on the preplant incorporated plots and by sprinklers on preemergence plots. Plot size was 5 by 15 ft replicated 4 times. Treatment, incorporation, and planting were done July 8. The soil was somewhat cloddy, even after power incorporation. Evaluations were made August 3 and August 24, 1977.

On August 3, good hairy nightshade control was obtained by all herbicide combinations. Those treatments with chloramben at 2 lbs ai/A had less, but not significantly, nightshade control. Vigor of direct seeded tomatoes was low with all treatments four weeks after treatment when compared to the direct seeded checks. The plug mix seemed to safen the herbicides at only the highest rates, such as pebulate plus diphenamid at 12 plus 4 lbs ai/A preplant incorporated and chloramben plus diphenamid at 4 plus 4 lbs ai/A preplant incorporated, and the combination of metribuzin plus pebulate plus diphenamid reduced tomato seedling vigor significantly. Six weeks after treatments, August 24, hairy nightshade control was lacking only in the plots with 2 lbs ai/A of chloramben. Nightshade control was equally good under both preplant incorporated and preemergence incorporation methods of pebulate plus diphenamid at either 6 plus 4 or 12 plus 4 lbs ai/A.

Tomato vigor in the direct seeded line was highest in the metribuzin plus chloramben at ½ plus 2 lbs ai/A, preplant incorporated, and pebulate plus diphenamid at 6 plus 4, preemergence and preplant incorporated. Other treatments had less vigorous tomatoes due to stunting by herbicides or weed competition. Pebulate at 12 lbs ai/A preemergence and preplant incorporated and metribuzin plus pebulate plus diphenamid at 1 plus 3 plus 4 lbs ai/A showed stunting. Weed competition was apparent in the checks and with chloramben plus diphenamid at 2 plus 4 lbs ai/A applied preemergence. The plug plantings had consistently higher vigor possibly due to the safening effect of the vermiculite-peat planting medium. Only chloramben plus diphenamid at 4 plus 4 lbs ai/A preemergence had appreciably lower vigor and lower number of plugs with plants. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend, Parlier, CA 93648)

A comparison of the effect of herbicides on hairy nightshade control and tomato vigor when direct seeded vs. plug planted

				Average[1] Tomato vigor	
Herbicide	Incorp. method	Rate lb/A	Nightshade control	Direct seeded	Tomato plug
Pebulate+Diphenamid	PPI	6+4	9.2	3.0	7.0
Pebulate+Diphenamid	PPI	12+4	9.5	2.0	5.5
Chloramben+Diphenamid	PRE	2+4	8.0	4.0	6.2
Chloramben+Diphenamid	PRE	4+4	10.0	1.2	3.8
Metribuzin+Pebulate+Diphenamid	PPI	½+3+4	9.5	1.5	5.5
Metribuzin+Pebulate+Diphenamid	PPI	1+3+4	9.8	1.8	5.0
Metribuzin+Chloramben	PPI	½+2	8.5	3.8	6.5
Pebulate+Diphenamid	PRE	6+4	9.8	4.0	6.0
Pebulate+Diphenamid	PRE	12+4	10.0	1.5	6.5
Check	-	-	1.5	7.2	6.8

[1] Average of 4 replications where 0 = no effect, 10 = complete weed control or most vigorous tomato plant. Treated 7/8/77. Evaluated 8/3/77.

The effect of activated carbon on the response of direct seeded plug and transplanted tomatoes. Lange, A.H., R. Goertzen, and L. Nygren. Activated carbon was studied as a safening agent when used in conjunction with Speedling transplants or a plug mix. The Speedling plant medium of sphagnum peat and vermiculite contained 5, 10, 20 or 50% activated carbon by weight of mix. The plug contained a 1:1 mixture of Vita-Peat (53.3% organic matter) and vermiculite. One-half of the plugs also contained 10% activated carbon by weight of mix. Both transplants and seeds in the plug mix and direct seeded were tomato variety VF-145-B7879. Three herbicides were used for this study on a Hanford fine sandy loam of 87.7% sand, 9.8% silt, 2.5% clay, and 0.34% organic matter. Pebulate and alachlor were preplant power incorporated and chloramben (methyl ester) was sprinkler incorporated with 0.55 inch of water. Power incorporation depth was 3 inches. A CO_2 backpack with three 8004 nozzles at 30 psi at 100 gpa was used. Plot size was 12 ft on 60 inch beds replicated three times. All 60 inches were incorporated then reshaped.

Among the carbon levels of the transplants, no statistical difference could be found between any carbon level means. All yield reduction is attributed to the herbicide treatment. No significance of the herbicide-carbon interaction could be found.

No herbicide treatment with carbon yielded as much as the check. Pebulate at 8 lbs ai/A with 20% and 50% carbon yielded the highest of the treatments. Pebulate at 16 lbs ai/A severely reduced fresh weights. Chloramben at 4 lbs ai/A and up was not safened by carbon as fresh weights were severely reduced. However, even the 2 lb ai/A rate was slightly reduced. No rate of alachlor was safened sufficiently, though alachlor at 4 lbs ai/A appeared higher than the other two rates.

More evidence of the safening effect by activated carbon resulted with the direct seeding in the plugs. Pebulate was safened by the plug mix as seen at the 4 and 8 lb ai/A rates. With carbon, an additional amount of safening occurred. However, pebulate at 16 lbs ai/A with carbon was still too phytotoxic in this low organic matter sandy soil. Considerable phytotoxicity occurred with chloramben at 2 to 4 lbs ai/A on plugs without carbon. Also chloramben above 4 lbs ai/A on plugs with carbon and to direct seeded were highly phytotoxic. Alachlor was safened at 4 lbs ai/A by a combination of plug mixture and carbon. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of activated carbon on the response of direct seeded plug and transplanted tomatoes as determined by fresh weight

		Average percent of untreated[1]						
		Transplant				Plug		
Herbicide	Rate lb/A	carbon 5%	carbon 10%	carbon 20%	carbon 50%	with carbon	no carbon	direct seeded
Pebulate	4	67.3	71.1	54.6	49.6	105.5	80.2	54.7
Pebulate	8	69.8	77.4	84.3	81.0	95.1	64.8	61.3
Pebulate	16	11.2	12.8	10.4	11.9	69.2	31.9	8.3
Chloramben	2	70.3	67.0	61.0	74.0	124.8	55.4	103.7
Chloramben	4	25.7	29.6	25.6	25.7	104.8	66.9	118.4
Chloramben	8	15.2	17.8	16.5	16.4	48.7	8.1	33.2
Alachlor	2	43.7	53.8	59.9	39.6	130.4	75.6	123.0
Alachlor	4	81.2	71.5	75.0	61.0	107.2	51.4	58.4
Alachlor	8	48.0	35.8	31.3	21.6	37.6	29.4	14.7
Check	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Average fresh weight of transplant cut just above 1st secondary leaf, weight of direct seed plug plants and weight of 2 ft of row for non-plug planted, divided by the weight of the untreated top.

The effect of initial level on the activity of two herbicides applied on soil surface of a Hanford fine sandy loam. Lange, A.H., J. Schlesselman, and R. Goertzen. Chloramben has been an excellent herbicide against hairy nightshade in tomatoes, but the safety to germinating tomatoes has been lacking or marginal. Results have been variable from test to test around the state. The main objective of this experiment was to evaluate the effect of initial irrigation on the activity of chloramben. The herbicides were applied to dry soil August 31, followed immediately by 3 levels of irrigation using an automatic rain simulator. Crops were planted September 15 and evaluated October 24, 1977. The organic matter was 0.57% with 60% sand, 31% silt and 9% clay.

One-eighth of an inch of water was sufficient to activate both formulations of chloramben. A half inch of water gave about the same activity on crops and weeds. However, the 2 inch irrigation greatly reduced the herbicidal activity on all crops and weeds. The high reading for weed control in the check with 2 inch irrigation is a characteristic of this Hanford fine sandy loam and has been observed in numerous trials, a result of silting in and crusting and showed even more in later ratings.

Broccoli and alfalfa were more sensitive to chloramben than tomatoes. Chloramben was more active than pebulate on shepherds purse.

The more soluble form of chloramben apparently moved out of the root zone of all crops and weeds under the 2 inch irrigation. With the 1/8 and 1/2 inch of water there was little if any difference in the activity of these two formulations on broccoli and tomatoes. On alfalfa, the less soluble methyl ester seemed more phytotoxic at 2 inches of water than the more soluble formulation. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

Table 1 The effect of initial irrigation level on the activity of two herbicides on tomatoes

				Average[1/]	
Herbicides	Rate lb/A	Solu. in water	1/8 inch	1/2 inch	2 inch
Chloramben	4	700	6.0	5.3	2.7
Chloramben (ME)	4	120	5.3	5.3	3.3
Pebulate	4	60	3.0	4.7	3.3
Check	-	-	1.3	2.7	1.0

[1/] Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete loss of stand and vigor. Evaluated 10/24/77.

Table 2 The effect of initial irrigation level on the activity of two herbicides on broccoli

				Average[1/]	
Herbicides	Rate lb/A	Solu. in water	1/8 inch	1/2 inch	2 inch
Chloramben	4	700	9.7	9.0	1.0
Chloramben (ME)	4	120	9.7	9.0	4.7
Pebulate	4	60	3.3	4.0	0.3
Check	-	-	2.3	2.7	2.7

[1/] Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete loss of stand and vigor. Evaluated 10/24/77.

An evaluation of four herbicides under sprinkler irrigation for American black nightshade control and for vigor of direct seeded and transplanted tomatoes with and without carbon on the roots. Lange, A., H. Kempen, R. Goertzen, and J. Woods. Chloramben and alachlor, applied preemergence, and pebulate and EPTC, applied preplant incorporated, were evaluated for American black nightshade control near Arvin, Kern County, California. Chloramben and alachlor were incorporated with sprinklers within 24 hours. Pebulate and EPTC were power incorporated 3 inches. Direct seeding one inch deep was compared to Speedling transplants with half of the transplants root-dipped into a carbon slurry for added protection. Treatments, seeding and transplantings were done February 24, 1977. The soil was a Hesperia fine sandy loam with 1.0% organic matter. The soil was moist 2 inches below with a dry crust on the surface.

Treatment width was 20 inches on 60 inch beds. Plots were 10 ft long, replicated 4 times. Application was with CO_2 backpack and one 8004 E nozzle using 100 gpa. Evaluations were made March 31 and May 20, 1977.

Good American black nightshade control was obtained by alachlor at 2 and 4 lbs/A and EPTC at 4 lbs/A. Commercial control was obtained by chloramben at 12 lbs/A, pebulate at 12 lbs/A and EPTC at 2 lbs/A. However, direct seeded tomato vigor was reduced by all of the above treatments and was only marginally acceptable with chloramben at 12 lbs/A.

Less phytotoxicity was observed with the carbon dipped transplants than those that were not carbon dipped. Phytotoxicity was more evident with EPTC treatments in the carbon dipped which is consistent with previous trials trying to safen EPTC with carbon. Chloramben at 12 lbs/A also showed some phytotoxicity even with carbon but some safening was observed. Phytotoxicity of the no carbon transplants was higher with most chemical treatments when compared to checks. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

An evaluation of four herbicides under sprinkler irrigation on American black nightshade control, and on direct seeded and transplanted tomatoes with and without carbon on the roots of transplants

			Average[1]			
			Direct seeded			
	Incorp	Rate	nightshade	tomato	Transplant phyto	
Herbicides	method	lb/A	control	stand & vigor	+ carbon	- carbon
Chloramben	PRE	4	3.8	9.2	0.0	2.5
Chloramben	PRE	8	6.2	5.5	2.0	4.5
Chloramben	PRE	12	6.8	6.8	3.0	4.2
Alachlor	PRE	2	9.8	1.8	2.0	5.0
Alachlor	PRE	4	10.0	0.0	2.8	5.5
Pebulate	PPI	4	3.5	3.2	2.0	5.0
Pebulate	PPI	8	5.2	2.2	1.5	4.0
Pebulate	PPI	12	7.0	0.0	1.0	3.8
EPTC	PPI	2	6.8	1.0	3.5	5.2
EPTC	PPI	4	9.0	0.2	3.0	7.8
Check	-	-	1.0	7.2	0.8	2.0

[1] Average of 4 replications. Based on 0 to 10 scale where 0 = no effect or no plants and 10 = perfect control or most vigorous plants. Seeded, transplanted and treated 2/24/77. Evaluated 3/31/77.

A comparison of furrow vs. drip irrigation, with and without napropamide in combination with CDEC or pebulate on a Hanford sandy loam. Lange, A., F. Aljibury, R. Goertzen, and T. Hawkins. Three herbicides were evaluated under two irrigation regimes, drip and furrow-sprinkler. One-half of the drip had napropamide injected through the lines and in the furrow-sprinkler one-half the plots had napropamide rotary hoe incorporated. CDEC and pebulate, each at 2 or 4 lbs/A, were preplant incorporated 2 to 3 inches with a Lilliston rotary hoe. Weekly drip injection of napropamide was made at 4 ppm for 30 minutes with a flow rate of 8 gpm.

Injections were for 10 weeks and a total of 1.45 lb/A of napropamide. The furrow plots had 1 lb/A napropamide rotary hoe incorporated. The top 30 inches of the 60 inch beds was incorporated. VF-145-7879 tomatoes were direct seeded and were germinated by sprinkler or by the drip irrigation. Also, to determine the effect on transplants, VF-145 Speedling transplants were planted. Phytotoxicity determinations were made from the Speedling transplants. These were pulled out before they interferred with the direct seeded tomatoes. At thinning, the sprinklers were changed to furrow irrigation. Six replications were made with 20 ft plots. A guard row was planted on each side of the harvest row. Chemicals were applied with a CO_2 backpack using three 8004 nozzles at 50 gpa. Treatments were applied April 12, with stand counts May 18 and harvest on August 25 and 26, 1977. The soil was tarp fumigated three weeks prior to planting with methyl bromide plus chloropicrin, thus no weed control ratings were taken. The soil was a Hanford sandy loam of 0.1% organic matter, 54% sand, 34% silt, and 12% clay.

Speedling transplant vigor was lower under the sprinkler plots, especially where napropamide was used. Under sprinklers, pebulate was slightly more phytotoxic than CDEC. Under drip irrigation, no significant differences were observed, except that the low rate of pebulate was slightly more vigorous than the other herbicide treatments. These evaluations were made May 18, five weeks after treatment and planting.

Stand counts from two 6 ft samples from each plot were made on May 18. Average stand counts were slightly lower under drip irrigation, however, the vigor was considerably higher along with an earlier germination of 7 to 10 days. Germination was more uniform and differences between treatments were not easily seen. Phytotoxicity due to chemicals were easily recognized with mechanical incorporation under sprinkler irrigation. Malformation of cotyledons was evident at 4 lbs/A of CDEC under sprinkler. No statistical differences in germination were found between napropamide and no napropamide.

The tomatoes were harvested August 25 and 26, 1977. No statistical differences were found between the napropamide and no napropamide whether evaluated within furrow or drip irrigations. However, a high degree of significance was found between the yields from furrow irrigation vs. drip irrigation. CDEC at 2 to 4 lbs/A and pebulate 2 to 4 lbs/A reduced yields under furrow irrigation, i.e., all the chemical treatments were below the furrow check. However, the furrow checks were also lower than any treatment in the drip plots. No significant difference was found among the chemical treatments and check in the drip irrigation plots.

In summary, injected napropamide did not affect yields. CDEC and pebulate were more phytotoxic under furrow than under drip irrigation. Drip irrigation produced significantly higher yields of tomatoes than furrow. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

Effect of CDEC and pebulate ppi followed with napropamide through drip irrigation

		Fruit wt. kg/plot[1]			
	Rate	Furrow		Drip	
Herbicides	lb/A	w/naprop.[2]	w/o	w/naprop.[3]	w/o
CDEC	2	102.3	102.0	130.2	125.7
CDEC	4	80.6	99.8	135.6	122.8
Pebulate	2	77.3	82.9	133.2	130.3
Pebulate	4	87.1	90.3	128.0	131.6
Check	-	110.7	106.0	129.3	136.7

[1] Average of 5 replications. Treated and planted 4/12/77. Harvested 10 ft on 8/25-26/77.

[2] 1.0 lb/A rotary hoe incorporated.

[3] 1.45 lb/A injected through dripper.

A comparison of six herbicides applied through emitters on indicator crops. Nygren, L. and A.H. Lange. Six preemergence herbicides, at 3 rates each, were applied through drip line emitters to a Delhi loamy sand with 87.7% sand, 9.8% silt, 2.5% clay, and 0.34% organic matter. A drip irrigation line with emitters at 2 ft intervals was placed on top of a prepared 30 inch bed. Indicator crops of Tomato (VF-145) and milo were seeded parallel to the drip line which was divided into 4-emitter plots and treated on August 18, 1976.

Herbicide applications were made to simulated drip line injection. A short 4-emitter section of drip line was connected to a small container pressurized with a constant pressure CO_2 bottle. Approximately 2 liters of a herbicide treatment was placed into the container and injected through the application drip line, laying next to the main line (emitter to emitter) at 10 psi. Each treatment application was replicated three times. After the last treatment was applied, the main drip line was allowed to run for 8 hours.

An evaluation of herbicide movement was made on September 1, 1976 by measuring the distance of herbicide injury from each emitter, as indicated by milo growth. On September 9, 1976 the milo top growth, within a 15 cm radius of each emitter, was cut and weighed. The remaining milo was hand pulled and all plots were reseeded on September 18, 1976, to evaluate residual activity on a later date, October 4, 1976. Results from herbicide movement evaluations on September 1, 1976 showed that oryzalin, EPTC, and trifluralin have the greatest capacity to move outward within the wet zone of the emitter. Napropamide and pebulate moved moderately well; while chloramben activity on this species was poor. While oryzalin, EPTC, and trifluralin moved equally well (September 1, 1976), fresh weights indicate trifluralin was less phytotoxic to the milo, resulting in stunted growth instead of complete control. Evaluations on October 4, 1976 for the growth of reseeded milo showed that trifluralin at 100 ppm 2 months after injection was the only compound with enough residual activity to to give commercial control. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

A comparison of six herbicides applied through emitters on indicator crops

Herbicide	Rate ppm	Herbicide[2] movement (cm)	Average[1] fresh wt.[3] milo (gm)	Milo[4] phyto.
Napropamide	1	2.3	19.8	2.3
Napropamide	10	3.4	19.4	2.3
Napropamide	100	8.9	11.5	1.0
Oryzalin	1	5.5	14.1	2.3
Oryzalin	10	11.4	16.6	5.0
Oryzalin	100	17.4	6.4	3.3
EPTC	1	10.0	14.1	1.3
EPTC	10	9.1	17.0	2.0
EPTC	100	20.1	5.3	1.3
Trifluralin	1	10.8	15.4	2.3
Trifluralin	10	14.2	12.3	5.0
Trifluralin	100	18.6	10.0	10.0
Pebulate	1	9.5	13.3	0.3
Pebulate	10	8.7	18.8	0.7
Pebulate	100	16.3	11.5	0.7
Chloramben	1	4.0	22.8	1.0
Chloramben	10	1.5	21.2	1.3
Chloramben	100	0.0	24.6	0.0
Check	-	0.0	24.8	0.8

[1] Average of 12 observations: 3 replications x 4 emitters/rep.

[2] Total movement (either side of emitter), 9/1/76.

[3] Fresh weight obtained from 15 cm each side of emitter, 9/9/76.

[4] Average rating: 0 = no effect, 10 = complete kill, 10/4/76.
Trial established 8/18/76; reseeded 9/18/76.

A brief summary of field dodder control resulting from preemergence or preplant soil incorporated CDEC and pebulate treatments in direct seeded tomatoes 1972-1977. Ashton, F.M., H.L. Carlson, R.K. Glenn, R.D. Kukas. This is a brief summary of the dodder control that has been achieved with CDEC and pebulate treatments in field experiments conducted in direct seeded tomatoes over the past six years. Because of dodder's innately erratic germination patterns under field conditions, most field experiments are plagued with large variability among replications. Such variability makes it difficult to reach statistically sound conclusions on the extent of control provided by a given treatment. It is believed that the consistency of all the trial results presented here in part makes up for the occasional lack of statistical inference in individual experiments. Perhaps more important, the dodder control results reported here were attained under a variety of field and weather conditions and the consistency of the results greatly increased the applicability of recommendations that have been previously reported.

The dodder control attained with selected preplant or preemergence treatments in field trials conducted from 1972 to 1977 are listed on the following table. Of all the treatments evaluated in the 1972 to 1974 trials, the only treatment resulting in acceptable dodder control and tomato tolerance was the 6 lb/A application of CDEC. Dodder control with this treatment ranged from 86 to 100%. A greenhouse screening study conducted in 1974, indicated that pebulate also had promise as a preplant dodder control herbicide. Accordingly, pebulate and pebulate-CDEC combination treatments were evaluated in field experiments conducted in 1975 through 1977. The results of these trials indicate that pebulate is somewhat less effective and possibly more erratic in controlling dodder than is CDEC. However, the pebulate-CDEC combination treatments have proven to be quite effective and in most cases control dodder better than either material used alone.

It is important to note that preplant and preemergence CDEC and pebulate treatments have resulted in early tomato stunting in some of these trials. The recommended use rate range for each of these herbicides in direct seeded tomatoes is 4 to 6 lb/A. The lower rate should be used on light soils or in early planted fields. Tomato injury with these herbicides is much more likely under cool early season conditions or in soil low in clay content or organic matter. In addition, when CDEC and pebulate are used in combination, the rate of each should be reduced at least 25% from that normally used alone. Failure to reduce rates where appropriate may result in noticeable reduction in the vigor of young tomatoes. The significance of this early stunting in terms of final yield has not been accurately determined. We wish to acknowledge the help of the following Farm Advisors: L.L. Buschmann, Sutter County; W.S. Seyman, Santa Clara County; J.P. Orr, Sacramento County; M.P. Zobel, Yolo County; R.C. King, San Joaquin County. Without their cooperation the attainment of this data would not have been possible. (Botany Dept., Univ. of Calif., Davis, CA 95616)

Summary of field dodder control resulting from preplant and preemergence applied CDEC and pebulate treatments in 15 field experiments conducted 1972 through 1977

			% Dodder control						
	Herbicide		CDEC		pebulate		CDEC + pebulate		
	rate	lb/A	4	6	4	6	4+4	6+4	6+6
Location	Type of application	year							
Sutter	PE[1]	72		100					
San Joaquin	PPI[2]	73		86					
Sutter	PE	73		99					
Sutter	PE	73		95					
Santa Clara	Post-G[3]	74		90					
Santa Clara	PE	74		95					
Sutter	PE	74		89					
Sutter	PE	74		94					
Sutter	PPI	75	95	85	95		99		
Santa Clara	PPI	76	83	92	82	80	96	99	98
Yolo	PPI	76	98	98	60	91	100	98	100
Sutter	PPI	76		97		95			100
Sutter	PPI	77		90		92	88		92
Sutter	PE	77		98		77	99		95
Sacramento	PPI	77				67	98	100	100

[1] PE = preemergence

[2] PPI = preplant incorporated

[3] Post-G = postemergence-granular

The effect of glyphosate and maleic hydrazide timing on broomrape control and processing tomato fruit yields. Goertzen, R. and A. Lange. Glyphosate and maleic hydrazide were evaluated as foliar translocated herbicides for broomrape control. VF-145 transplant tomatoes were planted May 5. Each plant site was inoculated with several grams of broomrape seed and chaff. Three treatment dates, June 22, July 21 and August 16, were chosen to determine the best timing of either chemical to prevent broomrape attachment or emergence. Also, two consecutive treatment dates of glyphosate were evaluated for tomato tolerance and broomrape control.

First broomrape emergence occurred during the first week in August, with the heaviest emergence from August 15 to September 15. Emerged broomrape were counted on September 2. Glyphosate at 1/16 lb ai/A when applied June 23 plus July 21, July 21 plus August 16, and August 16 had no broomrape strikes above ground. A few strikes occurred with glyphosate at 1/32 lb ai/A on July 21 plus August 16. Maleic hydrazide at 4 lbs ai/A applied June 22 had no broomrape strikes. The other treatments significantly reduced the number of strikes, but the broomrape were quite vigorous.

Tomato vigor was lowest with glyphosate at 1/16 lb ai/A sprayed June 22 and July 21 and with all treatments of maleic hydrazide. These low vigor rates were also reflected in the lower fruit yields. Generally, maleic hydrazide delayed growth if applied early and reduced vegetative growth.

All chemical treatments reduced the tomato production below the check. Glyphosate at 1/16 ai/A applied after fruit set on August 16 had the highest amount of fruit and highest percentage of ripe fruit of any chemical treatment. When glyphosate was applied early, i.e., before bloom, it reduced the vigor of the plant and this effect carried over through harvest with lower yields. Even at 1/32 lb ai/A applied in June, the residual phytotoxicity reduced yields. Likewise, the earlier maleic hydrazide was applied, the lower the fruit yields. The effects with glyphosate is somewhat variable, as 1/16 lb ai/A applied in July and August had higher yields than 1/32 lb ai/A applied twice at the same times. Glyphosate, applied right after fruit set, August 16, had the fewest broomrape strikes and also the highest fruit yield. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

Table 1 Effect of glyphosate and maleic hydrazide timing on processing tomato fruit yields

			Average[1/]		
Herbicides	Rate lb/A	Spray dates	Total fruit (kg)	Ripe fruit (kg)	% Ripe
Check	-	-	62.9d	60.2e	80
Glyphosate	1/16	8/16	54.9cd	43.9de	80
Glyphosate	1/16	7/21 8/16	47.9bc	38.8cd	81
Glyphosate	1/32	6/22	47.8bc	34.4cd	72
Maleic hydrazide	4	7/21	46.1bc	33.5c	73
Glyphosate	1/32	6/22 7/21	46.0bc	32.4c	70
Maleic hydrazide	4	8/16	45.8bc	31.0c	68
Glyphosate	1/16	6/22	37.9ab	21.0cb	56
Glyphosate	1/32	7/21 8/16	31.7a	20.5v	65
Glyphosate	1/16	6/22 7/21	31.7a	15.5ab	49
Maleic hydrazide	4	6/22	29.4a	9.0a	31

[1/] Average of 4 replications. LSD @ 5%.

Table 2 Effect of glyphosate and maleic hydrazide on broomrape germination and strikes

			No. broomrape strikes[1]		
Herbicides	Rate lb/A	Spray dates	9/2/77[2]	9/23/77[3] Live	9/23/77[3] Dead
Glyphosate	1/16	8/16	0.0	1.0	0.5
Glyphosate	1/32	7/21 8/16	0.3	0.3	0.3
Glyphosate	1/16	7/21 8/16	0.0	1.5	0.5
Glyphosate	1/16	6/22 7/21	0.0	2.5	0.0
Maleic hydrazide	4	7/21	1.8	1.0	1.0
Maleic hydrazide	4	8/16	1.7	0.7	1.7
Glyphosate	1/32	6/22	2.0	1.5	2.5
Maleic hydrazide	4	6/22	0.0	4.8	1.3
Glyphosate	1/32	6/22 7/21	2.5	4.8	1.5
Glyphosate	1/16	6/22	2.0	5.3	1.8
Check	-	-	4.4	3.8	4.6

[1] Average counts from 4 replications.

[2] Above ground strikes only.

[3] Above and below ground strikes; dead represents matured or diseased plants.

<u>Effect of preplant incorporated herbicides on broomrape control and tomato transplant phytotoxicity.</u> Lange, A., R. Goertzen, and J. Sagen. Five preplant incorporated herbicides were evaluated for branched broomrape control and transplant tomato phytotoxicity. The trial was established at the Patterson Ranch, Alameda County, California. Chemicals were applied by either CO_2 backpack using three 8004 nozzles or hand granular applicator on April 29. VF-145 tomato transplants were planted May 5. Several thousand broomrape seed and chaff were inoculated at each plant site to insure a uniform infestation. All treatments were power incorporated 6 inches deep. Plot size was 5 ft by 10 ft with 3 replications. Napropamide at 2 lbs ai/A was incorporated in all plots for general weed control.

Sodium azide was phytotoxic at 40 to 80 lbs ai/A. Plots were replanted up to four weeks later without reduction in phytotoxicity. Thus no broomrape hosts were established in these plots resulting in the lowest number of strikes.

Broomrape strikes were reduced or delayed by all treatments. Though no treatments completely eliminated germination, differences in emergence dates were quite evident. Trifluralin, R-37878, and MV-687 all had broomrape that matured in July or August, with some still emerging in September. Dowco-295 had 2 strikes that matured in mid-September, with most of the live delayed broomrape still below ground. Tomato hosts in the MV-687 and R-37878 plots senesced earlier than other treatments. Dowco-295 and trifluralin tomato vigor was similar to check. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

Effect of preplant incorporated herbicides on transplant tomato phytotoxicity and on broomrape control

		Average ratings[1/]			
	Rate	tomato phytotoxicity		broomrape strikes	
Herbicides	lb/A	6/1/77	8/12/77	8/12/77	9/29/77
Na Azide 15G	40	6.3	8.0	0.0	0.0
Na Azide 15G	80	8.3	6.0	0.0	1.0
Trifluralin	2	2.7	0.7	0.3	1.7
Trifluralin	4	2.0	3.0	1.0	3.0
R-37878	6	6.3	2.0	0.0	1.0
R-37878	12	4.3	0.0	0.7	2.3
MV-687	4	5.7	0.0	1.0	1.0
MV-687	8	5.3	0.0	0.3	3.0
Dowco-295	2	1.7	0.3	0.0	4.0
Check	-	5.3	0.0	1.0	7.3

[1/] Average of 3 replications. Treated 4/29/77. Transplanted 5/5/77. Evaluated 6/1 and 8/12/77. Phytotoxicity based on 0 to 10 scale where 0 = no effect and 10 = complete kill of plant.

<u>Preemergence weed control in potatoes under center-pivot irrigation.</u> Humburg, N.E. and H.P. Alley. A cooperator's farm in southeastern Wyoming was the location of herbicide test plots on Russet Burbank potatoes under center-pivot sprinkler irrigation. Individual plots of 9 ft by 30 ft were replicated three times in a randomized complete block design. Preemergence application of herbicides was made June 3, 1977, with 3-inch incorporation with a rolling cultivator within one hour of application. Herbicides were applied with a knapsack sprayer with a 3-nozzle boom that delivered 40 gpa water solution.

Environmental conditions at time of application were: partly cloudy, air temperature 83 F, relative humidity 23%, wind 0 to 4 mph, and dry surface soil temperature was 106 F with 82, 77 and 73 F at soil depths of 1, 2 and 4 inches, respectively. The sandy loam soil (67.2% sand, 78.4% silt, 4.4% clay) had 1.5% organic matter and a pH of 6.6.

Redroot pigweed was the predominant weed species found in the test area. At time of evaluations, July 7, redroot pigweed plants ranged from 4 to 12 inches, with an average height of 10 inches. Check plots averaged 1.7 pigweed per sq ft. Weed counts were taken from 40 ft of 1-ft band centered over the potato row in each plot.

All but two treatments, the low rates of dinitramine and metolachlor, gave better than 90% control of redroot pigweed. Metribuzin at 0.5 lb/A gave 100% control. Four herbicide combinations, alachlor + metribuzin (pre-mix) at 2.0 + 0.38 and 2.4 + 0.45 lb/A, dinitramine + metribuzin at 0.33 + 0.5 lb/A, and metolachlor + metribuzin at 1.25 + 0.38 lb/A, gave 100% control of redroot pigweed. There was no visual evidence of phytotoxicity to potato plants resulting from any herbicide treatment. The potato plants were severely damaged by hail on June 18.

Maximum potato yield was 299 cwt/A from plots treated with alachlor + metribuzin (pre-mix) at 2.4 + 0.45 lb/A. This yield was not significantly greater than 34 other treatments which produced 212 cwt/A or more. The non-treated check plots averaged 114 cwt/A. (SR 849. Wyoming Agric. Exp. Sta., Laramie, WY 82071)

Weed control and potato yields under center pivot sprinkler

Treatment[1/]	Rate lb/A	Redroot pigweed % control[2/]	Potato yield cwt/A[3/]
*Alachlor + Metribuzin	2.0 + 0.38	100	269 a-e[4/]
*Alachlor + Metribuzin	2.4 + 0.45	100	299 a
Alachlor + Metribuzin	2.0 + 0.38	99	242 a-e
Alachlor + Metribuzin	2.4 + 0.45	99	232 a-e
Alachlor	2.0	99	202 cde
Alachlor	3.0	98	268 a-e
*Alachlor + Linuron	1.825 + 0.7	99	272 a-e
*Alachlor + Linuron	2.2 + 0.8	98	209 b-e
Alachlor + Linuron	1.8 + 0.7	96	258 a-e
Alachlor + Linuron	2.2 + 0.8	98	209 b-e
Dinitramine	0.25	79	198 de
Dinitramine	0.33	94	216 a-e
Dinitramine	0.67	94	246 a-e
Dinitramine + Metribuzin	0.25 + 0.25	91	241 a-e
Dinitramine + Metribuzin	0.33 + 0.25	98	232 a-e
Dinitramine + Metribuzin	0.38 + 0.33	95	256 a-e
Dinitramine + Metribuzin	0.33 + 0.5	100	288 abc
Dinitramine + EPTC	0.25 + 1.5	96	225 a-e
Dinitramine + EPTC	0.33 + 2.5	98	269 a-e
Dinitramine + Alachlor	0.25 + 2.0	96	258 a-e
Dinitramine + Alachlor	0.5 + 2.0	98	252 a-e
Metribuzin	0.25	95	259 a-e
Metribuzin	0.38	99	265 a-e
Metribuzin	0.5	100	242 a-e
EPTC	1.5	95	191 e
EPTC	2.5	99	243 a-e
Metolachlor	1.5	89	218 a-e
Metolachlor	2.0	95	280 a-d
Metolachlor + Metribuzin	1.25 + 0.25	99	244 a-e
Metolachlor + Metribuzin	1.25 + 0.38	100	238 a-e
Metolachlor + Metribuzin	1.25 + 0.5	95	248 a-e
Metolachlor + Linuron	1.25 + 0.5	94	243 a-e
Alachlor + Linuron	2.0 + 0.5	97	198 de
Pendimethalin	0.75	91	214 a-e
Pendimethalin	1.0	96	293 ab
Pendimethalin + EPTC	0.75 + 2.0	99	256 a-e
Pendimethalin + EPTC	0.75 + 2.5	98	269 a-e
Pendimethalin + Metribuzin	1.0 + 0.5	98	212 a-e
Metribuzin (DPX 2504-B)	0.25	96	279 a-d
Metribuzin (DPX 2504-B)	0.5	99	249 a-e
Check	-	0	114 f

[1/] Herbicides applied June 3, 1977.

[2/] Weed counts July 7, 1977.

[3/] Potato harvest September 9, 1977.

[4/] Mean followed by the same letter(s) are not significantly different at the 5% level.

*Pre-mix.

Evaluation of herbicide combinations for annual broadleaf weed control in spinach. Peabody, Dwight V. Twenty-four herbicide and herbicide combinations, each at two rates, were applied either preemergence or postemergence or as sequential treatments: preemergence applications were made four days after planting; postemergence applications, five weeks after planting. All treatments were replicated four times. Soil type was silt loam with a pH of 6.8 and organic matter content of 1.5%.

Weed cover estimates were made May 12, 1977, with a 60 square (120 sq in) grid dropped two times in each plot. Plot size was 2 rows (20 in apart) by 15 ft long. Predominant weed species were: Pennsylvania smartweed, lambsquarters, chickweed, groundsel, henbit, and shepherdspurse. All applications were made with a tractor mounted, boom type sprayer in a total volume of water equivalent to 44 gallons per acre. Green weight yields of spinach were taken May 26, 1977; seed yields August 5, 1977.

The combinations of H 22234 with chlorpropham and H 22234 with lenacil at both rates of application were the only treatments that consistently resulted in both good weed control and high yields of processing spinach as well as spinach seed. Although certain other treatments did not cause yield reductions, annual weed control was not considered to be adequate. For instance, H 22234, when applied by itself as a preemergence treatment resulted in relatively poor weed control, but plots receiving the lower rate of application produced the next to highest yield of processing spinach. (Northwestern Washington Research and Extension Unit, Washington State University, Mt. Vernon, WA 98273)

Annual weed control and the effect of herbicides on seed and fresh weight yields of spinach

Treatment			Weed cover[1]	Fresh wt	Seed
herbicide	Rate(lb/A)	Time	%	yield T/A	yield #/A
H22234	2	PRE	29.5 h-l[2]	6.7 a-b	4152 c-j
	4		13.0 a-i	6.3 a-b	4578 b-i
Asulam	1.67		34.8 j-l	6.2 a-b	3812 d-j
	3.34		28.0 g-l	7.2 a	4246 b-j
Diclofop	1.5		41.5 l	5.9 a-c	3564 d-j
	3		37.5 k-l	6.4 a-b	4359 b-j
H22234 + Propham	2+4		15.0 a-i	6.1 a-b	4065 c-j
	4+4		10.0 a-f	5.7 a-d	4684 b-i
H22234 + Chlorpropham	2+0.5		2.8 a-d	6.3 a-b	5324 a-f
	4+0.5		2.3 a-d	6.0 a-c	6111 a-c
H22234 + Asulam	2+1.67		19.0 b-j	6.5 a-b	4849 a-h
	4+1.67		9.8 a-e	5.8 a-c	5076 a-g
H22234 + Ethofumesate	2+1		9.0 a-e	2.5 e-g	3599 d-j
	4+1		5.0 a-d	1.1 g	3985 d-j
H22234 + Methazole	2+1		5.3 a-d	-	-
	4+1		1.5 a-b	-	-
H22234 + Pendimethalin	2+1		0.8 a	-	-
	4+1		0.8 a	-	-
H22234 + CDEC	2+4		12.5 a-h	5.7 a-d	3460 e-j
	4+4		6.8 a-e	4.9 b-d	4255 b-j
H22234 + Lenacil	2+0.5		0.3 a	6.2 a-b	5488 a-e
	4+0.5		0.3 a	5.9 a-c	5523 a-e
Propham + Ethofumesate	4+1		2.1 f-g	13.8 a-i	3962 d-j
	4+2		0.7 g	10.8 a-g	2656 i-j
Propham + Methazole	4+1		-	3.5 a-d	-
	4+2		-	2.0 a-c	-
Propham + Pendimethalin	4+1		-	2.5 a-d	-
	4+2		-	3.0 a-d	-
Propham + Asulam	4+1.67		5.3 a-d	27.5 f-l	3979 d-j
	4+3.34		5.4 a-d	23.3 e-k	5114 a-g
Propham + Lenacil	4+0.5		6.5 a-b	19.0 b-j	4503 b-j
	4+1.0		5.8 a-c	11.5 a-g	5575 a-d
Ethofumesate + Chlorpropham	1+0.25		1.6 f-g	15.5 a-i	2812 i-j
	1+0.5		2.2 f-g	20.3 d-j	4292 b-j
Ethofumesate + Methazole	1+7		-	1.3 a-b	-
	1+2		-	0.0 a	-
Ethofumesate + Pendimethalin	1+1		-	4.5 a-d	-
	1+2		-	1.8 a-b	-
Ethofumesate + Asulam	1+1.67		2.1 f-g	11.3 a-g	3388 f-j
	1+3.34		1.7 f-g	9.5 a-e	4108 c-j
Ethofumesate + Lenacil	1+0.5	PRE	2.1 f-g	0.3 a	5306 a-f
	1+1		1.6 f-g	0.0 a	3826 d-j
HOE 29152	0.75	POE	5.0 b-d	62.5 m	3140 g-j
	1.5		4.2 c-e	55.3 m	2961 h-j
H22234 + Phenmedipham	2+1	PRE+POE	3.9 d-e	30.0 i-l	5500 a-e
	4+1		3.2 e-f	10.3 a-f	6750 a
H22234 + HOE 29152	2+0.5		5.3 a-d	20.0 c-j	3207 g-j
	4+0.5		5.2 b-d	8.0 a-e	4912 a-h
Check hoed & hand-weeded			6.3 a-b	3.8 a-d	6263 a-b
Check			6.0 a-c	60.5 m	2446 j

[1] May 12, 1977

[2] Means with the same letter(s) within the column are not significantly different at the 5% level.

Response of sweet corn cultivars to carbamate herbicides. Anderson, J. LaMar and Mervin G. Weeks. Preliminary studies in 1976 indicated a differential tolerance of sweet corn cultivars to EPTC applied alone or in combination with safeners. Also the insecticide fonofos applied as a tank mix with carbamate herbicides plus safeners was reported to alter sweet corn response to the carbamates. To determine the responses of sweet corn to carbamates a trial was established May 12, 1977 wherein ten treatments were replicated four times and incorporated by double harrowing with a spike tooth harrow. One row of each of eighteen sweet corn cultivars were planted across the herbicide treatments the same day. At the date of planting it was 72 F, clear and calm; however it rained seven of the next eight days for a total of 4.2 inches of moisture including two inches of snow. During this time soil temperatures were in the low 40's. Another two inches of moisture fell a week later and the soil developed a heavy crust. Germination was slow on all corn varieties but the early cultivars generally germinated and had a good stand, whereas later varieties had a very poor stand even though the crust was broken mechanically. Germination did not appear to be affected by a herbicide treatment.

As expected EPTC without safeners caused severe stunting and twisting of the corn, but varieties differed greatly in their response to EPTC from a severe reduction in yield to no stunting or yield reduction. A listing of cultivars showing their relative tolerance is shown below. The commercial formulation of EPTC + R-25788 caused some twisting of the ears of sensitive cultivars. The addition of the insecticide fonofos did not cause additional injury but rather appeared to act as a safener--reducing both injury to corn and herbicidal activity to the weeds.

Sensitivity of sweet corn cultivars to EPTC

sensitive	moderate	tolerant
Golden Beauty	NK 199	Silver Queen
Sundance	Tastyvee	Reliance
Early Cogent	Golden Earlipae	
Marcross	Country Gentleman	
	Jubilee	
	Golden Cross Bantam	
	Iochief	
	Early Yukon	
	Early Xtra Sweet	
	Bantam	
	Sunburst	
	Sunglo	

Fonofos although giving no weed control induces a yield increase over the untreated plots possibly due to control of soil borne insects as corn root worm. EPTC treated plots which caused stunting did not have the leaf cover and consequently the crop competition to suppress late germinating weeds. Weed and crop responses to treatment are summarized in the table. (Plant Science Department, Utah State University, Logan, UT 84322)

Effect of herbicide treatment on sweet corn

Treatment	Rate (lb ai/A)	Phytotoxicity	Weed control[2] July 1	Weed control[2] Aug. 5	Total[1] yield (lb.)	Weeds present
EPTC	6	Severe stunting of stalks, twisting ears	7.9	4.5	147	redroot pigweed, purslane, hairy nightshade
EPTC + R-29148	6	-	7.1	6	181	redroot pigweed, purslane, hairy nightshade, lambsquarters
Eradicane (EPTC + R-25788)	6	Slight--some twisting of ears	7	5.8	178.8	redroot pigweed, purslane, hairy nightshade, lambsquarters, prickley lettuce
Eradicane + Fonofos	6 4	Slight--less than Eradicane alone	4.8	5.8	193	redroot pigweed, purslane, hairy nightshade, lambsquarters
Surpass (Vernolate + R-25788)	6	-	9.1	8.5	219.8	hairy nightshade, purslane
Surpass + Fonofos	6 4	-	8.4	7.3	212	hairy nightshade, purslane, some redroot pigweed
Fonofos	4	-	0	0	181.5	redroot pigweed, hairy nightshade, purslane, lambsquarters, prickley lettuce, stinkgrass, foxtail
SD-50093 (Cyanazine + Atrazine)	1 0.5	-	9.7	9.5	224.5	purslane
SD-50093 (Cyanazine + Atrazine	2 1	-	9.8	10	224	-
Untreated control		-	0	0	163.8	redroot pigweed, hairy nightshade, purslane, lambsquarters, prickley lettuce, stinkgrass, foxtail

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[1] Represents the total yield of 3 replications of each of 18 sweet corn varieties.

[2] Rated 0-10, 0 = no weed control, 10 = plots weed free.

The effect of fonofos on corn tolerance to EPTC, with and without R-25788 and R-29148. Stebinger, E.R., A.P. Appleby, and B.D. Brewster. Despite the addition of a protectant, occasional crop injury has resulted from the use of some thiocarbamate herbicides. Several trials were conducted at Corvallis, Oregon in 1977 to determine whether EPTC may be interacting with the insecticide fonofos to cause injury to corn and to study factors which might influence such injury.

Commercial formulations were used in these studies. All pesticides were applied with a bicycle-wheel plot sprayer and incorporated with a tractor-driven rototiller. Each treatment was made to plots 8 by 25 ft. These were replicated five times. Jubilee sweet corn was planted the same day that the pesticides were applied. Unless otherwise stated, plots were irrigated as needed by an overhead sprinkler system.

In the fall, ears were harvested from 20 plants in each plot. Total fresh weights were taken for each plot and the ears were separated into mature, immature, and malformed ears. Visual evaluations were made just prior to harvest.

In the first study, plots were treated and planted on May 19. Irrigation was not necessary until June 23.

The addition of fonofos at 2.0 lb/A to EPTC at 8 lb/A caused severe ear malformation and reduced total ear weight more than EPTC (8 lb/A) alone. None of the other treatments produced a significant effect on the corn.

The second study was conducted to determine the effects of closely timed applications of fonofos and EPTC + R-25788. Jubilee sweet corn was planted on June 6. Plots were irrigated as needed starting on June 24. Treatments were replicated six times.

The addition of fonofos at 2 lb/A to EPTC + R-25788 at 8 lb/A caused severe ear malformation and reduced total ear weight compared to the same treatment without fonofos. Visual evaluations indicated that more injury occurred when fonofos and EPTC + R-25788 were applied together immediately prior to seeding than with split applications. A similar trend was noted in number of deformed ears. However, split applications did not reduce total ear weight and number of mature ears.

In a third study, two adjacent trials were established to determine the effects of irrigation on fonofos with EPTC + R-25788 or with EPTC + R-29148.

In both trials, treatments were made immediately prior to planting on June 13. One trial was irrigated with two inches of water on June 13. Both trials received 2 inches of water on June 28 after crop emergence.

In the trial that received irrigation immediately after planting, both rates of EPTC + R-25788 (4 lb/A and 8 lb/A) plus fonofos at 2 lb/A, caused severe ear malformation and a reduction in total ear weight and number of mature ears.

In the trial that was not irrigated immediately after seeding, injury occurred to corn only with the high rate of EPTC + R-25788 (8 lb/A) plus fonofos at 2 lb/A. This was indicated by visual evaluation and number of mature and deformed ears, but was not indicated by total ear weights.

In both of these studies, no injury occurred with EPTC + R-29148 plus fonofos at 2 lb/A at either high or low rates.

The effect of postemergence sprays on newly planted Tioga strawberry plants. Lange, A. Dormant Tioga plants from cold storage were planted 4 rows to a 60 inch bed with two bi-wall drip irrigation lines, one between the 1st and 2nd row and the other between the 3rd and 4th row and in 46 oz cans. They were sprinkler irrigated with ½ inch of water every other day for two weeks and then drip irrigated in the field and watered daily in the greenhouse.

Foliar herbicides were applied September 9, 1977 in 100 gallons of water per acre. The weeds were spotted spurge, puncturevine, carpetweed and grass 2 to 4 inches across and high, respectively.

The results with phenmedipham show excellent control of spotted spurge but less control of puncturevine. On the other hand, nitrofen controlled puncturevine but did not control spurge. Glyphosate gave control only at the high rate of 2 lb ai/A which was too phytotoxic to the strawberry plant. All herbicides caused some injury to recently dormant newly emerged Tioga strawberry plants in the greenhouse, but the strawberry plants grew out of the initial injury in the field. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

Table 1 The effect of 4 postemergence herbicides on actively growing 4 to 6 inch spurge, carpetweed, and newly planted Tioga strawberries, a greenhouse study

		Average ratings[1/]			
	Rate	Spurge			Strawberry[3/]
Herbicides	lb/A	960g[2/]	1300g[3/]	Carpetweed	phytotoxicity
Phenmedipham	1	2.0	1.0	2.5	2.6
Phenmedipham	2	5.8	3.0	1.8	3.8
Phenmedipham	4	7.8	5.8	6.2	5.5
Nitrofen	4	3.0	1.3	10.0	3.0
Nitrofen	8	6.2	4.2	7.3	3.0
Glyphosate	½	3.5	0.8	1.0	2.6
Glyphosate	2	10.0	7.5	8.0	5.5
Diclofop	1	2.2	0.0	0.0	0.5
Diclofop	4	4.5	0.8	1.8	1.0
Check	-	2.0	0.0	0.0	0.0

[1/] Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Evaluated 9/20/77. Treated 9/9/77.

[2/] Spurge in milk cartons.

[3/] Spurge and strawberries in 46 oz. tin can.

Table 2 The effect of postemergence sprays on spurge, puncturevine, and lovegrass seedlings in newly planted strawberries in the field

Herbicides	Rate lb/A	Average ratings[1/] Spotted spurge	Puncturevine	Love grass	Phytotoxicity strawberry
Nitrofen	2	4.3	10.0	4.3	0.0
Nitrofen	4	4.0	10.0	5.3	0.0
Phenmedipham	1	3.0	3.0	4.0	0.0
Phenmedipham	2	8.0	3.0	5.0	0.0
Phenmedipham	4	10.0	5.0	10.0	0.0
Glyphosate	1/4	1.3	-	2.6	1.6
Glyphosate	1/8	3.0	-	0.0	0.0
Glyphosate	1/16	0.0	0.6	1.0	0.0
Check	-	0.0	-	0.0	0.0

[1/] Average of 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete weed control ore complete kill of plant. Treated 9/9/77. Evaluated 9/20/77.

Annual weed control in an overhead sprinkler-irrigated vineyard. Kempen, H., A. Lange, J. Schlesselman, J. Woods. In February, 1976 a test plot was established in Kern County, California to test grape varietal (Barbera and Ruby Cabernet) response to certain herbicides and herbicide combinations. The grapes were planted as potted vines in the summer of 1973, and were put under overhead sprinklers. The soil was a sandy clay loam (46% sand, 26% silt and 27% clay) with 0.8% organic matter. The plot size was 80 inches by 14 feet with 3 replications in each variety. By the end of the 1976 growing season, eight out of a possible nine Ruby Cabernet vines were dead from simazine at 3.2 lb/A while one vine was dead at the 1.6 lb/A rate. Four Barbera vines fell to the same fate, all from simazine at 3.2 lb/A. A more detailed report of these results was made earlier.

On February 16, 1977 portions of this test plot were retreated. FMC 25213 and all of the simazine plots were not retreated. The 1976 glyphosate plot was retreated with prodiamine in 1977. The remaining plots were treated as they had been in 1976. Glyphosate was sprayed on all plots to kill any emerged weeds. At this time, a winter grass rating was also made to determine residual control from the 1976 treatments. Ratings were then made on April 12, 1977 and June 2, 1977 for 1977 weed control. No vine injury was noted from any of the 1977 treatments.

Good to excellent residual winter grass control was achieved from the 1976 treatments with simazine plus oryzalin (0.8 + 4.0 lb/A), norflurazon plus oxadiazon (2.0 + 4.0 lb/A and 4.0 + 4.0 lb/A), oxadiazon (4 lb/A), pendimethalin (4 lb/A), and oxyflurofen (4.0 lb/A). All the above treatments, with the addition of simazine (3.2 lb/A) and prodiamine (4.0 lb/A), also gave good to excellent barnyardgrass control during the spring months of 1977. Virtually complete Russian thistle control was achieved by using norflurazon plus oxadiazon (2.0 + 4.0 and 4.0 + 4.0 lb/A) and by prodiamine (4.0 lb/A). Good control was also attained in the simazine plus oryzalin (0.8 + 4.0 lb/A), the oxadiazon (4.0 lb/A), and the oxyfluorfen (4.0 lb/A) plots.

This trial indicates the potential for excellent annual weed control in sprinkler-irrigated grapes. Prodiamine and the combination norflurazon plus oxadiazon completely handled the weed spectrum present. If oxyzalin had been applied in 1977, it would probably have given results similar to those of prodiamine. Oxadiazon and oxyfluorfen were two other all around good treatments in this trial. (University of California, Cooperative Extension, Bakersfield, CA 93303)

Annual weed control rating

		Sprinkler irrigated vineyard[1]				
	Rate	Winter grass control	Barnyardgrass control		Russian thistle control	
Treatments		2/16/77	4/12/77	6/2/77	4/12/77	6/2/77
Untreated	-	3.7	4.5	5.0	2.0	1.3
Simazine[2]	0.8	4.0	5.8	5.8	6.8	2.2
Simazine[2]	1.6	3.0	5.0	2.5	4.8	2.5
Simazine[2]	3.2	2.0	9.8	7.7	7.2	5.5
Simazine + dinoseb + surfactant[2]	1.6 + 1.25 + ½%	1.8	5.8	4.5	8.3	4.0
Simazine + napropamide[2]	0.8 + 4.0	3.7	8.0	5.7	9.8	2.3
Simazine + oryzalin[2]	0.8 + 4.0	9.5	9.2	8.8	9.5	7.7
Norflurazon + oxadiazon	2.0 + 4.0	9.5	10.0	10.0	10.0	9.8
Norflurazon + oxadiazon	4.0 + 4.0	10.0	10.0	10.0	10.0	9.9
Oxadiazon	4.0	8.3	9.8	8.3	10.0	8.7
FMC 25213[2]	4.0	4.8	5.3	4.8	5.5	1.5
Pendimethalin	4.0	9.0	10.0	10.0	9.7	5.5
Oxyfluorfen	4.0	9.5	9.5	9.1	9.9	8.2
Glyphosate (prodiamine-1977)[3]	1.0 (4.0)	4.6	10.0	9.9	9.8	9.8

[1] 0 to 10 rating: 10 = complete kill

[2] Not retreated in 1977

[3] Retreated with prodiamine in 1977

Residual herbicides for the control of lovegrass in sprinkler-irrigated grapes. Kempen, H. and J. Woods. On January 31, 1977 a trial was established in Kern County, California on four year old French Colombard grapes for the control of Orcutt's lovegrass. The soil was a Hesperia loamy sand, and few weeds were present at time of application. The plots were 4 feet wide by 70 feet down the vine row and each treatment was replicated six times. Water was applied through the sprinkler system on February 2, 1977. Dinoseb and oil was sprayed on the plots in mid-February by the grower to kill emerged winter weeds. Weed control was rated on June 30, 1977 and again on September 21, 1977. No injury to the grape vines was noted with any of the treatments.

Lovegrass control was excellent with all three compounds, although oryzalin (4 lb/A) and prodiamine (4 lb/A) showed slightly more activity than napropamide (4 lb/A). Ratings were also made on tumble pigweed and common purslane which came in along with the lovegrass during the spring months. Purslane control was excellent with oryzalin and prodiamine, two similar dinitroanilines; but was only moderate with napropamide. All three herbicides gave moderate to good control of tumble pigweed. This trial indicates excellent annual weed control that can be attained in grapes through the use of residual herbicides. (University of California, Cooperative Extension, Bakersfield, CA 93303)

Lovegrass control in sprinkler-irrigated grapes

	Rate	Lovegrass control[1]		Tumble pigweed control[1]	Purslane control[1]
Treatment	lb/A	6-30-77	9-21-77	6-30-77	6-30-77
Untreated	-	2.3	4.3	2.2	1.8
Oryzalin	4	10.0	9.7	7.2	9.3
Prodiamine	4	9.5	9.7	7.5	8.8
Napropamide	4	9.0	8.9	7.5	5.5
LSD .05		1.713	2.10	2.361	2.461
.01		2.369	2.91	3.265	3.403

[1] 0 to 10 rating: 10 = complete kill

Herbicide combinations for annual broadleaf weed control in nonbearing almonds. Kempen, H. and J. Woods. On December 23, 1976 a trial was established to evaluate the effectiveness of herbicide combinations on annual broadleaf weed control in third year (at time of application) almonds in Kern County, California. The trial was divided into four main treatments and ten sub-treatments. The latter were put over the top of the main treatments. Due to the design of this experiment, there were no replications. Plots were 8 feet wide by 27 feet down the tree row, and were on a Delano sandy loam. A winter storm brought 0.75 inches of rainfall between December 30, 1976 and January 3, 1977. The plots were then without water until March 9, 1977 when the orchard was sprinkled. Sizes of weeds present at time of herbicide application were: cheeseweed--4 inches, London rocket--3 inches, flax-leaved feabane--1 inch and sowthistle--

1 inch. Weed control was evaluated by species on February 1, 1977 and on August 10, 1977. During the month of May, the grower applied a dinitro formulation to kill any weeds present at that time. The only weed not fully controlled by this treatment was fleabane.

No almond injury was observed from any of the treatments applied in late December. Weed control appeared to be best in the glyphosate main plot. Cheeseweed was the only emerged species not completely controlled by this compound. Oxyfluorfen was extremely effective on cheeseweed and London rocket, and showed good control of the remaining species. Weed control was also good with oxadiazon, but a few more weeds escaped than with the above materials. All three of these compounds showed good to excellent post-emergence activity on seedling weeds. Excellent season-long broadleaf weed control was exhibited by three herbicide combinations: glyphosate + oxadiazon, oxyfluorfen + glyphosate and oxyfluorfen + 2,4-D amine. All the above compounds show both post-emergence and residual activity with the exception of glyphosate; although, with glyphosate, there seemed to be some residual control of winter annual weeds. Glyphosate alone was an excellent treatment for emerged broadleaf weeds. Oxyfluorfen showed good residual control of the only summer weed present in this trial, redroot pigweed. (University of California, Cooperative Extension, Bakersfield, CA 93303)

Table 1 Herbicide combinations in nonbearing almonds (Rated August 10, 1977[1/])

		Flax-leaved fleabane control				Redroot pigweed control			
Subtreatments	Rate lb/A	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)
Simazine	0.4	10	8	5	10	10	0	2	0
Simazine	0.8	10	10	10	10	10	4	7	10
Oryzalin	2.0	9	4	0	10	10	7	10	10
Oryzalin	4.0	9	10	1	10	10	10	10	10
Oxadiazon	2.0	5	6	7	10	10	8	9	9
Oxadiazon	4.0	9	7	6	10	10	8	10	10
Norflurazon	1.0	6	3	0	10	9	0	10	10
Norflurazon	2.0	10	9	9	10	10	0	10	10
Prodiamine	2.0	9	7	6	8	10	10	10	10
Prodiamine	4.0	10	5	0	10	10	9	10	10
Glyphosate	0.5	10	8	6	10	10	8	10	3
Glyphosate	1.0	10	9	10	10	10	8	10	10
Napropamide	2.0	8	7	4	8	10	10	10	10
Napropamide	4.0	9	5	1	10	10	7	10	10
Linuron	0.5	10	5	2	-	10	6	9	-
Linuron	1.0	9	7	0	10	10	0	8	10
2,4-D Amine	1.0	10	10	4	10	10	4	10	7
2,4-D Amine	2.0	10	8	9	10	10	0	7	10
Untreated	-	8	5	0	10	10	2	10	8
Untreated	-	10	5	5	7	10	9	10	10

[1/] 0 to 10 rating: 10 = complete kill

(A) - Oxyfluorfen @ 2 lbs/A; (B) - Untreated; (C) - Oxadiazon @ 4 lbs/A

(D) - Glyphosate @ 1 lb/A

Table 2 Herbicide combinations in nonbearing almongs (Rated February 1, 1977[1/])

Subtreatments	Rate lb/A	Flax-leaved fleabane control				Pineapple weed control				Cheeseweed control			
		(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)
Simazine	0.4	10	6	5	10	8	4	7	10	10	2	8	4
Simazine	0.8	9	8	9	10	9	4	9	10	10	0	10	5
Oryzalin	2.0	9	6	6	10	9	4	8	10	10	3	9	8
Oryzalin	4.0	8	4	7	10	9	4	6	10	10	3	8	7
Oxadiazon	2.0	8	8	7	10	8	6	7	10	10	10	10	10
Oxadiazon	4.0	10	8	8	10	9.5	7	8	10	10	10	10	10
Norflurazon	1.0	8	7	7	10	8	6	9	10	10	3	9	8
Norflurazon	2.0	8	6	9	10	9	6	8	10	10	5	9	7
Prodiamine	2.0	8	4	7	10	9	4	6	10	10	4	10	7
Prodiamine	4.0	10	4	6	10	9	4	6	10	10	3	9	8
Glyphosate	0.5	10	8	8	10	10	10	10	10	10	6	10	9
Glyphosate	1.0	10	8	9	10	10	9	10	10	10	8	10	8
Napropamide	2.0	9	5	9	10	9	5	9	10	10	7	10	9
Napropamide	4.0	9	5	7	10	9	6	8	10	10	5	10	8
Linuron	0.5	9.5	5	8	--	10	5	9	--	10	8	10	-
Linuron	1.0	9.5	3	6	10	9.5	3	9	10	10	9	10	9
2,4-D Amine	1.0	9.5	8	4	10	10	7	9	10	10	7	10	10
2,4-D Amine	2.0	10	9	8	10	10	8	8	10	10	6	10	9
Untreated	-	7	4	7	10	8	4	8	10	10	8	7	8
Untreated	-	9	5	9	10	9	5	8	10	10	7	10	9

[1/] 0 to 10 ratings: 10 = complete kill

(A) - Oxyfluorfen @ 2 lbs/A; (B) - Untreated; (C) - Oxadiazon @ 4 lbs/A; (D) - Glyphosate @ 1 lb/A

Winter weed control with herbicide combinations in nonbearing almonds. Kempen, H. and J. Woods. A trial was established on December 14, 1976 to evaluate the effectiveness of herbicide combinations on annual weeds in two-year old almonds in Kern County, California. The trial was divided into four main treatments and eleven subtreatments. The latter were put on top of the main treatments. Due to the design of this experiment, there were no replications. Plots were 8 feet wide by 24 feet down the tree row, and were on a coarse sandy loam soil. Between December 30, 1976 and January 3, 1977, 0.41 inches of rain fell. The drip irrigation was turned on in mid-January.

Redstem filaree (4 to 6 inches diameter) and red brome (4 to 6 inches tall) were the two weed species present at time of herbicide application. This trial was evaluated on January 6, 1977 and January 27, 1977. Most of the herbicide treatments had not reached their maximum effectiveness by the earlier evaluation date. Later-season evaluations for weed control were not possible due to grower applied treatments of contact herbicides.

No injury was observed with any of the late fall herbicide treatments. For the control of red brome, glyphosate was the most effective of the main treatments, even though it was slow to take effect. Oxyfluorfen showed the most activity on redstem filaree, although oxadiazon and glyphosate were not far behind. For the control of both weed species, combination treatments appeared to be the most effective. Glyphosate + oxadiazon and glyphosate + oxyfluorfen both gave 100% weed control in this trial. Besides the postemergence weed control reflected in this data, oxadiazon and oxyfluorfen both should give residual weed control to these herbicide combinations. Glyphosate + oxyfluorfen combination looks very promising for postemergence broadleaf and grass control with some residual activity, and warrants further work in the future. (University of California, Cooperative Extension, Bakersfield, CA 93303)

Table 1 Winter weed control in nonbearing almonds (Evaluated January 6, 1977[1])

	Rate	Redstem filaree control				Red brome control			
Subtreatments	lb/A	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)
Simazine	0.4	9	0	2	2	4	1	0	2
Simazine	0.8	10	0	6	2	4	1	2	5
Oryzalin	2.0	10	0	5	2	3	1	1	4
Oryzalin	4.0	10	0	3	0	5	0	1	3
Oxadiazon	2.0	9.5	0	5	3	5	2	0	3
Oxadiazon	4.0	9	3	2	4	5	1	3	7
Norflurazon	1.0	9	0	0	0	4	1	3	5
Norflurazon	2.0	10	0	3	3	4	1	1	3
Prodiamine	2.0	9	0	1	3	4	1	2	7
Glyphosate + surfactant @ ¼%	0.5	9	0	2	0	6	2	4	5
Glyphosate + surfactant @ ¼%	1.0	8	0	0	0	5	1	7	5
Napropamide	2.0	9	0	4	4	2	0	1	4
Napropamide	4.0	9.5	0	3	3	5	1	0	5
Linuron	0.5	9	0	4	0	2	0	1	2
Linuron	1.0	8	0	2	3	3	0	2	4
2,4-D Amine	1.0	9	4	6	7	3	2	2	3
2,4-D Amine	2.0	9	2	8	0	3	0	1	4
Contact weed killer	2 qts[2]	9	8	8	6	4	2	2	9.5
Contact weed killer	4 qts[2]	10	9.5	9.5	9	4	3	3	9
Untreated	-	10	0	4	4	2	0	1	4
Untreated	-	9	0	3	2	3	1	2	3

[1] 0 to 10 rating: 10 = complete control

[2] 30% dinoseb be weight

(A) - Oxyfluorfen - 2 lbs/A; (B) - Untreated; (C) - Oxadiazon - 4 lbs/A; (D) - Glyphosate - 1 lb/A

Table 2 Winter weed control in nonbearing almonds (Evaluated January 27, 1977[1])

Subtreatments	Rate lb/A	Redstem filaree control (A)	(B)	(C)	(D)	Red brome control (A)	(B)	(C)	(D)
Simazine	0.4	10	0	8	9	3	1	1	10
Simazine	0.8	10	0	9	9	5	1	3	10
Oryzalin	2.0	10	2	8	9	4	2	1	10
Oryzalin	4.0	10	0	8	7	5	0	1	10
Oxadiazon	2.0	10	7	9	10	4	2	3	10
Oxadiazon	4.0	10	7	9	10	4	1	4	10
Norflurazon	1.0	10	0	8	7	6	5	4	10
Norflurazon	2.0	10	2	9	9	8	6	6	10
Prodiamine	2.0	9	1	9	7	4	1	3	10
Glyphosate + surfactant @ ¼%	0.5	9	4	10	7	10	6	10	10
Glyphosate + surfactant @ ¼%	1.0	10	6	10	7	10	9	10	10
Napropamide	2.0	9	3	9	9	4	3	3	10
Napropamide	4.0	10	3	8	9	5	4	3	10
Linuron	0.5	10	3	10	9	4	1	3	10
Linuron	1.0	10	3	10	9	5	1	3	10
2,4-D Amine	1.0	10	4	10	9	5	2	3	10
2,4-D Amine	2.0	10	7	10	9	4	2	3	10
Contact weed killer	2 qts[2]	9	6	10	7	4	2	3	10
Contact weed killer	4 qts[2]	10	7	10	10	5	2	3	10
Untreated	-	10	2	9	7	4	2	3	10
Untreated	-	9	1	8	7	5	2	3	10

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[1] 0 to 10 rating: 10 = complete control

[2] 30% dinoseb be weight

(A) - Oxyfluorfen - 2 lbs ai/A; (B) - Untreated; (C) - Oxadiazon - 4 lbs ai/A; (D) - Glyphosate - 1 lb ai/A

A comparison of six preemergence herbicides on the control of several weed species in almonds. Lange, A.H., L. Nygren, J. Schlesselman, and E. Stevenson. A stand of Merced and Non-pariel almonds, growing in a soil with 78.0% sand, 17.8% silt, 4.2% clay, and 1.1% organic matter, was treated with several preemergence herbicides for comparison of annual weed control. The trees were at the second leaf stage when treated on January 13, 1977. Herbicides were applied to 5 ft by 42 ft at 50 gpa and replicated four times. Annual weeds present at time of application included red maids, filaree, and chickweed. Paraquat at 1 lb/A was added to all treatments, including the check, to remove these standing weeds. An evaluation on March 6, 1977 showed that all the treatments were free from filaree growth and the best overall treatments were obtained from the oxyfluorfen and the high rate of norflurazon. Oxadiazon looked good on all weed species with the exception of chickweed. The remaining treatments gave only marginal control on the weed species present. Almond phytotoxicity ratings showed no injury from any treatment. (University of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

A comparison of six preemergence herbicides on the control of several weed species

		Average Ratings[1/]				
Herbicides	Rate lb/A	Overall	Fiddleneck	Red Maids	Chickweed	Almond Phyto
Norflurazon	2	5.5	5.2	3.0	7.5	0.0
Norflurazon	4	8.1	8.0	9.1	9.5	0.0
Oryzalin	4	4.0	4.0	1.0	9.5	0.0
Napropamide	4	3.8	2.5	0.0	9.5	0.0
Oxyfluorfen	2	9.4	9.6	10.0	7.2	0.0
Oxadiazon	4	8.4	9.9	9.2	2.2	0.0
Prodiamine	4	5.8	6.0	1.8	10.0	0.0
Check	-	2.0	0.0	1.0	10.0	0.0

[1/] Average of four replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete weed control or complete kill of plant. Treated 1/13/77. Evaluated 3/6/77.

The effect of thin layering preemergence herbicides on the residual activity as measured by groundsel and shepherds purse control in young almonds. Lange, A.H., J. Schlesselman, and R. Vargas. In a year of little rainfall, much herbicide activity can be lost after application. It is essential to find a means of herbicide incorporation to act as a substitute for immediate rainfall. A thin layering method of herbicide incorporation is being studied as a method of herbicide incorporation. A field trial was conducted to determine the effect of thin layering on several preemergence herbicides. A uniform stand of almonds growing in a soil containing 72.2% sand, 16.6% silt, 11.2% clay and 0.78% organic matter were divided into 2 tree plots and treated on November 15, 1976. All treatments were applied at 50 gpa. Immediately after application, one half of the plots were covered with a thin layer (½ inch to 1 inch) of soil by using a rotary ditcher. The other half were left uncovered for a direct comparison. The first significant precipitation, 0.25 inches of rainfall, occurred six weeks after application.

Weed control evaluations taken on March 15, 1977 indicate a slight increase in herbicide activity, when covered, for all compounds except oxyfluorfen and prodiamine. Norflurazon gave the best control whether covered or not. There was no injury resulting from herbicide treatments. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of thin layering on the residual activity of herbicides as measured by weed control in young almonds

Herbicide	Rate lb/A	Weed control[1/] Uncovered	Weed control[1/] Covered
Napropamide	4	5.1	6.8
Oryzalin	4	8.5	8.1
Oxyfluorfen	4	10.0	0.0
Prodiamine	4	8.3	4.9
Norflurazon	2	7.9	9.8
Norflurazon	4	9.1	9.8
Check	-	0	0

[1/] Average of 8 replications where 0 = no weed control, 10 = complete weed control.

Applied 11/15/76. Evaluated 3/15/77.

The effect of ten herbicides applied in a water suspension to Mission almond seedlings growing in a Delhi sandy loam. Lange, A.H. and L. Nygren. Seeds of Mission almonds were stratified then germinated in a greenhouse during the winter of 1977. When 4 to 6 inches high, the seedlings were transplanted to 46 oz containers and allowed to grow for several weeks. The potting soil used was a Delhi sandy loam with 72% sand, 22% silt, 6% clay, and 0.13% organic matter. Herbicide treatments were applied to the soil surface in a water solution of 100 ml/pot. The herbicide rates were applied in parts per million by soil weight of each pot on May 19, 1977.

Evaluations were made on the original phytotoxicity of the treatments, fresh weights of almond seedlings, vigor of seedling regrowth, and the weed control of a spurge and oxalis population.

Prodiamine, oxadiazon, oxyfluorfen and pendamethalin showed promising results at the 2 and 8 ppm rates. All observations of the above treatments indicated little or no phytotoxic effect, i.e., fresh weights greater than the checks probably due to weed competition in the check. There was vigorous regrowth of the tree tops (with the exception of oryzalin and oxadiazon at 8 ppm) and excellent weed control. Oryzalin and oxadiazon appeared to be safe on almonds at the 2 ppm rate, however, they were weak on spurge. At 8 ppm, these compounds appeared to affect the growth and vigor of the almond seedling. Glyphosate at 2 and 8 ppm applied to the soil surface, gave no indication of any phytotoxicity or reductions in growth and vigor of the almond regrowth. However, at 32 ppm, this compound appeared to slightly affect the normal meristematic development of the seedling as shown in the new growth.

Simazine, norflurazon, and napropamide were relatively safe at the lower rate, however, simazine was weak on spurge control. Norflurazon and napropamide were weak on both weed species. Methazole gave good control of oxalis but was only marginally safe, even at the lower rate. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of ten herbicides applied in a water suspension to Mission almond seedlings growing in a Delhi sandy loam

		Average[1]		
	Rate	Weed control[2]		Orig
Herbicides	ppm	Spurge	Oxalis	Phyto[3]
Simazine	1/8	1.8	10.0	1.2
Simazine	1/2	6.2	6.5	3.5
Simazine	2	10.0	10.0	6.5
Napropamide	2	0.5	2.5	0.0
Napropamide	8	4.8	3.8	2.0
Napropamide	32	3.8	2.5	1.8
Oryzalin	2	0.0	10.0	0.0
Oryzalin	8	9.0	10.0	0.0
Oryzalin	32	10.0	10.0	5.2
Prodiamine	2	10.0	10.0	0.5
Prodiamine	8	10.0	10.0	0.0
Prodiamine	32	10.0	10.0	1.8
Norflurazon	1/2	2.0	1.2	4.8
Norflurazon	2	0.0	6.8	8.2
Norflurazon	8	9.0	10.0	8.2
Oxadiazon	2	4.2	10.0	0.0
Oxadiazon	8	9.0	10.0	2.2
Oxadiazon	32	10.0	10.0	0.0
Oxyfluorfen	2	9.2	10.0	0.5
Oxyfluorfen	8	10.0	10.0	0.5
Oxyfluorfen	32	10.0	10.0	0.8
Pendamethalin	2	10.0	10.0	0.0
Pendamethalin	8	10.0	10.0	0.0
Pendamethalin	32	10.0	10.0	1.8
Glyphosate	2	4.2	2.8	0.0
Glyphosate	8	2.5	0.0	0.0
Glyphosate	32	0.0	5.0	3.2
Methazole	2	6.2	10.0	4.5
Methazole	8	0.0	10.0	8.0
Methazole	32	8.0	10.0	7.8
Check	-	3.8	0.0	0.0

[1] Average of 4 replications.

[2] 0 = no effect; 10 = complete kill. Evaluated 8/10/77.

[3] 0 = no effect; 5 = symptoms plus marginal burn, 10 = dead. Treated 5/19/77; evaluated 6/14/77.

The effect of continuous annual application of herbicide combinations on the growth of trees and the control of annual weeds in a close planted orchard. Lange, A., J. Schlesselman and L. Nygren. An orchard containing several tree fruit varieties was planted in a Hanford sandy loam (59% sand, 33% silt, 8% clay and 0.75% organic matter) on February 5, 1975. A study to determine the effect of annual herbicide application on the growth of these varieties was established on February 10, 1975. Repeat applications took place on January 9, 1976 and December 17, 1976. Twelve rows were included: 4 rows received herbicide application on a 5 ft berm only; 4 rows received complete application 10 ft on either side of tree (i.e., no tillage); the remaining 4 received no herbicidal application and were periodically tilled to control weeds. All herbicide treatments were applied at 50 gpa. Trunk diameter measurements were taken on November 22, 1976.

None of the treatments, either overall or strip application, were detrimental to the growth of the almond or nectarine varieties when compared to the complete tillage plots. The plots which received no chemical or mechanical weed control had trees with smaller trunk diameters due to competition with heavy weed populations.

Weed control ratings on August 8, 1977 showed that the combination of simazine and oryzalin produced the best weed control. Simazine and napropamide combinations gave excellent broadleaf control but missed the grasses. Oxadiazon and norflurazon gave good grass control and marginal control of the broadleaves. Oxfluorfen and napropamide combinations produced good results on both broadleaves and grasses. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of continuous annual application of herbicide combinations on the growth of two orchard varieties

		Almond dia. (cm)[1]			Nectarine dia. (cm)[1]		
Herbicides	Rate lb/A	overall chemical	strip (5ft berm)	tillage	overall chemical	strip (5ft berm)	tillage
Simazine + Oryzalin	1+4	5.8	7.4	-	4.7	4.6	-
Simazine + Napropamide	1+4	5.5	7.2	-	4.2	4.2	-
Oxadiazon + Norflurazon	4+2	7.9	6.9	-	4.6	5.0	-
Oxyfluorfen+ Napropamide	2+4	6.5	7.3	-	4.3	4.9	-
Check	-	5.3*	7.0*	6.8	3.9*	3.4*	4.5

[1] Average of 4 replications. Diameter of trunk measured 15 cm above ground level. Treated 2/10/75; 1/9/76; 12/17/76. Evaluated 11/22/76.

*Smaller trunk dia. due to weed competition in the check.

Screening new herbicides for preemergence weed control in newly planted trees. Lange, A., B. Fischer, J. Schlesselman, and L. Nygren. Rooted *Pistachio terebinthus*, black walnut seedlings, Troyer citrange, plus grafted trees of prune and apricot were planted March 1, 1977. Preemergence herbicides were applied March 24, 1977 and the postemergence herbicides were applied June 7, 1977. The evaluation for phytotoxicity was made on June 8, 1977 and September 15, 1977.

Simazine showed less injury at 2 lb/A than other earlier years. RH-6201 and MBR-16349 were toxic at 8 lb/A on most species. RP-26012 was also non-selective on most tree species even at the lower rate. Fluridone was somewhat safer on walnut and other species than on pistachio and almond. The weed control was outstandingly good even at the lower rate of ½ lb/A, so lower rates may be studied later. Weeds are reported to be controlled at 0.1 to 0.2 lb/A and perennials at 0.2 to 0.4 lb/A. MBR-16349, also somewhat non-selective in trees, showed problems on pistachio and walnut. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

A comparison of simazine with ten new herbicides on young newly planted tree seedlings as well as annual weed control

		Average ratings[1]												
Herbicides	Rate lb/A	Pear	French prune	Tilton apricot	Mission almond	Fig	Peach	Yellow Delicious apple	Plum	Walnut	Pist.	Citrus	Broad leaf	Grass
Simazine	2	0.0	3.3	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	10.0	9.6
Oryzalin	4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	8.6	10.0
Oryzalin	16	1.3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	10.0
Prodiamine	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	8.3	9.6
Prodiamine	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	9.3	10.0
DPX-1108[2]	4	0.6	0.0	0.0	0.0	0.0	0.0	1.0	0.6	0.6	1.0	0.0	10.0	9.6
DPX-1108[2]	16	0.0	0.0	0.0	0.0	1.0	0.6	0.0	1.0	1.0	0.0	0.0	10.0	10.0
Dupont 4432[2]	½	1.3	0.0	0.0	0.0	2.0	0.0	1.3	0.0	1.3	1.3	0.0	10.0	9.6
Dupont 4432[2]	2	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0
Oxyfluorfen	4	0.6	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	10.0
Oxyfluorfen	16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	9.6	10.0
RH-6201	2	0.6	0.6	0.0	2.0	0.0	1.0	0.6	0.6	0.0	0.0	0.0	9.3	8.0
RH-6201	8	3.0	6.3	5.6	9.3	3.3	8.0	6.3	6.6	4.6	2.6	3.3	9.0	8.0
RH-26012	4	2.6	10.0	9.3	7.0	10.0	6.6	0.6	8.6	2.3	6.3	0.3	9.6	10.0
RP-26012	16	10.0	10.0	10.0	10.0	10.0	10.0	9.6	10.0	10.0	10.0	4.6	10.0	10.0
Fluridone	½	1.6	1.6	1.0	1.0	3.3	0.0	0.0	0.0	1.3	0.0	0.0	10.0	10.0
Fluridone	2	0.6	0.0	1.0	4.3	3.3	1.0	0.0	0.0	1.3	5.6	0.0	10.0	10.0
MBR-16349	2	1.6	0.0	0.6	1.6	2.0	0.0	0.6	0.0	1.3	1.3	0.0	3.0	8.0
MBR-16349	8	7.0	6.3	7.0	7.3	4.0	6.0	5.0	6.3	5.6	3.0	6.3	3.6	9.0
HER-26910	4	1.3	1.3	1.3	1.3	1.3	0.0	1.3	2.0	1.3	1.3	0.0	4.3	6.6
HER-26910	16	0.3	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.6	0.0	1.6	3.3	8.3
Check (paraquat)	-	2.3	3.0	2.0	3.0	3.0	2.3	2.3	1.3	0.6	1.0	0.0	2.3	5.0

[1] Average of three replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Treated 3/24/77. Evaluated 9/15/77.

[2] Treated 6/7/77 with postemergence.

The effect of basal sprays of four herbicides on the growth of young trees. Lange, A., L. Nygren, and J. Schlesselman. For the control of perennial weeds with translocated herbicides in young trees it is necessary to know the potential hazard from spray drift onto the trunk and sucker growth if present. Nectarines and apples usually sucker badly, whereas almonds and pistachio do not. In these tests, only the two year old nectarine trees were heavily suckered. The basal 8 to 12 inches of all trees were sprayed May 5, 1977. The effects of the sprays were evaluated May 31, 1977 and August 30, 1977.

From the rating, nectarines appeared most sensitive showing effects from high and medium rates of glyphosate, MSMA, and 2,4-D. The trees were killed when the trunks were sprayed with 16 lb/A of 2,4-D (OSA) and badly damaged with MSMA at that rate. Glyphosate, on the other hand, caused some stunting of the young tree and some bark damage.

Young 2-year old Mutzu applies on M-111 rootstock were not affected by these rates. Young 2nd year *P. terribentha* rootstock were also not significantly affected by these herbicides at the sprayed rates.

First year Mission almond trees on Nemaguard rootstock were severely injured by the 16 lb/A rate of 2,4-D, but no effect was observed from the other herbicides. The 3 year old Mission almond trees on Nemaguard roots showed no apparent phytotoxicity from any of the herbicide treatments. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of May sucker sprays on this seasons top growth, sucker regrowth, and the trunk

		Average Ratings[1]						
		Nectarine					Almond phyto	
Herbicides	Rate lb/A	vigor top	vigor sucker	trunk[2]	Apple vigor	Pistachio vigor	1 st year	3 rd year
Glyphosate	4[3]	8.0	6.5	0.8	10.0	9.7	7.0	9.3
Glyphosate	8[3]	6.8	0.8	0.8	9.0	10.0	8.3	8.7
Glyphosate	16[3]	5.2	0.0	3.5	9.7	8.7	8.6	9.5
Paraquat	4	9.2	7.8	0.0	10.0	-	-	9.5
Paraquat	8	9.8	2.0	0.0	9.7	10.0	7.3	8.7
Paraquat	16	8.0	1.2	0.0	9.0	8.3	6.3	9.7
MSMA	4	9.0	1.2	0.5	9.7	-	-	8.7
MSMA	8	7.0	0.5	1.0	9.7	8.7	7.3	10.0
MSMA	16	3.0	0.5	4.0	9.3	9.0	6.6	9.5
2,4-D(OSA)	16	0.8	0.5	3.8	9.7	8.0	0.0	7.3
Check	-	9.0	9.0	0.0	9.3	8.7	7.0	9.0

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[1] Average of 4 replications. Based on 0 to 10 scale where 0 = no growth or dead and 10 = most vigorous. Treated 5/5/77. Evaluated 8/30/77.

[2] SPECIAL NOTE: Trunk damage was a roughening of bark and some gumming. Trunk phyto was rated where 0 = no effect, 10 = severe splitting and dead, 3 = some split and/or gumming.

[3] Pounds calculated on the salt basis.

The effect of foliar herbicide sprays on the vigor of regrowth of miscellaneous stone fruit trees. Lange, A. and J. Schlesselman. The tops of 44 trees were removed to 5 feet from the soil level on July 1, 1976. The foliage was allowed to regrow until it was about 5 feet long. This foliage was then sprayed May 24, 1977. The regrowth was rated on August 30, 1977. Several varieties of 7 year old apricot, peach, nectarine and plum trees were used.

The dramatic effect of foliar applied glyphosate can be seen at the 4 and 8 lb ai/A rate. This is particularly impressive when compared with the effect of 2,4-D and paraquat which did not appear to have translocated as much as the glyphosate. The addition of 2,4-D to glyphosate did not enhance translocation as appeared to have occurred in one earlier trial with bindweed. DPX-1108 showed considerable repression of top growth, but less than glyphosate or MSMA. However, DPX-1108 appeared to repress sucker growth closer to glyphosate. (Univ. of Calif., Coop. Ext., 9240 S. Riverbend Ave., Parlier, CA 93648)

The effect of May foliar sprays on the regrowth of miscellaneous stone fruit trees[1]

		Average ratings[2]		
Herbicide	Rate lb/A	Vigor of top growth	Top phytotoxicity	Vigor of sucker growth
Glyphosate	2	7.3	3.0	3.0
Glyphosate	4	0.7	9.7	0.3
Glyphosate	8	1.3	8.3	0.0
2,4-D	2	9.0	1.0	4.0
2,4-D	4	8.0	2.0	2.7
2,4-D	8	7.0	3.0	7.3
Glyphosate + 2,4-D	2+2	8.5	2.0	3.3
Paraquat	8	8.0	2.0	9.0
DPX-1108	8	4.7	2.0	3.0
DPX-1108	16	4.3	5.0	0.3
DPX-1108	32	1.3	6.3	2.3
MSMA	4	3.7	4.7	6.8
MSMA	8	3.0	7.3	4.7
Check	-	8.7	1.0	10.0

[1] Regrowth of 6 year cut-back stumps of peach, apricot, plum, and nectarine.

[2] Average of 3 replications. Based on 0 to 10 scale where 10 = most vigorous regrowth, 5 = about 1/2 maximum size, 0 = no regrowth or no phytotoxicity. Evaluated 8/30/77. Treated 5/24/77.

Effect of repetitive herbicide treatments on survival and growth of Scotch pine. Alley, H.P. and N.E. Humburg. A commercial Christmas tree farmer expressed concern over the effect upon tree survival and growth resulting from annual use of specific herbicides for weed control in Scotch pine. To help obtain such information, plots were established

March 23, 1976 at which time tree numbers and heights were recorded.

Weed control evaluations made in 1976, the year of initial herbicide treatment, indicated that pronamide applied alone was not as effective as atrazine + simazine or simazine alone for control of field sandbur or annual broadleaf weeds. To increase the spectrum of weed control, simazine was mixed with pronamide for the 1977 treatment. All treatments made in 1977 gave virtually 100% weed control.

Scotch pine survival and growth, after one years treatment, do not appear to be affected by the herbicides when compared to the hand-weeded plots. Percent increase in tree height averaged 33%, whereas pine on treated plots averaged from 32 to 44% increase. The study will be continued until the trees are harvested. (SR 845. Wyoming Agric. Exp. Sta., Laramie, WY 82071)

Weed control and growth of Scotch pine as effected by repetitive herbicide treatments

Herbicides[2]	Rate lb/A		Percent control[1]						Number of pine(s) and average height inches		Percent increase tree height
			1976			1977					
	1976	1977	SB	RT	PW	SB	RT	PW	1976	1977	
Pronamide	1.0		50	0	0				(37) 15.8	(37) 23.5	33
Pronamide + Simazine		1.0 + 0.5				100	100	100			
Pronamide	1.5		80	0	0				(37) 19.9	(36) 29.8	33
Pronamide + Simazine		1.5 + 0.5				100	100	100			
Simazine + Atrazine	0.8 + 0.8	0.8 + 0.8	90	100	100	100	100	100	(33) 18.6	(32) 32.9	44
Napronamide + Simazine	0.5 + 0.8	0.5 + 0.8	85	40	100	100	98	100	(33) 15.8	(32) 24.2	35
Simazine	1.6	1.6	95	95	100	100	98	100	(35) 18.2	(33) 26.7	32
Handweeded			--	--	-	-	--	-	(34) 15.3	(34) 22.8	33

[1] Percent control of weed species.
SB = field sandbur
RT = Russian thistle
PW = redroot pigweed

[2] Simazine added to pronamide treatment in 1977 due to poor weed control in 1976 from pronamide.

A preliminary evaluation of repeated glyphosate treatments on selected evergreens for Canada thistle control. Dunwell, W.C., A.A. Boe, and G.A. Lee. Control of Canada thistle in nurseries and botanical gardens at the University of Idaho is a severe problem. Previously, glyphosate has been successfully used as a nonselective herbicide for control of Canada thistle in these areas. This study was initiated to study the effects of repeated applications of glyphosate on selected evergreens and to evaluate the possible use of glyphosate as a selective herbicide in evergreen nurseries and gardens.

In May of 1976 a test nursery was planted with 3-year-old container stock of Alberta Spruce, Colorado Blue Spruce, Mugho Pine, Boxwood, American Arborvitae, and Creeping Juniper. This plot was oversprayed after first frost in September of 1976 and 1977, when the Canada thistle were in the flowering stage, with glyphosate (as an isopropylamine salt) at 3 lb/A (a.e.) in 40 gal/A of water using a three-nozzle CO_2 pressure backpack sprayer.

Damage to evergreens was visually evaluated on a monthly basis from the first treatment in September 1976. Weed control was evaluated by visual observations and was done monthly. Canada thistle showed signs of severe damage 4 weeks after spraying. Dandelion and clover were very slow to die; the spring following treatment they were severely stunted and chlorotic. Dandelion and clover in this condition died during the growing season. Glyphosate effects on winter injury in evergreens has yet to be severely tested. The winter of 1976 was relatively mild and as yet the winter of 1977 had not been severe. The evergreens did come through the winter of 1976 in good condition and proceeded to grow adequately through the subsequent spring and summer. Injury to the evergreens had not been observed following the second treatment.

Good weed control with no evident phytotoxicity to the evergreens was observed for both treatments, indicating the possible use of glyphosate as a selective herbicide in selected evergreens. (Idaho Agricultural Experiment Station, University of Idaho, Moscow, ID 83843)

Effect of preplant and postplant applications of paraquat and glyphosate on four ornamental species. Elmore, C.L. and W.E. Mast. One method of weed control to reduce competition of annual weeds with new ornamental plantings is to treat prior to the planting of the ornamentals. Since both paraquat and glyphosate possess little or no biological soil residual, excellent weed control should be obtained without injury to the ornamentals. To further evaluate tolerance of these two herbicides; a post directed treatment was applied to each of four ornamental species.

Herbicides were applied with a CO_2 constant pressure sprayer at 40 psi to bare soil on May 5, 1977 prior to the planting of liners of Chinese juniper, Japanese privet, Cape weed and St. johnswort. Three plants of each species were planted in each plot and replicated four times. A postemergence directed application at the same rates as the preplant treatments was applied June 13, 1977 in 50 gallons of water per acre.

Weed control and phytotoxicity evaluations were made June 6, July 26 and August 25, 1977. When paraquat or glyphosate was applied preplant to two shrub and two ground cover species no injury resulted. No significant control of redstem filaree or redroot pigweed was observed from preplant treatments.

Paraquat reduced the vigor of young Chinese juniper and St. johnswort plants when applied as a directed spray probably because of slight drift onto foliage. Glyphosate did not appear to have an appreciable effect on any of the species but cape weed. Since cape weed is a rapidly spreading ground cover it is difficult to direct the herbicide, thus some contact resulted, giving reduced vigor. Chinese juniper, Japanese privet and St. johnswort did not exhibit significant reduced vigor. (University of California, Botany Department, Davis, CA 95616)

Table 1 Control of weeds with paraquat and glyphosate preplant and postplant postemergence in ornamentals

Herbicide[2]	Rate lb/A	6/6/77 redstem filaree	6/6/77 redroot pigweed	7/26/77[1] total weed control
Paraquat	0.5	0.0	0.5	1.2
Paraquat	1.0	0.5	0.0	3.0
Paraquat	2.0	1.0	0.0	5.0
Paraquat	4.0	0.5	0.0	6.8
Glyphosate	1.0	1.2	0.0	2.0
Glyphosate	2.0	0.0	0.0	4.0
Glyphosate	4.0	0.5	0.0	5.8
Glyphosate	8.0	0.8	0.0	6.5
Untreated-Unweeded	-	0.0	0.0	0.0
Untreated-Weeded	-	0.0	0.0	10.0

[1] 43 days after post-directed application, principally redstem filaree

[2] Applied preplant 5/5/77; postplant 6/13/77

Table 2 Effects of preplant and postplant, postemergence directed treatments of paraquat and glyphosate on two shrub and two ground cover species[1]

		Phytotoxicity							
		Shrubs[2]				Ground covers[2]			
		Japanese privet		Chinese juniper		capeweed		St. johnswort	
Herbicide[3]	Rate lb/A	7/26	8/25	7/26	8/25	7/26	8/25	7/26	8/25
Paraquat	0.5	6.5	8.0	7.8	8.5	6.8	7.2	5.8	6.2
Paraquat	1.0	6.0	7.2	7.2	7.5	8.2	9.0	5.2	5.5
Paraquat	2.0	5.2	6.2	6.2	6.5	7.0	8.0	1.8	4.5
Paraquat	4.0	5.8	8.0	4.2	4.0	8.0	9.2	2.2	4.5
Glyphosate	1.0	6.8	6.8	8.2	8.5	7.5	9.0	7.8	8.2
Glyphosate	2.0	7.8	8.8	8.5	9.5	7.5	8.8	7.8	8.8
Glyphosate	4.0	6.0	6.5	6.8	8.2	6.0	7.2	3.8	6.2
Glyphosate	8.0	6.8	6.8	7.8	10.0	5.2	6.8	7.0	9.0
Control-Unweeded	-	4.5	1.5	7.0	7.0	5.8	6.5	5.8	7.0
Control-Weeded	-	5.8	7.5	8.8	10.0	9.0	10.0	9.0	9.5

[1] No phytotoxicity was observed on any ornamental specie on June 7, 1977 thus not shown in table.

[2] Vigor: 0 = dead plants; 10 = vigorous growth.

[3] Applied preplant 5/5/77; postplant 6/13/77.

Liverwort control in container grown ornamentals. Elmore, C.L. and L.S. Frey. The lower plant bryophyte liverwort is found as a competitive species in ornamental plants when they are grown in moist, shady conditions. It may become a weed in liners or many shade-loving container grown species.

In a study to evaluate control of liverwort in containers the herbicides oxadiazon and oxyfluorfen granules were evaluated in ten gallon container grown species. The liverwort plants were in the vegetative to sporulating stages when the herbicides were applied June 12, 1975. Granules were broadcast with a hand shaker over the top of ten single container replicates, then washed from the foliage by hand, sprinkling immediately after application.

Liverwort control evaluations (Table 1) and phytotoxicity were made visually at 2 weeks, 1, 4 and 7 months after application. Only the 1 month phytotoxicity evaluation is included because injury was only observed at this evaluation (Table 2). Liverwort was partially controlled with oxadiazon and oxyfluorfen in this study. Results were slow to be observed (1 month). Four pounds per acre of either herbicide was required to give approximately 70% control. (Cooperative Extension, University of California, Botany Department, Davis, CA 95616 and 4145 Branch Center Road, Sacramento, CA 95827)

Table 1 Control of liverwort with postemergence applications of two herbicides

Herbicide[1]	Rate lb/A	Weed control 2 wks 7-1-75	1 mo. 7-14-75	4 mo. 10-1-75	7 mo. 1-16-76
Oxadiazon	1	3.6	4.1	5.1	4.2
Oxadiazon	2	3.8	5.4	7.2	5.7
Oxadiazon	4	5.6	6.7	9.0	7.2
Oxadiazon	8	6.4	7.8	9.9	9.4
Oxyfluorfen	2	3.8	6.6	5.0	4.8
Oxyfluorfen	4	4.8	6.6	7.0	6.4
Oxyfluorfen	8	5.3	6.4	8.9	9.2
Control	0	2.2	2.2	2.6	3.5

[1] Treatments applied 6-12-75.

Table 2 Phytotoxicity of two postemergence herbicides to ten container grown ornamentals.

Herbicide	Rate lb/A	African lily	Japanese boxwood	Japanese privet	Evergreen euonymus	Perennial periwinkle	Golden euonymus	Tam juniper	Indian hawthorn	Japanese black pine	Pomegranate
Oxadiazon	1	1	2	2	1	0	0	0	1	0	0
Oxadiazon	2	2	2	-	0	-	0	0	0	0	0
Oxadiazon	4	2	-	2	0	1	-	0	0	-	
Oxadiazon	8	2	1	3	1	2	0	0	1	-	0
Oxyfluorfen	2	3	3	-	0	1	0	0	2	0	-
Oxyfluorfen	4	4	2	-	1	2	0	0	0	1	-
Oxyfluorfen	8	4	3	-	0	2	0	0	0	0	-
Control	0	1	1	2	0	2	0	0	0	0	0

PROJECT 5

WEEDS IN AGRONOMIC CROPS

Paul E. Keeley, Project Chairman

SUMMARY -

Sixty four reports covering thirteen agronomic crops were submitted. The reports are arranged alphabetically by crops and authors and briefly summarized below.

Alfalfa (10 papers) - Several herbicides (metribuzin, buthidazole, pronamide, propham, simazine, terbacil, and combinations of RH-2915 + paraquat and napropamide + metribuzin) applied in the spring to dormant or semidormant alfalfa provided control of downy brome and/or several broadleaf weeds resulting in yield increases in many cases. (See reports for rates used, length of time control was maintained and incidence of injury for this and other crops). Promising fall treatments for control of prickly lettuce, flixweed, shepherdspurse and common chickweed included terbacil, metribuzin, simazine, buthidazole, and pronamide. Fall applied terbacil and simazine were the most effective treatments for the control of seedling alfalfa, nightshade, and prickly lettuce in alfalfa for seed. In trials conducted in Washington, alfalfa tolerated EPTC applied directly in the row with the alfalfa seed.

Barley (4 papers) - Triallate, applied and incorporated either as a fall or spring treatment, plus a postemergence application of diclofop provided excellent control of wild oat. Other promising treatments for wild oat control included triallate, alone, or in combination with difenzoquat or barban. In zero-tillage plots, preplant applications of glyphosate or paraquat satisfactorily controlled volunteer crop and winter annual weeds, while acceptable control of wild oat was attained with postemergence applications of diclofop or difenzoquat. Among several treatments which provided control of kochia and lambsquarters, the most outstanding treatments were dicamba + 2,4-DE and VEL-4902 + 2,4-DA.

Beans-Kidney (1 paper) - Shielded sprays of MCPA, glyphosate, and DPX-1108 provided satisfactory control of perennial bindweed in beans without crop injury.

Bluegrass Seed Fields (2 papers) - Terbacil, applied in the fall, provided effective control of several broadleaf weeds (mayweed, henbit, field pennycress, shepherdspurse, and others) and downy brome and wild oat. Dowco-290 and triclopyr were effective mainly on broadleaf weeds.

Corn (3 papers) - Of several preplant treatments demonstrated to control pigweed, lambsquarter, nightshade, and green foxtail, alachlor and combinations of cyanazine + butylate + R-25788 were most outstanding. The most effective early post applications for these species included combinations of alachlor + atrazine and pendimethalin + cyanazine. When applied through center-pivot sprinklers, preemergence applications of alachlor + atrazine provided outstanding control of field sandbur, volunteer barley, and green foxtail.

Cotton (3 papers) - When applied and incorporated with a rolling cultivator at planting, ethalfluralin, alachlor, dinitramine, H-26910, R-24315 provided fair to good control of nightshade without substantial injury to the crop. Applied as postemergence treatments, HOE-29152 appeared promising for barnyardgrass control, while SN-55365 and SN-58132 controlled nightshade. H-26910 performed best for control of yellow nutsedge when incorporated into moist soil in which cotton was planted. Other herbicides showing promise for this weed included Dowco-295 and fluridone.

Lentils (2 papers) - Several herbicides (diclofop, HOE-29152, SN-533, ethofumesate, and alachlor) applied preplant provided control of barnyardgrass resulting in substantial increases in yield. The most promising treatments for broadleaf weeds included alachlor and SN-533, alone or in combination with dinitramine. Applied postemergence, HOE-29152 controlled barnyardgrass while control of henbit, mayweed, field pennycress, lambsquarter, and pigweed was obtained with a combination of metribuzin + dinoseb alkanolamine salt.

Peas-Spring (3 papers) - Preemergence surface applied RH-6201, R-24315 and R-40244 provided the best control of field pennycress, lambsquarter, and henbit, while HOE-29152 appeared promising for the control of barnyardgrass. Postemergence applications of barban, diclofop, and HOE-29152 controlled wild oat resulting in substantial increases in yield. HOE-29152 provided excellent quackgrass control, but the performance varied somewhat due to the stage of development of the quackgrass at the time of treatment.

Peppermint (5 papers) - Spring applications of HOE-29152 provided excellent control of the top growth of bermudagrass, extending throughout the summer. When this herbicide was applied at several dates, early spring applications were most effective for the control of perennial bluegrass. Good control of Canada thistle and high oil yields were obtained from sequential treatments of low rates of Dowco-290. June applications of bentazon for two consecutive years provided equal control of Canada thistle in both years, indicating that a resistant population of thistle was not developing. When timing of applications on peppermint was studied, injury from paraquat appeared to be associated with flaming.

Sorghum (1 paper) - Under sprinkler irrigation, propazine, alone, and bifenox in combination with propachlor provided broad-spectrum weed control (barnyardgrass, pigweed, purslane, and lambsquarters) in grain sorghum. Terbutryn and bifenox, which were less effective on barnyardgrass, controlled all of the broadleaf species present.

Sugarbeets (10 papers) - Applied preplant in furrow irrigated sugarbeets, several treatments including cycloate (alone or in combination with ethofumesate or H-22234), ethofumesate, pyrazon, and R-12001 provided control of foxtail and certain broadleaf weeds. Some of the most promising preplant treatments in sprinkler irrigated sugarbeets for the control of a broad spectrum of weeds (foxtail, pigweed, nightshade, lambsquarters, and kochia) included R-12001 and combinations of cycloate + ethofumesate and H-22234 + ethofumesate. Other combinations included ethofumesate + HOE-23408 or HOE-29152. As preemergence treatments for spring weed control, H-22234 and combinations of pyrazon + diclofop or HOE-29152 and diclofop + ethofumesate provided season-long weed control resulting in excellent yields of beets. Some of the most effective postemergence treatments for the control of foxtail, pigweed, and lambsquarters included combinations of desmedipham + phenmedipham + BioVeg, and HOE-23408 or H-29152 + desmedipham + phenmedipham + BioVeg.

Sunflower (1 paper) - Metolachlor + chloramben applied preemergence provided outstanding control of redroot pigweed, prostrate pigweed, and green foxtail without apparent damage to sunflowers.

Wheat (19 papers) - Several papers dealt with the control of wild oat in wheat. In winter and spring grown wheat, the addition of surfactants did not substantially improve the control of wild oat obtained with diclofop alone and sometimes tended to reduce yields. Difenzoquat, alone or applied as a sequential treatment following barban, also provided good control of wild oat in winter grown wheat. When the control of two strains of wild oats was evaluated in Oregon, diclofop, barban, and difenzoquat were more effective for the control of Oregon wild oats than Canadian wild oats in spring grown wheat. In this study, several surfactants improved control of the Canadian wild oats obtained with diclofop and difenzoquat. When evaluated for the control of a broad-spectrum of broadleaf weeds in winter sown wheat, dinoseb selective and 2,4-DP + bromoxynil provided good control resulting in substantial increases in yields. Also, low rates of fall-applied metribuzin in tank mix combination with linuron, chlorobromuron or terbutryn resulted in superior grain yields and broad spectrum weed control in zero-tillage winter wheat.

Some of the more promising treatments for canarygrass control in winter wheat included premergence applications of diclofop and nitrofen and postemergence applications of diclofop and metribuzin. Sequential treatments with barban followed by difenzoquat provided excellent control of both canarygrass and wild oats and increased yields substantially. The most promising treatments for the control of downy brome in established winter wheat included postemergence applications of metribuzin in combination with cyanazine, terbutryn, bromoxynil, diclofop, or dicamba. In an experiment conducted to study the value of fumigants for the control of johnsongrass, deep fumigation with 1,3-D prior to planting winter wheat dramatically reduced stands of johnsongrass the following spring and summer resulting in increases of yield of wheat. In an experiment designed to study the response of wheat and barley to EPTC, vernolate, and MV-687, coating seeds of these crops with the antidote R-32822 failed to adequately protect wheat varieties evaluated. Barley had considerable varietal interaction, with spring varieties such as 'Steptoe' showing greatest benefit.

PAPERS -

Downy brome control in dormant dryland alfalfa - spring treatments. Alley, H.P., N.E. Humburg, and G.L. Costel. The herbicides listed in the attached table were applied to a dryland alfalfa field on March 23, 1977, that was heavily infested with downy brome. The downy brome was in the 3 to 4-tiller stage with 4 to 6 leaves and the alfalfa was just breaking dormancy with approximately 0.5 inch green growth at the base of the plant at time of herbicide application.

All herbicides were applied with a three-nozzle knapsack spraying unit in a total volume of 40 gpa water. Plots were 9 ft wide by 30 ft in length and were arranged in a randomized complete block design with three replications. Percent downy brome control evaluations were done by visual estimates made June 8, 1977, two and one-half months after treatment. Alfalfa yield determinations were made by hand clipping a 2.5 ft diameter circle from each replicated plot and calculating production of oven-dry alfalfa per acre.

Eleven of 20 treatments gave 99% or better control of downy brome. Of the treatments which gave outstanding downy brome control, metribuzin, napropamide + metribuzin, and pronamide did not cause stunting or damage to the alfalfa. Buthidazole at all rates of application and the combination of prodiamine + metribuzin at all rates caused some alfalfa stunting; however, the stunting did not substantially affect the yield of alfalfa except at the high rate of 3 lb/A of buthidazole. (Wyoming Agricultural Experiment Station, Laramie, Wyoming, SR 836).

Downy brome control and alfalfa production year of treatment (1977) Sheridan, Wyoming

Herbicide 1/	Rate lb/A	Percent control Downy brome	Alfalfa lb/A	Observations
Napropamide + metribuzin	2 + 0.25	99	1918	
Napropamide + metribuzin	2 + 0.5	100	2368	
Napropamide + simazine	2 + 0.5	75	1830	
Metribuzin	0.5	100	1693	No damage to alfalfa
Napropamide	2	0	1425	Stunted alfalfa
Buthidazole	0.5	100	2095	All rates of buthidazole stunted the alfalfa
Buthidazole	1	100	1725	
Buthidazole	3	100	602	
Pronamide	0.5	99	1947	No alfalfa damage
Prodiamine	0.5	0	1125	
Prodiamine	1	0	1119	
Prodiamine	2	0	1457	
Prodiamine + metribuzin	0.5 + 0.5	100	1880	Some stunting of the alfalfa
Prodiamine + metribuzin	1 + 0.5	100	1442	
Prodiamine + metribuzin	2 + 0.5	100	1677	
metribuzin (4L)	0.5	100	950	
Velpar (90W)	0.45	50	1539	
Velpar (90W)	0.9	50	1391	
R-40244	0.5	0	1093	
R-40244	1	30	1139	
Check			1673	

1/ Treated March 23, 1977; visual evaluation June 8, 1977; harvested June 16, 1977.

Downy brome control in semi-dormant alfalfa one and two years following treatment. Alley, H.P., G.L. Costel and N.E. Humburg. The herbicides listed in the attached table were applied to a heavily weed-infested, low productive dryland alfalfa field on April 22, 1975 at the Sheridan Agricultural Substation. The soil was classified as a sandy loam with a pH of 7.1, 3.5% organic matter, 69% sand, 16% silt and 15% clay. Soil temperature at the time of treatment was 41 F at 1.0 inch, 44 F at 2.25 inches, and 44 F at the 4.5 inch soil depth.

The weed species consisted primarily of downy brome and field pepperweed, with a minor population of tansy mustard and meadow salsify. The alfalfa had approxiamtely 2 1/2 inches of green growth, downy brome was at the 1 to 2-leaf stage and was 1 inch tall, and the mustards were in the 6-leaf stage at time of treatment.

All herbicides were applied with a three-nozzle knapsack spray unit in a total volume of 40 gpa water. The plots were 9 by 30 ft, randomized with three replications.

Fourteen months after treatment, ten treatments gave 80% or greater downy brome control with several treatments maintaining better than 90% downy brome control. Percent control ratings indicated that napropamide + EPTC at 4 + 3 lb/A, napropamide at 4 lb/A, and FMC-25213 at 1 and 2 lb/A were more effective one year following treatment than the year of treatment. Secbumeton was the only treatment resulting in effective control of both the broadleaf and grass spectra the year following treatment.

Pronamide at 1.0 lb/A was the only herbicide which resulted in 80% or better control two years after treatment. All other treatment plots were reinfested with downy brome to near the same density as before treatment. (Wyoming Agricultural Experiment Station, Laramie, Wyoming, SR 834).

Downy brome control one and two years following treatment

Herbicide [1]	Rate lb/A	Downy brome (% control) [2] 1975	1976	1977
Napropamide 2E +	2			
EPTC 3S	2	0	0	0
Napropamide 2E +	4			
EPTC 3S	3	0	85	25
Napropamide 2E	2	30	45	0
Napropamide 2E	4	50	90	45
Bifenox	1	30	0	0
FMC-25213	1	60	90	22
FMC-25213	2	70	93	33
Fluchloralin + Cittowet	0.75	30	10	0
Fluchloralin + Cittowet	1.5	30	10	0
Fluchloralin	0.75	20	7	0
Fluchloralin	1.5	30	10	7
Buthidazole	0.25	30	7	0
Buthidazole	0.5	50	77	7
Buthidazole	1	100	77	23
Buthidazole	2	100	90	23
Metribuzin	0.5	100	77	13
Metribuzin	1	100	86	23
Simazine	1.2	85	79	30
Secbumeton	1.2	95	97	53
Terbacil	0.8	100	78	33
Diuron +	2			
Terbacil	0.5	100	78	13
Pronamide	0.75	90	95	42
Pronamide	1	98	96	82

[1] Treated April 22, 1975.

[2] Visual evaluations June 24, 1975, June 10, 1976 and June 15, 1977.

Weed control in dormant dryland alfalfa the year of and one year following treatment. Alley, H.P., G.L. Costel and N.E. Humburg. The herbicides listed in the attached table were applied to a heavily downy brome infested, low producing, dryland alfalfa field on March 23, 1976. The downy brome was in the 1 to 3-leaf stage with approximately 1/2 to 1 inch leaf height, and the field pepperweed was in the early cotyledon stage at time of herbicide application.

All herbicides were applied with a three-nozzle knapsack spray unit in a total volume of 40 gpa water. Plots were 9 ft wide and 30 ft in length and were arranged in a randomized complete block design with three replications. Alfalfa yield determinations, where weed control was apparent, were made by mowing the treated plots in 1976 and hand clipping a 2.5 diameter circle from each replicated plot in 1977. The alfalfa was oven dried and production calculated and reported as oven-dry alfalfa per acre.

Eight treatments gave 100% control of the downy brome the year of treatment; however, only 3 treatments, pronamide at 1 and 1.5 lb/A and buthidazole at 4 lb/A, resulted in 94% or greater downy brome control 15 months following treatment. Propham, metribuzin and the lower rates of buthidazole did not maintain effective downy brome control the year following treatment. Pronamide, which did not give effective downy brome control the year of treatment, gave near complete control the year following treatment. Prodiamine, R-33222 and simazine were the only treatments resulting in 80% or greater reduction in field pepperweed the year following treatment. (Wyoming Agricultural Experiment Station, Laramie, Wyoming, SR 835).

Weed control and alfalfa production the year of treatment (1976)1/ and one year following treatment (1977)2/ . Sheridan Agricultural Substation

Herbicide	Rate lb/A	Percent control				Alfalfa oven-dry lb/A	
		Field pepperweed		Downy brome			
		1976	1977	1976	1977	1976	1977
Metribuzin	0.5	100	73	100	5	1897	----
Metribuzin	1	100	30	100	10	2378	----
Pronamide	0.5	0	5	20	77	----	1130
Pronamide	1	0	0	55	99	----	1430
Pronamide	1.5	0	5	80	99	990	1210
R-33222	1	0	85	0	5	----	1716
R-33222	2	0	72	0	5	----	874
Propham	3	0	62	100	25	1794	----
Prodiamine	0.33	0	80	0	15	----	----
Prodiamine	0.5	0	65	0	25	----	----
Prodiamine	0.66	0	80	0	15	----	----
Simazine	1.2	99	87	90	56	2175	2270
Buthidazole	0.75	100	0	100	0	2249	1130
Buthidazole	1	100	0	100	20	2083	1230
Buthidazole	1.5	100	0	100	35	2416	1750
Buthidazole	2	100	0	100	45	1659	1330
Buthidazole	4	100	0	100	94	1479	2595
Check (mowed)	--	---	---	---	--	950	----
Check (clipped)	--	---	---	---	--	1172	1630

1/ Treated March 23, 1976; evaluated and harvested June 10, 1976.

2/ Evaluated and harvested June 17, 1977.

Weed control in alfalfa for seed. Cords, H.P. and L.M. Stockton. Row planted alfalfa grown for seed is especially susceptible to weed competition. In the Orovada area of Nevada past practice has been to rely on water-run EPTC and mechanically incorporated trifluralin, along with periodic cultivations, to control the weeds. This practice has resulted in a buildup of hairy nightshade. In addition, alfalfa seedlings have not been controlled. Two experiments were designed and applications made on the Don Morris farm in an attempt to solve the problem. The first trial involved application in November of eight herbicides at several rates both mechanically incorporated and unincorporated other than by precipitation. Largely because of the extremely dry winter, the entire treatment area was virtually weed free and no evaluations were made. The second experiment involved application in the spring prior to furrowing for irrigation (May 5, 1977). In that area, sufficient weeds were present for evaluation, and the data are shown in the table. Rain fell immediately after application and a week of rainy weather followed. The furrowing out process resulted in a layer of soil completely across each bed. These circumstances probably accounted for the effectiveness of some of the treatments. The soil is classified as a loam.

The only alfalfa injury was an early chlorosis from terbacil and diuron treatments, a contact effect. New growth was normal and no symptoms were visible at the time the plots were evaluated on June 17. Terbacil and simazine at the high rates were the most effective treatments. (Division of Plant, Soil and Water Science, University of Nevada-Reno, Reno, Nevada 89557).

Weed control in alfalfa for seed

			Weed control[1]		
Herbicide	Rate lb/A	Formulation	Seedling alfalfa	Hairy nightshade	Prickly lettuce
Terbacil	0.5	80WP	6.0	5.5	5.5
Terbacil	0.75	80WP	9.0	9.0	9.0
Simazine	1.0	80WP	8.2	6.5	8.5
Simazine	1.5	80WP	8.5	8.5	5.8
Diuron	1.0	80WP	3.8	4.0	3.8
Diuron	1.5	80WP	4.2	4.0	4.0
Napropamide	2.0	50WP	2.0	0	0
Napropamide	4.0	50WP	0	1.2	0
Napropamide	6.0	50WP	4.5	0	2.0
Napropamide	8.0	50WP	4.0	0	6.5
Napropamide	2.0	2EC	0	0	1.0
Napropamide	4.0	2EC	1.2	2.8	3.5
Napropamide	4.0	10G	0	0.8	1.2
EPTC	3.0	10G	0	0	0
Check			0	0	0

[1] 0 = no effect, 10 = all plants dead.

Fall applied herbicides in seed alfalfa. Cords, H.P. and L.M. Stockton. In alfalfa grown for seed, the thin stands allow excessive weed competition both from winter annuals and summer annuals. This experiment was designed to determine if both types of weeds could be controlled by dormant season application. Our usual recommendation is to apply these relatively early in the fall to take advantage of a majority of the winter precipitation for incorporation. Even so, the incorporation may be inadequate in many Nevada areas with average annual precipitation amounts of five inches or less. This experiment was designed to see if mechanical incorporation could increase effectiveness. The herbicides were applied in a cooperator's field at Lovelock, Nevada, November 19, 1976 in each of two adjacent locations. Applications were replicated four times at each location. Immediately after application, one of the two locations was cultivated twice with a rolling cultivator (Tandem Skew Treader). The winter was extremely dry with almost no precipitation until February. For this reason, almost no winter annual weeds germinated. The plots were irrigated in early May and evaluation for control of summer annual weeds and alfalfa seedlings was made June 16. The data are given in the table.

Incorporation decreased effectiveness of all herbicides except for trifluralin. Under these conditions, several herbicides persisted well enough to control kochia. Only the high rates of simazine, terbacil and metribuzin satisfactorily controlled alfalfa seedlings. (Division of Plant, Soil and Water Sciences, University of Nevada-Reno, Reno, Nevada 89557).

Fall applied herbicides in seed alfalfa

		Weed control ratings[1]			
		Incorporated		Unincorporated	
Herbicide	Rate lb/a	Kochia	Alfalfa seedlings	Kochia	Alfalfa seedlings
Terbacil	0.75	4.0	0	7.8	3.8
Terbacil	1.5	9.0	6.8	9.5	7.5
Simazine	1.0	7.2	1.0	8.5	1.5
Simazine	2.0	7.8	3.2	9.0	9.0
Pronamide	1.0	3.5	0	7.2	0
Pronamide	2.0	5.2	0	8.6	2.0
Buthidazole	0.5	-	-	9.0	4.2
Buthidazole	1.0	-	-	9.8	6.8
Buthidazole	2.0	-	-	9.4	6.2
Trifluralin	1.0	8.5	0	6.8	0
Trifluralin	2.0	7.7	0.8	6.8	0
Metribuzin	0.75	8.0	3.8	10	3.8
Metribuzin	1.5	7.0	5.8	10	9.1
Diuron	1.25	3.8	0	7.8	2.2
Diuron	2.5	3.8	1.5	7.8	1.8
Chlorpropham	2.0	1.5	0	-	-
Chlorpropham	4.0	2.2	0	-	-
Check	-	3.8	2.2	2.2	0

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

Summer and early fall application of herbicides for winter annual weed control. Cords, H.P. In northern and western Nevada, winter annual weeds often emerge prior to the last cutting of alfalfa. Consequently, herbicides whose activity is truly preemergence are generally ineffective. In an effort to overcome this difficulty, herbicides were applied at two locations after the second cutting in a three-cut area at our Main Station Field Laboratory (MSFL) at Reno and following the fourth (and last) cutting at our S-S Field Laboratory (S-S) at Wadsworth. Downy brome had emerged at time of treatment at Wadsworth but none of the broadleaf weeds had emerged. The field was irrigated approximately two weeks after treatment. Application dates were August 19 and October 1, 1976, respectively. Weed control evaluations were made May 12 and 13, 1977. Only one of the locations (MSFL No. 2) was harvested for yield determination, but samples were taken for weed separations at the S-S location as well as at MSFL No. 2. Yields and weed percentages are on the oven dry basis. Harvest was June 16, 1977. The data are shown in the table.

		Weed Control Ratings[1]						
		MSFL		Summer	Downy	Percent		Yield
	Rate	Flixweed		annuals	brome	weeds		T/A
	lb/A	Loc.	Loc.	Loc.		Loc.		Loc.
Herbicide	ai	1	2	1	S-S	2	S-S	2
FMC-25213	2.0	3.5	5.2	1.0	7.0	18	22	1.94
FMC-25213	3.0	2.0	2.2	1.5	9.5	12	5	2.11
FMC-25213	4.0	4.5	2.8	2.0	-	21	-	1.97
Simazine	1.0	9.5	8.8	5.0	2.2	6	15	1.91
Simazine	1.5	10	8.8	9.5	4.0	2	13	1.95
Terbacil	0.75	9.0	8.5	1.8	9.6	2	2	1.80
Metribuzin	0.75	0	0	1.5	9.4	27	7	1.79
Chlorpropham	2.0	1.8	0.8	0	6.8	17	14	1.87
Chlorpropham	4.0	0	0.5	0	6.2	17	13	2.19
Check	-	0	0	0	0	26	31	2.39

[1] 0 = no effect, 10 = all plants dead.

Metribuzin, terbacil and chlorpropham caused contact injury on sprayed foliage. New growth was normal in all cases. FMC-25213 failed to control broadleaf weeds at all locations. Metribuzin failed to persist long enough when applied in August to control winter annual weeds. Terbacil controlled the winter annuals at the MSFL locations but did not persist long enough to control summer annuals at MSFL No. 1. Simazine was more effective when applied in August than when applied in October, probably because of more thorough incorporation. It persisted long enough to control summer annuals at MSFL No. 1. (Division of Plant, Soil and Water Science, University of Nevada-Reno, Reno, Nevada 89557).

Fall applied herbicides in forage alfalfa. Cords, H.P. Several herbicides were applied November 24, 1976 to 1 year old alfalfa. Treatments were replicated 4 times in a randomized block design. The soil is classified as loam. The weeds, primarily prickly lettuce and flixweed, were emerged at the time of treatment. Weed control ratings were made May 12, 1977 and the first harvest was made June 21. Weed separations were made on a random grab sample at time of harvest. Yields and weed percentage are both reported on the basis of oven dry weight. Data are shown in the table.

Herbicide	Rate lb/A ai	Weed control rating[1]		Yield T/A	% Weeds at harvest
		Prickly lettuce	Flixweed		
Buthidazole	0.5	9.1	8.8	1.43	.4
Buthidazole	1.0	8.5	9.0	1.27	4
Buthidazole	2.0	10	10	1.28	0
Buthidazole	4.0	10	10	1.31	0
Terbacil	0.5	8.0	8.1	1.49	3
Terbacil	0.75	9.0	9.2	1.49	0
Terbacil	1.0	9.6	10	1.32	0
Metribuzin	0.5	10	9.4	1.50	0
Metribuzin	0.75	9.8	8.2	1.57	0.2
Simazine	1.0	7.5	6.2	1.58	11
Simazine	1.5	8.8	6.5	1.41	5
Check	-	0	0	1.75	40

[1] 0 = no control; 10 = all plants dead.

None of the treatments resulted in visible alfalfa injury. Despite an extremely dry winter, all herbicides appeared to be effective. Weeds in the simazine plots were not killed until after the alfalfa was irrigated in early March. The higher yield of the check plots was due to the weed content in the relatively thin alfalfa stand. (Division of Plant, Soil and Water Science, University of Nevada-Reno, Reno, Nevada 89557).

EPTC applied with alfalfa seed. Dawson, J.H. EPTC was applied in rows directly with alfalfa seed in four greenhouse experiments and four field experiments conducted during 1976-77. EPTC was applied as liquid and granular formulations. Included were several experimental controlled release granular formulations. Rates ranged from 0.6 to 14.4 kg/ha, and were based on the assumption that the treated area was a band 5 cm wide, to which the herbicide would spread from its original concentration within the seeded rows.

Alfalfa seed and EPTC were placed together in rows at depths of 6 to 18 mm in sandy loam or silt loam soil in which grass seed had previously been mixed. In the greenhouse and in spring and summer field experiments, the grass was barnyardgrass or foxtail millet. Under cooler field conditions of late summer and fall, Italian ryegrass replaced the warm-season species.

In three of the field experiments, the seed and herbicide were placed in the row together by hand in plots 1 m in length. For the fourth field experiment, clay granules of the same size and similar density as alfalfa seed were formulated to contain 10% EPTC. These were mixed with the alfalfa seed, and both were applied together with a tractor-mounted Planet Jr. seeder.

In all experiments, the activity of EPTC was similar from all formulations. No definite effects of the controlled release formulations were evident. In all experiments, a distinct band of grass control resulted from each application of EPTC. Control within a 5 cm band was usually 98 to 100%, but sometimes was as low as 86 to 91% at the lower rates. In the field, the width of the band of control was 5 to 9 cm.

At rates of 0.6 to 7.2 kg/ha, the stand of alfalfa was reduced in only one experiment. Typical symptoms of EPTC injury were often present, but were often less severe than those normally observed from incorporated applications of EPTC.

The tolerance of alfalfa to EPTC in these trials was phenomenal, considering that a quantity of herbicide to provide the prescribed rate in a 5 cm band was initially located in a 3 mm line directly with the seed. Thus the original rates of EPTC to which the seeds were exposed, and which they tolerated, were 17 times 0.6 to 7.2 kg/ha, or 10 to 120 kg/ha. Such applications were attempted only because we were comparing a commercial formulation of EPTC with experimental controlled release formulations, and reasoned that a controlled release carrier might delay exposure of the alfalfa until it had emerged and gained increased tolerance to the herbicide. We did not observe controlled release effects, but instead discovered unexpected tolerance of alfalfa to EPTC applied directly with the crop seed.

This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation by the USDA nor does it imply registration under FIFRA. (Agricultural Research Service, U.S. Department of Agriculture, Irrig. Agr. Res. and Ext. Center, Prosser WA 99350).

Evaluation of fall applied herbicides for weed control in dormant established alfalfa. Lee, G.A., M.E. Coleman-Harrell and G.A. Mundt. The study was initiated to evaluate fall applied herbicides for the control of undesirable weeds in established alfalfa. Plots were established at Bonners Ferry, Idaho on December 2, 1976. The weed infestation was predominately dandelion, bulbous bluegrass, shepherdspurse, common chickweed and meadow salsify. A lesser population of Kentucky bluegrass and Canada thistle was present in the study area.

Plots were 9 by 30 ft and replicated three times in a randomized complete block design. At the time of herbicide application, the air temperature was 33 F, soil temperature at 2 inches was 33 F, relative humidity was 40%, wind was calm and sky condition was overcast with high fog. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom and calibrated to deliver 40 gpa total volume. Weed control performance was obtained by biomass weight of the undesirable species in an area 3 by 10 ft. Alfalfa tonnage yields were determined by harvesting plants from a 3 by 10 ft area, drying forage in a forced-air oven for 48 hrs and calculating the yield on an acre basis.

In this study, 8 of the herbicide treatments resulted in 92.3% or better control of all weed species present. No treatment resulted in effective control of dandelion, meadow salsify or Canada thistle. Terbacil, simazine, pronamide, buthidazole and metribuzin provided excellent control of the broadleaf annual weeds present. Metribuzin at 1.0 lb/A, napropamide at 4.0 lb/A and pronamide at 1.0 lb/A resulted in the best control of bulbous bluegrass and Kentucky bluegrass compared to all other herbicide treatments.

All plots treated with herbicides produced higher alfalfa yields than the nontreated plots except those where R-24315 (50W) at 1.0 lb/A was applied. Lack of weed control with the low rate of R-24315 apparently allowed excessive weed competition to occur. Plots treated with buthidazole (5G) at .75 lb/A and buthidazole (50W) at .75 lb/A produced 4598 and 4602 pounds of forage per acre respectively, which was more than twice the yields produced in the nontreated check plots. Plots treated with R-24315 + napropamide at 2.0 + 4.0 lb/A, buthidazole (5G) at .5 and .75 lb/A, buthidazole (50W) at .5, .75 and 1.0 lb/A and metribuzin at .5 and 1.0 lb/A produced 54% or greater yields than the nontreated check plots. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843)

Influence of fall applied herbicide treatments on percentage weed control and alfalfa yields at Bonners Ferry, Idaho in 1977.

Treatment	Rate lb/A	Percentage weed control	Alfalfa	
			Yield lb/A	% Yield compared to check
Terbacil	.75	92.3	3193.8	140.6
Simazine	1.6	92.5	2980.4	131.2
Pronamide	1.0	93.6	2952.4	129.9
R-24315 (50W)	1.0	53.2	2217.3	97.6
R-24315 (50W)	2.0	75.9	2437.7	107.3
R-24315 (50W)	4.0	77.0	3317.5	146.0
R-24315 + Napropamide	1.0 + 2.0	43.0	2657.6	117.0
R-24315 + Napropamide	2.0 + 2.0	75.2	2801.9	123.3
R-24315 + Napropamide	1.0 + 4.0	59.4	3049.4	134.2
R-24315 + Napropamide	2.0 + 4.0	86.7	3518.9	154.9
Napropamide	2.0	57.2	2767.5	121.8
Napropamide	4.0	83.4	3274.3	144.1
Buthidazole (5G)	.5	81.5	4258.1	187.4
Buthidazole (5G)	.75	93.6	4598.4	202.4
Buthidazole (5G)	1.0	93.3	3393.3	149.3
Buthidazole (50W)	.5	83.0	3942.8	173.5
Buthidazole (50W)	.75	95.0	4602.5	202.6
Buthidazole (50W)	1.0	96.7	4348.3	191.4
Metribuzin	.5	69.9	3764.3	165.7
Metribuzin	1.0	97.1	3879.5	170.7
Methazole + pronamide	2.0 + 1.0	8.3	2859.0	125.8
Nontreated Check			2272.1	100.0

Evaluation of spring applied herbicides for weed control in dormant alfalfa. G.A. Lee, G.A. Mundt and W.S. Belles. Herbicide treatments were applied to dormant established alfalfa stands at the Animal Industries Farm, Moscow, Idaho on March 25, 1977. The purpose of the trial was to determine the effectiveness of spring applied herbicides for the control of annual weeds in established alfalfa. The alfalfa (cultivar - Ladak) stand was established in 1972 and was heavily infested with primarily winter annual weed species.

The most abundant species in the weed population were downy brome, shepherdspurse, Jacob's ladder, henbit, field pennycress, tansy mustard, and jagged chickweed. A lesser infestation of dandelion, mayweed, corn gromwell, common mallow, and purple mustard were present in the study site.

Plots were 9 by 30 ft and replicated three times in a randomized complete block design. Herbicide treatments were applied with a knapsack sprayer equipped with a three-nozzle boom in a total volume of 40 gpa water. At the time of herbicide application, the air temperature was 51 F, soil temperature was 49 F, relative humidity was 57%, wind at 2 to 5 mph, and sky condition was partly cloudy. Weed control performance and alfalfa yield data was obtained by harvesting biomass of weeds and alfalfa forage from a circular quadrat 2.5 ft in diameter. There were two random samples obtained from each replication. Visual evaluation of individual weed species control was obtained at time of harvest.

Because of drought conditions prevailing in all months during the course of the study except May, lack of moisture may have limited the activity of several herbicides. There were 7 herbicide treatments which resulted in 90.7% or better weed control based on biomass production. Oxyfluorfen caused severe chlorosis, leaf margin burning and death of broadleaf weed species within 10 days after application. The apparent lack of residual activity allowed late germinating weed species to reinfest the treated areas prior to harvest time resulting in unacceptable weed control. Metribuzin at 1.0 lb/A and terbacil at 1.0 lb/A provided 97.7 and 97.5% total weed control, respectively. The only species remaining in the plots was dandelion. Both the wettable powder and granular formulations of buthidazole at 1.0 lb/A and 3.0 lb/A resulted in 90.7% or better control of total weed population. Because of the deep root system of dandelion, it was unaffected by all buthidazole treatments. Propham at 3.0 lb/A gave excellent downy brome control but did not effectively control the broadleaf weeds present. The addition of dinoseb surfactant to propham increased the control of broadleaf weeds but not to a commercially acceptable level. Napropamide + metribuzin at 1.0 + .5 lb/A and 2.0 + .5 lb/A resulted in 87.8 and 82.7% total weed control, respectively. These combinations gave excellent downy brome control, but they were moderately effective in controlling the broadleaf portion of the weed population. R-24315 at all rates did not effectively control the total weed population as spring applied treatments.

The elimination of the competitive effect of weeds with herbicides resulted in an alfalfa yield response in many cases. Alfalfa yield increase of 53.8% or better was measured in plots where 17 of the 29 herbicide treatments were applied. Alfalfa yields were more than doubled in plots where oxyfluorfen + paraquat at .375 + .25 lb/A, propham + DNBP + W.A. at 3.0 lb/A + 3 pt + .5% and napropamide + metribuzin at 1.0 + .5 lb/A were applied. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Influence of spring applied herbicide treatments on percentage weed control and alfalfa yields in 1977 at Moscow, Idaho

Treatment	Rate lb/A	% Weed control	Alfalfa Yield lb/A	Alfalfa % Yield compared to check
Oxyfluorfen	.25	21.4	3093	117
Oxyfluorfen	.375	78.3	2725	103
Oxyfluorfen + W.A.	.375+.5%	69.0	2753	104
Oxyfluorfen	.5	58.6	2743	104
Oxyfluorfen + Pronamide	.375+.5	69.9	2977	113
Oxyfluorfen + Paraquat	.375+.25	95.0	5701	215
Metribuzin	.5	87.7	3517	133
Metribuzin	1.0	97.7	4177	158
Terbacil	.5	83.6	3513	133
Terbacil	1.0	97.5	4733	179
Buthidazole (50W)	.5	76.5	4111	156
Buthidazole (50W)	1.0	98.7	4910	186
Buthidazole (50W)	3.0	99.6	4339	164
Buthidazole (5G)	.5	85.5	3783	143
Buthidazole (5G)	1.0	90.7	2783	105
Buthidazole (5G)	3.0	97.5	3187	121
Propham*	2.0	41.0	3340	126
Propham*	3.0	36.7	2253	85
Propham*+Paraquat+W.A.	2.0+.25+.5%	22.9	2693	102
Propham*+Paraquat+W.A.	3.0+.25+.5%	49.8	4467	169
Propham*+Dinoseb+W.A.	2.0+3pt+.5%	59.0	4060	154
Propham*+Dinoseb+W.A.	3.0+3pt+.5%	70.0	5420	205
R-24315 (50W)	1.0	43.9	3408	129
R-24315 (50W)	2.0	38.4	3641	138
R-24315 (50W)	4.0	53.2	3253	123
Napropamide+Metribuzin	1.0+.25	22.3	5073	102
Napropamide+Metribuzin	1.0+.5	87.8	7140	270
Napropamide+Metribuzin	2.0+.25	42.1	3052	115
Napropamide+Metribuzin	2.0+.5	82.7	6300	239
Nontreated check	--		2640	100

*PCMC included as an extender.

<u>Wild oat control in dryland barley.</u> Alley, H.P., G.L. Costel and N.E. Humburg. A series of plots were established on a heavily wild oat infested field to compare triallate as a fall versus spring treatment, postemergence complementary treatments applied over the fall and spring-applied triallate-treated plots, and postemergence treatments only.

The selected area, which had been in spring barley, was plowed and prepared for herbicide application. Plots were 30 ft by 130 ft and randomized with three replications. The fall application of triallate was applied October 25, 1976 in a total volume of 17.5 gpa water and incorporated 2.5 to 3 inches deep with a Triple K unit. The spring application of triallate was applied April 22, 1977 and incorporated the same as the fall treatment. Barley (variety Steptoe) was seeded the same day. An extended dry period during the early part of the growing season was not favorable for herbicide activity.

Barban and diclofop were applied May 12, 1977 when the majority of the wild oat were in the 2-leaf stage. Difenzoquat was applied May 26, 1977 when the wild oat were in the 3 to 5-leaf stage of growth.

Quadrat counts were taken June 15, 1977 to evaluate barley stand and wild oat control. Yields of barley were not obtained as the plot area received hail.

The soil was classified as a silt loam (26.2% sand, 52.0% silt, 21.8% clay with 4.2% organic matter and a 7.4 pH).

Data indicate that there were no differences in percentage wild oat control obtained with triallate applied either as a fall or spring treatment. The most effective treatment was triallate applied and incorporated as a fall or spring treatment and diclofop applied as a postemergence treatment over the triallate treated plots. This complementary preplant-postemergence combination gave 93% and 96% control, respectively. The preplant-postemergence treatments of triallate plus barban or difenzoquat were no more effective than triallate alone. Diclofop, as a post treatment alone, was the most effective of the postemergence treatments and was comparable to triallate as a preplant treatment or triallate preplant plus the postemergence application of difenzoquat or barban. As has been indicated in previous studies, complementary treatments are more predictable and effective than either the preplant or postemergence treatments alone. (Wyoming Agric. Exp. Sta., Laramie, Wyoming, SR 838).

Wild oat control in dryland barley

Herbicide and Rate lb/A			Barley	Wild oat
Preplant		Post3/	% Stand Reduction	% control
		Fall treatment1/		
Triallate	1.25		0	70
Triallate	1.25	Diclofop 0.75	0	96
Triallate	1.25	Difenzoquat 1.0	0	75
Triallate	1.25	Barban 0.375	6	73
		Spring treatment2/		
Triallate	1.0		0	74
Triallate	1.0	Diclofop 0.75	0	93
Triallate	1.0	Difenzoquat 1.0	1	67
Triallate	1.0	Barban 0.375	0	71
		Postemergence only3/		
		Diclofop 0.75	2	64
		Difenzoquat 1.0	0	28
		Barban 0.375	0	16

1/ Triallate applied and incorporated October 10, 1976.

2/ Triallate applied and incorporated April 22, 1977.

3/ Post treatments barban and diclofop applied May 2, 1977 and difenzoquat May 22, 1977.

Wild oat control in irrigated barley. Alley, H.P., T.K. Schwartz and N.E. Humburg. Preemergence, postemergence and preemergence-postemergence demonstration plots were establishedon a cooperator's field to compare the three treatments for wild oat control in barley under flood-irrigated conditions.

The soil was classified as a loam (40.8% sand, 42.0% silt, 17.2% clay with 1.1% organic matter and a 7.6 pH).

The land was prepared and the barley (variety Klages) was seeded April 11, 1977. Triallate was applied the following day and incorporated with a spike-tooth harrow. Postemergence treatments, diclofop and difenzoquat, were applied May 11, 1977 when the majority of the wild oat were in the 3 to 5-leaf stage of growth. Barban was applied on two separate dates to the same plots. The first application was made on May 3, 1977 when the wild oat were in the 2-leaf stage and 8 days later on May 11 to newly emerged wild oat.

Percentage wild oat control and barley stand were determined by counting the wild oat and barley in ten sq-ft quadrats placed randomly throughout the treated areas.

Triallate applied and incorporated preemergence gave 87% control of the wild oat population, while diclofop, difenzoquat and barban applied postemergence over the triallate plots gave 93%, 80% and 98% control, respectively. No postemergence treatments resulted in satisfactory control. Diclofop and barban were comparable, giving 74% and 69% control of wild oat, respectively. The percentage control obtained with the sequential treatments of barban could have been higher with more uniform coverage. The utilization of 5 gpa spray nozzles for applying barban resulted in plugged nozzles and much difficulty in keeping the system operable. Poor coverage and skips were evident at harvest time.

All treated plots yielded higher than the untreated plots, ranging from an increase of 40.3 bu/A from the triallate-treated plots to a low of 7.6 bu/A increase where barban was used only as a postemergence treatment. (Wyoming Agric. Exp. Sta., Laramie, Wyoming, SR 839).

Wild oat control in irrigated barley

Herbicide and Rate lb/A		Wild oat	Barley 3/		
Preemergence 1/	Post 2/	% Control	Height inches	% Stand reduction	Yield bu/A
Triallate 1.25		87	25.9	7	98.6
Triallate 1.25	Diclofop 0.75	93	20.7	11	68.9
Triallate 1.25	Difenzoquat 1.0	80	24.4	4	84.8
Triallate 1.25	Barban 0.375	98	23.4	0	92.3
	Diclofop 0.75	74	24.9	3	72.9
	Difenzoquat 1.0	18	23.2	0	84.6
	Barban 0.375	69	20.8	0	65.9
Check			23.0	0	58.3

1/ Triallate applied and incorporated April 12, 1977.

2/ Post treatments diclofop and difenzoquat applied May 11, 1977 and barban May 3 and May 11, 1977.

3/ Harvested July 21, 1977.

Annual broadleaf weed control in irrigated barley. Humburg, N.E. and H.P. Alley. The herbicides and/or combinations were applied to spring barley (variety Steptoe) at the Torrington Agricultural Substation for evaluation of annual broadleaf weed control and their effect upon the barley. Barley was in the 2-leaf stage with 4 to 6-inch leaf height, kochia was in the 4 to 6-leaf stage and 1-inch tall, redroot pigweed was in the 2-leaf stage and 0.5 to 1-inch tall, and common lambsquarters in the 2 to 4-leaf stage and 1-inch tall at time of treatment. Herbicide applications were made with a knapsack sprayer equipped with a 3-nozzle boom calibrated to deliver 40 gpa water carrier. Plots were one sq rd in size, randomized with three replications. The soil was classified as a sandy loam (59.2% sand, 31.4% silt, 9.4% clay and 1.9% organic matter with a pH of 5.9).

Two treatments, dicamba + 2,4-DE at 0.125 + 0.375 lb/A and Vel 4092 + 2,4-DA at 0.125 + 0.375 lb/A, were the only treatments giving 100% control of kochia and common lambsquarters with barley yields greater than the untreated check plots. Four other treatments gave 97% or greater control of the two annual broadleaf weeds mentioned above. Buthidazole was the only treatment causing yield reductions lower than the check. The results obtained from this series of research plots indicate that buthidazole and bifenox do not appear to have a potential for annual weed control in irrigated barley. (Wyoming Agric. Exp. Sta., Laramie, Wyoming, SR 840).

Annual broadleaf weed control in barley

Herbicide 1/	Rate lb/A	Percent control 2/ KO	LQ	Barley % Stand	Injury %	Yield bu/A
Vel 4092 (3ec)	0.125	83	98	100	27	15.6
Dicamba	0.125	87	63	100	3	20.0
Vel 4092(3ec)+2,4-DA	0.125+0.375	100	100	100	37	22.1
Vel 4092(3ed)+2,4-DE	0.125+0.375	99	100	100	40	17.5
Dicamba +2,4-DA	0.125+0.375	97	100	100	0	21.2
Dicamba + 2,4-DE	0.125+0.375	100	100	100	23	20.5
Vel 4092 + MCPA	0.125+0.375	97	100	100	23	18.5
Dicamba + MCPA	0.125+0.375	87	100	93	13	23.4
Vel 4092 + Bromoxynil	0.062+0.375	97	100	100	7	26.3
Dicamba + Bromoxynil	0.062+0.375	82	97	100	10	17.8
Buthidazole (50W)	0.125	37	7	100	0	17.3
Buthidazole (50W)	0.25	80	100	92	17	13.8
Buthidazole (50W)	0.5	0	95	17	43	No harvest
Bifenox	0.25	13	37	100	0	19.6
Bifenox	0.5	50	50	100	0	23.5
Bifenox + MCPA	0.25+0.25	67	88	100	0	25.6
Bifenox + MCPA	0.5 + 0.5	73	97	100	0	24.0
Bifenox + 2,4-DA	0.25+0.25	57	63	100	0	19.0
Bifenox + 2,4-DA	0.5 + 0.5	82	100	100	3	23.0
Check	-----------	--	---	---	--	16.1

1/ Treated May 31, 1977.

2/ Visual evaluations made July 8, 1977.

KO = kochia, LQ = common lambsquarters.

Evaluation of herbicides for zero-tillage spring grain. Schirman, Roland. The use of summer fallow-winter wheat production systems in Pacific Northwest regions receiving annual precipitation of 35 to 45 cm has often led to situations of excessive soil erosion. Increased use of spring cereals in the rotation could reduce the erosion potential, but has received limited grower acceptance because yield reductions generally occur. Zero tillage trials indicate that possible increases in yield potential of spring crops can be gained through improved moisture storage during the winter months and by increased efficiency of the spring planting operation. Field trials were initiated to evaluate weed control systems for zero-til spring wheat and barley in this intermediate rainfall zone.

Preplant herbicides were applied to undisturbed spring barley (Lancaster site) or spring wheat (Sunset site) stubble on March 30, 1977. Plots were direct seeded April 1 with 'Fielder' spring wheat or 'Steptoe' spring barley. Postemergence herbicides were applied May 12 when the crops and wild oat (Sunset location) were in the 4-leaf stage. A visual estimate of crop injury and wild oat control was made, and a yield sample was taken at maturity with a small plot combine. Grain yields and percentage of wild oat control are given in Tables 1 and 2 for the Sunset and Lancaster locations, respectively.

No precipitation occurred for 5 weeks after planting, and this undoubtedly reduced the expected post-plant weed emergence. At the Sunset location, a dense stand of wild oat emerged with minimal broadleaf weeds. No significant post-plant weed growth developed at the Lancaster location.

Crop injury was observed at the higher rate of oxyfluorfen, especially in barley. Uneven distribution of the previous crop residue resulted in highly variable stand within the plot area.

Use of glyphosate or paraquat pre-plant satisfactorily controlled volunteer crop and winter annual weeds. Acceptable wild oat control was attained with diclofop or difenzoquat while buthidazole and oxyfluorfen did not give acceptable control as applied. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Washington State University, Pullman, WA 99164).

Table 1 1977 grain yields for zero-tillage spring wheat and barley at Sunset, Washington

Herbicide treatment	Rate kg ha^{-1}	% wild oat control	Grain yield, kg ha^{-1}	
			Wheat	Barley
Glyphosate (PP)[1/]	0.56			
Difenzoquat	0.84+			
Barban	0.28	81	1305 ab[2/]	1641 bc
Paraquat (PP)	0.74			
Diclofop	1.12+			
Barban	0.28	84	1903 ab	2119 b
Glyphosate	0.42+			
Metribuzin (PP)	0.56			
Difenzoquat	1.12	82	1439 ab	3181 a
Glyphosate (PP)	0.56			
Bromoxynil	0.42	2	478 ab	1332 bc
Glyphosate (PP)	0.56			
Bromoxynil	0.42+			
Diclofop	1.68	91	2092 a	1520 bc
Glyphosate (PP)	0.56			
Bromoxynil	0.42+			
Difenzoquat	1.12	82	1547 ab	2152 b
Glyphosate	0.42+			
Oxyfluorfen (PP)	0.42	21	1043 ab	706 c
Glyphosate	0.42+			
Oxyfluorfen (PP)	0.84	44	451 b	639 c
Glyphosate (PP)	0.56			
Buthidazole	0.21	20	827 ab	626 c
Glyphosate (PP)	0.56			
Buthidazole	0.42	52	1332 ab	1090 bc

[1/] pp = preplant, all other herbicides applied postemergent 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.

Table 2 1977 grain yields for zero-tillage spring wheat and barley at Lancaster, Washington

Herbicide treatment	Rate kg ha^{-1}	Grain yields, kg ha^{-1}	
		Wheat	Barley
Glyphosate (PP)[1]	0.56	1587 a[2]	2558 a
Paraquat (PP)	0.74	1778 a	2778 a
Glyphosate Metribuzin (PP)	0.43+ 0.56	1755 a	2775 a
Glyphosate (PP) Bromoxynil	0.56 0.42	2074 a	2849 a
Glyphosate (PP) Bromoxynil Diclofop	0.56 0.42+ 1.68	2195 a	2261 a
Glyphosate (PP) Bromoxynil Difenzoquat	0.56 0.42+ 1.12	1808 a	2567 a
Glyphosate Oxyfluorfen (PP)	0.42+ 0.42	1961 a	2729 a
Glyphosate Oxyfluorfen (PP)	0.42+ 0.84	1819 a	2199 a
Glyphosate (PP) Buthidazole	0.56 0.21	1815 a	2551 a
Glyphosate (PP) Buthidazole	0.56 0.42	1794 a	3194 a

[1] pp = preplant, all other herbicides applied post-emergent 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.

Bindweed control in beans. Bendixen, W.E. and A.H. Lange. The dried bean acreage in California is considerable. Much of this acreage lies along the California coast in relatively heavy soils where perennial bindweed grows abundantly and is often difficult to impossible to control selectively by tillage or chemical treatment. Shielded sprays of MCPA have been used successfully in recent years.

In last year's work, bindweed was sprayed with shielded sprays on July 27, 1976 in young light Red Kidney beans seeded June 4, 1976. The bindweed was 12 inches high in early bloom. The row spacing was 28 inches by 20 inches by 20 inches by 20 inches. The plots were 88 inches by 100 feet and replicated four times.

The data from the trial showed commercial control from MCPA at 2 lb/A and glyphosate at 4 lb/A. Somewhat less than apparent satisfactory control was obtained with DPX-1108 in the earlier ratings but much better control in the later evaluations. Yields in all treatments were as good or better than the untreated checks.

The effect of perennial bindweed control on the yield of beans

		B-Weed control			Bean phyto.		lb/A
Herbicides	lb/A	8/6	8/12	9/22	8/6	8/12	Yield 10/21
MCPA	2	9.4	9.8	9.6	0.0	0.2	1128 ab
Glyphosate	4	8.1	9.0	9.6	0.4	0.4	1180 b
DPX-1108	4	4.5	5.2	8.0	0.0	0.2	1122 ab
Check	-	0.0	0.0	0.0	0.0	0.0	1055 a

Planted 6/4/76; applied 7/27/76; harvested 10/21/76.
Letters do not significantly differ at the 10% level of significance.

Evaluation of fall applied herbicides for weed control in Kentucky bluegrass seed fields. Lee, G.A., W.S. Belles and G.A. Mundt. A study was conducted near Tensed, Idaho to evaluate potential herbicides for weed control in Kentucky bluegrass (cultivar: Baron) seed production fields. Herbicide applications were made November 23, 1976 after the field had been burned to remove the excess growth. At the time of herbicide applications, the air temperature was 34 F, soil temperature was 38 F, relative humidity was 73%, wind was calm, sky condition was light overcast and the soil surface was dry to a depth of 1 inch. Each plot was 9 by 30 sq ft. Herbicide treatments were replicated three times in a randomized complete block design. Herbicide applications were made with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa total volume. The weed population at the time of herbicide application consisted of mayweed, henbit, downy brome, field pennycress and shepherdspurse. Additional weed species present at the time of evaluation on June 7, 1977 were common lambsquarters, fiddleneck, prickly lettuce, and wild oat.

Drought conditions coupled with high temperatures during stubble burning suppressed seed production initials in the Kentucky bluegrass plants. The actual seed production suppression resulting from herbicidal phytotoxicity was difficult to evaluate. Kentucky bluegrass vigor reduction and seed production suppression is based upon the combined influence of environmental factors and herbicidal affect (accompanying table). Terbacil at 1.5 lb/A resulted in complete elimination of the Kentucky bluegrass crop. Areas treated with ethofumesate at 3.0 and 4.0 lb/A had substantial reduction of plant vigor as well as seed production. Kentucky bluegrass plants treated with diclofop at 1.0 and 1.5 lb/A produced 10 to 15% sterile panicles. Dowco 290 and triclopyr appeared to have the least adverse influence on the seed crop.

Terbacil at all rates provided excellent control of all weed species present. Ethofumesate at 4.0 lb/A and diclofop at 1.5 and

2.0 lb/A resulted in 90% control of downy brome. Ethofumesate at 3.0 and 4.0 lb/A resulted in severe malformation and suppression of henbit, but only the high rate of application provided adequate control of field pennycress and shepherdspurse. Dowco 290 and triclopyr gave excellent control of the broadleafed weed spectrum, but did not control either downy brome or wild oat. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Effect of fall-applied herbicides on Kentucky bluegrass vigor and percent weed control

		Bluegrass		Percent control							
Treatment	Rate lb/A	V.R.[1]	Seed prod. sup.[2]	Mustard[3]	May weed	Fiddle-neck	Henbit	Lambs-quarters	Prickly lettuce	Downy brome	Wild oat
Ethofumesate	2.0	15	8	15	10	0	70	0	0	45	0
Ethofumesate	3.0	15	88	15	15	0	0*	0	0	80	0
Ethofumesate	4.0	50	90	0	90	0	0*	0	0	90	0
Diclofop	1.0	35	20	0	0	0	0	0	0	58	0
Diclofop	1.5	10	35	0	0	0	0	0	0	90	0
Diclofop	2.0	35	48	0	0	0	0	0	0	90	0
Dowco 290	.25gal/A	20	0	100	98	99	99+	100	100	0	0
Dowco 290	.5 gal/A	20	10	100	100	100	100	98	100	0	0
Triclopyr	.25gal/A	20	10	100	100	93	100	100	100	0	0
Triclopyr	.5 gal/A	25	15	100	100	100	98	94	100	0	0
Terbacil	.5	10	0	100	100	100	100	100	100	100	100
Terbacil	1.0	15	10	100	100	100	100	100	100	100	100
Terbacil	1.5	100	100	100	100	100	100	100	100	100	100

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[1] V.R. = vigor reduction of the Kentucky bluegrass plants compared to plants in the nontreated check plots.

[2] Seed Prod. Sup. = seed production suppression estimations based on number of panicles present in herbicide treated plots compared to the nontreated check plots.

[3] Field pennycress and shepherdspurse.

Fall applied herbicides for weed control in established Kentucky bluegrass for seed production. Lee, G.A., W.S. Belles, G.A. Mundt, and O.K. Baysinger. A screening trial was established November 12, 1976 near Worley, Idaho to determine the potential of several herbicides for weed control in established Kentucky bluegrass (cultivar Glade) grown for seed production. At the time of herbicide applications, the air temperature was 35 F, soil temperature 40 F, relative humidity was 60%, sky condition was clear and the wind was 3 to 5 mph. The soil surface was dry to 1 inch and the subsurface moisture was intermediate. The herbicide treatments were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa total volume. Each plot was 9 by 30 ft. The herbicide treatments were replicated three times in a randomized complete block design.

At the time the trial was initiated, windgrass and wild oat were in the 1 to 2 leaf stage of growth. At the time of herbicide performance evaluation on June 6, 1977, shepherdspurse, field pennycress, common lambsquarters, prickly lettuce, pineappleweed, fiddleneck and fireweed were present in the study area.

Windgrass is a major concern to Kentucky bluegrass seed producers because of the difficulty of separating weed seed which results in reduced crop quality. Efforts are being made to develop more efficient control measures for the total weed spectrum commonly found in grass seed production fields.

All herbicide treatments gave excellent control of windgrass except Dowco 290 and triclopyr (attached table). Diclofop at 2.0 lb/A and terbacil at 1.0 and 1.5 lb/A resulted in 83% or better control of wild oat. The wild oat plants remaining in areas treated with ethofumesate at all rates were chlorotic and stunted slightly. Triclopyr at 0.25 and 0.5 gal/A, Dowco 290 at 0.5 gal/A and terbacil at all rates gave 90% or better control of the broadleaf and weed species present. Triclopyr and Dowco 290 did not, however, control windgrass or wild oat. Terbacil provided the best control of the total weed population without visual phytotoxicity to the Kentucky bluegrass crop. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Fall applied herbicides for weed control in established
Kentucky bluegrass for seed production

		Bluegrass	Percent Control				
Treatment	Rate lb/A	vigor reduction	Wind-grass	Mustards1/	Common lambsQ.	Wild oat	Others2/
Ethofumesate	2.0	0	100	77	60	7	13
Ethofumesate	3.0	0	100	52	55	20	13
Ethofumesate	4.0	8.3	100	88	83	13	43
Diclofop	1.0	1.0	100	0	0	37	0
Diclofop	1.5	0	100	0	0	51	0
Diclofop	2.0	0	100	0	0	87	0
Dowco 290	.25 gal/A	0	0	90	85	0	100
Dowco 290	.5 gal/A	0	0	97	93	0	100
Triclopyr	.25 gal/A	0	0	99	90	0	100
Triclopyr	.5 gal/A	0	0	94	95	0	100
Terbacil	.5	0	98	100	100	73	100
Terbacil	1.0	0	100	100	100	87	100
Terbacil	1.5	0	100	100	100	83	100

1/ Shepherdspurse and field pennycress.

2/ Prickly lettuce, pineappleweed, fiddleneck and fireweed.

Evaluation of herbicides applied through a center-pivot sprinkler. Humburg, N.E. and H.P. Alley. The site of the 1977 study was a 180-acre center pivot system on loamy sand soil (77.4% sand, 19.4% silt, 3.2% clay with 1.2% organic matter and a pH of 7.0). Corn was planted May 16, 1977 on 30-inch row spacing when soil moisture conditions were optimum.

Herbicide treatments were applied on six-acre plots. Herbicides were injected into the mainline with a single-piston pump located at the well head in the center of the circle. The sprinkler applied 0.45 inch of water at the rate of 5.6 acres per hour. Preemergence applications were made May 17 to 19 on dry surface soil. Air temperature and relative humidity ranged from 55 to 69 F and 33 to 93%, respectively. Postemergence application of alachlor was made on June 15 when corn was in the 4-leaf stage. Air temperature at this time was 82 F and relative humidity was 37%.

Weed populations on June 15 for the untreated check plots were as follows: field sandbur 3.8 and redroot pigweed 1.9 plants per linear foot of band 3 inches on either side of the corn row. Volunteer barley averaged 3.1 plants per linear foot. Other weed species present were skeletonweed, wild buckwheat, green foxtail and wild oat. The corn stand averaged 1.32 plants per foot of row or 23,000 plants/A; test plots ranged from 89% to 100% of the check plots.

Preemergence treatments where alachlor was applied at 2 lb/A in combinations with cyanazine were designed for split application (pre-plus postemergence treatments)of alachlor. The postemergence application of alachlor through the sprinkler system on June 15 was made when alachlor applied preemergence was anticipated to be no longer effective in controlling field sandbur. The most effective split application was alachlor + cyanazine preemergence at 3.0 + 1.0 lb/A with alachlor postemergence at 1.0 lb ai/A. Alachlor + cyanazine preemergence at 2.0 + 1.0 lb/A with alachlor postemergence at 2.0 lb ai/A provided only moderate control of early and late germinating sandbur. In this test, the 2.0 lb/A rate of alachlor applied as a preemergence treatment was inadequate.

EPTC + R-25788 + cyanazine and butylate + R-25788 + cyanazine gave good weed control early in the season but mid-season control was poor; split applications of EPTC + R-25788 or butylate + R-25788 might extend the period of effectiveness for these herbicides.

Outstanding preemergence treatments were alachlor + atrazine combinations and alachlor at 4 lb/A. Metolachlor, at rates used in this study, was less effective than other grass herbicides in controlling field sandbur throughout the season.

Forage yields were good under all treatments. Yield differences can be attributed partly to sampling site variation resulting from hilly terrain. (Wyoming Agric. Exp. Sta., Laramie, Wyoming, SR 852).

Weed control and forage yield from herbicides applied through center-pivot sprinkler

Herbicide(s) [1]	Rate lb/A	Corn stand % [2]	Percent control SB	VB	PW	Forage yield T/A [3]	Mid-season obs. sandbur control [4]
Alachlor	3.0	98	95	38	98	17.8	Moderate
Alachlor	4.0	100	70	35	100	21.7	Excellent
Alachlor + Atrazine	3.0 + 1.0	98	100	78	99	22.4	Excellent
Alachlor + Atrazine	2.5 + 1.0	100	100	97	100	26.0	Excellent
EPTC+R-25788+Cyanazine	3.0 + 1.0	95	100	95	100	26.0	Poor: late germ. Much late pigweed.
Butylate + R-25788 + Cyanazine	3.0 + 1.0	98	100	80	100	24.4	Moderate; late pigeweed.
Metolachlor + Atrazine	1.25+1.0	100	97	70	100	22.8	Moderate; early germ.
Cyanazine + Atrazine (Shell)	1.0 + 1.0	89	90	90	100	24.0	Poor: late germ.
Alachlor + Cyanazine	2.0 + 1.0	94	61	60	93	23.7	Poor: Early and late germination
Alachlor + Cyanazine + Alachlor (Post)	2.0 + 1.0 + 2.0	--	--	--	--	25.9	Moderate; early germ.
Alachlor + Cyanazine + Alachlor (Post)	3.0 + 1.0 + 1.0	--	--	--	--	24.6	Excellent
No treatment	---------	100	0	0	0	21.6	100% ground cover sandbur 2 to 2.5 ft height.

[1] Preemergence treatments May 17 to 19, 1977. Postemergence June 15, 1977.

[2] Corn stand = 10 sites per treatment. SB = field sandbur, VB = volunteer barley, PW = redroot pigweed.

[3] Forage yields August 24, 1977.

[4] Observations August 2, 1977.

Evaluation of preplant incorporated herbicides for weed control in corn. Humburg, N.E. and H.P. Alley. Plots were established at the Torrington Agricultural Substation May 5, 1977 to compare the relative effectiveness of preplant incorporated herbicides under furrow irrigation. All herbicides were applied full-coverage, incorporated to a soil depth of 1.5 inches with a flex-tine harrow and the corn (Funk's G-4288) planted the same day. Plots were 1 sq rd in size, randomized with three replications. The soil was a sandy loam (78.4% sand, 17.6% silt, 4.0% clay, with 1.2% organic matter and a pH of 7.2).

The weed species and density per linear ft, 2.5 inches on either side of the untreated corn row, were redroot pigweed 0.2, common lambsquarters 1.1, black nightshade 3.3 and green foxtail 1.1. Weed density and corn stand counts were recorded June 3, 1977, 28 days following herbicide application.

Cyanazine (4L) + butylate + R-25788 at 0.75 + 4.0 lb/A was the most effective treatment resulting in 100% control of all weed species recorded except black nightshade where control was 96%. Metolachlor + atrazine and alachlor + atrazine were as effective on the broadleaf species but exhibited weakness toward green foxtail. The stand of corn was not severely reduced by any treatment; however, there was stunting and severe injury induced by metolachlor alone and in combination with atrazine. Green foxtail appeared to be the most difficult weed species to control. (Wyoming Agric. Exp. Sta., Laramie, SR 850).

Weed control and corn stand resulting from preplant incorporated herbicides

	Rate	Percentage control[2]				Corn	
Herbicide [1]	lb/A	PW	LQ	NS	SET	% Stand	Observations
Cyanazine (4L) + Butylate + R-25788	0.75 + 4.0	100	100	96	100	100	Carbamate injury
Metolachlor (8E)	1.5	67	94	79	60	93	Stunted
Metolachlor (8E)	2.0	100	67	67	93	97	Stunted
Metolachlor (8E) + Atrazine(4L)	1.25 + 1.0	100	100	98	83	100	Carbamate injury symptoms
Metolachlor (8E) + Atrazine(4L)	1.25 + 2.0	100	100	97	60	100	Severe injury
*Metolachlor + Atrazine (4.5L)	2.25	100	100	97	45	100	Moderate injury
*Metolachlor + Atrazine (4.5L)	2.67	100	89	99	67	97	Moderate injury
Metolachlor(8E) + Cyanazine(4L)	1.25 + 1.25	67	100	92	67	99	
Metolachlor(8E) + Cyanazine(4L)	1.5 + 1.5	100	77	100	60	93	
*Alachlor + Atrazine	3.5 qt	100	69	80	67	100	Carbamate injury symptoms
*Alachlor + Atrazine	4.0 qt	100	89	97	100	87	Stunted and chlorotic
Alachlor + Atrazine (4L)	2.21 + 1.33	67	95	97	60	100	
Alachlor + Atrazine (4L)	2.5 + 1.5	100	100	100	57	100	Stunted and chlorotic
Alachlor + Atrazine (4L)	2.0 + 1.0	67	100	97	67	100	Severe carbamate symptoms
Propachlor (65W)	4.0	100	100	90	97	97	Chlorotic
Propachlor (4Fl)	4.0	100	74	84	57	97	Chlorotic
Alachlor	3.0	100	94	96	100	100	Carbamate symptoms

[1] Applied and incorporated May 5, 1977.

[2] PW = redroot pigweed, LQ = common lambsquarters, NS = black nightshade, SET = green foxtail

* Pre-mix.

Postemergence weed control in field corn. Humburg, N.E. and H.P. Alley. Plots were established at the Torrington Agricultural Substation to compare the effectiveness of postemergence herbicides, applied at two separate dates, under furrow irrigation. The corn (Funk's G-4288) was planted May 5, 1977 and the early postemergence treatment was applied when the corn was in the spike stage of growth. The late treatment was applied when the corn was in the 6-leaf stage and the weeds were 1 to 6-inches tall. All herbicides were applied full coverage with a 3-nozzle knapsack spray unit in a total volume of 40 gpa solution.

The results from this set of treatments indicated consistent weed control and safety to the corn were obtained with early postemergence treatments.

All early postemergence treatments gave 100% control of broadleaf weeds but were weak on green foxtail. The pre-mix combination of alachlor + atrazine (2.5 + 1.5 lb/gal) appeared to be the most effective treatment, followed closely by pendimethalin + cyanazine, and alachlor + atrazine.

Six treatments applied at the late stage of growth gave 100% control of broadleaf weeds but were ineffective for control of green foxtail. Green foxtail appeared to be the most difficult weed problem encountered with postemergence treatments in this evaluation series. (Wyoming Agri. Exp. Sta., Laramie, Wyoming, SR 851).

Weed control and corn stand resulting from postemergence treatments

Herbicide	Rate lb/A	Percentage control[2]				Corn stand
		PW	LQ	NS	SET	
	Early Post[1]					
Pendimethalin	1.5	100	100	100	22	91
Pendimethalin + Crop oil + X-77	1.5	100	100	100	44	93
Pendimethalin + Atrazine (4L)	1.0+1.0	100	100	100	60	92
Pendimethalin + Cyanazine (4L)	1.0+1.5	100	100	100	84	91
*Alachlor + Atrazine (2.5 + 1.5 lb/gal)	3.5 qt	100	100	100	92	91
*Alachlor + Atrazine (2.5 + 1.5 lb/gal)	4.0 qt	100	100	100	84	87
Alachlor + Atrazine (4L)	2.21+1.33	100	90	100	76	87
Alachlor + Atrazine (4L)	2.5+1.5	100	100	100	88	87
	Late Post[3]					
Pendimethalin	1.5	57	87	100	56	80
Pendimethalin + crop oil	1.5	86	93	100	56	90
Pendimethalin + Atrazine (4L)	1.0+1.0	100	100	100	56	80
Pendimethalin + cyanazine (4L)	1.0+1.5	100	100	100	54	87
Metolachlor (8E)	1.5	50	67	100	94	70
Metolachlor (8E)	2.0	100	67	100	62	80
Metolachlor + Atrazine (4L)	1.25+1.0	100	100	100	20	73
Metolachlor + Atrazine (4L)	1.5+1.2	100	100	100	64	77
*Metolachlor + Atrazine (4.5Fl)	2.25	100	100	100	52	93
*Metolachlor + Atrazine (4.5Fl)	2.7	100	93	100	76	73
Metolachlor (8E) + Cyanazine (4L)	1.25+1.25	100	100	100	44	83
Metolachlor (8E) + Cyanazine (4L)	1.5+1.5	100	100	100	36	90
Check	----------	---	---	---	--	100

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[1] Early post applied at spike stage of corn and weeds emerged.

[2] PW = redroot pigweed, LQ = common lambsquarters, NS = black nightshade, SET = green foxtail.

[3] Late post applied when corn in 6-leaf stage with 8 to 10 inches growth.

* Pre-mix.

Rocap incorporation of herbicides for nightshade control in cotton. Kempen, H. and J. Woods. A trial plot was established on April 6, 1977 in Kern Co., Ca. to evaluate herbicides for American black nightshade control in cotton. Incorporation was done with two gangs of rolling cultivators immediately before planting and immediately after knocking the preirrigated beds down to moisture. The cotton seed was planted at a 1 1/2 inch depth, the same depth as the incorporation of the 12 inch wide herbicide band. These four operations (knockdown of beds, herbicide application, herbicide incorporation, and planting) can all be done in one pass through the field and is collectively referred to as the ROCAP (Rolling Cultivator at Planting) technique. Plots in this trial were 15 feet long and were on a Traver fine sandy loam.

The first part of this trial using treatments of diuron, prometryn, methazole, fluometuron, cyanazine, and fluridone showed little nightshade control due to lack of rainfall for activation of the herbicide, although the addition of 1 lb/A of dinitramine improved control considerably. Some retardation was noted with this combination.

The second portion of the trial included dinitramine, ethalfluralin, alachlor, H 26910, Dowco 295, Hoe 29152, MBR 16349, R12001 and R24315. Ethalfluralin (1.5 lb and 3.0 lb/A) and alachlor (2.0 lb and 4.0 lb/A) gave very good control of nightshade in this trial. Dinitramine (1.0 lb and 2.0 lb/A), H 26910 (2.0 lb and 4.0 lb ai/A), R12001 (2.0 lb and 4.0 lb ai/A), and R24315 (2.0 lb and 4.0 lb ai/A) were slightly less effective. Dowco 295, Hoe 29152, and MBR 16349 did not give adequate control of nightshade. No substantial effect on the cotton was noted with any treatment except for some stand reduction with dinitramine at 2.0 lb/A.

Results of this trial are encouraging, although the seriousness of this problem requires almost complete control of American black nightshade. Further studies must evaluate the phytotoxicity risk when rains occur after planting. Of interest was the fact the nightshade emerged even without rainfall after planting. (UC Cooperative Extension, Bakersfield, Ca.).

Nightshade control in cotton* Rocap-preplant incorporation

Treatments	Rate lb/A	American black nightshade control
Untreated	----	3.3
Untreated	----	2.8
Dinitramine	1.0	7.5
Dinitramine	2.0	8.5
Ethalfluralin	1.5	8.3
Ethalfluralin	3.0	9.2
Alachlor	2.0	8.5
Alachlor	4.0	9.2
H 26910	2.0	7.2
H 26910	4.0	8.0
Dowco 295	1.0	3.0
Dowco 295	2.0	5.0
Hoe 29152	1.0	3.3
Hoe 29152	2.0	3.7
MBR 16349	1.5	3.8
MBR 16349	3.0	2.5
R12001	2.0	7.3
R12001	4.0	7.7
R24315	2.0	7.3
R24315	4.0	8.3

*Evaluated on May 18; Rated 0-10: 10 = complete kill.

The effect of herbicides applied postemergence over cotton for nightshade control. Kempen, H. and J. Woods. Two trials were established in Kern County, Ca. to evaluate postemergence control of American black nightshade in cotton. The first trial treated on April 27, 1977 was on cotton 2 1/2 inches tall (one true leaf). American black nightshade (1/2 inch tall), tumble pigweed (1/2 inch tall), and barnyardgrass (1 to 1 1/2 inches tall) were present within the plot.

Results indicated that fluometuron (2.0 and 4.0 lb/A) plus surfactant, SN 55365 (1.5 and 3.0 lb ai/A), and SN 58132 (1.5 and 3.0 lb ai/A) all gave excellent control of the broadleaf species present. Fluridone (0.05 and 0.1 lb/A) plus surfactant and H 26905 (2.0 and 4.0 lb ai/A) plus surfactant both gave slightly less control. The only material which gave good control of barnyardgrass was HOE 29152 (0.25, 0.5 and 1.0 lb ai/A) plus surfactant. Moderate to serious cotton injury occurred in all plots although H 26910, MSMA and metolachlor appeared to be the safest at the rates tested. Yields were reduced compared to the check on all treatments that were harvested.

On May 20, 1977 another trial was established in this same field. By this time the cotton was 4 to 5 inches tall (3 to 4 true leaves), the nightshade 1 to 4 inches tall, pigweed 2 to 5 inches tall, and the barnyardgrass 4 to 10 inches in diameter. Both directed sprays and over-the-top sprays of SN 55365, SN 58132, fluometuron, and MSMA were evaluated. None of these materials supplied really good control at this later stage of growth. Injury to the cotton (from the over-the-top application) was also more than could be tolerated.

HOE 29152, SN 55365, and SN 58132 are three new compounds which show some promise as postemergence sprays on cotton. The first being a grass killer, the other two would be used against broadleaves. As indicated in these trials, more work is necessary to evaluate cotton tolerance to these materials. In the case of the two broadleaf materials, possibly a lower rate (on small weeds) would be just as effective as the rates used in this trial. (UC Cooperative Extension, Bakersfield, Ca.).

Effect of herbicides applied over California cotton - one true leaf stage

Treatments (4/27/77)	Rate lb ai/A	Cotton injury * 5/6/77	Cotton injury * 5/18/77	Bales of lint/acre 10/25/77	Am. black nightshade control* 5/11/77	Tumble pigweed control* 5/11/77	Barnyard-grass control* 5/11/77
Check	--	0	0.8	1.93	1.0	0.5	0
Check	--	0	0.3	--	0.8	2.0	1.3
H 26910 + surfactant**	2.0	2.0	2.3	--	4.5	4.8	1.5
H 26910 + surfactant**	4.0	3.0	3.3	--	7.3	7.3	2.8
Fluridone + surfactant**	0.05	3.3	3.8	1.74	8.3	8.0	2.8
Fluridone + surfactant**	0.1	4.0	4.5	1.56	8.8	9.3	3.8
Fluometuron + surfactant**	2.0	2.5	4.5	1.28	10.0	10.0	3.3
Fluometuron + surfactant**	4.0	3.8	5.8	1.28	10.0	10.0	4.3
H 26905 + surfactant**	2.0	1.5	3.8	--	7.3	7.0	4.5
H 26905 + surfactant**	4.0	2.0	4.5	--	8.8	9.0	5.5
MSMA	2.0	1.5	2.5	--	4.5	5.3	4.3
MSMA	4.0	2.5	3.3	--	6.8	9.8	6.5
Metolachlor + surfactant**	2.0	1.8	2.8	--	2.5	1.3	2.0
Metolachlor + surfactant**	4.0	3.0	3.8	--	3.3	3.5	3.0
HOE 29152 + surfactant**	0.125	1.8	2.3	--	1.0	1.0	4.0
HOE 29152 + surfactant**	0.25	2.8	3.5	--	1.0	2.0	7.8
HOE 29152 + surfactant**	0.5	3.3	3.5	1.65	2.3	3.5	8.3
HOE 29152 + surfactant**	1.0	4.3	4.3	1.38	4.0	5.5	9.5
SN 55365	1.5	2.0	3.3	1.56	10.0	10.0	4.5
SN 55365	3.0	2.5	4.3	1.38	10.0	10.0	2.8
SN 58132	1.5	2.0	3.3	1.38	9.5	10.0	3.3
SN 58132	3.0	2.8	4.8	1.19	10.0	10.0	4.0
			LSD .05	0.3640			
			.01	0.4902			

* 0 - 10 rating: 10 = complete kill
contton - one true leaf; A. black nightshade - 1/2 inch tall; tumble pigweed - 1/2 inch tall; barnyard grass 1 - 1 1/2 inches tall

** 1/2% by volume

Progress on nutsedge control in California cotton. Kempen, H.M. and J.T. Woods. Results of 1977 research trials in the San Joaquin Valley indicate that under our pre-irrigated conditions H 26910, Dowco 295 and fluridone (EL 171) show promise for preplant nutsedge control.

H 26910, an acetanilide from Hercules, provides 6 to 8 weeks of control on yellow nutsedge and therefore works best when incorporated in the moist soil into which cotton is planted. The best incorporation techniques have been the "rocap" technique (rolling cultivators at planting) and the powered rototiller. The rocap technique uses two or three rolling cultivators in tandem set behind the dirt pusher (which removes the tops of the pre-irrigated beds) but ahead of the planter shoe. A 12 to 14 inch band of spray precedes the rolling cultivators. The powered rototiller works less dependably because too much of the treated soil on the beds is removed at planting. On clay or clay loam soils, though, the rototiller is preferred.

H 26910 continues to be safer after four years of tests than alachlor. Alachlor, another acetanilide, shows adequate safety except when sprinkled to simulate rainfall after planting. A subsurface layer of H 26910 placed 3/4 to 1 1/2 inches below the soil surface at planting deserves further study under simulated rainfall conditions to determine tolerance.

Dowco 295 (chemistry unavailable) tested for three years, shows greater unit activity than H 26910 or alachlor. It is effective on both nutsedges present, purple and yellow. H 26910 and alachlor are effective only on the more widely spread yellow nutsedge. However, Dowco 295 is no safer than alachlor at equal rates of application. It appears to provide 8 to 12 weeks of nutsedge control, so preplant disced-in application, normally done in January, might be effective. One trial indicated it was effective and safer this way. However, rocap incorporation or rototilling at planting are preferred techniques of application.

Fluridone (EL 171) is a very persistent herbicide with high unit activity. It has good safety and broad spectrum annual and perennial weed control capability. Preplant, disced-in, applications of 1/2 lb/A controls yellow nutsedge, but rocap or rototilled applications at planting, as is often done with trifluralin, are ineffective even on annuals. This appears to be due to a need for one or, preferably, more saturation irrigations to get maximum activity. A preliminary trial in 1977 indicated that a subsurface layer of 3/4 lb/A placed 1 1/2 inches deep (at cotton seed depth) was quite effective. Such a band treatment could reduce the persistence problem. Further studies are planned to apply such a treatment when listing for pre-irrigation and at planting.

Solanaceous weeds and crops are especially susceptible to fluridone and further studies need to measure carryover effects of low rates (0.1 to 0.4 lb/A) on these and other rotational crops grown in the San Joaquin Valley. Band treatment techniques which keep overall dosage below 0.2 lb/A need to be further evaluated and developed.

Growers are presently advised to use one or more mechanical measures to keep yellow nutsedge from competing for moisture with seedling cotton. Some soils permit use of subsurface sweeps to cut nutsedge shoots and roots at the ultimate seed planting depth before or at planting. Close early cultivation greatly aids in reducing competition for water. Where this is followed by thinning with a synchronous thinner, adequate control (75%) was achieved.

Mechanical and electronic guidance systems are presently needed. Such techniques are within current technological capabilities and should be implemented. (UC of California, Cooperative Extension, Bakersfield, Ca.).

Evaluation of postemergence herbicides for weed control in lentils. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt, and O.K. Baysinger. Plots were established at Moscow, Idaho to determine the effectiveness of various herbicides on grass and broadleaf weed control in lentils (cultivar: Tekoa). Plots were treated on June 1, 1977. Herbicides were applied with a knapsack sprayer equipped with a 3 nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 15 ft. Treatments were replicated three times in a randomized complete block design. The sky was clear during application. Air temperature and relative humidity were 62 F and 84%, respectively. Wind velocity was 0 to 3 mph. Soil temperature at 4 inches was 66 F. The soil at the study site was a Palouse silt loam with 3.5% O.M. and a pH of 6.5. Drought conditions prevailed during the 1977 growing season in the Palouse region of Idaho. Consequently, crop yields were greatly depressed and weed control was occasionally erratic. Percent lentil stand and percent weed control were obtained from actual species counts within two 6 inches by 5 ft quadrats per plot. Numbers of plants in the treated plots were compared to numbers in the nontreated check plots.

Diclofop did not show good activity when applied postemergence to barnyard grass. HOE-29152 at 1.0 lb/A, however, gave 91% control of barnyard grass and resulted in a 53% increase in lentil seed yield. HOE-29152 at 0.5 and 1.0 lb/A plus Renex 36 as a wetting agent gave good to excellent grass control but caused a reduction in lentil seed yield compared to those same rates of HOE-29152 applied alone. Metribuzin at all rates gave 94% or better henbit control. Only metribuzin + dinoseb alkanolamine salt at 0.25 + 3.0 lb/A gave satisfactory control of mayweed, field pennycress, redroot pigweed and lambsquarters, collectively categorized as other broadleaves. SN-533 did not provide good grass control but at 1.5 lb/A did relieve the competition from broadleaf weeds resulting in a 33% increase in lentil seed yield. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Effect of foliar applied herbicides on lentil stand and weed control

			Percentage weed control			Yield	
Treatment	Rate lb/A	Percent lentil stand	Barnyard grass	Henbit	Other broadleaves	lb/a	Percent of untreated check
Diclofop	1.0	74	59	25	3	346	126
Diclofop + WA	1.0	99	64	11	23	352	128
HOE-29152	0.25	117	51	26	7	294	107
HOE-29152	0.5	105	56	1	18	481	175
HOE-29152	1.0	113	91	15	17	421	153
HOE-29152 + WA	0.25	86	40	21	24	430	156
HOE-29152 + WA	0.5	99	73	24	17	387	141
HOE-29152 + WA	1.0	108	99	40	14	357	130
Metribuzin	0.25	108	40	97	47	289	105
Metribuzin	0.375	100	28	94	59	413	150
Metribuzin + dinoseb amine salt	0.25 3.0	90	21	97	97	419	152
SN-533	3.0	98	25	14	29	342	124
SN-533	1.0	81	25	26	28	294	107
SN-533	1.5	86	0	68	42	366	133
Untreated Check	2.0	100	0	0	0	275	100

Note: Wetting agent used was Renex 36 added to the herbicide spray mixture at a rate of 0.5% v/v.

Evaluation of preplant incorporated herbicide treatments for weed control in lentils. Lee, G.A., M.E. Coleman-Harrell, and G.A. Mundt. A study was established at Moscow, Idaho to determine the phytotoxic effects of various herbicides on lentils (cultivar: Tekoa) and effectiveness of control of grass and broadleaf weeds. Herbicides were applied preplant incorporated April 28, 1977 with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 30 feet. Treatments were replicated three times in a randomized complete block design. At the time of application the air temperature and relative humidity were 51 F and 52%, respectively. Soil temperature at 4 inches was 52 F. Wind velocity was 0 to 3 mph. The sky was clear. The soil at the study site was a Palouse silt loam with 3.5% O.M. and a pH of 6.5. April, 1977 was one of the driest Aprils on record. Drought conditions prevailed through April until early May. Rainfall was minimal throughout the 1977 growing season. Percent lentil stand and percent weed control were obtained by actual species count within two 6 inch by 5 ft quadrats per plot. Numbers of plants in treated plots were compared to numbers in the nontreated check plots.

All preplant incorporated herbicide treatments provided 82% or better control of barnyardgrass (attached table). SN-533 + dinitramine at 1.5 + .33 lb/A, ethofumesate at 3.0 lb/A and alachlor at 3.5 lb/A gave 98% or better control of redroot pigweed. Alachlor resulted in better control of common lambsquarters than all other herbicide treatments. SN-533, alone and in combination with dinitramine, provided excellent control of mayweed. No preplant herbicide treatment gave adequate control of henbit, field pennycress and annual sowthistle which were collectively categorized as other broadleaves. Alachlor caused a substantial decrease in lentil stand, but provided good control of barnyardgrass and the three major broadleaf weeds. Although the lentil stand was reduced, the elimination of a major portion of the weed competition during the early growing season resulted in an increase in yield in plots treated with alachlor compared to the untreated check plots. Lentil yields from eight of the herbicide treated plots were more than double the yields of the nontreated check plots. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Effect of preplant incorporated herbicides on lentil stand and weed control

			Percentage weed control					Yield	
Treatment	Rate lb/A	Percent lentil stand	Barnyard grass	Pig weed	Lambs-quarter	May-weed	Other broadleaves	lb/A	Percent of untreated check
Diclofop	1.0	105	86	-	-	-	-	224	144
HOE-29152	0.25	87	86	-	-	-	-	331	213
HOE-29152	0.5	86	83	-	-	-	-	379	244
HOE-29152	1.0	98	91	-	-	-	-	298	192
SN-533	1.0	102	82	82	23	98	63	304	196
SN-533	1.5	95	88	72	63	100	73	362	233
SN-533	2.0	82	88	68	55	100	57	399	257
SN-533 + Dinitramine	0.75 0.33	91	91	89	82	100	57	357	230
SN-533 + Dinitramine	1.0 0.33	89	83	79	79	100	69	306	197
SN-533 + Dinitramine	1.5 0.33	84	89	98	61	100	48	360	232
Ethofumesate	2.0	85	84	77	35	91	56	301	194
Ethofumesate	3.0	109	83	100	79	68	82	331	213
Alachlor	2.5	78	89	89	90	91	71	375	241
Alachlor	3.5	58	94	98	83	87	54	301	194
Untreated check	---	100	0	0	0	0	0	155	100

Evaluation of postemergence herbicides for quackgrass control in peas. Lee, G.A., M.E. Coleman-Harrell, and G.A. Mundt. Plots were established at Joel, Idaho to determine the effect of two herbicides on quackgrass control in peas (cultivar Alaska). Half of the HOE-29152 plots were treated on May 20, 1977 when the quackgrass was 4 to 6 inches high, and the other half on June 10, 1977 when the quackgrass was 6 to 12 inches high. MBR-16349 was applied only when the quackgrass was in the 4 to 6 inch stage of growth. Herbicides were applied with a knap-sack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa. Treatments were replicated three times in a randomized complete block design. Individual plots were 9 by 30 ft. Sky conditions were clear at the time of both applications. Air temperature and relative humidity during the first application were 58 F and 73%, respectively, and 59 F and 25%, respectively, during the second application. Soil temperatures at 4 inches were 56 F and 58 F at the two successive treatment dates, respectively. Wind velocity was 0 to 1 mph during both applications. The soil at the study site is a Latahco silt loam with 2% OM and a pH of 6.0.

Percent pea stand and percent quackgrass control were obtained from actual species counts within 6 inch by 5 ft quadrats per plot. Numbers of plants in the treated plots were compared to numbers in the nontreated check plots. Pea seed yield data were unobtainable due to a killing frost on July 5.

HOE-29152 at 1.0 lb/A without Renex 36 as a wetting agent gave excellent quackgrass control when applied to quackgrass 6 to 12 inches tall. Higher rates of HOE-29152 alone gave satisfactory control when applied to quackgrass in the 4 to 6 inch stage of growth. When applied with Renex 36, HOE-29152 at all rates gave excellent control when applied to quackgrass in the 4 to 6 inch stage of growth. MBR-16349 resulted in poor quackgrass control and caused a substantial reduction in cuticular wax on pea plants. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Spring pea stand and quackgrass control resulting from foliar applications of HOE-29152 alone and with a surfactant and MBR-16349 at two heights of quackgrass growth

Treatment	Rate lb/A	Percent pea stand		Percent quackgrass control	
		4 to 6 in	6 to 12 in	4 to 6 in	6 to 12 in
HOE-29152	1.0	85	100	66	93
HOE-29152	1.5	89	105	93	81
HOE-29152	2.0	104	94	92	79
HOE-29152	3.0	93	58	100	78
HOE-29152 + WA	1.0	90	83	93	76
HOE-29152 + WA	1.5	102	84	86	69
HOE-29152 + WA	2.0	94	100	100	75
HOE-29152 + WA	3.0	110	76	93	79
MBR-16349	1.0	97	---	66	--
MBR-16349	2.0	99	---	60	--
MBR-16349	3.5	99	---	65	--
Untreated check		100	100	0	0

Note: Wetting agent used was Renex 36 added to the herbicide spray mixture at a rate of 0.5% v/v.

Evaluation of preemergence herbicide treatments for weed control in spring peas. Lee, G.A., M.E. Coleman-Harrell, and G.A. Mundt. A study was established at Moscow, Idaho to determine the effect of various herbicides on spring pea (cultivar: small-sieve Alaska) stand and grass and broadleaf weed control. Plots were sprayed on April 29, 1977. Individual plots measured 9 by 25 ft. Herbicides were applied preemergence surface 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. Sky conditions were partly cloudy at time of application. Air temperature and relative humidity were 71 F and 40%, respectively. A 5 mph wind prevailed at the time of herbicide application. Soil temperature at 4 inches was 66 F. The soil was a Palouse silt loam with 3.5% OM and a pH of 6.5 Drought conditions prevailed in April 1977 until relieved by rains in early May. Plants were again stressed for moisture during the late spring and early summer months. Percent pea stand and percent weed control were obtained by actual species counts within two 6 inches by 5 ft quadrats per plot. Numbers of plants in treated plots were compared to numbers in the nontreated check plots.

The alkanolamine salt of dinoseb in combination with SN-533 gave excellent control of field pennycress whereas the ammonium salt of dinoseb plus SN-533 resulted in poor control of the weed species. RH-6201 showed good activity on broadleaf species but little activity on barnyardgrass. Similar results were obtained with R-40244. Diclofop did not give good control of barnyard grass when applied preemergence surface. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Effect of preemergence surface applied herbicides on spring pea stand and weed control

			Percent weed control				Yield	
Treatment	Rate lb/A	Percent pea stand	Barnyard grass	Field penny-cress	Lambs-quarters	Henbit	lb/A	Percent of check
Dinoseb amine salt	2.25	105	0	100	73	55	463	65
+ SN-533	0.75							
Dinoseb amine salt	2.25	111	17	100	55	61	696	98
+ SN-533	1.5							
Dinoseb amine salt	0.88	108	0	49	55	39	653	92
+ Propham *	3.0							
Dinoseb ammonium salt	1.0	130	0	57	81	52	760	107
+ SN-533	1.0							
SN-533	1.0	103	64	59	73	23	801	113
SN-533	1.5	145	20	50	58	49	584	83
SN-533	2.0	111	33	64	50	52	722	102
RH-6201	0.5	65	0	64	100	58	1126	159
Rh-6201	1.0	104	0	77	79	84	876	124
RH-6201	2.0	107	50	100	100	85	718	101
HOE-29152	0.25	127	35	34	72	59	1158	164
HOE-29152	0.5	130	80	13	26	40	917	130
HOE-29152	1.0	107	100	46	34	26	580	82
Diclofop	1.0	103	30	38	52	56	703	99
R-24315	1.0	96	50	24	61	23	1142	161
R-24315	2.0	137	55	91	81	25	902	127
R-24315	4.0	107	35	79	100	73	997	141
R-40244	0.5	122	0	93	75	98	531	75
R-40244	1.0	121	50	100	100	100	1214	172
R-40244	2.0	83	10	100	100	100	732	103
Untreated check		100	0	0	0	0	708	100

*Propham plus PCMC extender

Evaluation of postemergence herbicides for wild oat control in peas. Lee, G.A., G.A. Mundt and M.E. Coleman-Harrell. A field experiment was established at Moscow, Idaho to compare the effectiveness of candidate and labeled wild oat herbicides on peas (variety Alaskan small sieve). RH-6201, HOE-29152 and barban were applied June 3, 1977. The ambient temperature was 51 F, soil temperature at 4 inches was 60 F and the relative humidity was 88%. Dinoseb ammonium salt and diclofop were applied June 6, 1977. The ambient temperature was 71 F, soil temperature at 4 inches was 65 F and the relative humidity was 82%. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom. Sprayers which applied the other herbicides were calibrated to deliver 40 gpa. Treatments were replicated three times in a randomized complete block design. The soil at the study site is a Palouse silt loam with 3.5% O.M. and a pH of 6.5.

Percent pea stand and percent wild oat control were obtained from actual species counts within two 6 inches by 5 ft quadrats per plot. Number of plants obtained by this count were compared to similar counts taken in the untreated check plots. Wild oat control by biomass was obtained by clipping the wild oats at the soil surface within these two quadrat areas in each plot. These samples were dried and the resulting weights compared to the weights obtained in the untreated check plots.

HOE-29152 gave the best wild oat control with the resulting highest yield and selectivity (accompanying table). Percent crop stands of RH-6201 at 1.0 lb/A and dinoseb + SN-533 at 1.0 + 1.0 lb/A indicate the possibility of a phytotoxic effect on the crop whereas other compounds seem to have satisfactory selectivity. (Idaho Agricultural Experiment Station, Moscow, ID 83843)

Effect of foliar applied herbicides on pea stand
and percentage wild oat control

Treatment	Rate lb/A	Percent pea stand	Percentage wild oat control		Yield	
			By count	By biomass	lb/A	Percent of untreated check
Asulam	1.0	122	14	23	203	113
Asulam	2.0	82	23	45	170	95
Asulam + WA	1.0	100	40	58	247	138
Asulam + WA	2.0	92	48	74	280	156
Dinoseb + SN-533	1.0 1.0	70	21	42	273	153
RH-6201 + Diclofop	0.5 1.0	120	53	79	325	182
RH-6201	0.25	95	21	33	191	107
RH-6201	0.5	119	34	47	229	128
RH-6201	1.0	66	22	38	189	106
HOE-29152	0.25	98	32	54	327	183
HOE-29152	0.5	130	69	71	387	216
HOE-29152	1.0	119	98	96	535	299
Diclofop	0.5	82	67	67	419	234
Diclofop	0.75	105	83	90	389	217
Diclofop	1.0	84	93	95	578	323
Diclofop + WA	1.0	98	85	96	475	265
Diclofop	1.5	73	80	88	303	169
Barban	0.5	116	81	97	441	246
Untreated check		100	0	0	179	100

Note: Wetting agent used was Renex 36 added to the herbicide spray mixture at a rate of 0.5% v/v.

Note: Wild oat population density at time of harvest averaged 8 plants per square foot in the untreated check.

Bermudagrass control in peppermint with HOE 29152. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. A field trial was conducted to determine whether HOE 29152 would selectively control bermuda grass in peppermint. Plots, 2.5 m by 6.0 m, were arranged in a randomized block design with three replications.

The HOE 29152 was applied on May 20, 1977 at rates of 1.7, 3.4, and 6.7 kg/ha. Visual evaluations on August 7, 1977 indicated topgrowth control of 93, 98, and 100 percent from the low to the high rates of HOE 29152.

Peppermint tolerance was excellent, even at the highest rate. (Crop Science Department, Oregon State University, Corvallis 97331).

Canada thistle control in peppermint with bentazon. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. Canada thistle is a serious problem in western Oregon peppermint. Bentazon has been proven experimentally to be effective in reducing Canada thistle competition in peppermint. Since bentazon rarely eliminates a thistle stand, four trials established in 1976 were retreated in 1977 to observe whether the thistles which escaped control the first season were actually tolerant to bentazon.

The trials were replicated four or five times, with plots either 2.5 m by 6.0 m or 2.5 m by 7.5 m. Bentazon was applied as split applications in June both years, with two applications of 2.2 kg/ha each being applied about 10 days apart.

Visual evaluations were made about 6 weeks after treatment both years. The mint was harvested in late July or early August and the oil was distilled after the mint hay had dried.

Prior to the second annual split application, the thistle density in each plot was determined by randomly placing ten 0.9 m^2 hoops in each plot.

Although verticillium wilt and the dense thistle stands caused a great deal of variability in these trials, a significant increase in mint oil yield was recorded in two of the four trials the first year. Ten months following the first annual application, the thistle stand was significantly lower in the bentazon-treated plots than in the untreated plots in all four trials.

Thistle control following the second annual application was 90 percent or higher in all four trials with no particular indication that a resistant thistle population was developing. (Crop Science Department, Oregon State University, Corvallis 97331).

Canada thistle control and mint oil yields following
1 and 2 annual split applications and thistle density
following 1 annual split application of bentazon

1976 and 1977		1976			1977	
Treatment	Rate (kg a.i./ha)	% thistle control	Mint oil yield (kg/ha)	Thistles/ m^2	% thistle control	Mint oil yield (kg/ha)
		Location 1				
Bentazon	2.2 + 2.2	93	36.00**	4.7**	93	61.4 ns
Untreated control	0	0	16.8	33.9	0	33.2
		Location 2				
Bentazon	2.2 + 2.2	87	33.6*	2.0*	94	37.9*
Untreated control	0	0	18.1	41.7	0	7.5
		Location 3				
Bentazon	2.2 + 2.2	95	24.1 ns	4.9**	90	29.0 ns
Untreated control	0	0	28.7	19.6	0	28.8
		Location 4				
Bentazon	2.2 + 2.2	93	34.4 ns	1.1*	100	--
Untreated control	0	0	25.0	27.8	0	--

ns = non-significant
* = significant at 5% probability level
** = significant at 1% probability level

Response of Canada thistle and peppermint to Dowco 290. Whitesides, R.E. and A.P. Appleby. Canada thistle is a serious weed problem in peppermint fields. It interferes with harvest, reduces oil yields, and may reduce pepperment oil quality. The amine salt of Dowco 290 has given excellent results in controlling Canada thistle in peppermint.

A series of field experiments was conducted during 1975 and 1976 to examine peppermint tolerance and Canada thistle response to Dowco 290. Peppermint oil yield and Canada thistle density were considered most important in evaluating experimental results.

Peppermint tolerance to Dowco 290 was studied in weed-free peppermint (c.v. Mitcham). Rates of 0.25 lb a.e./A or more reduced peppermint oil yield. Time of application appeared to be less critical than rate of herbicide as oil production decreased with increasing rates. Mint injury was sufficiently severe at high rates to cause yield reductions the year of treatment, but recovery was good and no reduction in oil yield was found 1 year later.

Spring application of Dowco 290 to peppermint (cv. Mitcham and Todd's Mitcham) infested with Canada thistles resulted in erratic oil yield but good thistle control. Oil yield was difficult to evaluate because of the variability of the peppermint stand. All rates of Dowco 290 tested gave good short-term thistle control and rates of 0.5 lb a.e./A or more gave excellent seasonal control.

There was no advantage to split applications of Dowco 290 (fall plus spring) over a single application in the spring. An excellent combination of good thistle control and high oil yield was obtained from sequential treatments in the spring when 0.125 lb a.e./A was applied 10 weeks prior to harvest and 0.063 lb a.e./A was applied 2 weeks later.

Translocation of Dowco 290 through underground thistle parts was demonstrated by treating parent plants and observing the response in a connected daughter plant. The herbicide was not lethal at rates that translocated connected plants, but it did cause abnormal floral development.

Dowco 290 was sufficiently active when applied at 0.25 lb a.e./A to control all underground plant parts of test thistles even when treated plant parts were removed as soon as 1 hour after treatment. Root mortality was measured by a modified tetrazolium test.

Seedling Canada thistle plants were slightly more sensitive to Dowco 290 than plants which developed from mature rootstock. After seedling plants had developed a more complex root system, regrowth from rootstock of plants grown from seed and from mature rootstock was similar. (Crop Science Department, Oregon State University, Corvallis 97331).

Paraquat timing on peppermint. Brewster, B.D., Arnold P. Appleby, and Patrick K. Boren. Paraquat has been very effective for controlling winter annual weeds such as Italian ryegrass and common groundsel in dormant peppermint. However, peppermint injury has been reported when applications were made in early to mid-spring.

Three trials were conducted in peppermint fields which were flamed in the spring for rust control and three trials were conducted in fields which were not flamed to observe the conditions under which injury occurs. The plots in all six trials were 2.5 m by 6.0 m. The treatments (paraquat at 0.8 kg/ha and paraquat + terbacil at 0.8 + 0.9 or 0.8 + 1.8 kg/ha) were replicated three times in each trial.

In the three trials that were flamed, two contained treatments that were applied in the winter dormant season, in the spring prior to flaming, and in the spring after flaming. In the third trial, only the post-flaming treatments were applied.

The treatments in the three non-flamed trials were applied in the spring after the mint had begun to grow.

Visual evaluations of percent peppermint injury were made in the summer following treatment.

No injury to peppermint was visible in the three non-flamed trials or in the winter application in the flamed trials.

Serious mint injury occurred in two flamed trials when either paraquat or paraquat + terbacil was applied 11 or 18 days prior to flaming. The post-flaming treatments seriously injured the mint in one trial when they were applied 11 days after flaming. When applied either 1 or 2 days after flaming in the other two trials, no injury occurred.

The most probable reason for mint injury was repeated depletion of root carbohydrates by flaming and paraquat. When paraquat was applied immediately after flaming, the mint leaves were already necrotic so the paraquat had no effect on the mint. (Crop Science Department, Oregon State University, Corvallis 97331).

Perennial bluegrass control in peppermint with HOE 29152. Brewster, Bill D., Arnold P. Appleby, and Patrick K. Boren. Kentucky and Canada bluegrass are serious weed problems in Oregon peppermint fields. Three field trials were conducted to evaluate the efficacy and crop tolerance of HOE 29152 in controlling perennial bluegrass in peppermint.

In all cases, the treatments were replicated three times. Individual plots were 2.5 m by 6.0 m.

At location 1, Canada bluegrass was treated on five different dates. At locations 2 and 3, Kentucky bluegrass was treated on only one date. The treatments were evaluated in early July. The results are summarized in the table below.

At location 1, the early spring applications were most effective, but complete topgrowth kill was not achieved from any date of application. The low control rating on June 8 may have partially been due to the short interval between application and evaluation.

At locations 2 and 3, there was little difference in control between rates.

Peppermint was tolerant to all treatments in the three trials. (Crop Science Department, Oregon State University, Corvallis 97331).

Perennial bluegrass control and peppermint injury at three locations with HOE 29152

Rate (kg a.i./ha)	Bluegrass stage of growth	% perennial bluegrass control			% mint injury		
		Loc. 1	Loc. 2	Loc. 3	Loc. 1	Loc. 2	Loc. 3
December, 1976	5 to 7 cm tall						
1.7		27	-	-	0	-	-
3.4		77	-	-	0	-	-
February, 1977	7 to 10 cm tall						
1.7		60	-	-	0	-	-
3.4		85	-	-	0	-	-
April, 1977	7 to 15 cm tall						
1.7		83	-	-	0	-	-
3.4		97	-	-	0	-	-
May, 1977	Heading						
1.7		63	87	95	0	0	0
3.4		93	90	99	0	0	0
June, 1977	Flowering						
1.7		7	-	-	0	-	-
3.4		23	-	-	3	-	-
0		0	0	0	0	0	0

Weed control in grain sorghum under sprinkler irrigation. Hill, J.E. Grain sorghum is grown in rotation with a number of crops in California. Therefore, effective but relatively short-lived herbicides are needed that will control barnyardgrass and troublesome broadleaf weeds but not carry-over into subsequent crops. Carry-over of the triazine herbicides into rotational crops has limited the use of these effective herbicides in California grain sorghum.

An experiment was conducted on the University of California research station at Davis to determine the effectiveness of propachlor, bifenox and a combination of these herbicides as compared to propazine and terbutryn. Barnyardgrass was seeded in the plot and disked into the soil. Grain sorghum (Variety NK 129) was planted into dry soil on June 13, 1977. Preemergence surface (PES) applications were made on June 14 and the plot was irrigated with approximately 1 inch of water by sprinkling.

Barnyardgrass and several broadleaved species emerged in the untreated plots. Propazine effectively controlled all the weed species present whereas terbutryn controlled all of the broadleaf species but was less effective on barnyardgrass. Propachlor provided satisfactory control of barnyardgrass but was not effective on the broadleaf weeds. Bifenox showed limited activity on barnyardgrass but controlled the broadleaf species. The combination of bifenox and propachlor was as effective as either of the triazine herbicides in controlling all weed species present. None of the herbicides significantly reduced the grain sorghum stand.

The combination of bifenox and propachlor offers a potential for broad-spectrum weed control in grain sorghum while minimizing the problem of herbicide carry over into rotational crops. (University of California, Botany Department, Davis, CA 95616).

Weed control in grain sorghum

Herbicide	Rate lb/A	Weed control[1,2] Barnyard-grass	Pigweed	Purslane	Lambs-quarters	Phyto-toxicity[1]	Stand[1,2,3] Plants/m row
Propazine	1.0	9.6	10.0	10.0	10.0	0.3	20.0 a
Propazine	2.0	9.8	10.0	10.0	10.0	0.5	20.9 a
Terbutryn	1.0	6.6	9.7	10.0	10.0	0.0	19.6 a
Terbutryn	2.0	8.5	10.0	10.0	10.0	0.3	19.3 a
Propachlor	4.0	8.6	5.5	4.0	4.5	0.3	22.6 a
Propachlor	8.0	9.6	9.3	7.8	9.5	1.3	21.6 a
Bifenox	1.0	5.0	10.0	10.0	8.5	0.0	18.6 a
Bifenox	2.0	2.3	10.0	10.0	10.0	0.0	21.8 a
Bifenox + propachlor	1.0 +4.0	9.5	10.0	10.0	9.5	0.3	20.5 a
Untreated	-	0.5	0.0	0.0	0.8	0.0	18.9 a

[1] average of four replications

[2] 0 = no weed control/injury; 10 = complete weed control/injury

[3] numbers followed by the same letter do not differ significantly at the 5% level

Preplant-postemergence complementary herbicide treatments in sugarbeets. Alley, H.P., N.E. Humburg and A.F. Gale. A study established at the Powell Agricultural Substation was designed to obtain maximum weed control by utilizing optimal rates of preplant and postemergence herbicides. Application and incorporation of preplant herbicides was a simultaneous operation with planting of sugarbeets on April 26, 1977. Sugarbeet seed spacing was 6 inches on 22-inch bedded rows. Plots were on silt loam soil (58.2% sand, 32.0% silt, 9.8% clay, 1.6% organic matter and pH 7.7). Environmental conditions were: air temperature 75 F, 18% relative humidity, with soil temperatures of 106, 91, 86 and 77 F at surface, 1, 2 and 4-inch depths, respectively. Postemergence herbicides were applied full coverage in 40 gpa water on May 25; air temperature was 60 F and relative humidity was 52%.

Plant counts for sugarbeet stand and weed populations were made on June 8, 1977. Control of wild buckwheat was generally good, with 7 of the 10 treatments giving 80% or better control. Control was increased with ethofumesate or pyrazon in the preplant treatment. Control of green foxtail ranged from 81% to 99%, with no marked differences among treatments. Kochia occurred in most plots and was virtually eliminated from plots receiving preplant treatment with cycloate + ethofumesate at 1.5 + 1.5 lb ai/A. Phenmedipham + desmedipham at 0.5 + 0.5 lb ai/A and ethofumesate + desmedipham at 1.0 + 1.0 lb ai/A performed similarly as postemergence treatments. (Wyoming Agric. Exp. Sta., Laramie, Wyoming, SR 846).

Preplant-postemergence complementary herbicide treatments in sugarbeets
Powell, Wyoming

Herbicides[1] Preplant Postemergence	Rate lb/A	Sugarbeet stand[2] %	Percent control[2] WB	 GF
Cycloate +	4.0			
Phenmedipham + Desmedipham	0.5 + 0.5	91	26	92
Ethofumesate + Desmedipham	1.0 + 1.0	99	51	98
Cycloate + Ethofumesate +	1.5 + 1.5			
Phenmedipham + Desmedipham	0.5 + 0.5	90	80	97
Ethofumesate + Desmedipham	1.0 + 1.0	100	89	95
Cycloate + Pyrazon +	2.0 + 3.0			
Phenmedipham + Desmedipham	0.5 + 0.5	90	81	91
Ethofumesate + Desmedipham	1.0 + 1.0	89	82	81
Cycloate/triallate +	6.6 pints			
Phenmedipham + Desmedipham	0.5 + 0.5	88	80	83
Ethofumesate + Desmedipham	1.0 + 1.0	94	60	99
Ethofumesate +	2.0			
Phenmedipham + Desmedipham	0.5 + 0.5	80	94	86
Ethofumesate + Desmedipham	1.0 + 1.0	93	99	91
Check	---------	100	0	0

[1] Preplant herbicides applied April 26, 1977. Postemergence herbicides applied May 25, 1977.

[2] Plant counts June 8, 1977

Abbreviations: WB = wild buckwheat, GF = green foxtail.

Preplant applications for weed control in furrow irrigated sugarbeets. Humburg, N.E., H.P. Alley and A.F. Gale. A study to evaluate preplant applications of herbicides for controlling weeds in furrow irrigated sugarbeets was conducted at the Powell Agricultural Substation. Herbicides were applied in 7-inch bands with 34.5 gpa water solution (band-acre basis) on 22-inch bedded rows. Plots were 3 rows by 50 ft and replicated three times in a randomized complete block design. At the time of application on April 26, 1977, conditions were: air temperature 63 F, relative humidity 25% and soil temperatures of 88, 77 and 73 F for surface and depths of 1 and 4 inches, respectively. Soil was dry to a depth of 4 inches. Sugarbeet seed spacing was 6 inches. The soil was a loam (42% sand, 42% silt, 16% clay, 1.7% organic matter and pH 7.7).

The predominant weed species were common lambsquarters, wild buckwheat, wild mustard and green foxtail. Counts of sugarbeets and weeds were made on June 8, 1977. Sugarbeet stands in plots treated with R-12001 EC at 4.0 lb ai/A and R-12001 G at 6.0 lb ai/A were significantly lower than untreated check plots. No treatment gave complete control of all weed species. Control of lambsquarters ranged from 33% to 100%, with 6 treatments of the 31 applied giving 100% control. Cycloate and combinations of cycloate with ethofumesate or H-22234 generally gave good control of lambsquarters. Wild buckwheat was not completely controlled by any treatment, but cycloate + ethofumesate at 1.5 + 1.0 lb/A and R-12001 G at 6.0 lb ai/A gave 93% control. Complete control of wild mustard resulted from R-12001 G at 6.0 lb ai/A, pyrazon WP at 4.0 lb ai/A, and H-22234 + pyrazon Fl at 2.0 + 2.0 and 3.0 + 3.0 lb ai/A. All herbicide treatments provided better than 50% control of green foxtail, with 13 treatments giving complete control. (Wyoming Agric. Exp. Sta., Laramie, SR 848).

Effect of preplant treatments on sugarbeet stand and weed control, Powell, Wyoming

Herbicide(s) 1/	Rate lb/A	Sugarbeet stand 2/ %	Percent control 2/			
			LQ	WB	WM	GF
Cycloate + Ethofumesate	1.5 + 1.0	100	100	93	81	87
Cycloate + Ethofumesate	1.5 + 1.5	91	87	78	67	87
Cycloate + Ethofumesate	2.0 + 1.0	91	100	72	60	100
Cycloate + Ethofumesate	2.0 + 2.0	96	100	88	68	100
Cycloate + Ethofumesate	1.0 + 2.0	86	95	71	64	78
Cycloate	3.0	91	93	37	80	100
Ethofumesate	2.0	100	64	54	82	95
R-12001 EC	2.0	85	57	34	77	93
R-12001 EC	4.0	66	68	52	31	100
R-12001 EC	6.0	100	85	68	60	87
R-12001 G	2.0	94	64	41	86	71
R-12001 G	4.0	96	93	79	67	100
R-12001 G	6.0	65	100	93	100	100
Pyrazon WP	3.0	90	41	47	86	80
Pyrazon WP	4.0	98	73	80	100	57
Pyrazon Fl	3.0	94	62	52	67	51
Pyrazon Fl	4.0	96	60	55	86	87
Ethofumesate + Diclofop	2.0 + 0.5	100	100	85	57	100
Ethofumesate + Diclofop	2.0 + 1.0	98	72	83	60	100
Ethofumesate + Diclofop	2.0 + 2.0	77	78	48	28	100
Ethofumesate + Pyrazon	2.0 + 2.0	100	66	62	65	75
H-22234 + Ethofumesate	1.5 + 1.5	100	93	56	34	100
H-22234 + Ethofumesate	2.0 + 2.0	94	75	58	90	87
H-22234 + Ethofumesate	3.0 + 2.0	96	77	51	82	100
H-22234 + Ethofumesate	3.0 + 3.0	79	86	50	33	100
H-22234 + Cycloate	1.5 + 2.0	96	100	2	71	100
H-22234 + Cycloate	2.0 + 2.0	94	85	12	48	89
H-22234 + Cycloate	3.0 + 3.0	91	90	25	64	89
H-22234 + Pyrazon Fl	1.5 + 2.0	92	33	74	95	93
H-22234 + Pyrazon Fl	2.0 + 2.0	98	95	55	100	93
H-22234 + Pyrazon Fl	3.0 + 3.0	96	85	55	100	93
Check		100	0	0	0	0

1/ Treated April 26, 1977.

2/ Plant counts June 8, 1977. Abbreviations: LQ = common lambsquarters, WB = wild buckwheat, WM = wild mustard, GF = green foxtail.

Preplant applications for weed control in sprinkler irrigated sugarbeets. Humburg, N.E., H.P. Alley and A.F. Gale. A screening trial for evaluating preplant applications of herbicides for weed control in sugarbeets under sprinkler irrigation was established at the Torrington Agricultural Substation. Herbicides in 34.5 gpa water solution on a band-acre basis were applied and incorporated simultaneously with planting of Holly HH-21 pelleted seed on April 21, 1977. Herbicide application was on a 7-inch band on 22-inch bedded rows. Treatments on 3-row plots were replicated three times using a randomized complete block design. Environmental conditions at the time of treatment were: clear sky, air temperature 67 F, relative humidity 26%, with soil temperatures 88, 81, 74 and 54 F at surface, 1, 2 and 4-inch depths, respectively. Soil was classified as loamy sand (79.6% sand, 13.6 % silt and 6.8% clay with 1.4% organic matter and pH 7.4).

Sugarbeet stand and weed counts were made on May 17, 1977, using a 3-inch by 10-ft quadrat. Weed species present in the research area were kochia, common lambsquarters, black nightshade, redroot pigweed and green foxtail. Cycloate + ethofumesate at 2.0 + 2.0 lb ai/A and H-22234 + ethofumesate at 3.0 + 3.0 lb ai/A gave complete control of the weed species present without significantly reducing sugarbeet stand. Kochia was totally controlled by several H-22234 + ethofumesate treatments and by R-12001 EC at 2.0 and 4.0 lb ai/A. Control of common lambsquarters, black nightshade and redroot pigweed was good, with the exception of R-12001 G at 2.0 lb ai/A. Twenty-nine herbicides or herbicide combinations of the 31 treatments evaluated gave excellent control of green foxtail. R-12001 EC was outstanding as an individual herbicide for controlling the weed species present. Excellent combinations included cycloate + ethofumesate, H-22234 + ethofumesate and ethofumesate + diclofop. (Wyoming Agric. Exp. Station, Laramie, SR 847).

Effect of preplant treatments on sugarbeet stand and weed control, Torrington, Wyoming

Herbicide(s) 1/	Rate lb/A	Sugarbeet stand 2/ %	Percent control 2/ KO	LQ	NS	PW	GF
Cycloate + Ethofumesate	1.5 + 1.0	84	83	100	79	99	92
Cycloate + Ethofumesate	1.5 + 1.5	98	50	83	100	95	93
Cycloate + Ethofumesate	2.0 + 1.0	80	89	100	100	100	100
Cycloate + Ethofumesate	2.0 + 2.0	84	100	100	100	100	100
Cycloate + Ethofumesate	1.0 + 2.0	90	72	100	100	94	96
Cycloate	3.0	85	55	92	100	100	94
Ethofumesate	2.0	82	50	100	92	95	95
R-12001 EC	2.0	98	100	75	100	100	98
R-12001 EC	4.0	84	100	92	100	97	100
R-12001 EC	6.0	46	83	92	100	98	100
R-12001 G	2.0	88	67	17	75	45	70
R-12001 G	4.0	81	39	83	100	99	99
R-12001 G	6.0	85	67	83	100	98	100
Pyrazon WP	3.0	91	67	100	94	97	80
Pyrazon WP	4.0	44	67	100	94	100	81
Pyrazon Fl	3.0	94	22	100	81	84	77
Pyrazon Fl	4.0	88	67	100	80	82	54
Ethofumesate + Diclofop	2.0 + 0.5	90	100	92	97	100	100
Ethofumesate + Diclofop	2.0 + 1.0	82	67	83	85	100	81
Ethofumesate + Diclofop	2.0 + 2.0	73	67	83	91	88	77
Ethofumesate + Pyrazon	2.0 + 2.0	75	17	100	95	98	83
H-22234 + Ethofumesate	1.5 + 1.5	79	100	83	98	91	100
H-22234 + Ethofumesate	2.0 + 2.0	81	100	83	98	91	100
H-22234 + Ethofumesate	3.0 + 2.0	85	67	100	100	98	100
H-22234 + Ethofumesate	3.0 + 3.0	86	100	100	100	100	100
H-22234 + Cycloate	1.5 + 2.0	81	56	92	100	100	100
H-22234 + Cycloate	2.0 + 2.0	88	11	92	100	100	98
H-22234 + Cycloate	3.0 + 3.0	77	67	83	88	97	96
H-22234 + Pyrazon Fl	1.5 + 2.0	92	72	83	97	97	94
H-22234 + Pyrazon Fl	2.0 + 2.0	79	39	100	100	100	98
H-22234 + Pyrazon Fl	3.0 + 3.0	84	44	100	97	86	89
Check	---------	100	0	0	0	0	0

1/ Treated April 21, 1977.

2/ Plant counts May 17, 1977. Abbreviations: KO = kochia, LQ = common lambsquarters, NS = black nightshade, PW = redroot pigweed, GF = green foxtail.

Simulated dinitroaniline residue/pyrazon interaction evaluation. Norris, R.F. and R.A. Lardelli. This trial was designed to evaluate the possible interaction of pyrazon applied at planting with a simulated dinitroaniline residue in relation to toxicity to sugarbeets.

The trial was established at the University farm at Davis in a Yolo sandy loam soil. The dinitroaniline herbicides were applied using a Marvin Rowmaster power incorporator set 11 cm deep. The beets were planted on March 7, 1977. Pyrazon was applied on the soil surface and sprinkled in (March 10, 1977), using two sets of 1.5 inches water each irrigation. A split plot desgin was used employing main plots (dinitroaniline) of 4 beds by 100 ft and subplots (pyrazon) of 4 beds by 50 ft. All treatments were replicated four-fold. Weed escapes were removed by hand so that weed competition was not a factor in the experiment. The center two rows of each plot were harvested on Oct. 24 using a modified commercial digger; sucrose analyses were made on subsamples from each plot.

Overall pyrazon caused a significant reduction in yield but did not alter sucrose content. Trifluralin, at the rate used, caused a reduction in yield, and pyrazon increased the severity of the injury. Dinitramine at 0.038 lb/A did not affect the beets, but when combined with pyrazon caused a significant loss of yield. A similar interaction was observed for butralin. These results indicate that inclusion of pyrazon as a preplant herbicide can cause greater sugarbeet injury from a dinitroaniline residue in the soil. (Botany Department, University of California, Davis, CA 95616).

Interaction between dinitroaniline herbicides and pyrazon

Main treatment	Rate lb/A	Sub-treatment	Rate lb/A	Sugarbeets			Sucrose	
				Vigor/injury1/	Count2/	Tons/A3/	%	Tons/A3/
Trifluralin	0.25	Pyrazon	4.0	3.5	47	21.4	11.4	2.5
		No Pyrazon		5.8	70	24.2	11.0	2.7
Dinitramine	0.038	Pyrazon	4.0	6.6	49	23.4	10.5	2.5
		No Pyrazon		8.8	86	29.8	10.7	3.2
Dinitramine	0.125	Pyrazon	4.0	1.8	32	20.8	12.0	2.5
		No Pyrazon		2.5	43	21.4	11.4	2.4
Butralin	0.15	Pyrazon	4.0	8.5	70	26.2	10.9	2.9
		No Pyrazon		9.6	80	28.8	11.6	3.3
Butralin	0.50	Pyrazon	4.0	5.6	58	23.4	10.5	2.5
		No Pyrazon		6.1	82	24.2	10.8	2.6
Untreated check		Pyrazon	4.0	8.5	70	27.4	10.8	3.0
		No Pyrazon		10.0	86	29.4	10.8	3.2

All data are means of 4 replications.

1/ 10 = no injury full vigor; 0 = 100% kill, no vigor; assessed 4-14-77.

2/ Beet count was made on two beds a total of 20 ft.

3/ Harvest date: 10-24-77.

Influence of dodder on yield and quality of sugarbeets. Norris, R.F. and R.A. Lardelli. Dodder can sometimes seriously infest sugarbeet fields in the central valley of California; there is very little information available regarding the effect of dodder on sugarbeets. During the spring of 1977 a serious dodder infestation developed in a sugarbeet field near Davis. We took samples from this field at harvest to determine the level of loss attributable to dodder.

Prior to topping of the field, paired 10 ft sections of row were selected and marked with stakes. One row of each pair was heavily infested with dodder, and the other was free of the weed. After topping, the sugarbeets were dug by hand from each paired plot, weighed, and samples analyzed for sugar content.

The sugarbeet root yield was reduced by 17% by the dodder infestation. The sugar content was also reduced 17%. These two losses resulted in a 31% overall loss of sugar production per acre. The dodder infestation was not considered serious by the grower as it did not develop until the beets were approximately three months old. These results indicate that there was a substantial yield loss even when the dodder attack was relatively late. (Botany Department, University of California, Davis, CA 95616).

Influence of dodder on sugarbeet yield

	Yield +/A	% sucrose	lb/A sucrose
Dodder present	29.2 + 5.5	12.7 + 2.4	7,428
Dodder absent	35.0 + 8.0	15.4 + 1.4	10,750

Data are means of 7 paired observations.

Evaluation of preemergence herbicides for spring weed control in sprinkler irrigated sugarbeets. Norris, R.F. and R. A. Lardelli. Control of spring weeds with herbicides when sugarbeets are irrigated with sprinklers has generally been poor. Some of the more recently developed herbicides offer improved weed control under these conditions, and a trial was established on the University farm at Davis to evaluate these chemicals.

Sugarbeets were planted into a loam soil (1.2% OM) June 3, 1977. Herbicides were applied to the soil surface on June 6, using a CO_2 backpack sprayer with 8002E nozzles at 30 p.s.i. applying 40 gal/A. Each plot consisted of 2 beds by 15 ft with a 12 inch band of herbicide centered on the crop rows. The treatments were replicated three-fold. Sprinkler irrigation was initiated on June 7; approximately 1 inch of water was applied initially followed by another 1 inch five days later. All subsequent irrigation was by furrow. The test plot was cultivated in the furrows twice leaving approximately 10 inches on the bed top undisturbed. No other cultural operations were performed (ie no hand weeding, no thinning) except to apply sulfur to control mildew. The sugarbeets were dug by hand, and weighed on November 8.

A very heavy population of barnyardgrass developed, in conjunction with moderate numbers of redroot pigweed and purslane.

Several herbicides provided very little weed control (BASF-9021 OH, endothal, GCP-3688) or were toxic to the sugarbeets (oryzalin).

Herc-22234 was the only herbicide that was capable of controlling the majority of the weeds present; excellent yields were obtained. Considering that cycloate was not mechanically incorporated, the control it provided was good. The yield loss was attributable mainly to the purslane and to late emerging weeds. The experimental compound R-12001 appeared to offer good weed control. All the other herbicides, used alone, provided only partial control of the weeds present. Ethofumesate did not adequately control barnyardgrass which then became the main competitors in these plots. Diclofop and HOE-29152 both provided excellent grass control but did not affect the broadleaved species; the yield in these treatments then reflected broadleaved weed competition. Combination treatments of pyrazon plus diclofop or HOE-29152 and diclofop plus ethofumesate gave season-long weed control which resulted in excellent sugarbeet yield. Several of these treatments indicate that it should be possible to grow beets sown in the spring without using any hand labor. The experiment also showed that a yield loss of over 90% occurred when only weeds in the furrow were controlled. (Botany Department, University of California, Davis, CA 95616).

Evaluation of herbicides for use in sugarbeets when sprinkler irrigated for emergence.

		6-27-77					11-8-77	
	Rate	Sugarbeet		Control[1]			Harvest kg/plot[2]	
Herbicide(s)	lb/A	Stand	Vigor	BY	PU	RP	Tops	Roots
Ethofumesate	2.0	9.5	9.2	3.7	9.8	9.3	9.2	9.4ab[3]
Ethofumesate	4.0	9.0	8.0	6.8	10.0	10.0	--	--
Ethofumesate + Pyrazon	2.0 + 3.0	8.8	8.8	6.8	10.0	10.0	15.3	17.6bc
Herc. - 22234	2.0	9.5	9.3	9.1	7.5	9.8	21.9	28.5ef
Herc. - 22234	3.0	9.0	9.0	9.3	7.8	10.0	--	--
Herc. - 22234	4.0	9.5	8.8	9.7	7.8	9.9	21.5	30.2ef
Herc. - 22234 + Pyrazon	2.0 + 3.0	9.7	9.5	9.2	9.5	9.9	18.3	27.6def
Herc. - 22234 + Ethofumesate	2.0 + 2.0	9.2	8.5	9.8	9.7	10.0	20.1	27.7def
Diclofop	2.0	9.7	10.0	9.6	0	0	16.5	18.5cd
Diclofop	4.0	9.7	9.2	9.0	2.3	1.0	--	--
Diclofop + Pyrazon	2.0 + 3.0	9.2	9.2	9.8	10.0	9.3	20.8	32.7f
Diclofop + Ethofumesate	2.0 + 2.0	9.3	9.3	9.9	10.0	9.8	24.4	33.6f
HOE - 29152	0.5	9.8	9.8	9.8	0	1.3	--	--
HOE - 29152	1.0	9.7	9.8	9.9	0	0	16.0	16.7bc
HOE - 29152	2.0	9.8	9.8	10.0	0	0	--	--
HOE - 29152 + Pyrazon	1.0 + 3.0	9.5	8.7	10.0	9.8	9.7	18.8	28.5ef
Pyrazon + TCA	3.0 + 7.0	8.7	9.2	6.0	9.0	9.8	15.9	15.4bc
Pyrazon + Propham	3.0 + 3.0	8.8	8.7	3.7	10.0	10.0	8.9	8.4ab
Endothall	6.0	9.5	9.8	2.7	5.2	3.7	--	--
BASF 9021 OH	2.0	9.8	10.0	3.2	0	0	--	--
BASF 9021 OH	4.0	10.0	10.0	2.8	0	0	--	--
Cycloate	4.0	8.0	8.0	9.9	6.5	8.3	15.6	16.2bc
R-12001	2.0	9.2	9.3	9.2	8.9	1.7	--	--
R-12001	4.0	9.5	9.0	9.7	9.5	7.7	16.8	21.4cde
R-12001	6.0	8.0	7.2	9.7	9.7	7.7	--	--
Oryzalin	1.0	5.7	6.7	8.7	10.7	8.0	--	--
Oryzalin	2.0	4.7	5.7	8.8	10.0	9.3	--	--
GCP - 3688	1.50	9.8	9.8	1.0	2.7	7.7	--	--
GCP - 3688	3.0	9.5	9.3	4.0	4.0	8.7	--	--
Untreated check		10.0	10.0	0	0	0	4.8	1.6a
Untreated check		9.8	10.0	1.0	0.7	2.0	5.7	5.7a

All data are means of 3 replications.

[1] Stand or vigor: 0 = non present or no vigor; 10 = normal or full vigor.
Control: 0 = no control; 10 = complete control.

[2] Plot area harvested: 2 beds by 15 ft.

[3] Data followed by different letters differ significantly at the p=0.05 level.

Preplant herbicide treatments for weed control in sugarbeets. Schild, L.D. and E.E. Schweizer. Five experimental herbicides were compared to cycloate for the selective control of foxtail, redroot pigweed, common lambsquarters, and nightshade in sugarbeets.

The experiment was conducted on a sandy clay loam with 2.5% organic matter and a pH of 7.7. The herbicides were sprayed broadcast with water on April 14 at a total volume of 20 gpa and then incorporated 1½ inches deep with a rolling cultivator. Immediately following the herbicide incorporation, pelleted 'GW Mono-Hy D2' sugarbeet seeds were planted to a depth of 1¼ inches. Natural precipitation on April 15 of 1.10 inches and sprinkler irrigation on April 20 of 1.00 inch promoted germination.

The response of sugarbeets and weeds to the herbicides was determined by counting the number of weeds and by visually assessing crop vigor. Weeds were counted in two quadrats, each 4½ inches by 10 ft, per treatment from each of four replications. The stand of weeds in the treated plots has been expressed as a percentage of those weeds present in the untreated plots.

The stand of sugarbeets was reduced most by SN 533 at 2 lb/A or by mixtures of ethofumesate plus R-12001 and ethofumesate plus SN 533 (see Table). Sugarbeets were injured least with cycloate.

With the exception of R 12001 at 2 lb/A and SN 533 at 1 lb/A, all treatments reduced the stand of foxtail more than cycloate (87%). Ethofumesate at 2 lb/A mixed with SN 533 at 1½ lb/A or R 12001 at 4 lb/A completely controlled foxtail. Seven treatments reduced the stand of redroot pigweed more than did cycloate, with SN 533 plus ethofumesate completely controlling this species. Ethofumesate mixed with diclofop, HOE 29152, R 12001, or SN 533 reduced the stand of redroot pigweed 99% or more. These mixtures also controlled common lambsquarters and nightshade better than did cycloate. The treatment of R 12001 at 6 lb/A was the only herbicide applied alone that controlled common lambsquarters better than did cycloate. Nightshade was controlled completely by the mixture of 4 lb/A of R 12001 plus 2 lb/A of ethofumesate.

Six treatments reduced the total weed population better than did cycloate. With respect to sugarbeet tolerance and weed control, the mixtures of diclofop plus ethofumesate and HOE 29152 plus ethofumesate were the best treatments. These latter two mixtures warrant further investigation. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Fort Collins, CO 80523)

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

Treatments		Sugarbeet[a]		Weed control						
				Stand reduction					Control ratings[b]	
Herbicides	Rate lb/A	Stand reduction	Tolerance rating %	Fox-tail	Redroot pigweed	Lambs-quarter %	Night-shade	Avg	Grass	Broad-leaf %
Diclofop	1 1/2	5	88	94	14	49	60	54	92	24
Diclofop + Ethofumesate	1 1/2 + 2	3	93	99	99	96	79	93	98	96
HOE 29152	1/2	3	88	96	16	45	38	49	89	39
HOE 29152 + Ethofumesate	1/2 + 2	5	87	99	99	94	92	96	97	97
R 12001	2	8	84	85	75	65	72	74	90	56
R 12001	4	28	64	96	85	77	75	83	95	75
R 12001	6	22	54	98	85	96	95	94	99	85
R 12001 + Ethofumesate	2 + 2	57	29	99	99	92	95	96	99	98
R 12001 + Ethofumesate	4 + 2	52	19	100	99	99	100	99+	100	98
SN 533	1	8	82	69	82	60	56	67	68	76
SN 533	2	56	50	88	93	77	73	83	85	82
SN 533 + Ethofumesate	1 1/2 + 2	78	14	100	100	99	77	94	100	99
Ethofumesate	2	12	83	94	98	80	47	80	93	85
Cycloate	3	5	96	87	89	89	68	83	90	89

[a] Evaluations - June 7. Ratings of 0 = all plants were killed and 100 = no sugarbeet injury.

[b] Evaluations - June 7. Ratings of 0 = no weed control and 100 = all plants were killed.

Evaluation of herbicides for postemergence weed control in sugarbeets. Schild, L.D. and E.E. Schweizer. Herbicides, applied alone or as mixtures, were evaluated for selective control of foxtail, redroot pigweed, and common lambsquarters in sugarbeets.

The experiment was conducted on a sandy clay loam soil with 2.4% organic matter and a pH of 7.6. The herbicides were applied broadcast with a bicycle sprayer at a volume of 30 gpa on May 12. Stages of plant growth were: sugarbeets had 2 true leaves which were fully extended; foxtail had 3 to 4 leaves and were 2 to 3 inches in ht; redroot pigweed had 2 to 4 leaves and were 1/4 to 1/2 inches in ht; and common lambsquarters had 6 to 10 leaves and were 1 to 2 inches in ht. Precipitation before application was 0.42 inches on May 2, and 1.35 inches May 15-19.

The response of weeds and sugarbeets to the herbicides was determined by counting the number of weeds and by visually assessing crop vigor. Weeds were counted in two quadrats, each 5 inches by 10 ft, per treatment, from each of three replications. The stand of weeds in the treated plots has been expressed as a percentage of those weeds present in the untreated check plots.

The stand of sugarbeets was reduced most by the mixtures of diclofop plus desmedipham plus phenmedipham plus BioVeg and HOE 29152 plus desmedipham plus phenmedipham plus BioVeg (see Table). These two treatments also suppressed the foliar growth of sugarbeets the most. The least suppression in foliar growth resulted from phenmedipham and the mixture of desmedipham plus phenmedipham.

Six treatments reduced the stand of foxtail 94% or more, with the mixture of HOE 29152 at 1.5 lb/A plus Genapol X80 at 1/2% v/v completely controlling foxtail. The mixture of desmedipham plus phenmedipham with or without BioVeg reduced the stand of redroot pigweed by an average of 92%. Common lambsquarters was controlled 91% or more by five treatments, with the mixture of diclofop plus desmedipham plus phenmedipham plus BioVeg controlling 100% of this species. Overall weeds were controlled best (91 to 93%) when diclofop or HOE 29152 was mixed with desmedipham plus phenmedipham plus BioVeg. Further evaluations of these latter two mixtures are warranted. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Fort Collins, Colorado 80523).

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

Treatments		Sugarbeet[a]		Weed control					
				Stand reduction				Control ratings[b]	
Herbicides	Rate lb/A	Stand reduction (%)	Tolerance rating	Fox-tail	Redroot pigweed (%)	Lambs-quarters	Avg	Grass (%)	Broad-leaf
Phenmedipham	1	7	97	55	15	91	54	62	21
Desmedipham + Phenmedipham	1/2 + 1/2	2	96	55	93	94	81	67	95
Desmedipham + Phenmedipham + BioVeg	1/4 + 1/4 + 1 qt/A	3	88	23	92	95	70	60	97
Diclofop	1 1/2	3	89	99	7	54	53	99	13
Diclofop + Desmedipham + Phenmedipham	1/2 + 1/4 + 1/4	0	88	78	63	88	76	81	88
Diclofop + Desmedipham + Phenmedipham + BioVeg	1 + 1 1/2 + 1/2 + 1 qt/A	38	55	96	78	100	91	96	85
HOE 29152 + Genapol X80	1/2 + 1/2% v/v	3	68	94	11	46	50	96	47
HOE 29152 + Genapol X80	1 1/2 + 1/2% v/v	0	76	100	35	52	62	100	37
HOE 29152 + Desmedipham + Phenmedipham[c]	1/4 + 1/4 + 1/4	1	93	94	55	82	77	97	86
HOE 29152 + Desmedipham + Phenmedipham + BioVeg	1/2 + 1/2 + 1/2 + 1 qt/A	27	48	98	83	97	93	97	92

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[a] Evaluations - June 8. Ratings of 0 = all plants were killed and 100 = no sugarbeet injury.

[b] Evaluations - June 8. Ratings of 0 = no weed control and 100 = all plants were killed.

[c] Split application - 1st application when beets had 2-true leaves; 2nd application 14 days later.

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

The experiment was conducted on a sandy clay loam soil with a pH of 7.6 and 2.4% organic matter. Herbicide treatments were replicated three times. Herbicides were applied broadcast in water on May 12 (first application) and on May 26 (second application) with a bicycle sprayer at a volume of 30 gpa. Stages of growth at application were: sugarbeets 2 true leaves fully extended 2 inches; foxtail species cotyledon to 3 leaves, 2 to 3 inches in ht; redroot pigweed 4 leaves, 1/4 to 3/4 inches in ht; and common lambsquarters 4 to 8 leaves with a ht of 3/4 to 2 inches. Precipitation before the first application was 0.42 inches on May 2, between application 1.35 inches, and after the second application 0.28 inches on May 29.

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 quadrats, each 5 inches by 10 ft, per treatment from each of three replications. The stand of weeds in the treated plots has been expressed as a percentage of those weeds present in the untreated check plots.

Except for two herbicide mixtures the stand of sugarbeets was reduced 5% or less (see Table). The foliar growth of sugarbeets appeared to be suppressed 19 to 28% more by the addition of BioVeg.

The stand of grass was reduced 73% or more by five treatments, redroot pigweed 90% or more by ten treatments, and common lambsquarters 90% or more by eleven treatments. BioVeg improved overall weed control but reduced sugarbeet tolerance. The most effective herbicide mixtures were desmedipham plus phenmedipham plus BioVeg at 1/4 + 1/4 + 1 qt/A followed by 3/4 + 3/4 + 1 qt/A, or two applications at 1/2 + 1/2 + 1 qt/A. From our visual observations the split applications appeared to reduce the number of weeds more by killing the larger weeds which were only stunted initially from the first application. Further evaluations of mixtures of desmedipham plus phenmedipham applied as split applications with and without BioVeg are warranted. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Fort Collins, Colorado 80523).

Response of sugarbeets and weeds to a mixture of desmedipham (D) plus phenmedipham (P) applied alone, with BioVeg (B), or as split applications (Fort Collins, Colorado)

Treatments						Weed Control					
		Rate		Sugarbeet						Control ratings[b]	
		Application #1[c]	Application #2[d]	Stand	Tolerance rating[a]	Stand reduction					
Herbicide	No. applications	(lb/A)	(lb/A)	injury	(%)	SE[e]	PG	LQ (%)	Avg	Grass	Broadleaf (%)
D + P	2	¼ + ¼	¼ + ¼	0	99	39	81	69	63	73	92
D + P	2	3/8 + 3/8	3/8 + 3/8	3	87	69	96	92	86	87	96
D + P	2	½ + ½	½ + ½	0	87	78	94	97	90	89	99
D + P	1	½ + ½	–	4	93	48	67	91	69	68	81
D + P + B	2	¼ + ¼ + 1[f]	¼ + ¼ + 1[f]	1	80	40	89	76	68	78	93
D + P + B	2	3/8 + 3/8 + 1[f]	3/8 + 3/8 + 1[f]	21	63	67	95	98	87	88	99
D + P + B	2	½ + ½ + 1[f]	½ + ½ + 1[f]	10	59	82	99	98	93	94	100
D + P + B	1	½ + ½ + 1[f]	–	1	71	56	79	95	77	77	92
D + P	2	¼ + ¼	½ + ½	0	92	48	90	88	75	81	95
D + P + B	2	¼ + ¼ + 1[f]	½ + ½ + 1[f]	0	68	64	97	90	84	87	97
D + P	2	¼ + ¼	3/4 + 3/4	2	78	63	92	91	82	86	98
D + P + B	2	¼ + ¼ + 1[f]	3/4 + 3/4 + 1[f]	0	58	82	100	99	94	93	100
D + P	2	3/8 + 3/8	5/8 + 5/8	0	83	73	96	97	89	86	99
D + P + B	2	3/8 + 3/8 + 1[f]	5/8 + 5/8 + 1[f]	5	58	76	98	99	91	94	100

[a] Evaluations - June 9. Ratings of 0 = all plants were killed and 100 = no sugarbeet injury.

[b] Evaluations - June 9. Ratings of 0 = no weed control and 100 = all plants were killed.

[c] First application applied May 12; sugarbeets had 2-true leaves.

[d] Second application applied May 26; sugarbeets had 6-true leaves.

[e] SE = grasses; PG = redroot pigweed; LQ = common lambsquarters

[f] Equals one quart per acre of BioVeg.

The sites of uptake and effect of simulated overhead irrigation on uptake of diclofop by barnyardgrass. West L.D., J.H. Dawson, and A.P. Appleby. Diclofop has shown considerable promise for selective control of barnyardgrass in sugarbeets. A two-year study (1976 and 1977) was conducted to determine the site(s) of uptake of diclofop methyl ester by barnyardgrass and also the effect of overhead irrigation on uptake.

Greenhouse studies using glass-faced root boxes with a carbon band to separate first internode from the root system indicated that the primary site of soil uptake is the barnyardgrass root. Field results supported this since increasing amounts of overhead irrigation (soil-treated only) increased barnyardgrass control. However, factors other than chemical leaching may play a role.

The data in the following table show that diclofop has both soil and foliar activity on barnyard grass. This dual site of uptake has obvious advantages. Two of the more obvious are: (1) more surface area for chemical absorption than by either route alone and (2) when conditions for absorption by one route are not optimum, it may be compensated for by the other site. (Crop Science Department, Oregon State University, Corvallis 97331; Agr. Res. Serv., U.S. Dept. of Agr., Irrigated Agr. Res. and Ext. Center, Prosser, Washington 99350).

Mean noncompetitive plant rating percentages[ab] of diclofop-treated barnyardgrass under various shoot/root protection regimes at several rates of overhead irrigation. All plots, except the control, were treated with 1.1 kg/ha of diclofop

Treatment	Post-treatment irrigation (mm)	Noncompetitive plant rating[c] (%)			
		I	II	III	IV
1. Soil and shoot exposed	0.0	94.3 a	99.0 a	96.0 a	100.0 a
2. Soil and shoot exposed	2.5	99.0 a	100.0 a	99.0 a	100.0 a
3. Soil and shoot exposed	10.0[d]	98.0 a	99.0 a	96.8 a	100.0 a
4. Shoot protected and soil exposed	0.0	23.5 b	23.5 c	18.8 c	63.8 b
5. Shoot protected and soil exposed	2.5	29.5 b	86.5 b	22.0 c	100.0 a
6. Shoot protected and soil exposed	10.0	95.8 a	87.8 b	75.8 b	99.5 a
7. Shoot exposed and soil protected	0.0	97.0 a	93.5 ab	96.0 a	99.0 a
8. Control	-	0.0 c	1.0 d	4.0 d	3.0 c

[a] Means followed by a common letter are not significantly different at the 5% level using Duncan's New Multiple Range Test.

[b] Noncompetitive plant rating consists of dead plus static plants. Static plants are those that still contain some chlorophyll but have not developed appreciably since treatment and are therefore controlled.

[c] I, II, III, and IV refer to four experiments conducted over a two-year period at Prosser, Washington. Study I, initiated June 23, 1976, terminated August 12, 1976. Study II, initiated August 10, 1976, terminated July 11, 1977. Study IV, initiated August 1, 1977, terminated October 16, 1977.

[d] In Study I, 13 mm of water were applied to treatments 3 and 6 instead of 10 mm.

Annual weed control in cultivated sunflower. Alley, H.P., G.L. Costel and N.E. Humburg. The preplant incorporated and preemergence trials were established under dryland production at the Sheridan Agricultural Substation. Plots were 13.5 by 14 ft, randomized with three replications. All treatments were applied with a knapsack spray unit in a total volume of 40 gpa water. The preplant treatments were incorporated immediately following application with a Triple K unit. The preemergence treatments were applied immediately following the seeding operation. The soil was classified as a sandy loam (59.2% sand, 24.4% silt, 16.4% clay, with 1.4% organic matter and a pH of 6.2).

Metolachlor (8E) + chloramben at 2 + 2 lb/A and at 3 + 2 lb/A applied preemergence appeared to be the outstanding treatments, giving outstanding control without apparent damage to the sunflowers. Metolachlor (8E) as a preplant incorporated treatment reduced the sunflower stand by 50% of the untreated stand; this was not apparent when applied preemergence at the same rates. Oryzalin did not give satisfactory weed control and in addition reduced the sunflower stand by 80% at the 2.0 lb/A rate. (Wyoming Agric. Exp. Sta., Laramie, SR 837).

Annual weed control in cultivated dryland sunflower

Herbicide(s)	Rate lb/A	Percent control [1/] PW	PPW	SET	Observations
Preemergence					
Metolachlor (8E)	1.5	92	67	100	
Metolachlor (8E)	2.0	83	73	100	
Metolachlor (8E)	3.0	97	73	100	
Metolachlor (8E) + Chloramben	2.0 + 2.0	99	100	100	
Metolachlor (8E) + Chloramben	3.0 + 2.0	100	97	100	
Profluralin	1.0	67	57	100	
Oryzalin	1.0	78	50	50	
Oryzalin	2.0	85	80	95	Stand reduced 80%
Preplant					
Metolachlor (8E)	1.5	80	85	100	Stand reduced 50%
Metolachlor (8E)	2.0	96	96	100	Stand reduced 50%
Metolachlor (8E)	3.0	97	96	100	Stand reduced 50%

[1/] PW = redroot pigweed, PPW = prostrate pigweed, SET = green foxtail.

Postemergence control of downy brome in established winter wheat. Alley, H. P. and N.E. Humburg. A postemergence series of individual and combination herbicide treatments was applied to a winter wheat production field with a moderate to heavy infestation of downy brome on March 23, 1977. Herbicides included in the evaluation were those indicating promise from previous tests and new candidate compounds. At time of treatment, the winter wheat (Centurk) was in the 2 to 4-tiller stage of growth with the downy brome being in the 3 to 4-leaf stage with 3 to 4 tillers. The soil at the experimental site was classified as a sandy loam (72.0% sand, 16.8% silt, 11.2% clay with 3.3% organic matter and a 6.7 pH).

All treatments were applied with a three-nozzle knapsack spray unit in a total volume of 40 gpa water. Plots were one sq rd, randomized with three replications. Weed control evaluations were made on June 6, 1977, approximately two weeks after a severe hail.

The most promising treatments were metribuzin in combination with cyanazine, terbutryn, bromoxynil and diclofop. Although procyazine, propham (PPG-115), buthidazole, and R-24315 gave good control of downy brome all these treatments exhibited moderate to severe damage to the winter wheat.

The most interesting observations were the increased downy brome control and decreased damage to the winter wheat with the combinations of metribuzin + terbutryn, metribuzin + bromoxynil, metribuzin + dicamba and metribuzin + diclofop. (Wyoming Agric. Exp. Sta., Laramie, SR 841).

Postemergence downy brome control in established winter wheat

Herbicide [1]	Rate lb ai/A	Downy brome % control	Winter wheat phytotoxicity[2]
Buthidazole	0.125	0	0
Buthidazole	0.25	0	0
Buthidazole	0.5	90	30 (green)
R-24315	2.0	80	30 to 40
R-40244	0.5	0	0
R-40244	1.0	0	0
R-40244	2.0	0	0
Paraquat + WA	0.0625	0	0
Paraquat + WA	0.125	0	0
Paraquat	0.125	0	0
Paraquat	0.5	70	0
Metribuzin	0.125	0	0
Metribuzin	0.1875	0	0
Metribuzin	0.25	40	0
Metribuzin	0.375	98	20
Metribuzin + Terbutryn	0.125 + 1.0	50	0
Metribuzin + Bromoxynil	0.125 + 0.25	60	0
Metribuzin + Diclofop	0.125 + 1.0	0	0
Metribuzin + Dicamba	0.125 + 0.094	0	0
Terbutryn	1.0	0	0
Procyazine	2.0	80	20
Propham (PPG-115)	2.0	85	50
Cyanazine	1.2	0	0
Cyanazine + Metribuzine	1.0 + 0.25	90	40
Metribuzin + Terbutryn	0.25 + 0.25	95	0
Metribuzin + Bromoxynil	0.25 + 0.25	95	0
Metribuzin + Diclofop	0.25 + 1.0	95	0
Metribuzin + Dicamba	0.25 + 0.094	95	0

[1] Treated March 23, 1977.
[2] Phytotoxicity as compared to non-treated check 0 to 100%.

The effects of adjuvants on the control of two wild oat strains with diclofop. Brewster, B.D., Arnold P. Appleby, and Patrick K. Boren. A field trial conducted on a Canadian strain of wild oats in spring wheat in 1976 indicated that surfactants can enhance the activity of diclofop when soil moisture is low. These results on the Canadian wild oats were confirmed with a greenhouse trial in which the soil surface was protected so that the uptake of diclofop was entirely through the leaves.

Another field trial was conducted on spring wheat in 1977 to compare the effects of diclofop on two strains of wild oats, one from Canada and another from western Oregon.

The trial was replicated three times. Individual plots were 2.5 m by 7.5 m. Strips 2.5 m wide of Canadian wild oats and Oregon wild oats were planted across each plot after planting Fielder spring wheat. Herbicide applications were made at two different timings, the first when the wheat had formed the first tiller and the wild oats had two leaves, and the second when the wheat had formed two to three tillers and the wild oats had formed one to two tillers.

Results of some of the treatments are in the following table. Diclofop was more effective on the Oregon wild oats than on the Canadian wild oats. The differences were much more pronounced on the treatments which were applied at the later growth stage.

The addition of adjuvants to diclofop resulted in excellent control of the Canadian wild oats.

Similar differences in sensitivity of the two wild oat strains were also demonstrated with barban and difenzoquat, indicating that the difference in response may be due to a difference in leaf morphology rather than a difference in physiology of the two strains. (Crop Science Department, Oregon State University, Corvallis 97331).

Percent control of two wild oat strains and wheat grain yield following treatment with diclofop with and without adjuvants

Treatment	Rate kg/ha	% wild oat control		Wheat yield kg/ha
		Canadian	Oregon	
April 29				
Diclofop	0.7	92	97	3070
Diclofop	1.1	96	100	3000
Diclofop + Genapol X80	0.7 + 1/2%	99	100	2860
Diclofop + Genapol X80	1.1 + 1/2%	100	100	2940
Diclofop + Renex 36	0.7 + 1/2%	99	97	2880
Diclofop + Renex 36	1.1 + 1/2%	100	100	2570
Diclofop + SX 104	0.7 + 1/2%	100	100	3170
Diclofop + SX 104	1.1 + 1/2%	100	100	3030
Diclofop + Surfactant-crop oil blend	0.7 + 1/2%	96	99	3000
Diclofop + Surfactant-crop oil blend	1.1 + 1/2%	99	100	2940
Diclofop + Superior oil	0.7 + 1/2%	98	99	2880
Diclofop + Superior oil	1.1 + 1/2%	99	100	2930
Barban	0.4	52	82	3030
May 13				
Diclofop	0.7	88	99	3010
Diclofop	1.1	84	100	3070
Diclofop + Genapol X80	0.7 + 1/2%	94	99	3200
Diclofop + Genapol X80	1.1 + 1/2%	100	100	3140
Diclofop + Renex 36	0.7 + 1/2%	99	99	3020
Diclofop + Renex 36	1.1 + 1/2%	100	99	3300
Diclofop + SX 104	0.7 + 1/2%	100	100	3020
Diclofop + SX 104	1.1 + 1/2%	100	100	2740
Diclofop + Surfactant-crop oil blend	0.7 + 1/2%	99	100	3110
Diclofop + Surfactant-crop oil blend	1.1 + 1/2%	99	100	3090
Diclofop + Superior oil	0.7 + 1/2%	99	100	2940
Diclofop + Superior oil	1.1 + 1/2%	100	100	2970
Difenzoquat	1.1	85	100	3030
Difenzoquat + X-77	1.1 + 1/2%	92	100	2820
Control	0	0	0	2880

C.V. = 8.2%
LSD$_{.05}$ = N.S.

Deep fumigation with 1,3-D to control johnsongrass in winter wheat. Geronimo, J. 1,3-dichloropropene (1,3-D) soil fumigant was evaluated for its herbicidal effect on johnsongrass infesting a crop of winter wheat. The trial was conducted in a field situated in the Sacramento-San Joaquin Delta of California. The fumigant was injected at a depth of 12 to 16 inches into a loam soil containing 10% organic matter using a "V" shaped subsoiler with 5 curved chisels spaced 16 inches apart. Treatments were made in plots 16 ft wide by 100 ft long with 4 replicates per treatment. Date of application was November 21, 1975 when the soil temperature at a depth of one ft was 52 F and soil moisture was low. Sealing was accomplished immediately after fumigation on December 16, 1975. Control of johnsongrass was evaluated and wheat yields were taken on August 12 and 13, 1976.

At the three rates of 1,3-D applied, the stand of johnsongrass was reduced by 88, 96 and 97% when compared to untreated and unsubsoiled areas heavily infested with johnsongrass. Subsoiling alone significantly reduced the infestation of johnsongrass but not to as great an extent as obtained with injection of 1,3-D. Wheat yields were significantly increased with all 1,3-D treatments and also with subsoiling alone. Wheat kernel size was not affected by 1,3-D treatment and abnormal numbers of malformed ears were not observed.

The results show that johnsongrass was susceptible to the action of 1,3-D at the lowest rate applied, 184 lb ai/A. Subsoiling alone significantly reduced the stand of johsongrass by bringing rhizomes to the surface where they were subjected to desiccation and temperature extremes, but the reduction in stand obtained with subsoiling alone was significantly less than those obtained with the 1,3-D treatments. Wheat yields were significantly increased equally in subsoiled plots and in plots treated with up to 368 lb ai/A of 1,3-D. In summary, 1,3-D injected at 184, 276 and 368 lb ai/A 26 days before seeding winter wheat into a field infested with rhizomes and seed of johnsongrass produced equally significant reductions in the stand of johnsongrass and equally significant increases in the yield of winter wheat. (Dow Quimica Mexicana S.A. de C.V., Paseo de las Palmas 555, Mexico 10, D.F., Mexico).

Stand reduction of johnsongrass and yields of wheat 9 months after deep injection of 1,3-D soil fumigant

	Johnsongrass	Wheat	
Lb ai/A[1]	Reduction of spikes as % of unsubsoiled control	Yield lb/A	# kernels/ 10 g
184	88 c	8,238 b	268 b
276	96 c	8,413 b	264 b
368	97 c	8,407 b	264 b
Untreated, subsoiled	55 b	8,140 b	271 b
Untreated, subsoiled	(97.0)[2] 0 a	7,035 a	247 a

[1] Rates correspond to 20, 30 and 40 gpa of Telone II soil fumigant respectively. Telone II soil fumigant containing at least 92% 1,3-D was applied.

[2] Value in parentheses is the number of johnsongrass spikes per 800 ft^2. Average of 4 replicates. Values within columns followed by the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

Postemergence applications of herbicides in wheat. Hamilton, K.C., and H.F. Arle. Two tests were conducted during 1976-77 at Mesa, Arizona to determine the effects of postemergence applications of herbicides on Cajeme wheat. Wheat was planted in December in rows spaced 12 inches apart. Seed was planted in moist soil under a dry soil mulch. In one test, rates of MSMA, difenzoquat, and diclofop were applied on December 23, 1976 when wheat was 4 to 6 inches high. In the second test, the same herbicides were applied with dicamba, 2,4-D amine, or bromoxynil on the same date. Herbicides were applied in 40 gpa of water. Treatments were replicated four times on 6 by 30 foot plots. Development of wheat was observed every few weeks and plots were harvested by combine in May, 1977.

MSMA, difenzoquat, and diclofop applied alone did not affect the growth of wheat. In January and February, herbicide combinations containing dicamba caused stem bending and stunting of wheat. From March to May, combinations of 2,4-D with difenzoquat and diclofop stunted wheat and delayed maturity.

At harvest no herbicide treatment reduced grain yields. Combinations of 2,4-D with difenzoquat and diclofop reduced the bushel weight of wheat (Plant Sciences Department, University of Arizona, Tucson, Arizona 85721).

Wheat yield and bushel weight after postemergence applications of herbicides at Mesa, Arizona

Treatments				Yield of grain 1/	Bushel weight 1/
Herbicides	lb/A	Herbicide	lb/A	lb/A	lb
Untreated				6,240 a	64 a
MSMA	2			6,400 a	64 a
MSMA	4			6,240 a	64 a
Difenzoquat	1			6,320 a	64 a
Difenzoquat	2			6,080 a	64 a
Diclofop	1			6,080 a	64 a
Diclofop	2			6,400 a	64 a
MSMA + Diclofop	2 + 1			6,240 a	64 a
Untreated				6,240 a	64 a
MSMA	2	2,4-D	0.50	5,660 a	63 a
MSMA	2	Dicamba	0.25	6,030 a	64 a
Difenzoquat	1	2,4-D	0.50	5,660 a	60 b
Difenzoquat	1	Dicamba	0.25	5,950 a	64 a
Difenzoquat	1	Bromoxynil	0.25	6,030 a	64 a
Diclofop	1	2,4-D	0.50	5,990 a	61 b
Diclofop	1	Dicamba	0.25	5,990 a	64 a

1/ In each test and column, values followed by the same letter are not significantly different at the 5% level.

Annual grass control in wheat. Heathman, E.S. and D.R. Howell. Three herbicides were evaluated for control of canarygrass and wild oat, in Inia 66 wheat, drilled on the flat and border irrigated. The soil was a clay loam. Wild oat and canarygrass seed were roto-tilled in prior to planting wheat. Trifluralin was applied to the soil in 20 gpa of water and harrowed in December 14, 1976 prior to planting and the germination irrigation December 15, 1976. Barban was applied to the foliage of the weeds and wheat in 7 gpa water January 18, 1977 when wild oat had two leaves and canarygrass had one or two leaves. The second application of barban in the sequential treatment of barban followed by barban was applied 2 weeks later on February 1, 1977. Difenzoquat was applied to the foliage of the weeds and wheat in 10 gpa of water February 1, 1977 when wild oat was three to five leaf and canarygrass one to three leaf. Canarygrass was the major weed present and averaged near 3 per square foot. Wild oat averaged less than 0.3 per square foot. All herbicides were applied with a compressed air sprayer. Plot size was 15 by 26 feet in a randomized complete block design with four replications.

Harvest was June 9, 1977 when a 10 by 26 foot swath was combined from each plot. The total weight from each swath was used to compute yield per acre.

Trifluralin stunted wheat and reduced stands early in the season. Wheat growth at harvest was normal. Where trifluralin has been tested on lighter soil types, severe injury to wheat has occurred. Trifluralin controlled canarygrass but was less effective for wild oat.

Barban controlled canarygrass and wild oat as a single or as a sequential treatment. Because canarygrass was the most prevalent weed, control was essential for increased yields.

Difenzoquat did not control canarygrass but did control wild oat. The sequential treatment of barban followed by difenzoquat resulted in excellent weed control and the highest wheat yield. (Plant Sciences Dept., Cooperative Extension Service, Univ. of Arizona, Tucson, AZ 85721).

Yield of wheat in lb/A and percent control of canarygrass and wild oat with preplant and postemergence herbicides at Yuma, Arizona

Treatment	Rate lb/A	Wheat	% control	
			Canarygrass	Wild oat
Barban	.37	6260 a*	88 a	91 c
Barban + Barban	.3 + .3	5680 ab	98 a	99 a
Difenzoquat	.5	4930 b	35 b	94 bc
Difenzoquat	.75	4840 b	54 b	95 bc
Difenzoquat	1.0	4730 b	43 b	96 ab
Trifluralin	.5	5600 ab	85 a	83 d
Barban + Difenzoquat	.3 .75	6680 a	90 a	99a
Trifluralin + Difenzoquat	.5 .75	4810 b	88 a	96 ab
Check		4640 b	0 c	0 e

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

Canarygrass control in wheat. Hill, J.E. and D.W. Cudney. Canarygrass is a major problem for wheat production in the Imperial Valley and other areas of California. A trial was conducted at the University of California Imperial Valley Field Station, El Centro, California to determine the effectiveness of several herbicides and hand weeding for the control of canarygrass in wheat.

Canarygrass was seeded in the plot and disked shallowly into the soil. Wheat (variety Cajeme 71) was seeded at 80 lb/A. Preemergence surface (PES) treatments of diclofop (2 lb/A) and nitrofen (3 lb/A) were made on December 21, 1976, the date of planting, and the plot was irrigated following the PES treatments. Postemergence applications (see table for herbicides and rates) were made on January 31, 1977, at the 4 leaf stage of wheat development and the 1 to 2 leaf stage of canarygrass development. Canarygrass plants numbered 10 per sq ft in the untreated plots. One treatment was hand weeded at the time of postemergence application and twice again at ten day intervals.

Nitrofen, diclofop, and metribuzin provided good control of canarygrass. The two preemergence treatments gave the highest yields. All of the postemergence treatments gave acceptable, if not good, canarygrass control although yields were not as high in the post as in the preemergence treatments. Postemergence treatments of metribuzin and diclofop were phytotoxic to wheat as measured both from visual observations and from yield. Yields from the low rates of both diclofop and metribuzin, however, were significantly greater than from the untreated plots.

The results of this study indicate that these herbicides will control canarygrass in wheat. Preemergence treatments of nitrofen and diclofop appear to be the safest and most effective. Preemergence treatments, however, are less readily accepted by the cereal producer than are postemergence treatments. These results indicate that postemergence treatments of diclofop and metribuzin were effective in controlling canarygrass but somewhat phytotoxic to wheat at low rates. Perhaps lower rates of postemergence applications of diclofop will reduce the phytotoxic effects. (University of California, Cooperative Extension, Botany Department, Davis, CA 95616 and Court House, El Centro, CA 92243).

Canarygrass control in wheat

Treatment	Rate lb/A	Canarygrass[1], [2] control	Vigor[1], [3] reduction	Yield[1], [3] lb/A	Bushel wt[1]
Preemergence					
Diclofop	2.0	10.0	0.0	6352 a	63.5 ab
Nitrofen	4.0	9.0	0.0	6288 a	63.3 ab
Postemergence					
Diclofop	2.0	10.0	1.3	5535 b	64.0 a
Diclofop	4.0	10.0	3.5	4162 d	63.0 b
Metribuzin	0.25	9.0	2.3	4952 c	63.3 ab
Metribuzin	0.50	10.0	6.3	3215 e	61.8 c
Hand weeded	-	6.3	0.0	5756 b	63.8 ab
Untreated	-	0.0	0.0	4434 d	64.0 a

[1] average of four replications

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

[3] means followed by the same letter are not significantly different at the 5% level.

Evaluation of herbicides for weed control in fallow systems. Humburg, N.E. and H.P. Alley. The treatments were applied April 13, 1976 to established weed species. The downy brome was 1/2 to 1-1/2 inches tall with 4 to 5 leaves. Plots were one rd sq, randomized with three replications. The soil at the experimental site was classified as sandy loam (66.8% sand, 21.6% silt, 11.6% clay, with 0.49% organic matter and a pH of 6.0). All treatments were applied with a knapsack sprayer equipped with a 3-nozzle boom calibrated to deliver 40 gpa total volume of water carrier.

The weed population consisted of downy brome, tansy mustard and Russian thistle on June 28, 1976. Evaluations made on June 28, 1977 were only for residual control of downy brome and wheat stand.

Downy brome control in 1977 ranged from 0 to 99%. Herbicides giving 90% or greater control resulted in severe stand reduction. All herbicides with soil persistence exhibited control of downy brome in 1977, one year following treatment. However, with the exception of tebuthiuron and buthidazole at 1 and 2 lb/A, downy brome control on June 28, 1977, was approximately half that of one year earlier. Propham (Chem Hoe 135) at 3 and 4 lb/A gave 57% and 53% control, respectively, without stand injury. Buthidazole gave 40% and 85% downy brome control at 0.5 and 1.0 lb/A without significant stand reduction; yields were intermediate but not significantly lower than that of the best treatment. Higher rates of buthidazole significantly reduced wheat stand and yields. Treatments with glyphosate, which has no residual activity, resulted in plots that were heavily infested with downy brome and subsequently had low grain production. Tebuthiuron, at the rates applied, virtually eliminated all vegetation, including a heavy infestation of skeletonleaf bursage. (Wyoming Agric. Exp. Sta., Laramie, SR842).

Winter wheat yield, stand, heights and weed control in fallow systems resulting from single herbicide applications

		Downy brome		Wheat[1]			
	Rate	% control		%	Height	Drought	Yield
Herbicide	lb/A	1976	1977	Stand	inches	stress	bu/A
Propham (PPG-135)	3.0	99	57	100	21	3.3	16.3 c-h[2]
Propham (PPG-135)	4.0	99	53	100	21	3.7	13.8 c-h
Cyanazine (4WDS)	1.6	73	20	93	22	3.0	16.9 b-h
Cyanazine (4WDS)	2.4	73	47	100	23	3.0	17.3 a-h
Cyanazine (4WDS) + X-77	1.6	70	30	100	27	1.7	15.0 c-h
Cyanazine (4WDS) + X-77	2.4	86	33	100	25	2.7	16.8 b-h
Cyanazine (4WDS) + diesel	1.6	56	16	100	26	1.7	15.1 c-h
Cyanazine (4WDS) + diesel	2.4	96	60	100	26	2.3	20.1 a-g
Cyanazine (80W) + X-77	1.6	23	7	100	27	2.3	12.5 e-h
Cyanazine (80W) + X-77	2.4	57	23	100	29	1.0	10.7 ghi
Cyanazine (80W) + diesel	1.6	62	33	100	26	2.7	17.3 a-h
Cyanazine (80W) + diesel	2.4	83	30	100	26	2.0	13.2 d-h
Buthidazole (80W)	0.5	82	40	99	27	2.3	20.3 a-g
Buthidazole (80W)	1.0	100	85	98	29	1.7	22.1 a-e
Buthidazole (80W)	2.0	100	90	43	25	1.0	13.0 d-h
Buthidazole (80W)	4.0	100	99	9	21	1.0	3.1 i
Glyphosate	0.2	23	17	100	25	2.3	14.5 c-h
Glyphosate	0.3	40	0	97	22	3.7	11.4 f-i
Glyphosate	0.4	78	13	78	20	3.7	8.9 hi
Tebuthiuron	0.5	40	--	2	--	--	----
Tebuthiuron	1.0	80	--	2	--	--	----
Tebuthiuron	1.5	95	--	1	--	--	----
Tebuthiuron	2.0	100	--	0	--	--	----
Check	---	0	0	100	22	4.0	12.7 d-h

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[1] Stand and drought stress evaluations, and height measurements June 28, 1977. Drought stress: 0 = none, 5 = severe. Harvest July 18, 1977.

[2] Means with the same letter(s) within the same column are not significantly different at the 5% level.

Evaluation of three wild oat herbicides in winter wheat. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt, and F.H. Jacobs. Plots were established at Rexburg, Idaho to determine the effectiveness of three herbicides for wild oat control in winter wheat (cultivar Nugaines). Plots were treated in May, 1977. Herbicides were applied with a conventional field sprayer. Barban was applied in 7 gal of water per acre when the wild oat plants were in the 1-1/2 to 2 leaf stage as a conventional treatment. As a split application treatment, barban was re-applied 14 days after the first application. Diclofop was applied in 20 gal of water per acre when the wild oat plants were in the 2 to 3 leaf stage. Difenzoquat was also applied in 20 gal of water per acre when the wild oat plants were in the 4 to 5 leaf stage. Treatments were replicated three times in a randomized complete block design. Individual plots were 0.75 acres in size. The soil at the study site is a silt loam with 1.7% OM and a pH of 7.5. Percent wheat stand was obtained from actual species counts within four 6 inches by 5 ft quadrats per plot. Numbers of plants in treated plots were compared to numbers in nontreated check plots. Percent wild oat control was determined by comparing the green weights of wild oat plants in treated plots to the green weights of wild oat plants in the nontreated check plots.

Only diclofop at 1.0 lb/A provided satisfactory control of wild oat. All other treatments gave less than 79% control. Wheat yields in plots treated with split applications of barban were comparable to those yields in plots treated with diclofop at 1.0 lb/A. Yields in all other treatments were suppressed compared to the nontreated check plots. Plots treated with difenzoquat did not kill the wild oat plants. Consequently, wheat yields were suppressed due to wild oat competition. (Idaho Agriculture Experiment Station, Moscow, Idaho 83843).

Winter wheat stand and wild oat biomass control
resulting from foliar applications of 3 wild oat herbicides

Treatment	Rate lb/A	Percent wheat stand	Percentage wild oat control By biomass	Yield Bu/A	Yield Percent of untreated Check
Barban	0.375	103	63	54	81
Barban	0.5	113	71	60	90
Barban/Barban*	0.25/0.25	107	78	69	103
Diclofop	0.75	104	79	64	96
Diclofop	1.0	112	91	70	105
Difenzoquat	0.75	93	0	64	96
Difenzoquat	1.0	114	51	61	91
Untreated check		100	0	67	100

*Split application of barban. Second treatment applied 14 days after first treatment.

Note: Wild oat population density at time of harvest averaged 7 plants per square foot in the untreated check.

Evaluation of postemergence herbicides for wild oat control in winter wheat. Lee, G.A., G.A. Mundt and M.E. Coleman-Harrell. A field experiment was established at Grangeville, Idaho to compare the effectiveness of several herbicides for postemergence control of wild oats in winter wheat (variety Nugaines). The plots were treated May 12, 1977 when the winter wheat was in the 3 to 4 leaf stage of growth. Herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 30 ft. Treatments were replicated three times in a randomized complete block design. The winter wheat had undergone some moisture stress prior to the herbicide application but rain prior to herbicide treatment reduced the drought stress condition. Ambient temperature at time of application was 49 F, soil temperature 55 F at 4 inches, relative humidity 87% and the wind was calm. The soil at the study site is a Nezperce silt loam with 8.0% OM and a pH of 6.0.

Percent winter wheat stand and percent wild oat control were obtained from actual species counts within two 6 in by 5 ft quadrats per plot. Number of plants obtained by this count were compared to similar counts taken in the untreated check plots. Wild oat control by biomass was obtained by clipping the wild oats at the soil surface within these two quadrat areas in each plot. These samples were dried and the resulting weights compared to the weights obtained in the untreated check plots.

Difenzoquat alone at 1.5 lb/A gave the best wild oat control and the resulting highest yield (accompanying table). Difenzoquat + 2,4-D amine provided poor weed control compared to the tank mix of difenzoquat + 2,4-D LVE. The data indicate difenzoquat + 2,4-D amine could possibly be having an antagonistic response when applied as a tank mix.

MSMA when applied alone gave good crop tolerance but unsatisfactory wild oat control. Tank mixes of difenzoquat and MSMA gave good wild oat control but no benefit from the addition of MSMA is indicated. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Winter wheat stand and wild oat control resulting from foliar applications of difenzoquat and MSMA

Treatment	Rate lb/A	Percent wheat stand	Percentage wild oat control		Yield	
			By count	By biomass	bu/A	Percent of untreated check
Difenzoquat	0.75	94	66	77	64	97
Difenzoquat	1.0	101	91	93	67	102
Difenzoquat	1.5	103	98	97	68	103
Difenzoquat + 2,4-D amine	1.0 0.5	101	42	47	64	97
Difenzoquat + 2,4-D LVE	1.0 0.5	107	90	93	62	94
Difenzoquat + Bromoxynil	1.0 0.5	103	88	96	68	103
Difenzoquat + MCPA	1.0 0.5	94	79	88	64	97
Difenzoquat + MSMA	0.75 2.0	87	87	95	66	100
MSMA	2.0	97	7	26	66	100
MSMA	3.0	104	54	73	64	97
Untreated check		100	0	0	66	100

Note: Wild oat population density at time of harvest averaged 6 plants per square foot in the untreated check.

The effect of depth of incorporation of diclofop, dinitramine and trifluralin on spring wheat and spring barley tolerance. Mundt, G.A. and G.A. Lee. Three candidate herbicides for annual brome grass control were applied preplant incorporated at two depths to evaluate spring wheat (cultivar Fielder) and spring barley (cultivar Steptoe) tolerance. Herbicide incorporation was accomplished with a flextine harrow and a disk to a depth of 1 inch and 2 inches respectively, immediately following the herbicide application. The study was initiated May 17, 1977 at Moscow, Idaho.

All treatments were applied with a powerplot sprayer at a total volume of 25 gpa water carrier. Each plot was 9 by 50 feet in size and replicated three times in a randomized split-block design.

Ambient temperature at the time of treatment was 40 F, soil temperature of 54 F at 4 inches, and relative humidiity of 100%. Light rain fell during the application of the herbicides but was not sufficient to influence the incorporation operation. The soil at the experimental site was classified as a Palouse silt loam with a pH of 6.5 and 3.5% OM.

Percent crop stand was determined on June 6, 1977 by counting the number of plants in an area 6 in by 5 ft in two locations in each plot. Crop height measurements were obtained July 11, 1977, when the wheat and barley plants were in the milk stage of growth. All treatments were harvested September 10, 1977.

Diclofop at 0.75 lb/A caused the least damage to spring barley and spring wheat at both depths of incorporation as indicated by yield (accompanying table). Trifluralin and dinitramine applications resulted in a substantial decrease in crop stand regardless of the incorporation method. Trifluralin at 0.75 lb/A in spring barley and spring wheat lowered yield, height, and crop stand as compared to the other herbicide applications and untreated check.

The test weights of grain samples from herbicide treated plots were highest in areas where the disk incorporation was utilized. The herbicidal toxicity resulting from deep placement in the soil decreased the crop stand. Because of the drought conditions which prevailed during the 1977 growing season, the decrease in crop stand increased the soil water available to the remaining crop resulting in higher test weights.

Flex-tine harrow incorporation of trifluralin at both rates did not cause a significant decrease in yield, whereas, the deeper placement of the herbicide with the disk incorporation resulted in a suppression of plant growth and yield. Dinitramine at both rates was also more phytotoxic to the crop with a disk incorporation. The mode-of-action of these two herbicides is indicative of the response received by their deep placement. Both dinitramine and trifluralin are root pruning herbicides whereas diclofop does not apparently cause such a response. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

The effect of depth of incorporation of diclofop, dinitramine and trifluralin on spring wheat and spring barley tolerance

Treatment	Rate lb/A	% Crop Stand Flex	Disk	Height (cm) Flex	Disk	Test wt. lb/Bu Flex	Disk	Bu/A Flex	Disk
				SPRING BARLEY					
Check	-0-	100.0	100.0	40.7	39.7	38.7	35.8	27.0	34.3
Dinitramine	.33	93.2	85.8	45.5	44.1	38.1	41.7	37.1	36.3
Dinitramine	.50	79.7	81.5	50.3	43.5	40.8	41.5	37.3	31.7
Trifluralin	.50	98.0	77.7	45.3	45.1	38.3	39.0	44.6	38.1
Trifluralin	.75	81.0	76.8	47.1	41.9	39.2	42.3	38.3	29.3
Diclofop	.75	100.7	98.2	46.3	48.7	37.2	40.4	52.3	44.2
Diclofop	1.0	92.7	76.7	44.7	43.5	38.1	39.8	39.0	43.2
				SPRING WHEAT					
Check	-0-	100.0	100.0	35.9	44.7	50.6	52.7	18.9	27.8
Dinitramine	.33	81.9	68.8	39.7	42.0	51.3	53.3	23.1	16.8
Dinitramine	.50	76.8	41.8	39.3	41.0	51.3	51.6	27.9	21.3
Trifluralin	.50	80.2	45.9	40.0	40.8	50.7	53.4	26.8	26.3
Trifluralin	.75	63.5	25.5	36.6	37.9	51.3	53.9	24.0	15.1
Diclofop	.75	113.0	94.2	39.0	44.0	50.0	52.5	30.2	34.1
Diclofop	1.0	140.3	96.4	38.7	41.7	51.6	52.7	30.6	32.9

Influence of surfactants on wild oat control in winter wheat with diclofop - I. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt and O.K. Baysinger. A study was established at Grangeville, Idaho to determine the effect of various surfactants on the phytotoxicity of diclofop to winter wheat (cultivar Hyslop) and wild oat. Plots were treated on April 26, 1977, when the wheat was in the 1 to 3 leaf stage and the wild oat was in the 1 to 2 leaf stage. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 30 feet. Treatments were replicated three times in a randomized complete block design. The sky was partly cloudy at the time of application. Air temperature and relative humidity were 49 F and 46%, respectively. Wind velocity was 0 to 2 mph. Soil temperature at 4 inches was 56 F. The soil at the study site is a Nez Perce silt loam with 8% OM and a pH of 6.0. Percent wheat stand and percent wild oat control were obtained from actual species counts within two 6 inch by 5 foot quadrats per plot. Numbers of plants in the treated plots were compared to numbers in the nontreated check plots. Percent wild oat control "by biomass" was also determined by clipping the wild oat plants at the soil surface in each of two quadrats per plot and recording dry weights of those clippings. Dry weights of clippings from the treated plots were compared to dry weights from the nontreated check plots.

Diclofop at 0.63 lb/A applied alone gave 98% control of wild oat and increased wheat yield 35% compared to the yields from nontreated check plots. The addition of a surfactant did not increase wild oat control but did suppress yield compared to the low rate of diclofop alone. Diclofop at 0.75 and 1.0 lb/A alone and with surfactants caused the production of empty wheat heads in several plots. Apparently those empty heads resulted from tissue degradation of the wheat stems at the soil surface. Consequently, the corresponding yields were suppressed when compared to the yield in plots treated with 0.63 lb/A of diclofop alone. It appears from these data that satisfactory wild oat control and increased winter wheat yield can be obtained from treatments of diclofop without the addition of surfactants. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Winter wheat stand and wild oat control resulting from foliar applications of diclofop plus surfactants at the 1 to 3 leaf stage of the wheat

Treatment	Rate lb/A	Percent wheat stand	Percentage Wild oat control		Yield	
			By count	By biomass	Bu/A	Percent of Untreated Check
Diclofop	0.63	133	98	98	70	135
Diclofop	0.75	156	87	85	66	127
Diclofop	1.0	184	98	99	69	133
Diclofop + Genapol	0.63	141	98	99	62	119
Diclofop + Genapol	0.75	156	79	95	64	123
Diclofop + Genapol	1.0	135	95	98	65	125
Diclofop + Renex 36	0.63	153	87	87	56	108
Diclofop + Renex 36	0.75	205	100	100	56	108
Diclofop + Renex 36	1.0	182	100	100	63	121
Diclofop + SX-104-ES-75	0.63	176	95	65	66	127
Diclofop + SX-104-ES-75	0.75	146	93	97	60	115
Diclofop + SX-104-ES-75	1.0	173	94	92	61	117
Diclofop + Ortho volick	0.63	134	58	56	62	119
Diclofop + Ortho volick	0.75	124	64	67	64	123
Diclofop + Ortho volick	1.0	137	99	100	63	121
Diclofop + Genapol*	0.75	142	65	77	60	115
Diclofop + Renex 36*	0.75	142	98	99	63	121
Genapol		121	19	38	64	123
Renex 36		106	32	9	55	106
SX-104-ES-75		120	0	53	55	106
Ortho volick		132	0	17	56	108
Untreated check		100	0	0	52	100

Note: All surfactants added to herbicide spray mixture at a rate of 0.5% v/v.

* Diclofop plus surfactant formulated by American Hoechst Corp.

Note: Wild oat population density at time of harvest averaged 13 plants per square foot in the untreated check.

Influence of surfactants on wild oat control in winter wheat with diclofop II. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt and O.K. Baysinger. A study was established in Grangeville, Idaho to determine the effect of various surfactants on the phytotoxicity of diclofop to winter wheat (Cultivar: Hyslop) and wild oat. Plots were treated on May 1, 1977, when the wheat was in the 3 to 4 leaf stage and the wild oat was in the 2 to 3 leaf stage. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 30 ft. Treatments were replicated three times in a randomized complete block design. Sky conditions were clear at the time of application. Air temperature and relative humidity were 74 F and 47%, respectively. Wind velocity was 1 mph. Soil temperature at 4 inches was 65 F. The soil at the study site was a Nez Perce silt loam with 8% OM and a pH of 6.0. Percent wheat stand and percent wild oat control were obtained from actual species counts within two 6 inch by 5 ft quadrats per plot. Numbers of plants in the treated plots were compared to numbers in the nontreated check plots. Percent wild oat control "by biomass" was also determined by clipping the wild oat plants at the soil surface in each of two quadrats per plot and recording dry weights of those clippings. Dry weights of clippings from the treated plots were compared to dry weights from the nontreated check plots.

Winter wheat yields were substantially suppressed in plots treated with 1.0 lb/A of diclofop plus surfactants, even though excellent wild oat control was obtained. Comparable wild oat control was obtained in plots treated with diclofop alone at 1.0 lb/A and yields were not suppressed when compared to the nontreated check plots. Satisfactory wild oat control was obtained with the lower rates of diclofop plus surfactants and wheat yields were generally not suppressed. The 1.0 lb/A rate of diclofop with surfactants resulted in a decrease in crop stand and wheat yield. This was probably due in part to the production of several empty heads in those plots. The higher rate of diclofop caused tissue degradation of the wheat stem at the soil surface.

In another study conducted in the same field and crop under the same general conditions, diclofop was applied to wild oat infested wheat when the wheat was in the 1 to 3 leaf stage and wild oat was in the 1 to 2 leaf stage. Both studies were evaluated on the same day. Better wild oat control was obtained when diclofop was applied to wild oat in the 1 to 2 leaf stage. Wheat stand and yield were greater in those treated plots. Diclofop alone at 0.63 lb/A gave excellent wild oat control and the highest yield when applied to wheat in the 1 to 3 leaf stage. Comparable wild oat control in wheat treated in the 3 to 4 leaf stage was obtained only with the 1.0 lb/A rate of diclofop plus genapol, ortho volick, or with diclofop plus surfynol at 0.75 lb/A. However, at those treatment rates and time, yields were substantially suppressed compared to the yields obtained with diclofop alone when applied to wheat in the 1 to 3 leaf stage. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Winter wheat stand and wild oat control resulting from foliar applications of diclofop plus surfactants at the 3 to 4 leaf stage of the wheat

Treatment	Rate lb/A	Percent wheat stand	Percentage wild oat control		Yield	
			By count	By biomass	Bu/A	Percent of untreated Check
Diclofop	0.63	132	64	70	62	94
Diclofop	0.75	105	62	73	65	98
Diclofop	1.0	101	90	96	66	100
Diclofop + Genapol	0.63	94	88	87	71	108
Diclofop + Genapol	0.75	93	84	92	70	106
Diclofop + Genapol	1.0	111	97	98	60	91
Diclofop + Renex 36	0.63	106	86	88	67	102
Diclofop + Renex 36	0.75	103	90	90	65	98
Diclofop + Renex 36	1.0	102	83	91	55	83
Diclofop + SX-104-ES-75	0.63	106	93	93	66	100
Diclofop + SX-104-ES-75	0.75	92	96	97	71	108
Diclofop + SX-104-ES-75	1.0	102	95	97	62	94
Diclofop + Ortho volick	0.63	113	91	93	73	111
Diclofop + Ortho volick	0.75	103	98	96	66	100
Diclofop + Ortho volick	1.0	103	100	99	63	95
Diclofop + Renex 36*	0.75	117	94	92	60	91
Diclofop + Genapol*	0.75	102	88	83	71	108
Diclofop + Surfynol*	0.75	109	98	100	61	92
Untreated check		100	0	0	66	100

Note: All surfactants added to herbicide spray mixture at a rate of 0.5% v/v.

* Diclofop plus surfactant formulated by American Hoechst Corp.

Note: Wild oat population density at time time of harvest averaged 8 plants per square foot in the untreated check.

Influence of surfactants on wild oat control in spring wheat with diclofop I. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt and O.K. Baysinger. Plots were established at Moscow, Idaho to determine the effect of various surfactants on the phytotoxicity of diclofop to spring wheat (cultivar: Fielder) and wild oat. Plots were treated on June 4, 1977 when the wheat and wild oat were in the 1 to 3 leaf stage. Herbicides were applied with a knapsack sprayer equipped with a three nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 15 ft. Treatments were replicated three times in a randomized complete block design. The sky was overcast at the time of application. Air temperature and relative humidity were 50 F and 88%, respectively. The wind was calm. Soil temperature at 4 inches was 60 F. The soil at the study site was a Palouse silt loam with 3.5% OM and a pH of 6.5. Percent wheat stand and percent wild oat control were obtained from actual species counts within two 6 inch by 5 ft quadrats per plot. Numbers of plants in the treated plots were compared to populations in the untreated check plots. Percent wild oat control "by biomass" was also determined by clipping the wild oat plants at the soil surface in each of two quadrats per plot and recording dry weights of the harvested foliage. Dry weights of foliage from the treated plots were compared to dry weights from the nontreated check plots. Drought conditions prevailed during the 1977 growing season in the Palouse area of Idaho. Consequently, spring wheat yields were greatly reduced and weed control was often erratic.

Wild oat control by actual species count was generally quite poor. Possibly the harsh dry conditions initiated a relatively thick layer of cuticle on the wild oat plants thus protecting them from drought as well as creating a barrier which inhibited herbicide absorption. Consequently, there generally was not enough penetration of diclofop into the leaves of the wild oat plants to cause death. However, diclofop was active in reducing the vegetative growth of the wild oat plants. This fact is reflected by the suppression of wild oat biomass produced in most of the herbicide treated plots. Diclofop at 0.75 lb/A applied alone gave 94% control of wild oat and increased yield 62% compared to the nontreated check plots. No other treatment gave a substantially greater percent control of wild oat with a correspondingly equal or greater yield increase. It is apparent from these data that diclofop at 0.75 lb/A applied alone results in satisfactory wild oat control and an increase in wheat yield. (Idaho Agricultural Experiment Station, Moscow, Idaho).

Spring wheat stand and wild oat control resulting from foliar applications of diclofop plus surfactants at the 1 to 3 leaf stage of the wheat

Treatment	Rate lb/A	Percent wheat stand	Percentage wild oat control		Yield	
			By count	By biomass	Bu/A	Percent of untreated check
Diclofop	0.63	78	34	46	15	115
Diclofop	0.75	65	67	94	21	162
Diclofop	1.0	85	76	92	19	146
Diclofop + Renex 36*	0.75	98	76	90	20	154
Diclofop + Genapol*	0.75	92	66	94	19	146
Diclofop + Surfynol*	0.75	95	78	88	25	192
Diclofop + Renex 36	0.63	105	82	80	19	146
Diclofop + Renex 36	0.75	83	70	86	21	162
Diclofop + Renex 36	1.0	97	78	96	19	146
Diclofop + SX-104-ES-75	0.63	104	92	99	17	131
Diclofop + SX-104-ES-75	0.75	87	90	92	20	154
Diclofop + SX-104-ES-75	1.0	97	92	98	21	162
Diclofop + Genapol	0.63	111	55	86	20	154
Diclofop + Genapol	0.75	102	63	86	23	177
Diclofop + Genapol	1.0	112	88	87	20	154
Diclofop + Ortho volick	0.63	86	31	69	17	131
Diclofop + Ortho volick	0.75	113	44	89	19	146
Diclofop + Ortho volick	1.0	84	93	99	20	154
Renex 36		77	16	24	15	115
SX-104-ES-75		89	2	0	15	115
Genapol		99	19	11	18	138
Ortho volick		95	10	22	14	108
Untreated check		100	0	0	13	100

* diclofop plus surfactant formulated by American Hoechst Corp.

Note: All surfactants added to herbicide spray mix at a rate of 0.5% v/v.

Note: Wild oat population density at time of harvest averaged 8 plants per square foot in the untreated check.

Influence of surfactants on wild oat control in spring wheat with diclofop II. Lee, G.A., M.E. Coleman-Harrell, G.A. Mundt, O.K. Baysinger. Plots were established at Moscow, Idaho to determine the effect of various surfactants on the phytotoxicity of diclofop to spring wheat (cultivar: Fielder) and wild oat. Plots were treated on June 16, 1977 when the wheat and wild oat plants were in the 3 to 4 leaf stage. Herbicides were applied with a three-nozzle boom calibrated to deliver 40 gpa. Individual plots were 9 by 15 ft. Treatments were replicated three times in a randomized complete block design. The sky was clear at the time of application. Air temperature and relative humidity were 62 F and 60% respectively. There was no wind. The soil temperature at 4 inches was 65 F. The soil at the study site was a Palouse silt loam with 3.5% OM and a pH of 6.5. Percent wheat stand and percent wild oat control were obtained from actual species counts within two 6 inch by 5 ft quadrats per plot. Numbers of plants in the treated plots were compared to numbers in the non-treated check plots. Percent wild oat control "by biomass" was also determined by clipping the wild oat plants at the soil surface in each of two quadrats per plot and recording dry weights of the foliage. Dry weights of foliage from the treated plots were compared to dry weights of foliage from the nontreated check plots. Drought conditions prevailed during the 1977 growing season in the Palouse area of Idaho. Consequently, spring wheat yields were greatly reduced and weed control was often erratic.

Only diclofop at 1.0 lb/A alone and with Ortho volick at 0.5% v/v gave 92% or better wild oat control. The addition of surfactants to diclofop did not consistently increase wild oat control. The greatest yield increase was obtained with diclofop at 0.63 lb/A applied alone. This may be due to possible crop phytotoxicity from higher rates of diclofop applied to wheat in the 3 to 4 leaf stage. Wheat plants treated with diclofop at 1.0 lb/A exhibited visually detectable chlorosis for a period of 2 to 3 weeks after initial treatment. In another study conducted in the same crop and field under the same general conditions, diclofop was applied alone and with surfactants to spring wheat and wild oat in the 1 to 3 leaf stage. Wild oat control was consistently better and yields were substantially greater when diclofop was applied to wheat and wild oat in the 1 to 3 leaf stage. (Idaho Agricultural Experiment Station, Moscow, Idaho 83843).

Spring wheat stand and wild oat control resulting from foliar applications of diclofop plus surfactants at the 3 to 4 leaf stage of the wheat

Treatment	Rate lb/A	Percent wheat stand	Percentage wild oat control		Yield	
			By count	By biomass	Bu/A	Percent of untreated check
Diclofop	0.63	113	75	87	24	150
Diclofop	0.75	103	83	87	16	100
Diclofop	1.0	113	84	92	17	106
Diclofop + Renex 36	0.63	116	73	61	15	94
Diclofop + Renex 36	0.75	106	86	88	21	131
Diclofop + Renex 36	1.0	102	81	79	14	88
Diclofop + SX-104-ES-75	0.63	102	88	69	18	113
Diclofop + SX-104-ES-75	0.75	106	62	48	18	113
Diclofop + SX-104-ES-75	1.0	104	82	77	18	113
Diclofop + Genapol	0.63	106	50	83	19	119
Diclofop + Genapol	0.75	103	58	55	17	106
Diclofop + Genapol	1.0	111	87	79	19	119
Diclofop + Ortho volick	0.63	110	74	71	18	113
Diclofop + Ortho volick	0.75	101	92	92	21	131
Diclofop + Ortho volick	1.0	105	85	97	22	138
Diclofop + Renex 36*	0.75	115	88	88	20	125
Diclofop + Genapol*	0.75	114	47	58	15	94
Diclofop + Surfynol*	0.75	107	82	69	16	100
Untreated check		100	0	0	16	100

* Diclofop plus surfactant formulated by American Hoechst Corp.

Note: All surfactants added to herbicide spray mix at a rate of 0.5% v/v.

Note: Wild oat population density at time of harvest averaged 11 plants per square foot in the untreated check.

Postemergence ryegrass control in wheat. Norris, R.F., R.A. Lardelli, and T. Kearney. This experiment was initiated in Yolo County, California to determine the effectiveness of several postemergence herbicides for annual ryegrass control in wheat.

The ryegrass was at a tillering stage of growth when the herbicides were applied on February 14, 1977. Canarygrass was also present, but only as a scattered infestation. The wheat, var. Anza, was also tillering at application. Plot size was 8 by 25 ft; the experiment employed a randomized complete block design with four replications. The soil was a Rincon silty clay-loam at an intermediate moisture level. Herbicides were applied with a CO_2 backpack sprayer, using 8004 nozzles at 34 p.s.i. delivering 40 gal/A.

The stand of ryegrass proved to be severe, and caused strong early competition with the wheat. Yields at harvest were very low. All treatments provided at least partial control of the ryegrass and resulted in increased wheat yield. Metribuzin provided very early control; diclofop required a longer time to achieve control. Adding Surfynol 465 to diclofop did not improve its performance. Metribuzin was the only chemical to give good control of the canarygrass. (Botany Department, Univ. of California, Davis, and Cooperative Extenstion, Woodland, Calif.).

Postemergence ryegrass control in wheat

Treatments[a]				Control[b]				Wheat yield
	Rate	Wheat vigor		Annual	Ryegrass		Canarygrass	7-18-77
Herbicide	(lb/A)	3-18-77	6-10-77	3-1-77	3-18-77	6-10-77	6-10-77	lb/A
Metribuzin	0.25	9.3	9.3	8.0	8.1	7.6	6.8	2435bc
Metribuzin	0.50	9.6	8.8	10.0	9.6	9.4	9.0	2722c
Diclofop	1.00	7.9	9.9	2.5	5.0	9.7	2.5	2177bc
Diclofop	1.50	8.4	8.9	2.5	6.1	9.8	2.8	2107b
Diclofop	2.00	8.3	10.0	6.0	6.9	9.9	2.8	2539bc
Diclofop + Surfynol 465	1.00 + 0.5%	7.9	9.2	4.0	5.3	9.4	1.8	2106b
Diclofop + Surfynol 465	1.50 + 0.5%	8.1	9.3	3.0	6.6	9.6	2.3	2376bc
Diclofop + Surfynol 465	2.00 + 0.5%	8.3	9.8	3.0	6.3	9.95	2.0	2383bc
Barban	0.375	7.3	9.5	0.5	4.0	4.8	2.0	1494a
Barban	0.50	7.6	9.4	0.5	4.0	5.3	2.3	1555a
Untreated check		6.9	9.9	0	0	1.5	3.3	1037a

All data are means of 4 replications.

[a] Sprayed February 14, 1977. Wheat (Anza) late tillering to beginning elongation, ryegrass - fully tillering.

[b] Evaluation - see table. Ratings of 0 = no vigor of wheat or no control of weeds. 10 = full vigor of wheat or complete control of weeds.

Data followed by a different letter differ significantly at $p = 0.05$ level. (Duncan's multiple range test).

Varietal response of wheat and barley to antidote R 32822. Schirman, R. Use of antidotes to increase the selectivity of certain thiocarbamate herbicides is a commercial practice for some crops. Greenhouse trials were conducted to evaluate R 32822 as a potential protectant for wheat and barley.

Four replicates of 25 seeds each of selected varieties were planted in a Ritzville sandy loam. In the initial trial, seeds were coated with 0.75% by weight of R32822, with herbicides applied post-plant and incorporated with overhead watering. In further trials, rates of 0.8 and 0.4% protectant was used and the herbicide incorporated by blending with the soil immediately prior to planting. Seedling emergence and average height were recorded 14 or 16 days post-plant. Expansion of the first true leaf was used as the criterion for emergence.

All wheat varieties failed to show acceptable protection from R 32822. Barley had considerable varietal interaction with spring varieties such as 'Steptoe' showing greatest benefit while 'Boyer', a winter variety, was injured by the protectant. Tank mixing with the herbicide and application as a soil treatment was less effective than the seed treatment under greenhouse conditions. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Pullman, WA 99164).

Table 1. Seedling height (% of untreated) of selected barley and wheat varieties treated with antidote, R 32822

		Herbicide, kg/ha					
	No	EPTC		Vernolate		MV-687	
Variety	Herbicide	2.24	4.48	2.24	4.48	2.24	4.48
Barley							
Steptoe	100	76	20	62	7	88	27
Steptoe+[1]	100	90	80	82	42	71	45
Vanguard	100	50	7	57	19	76	33
Vanguard+	100	81	53	81	22	78	59
Luther	100	9	9	14	9	51	9
Luther+	94	81	69	79	37	57	49
Boyer	100	30	10	15	10	68	48
Boyer+	35	35	35	35	20	22	10
Larker	100	14	7	23	7	63	40
Larker+	102	84	62	76	8	84	16
Will	100	7	9	9	9	22	15
Will+	104	78	39	59	13	54	42
Blazer	100	29	8	43	8	76	42
Blazer+	92	87	49	68	15	72	44
Wheat							
Luke	100	16	13	11	9	27	11
Luke+	89	28	11	30	11	32	27
Daws	100	9	8	39	8	57	10
Daws+	89	76	19	72	15	72	17
Fielder	100	12	8	30	8	53	8
Fielder+	94	20	20	55	8	61	39
Urquie	100	9	8	8	8	31	12
Urquie+	91	37	8	38	22	70	35
Goatgrass	100	10	10	46	10	82	49
Downy brome	100	10	4	16	0	0	0
Wild oats	100	12	8	16	10	8	8

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[1] + = protectant on seed at 0.75% by weight.

Table 2. The effect of R 32822 as antidote for four varieties of barley when treated with vernolate or EPTC

		Rate						
		Vernolate, kg ha^{-1}				EPTC, kg ha^{-1}		
Variety	R32822 (%)	0	2.24	4.48	2.24 + 1.12 R32822 1/	0	1.68	3.36
		----------Average protection rate index 2/----------						
Blazer	0.0	92	0	0	5	100	0	0
	0.4	88	40	0	-	85	58	11
	0.8	86	40	2	-	85	55	0
Boyer	0.0	92	0	0	0	94	0	0
	0.4	9	3	0	-	15	9	0
	0.8	5	2	0	-	6	1	0
Luther	0.0	88	0	0	1	86	0	0
	0.4	92	26	0	-	113	67	0
	0.8	99	52	0	-	81	69	0
Steptoe	0.0	96	0	0	5	96	0	0
	0.4	93	77	23	-	76	94	29
	0.8	90	79	21	-	76	91	40
Wild oat	0.0	98	0	0	0	94	6	0
Downy brome	0.0	59	0	0	1	66	6	0
Goatgrass	0.0	132	0	0	3	-	-	-

1/ Tank mix.

2/ Calculated by multiplying seedling emergence by seedling height (both values expressed as percentage of check for each variety) and dividing by 100.

Integrated tillage-herbicide versus full herbicide fallow. Schirman, R. and D.C. Thill. Soil and water conservation and water storage are prime concerns in the low precipitation, winter wheat-summer fallow regions of the Pacific Northwest. Conventional management systems tend to leave fallow lands in a potentially erodible state, and may reduce water infiltration during the spring of the fallow year. By delaying or eliminating some or all tillage operations through the use of herbicides, soil losses due to wind erosion can be reduced and soil-water storage during the fallow year increased.

Using a backpack sprayer, sixteen herbicide treatments were applied broadcast to undisturbed winter wheat stubble in November of the fallow year. The plot site was located in the 30 to 36 cm precipitation zone of eastern Washington. Volunteer grain and downy brome were in the early tiller and broadleaf winter annuals in the 5 cm rosette stage at the time of treatment. In April, the herbicide plots were split with tillage (heavy disk) and no tillage. Each treatment was replicated 4 times with 3 by 6 meter plots. The tilled plots were rodweeded twice during the remainder of the fallow year, whereas the no-tillage treatments were retreated 2 to 3 times (April, June, and/or July) during the same period with a contact herbicide (paraquat or glyphosate) plus 2,4-D. Visual observations of weed control were made throughout the fallow period.

'Nugaines' winter wheat was planted in mid-September with a deep furrow drill. Grain yields were determined by harvesting the individual plots with a small plot combine. Grain yields and weed control ratings are given in the table.

Comparison of paired wheat yield means shows that the integrated (herbicide plus tillage) fallow treatments always yielded greater than the full herbicide fallow. This was primarily due to a more uniform moisture content in the seed zone of the integrated fallow treatments when compared with full herbicide fallow conditions resulting in earlier emergence of the crop. The tillage operations can reduce the evaporative loss of seed zone moisture by disrupting capillary and, perhaps, vapor flow of water to the soil surface. In addition, mid- to late-season weed control, particularly Russian thistle, was superior under integrated than full herbicide fallow conditions.

There was no significant difference between herbicide treatments within the integrated fallow regime. This was due to very limited weed emergence and establishment after the initial April tillage. The few weeds present were evenly distributed over the entire plot area, and were effectively controlled with timely rodweedings.

Differences in grain yields under full herbicide fallow conditions were, in most cases, related to early season (June) control of Russian thistle. If allowed to establish, Russian thistle is difficult the control with herbicides, depletes seed zone moisture, and hampers fall planting operations. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Pullman, WA 99164).

Winter wheat grain yields and weed control ratings for full herbicide versus integrated herbicide-tillage fallow

Treatment	Rate kg ha^{-1}	No. of retreat.[1]	% Average weed control: Downy brome + vol.wheat[2]	% Average weed control: Russian thistle[3] June	% Average weed control: Russian thistle[3] Sept	Grain yield kg ha^{-1} No-till	Grain yield kg ha^{-1} Tilled
Glyphosate	0.56+	3	81	50	12	1137	2468
+ mon 0011							
Paraquat	0.56+	3	81	50	65	1231	2468
+ X-77							
Propham 135	3.36	2	86	10	50	841	2616
Glyphosate	0.37+						
+ Atrazine	0.56	2	94	40	82	1964	2885
Glyphosate	0.37+						
+ Cyanazine	2.69	2	79	55	72	1870	2634
Glyphosate	0.37+						
+ Metribuzin	0.56	2	81	55	80	1244	2623
Glyphosate	0.37+						
+ Terbutryn	1.79	3	64	60	95	2273	2825
Glyphosate	0.37+						
+ Atrazine	0.56+						
+ Cyanazine	2.24	2	95	80	88	1856	2334
Paraquat	0.37+						
+ Atrazine	0.37+						
+ Metribuzin	0.37	2	88	50	85	1769	2811
Paraquat	0.37+						
+ Metribuzin	0.56	2	86	60	85	1708	2677
Propham 135	3.36+						
+ Cyanazine	2.69	2	93	43	87	1910	2563
Dalapon	2.58+						
+ Cyanazine	2.69	2	94	68	75	2468	2677
Cyanazine (F)	2.69	3	30	80	97	2125	2569
Cyanazine (G)	2.69	3	35	78	62	2206	2677
Cyanazine (WP)	2.69+						
+ Surfactant		3	25	85	88	2132	2731
Oxyfluorfen	0.56+						
+ Cyanazine	2.24	3	74	65	88	1937	2684
HSD 0.05						1084	905

1/ Retreated no-till plot April 7, June 4, and July 29, 1976.

2/ April evaluation prior to initial tillage.

3/ Evaluation for no-till plots only.

Weed control in zero-tillage winter wheat planted into dry pea, spring wheat, and spring barley stubble. Schirman, R. 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-till planting of winter wheat, are being developed to reduce soil losses and to improve water quality. A major problem in a zero-tillage winter wheat production system is the control of winter annual grass weeds, primarily downy brome, and winter annual broadleaf weeds such as catchweed bedstraw and flixweed.

'Nugaines' winter wheat was planted at Pullman, Washington in mid-October into undisturbed dry pea, spring barley, or spring wheat stubble with a double disk, no-till drill. Prior to planting, there was no weed emergence and, therefore, no preplant vegetation control required. Fall herbicide application (early November) were made broadcast, post-plant, but preemergence to the crop and weeds with a backpack sprayer. Spring treatments were applied in late March when the crop was well tillered and winter annual grass and broadleaf weeds were in the 3 to 7 leaf stage. Each treatment was replicated 4 times with 3 by 9 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. Grain yields, and crop injury and weed control ratings are given in Tables 1 and 2, respectively.

Extremely dry conditions prevailed throughout the 1976-77 cropping season, which may have altered the performance of some or all of the soil-active herbicides tested. Precipitation during the one-month period after application was 5.4 and 3.1 cm below the long-term normal for fall- and spring-applied treatments, respectively. Based on the previous response of winter wheat to particular herbicides, the 1976-77 crop year was considered a low injury year.

Herbicide performance varied between types of previous crop residue. Direct statistical comparisons were not made between stubble types because of differences in location, weed populations, soil type, amounts of residue, and reserve soil moisture. In general, residual weed populations were lower, crop residues less, and soil-moisture reserves greater under dry pea than spring barley and spring wheat stubble. This resulted in a greater wheat yield and superior weed control in dry pea than spring barley or spring wheat stubble.

There was no significant difference in grain yields between treatment means within the pea stubble due to low, uniform weed populations and minimal dry pea residue. The difference in grain yields between treatments within the barley stubble were primarily due to the interacting effects of differential downy brome control and crop tolerance to a particular herbicide treatment. Heavy residues and severe broad spectrum weed infestations resulted in an overall yield reduction and reduced performance of the herbicide treatments within the spring wheat stubble.

Overall, low rates of fall-applied metribuzin (0.28 kg ha^{-1}) in tank mix combination with linuron, chlorbromuron, or terbutryn resulted in superior grain yields and broad spectrum weed control. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Pullman, WA 99164).

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

		Grain yield, kg ha^{-1}		
Herbicide treatment	Rate kg ha^{-1}	Dry pea stubble	Spring wheat stubble	Spring barley stubble
Fall Metribuzin	0.45	2785 a[1]	807 ab	1870 a
Fall Diuron + Metribuzin	1.12+ 0.28	3107 a	969 a	1581 ab
Fall Terbutryn + Metribuzin	0.84+ 0.28	3551 a	652 ab	1809 a
Fall Chlorbromuron + Metribuzin	0.84+ 0.28	3484 a	827 ab	1648 ab
Fall Linuron + Metribuzin	0.84+ 0.28	3699 a	1036 a	1796 a
Spring Terbutryn + Metribuzin	0.84+ 0.28	3013 a	464 ab	1661 ab
Spring Chlorbromuron + Metribuzin	0.84+ 0.28	3450 a	383 b	1449 ab
Spring Bromoxynil + Metribuzin	0.28+ 0.28	4096 a	794 ab	1493 ab
Spring Metribuzin	0.37	3760 a	538 ab	1829 a
Spring Bromoxynil + MCPA	0.37+ 0.42	3047 a	827 ab	1601 ab
Spring Buthidazole	0.21	3309 a	552 ab	1486 ab
Spring Buthidazole	0.42	3235 a	552 ab	1460 ab
Spring Buthidazole + MCPA	0.21+ 0.56	3208 a	605 ab	1648 ab
Untreated	-	3048 a	511 ab	1063 b
Untreated	-	2631 a	363 b	1076 b

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[1] 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.

Table 2. Crop injury and downy brome control in zero-tillage winter wheat planted in dry pea, spring wheat, and spring barley stubble

		% Crop injury			% Downy brome control		
Herbicide treatment	Rate kg ha^{-1}	Pea stubble	S.wheat stubble	S.barley stubble	Pea stubble	S.wheat stubble	S.barley stubble
Fall Metribuzin	0.45	30	53	20	100	85	91
Fall Diuron	1.12+						
+ Metribuzin	0.28	20	30	13	100	57	90
Fall Terbutryn	0.84+						
+ Metribuzin	0.28	12	33	10	100	63	91
Fall Chlorbromuron	0.84+						
+ Metribuzin	0.28	20	28	8	95	63	82
Fall Linuron	0.84+						
+ Metribuzin	0.28	23	10	18	98	70	95
Spring Terbutryn	0.84+						
+ Metribuzin	0.28	18	25	5	90	60	82
Spring Chlorbromuron	0.84+						
+ Metribuzin	0.28	20	25	18	73	33	73
Spring Bromoxynil	0.28+						
+ Metribuzin	0.28	10	8	10	83	47	75
Spring Metribuzin	0.37	15	18	5	98		75
Spring Bromoxynil	0.37+						
+ MCPA	0.42	25	8	0	85	35	8
Spring Buthidazole	0.21	20	20	13	68	25	35
Spring Buthidazole	0.42	23	35	13	88	10	53
Spring Buthidazole	0.21+						
+ MCPA	0.56	20	25	0	88	33	18
Untreated	-	0	0	0	0	0	0
Untreated	-	0	0	0	0	0	0

Control of fiddleneck, common chickweed and other broadleaf weeds in winter sown wheat. Hill, J.E., K.W. Dunster and T.E. Kearney. Fiddleneck and common chickweed are problems in California winter-grown wheats. These weeds are generally tolerant to the widely used phenoxy-type herbicides 2,4-D and MCPA. Although appropriately timed applications of bromoxynil will control fiddleneck, common chickweed remains tolerant to this herbicide as well. Studies were initiated near Knights Landing, Yolo County, California to evaluate broadleaf herbicides alone and in combination on a broad spectrum of broadleaf weeds including the two difficult-to-control weeds, fiddleneck and common chickweed.

Applications of several broadleaf herbicides (see table) were made to broadleaf weeds at two stages of development on February 10 and 18, 1977 on 10 ft by 30 ft plots. The wheat (variety Anza) was at the 3 to 4 leaf and 3 to 6 leaf stage of development on the 10th and 18th respectively. Applications were made with a constant pressure CO_2 sprayer at 28 psi and in a volume equivalent to 22 gpa. Leaf stages of the broadleaf weeds at the time of treatment were as follows:

	Feb 10	Feb 18
common chickweed	1 to 3 leaf	4 to 7 leaf
fiddleneck	4 to 6 leaf	7 to 10 leaf
shepherdspurse	1 to 2 leaf	3 to 6 leaf
red maids	4 leaf	5 to 8 leaf

Fiddleneck was controlled by all but the phenoxy herbicides (see table). Common chickweed was controlled partially by 2,4-DP and bifenox and nearly completely by dinoseb selective and the combination of 2,4-DP + bromoxynil. All of the herbicides controlled the remaining two species, shepherdspurse and red maids. Wheat yields were significantly less where fiddleneck populations were highest (untreated, 2,4-D and MCPA) whereas the highest yields were obtained where both chickweed and fiddleneck were controlled (dinoseb selective and bromoxynil + 2,4-DP).

In the Central Valley of California where all of these weed species may occur at one time in wheat and barley, broad-spectrum herbicides or combinations are needed to provide adequate broadleaf weed control. These results indicate that combinations of 2,4-DP + bromoxynil may provide broad-spectrum broadleaf weed control similar to that obtained with dinoseb selective. (University of California, Cooperative Extension, Davis, CA 95616, Amchem Products, Fremont, CA 94536, and Cooperative Extension, P.O. Box 879, Woodland, CA 95695)

Control of fiddleneck, common chickweed and other broadleaf weeds in winter sown wheat

Treatment	Rate (lb/A)	weed control[1]				weed counts (plants/ft^2)				Phytotoxicity[1]	Yield[2] (lb/A)
		fiddleneck	common chickweed	red maids	shepherds-purse	fiddleneck	common chickweed	red maids	shepherds-purse		
Bromoxynil	0.38	9.9	4.8	10.0	10.0	0.0	3.8	0.0	0.0	0.0	6545 abc
Bromoxynil[3]	0.38	10.0	3.3	10.0	10.0	0.0	2.8	0.0	0.0	0.0	6522 abc
Bromoxynil	0.5	10.0	4.8	10.0	10.0	0.0	4.3	0.0	0.0	0.0	6700 ab
Bromoxynil[3]	0.5	10.0	3.8	10.0	10.0	0.0	4.8	0.0	0.0	0.0	6695 abc
MCPA amine	0.75	4.0	4.3	9.5	10.0	7.0	2.5	0.0	0.3	0.0	5845 bc
Bromoxynil[3] + MCPA amine	0.38 +0.38	10.0	4.3	10.0	10.0	0.0	4.8	0.0	0.0	0.3	6600 abc
2,4-DP	0.75	4.0	6.3	9.5	10.0	1.8	0.5	0.0	0.0	0.0	6685 abc
2,4-DP	1.0	2.5	6.0	6.5	9.3	4.3	1.8	0.0	0.0	0.0	6697 abc
Bromoxynil + 2,4-DP	0.38 +0.5	10.0	8.4	10.0	10.0	0.0	0.8	0.0	0.0	0.3	7097 ab
Bromoxynil + 2,4-DP	0.38	10.0	5.0	10.0	10.0	0.0	3.0	0.0	0.0	0.0	6907 ab
Dinoseb Selective	0.75	9.7	9.8	9.9	9.6	0.8	0.0	0.0	0.0	0.8	7217 a
2,4-D amine[3]	0.75	1.5	3.8	8.0	8.9	8.5	4.5	0.0	0.0	0.0	5415 cd
Bifenox	1.0	10.0	5.3	10.0	10.0	0.0	3.0	0.0	0.0	3.0	6962 ab
Bifenox	2.0	7.5	5.7	10.0	7.5	1.0	3.3	0.0	1.8	3.5	6892 ab
Untreated	-	0.0	0.0	0.0	0.0	10.0	3.9	1.8	6.0	0.0	4560 d
											cv 11.6%

[1] 0 = no plants dead, 10 = all plants dead.

[2] Numbers followed by the same letters do not differ at the 5% level of significance

[3] Second date of application (see text)

PROJECT 6

AQUATIC WEEDS

Richard Schumacker, Project Chairman

No papers were submitted.

PROJECT 7

CHEMICAL AND PHYSIOLOGICAL STUDIES

M.C. Williams, Project Chairman

SUMMARY -

Two papers were submitted. These papers dealt with the control of prostrate pigweed with napropamide and the detection of atmospheric residues of 2,4-D.

Napropamide is recommended for control of all weedy species of Amaranthus but prostrate pigweed shows some tolerance to this herbicide. Tolerance to napropamide may be due to the ability of prostrate pigweed to germinate at depths of 6 to 8 cm in the soil and thereby develop a large amount of stem tissue and an extensive root system before emergence or herbicide treatment.

Four sampling stations were established 20 to 30 miles apart in northeastern Oregon to detect atmospheric 2,4-D that might be transported north from herbicide treatments on grainfields. No significant long-distance transport of 2,4-D residues was found when the herbicide was used in grain production.

PAPERS -

Prostrate pigweed control with napropamide. Jachetta, J.J., S.R. Radosevich and C.L. Elmore. Currently napropamide is recommended for the control of all weedy species in the genus Amaranthus. However, prostrate pigweed is often not controlled by this treatment. A study was established at the South Coast Field Station, Orange County, California, to observe the tolerance of prostrate pigweed to napropamide.

Herbicide treatments were applied March 3, 1977 to 200 sq ft plots. One inch of water by sprinkler irrigation followed application. Two transects 1 ft by 20 ft were sampled per plot on April 23, 1977. The experiment was a randomized complete block design and was replicated 4 times. There was significantly less control of prostrate pigweed (48%) than redroot pigweed (86%).

In a laboratory study, seedlings of prostrate and redroot pigweed were grown on moist filter paper in petri dishes (ten seeds per dish). Three ml of herbicide solution (concentration range from 0.25 ppm to 25 ppm) was applied to each petri dish. The dishes were incubated to 24 C for 7 days, and the root length of the seedlings determined. Primary roots of prostrate pigweed grew 44% faster than redroot pigweed. However, this study indicated no tolerance to napropamide by either of the Amaranthus species.

Differential depth of germination in soil was investigated in greenhouse studies. It was found that prostrate pigweed could germinate at depths of 6 and 8 cm, while redroot pigweed did not germinate deeper than 4 cm. Neither species could emerge through a 4 lb/A band of napropamide which was incorporated 4 cm deep. In another experiment, a herbicide band 5 cm thick was covered with 2 cm of untreated soil and seeds of both species were planted 1 cm deep. Roots of both species could not penetrate through the treated soil layer.

Experiments are now in progress to determine if the time of herbicide application (early and late preemergence) and the depth at which pigweed germinates can account for the differential tolerances of pigweed to napropamide. We believe that the ability of prostrate pigweed to germinate deep in the soil, develop a large amount of stem tissue and an extensive root system before emergence or herbicide treatment may account for its observed field tolerance. (Dept. of Botany, Univ. of Calif., Davis 95616)

Atmospheric residues of 2,4-D in northeastern Oregon. Yu, T.C., E.R. Johnson and M.L. Montgomery. A 2-year air monitoring program was conducted to determine whether atmospheric residues of 2,4-D, used in the production of Oregon grain, were being transported to the north. The air sampling project was carried out during the primary spraying months of April and May.

Four sampling stations, 20 to 30 miles apart, were located along an east-west line a few miles north of the major grain-growing area. A solid sampler was designed to trap both the ester and non-volatile forms of the herbicide. Although the principal form of 2,4-D used in the region is the butyl ester, the sampler extracts were also analyzed for the ethylhexyl-, butoxyethyl-, isooctyl-, propyleneglycolbutylether-, acid, and amine salt forms of the herbicide. Sampling tubes were changed daily. The sensitivity of the method was about .02 micrograms per cubic meter of air (about .02 ppb).

During the first year of sampling all of the residues at the various sampling stations were quite low. Although most residues were below the limit of detection, a few residues up to 0.1 microgram per cubic meter were detected. The second year concentrations were quite similar, with generally low to non-detectable residues at most sampling stations. There were a few residues up to 0.1 micrograms per cubic meter of air.

The only exception to the above results was an abnormally high reading (4 micrograms/m^3) at a station during the second year of sampling. An investigation of this anomalous result revealed that an aerial application of 2,4-D was made to the field adjacent to the sampler at the time of high residues.

The results of this study indicate there is no significant long-distance transport of 2,4-D residues when the herbicide is used in grain production. (Agricultural Chemistry Oregon State University, Corvallis, OR 97331)

AUTHORS

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CROPS (continued)

HERBACEOUS WEEDS

(arranged alphabetically by scientific name)

HERBACEOUS WEEDS (continued)

(arranged alphabetically by scientific name)

HERBACEOUS WEEDS (continued)

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HERBACEOUS WEEDS (continued)

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HERBACEOUS WEEDS

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HERBACEOUS WEEDS (continued)

(arranged alphabetically by common name)

HERBACEOUS WEEDS (continued)

(arranged alphabetically by common name)

WOODY PLANTS

(other than ornamentals)

WOODY PLANTS (continued)

(other than ornamentals)

Page

ORNAMENTALS

HERBICIDE COMMON NAME OR DESIGNATION

This table was compiled from approved nomenclature adopted by the Weed Science Society of America (Weed Science 25(6), 1977 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
alachlor	2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide	43, 45, 48, 50, 52, 57, 59, 68, 124, 129, 132, 134 135, 139, 142
amitrole	3-amino-*s*-triazole	14
asulam	methyl sulfanilylcarbamate	17, 28, 71, 148
atrazine	2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine	30, 31, 73, 93, 129, 132, 134, 201
barban	4-chloro-2-butynyl-*m*-chlorocarbanilate	118, 120, 122, 148 175, 180, 185, 197
BASF 9021 OH	Unavailable	164
bensulide	*O*-*O*-diisopropyl phosphorodithioate *s*-ester with *N*-(2-mercaptoethyl) benzenesulfonamide	44
bentazon	3-isopropyl-1H-2,1,3,benzothiadiazin-(4)3H-one 2,2-dioxide	17, 50, 150
bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate	44, 106, 121, 154 207
bromacil	5-bromo-3-*sec*-butyl-6-methyluracil	26
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile	14, 121, 122, 175, 180, 186, 203, 207
buthidazole	3,[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-4-hydroxy-1-methyl-2-imidazolidinone	17, 104, 106, 108, 111, 113, 114, 117 121, 122, 175, 183 203
butralin	4-(1,1-dimethylethyl)-*N*-(1-methylpropyl)-2,6-dinitrobenzenamine	44, 45, 161
CDEC	2-chloroallyl diethyldithiocarbamate	44, 48, 60, 63, 71

HERBICIDE COMMON NAME OR DESIGNATION (continued)

Common Name or Designation	Chemical Name	Page
chloramben	3-amino-2,5-dichlorobenzoic acid	45, 48, 50, 51, 52, 54, 55, 57, 58, 59, 62, 174
chlorbromuron	3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea	203
chloropicrin	trichloronitromethane	60
chloropropham	isopropyl *m*-chlorocarbanilate	71, 111, 112
cyanazine	2-[[4-chloro-6-(ethylamino)-*s*-triazin-2-yl]amino]-2-methyl=propionitrile	73, 129, 132, 134, 135, 175, 183, 201
cycloate	s-ethyl N-ethylthiocyclohexane=bamate	43, 157, 158, 159, 164, 167
1,3-D (Telone II)	1,3-dichloropropene	8, 52, 178
2,4-D	(2,4-dichlorophenoxy)acetic acid	4, 5, 12, 14, 15, 16, 17, 19, 21, 22, 26, 27, 28, 33, 92, 93, 121, 180, 186, 201, 207, 212
dalapon	2,2-dichloropropionic acid	201
desmedipham	ethyl *m*-hydroxycarbanilate carbanilate (ester)	157, 169, 171
dicamba	3,6-dichloro-*o*-anisic acid	4, 12, 16, 17, 19, 26, 121, 175, 180
dichlorprop	2-(2,4-dichlorophenoxy)propionic acid	26
diclofop	methyl 2-[4-(2-4-dichlorophenoxy) phenoxy]propanoate	71, 76, 118, 120, 122, 125, 128, 140, 142, 148, 158, 159, 164, 167, 169, 173, 175, 176, 180, 182, 185, 187, 188, 191, 193, 195, 197
difenzoquat	1,2-dimethyl-3,5-diphenyl-1*H*-pyrazolium	118, 120, 122, 175, 180, 181, 185, 186

Common Name or Designation	Chemical Name	Page
dinitramine	*N*^{4},*N*^{4}-diethyl-α,α,α-trifluoro-3,5-dinitrotoluene-2,4-diamine	68, 135, 142, 161, 187
dinoseb	2-*sec*-butyl-4,6-dinitrophenol	77, 80, 83, 117, 140, 145, 148, 207
diphenamid	*N*,*N*-dimethyl-2,2-diphenylacetamide	44, 55
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	106, 110, 111, 135, 203
Dowco 233	(See triclopyr)	
Dowco 290	3,6-dichloropicolinic acid	4, 12, 20, 125, 128, 151
DPX-1108 (Krenite)	Ammonium ethyl carbamoxyl phosphonate	5, 15, 28, 34, 35, 50, 90, 93, 124
DPX-3674 (Velpar)	3-cyclohexyl-6-(dimethylamino)-1-methyl-*s*-triazine-2,4(1*H*,3*H*)dione	30, 104
DuPont 4432	Unavailable	90
endothall	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	164
EPTC	*s*-ethyl dipropylthiocarbamate	43, 59, 62, 68, 73, 75, 106, 110, 113, 129, 199
ethalfluralin	*N*-ethyl-*N*-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzenamine	135
ethephon	(2-chloroethyl)phosphonic acid	15
ethofumesate	2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranol methane-sulfonate	71, 125, 128, 142, 157, 158, 159, 164 167
fluchloralin	*N*-(2-chloroethyl)-2,6-dinitro-*N*-propyl-4-(trifluoromethyl)aniline	106
fluridone	1-methyl-3-phenyl-5[(3-trifluoromethyl)phenyl]-4(1H)-pyridinone	4, 7, 90, 135, 137, 139
FMC-25213	*r*-2-ethyl-5-methyl-*c*-5-(2-methylbenzyloxy)-1,3-dioxane	77, 106, 112
fluometuron	1,1-dimethyl-3-(α,α,α-trifluoro-*m*-tolyl)urea	135, 137

Common Name or Designation	Chemical Name	Page
fonofos (insecticide)	O-ethyl-S-phenylethylphosphonodithiolate	73, 75
GCP-3688	Unavailable	164
glyphosate	N-(phosphonomethyl)glycine	2, 3, 5, 6, 12, 13, 14, 15, 16, 17, 26, 28, 30, 31, 34, 35, 65, 76, 77, 80, 83, 87, 92, 93, 96, 122, 124, 183, 201
H-22234	N-chloroacetyl-N-(2,6-diethyl=phenyl)glycine ethyl ester	71, 158, 159, 164
H-26905	O-ethyl-O-(3-methyl-6-nitrophenyl)-N-sec-butyl-phosphorothioamedate	137
H-26910	N-chloroacetyl-N-(2-methyl-6-ethylphenyl)-glycine isopropyl ester	7, 44, 90, 135, 137, 139
hexaflurate	potassium hexafluoroarsenate	26
HOE-29152	methyl 2[4-(4-trifluoromethylphenoxy) phenoxy]propanoate	71, 135, 137, 140, 142, 144, 145, 148, 149, 153, 164, 167, 169
Krenite	(See DPX-1108)	
lenacil	3-cyclohexyl-6,7-dihydro-1H-cyclopentapyrimidine-2,4(3H,5H)-dione	71
linuron	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	60, 80, 83, 203
maleic hydrazide (MH)	1,2-dihydro-3,6-pyridazinedione	65
MBR-16349	Unavailable	90, 135, 144
MCPA	[(4-chloro-o-tolyl)oxy]acetic acid	121, 124, 186, 203, 207
methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione	71, 87, 114, 135
methyl bromide	bromoethane	52, 60

Common Name or Designation	Chemical Name	Page
metolachlor	2-chloro-*N*-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	43, 45, 48, 68, 129, 132, 134, 137 174
metribuzin	4-amino-6-*tert*-butyl)-3-(methylthio)-*as*-triazin-5-(4H)one	43, 45, 50, 55, 68, 104, 106, 108, 111, 112, 113, 114, 117, 122, 140, 175, 182, 197, 201, 203
MSMA	monosodium methanearsenate	92, 93, 137, 180, 186
MV-687	Unavailable	50, 67, 199
Na Azide	Sodium azide	67
napropamide	2-(α-naphthoxy)-*N*,*N*-diethylpropionamide	44, 60, 62, 77, 80, 81, 83, 86, 87, 89, 93, 104, 106, 110, 114, 117, 211
nitrofen	2,4-dichlorophenyl-*p*-nitrophenyl ether	76, 182
norflurazon	4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone	77, 80, 83, 86, 87, 89
oryzalin	3,5-dinitro-N^4,N^4-dipropylsulfanilamide	4, 62, 77, 80, 83, 86, 87, 89, 90, 164, 174
oxadiazon	2-*tert*-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)Δ^2-1,3,4-oxadiazon-5-one	4, 77, 80, 83, 87, 89, 98
oxyfluorfen	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene	13, 77, 80, 83, 86, 87, 89, 90, 98, 117, 122, 201
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion	13, 14, 48, 92, 93, 96, 117, 122, 152, 175, 201
pebulate	S-propyl butylethylthiocarbamate	7, 43, 44, 45, 48, 50, 55, 57, 58, 59, 60, 62, 63
pendimethalin	*N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	68, 71, 77, 87, 134

Common Name or Designation	Chemical Name	Page
phenmedipham	methyl m-hydroxycarbanilate m-methylcarbanilate	71, 76, 157, 169 171
picloram	4-amino-3,5,6-trichloropicolinic acid	4, 12, 16, 17, 19, 20, 26, 33, 35, 36, 37, 38
procyazine	2-[[4-chloro-6-(cyclopropylamino)-1,3,5-triazine-2-yl]amino]-2-methylpropanenitrile	30, 175
prodiamine	N^3,N^3-di-n-propyl-2,4-dinitro-6-trifluoromethyl-m-phenylenediamine	4, 77, 80, 83, 86, 87, 90, 93, 104, 108
profluralin	N-(cyclopropylmethyl)-α,α,α-trifluoro-2,6-dinitro-N-propyl-e-toluidine	174
prometryn	2,4-bis(isopropylamino)-6-(methylthio)-s-triazine	135
pronamide	3,5-dichloro(N-1,1-dimethyl 2-propynl)benzamide	104, 106, 108, 111, 114, 117
propachlor	2-chlor-N-isopropylacetanilide	132, 154
propazine	2-chloro-4,6-bis(isopropylamino)-s-triazine	154
propham	isopropyl carbanilate	71, 108, 117, 145, 164, 175, 183, 201
pryazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	157, 158, 159, 161, 164
R-12001	S-isopropyl-5-ethyl-2-methyl-pyridine-1-carbothibate	44, 135, 158, 159, 164, 167
R-24315	Unavailable	114, 117, 135, 145, 175
R-25788	N,N-diallyl-2,2-dichloroacetamide	73, 75, 129
R-29148	2,2,5-trimethyl-N-dichloroacetyl-oxazolidine	73, 75
R-32882	Unavailable	199
R-33222	Unavailable	108
R-37878	Unavailable	67

Common Name or Designation	Chemical Name	Page
R-40244	1-(*m*-trifluoromethylphenyl)-3-chloro-4-chloromethyl-2-pyrrolidone	44, 104, 145, 175
RH-6201	Unavailable	50, 90, 145, 148
RP-26012	Unavailable	90
secbumeton	*N*-ethyl-6-methoxy-*N*'(1-methylpropyl)-1,3,5-triazine-2,4-diamine	106
silvex	2-(2,4,5-trichlorophenoxy)propionic acid	12, 28, 37
simazine	2-chloro-4,6-bis(ethylamino)-*s*-triazine	30, 77, 80, 83, 87, 89, 90, 93, 104, 106, 108, 110, 111, 112, 113, 114
SN-533	*N*-ethyl-*N*-propyl-3-(propylsulfonyl)-1*H*-1,2,4-triazole-1-carboxamide	140, 142, 145, 148 167
SN-55365	Unavailable	137
SN-58132	Unavailable	137
TCA	trichloroacetic acid	164
tebuthiuron	*N*-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-*N*,*N*'-dimethylurea	12, 183
Telone II	(See 1,3-D)	
terbacil	3-*tert*-butyl-5-chloro-6-methyluracil	106, 110, 111, 112, 113, 114, 117, 125, 128, 152
terbutryn	2-(*tert*-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine	154, 175, 201, 203
triallate	S-(2,3,3-trichloroallyl)diisopropylthiocarbamate	118, 120, 157
triclopyr	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	4, 12, 20, 21, 22, 27, 28, 33, 35, 37, 50, 125, 128
trifluralin	α,α,α,-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-p-toluidine	44, 62, 67, 111, 139, 161, 181, 187
2,4,5-T	(2,4,5-trichlorophenoxy)acetic acid	26, 27, 28, 33, 35, 36, 37
VEL-4092	Unavailable	121

Common Name or Designation	Chemical Name	Page
Velpar	(See DPX-3674)	
vernolate	S-propyl dipropylthiocarbamate	73, 199

SURFACTANTS

ABBREVIATIONS USED IN THIS REPORT

A	acre(s)
a.i.	active ingredient
a.e.	acid equivalent
aehg.	acid equivalent/hundred gallons
bu.	bushel(s)
C	degrees Centigrade
cm.	centimeter(s)
cwt	100 pounds
F	degrees Fahrenheit
fps	feet per second
ft.	foot or feet
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)
ppb	parts per billion

ABBREVIATIONS USED IN THIS REPORT (continued)

ppm	parts per million
psi	pounds per square inch
pt.	pint
sq.	square
sq ft	square feet
rd.	rod
wt.	weight
WA.	wetting agent