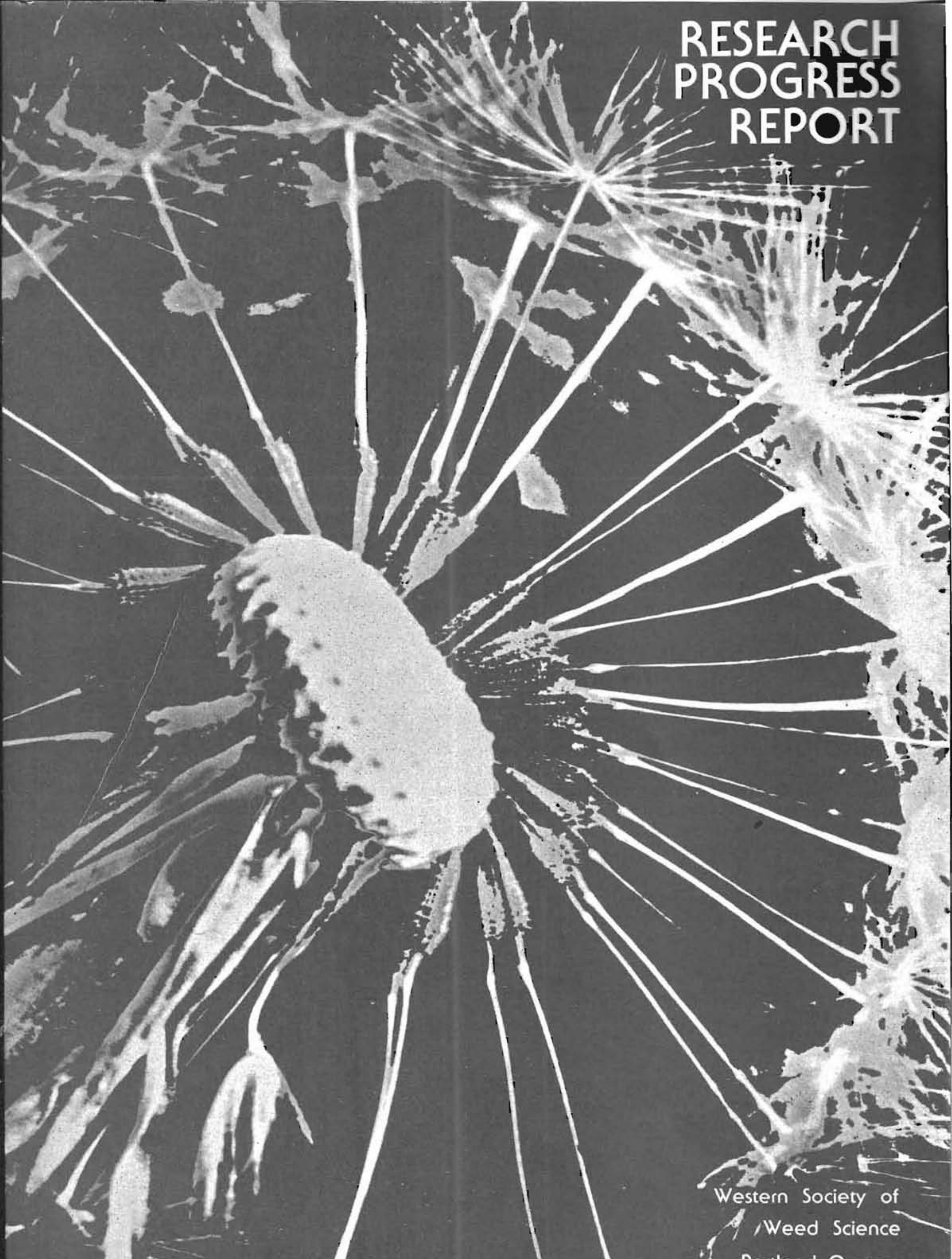

RESEARCH PROGRESS REPORT

Western Society of Weed Science

Portland, Oregon
March 16, 17, and 18, 1976

FOREWARD

The 1976 annual Research Progress Report of the Western Society of Weed Science consists of 104 reports and abstracts of recent investigations in weed science. This is slightly above the average of 96 papers submitted over the past 12 years (range 72-125). All reports were voluntarily submitted by research, extension, regulatory and commercial weed scientists. The report will be complimented by the proceedings from the annual meeting to be held in March, 1976 in Portland, Oregon. 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 Information contained in the Research Progress Report should be considered tentative and NOT FOR PUBLICATION.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. Reported 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 23(6), 1975 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 difficult deadlines imposed upon him.

Robert L. Zimdahl
Chairman of the Research Committee
Western Society of Weed Science
1976

ACKNOWLEDGEMENT

Cover photo courtesy of Dr. J. L. Fults, Professor Emeritus, Department of Botany and Plant Pathology, Colorado State University.

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PROJECT 1. PERENNIAL HERBACEOUS WEEDS

D. G. Swan, Project Chairman

SUMMARY

Fifteen papers were submitted. These papers were concerned with control of bermudagrass (two varieties), Canada thistle, field bindweed, field horsetail, johnsongrass, purple nutsedge and Russian knapweed.

Bermudagrass

Glyphosate, in a gallonage study, gave best control at 4 lb/A in 100 gpa. Increasing the surfactant did not increase control. Bromacil, DPA-3674, norflurazon, tebuthiuron and terbacil were effective when disked into the soil. Irrigation was a less effective means of activation. Glyphosate, dalapon and cacodylic acid did not kill either variety of bermudagrass. Repeat applications of glyphosate at 3 lb/A were required to reduce the number of plants.

Canada thistle

Tordon 212 and Dowco 290 gave 100% control one year after application. Dicamba gave 95% control. In another study, metribuzin and picloram gave 79 to 88% control.

Field bindweed

Dicamba, VEL-4359, Tordon 212, Dowco 290 and GK-40 gave 90% or better reduction in stand one year after application. Tordon 212 was most effective. In another study, where treatments were applied in conjunction with dry bean production, all treatments resulted in increased bean yields. Glyphosate was outstanding, trifluralin next best, bentazon good and MCPA weakest. In a second experiment 1,3-D and layered trifluralin were tested. All rates and combinations gave good field bindweed control.

Field horsetail

Control with dichlobenil applied in January was 57% the second season. When applied in February control was 87% in the second season. Control from asulam was from 37 to 66%. Applying asulam following a dichlobenil treatment did not enhance control.

Johnsongrass

Glyphosate applied at 2 lb/A gave 75% control three months after application. Combining MSMA with glyphosate reduced control.

Purple nutsedge

The response of nutsedge to glyphosate was slow. Two to six weeks were required to kill topgrowth with 4 and 6 lb/A applications. The weed was not killed in one season. Triclopyr gave good initial control only. Cyperquat was not effective. In another study dichlobenil gave 90% control. FMC-25213 gave 80% control. The other treatments were not as effective.

Russian knapweed

Fifteen of the 22 treatments gave complete control one year after application. Tordon 212, dicamba, VEL-4207, VEL-4359, Dowco 290 and glyphosate were effective.

Response of bermudagrass to glyphosate in four volumes of water. Hamilton, K.C. Common bermudagrass plants spaced 9 by 15 feet were established by planting rhizome segments from a single plant in the spring of 1974 at Tucson, Arizona. During the first year, seed heads were removed by mowing. During 1974 and 1975, low rates of trifluralin and simazine were applied to the soil to control annual weeds. Irrigation was similar to that used for cotton.

Plants covered an estimated 33 square feet when treatments started. Starting April 28, 1975, 2 lb/A of glyphosate was applied every 8 weeks in 25, 50, 100, or 200 gpa of water. Additional treatments were (a) 4 lb/A of glyphosate in 100 gpa and (b) 2 lb/A of glyphosate in 100 gpa of water containing 0.3% of surfactant Mon 0011. Each plot contained four plants and treatments were replicated four times. The area covered by living topgrowth was estimated for each plant before each treatment.

All applications of herbicides killed the topgrowth of bermudagrass, but regrowth occurred after one and two applications of all treatments (see table). The amount of regrowth increased as the volume of spray solution increased from 25 to 200 gpa. By the end of the growing season, the most effective treatment was the 4 lb/A of glyphosate in 100 gpa of water. Increasing the amount of surfactant did not improve the control of bermudagrass with glyphosate. (Arizona Agr. Exp. Sta., Tucson)

Bermudagrass plants with topgrowth and area covered by live topgrowth after application of glyphosate in four volumes of water at Tucson, Arizona in 1975.

Treatment		Date of observation			
Rate lbs/A	Volume gpa	4/28	6/23	8/18	10/13
		Plants with topgrowth			
2	25	16	16	16	16
2	50	16	16	16	16
2	100	16	16	16	16
2	200	16	16	16	16
4	100	16	16	16	7
2	100+WA	16	16	16	16
		Square feet per growing plant			
2	25	34	3.7	3.1	0.2
2	50	37	6.6	5.3	0.2
2	100	32	9.9	9.3	1.2
2	200	34	18.5	22.8	9.9
4	100	29	0.1	0.4	0.1
2	100+WA	32	5.1	5.0	0.2

Response of common bermudagrass to herbicides applied to the soil. Hamilton, K.C. Response of bermudagrass to eight herbicides applied to the soil and incorporated by two methods was studied in four tests at Tucson, Arizona. In the spring of 1973 and 1974, 192 plants of common bermudagrass plants spaced 9 by 15 feet were established by planting rhizome segments from a single parent plant. During the first year, seed heads were removed by mowing. Each year, low rates of trifluralin and simazine or diuron were applied to control annual weeds. Irrigation was similar to that used for cotton.

Herbicides (table) were applied to the soil and incorporated by (1) basin irrigation only or (2) disking followed by basin irrigation in April. Separate tests were conducted in 1974 and 1975. Plots contained three plants and treatments were replicated four times. Area covered by topgrowth was estimated for each plant every 2 months. Bermudagrass plants covered an average of 17 and 39 sq ft when treatments started in 1974 and 1975, respectively.

Best initial bermudagrass control was with herbicides disked into the soil. In both years, all herbicides disked into the soil controlled bermudagrass for the first 2 months. Six months after treatment, bromacil, DPX-3674, norflurazon, tebuthiuron, and terbacil gave the best control where herbicides were disked into the soil (table). This occurred in both years. Six months after treatment, bromacil, DPX-3674, karbutilate, tebuthiuron, and terbacil gave the best control where herbicides were only irrigated into the soil. In 1975, herbicides irrigated into the soil were less effective than the same treatments in 1974. Plants were larger in 1975 and topgrowth may have absorbed the herbicides preventing root uptake. In both years norflurazon was more effective when disked into the soil than when activated by irrigation. (Arizona Agr. Exp. Sta., Tucson)

Bermudagrass plants with topgrowth and area covered by live topgrowth after application of herbicides to the soil at Tucson, Arizona.

Treatment		Plants with topgrowth		Sq ft per growing plant	
Method					
Herbicide	lb/A	10/7/74	10/13/75	10/7/74	10/13/75
Irrigated in					
atrazine	6	2	12	0.2	24.0
bromacil	6	0	6	0	0.3
DPX-3674	6	0	3	0	0.3
karbutilate	6	0	8	0	3.2
norflurazon	6	10	12	10.7	28.0
siduron	6	9	12	29.1	48.7
tebuthiuron	6	3	6	0.3	1.0
terbacil	6	0	4	0	0.3
Disked in					
bromacil	6	6	2	1.0	2.7
dichlobenil	9	12	10	38.2	6.9
DPX-3674	6	5	1	0.5	0.5
EPTC	9	12	11	21.6	41.9
norflurazon	6	1	2	3.7	2.7
pronamide	6	10	10	8.4	26.5
tebuthiuron	6	5	1	0.3	0.5
terbacil	6	2	0	2.0	0

Response of two bermudagrass types to foliar applications of three herbicides. Hamilton, K.C. Giant and common bermudagrass plants spaced 9 by 15 feet apart were established by planting rhizome segments from a single parent plant of each type in the spring of 1974 at Tucson, Arizona. During the first year, seed heads were removed by mowing. During 1974 and 1975, low rates of trifluralin and simazine were applied to the soil to control annual weeds. Irrigation was similar to that used for cotton. Starting April 29, 1975, (a) 2 lb/A of glyphosate and (b) 20 lb/A of dalapon in 25 gpa were each applied every 8 weeks. Cacodylic acid at 2 lb/A for the first six applications and 4 lb/A (starting July 21) was applied in 80 gpa of water every 2 weeks. Each plot contained four plants and treatments were replicated four times. The area covered by living topgrowth was estimated for each plant before each treatment.

Most applications of 2 lb/A of cacodylic failed to kill all topgrowth of giant and common bermudagrass. In June, cacodylic acid appeared less effective than glyphosate or dalapon (table). The 4 lb/A applications of cacodylic acid usually killed bermudagrass topgrowth. There was little difference in the response of giant and common bermudagrass to herbicides until late in the year when regrowth of giant bermudagrass was much faster than regrowth of common bermudagrass. In October, glyphosate appeared to give better control than dalapon or cacodylic acid. No herbicide treatment killed either bermudagrass in one season. (Arizona Agr. Exp. Sta., Tucson)

Bermudagrass plants with topgrowth and area covered by live topgrowth after foliar applications of three herbicides at Tucson, Arizona in 1975.

Treatment			Date of observation			
Type	Herbicide	Rate (lb/A)	4/29	6/23	8/18	10/13
			Plants with topgrowth			
Giant	glyphosate	2	16	16	16	16
Giant	dalapon	20	16	16	16	16
Giant	cacodylic acid	2-4	16	16	16	16
Common	glyphosate	2	16	16	16	16
Common	dalapon	20	16	16	16	14
Common	cacodylic acid	2-4	16	16	16	16
			Square feet per growing plant			
Giant	glyphosate	2	3	0.2	0.3	0.2
Giant	dalapon	20	3	0.1	0.7	1.3
Giant	cacodylic acid	2-4	3	3.3	2.7	1.1
Common	glyphosate	2	42	4.3	5.7	0.7
Common	dalapon	20	41	8.9	2.5	0.9
Common	cacodylic acid	2-4	36	28.1	18.5	4.5

Response of two bermudagrass types to glyphosate. Hamilton, K.C. Giant and common bermudagrass plants spaced 9 by 15 feet were established by planting rhizome segments from a single parent plant of each type in the spring of 1974 at Tucson, Arizona. During the first year, seed heads were removed by mowing. During 1974 and 1975, low rates of trifluralin and simazine were applied to the soil to control annual weeds. Irrigation was similar to that used for cotton. Starting April 29, 1975, 1, 2, and 3 lb/A of glyphosate in 25 gpa of water were applied at 2 and 3-month intervals until October. Each plot contained four plants and treatments were replicated four times. The area covered by living topgrowth was estimated for each plant before each treatment.

All treatments killed the topgrowth of giant and common bermudagrass. In July, applications of glyphosate at 2-month intervals appeared superior to applications at 3-month intervals, but by October there was no apparent difference (table). After four applications of glyphosate only 3 lb/A reduced the number of plants with regrowth. There was little difference in the response of giant and common bermudagrass to glyphosate. Two and 3 lb/A of glyphosate gave a similar reduction in size of bermudagrass plants and both were better than 1 lb/A. (Arizona Agr. Exp. Sta., Tucson)

Bermudagrass plants with topgrowth and area covered by live topgrowth after applications of glyphosate at Tucson, Arizona in 1975.

Treatment			Date of observation				
Type	Months between	lb/A	4/29	6/23	7/21	8/18	10/13
			Plants with topgrowth				
Giant	2	1	16	16	16	16	16
Giant	2	2	16	16	16	16	16
Giant	2	3	16	6	9	11	12
Giant	3	1	16	16	16	16	16
Giant	3	2	16	16	16	16	16
Giant	3	3	16	5	16	6	13
Common	2	1	16	16	16	16	16
Common	2	3	16	16	16	16	16
Common	2	3	16	16	16	16	9
Common	3	1	16	16	16	16	16
Common	3	2	16	16	16	16	16
Common	3	3	16	16	16	10	15
			Square feet per growing plant				
Giant	2	1	6	2.0	2.1	2.7	0.8
Giant	2	2	4	0.4	0.2	0.4	0.1
Giant	2	3	3	0.1	0.1	0.1	0.1
Giant	3	1	5	2.6	5.2	1.8	1.3
Giant	3	2	5	0.8	1.4	0.3	0.3
Giant	3	2	6	0.1	0.2	0.1	0.1
Common	2	1	36	22.1	20.2	33.0	1.9
Common	2	2	38	4.8	2.6	3.6	0.1
Common	2	3	35	1.5	0.7	1.2	0.1
Common	3	1	38	18.9	46.5	7.0	3.1
Common	3	2	38	7.5	20.5	2.4	0.4
Common	3	3	36	2.5	7.3	0.1	0.1

Canada thistle control. Alley, H. P. An area which had been cultivated during part of the 1974 growing season was selected for the Canada thistle control study. Canada thistle had recovered from previous cultivations and was in the early bud-stage at time of treatment. The herbicides were applied 7/10/74 with an experimental, three-nozzle knapsack spray unit in a total volume of 40 gpa water. Plots were 1 sq rd in size with each treatment replicated three times. The soil at the location was classified as sandy loam (76.8% sand, 12.4% clay, 10.8% silt, 2.18% organic matter and 7.6 pH).

Visual weed control evaluations were made 7/1/75 approximately one year following treatment.

The visual control ratings indicate that dicamba + 2,4-D was more effective than high rates of dicamba applied alone. Dowco 290 (M-3792) at 0.75, 1.5 and 3.0 lb/A gave 100% control as did picloram + 2,4-D at 0.5 + 1.0 and 1.0 + 2.0 lb/A (Tordon-212). Dowco 290 + 2,4-D (M-3785 at 0.5 + 2.0 lb/A approached the effectiveness of 0.75 lb/A of Dowco 290 applied alone. Triclopyr (M-3724) was not as effective as Dowco 290, even at higher application rates. Glyphosate at 3.0 and 4.0 lb/A reduced the stand by 70 and 80%, respectively, annual broadleaf weeds invading the plots and healthy Canada thistle indicated no apparent soil activity. VEL-4207 showed more potential for Canada thistle control than did VEL-4359. (Wyoming Agr. Exp. Sta., Laramie, SR-673)

Herbicides, Canada thistle control, and visual observations[1/].

Herbicide	Rate lb/A	Percent control	Observations
dicamba +	1.0		
3,4-D[2/]	3.0	80	
dicamba +	1.5		
2,4-D	4.5	80	
dicamba	2.0	50	
dicamba	4.0	95	
VEL-4207	2.0	70	
VEL-4207	4.0	80	
VEL-4359	2.0	0	
VEL-4359	4.0	60	
picloram +	0.5		
2,4-D[3/]	1.0	100	
picloram +	1.0		
2,4-D	2.0	100	
Triclopyr (M-3724)	0.75	40	
Triclopyr (M-3724)	1.5	85	New Canada thistle seedlings in plots
Triclopyr (M-3724)	3.0	85	New Canada thistle seedlings in plots
Dowco 290 (M-3972)	0.75	100	100% control, skeletonleaf bursage
Dowco 290 (M-3972)	1.5	100	100% control, skeletonleaf bursage
Dowco 290 (M-3972)	3.0	100	100% control, skeletonleaf bursage
Dowco 290 +	0.125		
2,4-D (M-3785)	0.5	90	Activity on remaining C. thistle
Dowco 290 +	0.25		
2,4-D (M-3785)	1.0	95	Activity on remaining C. thistle
Dowco 290 +	0.5		
2,4-D (M-3785)	2.0	95	Activity on remaining C. thistle
GK-40	2 gal	70	
glyphosate	3.0	70	Annual weeds in plots
glyphosate	4.0	80	Annual weeds in plots

1/ Treated 7/10/74 Evaluated 7/1/75
2/ Dicamba + 2,4-D (Velsicol's Weedmaster - 1 lb dicamba + 3 lb 2,4-D/gal)
3/ Picloram + 2,4-D (Dow's Tordon-212 - 1 lb picloram + 2 lb 2,4-D/gal)

Canada thistle control. Zimdahl, R. L. The objective of these studies was to evaluate, under field conditions, the efficacy of several herbicides for control of Canada thistle.

The plots were established Oct. 1, 1974 in an uncultivated, unirrigated field, and sprayed with a bicycle plot sprayer using 26 gallons of water per acre. The soil and foliage were dry, the air temperature was 74 F, and the soil temperature (at 3 inches) was 56 F. Most of the Canada thistle was in the rosette stage. Granular picloram was applied by hand in five pounds of gravel per plot. The spring treatments were applied on May 10, 1975 in 22 gallons of water per acre. The soil and foliage were dry; air and soil temperatures were 52 and 48 F, respectively. Canada thistle had six to ten leaves at the time of spring application.

Mebribuzin at 2 and 4 lb/A was the most successful treatment. It was apparent that 4 lb of metribuzin may not be necessary to control thistle. Even though metribuzin was an excellent treatment, it did not eradicate the stand in one year. The stand was reduced to what was considered an uneconomic level, especially if a competing crop were planted. The combination of fall plus spring treatments was nearly equal in control to fall application alone. The combination of metribuzin in the fall and glyphosate in the spring, or metribuzin in the fall and dicamba plus chlorflurenol in the spring provided good control but these combinations were not as good as metribuzin alone at the higher rate. Picloram applied in the granular form gave excellent control at one-half and one pound. The combination of one-half pound of picloram in the fall plus one-half pound in the spring was nearly as successful. Triclopyr, an analog of picloram, was not satisfactory for the control of Canada thistle in these studies. Dicamba plus 2,4-D ester gave some control but was not satisfactory in these studies. However, combinations of dicamba with chlorflurenol, a growth regulator, improved the control gained from dicamba with 2,4-D ester. It was evident that the two pound rate of dicamba was superior to the one pound rate. Averaging the six rates of chlorflurenol with each rate of dicamba yielded a visual control for one pound of dicamba, regardless of chlorflurenol rate, of 40 while the stand count showed a 45% reduction from the check. The two pound rate of dicamba, again independent of the rate of chlorflurenol, showed a 65% visual control and an 80% reduction in stand when compared to the check. It is my opinion that dicamba and chlorflurenol were not as successful as they were in 1974, but do offer promise for annual control of Canada thistle. The one pound rate may be satisfactory but further study is needed to define the optimum rate combinations of dicamba and chlorflurenol. When dicamba plus chlorflurenol were applied in the spring the control was similar to that obtained with fall application. (Weed Research Laboratory, Dept. of Botany and Plant Pathology, Colo. State Univ., Fort Collins, 80523)

Canada thistle control - Loveland 1974-75.

Fall application	Rate lb/A	Spring application	Rate lb/A	Visual[1/] control rating	Stand[2/] count as % of control
metribuzin	2.0			69	24
metribuzin	4.0			79	39
metribuzin	2.0	metribuzin	1.0	76	41
metribuzin	2.0	2,4-D ester	2.0	72	34
metribuzin	2.0	dicamba + chlorflurenol	1.0 + 0.67	73	32
metribuzin	2.0	glyphosate	1.0	75	40
glyphosate	2.0			22	68
glyphosate	2.0	metribuzin	1.0	68	24
glyphosate	1.0	dicamba + chlorflurenol	0.5 + 0.33	30	55
glyphosate	1.0	dicamba + chlorflurenol	1.0 + 0.67	54	44
picloram	0.5			71	23
picloram	1.0			88	14
picloram	0.5	picloram	0.5	83	33
dicamba + 2,4-D ester	1.0 1.0			33	59
dicamba + chlorflurenol	1.0 + 0.125			40	64
dicamba + chlorflurenol	1.0 + 0.25			51	32
dicamba + chlorflurenol	1.0 + 0.5			29	48
dicamba + chlorflurenol	1.0 + 0.67			37	46
dicamba + chlorflurenol	1.0 + 0.75			35	51
dicamba + chlorflurenol	1.0 + 1.0			43	30
dicamba + chlorflurenol	2.0 0.125			67	20
dicamba + chlorflurenol	2.0 + 0.25			71	15
dicamba + chlorflurenol	2.0 + 0.5			61	24
dicamba + chlorflurenol	2.0 0.67			72	19
dicamba + chlorflurenol	2.0 + 0.75			55	28

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Fall application	Rate lb/A	Spring application	Rate lb/A	Visual[1/] control rating	Stand[2/] count as % of control
dicamba + chlorflurenol	2.0 + 1.0			61	16
		dicamba + chlorflurenol	2.0 + 0.67	68	43
		dicamba + chlorflurenol	1.0 + 0.67	43	72
dicamba + chlorflurenol+ glyphosate	1.0 + 0.67 + 1.0			46	44
dicamba + chlorflurenol+ metribuzin	1.0 + 0.67 + 0.5			59	31
dicamba + chlorflurenol	1.0 + 0.67	metribuzin	0.75	62	27
Control - no herbicide					100

1/ Visual control rating - An average of 5 ratings on three replications; 0 = no control; 100 = complete control.

2/ The stand count is the average number of thistle plants counted in three 2 sq ft quadrats per plot in three replications in May, June, and August. The control contained an average of 13.7 plants/2 sq ft.

Field bindweed control. H. P. Alley. The experimental site was a summer fallowed dryland wheat production strip which had been disked once before treatments were applied. The bindweed had recovered from the cultivation operation and was in the bud stage with 12 to 14 inches above ground growth at time of treatment. The herbicides were applied 7/2/74 in a total volume of 40 gpa with an experimental, 3-nozzle knapsack sprayer. Plots were 1 sq rd in size with three replications. The soil was classified as a sandy loam (64.8% sand, 27.2% silt, 8.0% clay, 2.3% organic matter, and 7.4 pH).

Visual weed control observations were made 8/1/74 and 7/22/75, approximately one month and one year following treatment, with the data obtained one year following treatment presented (table).

Dicamba at 4 lb/A, VEL-4359 at 4 lb/A, picloram + 2,4-D (Tordon-212) at 0.5 + 1 and 1 + 2 lb/A, and Dowco 290 (M-3972) at 1.5 and 3 lb/A, and GK-40 at 2 gpa all gave 90% or better reduction in stand one year following treatments.

The early observation, one month following treatment, indicated very little activity from Dowco 290 (M-3972) and picloram + 2,4-D as both treatments show slow activity. (Wyoming Agric. Expt. Sta., Laramie, SR-672)

Herbicides, field bindweed control and observations.

Herbicide[1/]	Rate lb/A	Percent control	Observations
dicamba + 2,4-D[2/]	1 + 3	60	
dicamba + 2,4-D	1.5 + 4.5	70	
dicamba	2	80	
dicamba	4	98	
VEL-4207	2	40	
VEL-4207	4	60	
VEL-4359	2	60	
VEL-4359	4	98	
picloram + 2,4-D[3/]	0.5 + 1.0	100	Plots bare
picloram + 2,4-D	1 + 2	100	Plots bare
triclopyr (M-3724)	0.75	50	
triclopyr (M-3724)	1.5	60	
triclopyr (M-3724)	3	70	
Dowco 290 + 2,4-D (M-3785)	0.125 + 0.5	60	
Dowco 290 + 2,4-D (M-3785)	0.25 + 1.0	70	
Dowco 290 + 2,4-D (M-3785)	0.5 + 2.0	85	
Dowco 290 (M-3972)	0.75	20	
Dowco 290 (M-3972)	1.5	90	
Dowco 290 (M-3972)	3	100	
GK-40	2 gal.	90	

1/ Treated 7/2/74. Evaluated 7/22/75.
2/ Dicamba + 2,4-D (Velsicol's Weedmaster 1 lb dicamba + 3 lb 2,4-D/gal)
3/ Picloram + 2,4-D (Dow's Tordon 212 - 1 lb picloram + 2 lb 2,4-D/gal)

Field bindweed control in dry beans. Robert F. Norris and Renzo A. Lardelli. Field bindweed is a serious weed problem in many California crops; low growing field beans offer very little competition against the weed. Shielded sprays of MCPA have been used with limited success over the years. In recent years bladed trifluralin has appeared promising; bentazon postemergence offers a possible new treatment, and glyphosate preplant offered a completely new approach.

A two year trial was established on the Agronomy farm at Davis in 1974 and continued in 1975; identical treatments were applied each year to the same plots. The field bindweed was irrigated in the spring of each year until it had reached a full flowering stage, with some fruits already set and developing, at which time the glyphosate treatments were applied. The sequence of events in the two years was:

	Operation	1974	1975
1	4.0 lb/A glyphosate applied with tractor-mounted compressed air sprayer, 22 gpa	June 19	June 6
2	Field disked twice along length of plots, then relisted.	July 1	June 23
3	Furrow irrigation to field capacity	July 3	June 30
4	Unexpected rainfall - approx. 1 in.	July 8	
5	0.75 lb/A trifluralin applied to all plots except those for bladed trifluralin, powertiller incorporated 4 in. deep	July 15	July 8
6	1.0 lb/A trifluralin bladed into bed	July 16	July 8
7	Kidney beans (Sutter Pink) sowed to moisture	July 17	July 10
8	Cultivation in furrows		
9	First bentazon treatment applied	August 2	July 26
10	MCPA applied, shielded sprayer used	August 8	August 15
11	Second bentazon treatment applied	August 26	August 8
12	Cultivation in furrows		
13	Harvested with modified commercial	October 23	November 3

Irrigation was applied as needed for normal bean growth and in relation to various cultural practices. The bladed trifluralin was applied with a specially developed spray sweep set inside a Marvin bed shaper; (the Marvin Landplane Co. of Woodland, California is thanked for help in developing this blade unit). The unit was set to provide a layer 4 in. deep from the top of the bed, and used a pair of 11002 nozzles at 28 psi delivering 57 gpa. Bentazon was applied with a CO_2 backpack handsprayer using 8002 nozzles applying 30 gpa/A at 2.5 mph, and MCPA was applied with a tractor mounted shielded sprayer using 8003 nozzles at 24 psi and delivering 49 gpa at 3 mph.

The only treatment that caused any bean injury was bentazon. A slight yellowing of leaf margins was observed for a few days after treatment, especially following application to younger beans. This symptom was rapidly outgrown. Use of the shielded sprayer effectively eliminated injury to the beans following the MCPA treatment. The untreated checks showed water stress symptoms toward the end of some irrigation cycles, treated plots did not.

Field bindweed control following glyphosate treatment was excellent, counts of the regrowth showed control to be almost complete. Bladed trifluralin also reduced field bindweed regrowth substantially, although it is doubtful if any permanent effect was obtained as the shoot counts were higher in 1975 than 1974. Both postemergence treatments suppressed field bindweed top growth temporarily, but no permanent control was effected. All treatments increased bean yield. MCPA was weakest, bentazon was better, bladed trifluralin was even better, and glyphosate applied presowing was outstanding. Some of the glyphosate effect may have been due to killing of weeds other than field bindweed following the initial preirrigations, as general weed control in the beans was better where glyphosate had been used. There did not seem to be any benefit, in this trial, from treating two years successively. The practice of killing field bindweed with glyphosate prior to sowing a relatively short season crop like beans offers considerable potential. Field bindweed control in 1975 also substantially reduced the amount of trash screened out of the harvested sample; this would be an added benefit from these treatments. (Botany Department, University of California, Davis, 95616)

Field bindweed control in dry beans.

Main treatment	Rate lb/A	Sub-treatment	Rate lb/A	Bindweed counts 8/2/74	Bindweed counts 7/28/75	Yield, lb/plot 10/23/74	%	Yield, lb/plot 11/11/75	%	Screening loss-%
Glyphosate	4.0	Trifluralin (bladed 4 in. deep)	1.0	1.3	0.5	48.5	57	61.7	42	10.3
Untreated	-	Trifluralin (bladed 4 in. deep)	1.0	20.0	49.0	37.4	21	53.7	23	13.0
Glyphosate	4.0	Bentazon (postemergence)	1.0 + 1.0	1.3	1.3	45.0	48	60.4	38	9.4
Untreated	-	Bentazon (postemergence)	1.0 + 1.0	122.3	82.8	34.1	10	48.6	11	14.3
Glyphosate	4.0	MCPA (postemergence, shielded)	1.5	2.3	0.3	44.2	43	58.9	35	8.4
Untreated	-	MCPA, (postemergence, shielded)	1.5	124.0	87.5	30.9	0	48.0	10	14.8
Glyphosate	4.0	Untreated	-	1.0	1.3	40.7	32	60.1	38	9.2
Untreated	-	Untreated	-	93.5	108.5	30.9	0	43.6	0	19.0

All data are means of 4 replications.

Bindweed counts were made from center 4 beds (10 in each) x 20 ft.

Yields were taken from center 4 rows x 112 ft, % yield data reflect increase over untreated check.

Screening loss derived from before and after screening weights of the samples, expressed as %.

The effect of injected 1,3-D and layered trifluralin for bindweed and pigweed (Amaranthus sp.) control. Lange, A., J. Radewald, W. Humphrey, J. Schlesselman and R. Goertzen. Layered trifluralin and injected 1,3-D fumigant were applied in different rate combinations for bindweed control.

The applications were made 10/23/74. Plots were 10' x 25' and replicated 6 times. The fumigant was first injected 16" - 18" deep at 10, 20 and 40 gpa and then followed by trifluralin layered 4" deep with rates of 1,2 and 4 lb/A. Checks consisted of no fumigant with all rates of trifluralin, no trifluralin with all rates of fumigant and neither fumigant nor trifluralin.

All rate combinations of trifluralin and fumigant gave good bindweed control. Trifluralin, by itself, gave almost as good results, suggesting less effect of the fumigant. The fumigant by itself, gave good control. Trifluralin by itself gave good pigweed control. In combination with the fumigant, control with trifluralin appeared to decrease with increasing rates of fumigant. There was a suggestion that the fumigant may have stimulated the pigweed or controlled the bindweed allowing the pigweed to grow more vigorously. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California, 93648)

The effect of combinations of injected fumigant and layered trifluralin for bindweed and pigweed control.

		Average 1/							
		Bindweed Control				Pigweed Control			
Herbicides	lb/A	T-0	T-10	T-20	T-40	T-0	T-10	T-20	T-40
trifluralin	1	9.7	10.0	9.7	10.0	8.7	7.3	5.8	6.3
trifluralin	2	9.7	10.0	10.0	9.8	9.3	9.2	6.8	7.5
trifluralin	4	9.5	10.0	10.0	10.0	8.5	8.3	7.0	6.8
check	-	1.0	8.2	9.3	9.0	6.2	2.8	2.7	3.2

1/ Average of 6 replications. Based on 0 to 10 scale where 0 = no control and 10 = complete weed control. Treated 10/23/74. Evaluated 5/21/75. T = 1,3 dichloropropene gallons per acre.

Control of field horsetail with dichlobenil and asulam. Ryan, G.F. Experiments were established at two locations in 1974 to compare asulam with dichlobenil for horsetail control, and to determine the effect of using asulam in conjunction with dichlobenil by spraying the horsetail shoots that emerge during the summer following dichlobenil applications.

The soil at both locations was Puyallup sandy loam. Granular dichlobenil was used at 6 lb/A in both experiments. In Experiment 1, dichlobenil was applied in January, February or March. Asulam was applied at 3 or 6 lb/A June 21, and again September 11, because of later emerging horsetail shoots. Treatments were replicated three times on 5 by 25 ft plots. In Experiment 2, dichlobenil was applied in January or March, and asulam was applied July 30 at 6 or 9 lb/A. Plots were 10 by 10 ft, with three replications. Asulam was applied in 100 gpa water in both experiments, with 0.2% (vol/vol) surfactant (R-11).

Control from dichlobenil was 97 to 100% early in the season in both experiments (Tables 1 and 2), and was above 90% in September. In July, 1975, control from the January and March, 1974, applications was 53 to 57%, significantly lower than the 87% control from the February application (Table 1). Application of asulam on the few shoots that emerged the first summer following dichlobenil treatment did not enhance control in the second season (Tables 1 and 2). A year following treatment, control from asulam alone ranged from 37% (3 + 3 lb/A, Table 1) to 66% (9 lb/A, Table 2). (West. Wash. Res. and Ext. Cent., Wash. State Univ., Puyallup, 98371)

Table 1. Control of field horsetail with dichlobenil and asulam.

Experiment 1

Dichlobenil[1/] Date applied (1974)	Asulam[2/] Rate lb/A	Percent control[3/] [4/] 6/21/74	9/11/74	7/25/75
1/11	--	97.6 d	98.1 b	57 bc
1/11	3 + 3	99.2 bc	99.2 ab	73 ab
1/11	6 + 6	99.7 cd	99.0 ab	65 abc
--	3 + 3	--	--	37 c
--	6 + 6	--	--	60 abc
2/15	--	100.0 a	99.9 a	87 a
2/15	3 + 3	99.9 ab	99.8 a	80 ab
2/15	6 + 6	99.8 ab	99.9 a	73 ab
3/15	--	99.9 a	99.4 ab	53 bc
3/15	6 + 6	99.9 a	98.5 b	38 c

1/ Dichlobenil applied at 6 lb/A
2/ Asulam applied 6/21 and 9/11/74
3/ Percent control was based on shoot counts in 1974, and on visual rating in 1975
4/ Means in the same column followed by the same letter are not significantly different at the 5% level

Table 2. Control of field horsetail with dichlobenil and asulam.

Experiment 2

Herbicide	Rate (lb/A)	Date applied (1974)	Percent control[1/] [2/] 6/14/74	9/29/74	7/21/75
Dichlobenil	6	1/21	100 a	96 a	79 ab
Dichlobenil	6	1/21	100 a	93 a	85 a
+ asulam	6	7/30			
Dichlobenil	6	1/21	100 a	96 a	87 a
+ asulam	9	7/30			
Asulam	9	7/30	--	--	66 b
Dichlobenil	6	3/25	98 a	99 a	82 a

1/ Percent control was based on shoot counts compared with untreated check plots.
2/ Means in the same column followed by the same letter are not significantly different at the 5% level.

Johnsongrass control with glyphosate. Lange, A., J. Schlesselman and R. Goertzen. Combination sprays of glyphosate and MSMA were applied 7/29/75 on full size flowering johnsongrass. Some plots were sprayed with glyphosate 7/29 and a second time 4, 8 or 24 hours later. Good control of johnsongrass was obtained at 2 lb/A. The 1 lb/A rate was suboptimal. The addition of MSMA also at suboptimal rates showed some initial effects but these did not persist into the fall reading (10/20/75). (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of timing a follow up spray of MSMA on the control of johnsongrass with glyphosate.

			Average[1/]	
Herbicides	lb/A	Date Sprayed	Initial[2/] control 8/29/75	Subsequent[3/] control 10/20/75
Glyphosate	1	7/29	6.2	4.8
Glyphosate	2	7/29	8.0	7.5
Glyphosate + MSMA	1+2	7/29	6.8	0.5
Glyphosate + MSMA	1(+2)	7/29(+ 4 hr)	7.5	0.5
Glyphosate + MSMA	1(+2)	7/29(+ 8 hr)	7.2	2.0
Glyphosate + MSMA	1(+2)	7/29(+24 hr)	7.8	0.5
Check	--	--	0.0	3.8[4/]

1/ Average of 4 replications. Applied 7/29/75.
2/ Based on initial effect and 0 to 10 scale where 0 = no effect, 10 = completely burned down.
3/ Based on regrowth and 0 to 10 scale where 0 = no effect, most vigorous regrowth and 10 = complete kill.
4/ Rating due to competition from bermudagrass.

Response of purple nutsedge to glyphosate. Hamilton, K.C. Response of purple nutsedge to foliage applications of glyphosate was studied at Tucson, Arizona in 1974 and 1975. One hundred-ninety-two plants spaced 10 by 15 feet were established from single tubers from the same parent in 1973. During the first year, seed heads were removed by mowing. Each year, low rates of trifluralin and diuron or simazine were applied to the soil to control annual weeds. Irrigation was similar to that used for cotton. Plants averaged 60 and 210 stems when treatments started in 1974 and 1975, respectively. Starting May 20, 1974 and May 27, 1975, 2, 4, or 6 lb/A of glyphosate in 25 gpa of water was applied at 2 and 3-month intervals until November. Most plots contained four plants and each treatment was replicated four times. The number of stems per plant was estimated before each treatment.

The response of purple nutsedge to glyphosate was slow. Two to 6 weeks were required to kill topgrowth, even with the 4 and 6 lb/A applications. No treatment killed all purple nutsedge plants in a single season (table). There was little difference in the amount of control between the 2 and 3-month intervals. Control increased as the amount of glyphosate increased. In 1974, the response to glyphosate rate was most evident in the number of stems per plant. In 1975, the response to rate was most evident in the number of plants with topgrowth. (Arizona Agr. Exp. Sta., Tucson)

Purple nutsedge plants with topgrowth and number of stems per plant after applications of glyphosate at Tucson, Arizona in 1974 and 1975.

Treatment		Plants with topgrowth		Stems per growing plant[1/]	
Months between	lb glyphosate/A	11/4/74	11/10/75	11/4/74	11/10/75
2	2	9	11	30 a	8 a
2	4	10	8	13 ab	7 a
2	6	4	3	2 b	5 a
3	2	15	10	33 a	11 a
3	4	7	7	10 ab	7 a
3	6	8	2	2 b	5 a

1/ In a column, values followed by the same letter are not significantly different at the 5% level.

The effect of foliar herbicides on nutsedge control. Lange, A., J. Schlesselman and R. Goertzen. A heavy infestation of purple nutsedge in a Delhi loamy sand was sprayed 7/23/75 with three herbicides and two combination treatments. One combination was applied in one spray. The second combination treatment was sequential with cyperquat going on 5 days after the glyphosate. A July foliar application of glyphosate at 4 lb/A gave excellent control of nutsedge which persisted into September, the last reading. Although triclopyr gave good initial control the control did not carry through until September. Cyperquat gave little more than a slight chlorosis. The combination of glyphosate and cyperquat was not outstanding. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of foliar sprayed herbicides and combinations on nutsedge control.

Herbicides	lb/A	Date sprayed	Average[1/] Nutsedge Control 8/5/75	8/18/75	9/5/75
glyphosate	4	7/23	6.8	9.5	9.2
triclopyr	4	7/23	6.8	6.0	5.0
triclopyr	8	7/23	8.0	7.8	5.2
cyperquat	4	7/23	2.5	2.8	2.2
cyperquat	8	7/23	3.8	3.2	3.0
glyphosate + cyperquat	2+2	7/23	4.5	7.8	8.0
glyphosate + cyperquat	2(+2)	7/23(+7/28)	4.2	7.0	7.8
Check	--	--	0.5	0.2	0.5

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete control.

A comparison of new herbicides for purple nutsedge control. ange, A., R. Goertzen and J. Schlesselman. Four new herbicides were incorporated with a power tiller on 7/25/75. The beds were reshaped, irrigated and left unplanted. A purple nutsedge control rating was made 9/5/75. Dichlobenil, the standard of comparison, was not excelled. FMC-25213 showed moderate control of nutsedge. GS-24705 gave better control of purple nutsedge than alachlor. HER-26905 did not control purple nutsedge. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

A comparison of 5 incorporated herbicides for the control of purple nutsedge.

Herbicide	lb/A	Average[1/] Purple Nutsedge Control
dichlobenil	4	9.0
FMC-25213	4	6.5
FMC-25213	8	8.0
HER-26905	4	1.8
HER-26905	8	2.5
alachlor	2	0.8
alachlor	4	2.2
GS-24705	2	3.5
GS-24705	4	6.5
Check	--	0.8

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete lack of regrowth. Treated 7/25/75. Evaluated 9/5/75.

Russian knapweed control. H. P. Alley. A pasture which had been invaded by a heavy stand of Russian knapweed was selected for the control evaluation site. Russian knapweed was in the late bud-stage of growth at time of treatment. The herbicides were applied 7/9/74 in a total volume of 40 gpa water with an experimental, three-nozzle knapsack sprayer. Plots were 1 sq rd in size with each treatment replicated three times. The soil at the experimental site was classified as a sandy loam (72.8% sand, 19.6% silt, 7.6% clay, 2.53% organic matter, and 7.9 pH).

Visual weed control observations were made 7/1/75 approximately one year following treatment.

Fifteen of the twenty-two treatments completely eliminated Russian knapweed. VEL-4207 and VEL-4359 at the higher rates of application gave 100% control as did all rates of Dowco 290 (M-3972). Glyphosate at 3 lb/A eliminated the Russian knapweed with many annual weeds reinfesting the treated areas. Lower rates may also be effective. Triclopyr (M-3724) gave outstanding control at the rates used, however, new Russian knapweed seedlings were reinvading the plots. (Wyoming Agric. Expt. Sta., Laramie, SR-675)

Herbicides, Russian knapweed control, and visual observations[1/]

Herbicide	Rate lb/A	Percent Control	Observations
dicamba +	1.0	70	
2,4-D[2/]	3.0		
dicamba +	1.5	100	
2,4-D	4.5		
dicamba	2.0	100	
dicamba	4.0	100	
VEL-4207	2.0	95	
VEL-4207	4.0	100	
VEL-4359	2.0	98	Hurt native grass
VEL-4359	4.0	100	Hurt native grass
picloram +	0.5	100	
2,4-D[3/]	1.0		
picloram +	1.0	100	
2,4-D	2.0		
triclopyr (M-3724)	0.75	95	Russian knapweed seedlings in plots
triclopyr (M-3724)	1.5	95	Russian knapweed seedlings in plots
triclopyr (M-3724)	3.0	95	Russian knapweed seedlings in plots
Dowco 290 (M-3972)	0.75	100	
Dowco 290 (M-3972)	1.5	100	
Dowco 290 (M-3972)	3.0	100	
Dowco 290 +	0.125	100	
2,4-D (M-3785)	0.5		No damage to grass
Dowco 290 +	0.25	100	
2,4-D (M-3785)	1.0		No damage to grass
Dowco 290 +	0.5		
2,4-D (M-3785)	2.0	100	No damage to grass
GK-40	2 gal	95	Sweetclover in plots
glyphosate	3.0	100	Sweetclover, kochia, foxtail, and barley growing in plots
glyphosate	4.0	100	

1/ Treated 7/9/74. Evaluated 7/1/75.
2/ Dicamba + 2,4-D (Velsicol's Weedmaster - 1 lb Dicamba + 3 lb 2,4-D/gal)
3/ Picloram + 2,4-D (Dow's Tordon-212 - 1 lb picloram + 2 lb 2,4-D/gal)

PROJECT 2. HERBACEOUS WEEDS IN RANGE AND FORESTS

A. Wayne Cooley, Project Chairman

SUMMARY

Papers were submitted concerning chemical control of Lambert crazyweed, a poisonous plant to animals, chemical control of grasses and forbes to increase conifer seedling survival in eastern Oregon and biological evaluations utilizing insects for control of spotted knapweed and leafy spurge.

Lambert crazyweed control was 90 percent or greater in a Wyoming test, 13 months after application of Dowco 290 (M-3972) at 1.0 and 3.0 lb/A, picloram + 2,4-D at 0.25 + 0.5 lb/A, 2,4-D (LVE + W.A.) at 2.0 lb/A, dicamba at 2.0 lb/A, dicamba + 2,4-D at 0.5 + 1.5 lb/A, picloram at 0.25 lb/A, and triclopyr at 6.0 and 9.0 lb/A.

Dalapon and dalapon + atrazine were applied to covered and uncovered seedling ponderosa pine and Douglas-fir to evaluate phytotoxicity and grass and forb control. The dalapon-atrazine mixture provided better forb control than dalapon alone. Seedling survival of ponderosa pine and Douglas-fir was good to excellent with no apparent differences between the treated plots and controls, probably due to an unusually cool, moist summer.

Herbicide evaluation for control of Lambert crazyweed. Alley, H. P. Lambert crazyweed is commonly known as locoweed by livestock men and is so designated in recent USDA poisonous plant publications. The plant causes a crazy behavior of poisoned animals. "Locoed" horses seldom recover completely, but until recently, the effects on cattle consuming the plant were not fully understood. Wyoming cattlemen report uneconomical gains, abortion, calves unable to drink or eat and even locoed game animals. Animals will not ordinarily eat crazyweed, but seem to cultivate a taste for it upon consuming small quantities.

With the economic losses being suffered by cattlemen from crazyweed infested rangeland, grazing associations organized and asked for specific control recommendations. The herbicide evaluation program as outlined in the following table was a result of such a request.

Evaluation plots were established in a heavy crazyweed infested rangeland on 5/22/74. The crazyweed was in bud to early bloom stage at time of treatment. All herbicides were applied with a three-nozzle knapsack spray unit in a total volume of 40 gpa water. Plots were 9 ft by 30 ft, with three replications.

All crazyweed plants growing in the treated area were counted just prior to treatment and again on 7/24/75, approximately 13 months after treatment.

Dowco 290 (M-3972) at 1 and 3 lb/A gave 100% control as did picloram + 2,4-D at 0.25 + 0.5 lb/A (Tordon 212). The treatments of 2,4-D (LVE + W.A.) at 2 lb/A, dicamba at 2 lb/A, dicamba + 2,4-D at 0.5 + 1.5 lb/A, picloram at 0.25 lb/A, and triclopyr at 6 and 9 lb/A all resulted in 90% or better reduction in stand of crazyweed. Over 15,000 acres, in the past two years, have been sprayed with 2,4-D ester treatment with outstanding results. (Wyoming Agric. Expt. Sta., Laramie, SR-674)

Herbicides and resulting control of Lambert crazyweed[1/].

Herbicide	Rate lb/A	Counts 1974	1975	Percent stand reduction
2,4-D LVE	2	119	33	72
2,4-D LVE + W.A.	2	73	6	92
2,4-D amine	2	73	109	0
2,4-D amine + W.A.	2	72	77	0
silvex	2	107	18	83
silvex + W.A.	2	95	15	84
dicamba	1	97	29	70
dicamba	2	71	4	94
dicamba + 2,4-D[2/]	0.25 + 0.75	119	70	42
dicamba + 2,4-D	0.5 + 1.5	165	11	93
picloram	0.25	176	2	99
picloram + 2,4-D[3/]	0.25 + 0.5	148	0	100
VEL-4207	1	129	50	61
VEL-4207	2	122	28	77
Dowco 290 (M-3972)	0.5	128	151	0
Dowco 290 (M-3972)	1	122	0	100
Dowco 290 (M-3972)	2	162	0	100
triclopyr	3	139	48	54
triclopyr	6	104	9	93
triclopyr	9	103	7	93

1/ Treated 5/22/74, counted 5/22/74 and 7/24/75
2/ Dicamba + 2,4-D (Velsicol's Weedmaster - 1 lb dicamba + 3 lb 2,4-D/gal)
3/ Picloram + 2,4-D (Dow's Tordon 212 - 1 lb picloram + 2 lb 2,4-D/gal)
W.A. = X-77 added at 2 pints/100 gal mix

Postplanting control of grasses competing with ponderosa pine and Douglas-fir. Dimock, E.J., II. Delayed snowmelt and late-spring planting often combine with low summer rainfall and a short growing season to reduce survival of conifer plantations in eastern Oregon's Blue and Wallowa Mountains. Dalapon may prove useful as a postplanting spray to control grass and enhance conifer survival in grassy forest habitats. Earlier studies have shown that dalapon alone, especially when applied after new foliage emerges, can injure conifers; mixing atrazine with dalapon may mask such phytotoxicity as well as provide a broader spectrum of vegetation control. Also, in spot applications of herbicides around young seedlings, foliage can be temporarily covered at little additional cost. Hence, to evaluate the effectiveness of dalapon--used both alone and in mixture with atrazine--plus the need for seedling protection at time of spraying, ponderosa pine and Douglas-fir were each tested at two locations on the Wallowa-Whitman National Forest in 1975. The same 7 treatments were applied at each of the above 4 species-location combinations:

1 - untreated (control
2 - seedlings covered, 4 lb dalapon per acre
3 - seedlings covered, 8 lb dalapon per acre
4 - seedlings covered, 8 lb dalapon plus 4 lb atrazine per acre
5 - seedlings uncovered, 4 lb dalapon per acre
6 - seedlings uncovered, 8 lb dalapon per acre
7 - seedlings uncovered, 8 lb dalapon plus 4 lb atrazine per acre

All chemicals were applied with backpack sprayers in water at 100 gpa to circular spots of 2.5 ft radius surrounding each seedling. Each treatment contained 25 seedlings and all treatments were replicated in 5 blocks. Seedlings were planted in late May or early June; competing grasses and forbs were sprayed about a week or two after planting. Control of grass and forbs plus damage to conifers was assessed in early July; seedling survival was recorded in late October.

Dalapon alone provided fair to good grass control in all cases, but little forb control at any of the four locations (table). Dalapon at 8 lb/A was consistently more effective than dalapon at 4 lb/A on grass, but showed little added effectiveness on forbs. The dalapon-atrazine mixture gave best grass control at all 4 locations, excellent forb control at Enterprise (2 locations), and fair to good forb control at Unity and La Grande. Virtually no damage to conifer foliage was seen at any location, whether seedlings had been covered at time of spraying or not. Seedling survival of ponderosa pine and Douglas-fir after one summer was good to excellent at all locations, and there were no apparent differences between spray treatments or controls. An unusually cool, moist summer probably favored seedling survival and minimized possible adverse effects on seedlings due to spray treatments.

Both seedling survival and residual activity of herbicides will be reassessed in 1976. (Pac. Northwest Forest and Range Exp. Sta., U.S. Forest Serv., Corvallis, Oregon)

Grass and forb cover, estimated control, and seedling survival after postplanting spot sprays of dalapon and atrazine on ponderosa pine and Douglas-fir.

Item	Untreated		covered			uncovered	
		Dalapon 4 lb	Dalapon 8 lb	Dalapon Atrazine 8 + 4 lb	Dalapon 4 lb	Dalapon 8 lb	Dalapon Atrazine 8 + 4 lb
	percent						
Ponderosa pine, Unity							
grass cover	47	45	40	45	36	37	37
grass control	0	31	47	71	28	47	64
forb cover	3	3	2	2	4	4	2
forb control	0	1	8	54	1	4	29
seedling survival	78	75	58	80	65	74	73
Ponderosa pine, Enterprise							
grass cover	58	42	45	61	48	56	56
grass control	0	24	54	95	38	62	94
forb cover	40	48	45	37	50	39	37
forb control	0	6	14	88	10	11	86
seedling survival	68	64	80	80	68	72	75
Douglas-fir, LaGrande							
grass cover	34	37	30	32	31	35	34
grass control	0	50	65	68	53	62	64
forb cover	3	3	3	3	2	3	3
forb control	0	8	8	23	4	4	20
seedling survival	95	90	93	94	90	97	90
Doublas-fir, Enterprise							
grass cover	35	26	21	35	30	27	38
grass control	0	18	22	92	14	32	90
forb cover	49	46	45	46	42	47	41
forb control	0	11	11	81	9	15	79
seedling survival	90	85	89	90	90	86	88

Biological control of spotted knapweed in western Montana. Story, J. M., L. O. Baker, and N. L. Anderson. A gall fly, *Urophora affinis* Frfld., was introduced into western Montana in 1973 to be evaluated for its potential as a biological control agent for spotted knapweed (*Centaurea maculosa* Lam.). The insect deposits its eggs inside the young flower buds of spotted knapweed where the resulting larvae feed. The feeding of the larvae reduces achene production and causes the plant tissues to form a gall around the larvae.

The first release of 150 *U. affinis* adults was made in June 1973 into a 3.6 meter long x 1.8 meter wide x 1.8 meter high field cage placed in a heavy infestation of spotted knapweed. During July 1974 and 1975 2,700 additional adults were released at five locations in Western Montana.

Approximately 15 percent of the seed heads within the cage contained galls in May 1974. This figure increased to 71 percent after reproduction in 1975. Flies were observed in 1975 at a distance of up to 100 meters, but galls were found up to only 34 meters from the release site.

Gall flies were found in the webs of a spider, *Dictyna major* Menge, that builds its web at the top of spotted knapweed plants. Its effect on the fly population has not been determined. (Montana Agricultural Experiment Station, Bozeman)

Biological control of leafy spurge. Baker, L. O. *Hyles euphorbiae* eggs provided by the Biological Control of Weeds Laboratory, Albany, California were used to produce about 12,000 larvae. These larvae were field released in Montana at 14 locations during July, 1974 in colonies of from 500 to 1,000. Additionally about 1,000 larvae were released into a field cage approximately six meters square by one meter high.

Almost no feeding occurred at two locations and the larvae disappeared rapidly. At one of these locations wasps were seen to parasitise the larvae. At other locations extensive larval feeding occurred and it is assumed that normal pupation resulted.

The caged larvae developed without apparent predation or parasitization. The cage was removed during the winter and replaced in May, 1975.

No *H. euphorbiae* were recovered in 1975 from any of the field releases. Three adults appeared in the cage and produced approximately 100 larvae that developed normally.

The top of the cage was removed in September, 1975 and poison bait was placed to control a population of field mice. (Montana Agricultural Experiment Station, Bozeman, 59715)

PROJECT 3. UNDESIRABLE WOODY PLANTS

Ron Stewart, Project Chairman

SUMMARY

Initial results of tests by Hamilton, Radosevich, and McHenry to control resprouting of cut blue gum eucalyptus trees show that axe-frill applications are more effective than stump sprays. Glyphosate produced complete control of resprouting; 2,4-D amine was less effective but acceptable. Silvex and MSMA were unsatisfactory.

Plumb and Boozer found that triclopyr and picloram + 2,4-D foliar sprays produced good first year control of redshank chamise in southern California. A combination of 2,4-D and dichlorprop was much less effective. January applications of as little as 1/2 oz per plant of picloram pellets (10% ai) controlled all but the largest plants. In contrast, response to karbutilate granules (10% ai) at 1 oz per plant was very limited 7 months after treatment.

Triclopyr also looks promising for control of brush species on forest lands in the Oregon Coast Ranges. Stewart and Weatherly found that an amine salt formulation was slightly more effective than an ester formulation 4 months after treatment. A 3 lb a.e. per acre rate may be adequate for the amine formulation, but higher rates seem to be required for the ester formulation.

Eucalyptus resprout control. Hamilton, W. D., S. R. Radosevich, and W. B. McHenry. Several experiments were conducted in the east San Francisco Bay hills near Berkeley, California to control resprouting of previously cut blue gum trees (*Eucalyptus globulus* Labill). An initial study, conducted in early 1973 (one year following a severe winter freeze) indicated that a water-soluble amine of 2,4-D, glyphosate, and AMS applied to stumps in axe-frills produced satisfactory control. Basal spray treatments of herbicides in diesel oil were unsatisfactory.

A second study for stump sprout prevention was initiated on October 26, 1973 in cooperation with the Oakland Park Department. It was a refinement of the first study.

The trees had been cut several months prior to herbicide treatment. Stumps were approximately one foot in height and were 4- to 8-in. in diameter.

Undiluted water-soluble herbicides or the same herbicides diluted 75% were applied into axe-frills cut just above the soil line. In addition broadcast applications were made to 2- to 3-ft blue gum resprouts. All plots were 200 sq ft and each plot was replicated three times. Numbers of dead and alive stumps were counted on May 13, 1974 and April 3, 1975.

The evidence, two years after treatment, indicated that the axe-frill method of stump sprout control of blue gum was superior to spray treatments. Glyphosate provided 100% control at both full and quarter strength concentrations. The water soluble amine of 2,4-D produced acceptable control but less than that of glyphosate; MSMA was not satisfactory. (Cooperative Exten. Serv., Alameda Co. and Botany Department, Univ. of California, Davis, Calif.)

Blue gum resprout control.

Treatment	Rate	May 13, 1974, evaluation*			April 3, 1975, evaluation*		
		Live stumps	Dead stumps	Control	Live stumps	Dead stumps	Control
	(% or lb/A)	--- Number ---		(Percent)	--- Number ---		(Percent)
Axe-frill							
2,4-D	100%	1	21	95.5	2	13	86.6
2,4-D	25%	3	15	83.3	6	12	66.6
MSMA	100%	5	7	58.3	5	5	50.0
glyphosate	100%	0	16	100.0	0	16	100.0
glyphosate	25%	0	10	100.0	0	8	100.0
Broadcast							
2,4-D	4	9	4	30.0	11	1	8.3
silvex	4	6	5	45.4	12	0	0
glyphosate	4	7	7	50.0	8	4	33.3
control	-	16	0	0	17	2	10.5

* Number of stumps per 3 replications

Response of redshank chamise to foliage and soil-applied herbicides. Plumb, T. R. and J. R. Boozer. A test was established at two sites on the Cleveland National Forest (southern California) to determine the effect of foliage and soil applied herbicides on sprouting redshank chamise. Redshank is an extremely vigorous sprouting chaparral shrub which is moderately resistant to foliage applied phenoxy herbicides. Study Site 1 (3,000 ft elevation) and Site 2 (4,500 ft elevation) were cleared by tractor chaining during the winter of 1973-74. Regrowth at the beginning of the test ranged in height from 1 to 5 ft.

A water emulsion containing 2 lb a.e. each of the butoxyethanol esters of 2,4-D and dichlorprop per 100 gal of water plus 1 gal of diesel oil was sprayed on individual plants at both sites in January, May, and August 1975 with a 3 gal pressure sprayer. Picloram pellets (10% ai) at 1/2 oz per plant and karbutilate granules (10% ai) at 1 oz per plant were applied in a narrow band around the root crown of individual plants in January 1975 at Site 2. In May foliage applications of the triisopropanolamine salts of picloram at 1/2 lb a.e. plus 2,4-D at 2 lb a.e. per 100 gal of water and the triethylamine salt of triclopyr at 3 lb a.e. per 100 gal of water were applied at Site 2. Two replications of 20 plants were treated at each site with each test formulation.

Results 6 to 7 months after the January and May treatment dates are shown in the table. The 2,4-D + dichlorprop formulation apparently killed a few plants, but most damage was restricted to the leaves and upper stems with the stems still green at the base. Some plants have new sprouts up to 2 ft tall. The number of untreated plants doubled during this time.

The 1/2 oz rate of picloram pellets was apparently more than enough to control redshank. In fact, results on an adjacent area suggested that 1/4 oz per plant was an adequate dose for all but very large plants. Response to karbutilate was very limited 7 months after treatment. During this time, the plants almost doubled in number. However, karbutilate is slower acting than picloram.

Redshank response to the picloram + 2,4-D formulation was more severe than to 2,4-D + dichlorprop. One-third of the plants were apparently dead and live tissue was restricted to green lower stems. Triclopyr was more effective than picloram and produced an apparent 75% plant kill. Obviously these are preliminary results; final evaluation will take another 1 to 2 years. (U.S. For. Serv., Forest Fire Lab., Riverside, Calif. and Cleveland National Forest, Escondido, Calif.)

Response of redshank chamise to herbicides 6 months after treatment.

Location	Treatment	Rate	Plant volume: Initial	Plant volume: 6 months	Plant volume: % of initial	Plant condition: <50% foliage kill	Plant condition: >50% foliage kill	Plant condition: Apparent plant kill
			----(cu ft)----		(%)	-------------(%)------------		
	January application							
1	2,4-D + dichlorprop (foliage spray)	2+2 lb a.e./ 100 gal	29.2	9.9	34	3	77	20
	Control	--	13.9	27.0	194	100	0	0
2	2,4-D + dichlorprop (foliage spray)	2+2 lb a.e./ 100 gal	10.0	3.0	30	10	50	40
	picloram (10% ai pellets)	1/2 oz/ plant	10.5	0.1	1	0	3	97
	karbutilate (10% ai granules)	1 oz/ plant 1/	9.1	16.5	181	60	30	0
	Control	--	10.5	25.8	246	100	0	0
	May application							
1	2,4-D + dichlorprop (foliage spray)	2+2 lb a.e./ 100 gal	42.3	10.0	24	5	85	10
	2,4-D + dichlorprop (foliage spray)	2+2 lb a.e./ 100 gal	15.6	2.4	15	0	100	0
	2,4-D + picloram (foliage spray)	2+1/2 lb a.e./100 gal	21.0	1.2	6	0	68	32
	triclopyr (foliage spray)	3 lb a.e./ 100 gal	13.8	0.3	2	0	27	73

1/ Amount of commercial formulation per plant; only 10 plants per replication, all other formulations, 20 plants per replication with two replications per treatment.

Aerial sprays of triclopyr for brush control. Stewart, R. E. and H. Weatherly. Aerial sprays of the triethylamine salt (M-3724) and ethylene glycol butyl ether ester (M-4021) formulations of triclopyr were tested to control shrubs and weed trees on cutover forest lands. Sprays were applied by helicopter on June 6, 1975 to unreplicated 2 A plots near Mapleton, Oregon. The following treatments were tested:

Herbicide	Rate (lb a.e./A)	Surfactant (oz/100 gal)
M-3724	3	12
	4.5	36
	6	24
M-4021	3	12
	6	24

Initial results were observed on October 2, 1975 only 4 months after treatment. On each plot, between 7 and 20 individual plants of each major species were examined for herbicidal effect using a modified Dow rating scale.

The preliminary results suggest that the amine salt formulation of triclopyr is somewhat more effective than the ester formulation. A 3 lb a.e. per acre rate seems adequate for M-3724, but higher rates may be necessary with M-4021. Final results will be obtained at the end of the 1976 growing season. (U.S. Forest Serv., Forestry Sciences Lab., Corvallis, Oregon)

Initial effect of aerial sprays of M-3724 and M-4021.

Species	Average rating[1/] by treatment rate lb a.e./A M-3724			rate lb a.e./A M-4021	
	3	4.5	6	3	6
Salmonberry	3	3	3	2	2
Western thimbleberry	4	3	5	2	4
Pacific red elder	5	5	-	-	-
Vine maple	3	2	2	2	3
Red alder	-	5	-	-	-
Ocean spray	5	-	3	-	3
Cascara buckthorn	-	5	-	-	-
California hazel	2	-	3	2	2

1/ 0 = no effect, 5 = dead.

PROJECT 4. WEEDS IN HORTICULTURAL CROPS

L. J. Senior, Project Chairman

SUMMARY

Twenty-one research reports were submitted for the Horticultural Section. These reports included results from trials in California, Wyoming, Oregon and Texas on fifteen different crops.

Tomatoes

Nine reports from California were submitted relating to weed control in tomatoes. Major emphasis was on difficult to control or "resistant" weeds such as mustard, yellow nutsedge, nightshade and field bindweed. Deep fumigation with 1,3-D fumigant showed promise against yellow nutsedge. Pebulate, FMC-25213 and EL-161, preplant gave good control of yellow nutsedge. Fall applications of glyphosate showed promise for spring control of bindweed. U-27267 and FMC-25213 gave fair control of mustard when preplant incorporated. Pebulate, penoxalin FMC-25213 and EL-161 preplant showed good control of nightshade and groundcherry.

Asparagus

One trial in California showed that trifluralin incorporated during the summer of 1974 gave excellent control of field bindweed the following spring. Significant yield increases were obtained from all treatments.

Broccoli

One trial in California showed that napropamide applied postplant preemergence resulted in good control of common groundsel, shepherd's purse and sow thistle. The crop tolerance was acceptable.

Potatoes

In a trial in Wyoming where the herbicides were incorporated postplant preemergence excellent weed control was obtained with many herbicides. Common sunflower was controlled by several compounds or combination of compounds.

Cucumbers

One trial in Texas showed that several combinations of herbicides resulted in excellent weed control except no preplant herbicides controlled common sunflower.

Fruits and nuts

Five yearly applications to a walnut grove in California resulted in excellent annual weed control from several herbicides and herbicide com-

binations. Due to the selectivity of the herbicides generally the combinations were more outstanding.

In California twenty new herbicides were applied to newly planted citrus, deciduous fruit and nut trees. Several compounds showed severe phytotoxicity and several showed selectivity to certain varieties. The compounds that were the safest on most young tree varieties were R-20810, R-20630, penoxalin and RH-2915.

In California new compounds were screened against nine varieties of grape cuttings and rootings. Several compounds showed excellent control of grasses. Compounds showing a greater selectivity than simazine were simazine + napropamide + glyphosate, simazine + oryzalin + glyphosate, FMC-25213, HER-26905 and U-44078.

Another grape trial in California showed that where directed sprays of glyphosate were kept off the foliage no injury symptoms were evident the following spring. However, where foliage was sprayed, injury was evident the next spring.

Ornamentals

A trial in California in container grown ornamentals showed that RH-2915 and perfluidone controlled common groundsel for five months.

Another container grown ornamental trial in Oregon showed that dichlobenil granulars gave excellent grass and broadleaf control. Also, napropamide applied through the sprinklers gave excellent grass control.

Christmas trees

In Wyoming a trial in Scotch pine Christmas trees was conducted. The predominant weed species was field sandbur. The outstanding treatments were atrazine + simazine, GS-14254 and simazine which controlled the sandbur and common sunflower, horseweed and kochia.

Deep fumigation for the control of resistant weed species in tomatoes. Lange, A., H. Kempen, D. Johnson and R. Goertzen. Two soil fumigants, 1,3-dichlorpropene and methyl bromide, were injected 12-14 inches deep into dry and moist Hanford sandy loam 7/31/75 to determine the efficiency of fumigants as herbicides on nutsedge and other annual weeds. A moisture seal of about 3/8 inch of sprinkler irrigation (4 inches deep), was applied immediately after fumigation. One week later the tops of the beds were scraped off to expose the internal fumigation zone. Tomatoes were then direct seeded onto the scraped off flattened beds. These beds were sprinkler irrigated periodically to induce germination. One ft^2 seedling counts were made at 1 month after germination. Fresh weight of the tomato vegetation was taken 9/9/75.

1,3-dichlorpropene at 1,000 lb/A (100 gpa) gave the desired weed kill and nutsedge control. Tomato seed was used to simulate nightshade seed in the area of fumigation. However, at this rate residual 1,3-D fumigant stunted the growth and reduced the stand of tomatoes seeded 4-15 days after fumigation. An odor was detected at 4 days suggested that at this rate even 15 days was too soon to follow with tomatoes. 1,3-D fumigant at 200 lb/A appeared to kill some nutsedge but did not affect annual weed counts.

These results seem to warrant work with 1,3-D fumigation in the preplant formation of beds to control weed seeds and nutsedge. The time from fumigation to seeding and the minimum amount of fumigant needed will be evaluated in future tests. Methyl bromide gave erratic results, because no tarping was used, the soil was sandy and the soil moisture may not have been optimum for fumigation. Methyl bromide in moist soil appeared to give somewhat better weed control than in dry as shown by the weed count, nutsedge control and fresh tomato weights. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of two deep injected soil fumigants without plastic covering on annual weeds, nutsedge and direct seeded tomatoes.

Herbicides	lb/A	Soil[3/] moisture	Weed[1/] count[5/]	Nutsedge count	% Nutsedge[2/] control	% Tomato seed kill[2/]	Tomato count planted 4-15 day	Fresh[4/] wt tomato /grams
Telone	200	moist[6/]	34.3	35.0	17	25	197.0	1106
Telone	200	dry	27.0	13.0	69	0	203.0	402
Telone	1000	moist[6/]	0.3	0.0	100	98	84.5	425*
Telone	1000	dry	0.0	26.0	38	88	100.0	260*
CH_3Br	400	moist[6/]	6.3	31.0	26	0	43.7	334
CH_3Br	400	dry	9.6	31.0	26	8	160.0	197
CH_3Br	1200	moist[6/]	10.3	29.0	31	0	170.0	1146
CH_3Br	1200	dry	28.3	18.0	57	23	295.0	707
Check	--	dry	21.2	42.0	0	0	--	--

1/ Counts are number per 1 ft^2. Average of 3 replications. Evaluated 9/2/75.
2/ 50 nutsedge tubers and ∿ 400 seeds placed at random in bags in fumigation zone near where ultimate bed top would be in pots in greenhouse. Average of 3 replications. Evaluated 9/17/75.
3/ 0.4 inches irrigation prior to fumigation.
4/ Weight in grams of 10 ft seeded row. Evaluated 9/9/75.
5/ Pigweed, watergrass, filaree, puncture vine, carpetweed and purslane.
6/ About 1/2 inch of sprinkler irrigation prior to fumigation.

Average maximum 97.2 F. Average minimum 58.6 F. * Stunted by reduced vigor; plots were without weeds.

The effect of fall 1974 herbicide treatments on the control of bindweed and seeded tomatoes in the spring of 1975. Lange, A., W. Humphrey, R. Goertzen and J. Schlesselman. Glyphosate and 2,4-D were applied at 2 different fall dates in combinations with N.P. oil, X-77 spreader, Vistick surfactant, Paraquat, Urea, MSMA and flame to evaluate residual control of spring bindweed and its carry-over effect on newly seeded tomatoes.

The application dates were August 31, 1974 and November 7, 1974. All plots were 10 ft x 20 ft and replicated 4 times. Foliar applications were made at 50 gpa.

Glyphosate, at 8 lb/A, gave the best control of spring growth of bindweed, however, 4 lb/A was not greatly different. Combinations of glyphosate at 4 lb/A with weed oil, Urea, Vistik or X-77 were similar. Paraquat gave less control. Best control of bindweed seedlings was obtained with the August 31 treatment. All plants were in or just after full bloom. Vigor of the tomato stand after spring germination appeared unaffected by herbicide applications made the previous fall.

The oil soluble amine of 2,4-D was not as good in controlling bindweed as glyphosate nor was the combination of 2,4-D and MSMA. 2,4-D applied in late fall appeared to give better control than when applied in August.

The effect of fall 1974 herbicide treatments on the control of bindweed and seeded tomatoes in the spring of 1975 (A36-30-502-1-74).

Herbicides	lb/A	Average[1/] Tomato vigor	Bindweed control
Glyphosate	4	8.8	8.5
Glyphosate	8	8.5	9.5
Glyphosate + N.P. oil	(2%)4	8.3	8.5
Glyphosate + X-77	(1%)4	9.3	8.3
Glyphosate + Vistik	4	7.3	8.8
Glyphosate + Paraquat[2/]	4+1	9.3	6.8
Glyphosate + Flame[2/]	4	9.0	3.0
2,4-D (OSA)	4	8.8	5.3
2,4-D (OSA)	8	8.5	4.0
Glyphosate + Urea	4	8.3	8.3
2,4-D + MSMA	2+2	9.0	7.5
2,4-D + MSMA	4+4	9.3	5.3
Glyphosate[2/]	4	9.8	7.2
2,4-D[2/]	4	9.0	7.5
Check	--	8.3	0.8

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no tomato growth, 10 = best tomato growth; 0 = no bindweed control, 10 = complete kill of bindweed.

2/ Treatment 11/7/74. All others treated 8/31/74.

The effect of 10 preemergence herbicides on direct seeded tomatoes, peppers, mustard and millet. Lange, A., R. Goertzen and B. Fischer. Ten chemicals were evaluated as preplant incorporated herbicides for weed control in tomatoes and peppers. The vigor of tomatoes and peppers and the control of seeded mustard and millet were evaluated. Vigor of tomatoes and peppers was affected by a combination of weed competition and/or herbicide activity.

Napropamide, U-27267, FMC-25213 and SD-29226 showed the least reduction in tomato and pepper vigor. U-27267 and FMC-25213 showed the best control of mustard. FMC-25213, NTN-6867, SD-29226, HER-26905, VCS-5052 and benthiocarb all had good millet control at their higher rates. Napropamide and FMC-25213 gave good millet control also at the lower rates. FMC-25213 showed the best overall weed control with the least tomato and pepper vigor reduction. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of 10 preemergence herbicides on direct seeded tomatoes, peppers, mustard and millet.

		Vigor		Average[1/]		Control	
		Tomato		Pepper			
Herbicides	lb/A	5/23	6/27	5/23	6/27	Mustard[2/]	Millet[2/]
Napropamide	1	8.5	9.5	9.5	8.3	1.0	6.8
U-27267	1	8.8	9.5	8.5	8.8	3.2	0.0
U-27267	4	7.5	9.3	8.8	9.5	7.0	6.2
FMC-25213	1	8.7	9.3	9.0	6.8	5.8	6.8
FMC-25213	4	8.5	9.5	7.8	8.8	7.5	7.0
NTN-6867	1	7.0	8.0	7.0	7.5	1.0	5.8
NTN-6867	4	4.3	6.5	8.0	7.7	2.2	8.8
SD-29226	1	8.8	8.8	9.2	8.3	0.5	5.2
SD-29226	4	8.5	9.0	8.5	8.5	4.5	8.0
HER-26905	1	7.5	7.8	8.0	6.5	1.2	5.3
HER-26905	4	5.3	6.3	6.2	7.3	4.0	9.0
VCS-5052	1	9.0	8.3	9.2	5.3	0.0	2.5
VCS-5052	4	8.5	8.0	8.0	7.7	0.2	8.0
EL-161	1/4	9.0	8.5	8.2	7.7	2.5	3.0
EL-161	1	5.0	5.7	7.2	8.3	1.2	10.0
MBR-15846	1	8.3	8.3	8.5	6.7	1.0	0.0
MBR-15846	4	8.5	7.8	9.0	7.3	3.8	0.0
Benthiocarb	4	8.7	8.5	9.3	7.5	0.5	0.8
Benthiocarb	16	8.0	7.5	7.8	7.5	0.0	8.2
Check	--	8.8	6.8	8.0	7.3	0.0	0.0

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no stand and 10 = most vigorous. Treatment and planting date - 4/4/75.

2/ Seeded mustard and millet. Based on 0 to 10 scale where 0 = no control and 10 = complete kill.

Nightshade nutgrass control studies in processing tomatoes. Orr, J. P., R. Mullen and A. Lange. Seven preplant incorporated herbicides and 3 combinations were applied to a moderately high organic sandy loam on 3/19/75. VF-315 tomato seed was planted into beds the same day on 5 foot centers. Irrigation was by furrow. Only EL-161 gave severe tomato stand reduction. Metribuzin in combination with FMC-25213 and penoxalin gave slight stand reduction. Herbicides giving outstanding nightshade and groundcherry control were: penoxalin, FMC-25213 and EL-161. Those giving good nutsedge control included FMC-25213 and EL-161. Napropamide, often good on nutsedge in low organic matter soil, was not effective in this experiment. (Cooperative Extension Service, University of California, 650 Capital Mall, Sacramento, California 95814)

A comparison of 7 herbicides and 3 combinations for annual weed control in tomatoes.

Herbicides	lb/A	Average[1/] Weed control Nightshade	Nutsedge	Tomato Stand reduction
penoxalin	3/4	4.5	3.2	1.0
penoxalin	1 1/2	8.2	5.0	2.2
FMC-25213	1	6.2	5.2	1.2
FMC-25213	2	8.7	9.5	1.1
FMC-25213	4	7.5	8.2	1.1
FMC-25213 + metribuzin	1+1/2	6.0	8.0	1.0
FMC-25213 + metribuzin	2+1/2	9.7	10.0	2.5
FMC-25213 + metribuzin	4+1/2	9.5	9.5	1.7
metribuzin	1/4	2.0	1.7	0.0
metribuzin	1/2	3.2	4.7	0.0
metribuzin	1	3.7	2.2	0.0
Bulab-37	1/2	0.0	1.2	0.0
Bulab-37	1	4.8	4.0	1.2
butralin	1 1/2	7.2	5.7	1.2
butralin	3	6.2	5.0	0.0
napropamide	2	0.0	3.8	0.0
trifluralin + diphenamid	1/4+4	3.7	6.5	0.0
Bulab-37	2	2.5	3.7	0.0
napropamide + pebulate	2+4	1.7	5.2	0.0
EL-161	1	7.0	7.7	3.7
EL-161	2	9.2	8.7	7.5
check	--	0.0	0.0	0.0

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no stand or no weed control and 10 = best tomato stand or 100% weed control. Nightshade included groundcherry rating. Nutsedge = Yellow nutsedge (*C. esculentus*).

A comparison of incorporation methods and combinations for annual weed control in direct seeded processing tomatoes. Lange, A., R. Brendler, R. Goertzen and J. Schlesselman. Most herbicides and combinations were not effective at giving broadleaf annual weed control, particularly black nightshade. The most effective herbicide for all weeds was FMC-25213 which was particularly effective on grasses. It was not outstanding on nightshade, but showed more injury to nightshade than tomatoes.

The combination of napropamide and CDED was not adequate but showed some grass control. The combination napropamide and pebulate appeared to give more phytotoxicity to nightshade than to tomatoes, here and in other trials, but was not outstanding in this trial. The combination of napropamide and chloramben was more phytotoxic to the tomatoes and nightshade.

Applying carbon on the seed row in this trial (reported elsewhere) afforded some slight protection for tomato germination but was not striking under the conditions of this experiment. (Cooperative Extension, University of California, Parlier, California 93648)

The effect of herbicide combinations on weed control under sprinkler irrigation.

Herbicides	lb/A	Incorp.[2/] method	Average[1/] Broadleaf weeds[3/]	Barnyard grass
napropamide	1	mechanical	3.0	4.8
napropamide	4	mechanical	5.2	9.6
napropamide + pebulate	1+3	mechanical	4.0	6.4
napropamide + pebulate	1+6	mechanical	4.2	5.2
napropamide + chloramben	1+3	sprinkler	5.2	4.8
napropamide + chloramben	1+6	sprinkler	4.8	6.8
napropamide + DCPA	1+3	sprinkler	2.4	2.0
napropamide + DCPA	1+6	sprinkler	1.2	2.2
napropamide	1	sprinkler	0.0	0.8
napropamide	4	sprinkler	0.2	0.6
napropamide + CDEC	1+3	mechanical	5.6	7.2
FMC-25213	1	mechanical	5.6	9.0
FMC-25213	4	mechanical	7.0	10.0
HER-26905	1/2	mechanical	0.8	2.8
HER-26905	1	mechanical	1.2	4.2
check	--	--	1.8	0.0

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete control. Treated 5/5/75.

2/ Sprinkler 5/8/75 followed by furrow.

3/ Broadleaf weeds included black and hairy nightshade, pigweed and goosefoot.

The effect of tomato age on the activity of metribuzin. Goertzen, R. and A. Lange. Young tomatoes of the VF-65 variety seeded 5/19 and 5/29/75 were more susceptible to metribuzin than tomatoes two to three weeks older, i.e., seeded 4/23/75 or 5/6/75. Only 1/4 lb/A was sufficiently safe on 6 week old tomatoes. Those a month old were damaged at this rate but would have recovered. With this lack of sufficient safety on young tomato plants it is not likely that metribuzin could be used with consistent results. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of growth stage on the resistance of VF-65 tomato seedling to postemergence applications of metribuzin.

		Average[1/] phytotoxicity Date seeded:			
Herbicides	lb/A	4/23/75	5/6/75	5/19/75	5/29/75
metribuzin	1/4	--	--	0.5	3.5
metribuzin	1/2	2.5	2.3	4.3	9.5
metribuzin	3/4	3.3	3.5	7.8	8.5
metribuzin	1	2.3	3.8	8.0	10.0
metribuzin	1 1/2	2.0	3.5	9.5	10.0
metribuzin	2	3.0	4.5	--	--
check	--	1.0	0.5	0.0	0.0

1/ Based on 0 to 10 scale where 0 = no effect, 5 - chlorosis and burn and 10 = completely killed. Applied 7/1/75 to young tomatoes, seeded 4/23 to 5/29/75, i.e., 4 weeks to 9 weeks old. Evaluated 7/3/75. Average maximum and minimum temperatures: 90.3 F and 54.3 F.

A comparison of postemergence herbicides for resistant weeds in tomatoes. Lange, A., R. Goertzen and J. Schlesselman. Weeds of different ages were sprayed 6/23/75 with 8 different postemergence herbicides. Glyphosate was equally phytotoxic to tomatoes and nightshade. It was also effective on barnyardgrass and puncture vine. Dowco-290 and DPX-1108 showed no selective advantage for controlling weeds in tomatoes. Phenmidepham and bentazon were more toxic to nightshade and tomato than to barnyardgrass and puncture vine. RH-2915 was more effective on puncture vine than on barnyardgrass. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

A comparison of the postemergence activity of 8 herbicides on young tomato seedlings and 3 weed species.

		Average[1/]			
Herbicides	lb/A	Tomato[2/]	Nightshade[2/]	Barnyardgrass[3/]	Puncture vine[4/]
glyphosate	1/4	3.3	2.7	4.5	5.5
glyphosate	1/2	--	4.3	5.0	8.5
glyphosate	1	--	7.0	9.5	10.0
Dowco-290	1/4	6.7	6.7	3.0	0.0
Dowco-290	1/2	--	7.7	1.0	0.0
Dowco-290	1	8.0	7.7	0.0	1.0
triclopyr	1/2	--	8.0	3.0	0.5
triclopyr	1	8.0	--	0.0	9.5
DPX-1108	1	1.7	3.0	1.0	0.0
DPX-1108	4	2.3	--	2.0	0.0
propanil	1	--	0.3	3.0	0.5
propanil	4	--	--	8.0	5.0
phenmidepham	1	10.0	9.7	5.0	1.5
phenmidepham	4	10.0	10.0	8.0	1.0
RH-2915	1/2	--	--	4.5	10.0
RH-2915	2	--	--	8.5	10.0
bentazon	1	8.0	5.7	1.5	1.0
bentazon	4	8.0	8.3	--	--
Check	--	1.0	0.7	0.0	0.0

1/ Average of 2 or 3 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill. Treatment 6/23/75. Evaluated 7/3/75.
2/ About 3-4 inches high when sprayed topical.
3/ Barnyardgrass = watergrass in the 3-4 inch stage.
4/ Puncture vine 3-6 inches across.
5/ Average maximum 90.5 F. Average minimum 53.1 F.

A comparison of 8 postemergence herbicides on tomatoes. Lange, A., R. Goertzen and J. Schlesselman. Young tomato plants seeded 3/31/75 and older plants seeded 3/3/75 were sprayed 5/7/75 with 8 postemergence herbicides. Glyphosate at 1/4 lb/A was about the upper limit of use and this rate appeared to affect fruit set. HER-26905 was relatively non-toxic to both ages. Propanil was sufficiently safe on the older plants and possibly at 1 lb/A on young plants. Bromoxynil was too toxic on both ages. Bifenox was relatively safe. MBR-12325 and difenzoquat were safe on the older plants. Benthiocarb showed little or no postemergence activity. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

The effect of 8 postemergence herbicides on 2 ages of VF 65 tomato plants.

		Average 1/			
		5/11/75		5/16/75	
Herbicides	lb/A	Young tomatoes	Old tomatoes	Young tomatoes	Old tomatoes
glyphosate	1/16	2.0	0.0	1.7	0.0
glyphosate	1/4	3.0	0.8	3.5	2.7
glyphosate	1	5.2	5.5	9.5	8.3
HER-26905	1	2.2	0.0	0.8	2.3
HER-26905	4	2.0	1.5	2.8	1.0
propanil	1	0.8	0.0	2.2	0.8
propanil	4	6.8	1.5	9.0	2.8
bromoxynil	1	8.0	1.5	10.0	6.2
bromoxynil	4	9.5	3.5	10.0	8.2
bifenox	1/4	2.2	0.0	1.0	0.0
bifenox	1	4.0	1.5	2.5	0.2
MBR-12325	1	0.8	0.0	5.5	2.5
MBR-12325	4	3.8	1.5	7.0	4.2
difenzoquat	1	0.5	0.0	2.8	1.8
difenzoquat	4	5.3	2.8	8.8	3.8
benthiocarb	1	0.2	0.0	0.5	0.0
benthiocarb	4	1.2	1.0	1.2	0.5
Check	--	0.0	0.2	0.0	0.0

1/ Average of 4 replications. Based on 0 to 10 scale where 0 = least vigorous and 10 = most vigorous. Young tomatoes planted 3/31/75; old tomatoes planted 3/3/75. Treated 5/7/75.

2/ Average maximum 88.5 F. Average minimum 52.7 F.

Preplant incorporated herbicides for yellow nutsedge control in tomatoes. Kempen, H. M. Herbicides in a Hesperia sandy loam (OM=0.1% - .3%) were incorporated with 2 gangs of Lillistons' in tandem at 4 mph cutting 3-4 inches deep on 1/30/75 and then planted with tomatoes. One inch of rain fell on 2/3/75 and one-half on 2/10/75. Emergence was 25% on 3/5/75.

High rates of pebulate injured tomatoes and tended to reduce stands; high rates of bensulide appeared to injure tomatoes slightly, but a combination of bensulide and diphenamid looked very safe. H-25893 and H-26910 were toxic to tomatoes and nutsedges but did not control nightshade. Pebulate provided acceptable yellow nutsedge control to mid-May. Nutsedge became dense before harvest in late July.

Preplant incorporated herbicides for yellow nutsedge control in furrow irrigated canning tomatoes (V6-75).

		Tomatoes				Nightshade	Yellow nutsedge	
		count		injury		count	count	control
Herbicides	lb/A	3/19	4/1	4/1	4/23	4/1	4/1	5/13
pebulate	4	23	26	1	1	10	9	6.0
pebulate	8	18	20	4	3	8	2	8.7
pebulate + napropamide	4 1	19	25	1	0	13	6	9.0
pebulate + napropamide	8 2	19	23	2	1	14	2	8.7
pebulate + diphenamid	4 4	20	25	3	1	91	0	9.3
pebulate + diphenamid	8 8	13	19	5	3	77	0	9.5
pebulate + bensulide	4 4	24	29	0	1	14	0	9.0
pebulate + bensulide	8 8	14	17	3	4	19	0	9.7
napropamide	1	20	24	2	1	88	3	7.3
napropamide	2	21	22	0	1	43	9	7.3
bensulide	4	22	25	0	1	17	3	4.7
bensulide	8	10	11	3	2	11	5	7.3
bensulide + diphenamid	4 4	24	29	0	0	2	9	6.3
bensulide + diphenamid	8 8	21	22	0	0	43	1	9.0
H-25893	2	10	11	6	5	4	0	8.5
H-25893	4	6	4	9	6	8	1	8.7
H-26910	2	5	5	9	6	22	0	9.3
H-26910	4	3	2	10	7	10	0	10.0
Check	--	26	31	0	0	15	50	1.7
Check	--	24	26	0	0	10	18	4.7

1/ Based on 0 to 10 scale for injury and control where 0 = no effect and 10 = complete kill or control. Counts of tomatoes are averages of 3 replications; for nutsedge and nightshade counts are totals of 3 replications.

The effect of initial sprinkler irrigation level on the activity of 3 herbicides. Agamalian, H. and A. Lange. Three herbicides, pronamide, nitrofen and napropamide were sprinkler incorporated at three levels, 1/4 inch, 3/4 inch, 1 1/2 inch, to determine the optimum initial amount of irrigation or rainfall necessary to activate the herbicide as evaluated with lettuce, tomatoes, nightshade and annual weeds including pigweed, goosefoot, burning nettle, purslane and lambsquarters.

Nitrofen at 6 lb/A gave the best nightshade and annual weed control at all irrigation levels. However, tomatoes and lettuce were severely stunted with as little as 1/4 inch water. Pronamide, at 2 lb/A, gave good nightshade and annual weed control, but moderately stunted the lettuce and severely stunted the tomatoes with only 1/4 inch water. Napropamide, at 2 lb/A, seemed to be safe on tomatoes and weak on nightshade, both members of Solanaceae. Napropamide moderately stunted the lettuce and gave only fair weed control at 2 lb/A. All 3 herbicides seemed to be activated with the minimum water, i.e., 1/4 inch. They showed, if anything, only a slight increase in activity with increasing amounts of water. (Cooperative Extension, University of California, Salinas and Parlier, California, resp.)

The effect of initial sprinkler irrigation level on the activity of 3 herbicides.

Herbicides	lb/A	Amount of irrigation incorporated	Average[1/] Lettuce	Tomato	Night shade	Other annual weeds
pronamide	2	1/4	3.0	8.0	6.2	5.5
		3/4	4.5	9.0	8.0	6.8
		1 1/2	2.2	10.0	9.8	8.5
nitrofen	6	1/4	8.8	6.2	10.0	10.0
		3/4	8.0	7.5	10.0	9.3
		1 1/2	7.5	8.8	9.0	9.0
napropamide	2	1/4	5.0	2.5	2.5	4.2
		3/4	5.8	1.5	2.2	5.2
		1 1/2	5.8	3.2	1.8	4.2
Check	--	1/4	0.5	1.8	1.5	2.0
		3/4	2.2	0.8	2.0	1.8
		1 1/2	1.0	0.8	1.2	1.5

[1/] Average of 4 replications. Based on 0 to 10 scale where 0 = no effect and 10 = complete kill or control. Treatment 4/30/75. Evaluated 5/30/75. Seeded 4/29/75.

Field bindweed control in established asparagus. Agamalian, H. S. and F. Colbert. The replicated trials were applied to a ten year old stand of U.C. 72 asparagus. Soil incorporation treatments of trifluralin were applied at three rates. The herbicides were sprayed and immediately incorporated using L-shaped blades on a power tiller. Depth of incorporation was three to four inches. The asparagus crowns varied from five to six inches deep.

The trials were established following spring harvest on June 29, 1974. Yield and efficacy data were obtained in crop year 1975. The soil analysis was 0% clay, 48% silt and 22% sand, and 0.7% organic matter.

Results showed initial field bindweed control at all three rates. Evaluations at the termination of harvest indicated reduced control at the one and two lb/A rates. Four lb/A held throughout the season. Crop selectivity was maintained at all three rates. Yield data from 23 harvests indicate significant yield increases over weedy controls. (Cooperative Extension, University of California, Salinas, Eli Lilly Research, Fresno)

Field bindweed control with trifluralin.

		Weed control		Crop phytotoxicity		Harvest[1/]	
Herbicide	lb/A	4/11	6/4	4/11	6/4	lb/plot	% control
trifluralin	1	9	5.2	0	0	101.0 b	104.6 b
trifluralin	2	10	6.0	0	0	120.3a	124.6a
trifluralin	4	10	8.8	0	0	121.5a	125.8a
Control	0	0	0	0	0	96.5 b	100.0 b

1/ Means following with the same letter are significantly different at the 0.05 level.

<u>Evaluation of several herbicides for the control of resistant weeds in broccoli.</u> Agamalian, H. S. Current herbicide programs in broccoli production are not effectively controlling several weeds. Several candidate herbicides were evaluated for the control of common groundsel, annual sow thistle and shepherd's purse.

The applications were made postplant preemergence, followed by sprinkler irrigation of 1.5 inches. The trial was a complete randomized block design. The soil analysis was 20% clay, 26% silt, 54% sand and 0.7% organic matter. The variety was Southern Comet.

Results from this experiment indicate that napropamide provided good control of the three major weed species. Crop tolerance was acceptable as observed from stand counts and yield data. Other candidate herbicides which merit additional studies are Bay NTN-6867, H-22234 and RH 2512. (Cooperative Extension, University of California, Salinas)

Weed control, crop phytotoxicity and yield data.

Herbicide	lb/A	Weed control@ Cg	Sp	St	Crop[b] Phyto	Stand count 50 ft row	Harvest[1/] lb/A
perfluidone	2	6	2.8	1.3	0.8	16	9,187abc
perfluidone	4	6.3	3	3	1.3	17.8	8,976abc
napropamide	1	9.1	7.4	9.1	1.5	15.0	9,504abc
napropamide	2	9.9	9.5	10	2	21.5	11,088abc
R-37878	1	0	0	0	0	16.8	6,864ab
R-37878	4	1.0	0.8	0.8	0	18.3	4,752a
nitrofen + dcpa	6 + 10	6.5	9	5.3	3.8	15.3	7,656ab
dinitramine	0.5	5.5	6.3	5.0	2.0	14.5	7,392ab
dinitramine	1	8.8	9.3	9.0	7.0	8.5	3,960a
RH 2512	0.25	6.5	7.8	7.0	2.5	18.0	10,032abc
RH 2512	0.5	8.9	9.9	9.5	5.5	14.3	7,920ab
H-22234	2	6.5	8.9	9.8	1.5	18.8	8,184abc
H-22234	4	6.3	9.8	9.8	5.5	14.0	6,864ab
Bay NTN-6867	2	6.4	8.3	6.0	2.3	18.5	8,976abc
Bay NTN-6867	4	9.1	9.7	9.3	3.8	15.3	8,184ab
Control	0	0	0	0	2	18.3	3,960a
Control (weeded)	0	10	10	10	0	18.5	8,448abc

@ = rating by species 0 - 10 scale.
Cg = common groundsel, Sp = shepherd's purse, St = sow thistle
b = crop phytotoxicity rating 0 - 10 scale.
1/ Values followed by the same letter are not significantly different at the 5% level of probability.

Preemergence weed control in potatoes. Alley, H. P. and G. A. Lee. Preemergence weed control trials were established under center-pivot sprinkler irrigation to evaluate several herbicides and combinations for weed control in potatoes (tables 1 and 2). The potatoes (variety Russet Burbank) were planted on June 2, 1975, and treatments applied June 4, 1975. The potatoes were planted 4 inches deep, and the herbicides incorporated with a Lilleston rolling cultivator to a soil depth of 2 inches immediately following herbicide application. Each treatment was 9 x 50 ft, randomized with three replications. All herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa of water carrier. The soil at the location was classified as a sandy loam with a pH of 6.8, 0.87% O.M., 76.8% sand, 12.8% silt, and 10.4% clay.

The weed population consisted of redroot pigweed, common lambsquarters, black nightshade and common sunflower. The plots were visually evaluated for weed control, potato stand and vigor 42 days following herbicide application.

None of the treatments reduced the potato stand or severely affected the vigor. Linuron + alachlor at 0.75 + 2.0 lb/A, FMC-25213 at 3 lb/A and dinitramine + metribuzin at 0.5 + 0.5 and 0.66 + 0.5 lb/A resulted in complete control of the weed species infesting the experimental site. Several individual herbicide treatments which included alachlor, metribuzin, EPTC and vernolate + R-25788 resulted in 100% control of all weed species except common sunflower. Thirty of the 31 treated plots produced potato yields greater than the nontreated check plots with alachlor at 3.0 lb/A and dinitramine + metribuzin at 0.5 + 0.5 lb/A treated plots yielding 103.7 cwt/A more than the untreated plots. (Wyoming Agric. Expt. Sta., Laramie, SR-691)

Table 1. Effect of preemergence incorporated individual herbicides on potato stand, vigor, yield and percentage weed control.

		Potato				Percentage control			
Treatment	Rate lb/A	S[1/]	V[2/]	Yield cwt/A	Specific gravity	Redwood pigweed	Common lambs-quarters	Black night-shade	Common sun-flower
FMC-25213	2.0	100 a	91 c[3/]	217.8	1.084	98 a-d	100 a	100 a	100 a
FMC-25213	3.0	100 a	100 a	249.3	1.085	100 a	100 a	100 a	100 a
profluralin	0.5	100 a	94 d	185.1	1.088	94 d	100 a	89 cd	0 d
profluralin	0.75	100 a	100 a	242.0	1.087	100 a	100 a	64 e	0 d
trifluralin	0.5	100 a	100 a	205.7	1.088	95 cd	100 a	50 f	0 d
dinitramine	0.5	100 a	100 a	263.8	1.090	98 a-c	100 a	92 bc	0 d
dinitramine	0.66	100 a	100 a	266.2	1.087	100 a	100 a	92 bc	0 d
CGA-24705	1.5	100 a	100 a	249.3	1.087	87 e	100 a	90 b-d	12 c
CGA-24705	2.0	100 a	100 a	292.8	1.083	98 a-c	100 a	91 b-d	10 c
CGA-24705	3.0	100 a	95 b	272.2	1.092	100 a	100 a	100 a	22 b
EPTC (3SS)	4.0	100 a	100 a	288.0	1.089	100 a	100 a	100 a	0 d
EPTC (E.C.)	3.0	100 a	100 a	256.5	1.088	100 a	100 a	100 a	0 d
metribuzin	0.5	100 a	100 a	256.5	1.090	100 a	100 a	100 a	95 a
metribuzin	1.0	100 a	100 a	261.4	1.092	100 a	100 a	95 ab	100 a
linuron	1.0	100 a	100 a	213.0	1.092	98 a-c	100 a	87 d	100 a
alachlor	3.0	100 a	100 a	309.7	1.091	100 a	100 a	100 a	10 c
H-22234	3.0	100 a	95 b	236.5	1.090	100 a	100 a	95 ab	10 c
Check		100 a	94 b	196.0	1.089				
C.V.			1.46%			2.00%	0.90%	3.05%	8.49%

1/ Percent stand potato.
2/ Percent vigor potato.
3/ Means with same letter(s) in the same column are not significantly different at the 0.05% level.

Table 2. Effect of preemergence incorporated herbicide combinations on potato stand, vigor, yield, and percentage weed control.

		Potato				Percentage control			
Treatment	Rate lb/A	S[1]	V[2]	Yield cwt/A	Specific gravity	Redroot pigweed	Common lambs-quarters	Black night-shade	Common sun-flower
FMC-25213 + metribuzin	2.0 + 0.5	100 a	93 c[3]	234.7	1.084	93 d	100 a	100 a	100 a
profluralin + EPTC	0.5 + 2.0	100 a	100 a	198.4	1.086	100 a	100 a	85 d	0 d
trifluralin + EPTC	0.5 + 2.0	100 a	100 a	242.0	1.087	100 a	100 a	100 a	0 d
dinitramine + EPTC	0.66 + 1.5	100 a	100 a	263.8	1.089	96 b-d	100 a	100 a	0 d
dinitramine + EPTC	0.5 + 2.0	100 a	100 a	268.6	1.085	99 ab	100 a	100 a	0 d
dinitramine + alachlor	0.5 + 2.0	100 a	100 a	249.3	1.090	100 a	100 a	100 a	0 d
vernolate + R-25788 (3SS)	3.0	100 a	100 a	275.9	1.090	100 a	100 a	100 a	0 d
vernolate + R-25788 (3SS)	4.0	100 a	100 a	285.6	1.091	100 a	100 a	100 a	0 d
linuron + alachlor	0.75 + 2.0	100 a	100 a	270.2	1.088	100 a	100 a	100 a	100 a
dinitramine + metribuzin	0.5 + 0.5	100 a	100 a	309.7	1.092	100 a	100 a	100 a	100 a
dinitramine + metribuzin	0.66 + 0.5	100 a	100 a	271.4	1.092	100 a	100 a	100 a	100 a
dinitramine + alachlor	0.66 + 2.0	100 a	100 a	265.7	1.089	100 a	100 a	98 a	3 d
H-22234 + EPTC	2.0 + 2.0	100 a	95 b	236.5	1.090	100 a	100 a	95 ab	10 c
Check		100 a	100 a	196.0	1.089				
C.V.		1.46%				2.00%	0.90%	3.05%	8.49%

1/ Percent stand potato.
2/ Percent vigor potato.
3/ Means with same letter(s) in the same column are not significantly different at the 0.05% level.

Soil and topical applications of herbicides in cucumbers. Menges, R. M. Preplanting soil-incorporated applications, preemergence non-incorporated applications, and postemergence soil-incorporated or contact applications of herbicides were studied for selective control of Palmer amaranth, common purslane, wild common sunflower, and Japanese millet in cucumbers. Only preplanting soil-incorporated napropamide decreased the yield of cucumbers. Outstanding treatments were 4 1/2 lb/A of preplant soil-incorporated bensulide + 1 1/2 lb/A of butralin + 3/4 lb/A of postemergence soil-incorporated trifluralin and 3 lb/A of preplant bensulide + 10 lb/A of preemergence DCPA + postemergence soil-incorporated trifluralin.

All preplanting soil-incorporated applications of herbicides failed to control wild common sunflower. Several herbicides including bensulide and DCPA failed to control Palmer amaranth in preplant soil-incorporated applications. Preplanting applications of naptalam, perfluidone, and naptalam + bensulide and postemergence contact applications of bentazon failed to control weeds.

No herbicide application persisted in soil 4 months to affect the growth of field-grown Palmer amaranth or sorghum. (Agricultural Research Service, U.S. Department of Agriculture, P. O. Box 267, Weslaco, Texas 78596)

Control of annual weeds in established Hartley and Ashley variety walnuts. Elmore, C. L., D. M. Holmberg, E. J. Roncoroni, and C. L. Langston. A study was established in 5 year old Hartley and Ashley walnuts to evaluate long term annual weed control with herbicides and herbicide combinations. Yearly fall applications (5 years) were made with a CO_2 pressure sprayer to single tree plots 25 ft x 10 ft, replicated 4 times. The soil was a Yolo clay loam with an analysis of sand 24%, silt 46%, clay 30%, and organic matter 1.5%. The plots were sprinkler irrigated for the duration of the study.

Visual weed control evaluations were taken during the growing season.

Simazine at the 2 lb rate gave early control of annual weeds (1972 evaluation) but did not give effective control of little mallow and barnyardgrass in the summer, thus accounting for the low evaluations during the remaining years.

Although the 4 lb/A rate of napropamide did not give excellent control through the first season, commercial weed control (70% or better) was achieved after the second application. Adding 2 lb/A of simazine to 4 lb of napropamide gave slightly better control than doubling the napropamide rate to 8 lb/A.

Oxadiazon did not control chickweed thus, the low evaluations. Oxadiazon gave good control on all the remaining weed species. When combined with simazine, to achieve broader spectrum control, results were excellent.

When nitralin, oryzalin, napropamide or oxadiazon were combined with simazine or norflurazon annual weeds were controlled for the full season.

No phytotoxicity was observed on either Hartley or Ashley variety walnuts from any herbicide treatments. (Cooperative Extension, University of California, Davis and Yolo County)

Annual weed control with five consecutive years of treatment with preemergence herbicides in walnuts.

Herbicide	Rate lb/A	Annual weed control[1/]				
		9/7/71	4/6/72	7/19/73	6/5/74	10/3/75
simazine	2	1.5	9.0	3.3	6.0	4.5
simazine + nitralin	2 + 4	8.3	7.8	8.1	9.3	6.5
napropamide	4	5.5	7.8	8.8	8.1	7.0
napropamide	8	8.9	9.1	9.5	9.3	7.8
simazine + napropamide	2 + 4	5.5	9.9	9.6	9.9	8.4
oxadiazon	2	2.8	6.0	5.8	3.3	6.0
oxadiazon	8	7.4	8.0	9.6	3.8	8.1
simazine + oxadiazon	2 + 4	--	10.0	8.6	9.5	9.1
simazine + oryzalin	2 + 4	--	10.0	9.3	9.5	9.0
norflurazon + oxadiazon	2 + 4	--	9.1	8.0	8.8	9.2
norflurazon + oxadiazon	4 + 8	--	9.6	9.5	10.0	9.7
simazine + oryzalin	4 + 8	--	--	--	9.8	9.4
Control	--	0.0	0.0	0.8	0.0	2.2

1/ Weed control evaluations: 0 = no control, 10 = 100% control. Average of 4 replications.

The screening of new preemergence herbicides in citrus, deciduous fruit and nut trees. Lange, A. H., B. B. Fischer, J. Schlesselman, and R. Goertzen. Twenty new herbicides were applied to 10 varieties of deciduous fruit and nut trees and a citrus rootstock to determine the activity on annual weeds and the amount of phytotoxicity to the trees in comparison to simazine. The varieties included Santa Rosa plum on Marianna-2624, Fay Elberta peach on Nemaguard, Tilton apricot on apricot, French Improved prune on Marianna-2624, Northern California Black walnut seedling, Snow Queen nectarine on Nemaguard, Calimryna fig, pistachio rootstock and Troyer citrange rootstock. One each of the 11 varieties was planted at 1 ft intervals in 20 ft x 10 ft plots on 3/13/75. Each plot was isolated from the others by borders to reduce herbicide contamination from adjacent plots during irrigation. The soil was a Hanford sandy loam with 59% sand, 33% silt, 8% clay, and 0.75% organic matter. Herbicide application was on 3/27/75 followed by 1 inch of sprinkler irrigation. Subsequent sprinkler irrigations continued through the summer from 4/24/75 to 9/9/75 for a total of 26 inches.

The initial evaluation of herbicide activity on broadleaves showed complete or nearly complete weed control with most treatments. By 3 months only 13 treatments remained as active as simazine on annual grasses. After 6 months only RH-2915, R-20810, R-20630, HER-26905 and penoxalin showed excellent residual grass control.

Several herbicides including MBR-15802 and MBR-16302 showed severe phytotoxicity to young trees; being safest on fig and citrus at low rates. R-31401 was safest on cherry, walnut, pistachio, and apricot. DPX-1108, VCS-4207 and the SN compounds were relatively nonselective at low rates and with some varieties. Lack of weed control was undoubtedly responsible for some poor growth.

Several herbicides showed safety with most trees even at high rates. These included RH-2915, FMC-25213, R-20810, R-20630, HER-26905 and penoxalin. Some herbicides showed safety at low rates only; such as R-37878 and cyperquat.

From this screening trial there appears to be several new compounds that look promising as excellent preemergence herbicides for young tree varieties. R-20810, R-20630, penoxalin and RH-2915 were the safest compounds. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

A comparison of relative phytotoxicity of 39 preemergence herbicide treatments on young tree species.

Herbicides	lb/A	Stone Fruit[2/]	Mission Almond	Black Walnut	Pista-chio	California Fig	Tr Cit Citrus	Broadleaf W/C 5/10/75	Grass Control 9/22/75
		Average[1/]							
Simazine	2	2.2	4.0	0.0	0.0	5.3	1.0	10.0	6.3
RH-2915	2	0.0	0.0	0.1	0.0	0.0	4.7	10.0	8.3
RH-2915	8	0.1	0.0	0.0	1.0	0.0	1.3	10.0	9.0
FMC-25213	4	0.1	0.0	0.0	0.0	0.0	3.3	10.0	3.3
FMC-25213	16	0.7	0.7	0.7	1.3	3.3	3.3	10.0	4.7
R-20810	4	0.0	0.0	0.0	0.0	0.0	5.0	10.0	7.7
R-20810	16	0.0	0.0	0.0	0.0	0.0	1.3	10.0	9.3
R-20630	4	0.0	0.0	0.0	0.0	0.0	3.0	10.0	9.3
R-20630	16	0.0	0.0	0.0	0.0	0.0	3.3	10.0	10.0
SN-45311	2	1.1	0.0	2.0	2.0	3.0	1.3	10.0	5.3
SN-45311	8	5.3	6.0	3.0	7.7	8.3	1.5	9.6	4.7
SN-53808	2	1.5	2.7	5.0	2.7	4.0	4.3	10.0	4.3
SN-53808	8	9.1	8.7	5.3	10.0	8.3	0.0	10.0	5.3
SN-49962	2	1.0	0.7	1.0	1.0	1.0	5.0	9.0	3.0
SN-49962	8	4.0	3.0	1.7	1.0	5.0	0.0	10.0	4.3
VCS-5052	2	0.8	1.0	0.7	1.7	1.0	3.3	6.6	1.3
VCS-5052	8	1.7	1.7	1.3	0.7	1.3	1.7	9.0	3.0
VCS-4207	2	2.5	4.0	3.0	2.3	4.3	10.0	7.3	2.3
VCS-4207	8	8.9	8.3	5.3	4.7	6.0	10.0	10.0	3.0
HER-26905	4	0.2	0.0	0.7	0.0	0.0	3.3	9.6	6.7
HER-26905	16	0.3	1.0	0.7	0.0	0.7	1.7	10.0	8.0
Penoxalin	4	0.2	0.0	0.0	0.0	0.0	6.0	10.0	8.0
Penoxalin	16	0.0	0.0	0.0	0.0	0.0	1.7	10.0	10.0
Cyperquat	4	1.3	0.7	1.7	1.7	1.7	0.0	4.0	1.7
Cyperquat	16	--	4.0	6.0	4.0	7.0	5.0	0.0	3.7
DPX-1108	8	0.0	0.0	0.7	0.0	0.7	0.0	7.6	2.7
DPX-1108	32	4.6	5.0	5.0	5.3	5.0	10.0	1.6	2.3
R-37878	2	0.2	0.0	0.7	1.7	0.7	6.5	8.3	3.0
R-37878	8	2.5	3.0	0.0	1.7	4.0	6.7	9.6	3.0
R-31401	2	2.9	4.7	1.3	1.0	3.3	4.0	10.0	4.3
R-31401	8	8.8	8.7	4.3	2.0	8.3	10.0	10.0	6.3
U-44078	2	3.4	3.7	1.7	1.3	3.0	3.3	9.3	4.0
U-44078	8	1.0	1.7	1.0	1.0	0.7	1.0	10.0	6.0
MBR-16302	2	4.2	6.3	5.0	3.3	2.3	3.3	9.0	1.7
MBR-16302	8	7.0	6.7	7.7	4.3	4.3	7.0	10.0	1.3
MBR-15802	2	4.4	5.0	4.3	3.0	1.0	0.0	8.3	1.3
MBR-15802	8	9.2	9.0	8.7	7.0	6.0	5.0	10.0	0.3
Check	--	0.9	0.7	1.0	0.0	0.7	0.0	2.6	1.0

1/ Average of 3 replications. Based on 0 to 10 scale where 0 = no control and 10 = complete control.

2/ Stone fruit = average phytotoxicity on peach, nectarine, apricot, plum, prune and cherry.

Herbicide screening trial on 9 varieties of newly planted grape cuttings and rootings. Lange, A. H., B. B. Fischer, J. Schlesselman and R. Goertzen. Several new preemergence herbicides were evaluated in the 1975 grape screening trial to determine their weed control efficacy and safety to the vines. Nine varieties of grape rootings and cuttings were planted in 10 x 5 ft plots on 3/26/75. The varieties included Thompson Seedless rootings and cuttings, Harmony rootings, and cuttings of Cardinal, Ruby Seedless, Perlette, White Riesling, Ribier, Flame Tokay and Emperor. The soil was a Hanford sandy loam with 58% sand, 32% silt, 10% clay and 0.6% organic matter. The vines were treated on 3/27/75 and sprinkler irrigated with 1 inch water on 3/28/75. The plots were then flood irrigated at about 2 week intervals throughout the summer.

Three months after application, 19 of the treatments showed commercially acceptable control of weeds, most of which were comparable to simazine. After 6 months, only RH-2915, R-20810, R-20630, penoxalin and the combination of simazine + oryzalin demonstrated excellent control of grasses, mainly with the high rates.

The effect of these herbicides on the grape varieties were in general similar. Four herbicides were insufficiently selective to all grape varieties: VCS-4207, R-31401, MBR-16302 and MBR-15802. The effect on the grape varieties by other herbicides indicated some variation between varieties. Because of the somewhat weak condition of some of the cuttings not one treatment appeared to be completely selective for all grape varieties. For example, R-20630 showed good residual activity on annual weeds, but was relatively non-phytotoxic to most varieties with the exception of White Reisling and Emperor.

Fresh cane weights were taken 9/12/75 and for the most part substantiated the phytotoxicity ratings. Weed competition, as seen in comparison with the fresh weight of the check vines and simazine, undoubtedly masked some of the herbicide phytotoxicity and in some cases may have added to the phytotoxicity. However, from a practical point of view those treatments with the greatest fresh weight probably represented those herbicides with the greatest margin of selectivity.

Those herbicides with the most fresh weight at 4X rate were RH-2915, R-20810, R-20630 and penoxalin. Those showing selectivity greater than simazine included simazine + napropamide + glyphosate, simazine + oryzalin + glyphosate, FMC-25213, HER-26905 and U-44078. (San Joaquin Valley Agricultural Research and Extension Center, University of California, Parlier, California 93648)

Activity of preemergence herbicides on annual weeds on 9 varieties of new grapes.

Herbicides	lb/A	General[2] weeds 6/27/75	Grass Weed control[1] 9/22/75	Grape Top Average fresh weight 9/12/75
simazine	2	9.0	4.3	86.8
glyphosate + s + n[3]	4(1+4)	8.7	3.7	135.3
glyphosate + s + o[4]	4(1+4)	10.0	9.0	140.7
RH-2915	2	7.7	0.7	44.0
RH-2915	8	9.0	9.3	253.6
FMC-25213	4	7.7	2.3	101.3
FMC-25213	16	8.0	3.7	92.1
R-20810	4	8.3	3.7	125.5
R-20810	16	9.7	9.3	153.3
R-20630	4	9.3	7.3	153.3
R-20630	16	10.0	10.0	150.2
SN-45311	2	5.3	1.3	63.2
SN-45311	8	10.0	3.7	61.8
SN-52808	2	5.0	0.7	46.6
SN-52808	8	10.0	4.0	46.4
SN-49962	2	4.3	0.0	62.5
SN-49962	8	6.7	0.0	40.7
VCS-5052	2	1.0	0.0	44.1
VCS-5052	8	3.7	1.0	69.0
VCS-4207	2	1.7	0.7	10.3
VCS-4207	8	4.0	0.0	0.4
HER-26905	4	8.3	5.0	115.3
HER-26905	16	9.3	7.3	118.9
penoxalin	4	9.3	8.3	140.3
penoxalin	16	10.0	10.0	182.8
cyperquat	4	4.0	1.0	36.2
cyperquat	16	1.3	1.3	32.1
DPX-1108	8	1.3	0.0	27.2
DPX-1108	32	0.0	0.0	7.5
R-37878	2	1.0	0.0	21.1
R-37878	8	5.0	1.3	47.2
R-31401	2	5.0	0.7	33.3
R-31401	8	8.7	0.7	7.4
U-44078	2	8.7	5.3	131.5
U-44078	8	9.0	6.3	77.6
MBR-16302	2	3.3	0.7	1.2
MBR-16302	8	5.7	0.0	0.6
MBR-15802	2	3.7	0.3	<2.3
MBR-15802	8	5.7	0.7	<1.8
Check	--	1.7	0.3	25.5

[1] Average of 3 replications. Based on 0 to 10 scale where 0 = no control and 10 = complete control. Treated 3/27/75.
[2] Mainly pigweed and barnyardgrass and crabgrass.
[3] s + n = simazine + napropamide
[4] s + o = simazine + oryzalin

Tolerance of young trees and vines to glyphosate. Kempen, H. M. Small trials were conducted on grape, almond, pistachio, orange, plum, peach, apricot and apple one to two years old. Glyphosate at rates of 1, 3, 6 and 12 lb/A was applied.

Directed sprays onto the trunks and sometimes lower foliage were made to individual trees replicated three times. Most applications were applied before dormancy in October, 1974 and observed in 1975 when new growth developed. Additionally, small plot trials were conducted in combination with soil active herbicides and two large unreplicated plots on grapes were made.

Results showed that where directed sprays were kept off the foliage of these young trees and vines, no foliar injury symptoms were evident the following spring. However, where foliage was sprayed, injury was evident the next spring.

Large unreplicated one-third acre plots of grapes were broadcast treated with 10 lb/A of glyphosate on May 15, 1975. There were slight injury symptoms but no evidence of vigor or yield depression on the two varieties tested -- Thompson seedless (third year) and Royalty (10 years).

Combination trials with oxadiazon, napropamide or oryzalin showed excellent activity from glyphosate on weeds and no tree injury. Combinations of oxadiazon plus glyphosate were most effective. (Cooperative Extension, University of California, Bakersfield)

Herbicides on large weeds in one year old peaches and apples[1/].

Treatments	lb/A	weed control ratings[3/] peaches	apples
Untreated	--	0.0	1.7
glyphosate + oxadiazon	1 + 4	9.5	9.7
glyphosate + oxadiazon	2 + 8	9.5	10.0
glyphosate + napropamide	1 + 4	9.0	8.7
glyphosate + napropamide	2 + 8	8.0	9.3
glyphosate + oryzalin	1 + 4	7.5	7.7
glyphosate + oryzalin	2 + 8	8.5	9.3
oxadiazon	4	4.0	3.3
oxadiazon	8	5.5	5.0
ocadiazon + dinoseb[2/]	4 + 1	6.0	6.7
oxadiazon + dinoseb[2/]	8 + 2	8.5	8.0
oxadiazon + dinoseb amine	4 + 1 1/2	6.0	6.0
oxadiazon + dinoseb amine	8 + 3	4.5	7.0
oxadiazon + paraquat	4 + 1/2	7.0	8.1
oxadiazon + paraquat	8 + 1	9.5	9.0

1/ Applied 2/9/73 when trees were dormant. Weeds included London rocket, shepherd's purse, redstem filaree, sow thistle, groundsel, sweet clover and horseweed. Weeds were 6-12 inches tall. Plot size was 7 x 7 ft, replicated 3 times in each orchards. Soil type was San Emidgio loamy sand under sprinklers.

2/ Emulsifiable 2 lb/gal formulation of dinoseb.

3/ Rated 0 to 10: 0 = no effect, 10 = kill.

Control of common groundsel in container grown ornamentals. Elmore, C. L., W. A. Humphrey and T. Mock. The broadleaf weed, common groundsel, has become more severe with the increased use of the grass-controlling herbicides, nitralin, trifluralin and DCPA in ornamentals. None of these herbicides control common groundsel well. A study was initiated to evaluate herbicides in container grown English boxwood at the University of California, South Coast Field Station. Two year old plants replicated six times were treated with granular or wettable powder formulations of six preemergence herbicides on April 18, 1975. The plants were grown in a modified U.C. mix (89% sand, 5% silt, 6% clay and 13.2% organic matter) and irrigated with overhead sprinklers.

Weed control was evaluated by pulling and weighing or counting common groundsel plants at 1, 3 and 5 months after treatment. Phytotoxicity was visually evaluated.

The herbicide RH-2915 gave excellent control of common groundsel over a five month period at 2,4 and 6 lb/A. Although some common groundsel plants were apparent at 5 months they were severely stunted and noncompetitive. Perfluidone also gave excellent control for 5 months. The herbicides USB-3153 at 2 and 8 lb/A, oxadiazon at 8 lb/A, napropamide at 8 and 16 lb/A and the combination of napropamide 4 lb/A plus nitrofen 4 lb/A gave good control for 1 month but did not give residual control over 5 months.

English boxwood was not injured by any herbicide treatment in this test. (University of California, Cooperative Extension, Davis and Orange County and South Coast Field Station)

Preemergence control of common groundsel in container grown ornamentals.

Herbicide	Rate lb/A	Common groundsel weight (gm)/container 1 mo	3 mo[1/]	5 mo[1/]
RH-2915	2	0	0.3	2.5
RH-2915	4	0	0.1	2.0
RH-2915	6	0	0.0	0.0
perfluidone	4	0.5	0.1	1.1
perfluidone	16	0.7	0.1	0.5
USB 3153	2	0.7	2.3	6.2
USB 3153	8	0.3	3.5	11.0
oxadiazon	4	6.0	4.1	7.7
oxadiazon	8	0.1	0.3	6.5
napropamide	8	0.3	14.3	17.2
napropamide	16	0.3	0.3	9.0
nitrofen	4	2.3	9.0	5.5
nitrofen + napropamide	4 + 8	0.1	4.2	3.2
Control	--	10.8	10.2	9.0

[1/] Number of groundsel seedlings per container.

Weed control in container grown ornamentals. Collins, R. L. A number of herbicides are used in Oregon nurseries for weed control in container grown stock. These herbicides are principally applied as granules. Considerable interest has been expressed in applying herbicides through sprinkler irrigation systems.

Simazine, dichlobenil and trifluralin granules were compared to napropamide EC applied through sprinklers in a test with six replicates. Each replicate consisted of a two gallon container of Rhododendron, Exbury Azalea, Golden Pfitzer Juniper, Mugo Pine and Tam Juniper. The granules were applied with a shaker can and the napropamide 2 EC was applied continuously through a sprinkler system at 60 psi, taking 30 minutes to apply an acre inch of water. The plots were seeded with rye grass and red clover. The seed was worked into the top inch of soil and the herbicides applied broadcast preemergence to the weeds but over the top of the ornamentals. The ornamental liners were first grown in hot house beds then transferred to containers in a bark-peat moss growing medium. Visual ratings were made four months after application at the test site in Cornelius, Oregon.

Dichlobenil gave excellent control of grass and broadleaf weeds but some injury was noted with Pfitzer and Tam junipers. Napropamide gave excellent grass control but poor broadleaf weed control. It would appear that applying napropamide through irrigation water is a satisfactory method of application. Simazine and trifluralin gave poor weed control. (Pest Management Consultant, Hillsboro, Oregon)

Summary of weed control in container grown ornamentals, Cornelius, Oregon.

Treatment	Rate lb/A	Weed control grass	Weed control BL	Crop Tolerance: Azalea	Rhododendron	Golden Pfitzer Juniper	Mugo Pine	Tam Juniper
napropamide 2 EC	4	9.5	6.0	0	0	0	0	0
napropamide 2 EC	8	9.0	2.0	0	0	0	0	0
simazine 4% gran	2	0	0	0	0	0	0	0
dichlobenil 4% gran	3	9.8	9.0	0	0	0.5	0	1.0
dichlobenil 4% gran	4	10.0	10.0	0	0	1.0	0	1.0
trifluralin 5% gran	4	3.0	0	0	0	0	0	0
Check	--	0	0	0	0	0	0	0

Ornamentals transplanted July, 1974. Herbicides applied 11/29/74. Evaluated 3/24/75. 0 = no effect; 10 = complete elimination.

Weed control in Scotch pine Christmas trees. H. P. Alley and A. F. Gale. Field sandbur and annual broadleaf weeds are a problem in establishing evergreen trees. In addition to affording competition during establishment and growth, field sandbur can also be a serious problem during tree harvest, especially for the individual in the select and harvest program.

A field of 4-year-old Scotch pine trees, heavily infested with field sandbur was selected for the experimental site.

All herbicide treatments were applied with a three-nozzle knapsack spray unit in a total volume of 40 gpa water, directly over the 4-year-old Scotch pine. Plots were single-row, 60 ft long, randomized with three replications. The soil was classified as a sandy loam (79.2% sand, 10.8% silt, 10% clay, 1.9% organic matter and 7.3 pH).

Field sandbur was the predominant weed species with a lesser infestation of common sunflower, horseweed and kochia. The previous year's weed growth created a dense prostrate cover at time of treatment.

Visual weed control and phytotoxicity readings were made 7/22/75, approximately three months following treatment.

Atrazine + simazine at 0.5 + 0.5 lb/A and 0.75 + 0.75 lb/A, GS-14254 (Sumitol) at 1 lb/A and 1.5 lb/A, and simazine were the best treatments of the series, resulting in 85% or better field sandbur control and elimination of all annual broadleaf weeds common to the area. Bioxone gave outstanding broadleaf weed control, but was weak on field sandbur; whereas, asulam gave fair field sandbur control, but was weak on kochia. Oxadiazon plots were invaded by common sunflowers. These three herbicides caused no apparent damage to the trees, but did not afford adequate control of the weed complex. (Wyoming Agri. Expt. Sta., Laramie, SR-671)

Weed control in Scotch pine Christmas trees[1/].

Herbicide	Rate lb/A	Percent control[2/]	Observations
bioxone	2.25	70	No damage to trees.
bioxone	4.5	70	Excellent broadleaf weed control.
bioxone	6	75	All three rates appear the same.
asulam	2	75	No damage to trees.
asulam	4	80	Kochia abundant in asulam plots.
oxadiazon	2	50	No damage to trees.
oxadiazon	3	60	Fair on sandbur, sunflowers abundant.
napronamide + simazine	4.0 + 0.8	70	No damage to trees, kochia in plots.
napronamide + simazine	6.0 + 1.0	75	No damage to trees, kochia in plots.
GS-14254	1	85	No damage to trees.
GS-14254	1.5	90	No damage to trees.
atrazine + simazine (W.P.)	0.5 + 0.5	90	No damage to trees.
simazine (80W)	1.6	85	No damage to trees.
atrazine + simazine (W.P.)	0.75 + 0.75	95	No damage to trees.
USB-3153	0.5	0	
USB-3153	0.66	0	No activity on sandbur
USB-3153	1.33	0	

1/ Treated 4/16/75, evaluated 7/22/75.
2/ Evaluation for field sandbur.

PROJECT 5. AGRONOMIC CROPS

Jack P. Orr, Project Chairman

SUMMARY

A total of 49 papers covering ten agronomic crops were submitted. The papers have been arranged and are briefly summarized by crop. Late reports may not be included in the summary.

Alfalfa

Trials on established alfalfa in California show that several of the newer herbicides GS-14254, terbacil, pronamide plus RH-2915 and metribuzin can offer weed control superior to that of herbicides currently available. Also, treatment in mid December is much superior to treatment in late January. Crop tolerance was good with most of the herbicides except for terbacil at 4 lb/A.

On two split spring applications for control of dodder in alfalfa DCPA at 10 lb/A each application, provided slightly better control than chlorpropham + PPG-124 6 and 4 lb/A which gave good to fair control. Pronamide 1 and 2 lb/A gave poor control.

Summer applications made for control of yellow foxtail showed asulam at 2 and 4 lb/A exhibited excellent control with no phytotoxicity to the alfalfa.

Barley

In a trial conducted in Colorado for control of wild oats in barley; there was no difference in the ability of HOE-23408, difenzoquat and triallate to control wild oats; but they were all superior to barban.

Yield of wild oats was greatly reduced by the combination of difenzoquat, HOE-23408 and triallate.

Another trial showed triallate and difenzoquat were less effective when applied on late planted barley. It is essential to get control of wild oats in late planted barley, due to the inability of barley to compete with the wild oats. In California an experiment with difenzoquat and broadleaf herbicide combinations in non-irrigated barley showed wild oat control was acceptable at all rates tested. Barley injury was observed with 2,4-D amine in combination with difenzoquat when applied at the 2-leaf stage. Greater selectivity resulted in the bromoxynil and difenzoquat combination; and with treatments made when barley was in the three-four leaf stage.

Field Beans

Three separate experiments on field beans were conducted in Wyoming. Under sprinkler irrigation trifluralin + alachlor and bifenox + alachlor applied preemergence on the surface gave 100% control of broadleaf weeds and 99% control of green foxtail. Under furrow irrigation dinitramine + EPTC and profluralin + EPTC gave 100% weed control and six other combinations affected bean vigor. The third experiment also under furrow irrigation showed superior weed control from dinitramine, butralin and EPTC.

Field Corn

Experiments conducted with field corn in Utah showed treatments containing atrazine or EPTC-R25788 were the most effective in providing full season control of redroot pigweed, lambsquarters, bristly foxtail and foxtail species. Especially encouraging was the EPTC-R25788 plus R-31401 application where broad leaved and grassy annual weeds were controlled very well. Corn tolerance was excellent. Atrazine gave excellent control of broadleaved weeds but poor grass control. These trials support previous conclusions that combinations of herbicides are required to give satisfactory control of broadleaved and grassy species commonly present in Utah corn fields.

Cotton

In Arizona trifluralin, profluralin, penoxalin and dinitramine were applied to the soil 2 weeks and immediately before disking for control of weeds in cotton.

Both applications of dinitramine at 0.5 lb/A caused moderate stunting of cotton seedlings. There was no significant difference in seedling stands 1 to 4 weeks after emergence due to herbicide treatments. Applications of trifluralin and profluralin at 0.75 lb/A 2 weeks before incorporation had less control of broadleaf weeds than other treatments. There was no difference in cotton yield between herbicide treatments.

In another experiment a rate study with phenoxalin showed excellent broadleaf and grass control at rates from 0.25 to 1.75 lb/A with excellent cotton tolerance.

Experiments in New Mexico for control of yellow and purple nutsedge in cotton with perfluidone showed dosages of 2.3 or 4.6 kg/ha placed around or below tubers of both species of nutsedge or the seed of cotton resulted in good control and unacceptable injury to cotton. Shallow placement of the herbicide above the nutsedge tubers and cotton seed gave little or no control and visible but minor injury to cotton.

Peppermint

Experiments in Oregon with pronamide applied in December to dormant peppermint showed considerable mint injury at 3.0 and 4.0 lb/A rates. Fresh hay yields were reduced significantly at 1.5 lb/A and higher rates.

Another experiment in a field infested with Italian ryegrass; pronamide at rates of 1.0 and 2.0 lb/A yielded 49.7 and 50.6 lb/A of peppermint oil. These were significantly higher than the check.

Pronamide is an attractive candidate for grassy weed control in peppermint, despite yield reductions at higher rates in clean mint.

For control of Canada thistle in peppermint, early applications of Dowco 290 at 0.125 lb/A gave excellent control and minimal mint injury. It appears that light rates (less than 0.25 lb/A) and early application dates (late May) will provide optimum oil yields in Canada thistle infested peppermint.

Rice

An experiment in California for control of river bulrush in rice proved early applications of bentazon at 2 and 4 lb/A gave higher yields than the control on later treatments because of early bulrush competition. No phytotoxicity to the rice was observed.

In another experiment studying the activity of perfluidone in rice, ringed plots increased the activity when applied preemergence, 1 day post-flood at 2 and 4 lb/A. Severe rice injury and good weed control were evident throughout the season. An 18 day postemergence treatment in ringed plots showed more activity, with good weed control and the rice showing more tolerance.

Sorghum

An experiment in Arizona showed that applications of dicamba over-the-top of sorghum temporarily reduced root development, caused stunting, and leaves to appear stressed for moisture. Applications 6 weeks after emergence delayed maturity. Lowest yields were obtained from the 6 week treatment compared to higher yields from the 2 and 4 week after emergence treatments.

Sugarbeets

In experiments in Utah with preplant soil incorporated herbicides considerable early stunting of the beets was observed with ethofumesate at 2.5 and 3.5 lb/A. The sugarbeets grew out of this injury and no decrease in yield was obtained. Redroot pigweed and wild oat control was excellent and lambsquarters control was poor. The combination of ethofumesate with cycloate at 3 lb/A; and H 22234 at 2.0 lb/A gave excellent weed control. Moderate injury was obtained with the ethofumesate plus H 22234 2.0 + 2.0 lb/A.

In Arizona preplant applications of ethofumesate, H 22234 and cycloate in combination with postemergence treatments stunted sugarbeets and reduced stands. Best season-long weed control was with ethofumesate. There was no significant difference in yields between five herbicide preplant and postemergence combinations.

In California preemergence treatments with ethofumesate and H 22234, 4.0 and 3.0 lb/A, respectively, gave good barnyardgrass control. Ethofumesate caused distortion of the growth of some sugarbeet seedlings but later they outgrew this distortion.

In postemergence applications to sugarbeets in Utah several materials were demonstrated to possess economic potential for control of watergrass and lambsquarters. The most promising was a three-way combination of phenmedipham, desmedipham, and HOE-23408 at 0.75, 0.75, and 1.0 lb/A, respectively.

In California postemergence applications of HOE-22870 and HOE-23408 gave selective control of barnyardgrass 2 to 8 inches tall. Under conditions of this test 4.0 lb/A gave fair control and 8.0 lb/A gave good control with no injury to the beets.

Wheat

Experiments in Utah for postemergence wild oat control in spring wheat showed HOE-23408 at 0.75, 1.0, 1.5 and 2.0 lb/A gave good to excellent control and a decrease in wheat yield with increasing rates. Difenzoquat at 0.5, 0.75 and 1.0 lb/A gave poor wild oat control. Additional wetting agents to difenzoquat showed some advantage in control. Barban at 0.25 and 0.375 lb/A gave poor control of wild oats.

Experiments in Oregon with HOE-23408 for control of wild oats and Italian ryegrass showed control from preemergence treatments was acceptable for ryegrass but poor for wild oats. Control was considerably better from postemergence treatments. A rate of 1 lb/A applied early postemergence gave an average yield increase of more than 45 bu/A and excellent grass control. The 2 lb/A rate gave minor injury symptoms and yields tended to be slightly lower than the 1 lb/A rate. Late postemergence treatments were highly effective.

Experiments in Oregon for downy brome control showed good to excellent control was obtained with postemergence applications of metribuzin, cyanazine and propham. Combinations of metribuzin-bromoxynil and atrazine-bromoxynil resulted in good control of downy brome. Good to excellent yields were obtained. Considerably lower yields were obtained with propham and the propham-bromoxynil combination.

Herbicides for postemergence yellow foxtail control in established alfalfa. Smith, N. L., C. Wilson, and B. Richardson. A study was initiated to test the effectiveness of DCPA, pronamide, chlorpropham + PPG-124, EPTC, asulam and HOE-23408 for the postemergence control of yellow foxtail in established alfalfa.

Applications were made to an alfalfa field heavily infested with yellow foxtail immediately following the fourth cutting (July 7) in Sutter County, California. Granular formulations of DCPA, pronamide, chlorpropham and EPTC were applied with a Whirlybird spreader. Asulam and HOE-23408 were broadcast sprayed in 35 gpa water using a CO_2 constant pressure sprayer. The plots were 200 ft^2 and replicated four times. The field was flood irrigated within 24 hours following treatment. The growth stage of yellow foxtail varied from seedlings to 8 inch tall plants.

A second trial was established September 3, in an alfalfa field near Red Bluff, California. Asulam and HOE-23408, the only herbicides tested at this location, were applied in 45 gpa water with a CO_2 constant pressure sprayer. The plots were 100 ft^2 and replicated four times. Yellow foxtail was 12-16 inches in height and seedheads were present. The field was sprinkler irrigated 24 hours following the application.

An initial weed control rating was made in Sutter County on August 15 and again after two cuttings on September 17. A single evaluation was made at the Red Bluff location on October 15.

Asulam exhibited excellent control at both 2 and 4 lb/A at both locations. Control was unacceptable from the other herbicides tested. No phytotoxicity to alfalfa was noted from any of the herbicides tested. (Cooperative Extension, University of California, Davis, Sutter County and Tehama County)

Yellow foxtail control in alfalfa.

			Control (10=100%)[1/]		
			Sutter Co.		Tehama Co.
Herbicide	Formulation	lb/A	8/15/75	9/17/75	10/15/75
DCPA	5 gal	10	2.0	2.8	--
pronamide	4 gal	1	0.8	1.5	--
pronamide		2	3.8	2.5	--
chlorpropham + PPG 124	20 gal	4	2.0	1.5	--
chlorpropham + PPG 124		8	3.3	3.0	--
EPTC	5 gal	3	6.3	3.8	--
asulam	3.34 lb/gal	2	9.5	9.5	9.3
asulam		4	9.5	9.7	9.9
HOE-23408	3 lb/gal	1	3.3	2.8	2.0
HOE-23408		2	1.3	0.8	1.3
Control	--	--	3.0	1.5	--

1/ Average of four replications.

Dodder control in established alfalfa. Smith, N. L. and J. L. Farley. Dodder has long been a problem in established alfalfa in California. Dodder seed germinates in the spring generally about the time the first hay cutting is made. It becomes parasitic following attachment to the alfalfa plant. Dodder has the capability of producing large amounts of seed which is easily spread during haying operations resulting in heavy infestations within a few years.

A dodder infested alfalfa field near Los Banos, California was selected to evaluate the efficacy of pronamide, chlorpropham + PPG-124 and DCPA for dodder control. Because of the relatively short residual lives of these herbicides the effectiveness of split applications was tested. Only pronamide was studied in a single application (table). Wettable powder formulations of pronamide and DCPA were applied in 25 gpa water with a CO_2 constant pressure sprayer. A Whirlybird spreader was used to apply granular pronamide and chlorpropham-124 (table). The experiment was conducted as a randomized block design with four replications. The plot size was 2250 ft^2.

The first herbicide application was made on April 30, 1975. At that time no dodder seedlings were apparent and the alfalfa had regrown 6 to 12 inches following the first hay cutting. The soil surface was dry and large cracks were evident. The field was flood irrigated on May 12, 1975.

A second treatment was made after the third cutting but prior to a flood irrigation on July 14. Chlorpropham + PPG-124, DCPA and two pronamide treatments were retreated. Rainfall totaling .04 inches occurred within 24 hours of application.

Evaluations of dodder control were made visually on June 16, July 14 and August 22. The results are shown in the table. DCPA provided slightly better control than chlorpropham and both were superior to pronamide through the July evaluations. A single early 2 lb/A application of pronamide granules exhibited good control at the August 22 evaluation. This observation was difficult to explain considering the poor dodder control evident from the repeated 2 lb/A application of pronamide. Perhaps variability in the dodder stand can account for this difference. (University of California, Cooperative Extension, Davis, and Farm Advisor, Merced County)

Dodder control in established alfalfa.

Herbicide	Formulation	Rate lb/A 4/30/75	Rate lb/A 7/14/75	5/16/75 dodder plants	5/16/75 dodder area, sq ft[1]	Control[2] 7/14	Control[2] 8/22	% of area infested[3] 7/14	% of area infested[3] 8/22
pronamide	4% granule	1	--	13.3	23	3.0	6.3	15.0	23.8
pronamide	4% granule	1	1	9.0	13.5	2.5	4.0	15.0	23.8
pronamide	50% WP	2	--	5.5	10.1	5.0	4.9	11.5	21.5
pronamide	4% granule	2	--	7.8	11.5	4.8	8.3	10.5	7.5
pronamide	4% granule	2	2	13.0	15.8	3.3	4.3	14.5	26.3
chlorpropham + PPG-124	20% granule	6	4	3.8	3.0	6.5	8.3	7.0	7.5
DCPA	75% WP	10	10	1.0	1.8	7.8	6.9	4.5	12.5
Control	--	--	--	16.3	52.8	4.3	6.0	15.0	17.8

All values represent the average of four replications.

1/ Visual estimate of infested area.
2/ Control: 0 = no control, 10 = complete control.
3/ % of area infested: visual estimate of plot area containing dodder.

Mixed winter annual weed control in established alfalfa: comparison of two treating dates. Robert F. Norris, Renzo A. Lardelli and Carl A. Schoner, Jr. A trial was initiated in an established field of 'Lahonton' alfalfa in Yolo County California as part of an ongoing program to evaluate both registered and experimental herbicides for use in alfalfa in relation to crop tolerance and weed control, and to better ascertain if early or late winter herbicide treatments varied in activity.

Treatments were applied to semi-dormant alfalfa with approximately 2 to 3 inches of growth on Dec. 18, 1974 and Jan. 30, 1975. A heavy population of annual bluegrass and common chickweed were present with moderate numbers of groundsel also growing; scattered speedwell was also present. All weeds were from 1 to 1.5 inches tall in December, and were only 10 to 20 percent larger by late January due to cool weather in the intervening period. A CO_2 backpack sprayer was used for herbicide application, with 8003 nozzles at 30 psi delivering 40 gal/A.

Most treatments did not cause any phytotoxicity to the alfalfa. Terbacil at 2.0 lb/A did not injure the crop but 4.0 lb/A caused progressively more severe phytotoxic effects. An alfalfa vigor evaluation was made on June 20; terbacil at 4.0 lb/A was the only treatment causing crop injury at that date, when a 40% vigor loss was still noted. RH-2915 caused some early crop vigor reductions, especially the January treatment; this injury was not evident at the June 20 evaluation. Chlorpropham with PPG-124 plus dinoseb likewise caused some vigor loss in March and April, but was no longer causing vigor loss in June.

Treatments applied in mid December were almost universally superior to those applied in late January; paraquat was perhaps the only exception, proving to be equally effective at either date. Particularly notable examples of less weed control when applied in late January versus mid December were chickweed control by diuron, control of all weeds by GS-14254, groundsel control by terbacil, mebribuzin, or chlorpropham with PPG-124 plus dinoseb and all other weed/herbicide interactions to a lesser degree. Weed control from most herbicide treatments made in mid December was commercially acceptable to essentially complete; treatments that were inadequate due to inability to control one or more weeds included dinoseb with X-77, RH-2915 at the non-injurious rate of 0.5 lb/A and SD-29026. Diuron, weed oil plus dinoseb, and pronamide did not achieve weed control equal to the treatments of paraquat, GS-14254, terbacil at 1.0 lb/A, pronamide plus RH-2915, metribuzin or chlorpropham with PPG-124 plus dinoseb. This trial clearly showed that a) several of the newer herbicides can offer weed control superior to that currently available, and b) that treatment in mid December is much superior to treatment in late January. (Botany Department, University of California, Davis, 95616; and Cooperative Extension, Woodland, 95095)

Mixed winter annual weed control in established alfalfa.

Treatment	Rate lb/A	Date treated	Alfalfa vigor 3/4	Alfalfa vigor 4/3	Weed Control: Annual Bluegrass 2/11	Annual Bluegrass 3/14	Common Chickweed 2/11	Common Chickweed 3/14	Groundsel 2/11	Groundsel 3/14	Speedwell[1/] 3/14
diuron	2.4	A	10.0	9.5	10.0	10.0	10.0	10.0	8.3	5.0	0.5
		B	10.0	9.5		9.0		4.3		1.5	1.5
diruon + dinoseb	2.4+1.75	A	10.0	10.0	9.8	10.0	9.9	10.0	8.3	7.0	0.8
+ 0.5% X-77		B	9.8	9.8		9.4		2.5		1.5	0.8
weed oil/dinoseb	2/	A	10.0	10.0	9.2	9.4	9.4	9.4	9.6	9.5	0
+ 0.5% X-77		B	10.0	10.0		8.0		5.3		9.5	0.3
paraquat	0.75	A	9.8	9.0	9.95	9.8	9.5	9.0	9.6	9.8	0.8
+ 0.5% X-77		B	9.3	9.0		9.8		9.5		9.8	0.8
dinoseb + 0.5% X-77	1.75	A	10.0	9.5	3.8	3.8	6.6	3.0	7.3	5.0	0
		B	9.8	9.5		3.3		1.3		5.5	0.5
GS-14254	2.0	A	10.0	10.0	10.0	10.0	9.9	10.0	10.0	10.0	0
		B	10.0	10.0		5.8		4.3		2.3	0.8
terbacil	1.0	A	9.8	9.8	10.0	10.0	9.9	10.0	10.0	10.0	0
		B	9.8	9.8		7.0		7.3		2.3	1.0
terbacil	2.0	A	10.0	10.0	10.0	10.0	9.9	10.0	10.0	10.0	0
		B	10.0	10.0		9.3		9.5		3.6	1.0
terbacil	4.0	A	9.8	7.5	10.0	10.0	10.0	10.0	10.0	10.0	0
		B	9.8	7.5		9.8		9.8		9.0	0.5
pronamide	1.50	A	10.0	10.0	3.8	10.0	6.9	10.0	2.0	0	0
		B	10.0	10.0		9.5		7.5		1.0	1.5
pronamide + dinoseb	1.5+1.75	A	9.8	9.3	8.0	10.0	8.3	10.0	5.8	4.5	0
+ 0.5% X-77		B	9.5	9.0		9.3		8.3		2.5	1.0
RH-2915	0.5	A	8.8	9.0	5.5	7.8	5.8	5.3	10.0	10.0	0
		B	7.3	8.0		5.8		3.8		7.8	0
RH-2915	1.0	A	8.0	7.8	6.5	8.8	8.4	7.2	9.9	9.5	0
		B	5.5	7.3		6.5		4.0		9.9	0
pronamide	2.0+1.0	A	8.3	7.8	10.0	10.0	10.0	10.0	10.0	10.0	0
+ RH-2915		B	5.0	6.8		10.0		9.6		10.0	0
metribuzin	1.0	A	10.0	9.8	10.0	10.0	9.9	10.0	9.9	9.5	0
		B	10.0	9.8		8.0		9.3		0.3	0

Mixed winter annual weed control in established alfalfa (cont'd.)

Treatment	Rate lb/A	Date treated	Alfalfa vigor 3/4	Alfalfa vigor 4/3	Weed Control: Annual Bluegrass 2/11	Annual Bluegrass 3/14	Common Chickweed 2/11	Common Chickweed 3/14	Groundsel 2/11	Groundsel 3/14	Speedwell[1/] 3/14
metribuzin	2.0	A	10.0	9.3	10.0	10.0	9.9	10.0	10.0	8.0	0
		B	9.8	8.8		9.9		9.8		1.0	0
chlorpropham[3/]	2.0+1.75	A	8.8	8.5	9.95	10.0	10.0	10.0	10.0	9.8	0
+ dinoseb		B	7.8	8.3		9.4		9.1		1.5	0.8
+ 0.5% X-77											
chlorpropham[3/]	4.0+1.75	A	7.8	8.5	9.1	10.0	10.0	10.0	9.8	7.4	0
+ dinoseb		B	6.5	7.5		9.4		10.0		3.0	0.5
+ 0.5% X-77											
procyazine	1.0	A	10.0	9.5	10.0	9.9	9.9	9.8	10.0	5.4	0
		B	10.0	9.5		4.8		8.5		3.8	1.3
procyazine	2.0	A	10.0	9.8	10.0	10.0	10.0	10.0	9.9	10.0	0
		B	10.0	9.8		8.4		9.5		6.8	1.5
SD-29026	0.5	A	9.5	9.3	6.5	6.3	6.8	6.3	6.4	5.3	1.0
		B	9.3	9.3		8.3		1.5		3.0	1.3
SD-29026	1.0	A	10.0	9.8	4.5	9.3	4.1	4.5	8.0	9.2	1.3
		B	9.5	9.5		9.1		2.5		4.8	1.3
SD-29026	2.0	A	10.0	9.5	4.6	9.9	5.4	4.3	9.9	9.9	1.3
		B	8.3	8.8		9.8		2.0		4.5	0.5
Untreated check		A	9.8	9.8	0	1.3	0	0	0.8	1.0	1.3
		B	9.5	9.5		2.0		0		0	1.3

All data are means of 4 replications.
All dinoseb treatments were using the non-selective formulation.
Vigor: 0 = all dead, 10 = full vigor; Control: 0 = none, 10 = complete control

1/ Rating was based on a population as follows: 0 = none, 1 = light, 2 = heavy.
2/ Weed oil plus dinoseb: 50 gal weed oil, 1.25 lb/A dinoseb plus 30 gal water/A.
3/ Chlorpropham formulation used included PPG-124.

Weed control in seedling alfalfa under preplant and postemergence conditions. R. F. Norris, R. A. Lardelli and C. A. Schoner, Jr. Weed problems can be reduced if a vigorous stand of alfalfa is established. Herbicides can help in establishing the stand, but more accurate data relating weed control to alfalfa yield and stand are still needed.

A trial was established on the University farm at Davis in a fall-seeded alfalfa field situated on Yolo loam soil in fine tilth. Preplant herbicide treatments were applied on Oct. 11, 1974 using a commercial field sprayer followed by twice-over disking about 3 to 4 inches deep. Alfalfa (var. Eldorado R) was drilled directly following treatment. Approximately 1 inch of rain fell on Oct. 27 and a further 1 inch on Dec. 27. Postemergence herbicide treatments were applied to subplots within the main preplant incorporated treatments, on Dec. 16, 1974 using a CO_2 backpack sprayer, set at 28 psi, using 8003 nozzles delivering 40 gpa. Weeds present included miner's lettuce (2.5 to 7 cm tall), shepherd's purse (2 to 3 cm rosettes), groundsel (2.5 cm tall), common chickweed (1 to 1.5 cm), and henbit (1.5 cm). Split plot statistical analyses of results were made where appropriate.

Early observation in December indicated profluralin caused considerable stunting of the alfalfa, benefin less stunting, and EPTC only slight stunting. This symptom was rapidly outgrown and seemed to be of no consequence at first harvest or at the late summer stand count. Postemergence treatments of chlorpropham and especially chlorpropham plus PPG-124 made at the three-trifoliate leaf growth stage of the alfalfa caused serious injury to the crop. Statistically significant stand reductions occurred in comparison with the untreated check. Yields of the chlorpropham treated plots did not fall below those of the check at first harvest, presumably due to early weed control. Dinoseb caused some leaf burn but this was rapidly outgrown; 2,4-DB amine and propham caused only temporary stunting of the alfalfa.

No single treatment provided more than slight weed control; the preplant treatments of profluralin or benefin were marginally superior to EPTC due to the weed species present. The postemergence treatments alone were even less satisfactory; the chlorpropham treatments actually resulted in increased weed yield. This was attributed to the reduced alfalfa competition, coupled with a weed species shift to the non-controlled groundsel. Combinations of preplant and postemergence herbicides resulted in greatly improved weed control; this was especially noticeable with a combination of dinoseb applied postemergence and any preplant herbicide. 2,4-DB following profluralin also provided a similar effect. These results appear synergistic, but probably only reflect the effect of increasing the number of weed species controlled; most treatments controlled only some species which allowed the remaining ones to grow better and become dominant. This weed population shift was very obvious at harvest, propham and chlorpropham treatments were almost solid groundsel, profluralin and benefin were heavily infested with shepherd's purse, and 2,4-DB or dinoseb with or without EPTC were shifted to abundant miners lettuce. If a particular combination provided complementary control, then overall results were improved.

Although weed control was not complete large alfalfa yield increases were obtained, exceeding the control four-fold in several treatments. Conversely, weeds essentially eliminated the first cutting, an alfalfa yield of 40 g/m^2 equals 0.18 tons/A (table). The best overall combinations for weed control and alfalfa yield, although not ideal, were benefin or profluralin preplant followed by 2,4-DB or dinoseb, or EPTC preplant followed by dinoseb. (Botany Department, University of California, Davis, and Cooperative Extension, Woodland)

Weed control in seedling alfalfa - yield data.

Preplant treatment and rate	Postemergence treatment	Rate	Alfalfa Yield	Alfalfa %	Weeds Yield	Weeds %	Weeds % Weeds
EPTC	propham	4.0	112	280	200	63	64
3.0 lb/A	chlorpropham +	4.0	116	290	213	66	65
	chlorpropham	4.0	108	270	271	84	71
	2,4-DB amine	1.0	94	235	378	117	80
	dinoseb	1.0	180	450	156	49	47
	Untreated	--	92	230	297	92	76
benefin	propham	4.0	149	372	238	73	62
1.0 lb/A	chlorpropham +	4.0	86	215	318	99	79
	chlorpropham	4.0	145	362	203	63	58
	2,4-DB amine	1.0	162	405	270	84	62
	dinoseb	1.0	150	375	169	52	53
	Untreated	--	118	295	235	73	67
profluralin	propham	4.0	154	385	194	60	56
1.0 lb/A	chlorpropham +	4.0	96	240	228	71	71
	chlorpropham	4.0	99	248	263	82	73
	2,4-DB amine	1.0	184	460	182	57	50
	dinoseb	1.0	163	408	116	36	42
	Untreated	--	111	278	245	76	69
Untreated	propham	4.0	114	285	288	89	72
	chlorpropham +	4.0	64	160	385	120	86
	chlorpropham	4.0	104	260	334	104	76
	2,4-DB amine	1.0	104	260	285	88	73
	dinoseb	1.0	115	288	288	89	71
	Untreated	--	40	100	322	100	89

Percent data in relation to yield reflect treatment as a percent of check. Yield data are g/m^2, harvested on 4/24/75.

Sub-surface line injection of EPTC for new seedlings of alfalfa. Dawson, J. H. EPTC has long been applied by soil incorporation before seeding to control various annual weeds in new seedings of alfalfa. EPTC is also effective when applied by sub-surface line injection. However, there has been little, if any, experience using this method of application of EPTC for selective weed control in alfalfa.

In the Pacific Northwest, the related thiocarbamate, cycloate, is applied each year to many thousands of acres of sugarbeets by sub-surface line injection. Thus, equipment is commercially available for injecting herbicide and planting sugarbeets in one efficient operation. In 1975, we used such equipment to seed alfalfa and inject EPTC.

Using a Francom Injector and Milton Seeder, EPTC was injected in two lines 2 inches deep and 2.25 inches apart, while alfalfa was seeded 0.75 to 1 inch deep midway between the two lines. Figuring the treated area per row to be a band 4.5 inches wide, EPTC was applied at 0, 1, 2, 3, and 4 lb/A in 40 gpa water. Two separate, unreplicated experiments were established in late March and early April.

No rate of EPTC reduced the uniform and abundant stand of alfalfa in either experiment. Symptoms of EPTC injury were evident at 2 lb/A and became more severe as the rate increased. Injured plants were stunted, and leaflets of their unifoliate and first to third trifoliate leaves did not expand normally. Subsequent leaves were normal, and the plants recovered fully, so that no effects of the EPTC were evident in July.

The weeds abundant in one experiment were common lambsquarters, hairy nightshade, and barnyardgrass. Based on stand counts, there was 100% control of all species at all rates of EPTC. In the second experiment, only barnyardgrass was abundant. There was partial control of this species at 1 lb/A, and control was 100% at all higher rates.

The excellent selective control of several species of weeds in these preliminary trials indicates that sub-surface line injection of EPTC is a promising method for weed control in new seedings of alfalfa, especially when planted for seed production in rows where inter-row tillage is practiced. In areas where injected cycloate is used for weed control in sugarbeets, it should be very convenient to adjust the seeder to handle alfalfa seed, and then to use the same equipment to inject EPTC and seed alfalfa. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Prosser, Washington 99350)

Longevity of weed control in dormant alfalfa resulting from napronamide alone and in combination with other herbicides. Alley, H. P., G. A. Lee and G. L. Costel. These studies were established on a heavily weed-infested, low productive dryland alfalfa field on 4/5/73 at the Sheridan Agricultural Experiment Station. The weed complex consisted primarily of downy brome with lesser populations of tansy mustard, blue mustard, field pepperweed and meadow salsify. Downy brome was 0.75 to 1.0 inch tall, tansy mustard 0.5 inch rosette, blue mustard 1 inch growth, 3- to 4-leaf, and field pepperweed 0.5 inch growth at time of herbicide treatment. Alfalfa showed some green growth near the crown of the plant. The soil was classified as a Wyarno clay loam with a pH of 7.1, 3.5% organic matter, 69.7% sand, 16% silt, and 15% clay.

All herbicides were applied with a three-nozzle knapsack sprayer in a total volume of 40 gpa water. Treatments were 1 sq rd, randomized with three replications.

Weed control determinations were made by clipping and separating the alfalfa and weeds in 1973, with visual determinations made in 1974 and 1975. Alfalfa production was determined by harvesting a 2.5 ft diameter quadrats from each plot, oven-drying and weighing for yields. No alfalfa yields were determined in 1974 due to severe drought.

Weed control data accumulated over the three year period showed that napropamide and pronamide were very effective downy brome herbicides, but weak on annual broadleaf weeds, whereas, terbacil had good activity on both annual grass and broadleaf weeds. Combinations were made to increase the spectrum of weed control.

Weed control resulting from napropamide at 4.0 and 6.0 lb/A and napropamide + pronamide at 2.0 + 1.0 and 4.0 + 1.0 lb/A increased the second and third year after treatment and were as effective in reducing the infestation of annual weeds as napropamide + terbacil. All single or combination treatments were very effective toward downy brome, but did not control a high percentage of the annual pepperweed. Effective downy brome control could be expected for at least three years under climatic and soil conditions similar to the experimental site.

Differences in oven-dry alfalfa production between the treated plots and the check (untreated) were not as great in 1975 as in 1973, however, production was equal to or greater on all treated areas, except napropamide at 2.0 lb/A which gave only 60% control of the weed population. (Wyoming Agric. Exp. Sta., Laramie SR-667)

Weed control and alfalfa production from herbicide treated plots (Sheridan Agric. Exp. Sta.).

Treatment[1/]	Rate lb/A	Alfalfa lb/oven-dry/A[2/] 1973	1975	Percentage Weed Control 1973	1974	1975
napropamide	2.0	1667	3176	48	70	60
napropamide	4.0	2020	3542	79	98	90
napropamide	6.0	1973	3910	74	98	95
napropamide + terbacil	2.0 0.5	2533	3542	98	90	98
napropamide + terbacil	4.0 0.5	2720	4398	99	99	98
napropamide + pronamide	2.0 1.0	2007	3054	77	99	98
napropamide + pronamide	4.0 1.0	2147	3665	81	99	100
Check	--	1320	3317	0	0	0

1/ Treatments applied 4/5/73.
2/ Clippings taken 6/20/73 and 6/24/75.

Weed control in seeded alfalfa under sprinkler irrigation. Alley, H. P., G. A. Lee and A. F. Gale. The study was established at the Torrington Agricultural Substation to evaluate preplant incorporated herbicides for weed control in alfalfa establishment under sprinkler irrigation. The herbicides were applied May 9, 1975 and incorporated to a soil depth of 1.5 inches with a flex-tine harrow. The alfalfa (variety Ranger) was planted at a seeding rate of 4 lb/A with a grain drill attachment, the same day of treatment. Plots were 1 sq rd in size, randomized with three replications. All herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa water carrier. The soil at the experimental site was classified as a sandy loam with 69.6% sand, 20.0% silt, 10.4% clay, 1.4% O.M. and 7.3 pH. The plot area received 0.5 inches sprinkler irrigation within 24 hours of herbicide applications.

The weed species consisted of redroot pigweed, common lambsquarters, black nightshade, green foxtail and a minimum amount of other species. At time of evaluation the nontreated check plots had a weed density of 50% ground cover comprised of 75% broadleaved weed species and 25% green foxtail. Alfalfa seedling vigor, stand and percentage weed control were determined by visual observations.

Four of the 25 herbicide treatments resulted in 98% or greater control of the weed species, whereas ten other treatments resulted in 90% or greater control. The outstanding treatments which resulted in outstanding weed control with a minimum reduction in alfalfa seedling stand and vigor, were EPTC alone, and EPTC in combination with butralin and profluralin. All treatments, except trifluralin at 0.5 lb/A and VEL-5052 at 4.0 lb/A, gave 90% or greater green foxtail control. Control of black nightshade ranged from 50% to 100%, with fourteen of the treatments resulting in 95% or greater control and three treatments giving 65% or less control. (Wyoming Agric. Expt. Sta., Laramie, SR-683)

Alfalfa seedling stand and vigor, and percent weed control.

Treatment	Rate lb/A	Alfalfa S[1]	Alfalfa V[2]	Percentage Control: Redroot pigweed	Common lambs-quarters	Black nightshade	Green foxtail	Others[3]
VEL-5052	2.0	100	0	70	75	82	90	55
VEL-5052	4.0	90	20	40	0	90	75	0
SD-29026	0.5	80	20	70	80	65	90	70
SD-29026	2.0	60	30	85	90	95	95	95
penoxalin	1.0	50	30	98	100	100	99	98
penoxalin	1.5	30	30	98	100	95	99	92
penoxalin	2.0	20	50	94	100	98	99	98
profluralin	0.75	60	20	85	100	95	96	94
profluralin + EPTC	0.5 + 2.0	90	30	98	100	99	100	99
dinitramine	0.5	60	20	97	97	99	99	95
dinitramine	0.66	60	30	95	98	95	95	97
dinitramine + EPTC	0.33 + 1.5	40	20	97	100	100	100	100
dinitramine + EPTC	0.5 + 2.0	35	20	99	100	99	100	99
trifluralin + EPTC	0.5 + 2.0	50	20	95	99	96	99	96
trifluralin	0.5	45	10	80	44	50	70	80
trifluralin	0.75	35	35	95	92	55	94	90
USB-3153	0.33	40	15	95	98	80	90	96
USB-3153	0.5	50	10	95	95	80	90	92
USB-3153	0.66	40	20	92	95	90	90	90
USB-3153 + EPTC	0.33 + 2.0	60	10	96	99	98	100	92
EPTC	4.0	90	10	100	100	100	100	90
butralin	1.0	100	0	90	90	92	97	85
butralin	1.5	80	0	98	99	98	97	95
butralin + EPTC	1.0 + 2.0	90	0	99	100	100	99	100
benefin	1.12	85	10	92	95	86	96	96

[1] Percent alfalfa stand.
[2] Percent vigor reduction of alfalfa plants.
[3] Others include kochia and common purslane.

Downy brome control in semi-dormant dryland alfalfa resulting from spring application. Alley, H. P. and G. L. Costel. The herbicides listed in the table were applied to a heavily weed-infested, low productive dryland alfalfa field on 4/22/75 at the Sheridan Agricultural Experiment Station. The soil was classified as a Wyarno clay loam with a pH of 7.1, 3.5% organic matter, 69% sand, 16% silt, and 15% clay. Soil temperature at time of treatment was 41 F at 1.0 inch, 44 F at 2 1/4 inches and 44 F at the 4 1/2 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 started to grow and was approximately 2 1/2 inches tall; the downy brome, 1 1/2 to 2 leaf and 1.0 inch tall, and mustards in the 6-leaf stage at time of treatment.

All herbicides were applied with a three-nozzle knapsack spraying unit in a total volume of 40 gpa water. The plots were 9 ft by 30 ft, randomized with three replications. Yield determinations were made by clipping those plots showing potential for downy brome control in dormant alfalfa, oven-drying and calculating production of oven-dry alfalfa produced per acre.

Eleven of the treatments gave 85% or better downy brome control, with seven being evaluated as 100%.

A new compound, VEL-5026 at rates of 0.5, 1.0 and 2.0 lb/A performed as well as metribuzin, terbacil, and diuron + terbacil combination for downy brome control and exhibited no apparent phytotoxicity to alfalfa.

Of the seven outstanding treatments, simazine exhibited damage to alfalfa in the form of yellowed plants. GS-14254 exhibited some stunting of alfalfa, pronamide was not effective on annual pepperweed. VEL-5026, terbacil, diuron + terbacil and metribuzin were the only treatments in this group that did not cause phytotoxic symptoms.

Although differences in the yield of alfalfa were not as striking as in previous years, all treatments which gave 85% or better control of downy brome, out-yielded the untreated check. In addition to 3317 lb/A of oven-dry alfalfa, the check plots produced an average of 2155 lb/A oven-dry downy brome. The smaller differences could be attributed to the precipitation pattern between years. (Wyoming Agric. Expt. Sta., Laramie, SR-668)

Downy brome control in semi-dormant, dryland alfalfa, Sheridan Agri. Expt. Sta., Sheridan, Wyoming.

Treatment[1/]	Rate lb/A	Visual control rating	Yield alfalfa lb/A (oven-dry)[2/]	Observations
napropamide +	2.0			
EPTC 3SS	2.0	0		
napropamide +	4.0			
EPTC 3SS	3.0	0		
napropamide	2.0	30		Alfalfa stand reduced competition
napropamide	4.0	50	3278	
bifenox	2.0	30		
FMC-25213	2.0	60	3559	Downy brome stunted
FMC-25213	3.0	70	3266	Downy brome and alfalfa stunted
fluchloralin	0.75	20		
fluchloralin	1.5	30		Alfalfa stunted
fluchloralin + citowet	0.75	30		Downy brome and alfalfa stunted
fluchloralin + citowet	1.5	30		Downy brome and alfalfa stunted
VEL-5026 (W.P.)	0.25	50	3931	
VEL-5026 (W.P.)	0.5	100	4276	
VEL-5026 (W.P.)	1.0	100	4156	
VEL-5026 (W.P.)	2.0	100	3456	
metribuzin	0.5	100	4179	
metribuzin	1.0	100	4858	
simazine	1.2	85	3954	Damage to alfalfa
GS-14254 3.2 E.C.	1.2	95	3777	Downy brome small
terbacil	0.8	100	4432	
diuron +	2.0			
terbacil	0.5	100	3711	Clean - no damage
pronamide	0.75	90	4559	Left annual pepperweed
pronamide	1.0	98	4043	Left annual pepperweed
Check	--	00	3317	Left annual pepperweed

1/ Treated 4/22/75.
2/ Readings and clippings taken 6/24/75.

Difenzoquat and broadleaf herbicide combinations in non-irrigated barley. Agamalian, H. S. and D. R. Colbert. Effectiveness of difenzoquat as a post emergence wild oat herbicide has been reported by several workers. Combining broadleaf and wild oat herbicides has obvious advantages. Two trials were established in a randomized complete block design with four replications. Application was made when the barley had two and three true leaves. The wild oats were in the one-two leaf stage and the three-four leaf stage. The herbicides were applied in 25 and 32 gpa of water. The variety was C.M. 67.

Results of these experiments are provided in the following table. Wild oat control was acceptable at all rates. Barley injury was observed with 2,4-D amine in combinations with difenzoquat, especially at the two leaf stage of the barley. Bromoxynil in combination with difenzoquat resulted in greater crop selectivity at this stage of application. When barley was in the three-four leaf stage the combinations resulted in greater crop selectivity. (Cooperative Extension, University of California, Salinas, American Cyanamid Company, Lodi)

Table 1. Wild oat and broadleaf combinations applied to barley at the two leaf stage.

Herbicide	lb/A	Crop Phytotoxicity 1/24	4/17	Oat Control	Broad-leaf Control	Harvest[1/] lb/A
difenzoquat	0.75	1.5	1.8	9.0	0	3947 a b
difenzoquat + 2,4-D	0.75 + 0.5	2.0	5.8	8.5	10	3641 a b
difenzoquat + bromoxynil	0.75 + 0.5	1.5	0.5	9.0	10	3933 a b
bromoxynil	0.5	0.5	1.5	3.3	10	3675 a b
2,4-D amine	0.5	0.3	5.3	0	10	3471 a
Control	0	0	2.0	0	0	3028 a

[1/] Values followed by the same letter are not significantly different at the 5% level of probability.

Table 2. Difenzoquat and broadleaf combinations applied to barley at the three to four leaf stage.

Herbicide	lb/A	Crop Phytotoxicity 1/24	4/11	Oat Control	Broad-leaf Control	Harvest[1/]
difenzoquat	0.62	0.3	1.7	7.0	0	2994 a
difenzoquat	0.75	1.0	2.0	8.3	0	2975 a
difenzoquat	1.0	1.0	1.3	9.0	0	3176 a b
difenzoquat + 2,4-D	0.75 + 0.5	1.3	2.0	9.0	9	3285 a b
difenzoquat + bromoxynil	0.75 + 0.5	1.0	2.0	9.0	9	3247 a b
2,4-D amine	0.5	0.3	4.0	2.7	9	2904 a
bromoxynil	0.5	0.3	2.3	8.3	9	3138 a
Control	0	0	2.3	2.0	0	2665 a

[1/] Values followed by the same letter are not significantly different at the 5% level of probability.

Wild oat control in barley. Zimdahl, R. L. and D. T. McCreary. These studies were designed to evaluate the interaction of date of planting and the efficacy of promising herbicides.

Experiment I evaluated eight herbicides in twenty treatments. Each was replicated four times in a randomized complete block design. Moravian malting barley was planted March 26. Triallate was incorporated to a depth of three inches with a spike tooth harrow immediately after application. The barley and wild oats were harvested July 24.

In experiment II the first planting was April 15; the second was May 5. The treatments were not replicated, but each plot consisted of a land 24 ft wide and 200 ft long. All treatments were applied with a tractor drawn sprayer. Post emergence treatments were applied when the wild oats had two to four leaves. Harvesting was done by a small plot combine in two 4.9 x 100 ft strips in each land on September 1.

The data from experiment I show that no herbicide increased the yield above the control. A major purpose of this experiment was to compare HOE-23408 and difenzoquat with triallate and barban. The data revealed that there is no difference in the ability of HOE-23408, difenzoquat and triallate to control wild oats but they are all superior to barban. Although field observations did not show a reduction of wild oat stand, height and vigor were reduced with both postemergent herbicides. Late in the season, the wild oats did not emerge above the barley as the wild oats in the control did. However, even though growth and late season vigor were reduced, these effects did not result in an increase in yield of barley. There was a tendency toward reduced yield by the late postemergence applications of HOE-23408.

The comparison of triallate alone and in combination with HOE-23408 of difenzoquat was interesting. There was a slight increase (not significant) in yield and wild oat control rating from either of the combinations. There was also a decrease in the yield of wild oats expressed as pounds of wild oat seed per acre or as a percent of the control. Although combination treatments did not increase yield they may, over the course of time, significantly reduce the wild oat population.

The most interesting comparisons were those concerned with the yield of wild oats which was greatly reduced by the combination of difenzoquat or HOE-23408 and triallate. Over several years, we have been unable to show significant increases in the yield of barley because of the use of wild oat herbicides. However, we have been able to show increases in the quality of the grain and a long term reduction in the number of wild oat seeds returned to the soil. Three of the treatments failed to reduce the yield of wild oats below the check. These were: barban alone; HOE-23408 at 3/4 lb applied early post; and difenzoquat at 3/4 lb applied late post. All other treatments statistically yielded fewer wild oats than did the check. However, there were no statistically significant differences among them. The wild oat yield was reduced up to 93% by the combination of HOE-23408 and triallate.

In experiment II all herbicides performed satisfactorily. Triallate and difenzoquat were somewhat less effective when applied on the late planted barley. This is evident in control ratings and in yield of wild oats. All other treatments reduced the yield of wild oats. It is important to note the increase from the check when herbicides are used on late planted barley (table). This indicates that the control of wild oats is very important when planting is delayed. This is possibly due to the inability of barley to effectively compete with wild oat plants when they have a large head start. (Weed Research Laboratory, Colorado State University, Fort Collins, 80523)

Treatments, wild oat control ratings, and yields, experiment II, 1975.

Herbicide	Rate lb/A	Time[1/] of appl.	Wild[2/] oat control rating	Barley yield bu/A	Wild oat yield lb/A	Wild oat yield as % of control
Early planting April						
triallate	1.25	PPI	94	59.2	9.6	9
difenzoquat	1.0	Post	86	62.2	12.8	13
HOE-23408	1.0	Post	98	61.3	4.8	5
triallate + difenzoquat	0.75+ 0.75	PPI Post	96	64.1	9.6	9
triallate + HOE-23408	0.75+ 0.75	PPI Post	96	58.1	4.8	5
Control No herbicide	--	--	--	45.2	102.4	--
Late Planting May 5						
triallate	1.25	PPI	73	50.8	62.4	16
difenzoquat	1.0	Post	74	51.4	115.2	29
HOE-23408	1.0	Post	94	58.6	27.2	7
triallate + difenzoquat	0.75+ 0.75	PPI Post	98	55.6	12.8	3
triallate + HOE-23408	0.75+ 0.75	PPI Post	98	62.9	17.6	4
Control No herbicide	--	--	--	36.7	392.0	--

1/ PPI = Preplant incorporated
Post = Postemergence at 3-5 leaf stage of wild oat.

2/ 0 = No control, 100 = complete wild oat control.

Preemergence weed control in field beans under sprinkler irrigation. Alley, H. P., G. A. Lee and A. F. Gale. The study was established to evaluate weed control and crop tolerance to surface-applied preemergence herbicides under sprinkler irrigation. Beans (variety G.N. 59) were planted 5/15/75 and herbicides were applied soon after planting. The soil from the experimental site was classified as a sandy loam consisting of 69.6% sand, 20.0% silt, 10.4% clay, 1.4% O.M., and a pH of 7.3. All herbicides were applied with a knapsack spray unit equipped with a three-nozzle boom calibrated to deliver 40 gpa of water carrier. The plots were one sq rd in size, randomized with three replications. Plots received 0.5 inch overhead irrigation within one hour after herbicides were applied.

The weed spectrum was comprised of redroot pigweed, common lambsquarters, black nightshade, green foxtail and a limited number of other weed species. The population at the time of control evaluation, 6/18/75, was 2.3 green foxtail, 1.1 redroot pigweed, 1.1 common lambsquarters, 0.9 black nightshade, 0.8 others per linear ft, 2.5 inches on either side of the bean row. Percent weed control was determined by comparing weed counts obtained from the treated plots as compared to counts obtained from the untreated plots.

Bifenox + alachlor at 1.5 + 1.5 lb/A and bifenox + alachlor at 1.5 + 2.0 lb/A resulted in a significant reduction in bean stand which was 54% and 71%, respectively, as compared to the untreated plot stand. These two treatments also resulted in a 50% to 60% vigor reduction of the field beans. The high rate of penoxalin was the only other treatment exhibiting phytotoxicity to field beans, resulting in a 30% vigor reduction.

Two treatments, trifluralin + alachlor at 0.5 + 2.5 lb/A and bifenox (4L) + alachlor at 1.5 + 1.5 lb/A, gave 100% control of the broadleaf weed complex and 99% of green foxtail. Ten other treatments gave 93% or greater control of both the broadleaf and grass weeds. (Wyoming Agric. Expt. Sta., Laramie, SP-687)

Percent weed control, field bean stand and yields - Torrington, 1975.

	Fieldbeans		Percentage control				
Treatment	Rate lb/A	Percent stand	Redroot pigweed	Common lambs-quarters	Black nightshade	Green foxtail	Others[1/]
profluralin	0.5	93 a[2/]	38 b	68 c	17 c	26 b	82 a
profluralin	0.75	94 a	94 a	92 a	36 b	95 a	0 c
trifluralin + EPTC (3SS)	0.5 + 2.0	99 a	94 a	96 a	85 a	99 a	86 a
profluralin + EPTC (3SS)	0.5 + 2.0	98 a	97 a	100 a	92 a	100 a	86 a
CGA-24705	2.0	99 a	100 a	100 a	97 a	99 a	71 ab
CGA-24705	1.5	91 a	97 a	77 bc	100 a	99 a	50 b
alachlor	2.0	96 a	100 a	100 a	97 a	100 a	95 a
alachlor	2.5	95 a	100 a	100 a	100 a	99 a	98 a
alachlor	3.0	85 a	100 a	98 a	100 a	100 a	99 a
penoxalin	1.0	95 a	94 a	98 a	88 a	100 a	93 a
penoxalin	1.5	93 a	97 a	100 a	84 a	98 a	100 a
penoxalin	2.0	91 a	97 a	100 a	82 a	99 a	89 a
penoxalin + EPTC (3SS)	1.0 + 2.0	91 a	100 a	100 a	100 a	100 a	95 a
penoxalin + EPTC (3SS)	1.0 + 1.5	99 a	100 a	100 a	100 a	100 a	89 a
trifluralin + alachlor	0.5 + 2.5	98 a	100 a	100 a	100 a	99 a	100 a
bifenox (4L) + alachlor	1.5 + 1.5	54 c	100 a	100 a	100 a	99 a	100 a
bifenox (4L) + alachlor	1.5 + 2.0	71 b	100 a	100 a	100 a	100 a	89 a
dinitramine	0.5	97 a	100 d	96 a	96 a	96 a	100 a
dinitramine + EPTC (3SS)	0.5 + 2.0	86 a	91 a	100 a	100 a	99 a	99 a
dinitramine + alachlor	0.5 + 2.0	85 a	94 a	100 a	97 a	100 a	95 a
Check	--	100					
C.V.		8.64%	8.77%	5.67%	11.77%	10.01%	20.96%

1/ Includes kochia, common purslane, Russian thistle, and wild buckwheat.
2/ Means followed by the same letter(s) within each column are not significantly different at the 5% level.

Evaluation of preplant incorporated herbicide combinations for weed control in fieldbeans. Alley, H. P., G. A. Lee and A. F. Gale. The study was established at the Torrington Agricultural Substation to evaluate the weed control potential and field bean tolerance to herbicide combinations applied preplant under furrow irrigation. The herbicide treatments were applied May 15, 1975 and incorporated to a soil depth of 1.5 inches with a flex-tine harrow immediately following herbicide application. The field beans (variety G.N. 59) were planted May 16, 1975 one day following treatment. Plots were 1 sq rd with treatments randomized with three replications. The soil at the location was classified as a sandy loam (69% sand, 19% silt, 12% clay, 2.1% O.M. and 7.5 pH). All herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa water carrier.

The weed density at time of evaluation in the untreated (check) was: green foxtail 11.9, black nightshade 2.1, lambsquarters 2.3, redroot pigweed 0.82, and others 1.4 plants per linear foot, 2.5 inches on either side of the field bean row. Actual field bean and weed counts were taken June 16, 1975 32 days following treatment, to determine bean stand and percentage weed control.

Excellent control of the weed spectrum was obtained with all combinations, ranging from 95% to 100%. Two combinations, dinitramine + EPTC at 0.375 + 2.0 lb/A and profluralin + EPTC at 0.5 + 2.0 lb/A, resulted in 100% control. The advantage of herbicide combinations is apparent in the percentage black nightshade as well as other weed species control obtained as compared to control resulting from single herbicide treatments.

Field bean vigor was affected by six combinations with the most toxic being dinitramine + alachlor at 0.375 + 2.0 lb/A and trifluralin + alachlor at 0.5 + 2.5 lb/A. Even though stand and vigor were reduced, the treated plots yielded greater than the untreated plots. (Wyoming Agric. Expt. Sta., Laramie, SR-682)

Effect of preplant incorporated herbicide combinations on percentage weed control, field bean stand, vigor and yield.

		Field beans			Percentage control				
Treatment	Rate lb/A	S[1]	V[2]	Yield lb/A	Redroot pigweed	Common lambs-quarter	Black nightshade	Green foxtail	Others[3]
fluromidine	2.0								
+ EPTC	2.0	93 a-d	20	1467	100 a	98 a-c	100 a	99 a	98 a
trifluralin	0.5								
+ EPTC	2.0	89 a-d	20	2110	98 a	99 a-c	100 a	99 a	97 a
dinitramine	0.33								
+ EPTC	1.5	91 a-d	0	2247	100 a	99 a-c	98 a-d	99 a	99 a
dinitramine	0.375								
+ EPTC	2.0	82 b-d	0	2226	100 a	100 a	100 a	100 a	100 a
profluralin	0.5								
+ EPTC	1.5	95 a-d	0	1981	100 a	98 a-c	97 a-e	98 a	95 a
profluralin	0.5								
+ EPTC	2.0	98 a	0	1881	100 a	100 a	100 a	100 a	100 a
dinitramine	0.33								
+ alachlor	1.5	82 b-d	20	2289	100 a	98 a-c	99 ab	99 a	100 a
dinitramine	0.375								
+ alachlor	2.0	74 e-g	50	1953	100 a	99 a-c	100 a	99 a	100 a
trifluralin	0.5								
+ alachlor	2.5	92 a-d	40	1512	96 a	99 a-c	100 a	99 a	100 a
profluralin	0.5								
+ CGA-24705	1.5	100 a	0	1700	100 a	98 a-d	94 a-g	97 a	93 a
profluralin	0.5								
+ CGA 24705	2.0	100 a	0	1254	100 a	100 a	100 a	99 a	100 a
H-22234	2.0								
+ EPTC	2.0	91 a-d	25	1375	100 a	97 a-d	99 ab	99 a	97 a
Check	--	100	0	846					
C.V.		8.95%		6.30%	7.06%	5.03%	5.42%	8.77%	

1/ Percent bean stand.
2/ Percent vigor reduction.
3/ Kochia, common purslane, Russian thistle and wild buckwheat.

Evaluation of preplant incorporated herbicides for weed control in field beans. Alley, H. P., G. A. Lee and A. F. Gale. The study was established at the Torrington Agricultural Substation to evaluate the weed control potential and field bean tolerance to single herbicides applied preplant under furrow irrigation. The herbicide treatments were applied May 15, 1975 and incorporated to a soil depth of 1.5 inches, with a flex-tine harrow, immediately following the application of the herbicides. The field beans (variety G.N. 59) were planted May 16, 1975, one day following treatment. Plots were 1 sq rd in size with treatments randomized with three replications. The soil at the location was classified as a sandy loam (69% sand, 19% silt, 12% clay, 2.1% O.M. and 7.5 pH). All herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa water carrier.

The weed density at the time of evaluation in the untreated (check) was: green foxtail 11.9, black nightshade 2.1, common lambsquarters 2.3, redroot pigweed 0.82, and others 1.4 plants per linear foot, 2.5 inches on either side of the field bean row. Actual field bean and weed counts were taken June 16, 1975, 32 days following treatment, to determine bean stand and percentage weed control.

Percentage control of the total weed spectrum ranged from 87% to 99%. Dinitramine at 0.33 lb/A was the lowest recorded, while two treatments resulted in a 99% reduction of the weeds infesting the experimental site, and 13 others gave 94% or greater control. Black nightshade appeared to be the most difficult to control, however, VEL-5052 at 4.0 lb/A and alachlor at 3.0 lb/A resulted in 100% control, with dinitramine at 0.375 and 0.5 lb/A, penoxalin at 2.0 lb/A, fluromidine at 2.5 lb/A, EPTC at 3.0 lb/A and CGA-24705 at 2.0 lb/A all resulting in 97% or greater control of black nightshade. Penoxalin at application rates of 1.0, 1.5 and 2.0 lb/A reduced the bean stand from 25 to 33%, respectively, with a 20 to 60% vigor reduction. H-26905 at 1.5 and 3.0 lb/A did not reduce the stand significantly, but did reduce the bean vigor by 40%. Bean yields from plots treated with five of the herbicides produced from 2,015 to 2,368 lb/A of beans as compared to 846 lb/A of beans from the untreated check.

A combined comparison of weed control and bean yields indicates that dinitramine at 0.375 and 0.5 lb/A, butralin at 1.5 lb/A, EPTC at 3.0 lb/A, were outstanding treatments. Penoxylin reduced the bean stand by 34% and trifluralin exhibited weakness toward black nightshade. (Wyoming Agric. Expt. Sta., Laramie, SR-689)

Effect of preplant incorporated herbicides on percentage weed control, field stand, vigor and yield.

		Field Beans			Percentage Control				
Treatment	Rate lb/A	S[1/]	V[2/]	Yield lb/A	Redroot pigweed	Common lambsquarters	Black nightshade	Green foxtail	others[3/]
VEL-5052	2.0	89 a-d	0	1473	90 a	84 e	95 a-f	70 c	89 ab
VEL-5052	4.0	93 a	0	1610	100 a	92 a-e	100 a	96 a	99 a
profluralin	0.5	96 a-c	0	1693	87 a	84 de	90 b-g	90 ab	90 a
profluralin	0.75	94 a-d	0	1656	100 a	97 a-e	89 d-g	96 a	97 a
dinitramine	0.33	89 a-d	0	2042	88 a	86 b-e	85 gh	82 b	94 a
dinitramine	0.375	93 a-d	0	2058	97 a	93 a-c	99 a-c	94 a	100 a
dinitramine	0.5	73 e-g	20	2368	97 a	94 a-e	98 a-c	91 ab	100 a
trifluralin	0.5	93 a-d	10	2019	100 a	91 a-d	87 f-h	91 ab	99 a
trifluralin	0.75	80 c-f	20	2128	93 a	91 a-e	79 h	94 a	95 a
butralin	1.0	93 a-d	0	1767	98 a	86 c-e	95 a-f	82 b	99 a
butralin	0.5	94 a-d	0	2160	98 a	91 a-e	94 a-g	98 a	98 a
penoxalin	1.0	80 d-f	20	1040	93 a	91 ab	88 d-g	98 a	98 a
penoxalin	1.5	66 f-g	40	2298	94 a	99 a-c	95 a-f	96 a	98 a
penoxalin	2.0	62 g	60	1917	91 a	99 a-c	98 a-c	96 a	97 a
alachlor	3.0	98 ab	0	1253	100 a	97 a-c	100 a	99 a	100 a
fluromidine	2.5	98 ab	0	1458	100 a	95 a-e	97 a-c	98 a	100 a
EPTC	3.0	95 a-d	0	2015	100 a	100 a	99 ab	98 a	97 a
CGA-24705	1.5	94 a-d	0	1427	95 a	98 a-e	95 a-f	94 a	98 a
CGA-24705	2.0	92 a-d	0	1684	94 a	91 a-e	98 a-d	96 a	75 b
H-26905	1.5	90 a-d	40	820	100 a	95 a-d	94 a-g	97 a	100 a
H-26905	3.0	86 a-e	40	1460	100 a	92 a-c	94 a-g	98 a	98 a
Check	--	100 a	0	846					
C.V.		8.95%			6.30%	7.06%	5.03%	5.42%	8.77%

1/ Percent bean stand.
2/ Percent vigor reduction
3/ Kochia, common purslane, Russian thistle, and wild buckwheat.

Annual broadleaf and grassy weed control in corn with preplant incorporated herbicides. Evans, J. O. Two experiments were conducted with field corn in 1975 to compare several new herbicides and new formulations of registered compounds for spring germinating annual weeds in Utah. The two trials were on separate fields located approximately one mile apart and operated by the same manager. Since the fields had similar soil types, were prepared and treated the same day and planted with the same corn hybrid, the results will be presented in a single table. Treatments were applied to 12 x 50 ft replicated plots on May 22, 1975 and immediately incorporated in the silt loam soil in two directions with a Triple-K harrow set three and one-half inches deep. Corn was planted in both fields and it began to rain that evening. The two-day storm left 1.15 inches of precipitation and intermittent periods of rain over the following two weeks resulted in a total accumulation of 2.23 inches of rainfall within 15 days after treating and planting. This probably allowed some shallow weeds to become established above the most soluble herbicides lowering the overall performance of some promising chemicals. Treatments containing atrazine or EPTC-R-25788 were the most effective in providing full season control. Especially encouraging was the EPTC-R-25788 plus R-31401 application where broadleaved and grassy annual weeds were controlled very well. This combination shows excellent safety to field corn and broad spectrum activity against the common corn weeds. Atrazine demonstrated near perfect control of broadleaved weeds but was disappointing on certain grassy types such as bristly and other foxtail species. Cyanazine and procyazine were likely leached from the surface and allowed weeds to come above the treatments as was alachlor and CGA 24705, allowing the grassy weeds to become established to a much greater degree than in previous tests with these materials. These trials support previous conclusions that combinations of herbicides are required to give satisfactory control of the several species commonly present in corn fields in Utah, especially when weather conditions are unfavorable for optimum performance of the herbicides. No treatments caused excessive injury to the crop. (Utah Agricultural Experiment Station, Logan)

Annual broadleaf and grassy weed control in corn with preplant incorporated herbicides.

Treatment	Rate lb/A	Field corn response: Injury index	Percent weed control by species: Redroot	Lambsquarters	Bristly Foxtail	Foxtail sp.
atrazine	3.0	0	94	97	13	67
cyanazine	2.5	0.5	63	80	43	77
procyazine	2.0	0	51	77	56	75
procyazine	3.0	0	68	81	50	89
metribuzin + alachlor	0.5 + 1.5	0.2	79	88	88	90
dicamba + alachlor	0.5 + 1.5	0	71	85	61	62
alachlor	2.5	0	52	63	66	83
Check	--	0	0	0	0	0
CGA-24705	2.5	0	44	60	21	66
EPTC (R-25788)	4.0	0	93	97	99	94
vernolate (R-25788)	4.0	0	86	93	91	96
butylate (R-25788)	4.0	0	70	67	97	98
EPTC (R-29148)	4.0	0	75	80	90	94
vernolate (R-29148)	4.0	0	64	84	78	96
EPTC (R-25788) + R-31401	3.0 + 1.0	0	90	94	99	98
vernolate (R-25788) + R-31401	3.0 + 1.0	0	81	95	90	83
BAY-NTN-6867	3.0	0	42	74	88	92
BAY-NTN-6867	6.0	0	69	72	87	94

Injury index 0 - 10; 0 = no effect, 10 = complete kill.

Sprinkler-applied preemergence herbicides for weed control in corn. Alley, H. P. and G. A. Lee. The study was the second over a span of two years, initiated to determine the effectiveness and feasibility of applying preemergence herbicides through a center-pivot sprinkler for weed control in corn. The overhead sprinkler system was calibrated to make one revolution every 42 hours on a 126 A field or irrigate 2.0 A/hr. The system applied approximately 0.5 inch of water. A piston pump was utilized to inject the herbicide solution into the irrigation system at a point 5 ft from the well head. The auxiliary piston pump delivered 1.0 pt of solution per minute. The plots were 6.0 A in size which required 2.0 hr per herbicide treatment for injection into the system. The soil was classified as a sandy loam (67% sand, 25% silt, 8% clay, 2.4% O.M. with a pH of 7.5). The corn was planted 4 days prior to herbicide application which was May 22 and 23, 1975.

The predominant weed species on the experimental site were: redroot pigweed, Russian thistle, field sandbur and minor species classified as others. The density of the weed species per linear ft, 2.5 inches on either side of the corn row, was: field sandbur 82.6, redroot pigweed 3.4, Russian thistle 3.4, and others 0.67. Weed counts were taken on June 19, 1975, 26 days following application of the herbicides. Three sub-samples in each treatment area and untreated check where all weeds were counted and recorded were utilized to determine percentage weed control.

Russian thistle and field sandbur were the most difficult species to control. Five of the thirteen treatments resulted in 100% control of Russian thistle, but only one of the treatments controlled 100% of the field sandbur. Atrazine + vernolate + R-25788 at 1.0 + 2.0 + 0.25 lb/A was the only treatment resulting in 100% control of the weed species complex infesting the experimental area. Five treatments resulted in 100% control of the broadleaf weeds and 97.2% to 99.6% control of field sandbur. No phytotoxicity to corn was apparent nor was the corn stand reduced as a result of any of the herbicide applications. (Wyoming Agric. Expt. Sta., Laramie, SR-688)

Corn stand and weed control resulting from sprinkler-applied herbicides.

Treatment	Rate lb/A	Percent corn stand	Percentage control			
			Redroot pigweed	Russian thistle	Field sandbur	Others[1/]
atrazine	1.2	100	100	100	99.6	100
atrazine + alachlor	1.0 + 2.0	100	100	100	99.2	100
atrazine + vernolate + R-25788	1.0 + 2.0 + 0.25	100	100	100	100	100
EPTC (RS) + R-25788	4.0 + 0.375	100	100	98.5	96.1	100
EPTC (RC) + R-25788	4.0 + 0.375	100	94.1	96.7	87.9	100
EPTC (CE) + R-25788	4.0 + 0.375	100	100	94.4	98.7	100
butylate (CE) + R-25788	4.0 + 0.375	100	100	96.7	98.2	100
butylate (RS) + R-25788	4.0 + 0.375	100	100	98.5	96.5	100
butylate + R-25788	4.0 + 0.375	100	100	83.4	99.9	100
alachlor	2.5	100	96.9	93.8	98.8	100
alachlor + cyanazine	1.5 + 2.5	100	100	100	99.3	100
atrazine + butylate + R-25788	1.0 + 3.0 + 0.25	100	100	100	97.0	100

1/ Others include common lambsquarters, kochia and skeletonweed.

Evaluation of preplant incorporated thiolcarbamate herbicides and combinations for weed control in corn. Alley, H. P., G. A. Lee and A. F. Gale. The evaluation plots were established at the Torrington Agricultural Experiment Station to compare the relative effectiveness of preplant incorporated thiolcarbamate herbicides and combinations for annual weed control in corn grown under furrow irrigation. Plots were established 5/7/75 and the corn, (hybrid PX-488), planted five days after treatment. All herbicide treatments were incorporated to a soil depth of 1.5 inches with a flex-tine harrow. Herbicide applications were made with a knapsack sprayer equipped with a three-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 (74% sand, 18% silt, 8% clay and 0.98% O.M. with a pH of 7.4). The plots were furrow irrigated two days following planting.

The weed species and density per linear ft, 2.5 inches on either side of the corn row, were: green foxtail 13.2, redroot pigweed 1.4, common lambsquarters 1.2, black nightshade 0.66, and others 0.1. Weed density and corn stand counts were recorded 6/18/75, 41 days after initial treatment.

Although no significant differences could be shown between treatments, visual differences were apparent. Four treatments, EPTC + R-25788 (Encap) at 4.0 + .375 lb/A, EPTC + cyanazine + R-25788 at 3.0 + 2.0 + .25 lb/A, EPTC + R-31401 + R-25788 at 3.0 + 1.0 + .25 lb/A and vernolate + R-25788 (E.C.) at 3.0 + .25 lb/A, resulted in 100% control of the weed species. Seven other treatments gave 100% control of the broadleaf weeds and 98% control of green foxtail.

These data indicate that several thiolcarbamate herbicides and combinations will give outstanding control of annual weeds in corn under the climatic conditions common to the experimental area. (Wyoming Agricultural Expt. Sta., Laramie, SR-685)

Corn stand and percentage weed control from preplant incorporated thiolcarbamate herbicides and combinations.

Treatment	Rate lb/A	Percent corn stand	Percentage control: Redroot pigweed	Common lambs-quarters	Black nightshade	Green foxtail	Others[3/]
EPTC + R-25788	3.0 + 0.25	96 a[2/]	100 a	100 a	100 a	99 a	100 a
EPTC (Encap) + R-25788	4.0 + 0.375	96 a	100 a	100 a	100 a	100 a	100 a
EPTC + alachlor (4L) + R-25788	2.0 + 2.0 + 0.167	98 a	100 a	100 a	100 a	99 a	100 a
EPTC + alachlor (4L) + R-25788	3.0 + 2.0 + 0.25	100 a	100 a	100 a	100 a	99 a	100 a
EPTC + cyanazine (80W) + R-25788	2.0 + 2.0 + 0.167	96 a	96 a	100 a	100 a	96 a	100 a
EPTC + cyanazine (80W) + R-25788	3.0 + 2.0 + 0.25	100 a	100 a	100 a	100 a	100 a	100 a
EPTC + R-31401 + R-25788	2.0 + 1.0 + 0.167	98 a	100 a	98 a	100 a	96 a	100 a
EPTC + R-31401 + R-25788	3.0 + 1.0 + 0.25	94 b	100 a	100 a	100 a	100 a	100 a
R-31401	1.0	98 a	100 a	100 a	100 a	93 a	100 a
R-31401	2.0	98 a	100 a	100 a	100 a	94 a	100 a
butylate + R-25788	4.0	96 a	95 a	98 a	100 a	98 a	100 a
butylate + R-31401 + R-25788	3.0 + 1.0 + .025	100 a	100 a	100 a	100 a	99 a	100 a
butylate + cyanazine (80W) + R-25788	3.0 + 2.0 + 0.25	94 ab	100 a	100 a	100 a	98 a	100 a
butylate + cyanazine (80W) + R-25788 + L.F.[1/]	2.0 + 2.0 + 0.25	100 a	95 a	89 a	100 a	92 a	100 a
vernolate (E.C.) + R-31401 + R-25788	2.0 + 1.0 + 0.67	100 a	100 a	100 a	100 a	98 a	100 a
vernolate (E.C.) + R-31401 + R-25788	3.0 + 1.0 + 0.25	98 ab	100 a	100 a	100 a	99 a	100 a
vernolate (E.C.) + R-25788	3.0 + 0.25	98 a	100 a	100 a	100 a	100 a	100 a
C.V.		4.51%	10.42%	10.72%	10.19%	10.77A	0.0%

1/ Liquid fertilizer.
2/ Means with the same letter(s) within each column are not significantly different at the 5% level.
3/ Includes common purslane, kochia, shepherd's purse, and Russian thistle.

Evaluation of preplant incorporated triazine herbicides and combinations for weed control in corn. Alley, H. P., G. A. Lee and A. F. Gale. These plots were established at the Torrington Agricultural Experiment Station to compare the relative effectiveness of preplant incorporated triazine herbicides and combinations for annual weed control in corn grown under furrow irrigation. Plots were established 5/7/75 and the corn (hybrid PX-448), planted five days after treatment. All herbicides were incorporated to a soil depth of 1.5 inches with a flex-tine harrow. Applications were made with a knapsack sprayer equipped with a three-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 (74% sand, 18% silt, 8% clay and 0.98% O.M. with a pH of 7.4). The plots were furrow irrigated two days following planting.

The weed species and density per linear ft, 2.5 inches on either side of the corn row, were: green foxtail 13.2, redroot pigweed 1.4, common lambsquarters 1.2, black nightshade 0.66, and others 0.1. Weed density and corn stand counts were recorded 6/18/75, 41 days after initial treatment.

None of the triazine herbicides or combinations included in the evaluation gave 100% control of the weed spectrum, as in past years. One treatment, atrazine + procyazine at 0.5 + 1.5 lb/A, appeared very weak on all weed species, being significantly different than all treatments except CGA-24705 at 2.0 lb/A toward common lambsquarters. (Wyoming Agric. Expt. Sta., Laramie, SR-684)

Corn stand and percentage weed control from preplant incorporated triazine herbicides and combinations.

Treatment	Rate lb/A	Percent corn stand	Percentage control: Redroot pigweed	Common lambs-quarters	Black night-shade	Green foxtail	Others[3]
atrazine (80W) + procyazine (80W)	0.5 + 1.5	100 a[2]	67 b	67 b	54 b	60 b	100 a
atrazine (4L) + procyazine (80W)	0.5 + 1.5	96 a	100 a	100 a	100 a	97 a	100 a
atrazine (4L) + procyazine (80W)	0.4 + 1.2	98 a	95 a	100 a	96 a	96 a	100 a
atrazine + CGA-24705	1.0 + 1.25	96 a	100 a	100 a	100 a	99 a	100 a
atrazine + CGA-24705	1.25 + 1.25	96 a	100 a	100 a	100 a	99 a	100 a
procyazine (80W)	1.6	98 a	100 a	100 a	100 a	91 a	100 a
procyazine (80W)	2.0	98 a	100 a	100 a	100 a	92 a	100 a
CGA-24705	1.5	98 a	95 a	92 a	100 a	90 a	100 a
CGA-24705	2.0	100 a	98 a	82 ab	89 a	96 a	100 a
procyazine (80W) + CGA-24705	1.25 + 1.25	98 a	95 a	100 a	100 a	90 a	100 a
procyazine (80W) + CGA-24705	1.5 + 1.5	96 a	98 a	100 a	89 a	89 a	100 a
procyazine (80W) + CGA-24705 (prepackaged)	1.25 + 1.25	96 a	98 a	100 a	100 a	96 a	100 a
cyanazine (80W) + alachlor	2.0 + 3.0	98 a	100 a	100 a	100 a	98 a	100 a
cyanazine + alachlor + L.F.[1]	2.0 + 2.0	96 ab	100 a	100 a	93 b	98 a	100 a
cyanazine (80W)	2.0	98 a	100 a	100 a	100 a	97 a	100 a
alachlor	2.5	96 a	100 a	100 a	93 a	99 a	100 a
SD-50093 (80W)	1.6	100 a	100 a	100 a	100 a	87 a	100 a
SD-50093 (80W)	2.4	100 a	100 a	100 a	100 a	87 a	100 a
C.V.		4.51%	10.42%	10.72%	10.19%	10.77%	0.0%

1/ Liquid fertilizer.
2/ Means with the same letter(s) within each column are not significantly different at the 5% level.
3/ Includes common purslane, kochia, shepherd's purse and Russian thistle.

Preemergence weed control in corn under sprinkler irrigation. Alley, H. P., G. A. Lee and A. F. Gale. The experimental plots were established to study annual weed control and corn tolerance resulting from surface applied preemergence herbicides under sprinkler irrigation. The study was conducted at the Torrington Agricultural Experiment Station which has a sandy loam soil (74% sand, 18% silt, 8% clay and 0.98% O.M. with a pH of 7.4). The corn (hybrid PX-448) was planted 5/8/75 and the herbicide treatments were applied immediately following planting. The herbicides were applied with a knapsack sprayer equipped with a three-nozzle boom in a total volume of 40 gpa water. Plots were one sq rd, randomized with three replications. The experimental plot area received a 0.5 inch sprinkler irrigation with 24 hours after initial herbicide application.

The major weed infestation consisted of redroot pigweed, common lambsquarters, black nightshade and green foxtail. The weed density per linear ft, 2.5 inches on either side of the corn row was: green foxtail 3.5, black nightshade 2.9, redroot pigweed 2.2, common lambsquarters 0.8, and others 0.45. Actual weed counts were taken and recorded to compute percentage control, 6/18/75, 40 days after treatment.

The herbicide VEL-5026 did not dissolve even with intensive mixing, and the combination of bifenox 80W and alachlor readily separated in the mixing container. Combinations of bifenox and alachlor caused lateral leaf necrosis to the corn and reduced vigor by 10 to 20%. Moderate corn leaf malformation was also apparent where EPTC + R-25788 + alachlor at 2.0 + 0.167 + 2.0 lb/A or 2.0 + 0.25 + 2.0 lb/A, procyazine + alachlor at 1.25 + 2.0 lb/A, and VEL-5052 were applied.

Four treatments, atrazine (80W) + procyazine (80W) at 0.5 + 1.5 lb/A, penoxylin at 1.0 lb/A, alachlor + atrazine at 2.0 + 1.0 lb/A, and SD-50093 at 2.4 lb/A, gave complete elimination of the weed species recorded. Twelve other treatments controlled 92% to 1-0% of the weed spectrum and are not significantly different from the four giving complete elimination. (Wyoming Agric. Expt. Sta., Laramie, SR-686)

Corn stand and percentage weed control from preemergence, surface applied herbicides under sprinkler irrigation.

Treatment	Rate lb/A	Percent corn stand	Percentage Control				
			Redroot pigweed	Common lambs-quarters	Black night shade	Green foxtail	Others[2/]
procyazine (80W)	1.6	98 ab[1/]	93 ab	100 a	100 a	93 ab	100 a
procyazine (80W)	2.0	100 a	97 a	100 a	100 a	97 a	100 a
EPTC + R-25788 + alachlor	2.0 + 0.167 + 2.0	98 ab	100 a	100 a	100 a	100 a	100 a
EPTC + R-25788 + alachlor	3.0 + 0.25 + 2.0	98 ab	100 a	100 a	100 a	100 a	100 a
procyazine (80W) + alachlor	1.25 + 2.0	96 ab	100 a	100 a	98 ab	100 a	100 a
CGA-24705	2.0	85 d	100 a	90 b	99 a	100 a	54 f
VEL-5052	4.0	100 a	97 a	97 a	93 bc	98 a	92 a
EPTC (3SS) + R-25788	4.0 + 0.33	100 a	96 ab	97 a	100 a	100 a	58 ef
VEL-5026	0.125	98 ab	87 bc	100 a	91 c	86 b	89 ab
VEL-5026	0.062	98 ab	82 c	90 b	84 d	67 c	76 cd
atrazine (80W) + procyazine (80W)	0.5 + 1.5	100 a	100 a	100 a	100 a	100 a	100 a
atrazine (4L) + procyazine (80W)	0.5 + 1.0	98 ab	100 a	100 a	100 a	100 a	100 a
penoxylin	1.5	96 ab	100 a	100 a	96 ac	100 a	100 a
penoxylin	2.0	100 a	95 ab	100 a	98 ab	100 a	100 a
penoxylin + atrazine (4L)	1.0 + 1.0	100 a	100 a	100 a	100 a	100 a	100 a
penoxylin + atrazine (4L)	1.0 + 0.5	96 ab	100 a	100 a	98 ab	100 a	100 a
bifenox + alachlor	1.6 + 2.0	96 ab	100 a	100 a	100 a	99 a	67 de
bifenox (E.C.) + alachlor	2.0 + 2.0	92 bc	100 a	100 a	100 a	100 a	79 bc
SD-50093 (80W)	1.6	98 ab	100 a	100 a	100 a	100 a	100 a
SD-50093 (80W)	2.4	100 a	100 a	100 a	100 a	100 a	100 a
alachlor + cyanazine (4L)	2.0 + 2.0	100 a	100 a	100 a	100 a	99 a	100 a
Check		100					
C.V.		3.5%	4.72%	.44%	3.21%	4.52%	20.95%

1/ Means with the same letter(s) within each column are not significantly different at the 5% level.

2/ Includes common purslane, kochia, shepherd's purse and Russian thistle.

Control of nutsedges in cotton with perfluidone. Whitworth, J. W. and Jose Vides. Increasing infestations of yellow and purple nutsedge in the croplands of New Mexico have created a serious problem, especially in fields that are cropped to cotton. Reports from other cotton growing states and experience in New Mexico indicated that perfluidone could be very effective in controlling nutsedge in cotton but performance was very erratic. Laboratory, greenhouse and field experiments were conducted on suspect variables including cotton varieties, herbicide formulation, placement and time of application.

Of the ten varieties of cotton tested in the laboratory, a widely grown New Mexico variety, 1517-V, showed a 43% reduction in the growth of the shoot at 9.1 kg/ha of perfluidone as compared to only 8% for Stoneville 74, a type widely grown in the Southeast.

Slight, but significant differences between the liquid and wettable powder formulations of perfluidone were noted in laboratory experiments. At the higher dosages tested (8 and 16 ppm), the liquid formulation caused a greater inhibition of root growth on cotton seed incubated for 6 days in rolls of blotter paper.

Under both greenhouse and field conditions, placement of perfluidone in the soil was more important than rate. Dosages of 2.3 or 4.6 kg/ha placed around or below the tubers of both species of nutsedge or the seed of cotton invariably resulted in impressive control of nutsedge and unacceptable injury to cotton. Shallow placement of the herbicide above the nutsedge tubers and cotton seed gave little or no control of the nutsedges and visible but minor injury to cotton. Under New Mexico conditions, the placement of perfluidone in the soil which gives good control of nutsedge results in an unacceptable level of stand reduction and injury to cotton. (New Mexico State University, Agronomy Dept., Las Cruces, N.M. 88003)

Rates of penoxalin in cotton. Arle, H. F. and K. C. Hamilton. Study of the effects of preplanting applications of penoxalin in cotton was continued at the Cotton Research Center, Phoenix, Arizona in 1975. Herbicides (table) were applied preplanting and disked into the soil on February 26 before furrowing for the preplanting irrigation. Treatments were replicated four times on four-row plots 41 ft long. The soil contained 27% sand, 45% silt, clay 28%, and 1% organic matter. In April, cotton (var. Deltapine 16) was planted in moist soil under a dry mulch; however, on April 24 the field was irrigated to improve cotton stands. Cotton seedlings in marked, 10 ft sections of row were counted 1, 2, 3, and 4 weeks after emergence. All plots were cultivated three times with a sectioned, rolling cultivator. Diuron (1.2 lb/A) was applied on June 5 as a directed spray covering the furrow and base of cotton plants. Weeds present included Wright groundcherry, Palmer amaranth, junglerice, and browntop panicum. Weed control was estimated at mid-season and after cotton was defoliated. The center rows of each plot were machine-picked in November.

Trifluralin stunted young cotton. This was not observed with any rate of penoxalin. There was no difference in stands of cotton 1 to 4 weeks after emergence due to herbicide treatments (table). In July, weed control was less with the 0.25 lb/A rate of penoxalin than with other treatments. This was the only treatment with weeds present at harvest. There was no difference in yield due to herbicide treatments. (Arizona Agr. Exp. Sta., Phoenix and Tucson)

Cotton stand and yield and weed control with preplanting applications of penoxalin at Phoenix, Arizona.

Treatment preplanting Herbicide	lb/A	Cotton plants per foot of row 1/ 4/24	5/14	Weed control estimated 2/ 0 = None 100 = complete Broadleaf 7/16	Broadleaf 11/19	Grass 7/16	Grass 11/19	Yield seed cotton lb/A 1/
trifluralin	0.75	2.9 a	3.9 a	98	98	100	100	2,140 a
penoxalin	0.25	2.6 a	3.1 a	92	98	98	99	2,180 a
penoxalin	0.50	2.8 a	3.9 a	98	100	100	100	2,100 a
penoxalin	0.75	3.1 a	3.6 a	97	98	100	100	1,960 a
penoxalin	1.00	3.4 a	3.8 a	100	100	100	100	2,120 a
penoxalin	1.25	2.8 a	3.2 a	99	99	100	100	2,180 a
penoxalin	1.50	3.5 a	4.1 a	100	100	100	100	2,060 a
penoxalin	1.75	2.8 a	3.0 a	99	100	100	100	2,040 a

1/ Values followed by the same letter are not significantly different at the 5% level.

2/ All plots were treated with 1.2 lb/A of diuron in June.

Time of incorporation of preplanting applications of herbicides in cotton. Arle, H. F. and K. C. Hamilton. Four herbicides were applied to the soil 2 weeks and immediately before disking at the Cotton Research Center, Phoenix, Arizona to determine the effect of delay between application and incorporation. Herbicides (table) were applied on February 12 and February 26. Between these dates there were rains of .20, .11, and .05 inches. On February 26, 1975 all plots were disked before furrowing for the preplanting irrigation. Treatments were replicated four times on four-row plots 41 feet long. The soil contained 26% sand, 48% silt, 26% clay, and 1% organic matter. In April, cotton (var. Deltapine 16) was planted in moist soil under a dry mulch; however, on April 24 the field was irrigated to improve cotton stands. Cotton seedlings in marked, 10 ft sections of row were counted 1, 2, 3, and 4 weeks after emergence. All plots were cultivated three times with a sectioned, rolling cultivator. Diuron (1.2 lb/A) was applied on June 5 as a directed spray covering the furrow and base of cotton plants. Weeds present included Wright groundcherry, Palmer amaranth, junglerice, and browntop panicum. Weed control was estimated at mid-season and after cotton was defoliated. The center rows of each plot were machine-picked in November.

Both applications of dinitramine caused moderate stunting of cotton seedlings. There was no significant difference in seedling stands 1 to 4 weeks after emergence due to herbicide treatments (table). Applications of trifluralin and profluralin 2 weeks before incorporation had less control of broadleaf weeds than other treatments. There was no difference in yield of cotton between herbicide treatments. (Arizona Agric. Expt. Sta., Phoenix and Tucson)

Cotton stand and yield and weed control with four herbicides applied immediately and 2 weeks before incorporation at Phoenix, Arizona.

Treatment preplanting			Cotton plants per foot of row 1/		Weed control estimated 2/ 0 = None 100 - complete				Yield seed cotton lb/A 1/
					Broadleaf		Grass		
Date	Herbicide	lb/A	4/24	5/14	7/16	11/19	7/16	11/19	
2/12	trifluralin	.75	3.2 a	3.9 a	74	94	100	100	2,300 a
2/26	trifluralin	.75	2.2 a	3.2 a	98	100	100	100	2,140 a
2/12	profluralin	.75	2.7 a	3.7 a	82	95	100	100	2,240 a
2/26	profluralin	.75	2.3 a	2.9 a	98	98	100	100	2,300 a
2/12	penoxalin	.75	2.8 a	3.4 a	96	100	100	100	2,300 a
2/26	penoxalin	.75	2.7 a	3.4 a	100	100	100	100	2,300 a
2/12	dinitramine	.50	1.8 a	2.7 a	96	100	100	100	2,320 a
2/26	dinitramine	.50	3.0 a	3.7 a	99	100	100	100	2,060 a

1/ Values followed by the same letter are not significantly different at the 5% level.

2/ All plots were treated with 1.2 lb/A of diuron in June.

Weed management in cotton. Kempen, H. M. Evaluation of grower systems for managing weeds on Kern County cotton farms has shown a slow evolution of the techniques used. Growers have been using trifluralin for control of annual weeds. However, they have developed many techniques of application which aid them in overcoming certain problems.

Most dependable has been the technique of incorporating trifluralin into pre-irrigated beds when planting cotton. Two gangs of rolling cultivators are set behind the dirt pusher but ahead of the planter unit. This technique allows them to plant into optimum moisture whereas preplant disked-in applications require planting deep into beds despite moisture levels. This technique also eliminates carryover problems where sugarbeets and other subsequent crops follow, since only a 10 inch band is treated. Likewise, depth of incorporation is easily controlled. The disadvantages of the technique are that equipment is difficult to set up initially and rolling cultivators do not work well on loam soils; there growers use powered rototillers.

A second band treatment technique has been the subsurface layer. A spray sweep set ahead of the dirt pusher on the planting unit applies a 10 inch band about 3/4 inch from the soil surface, whereas the cotton seed is planted 1 1/2 inches deep. This technique is simple to set up but requires close supervision. On sled planters it is an accurate technique and provides the same advantage of the rolling cultivator technique. Trifluralin rates of application should be 1/2 to 3/4 of those labeled for preplant incorporation. Presently only profluralin is registered when applied this way.

After such band treatments, most growers find they need no layby treatment since cotton shades well. Where salinity prevents good growth, layby treatments of shorter residual herbicides such as dinitramine are preferred. Certain weeds such as groundcherry, annual morningglory and smooth pigweed can become problems after layby cultivation. These are usually controlled with directed sprays of prometryne or diuron.

Though growers find these band treatment techniques solve certain problems, most growers still apply trifluralin and other dinitroanilines preplant ahead of the pre-irrigation. Application is done between October and March. Incorporation techniques include treatment ahead of listing without disking, harrowing once plus one disking before listing, and disking twice. On sandy loams one disking seems to be preferred. Though cotton retardation sometimes occurs where trifluralin and other analogs are disked in, yield losses do not occur except where excess rates are applied and/or deep tillage occurs.

Such herbicide programs provide excellent annual weed control except for nightshades and perennial grasses and sedges which are becoming more prevalent. MSMA is used postemergence but is not widely accepted for nutsedge control because of timing requirements.

Therefore, research efforts are being aimed at these difficult weeds. Results which show several promising herbicides have been summarized in a Kern County progress report, "Research and Evaluation of Herbicides in Cotton." (Cooperative Extension, University of California, Bakersfield)

Peppermint tolerance to dormant applications of pronamide. Harper, D. R., A. P. Appleby, and R. L. Spinnery. Pronamide was applied in December at 0.5, 1.0, 1.5, 2.0, 3.0 and 4.0 lb/A to dormant peppermint at two locations in western Oregon. Location 1 was lightly infested with Kentucky bluegrass and Location 2 was virtually weed-free. In both experiments the plot size was 8 x 20 ft. Treatments were replicated five times. Visual evaluations for weed control and crop injury were made on March 6 and July 9, 1975 at Location 1, and crop injury evaluations were made on July 11, 1975 at Location 2. The plots were harvested on July 31 at Location 1, and August 1 at Location 2. Kentucky bluegrass control at Location 1 was 95% at 1.5 lb/A. Pronamide caused considerable mint injury (18-21%) at the 3.0 and 4.0 lb/A rates at both locations. Fresh hay yields were reduced significantly at both locations at 1.5 lb/A and higher rates. At Location 2 there were no significant reductions in oil yield. At Location 1 the 1.5, 2.0 and 3.0 lb/A rates caused yield reductions to near significant levels and the 4.0 lb/A rate caused severe injury. These yield reductions were measured under conditions of little or no weed competition.

In another experiment conducted in a peppermint field severely infested with Italian ryegrass, plots treated with 1.0 and 2.0 lb/A of pronamide yielded 49.7 and 50.6 lb/A of peppermint oil, respectively. These yields were 32.7 and 33.6 lb/A increases over the weedy check which yielded 17.0 lb/A of peppermint oil.

The large increase in yield measured under conditions of severe weed pressure, coupled with the fact that pronamide does not reduce peppermint stand densities, make it an attractive candidate for grassy weed control in peppermint, despite yield reductions at the higher rates in clean mint. (Agronomic Crop Science Department, Oregon State University, Corvallis, 97331)

Peppermint tolerance to dormant applications of Pronamide.

Treatment	lb/A	Visual observations: % Bluegrass control, March 6, Loc. 1	Visual observations: % Bluegrass control, July 9, Loc. 2	Visual observations: % Mint injury, July 9, Loc. 1	Visual observations: % Mint injury, July 11, Loc. 2	Peppermint yield: lbs of mint foliage/27 ft^2, Loc. 1	Peppermint yield: lbs of mint foliage/27 ft^2, Loc. 2	Peppermint yield: lbs mint oil/A, Loc. 1	Peppermint yield: lbs mint oil/A, Loc. 2
pronamide	0.5	44	50	0	0	18.2	15.3	65.9	67.6
pronamide	1.0	76	75	1	1	16.9	14.9	65.3	69.7
pronamide	1.5	95	95	8	11	15.2	13.9	55.9	66.0
pronamide	2.0	100	90	10	10	16.1	13.3	55.3	62.2
pronamide	3.0	99	95	18	20	13.5	12.9	56.6	63.8
pronamide	4.0	100	99	21	21	11.6	12.1	45.4	57.2
Check	--	0	0	0	0	19.3	17.3	70.8	67.9
					$L.S.D._{.50}$	3.2	2.2	14.9	n.s.
					$L.S.D._{.50}$	4.3	3.0	n.s.	n.s.
					C.V.	15.5%	11.8%	6.1%	14.8%

Selective control of Canada thistle in peppermint with Dowco 290. Whitesides, R. E., A. P. Appleby and R. L. Spinney. Canada thistle is a serious problem in peppermint because it reduces yields and interferes with harvest. The amine salt of Dowco 290 has given excellent results in control of Canada thistle in peppermint.

In the spring of 1975, four locations were selected for trials to test Dowco 290. Two locations (1 and 2) were peppermint fields heavily infested with Canada thistle and the other two (3 and 4) were weed-free peppermint stands. All treatments were applied between May 26, 1975 and July 3, 1975, with a compressed air bicycle-wheel plot sprayer. Plots infested with Canada thistle were 16 x 20 ft. Treatments were applied on two dates at each location. At the early dates peppermint was emerging to 6 inches tall and Canada thistle ranged from just emerging to 15 inches tall. At the later dates, mint was 8-12 inches tall and thistle was mostly in the bud stage.

Upper plant parts of peppermint treated with Dowco 290 turned dark red. The terminal leaves became leathery and often folded upward along the midrib which caused the plant to have a spindle-top appearance. Leaves that developed after application frequently grew together at the base and formed a cup-shaped leaf around the stem. The leaf surface became warty and wrinkled.

After treatment with Dowco 290 severe epinasty occurred on Canada thistle, followed by leaf necrosis that developed toward the stem and eventually resulted in complete necrosis and death.

When Dowco 290 was applied at .25 lb/A or more, oil yields of peppermint were reduced. Rates of .125 lb/A or higher gave excellent control of Canada thistle. Early applications (late May) of Dowco 290 at .125 lb/A to Canada thistle infested plots gave excellent Canada thistle control and resulted in minimal mint injury. It appears that light rates (less than .25 lb/A) and early application dates (late May) will provide optimum oil yields in Canada thistle infested peppermint. Suppression of oil yields can occur without a significant depression of hay yield.

Mint reduction ratings and Canada thistle control ratings as well as oil yields are listed in the following table. (Agronomic Crop Science Department, Oregon State University, Corvallis 97331)

Selective control of Canada thistle in peppermint with Dowco 290.

		Thistle infested locations						Weed free locations			
		Visual evaluations[a/]						Visual evaluations			
		% mint reduction[d/]		% Thistle control		Oil yield lb/A		% Mint reduction		Oil yield lb/A	
Treatment	lb/A	July 16	July 10	July 16	July 10			July 10	July 16		
		1[b/]	2[b/]	1[b/]	2[b/]	1[b/]	2[c/]	3[d/]	4[d/]	3[d/]	4[d/]
Early treatment											
Dowco 290	.0625	0	1	85	89	51.2	65.4	--	--	--	--
	.125	2	0	95	97	61.2	58.3	--	--	--	--
	.25	11	4	98	99	56.8	35.5	13	2	35.6	40.1
	.5	14	7	100	100	52.7	31.7	20	12	28.0	39.2
	1	14	28	100	100	50.7	28.5	43	28	24.5	27.3
	2	--	--	--	--	--	--	56	63	20.5	9.3
Later treatment											
Dowco 290	.0625	0	0	85	64	57.3	37.7	--	--	--	--
	.125	3	0	70	86	60.9	40.0	--	--	--	--
	.25	6	4	75	93	45.6	39.2	0	2	40.6	34.6
	.5	8	7	100	95	51.2	23.3	7	7	45.3	36.8
	1	11	3	100	86	47.2	28.0	16	12	32.6	20.5
	2	--	--	--	--	--	--	24	9	21.9	18.4
Check		0	0	0	0	47.8	30.2	0	0	53.7	49.9
L.S.D. $_{.05}$						n.s.	--			9.5	10.5

a/ 0 = No reduction, 100 = complete kill.
b/ Average of 4 replications.
c/ Average of 2 replications.
d/ Average of 6 replications.
e/ Based on stand thinning, heights, reduction, and foliage malformation.

Winter annual weed control in peppermint with paraquat. Harper, D. R., A. P. Appleby and R. L. Spinney. Paraquat was applied alone and in combination with soil residual herbicides to dormant peppermint at two locations in western Oregon. At Location 1 the treatments were applied on January 15, 1975 in 59 gpa of water and on December 16, 1974 at Location 2 in 25 gpa. At both sites the treated grass species were fully tillered and 2 to 4 inches tall. In both experiments plot size was 8 x 10 ft. Treatments were replicated three times and applied with a compressed air bicycle-wheel sprayer.

Paraquat alone and in combination with the soil residual herbicides provided near perfect control of Italian ryegrass and rattail fescue when evaluated in March. Location 1 received a standard treatment of 1.6 lb/A of terbacil on May 1, 1975. This treatment assisted by the January treatments containing paraquat, resulted in season-long Italian ryegrass control. Plots treated with paraquat, alone or in combination, yielded higher amounts of peppermint oil than plots treated only with other herbicides. Grass control at Location 2 was unacceptable when evaluated on July 11, 1975 in all treatments, demonstrating the value of the late spring treatment.

No peppermint injury was observed at either of these locations other than initial foliage necrosis caused by paraquat. In another experiment, four sequential paraquat treatments at 0.38, 0.50 and 1.0 lb/A on each date, were applied to a peppermint field between January 1975 and April 1975 with no reduction in peppermint oil yields. (Agronomic Crop Science Department, Oregon State University, Corvallis, 97331)

Weed control in dormant peppermint in western Oregon.

		Location 1[1/]			Location 2[2/]			
		% Italian ryegrass control			% Italian ryegrass control		% Rattail fescue control	
Treatment	Rate lb/A	March 24	July 11	lbs mint oil/A	March 6	July 11	March 6	July 11
paraquat[3/]	0.38	96	88	64.0	100	50	100	53
terbacil	1.6	45	87	45.0	0	17	46	13
diuron	2.4	85	73	43.7	13	40	50	63
pronamide	1.0	50	96	49.7	--	--	--	--
paraquat + terbacil[3/]	0.38 + 1.6	100	100	61.4	100	70	100	62
paraquat + diuron[3/]	0.38 + 2.4	99	99	67.1	100	70	100	67
paraquat + pronamide[3/]	0.38 + 1.0	98	100	62.0	--	--	--	--
Check	--	0	0	17.0	0	0	0	0
L.S.D. $_{.05}$				20.9				

1/ Applied January 15, 1975 and oversprayed with 1.6 lb/A of terbacil approximately May 1, 1975.
2/ Applied December 16, 1974.
3/ X-77 was added to the spray mixture at 0.5% v:v.

Bentazon for the control of river bulrush in rice. Bayer, D. E., E. J. Roncoroni, L. A. Jackson and D. M. Brandon. River bulrush has become more evident in Northern California rice lands as more land is kept in rice culture due to higher production demands. The practice of crop rotation kept river bulrush to a minor weed problem. Once river bulrush becomes established, cultural practices used in preparing the seedbed helps in spreading the river bulrush nutlets.

A bentazon timing trial was established on rice 'M-3' heavily infested with river bulrush. Bentazon at 2 and 4 lb/A, with and without the addition of 1/2% Surfactant WK, was applied at four time intervals during the growing season.

The first application was 34 days after planting. The river bulrush was 2.5 ft to 3 ft tall and 30% flowering. At the 43 day application the river bulrush was 3 ft to 3.5 ft tall and 100% flowering. The rice was 16 to 18 inches tall with 5 leaves. The 84 and 114 day treatments were applied to mature river bulrush.

Plots 20 by 10 ft, replicated 4 times, were harvested with a Massey-Ferguson plot harvester. Visual river bulrush control ratings were taken 6/12, 6/30 and 10/23/75. The river bulrush stand averaged one plant per 1.5 sq ft of area.

Early applications of bentazon at 2 and 4 lb/A gave higher yields than the control or later treatments because of the early river bulrush competition. Later bentazon applications equalled the 34 and 43 day treatments in controlling river bulrush.

No phytotoxicity was observed from the bentazon treatments to the M-3 variety of rice. (Botany Department, University of California, Davis and Cooperator W. Lovelace, Maxwell, California)

Table 1. Harvest weight of rice 'M-3' treated with bentazon.

Herbicide	lb/A	Timing[1/]	lbs[2/]	Duncan's Multiple range (.05)
bentazon	4	34	24.47	A
bentazon	2	34	23.67	A B
bentazon	4	43	22.32	A B C
bentazon	2	43	21.75	B C D
control	--	--	21.55	B C D
control	--	--	21.42	B C D
bentazon + WK[3/]	4 + .5%	114	20.72	C D E
bentazon	4	84	20.52	C D E
bentazon	2	114	20.12	C D E
bentazon	2 + .5%	114	19.87	C D E
bentazon + WK	2 + .5%	84	19.67	D E
bentazon	4	114	19.67	D E
bentazon	2	84	19.67	D E
bentazon + WK	4 + .5%	84	18.47	E

1/ Days after planting.
2/ Average of 4 replications at 14% moisture. Any two means not underscored by the same letter are significantly different at the 5% level.
3/ Surfactant WK

Table 2. River bulrush control.

Herbicide	R/A	Timing	river bulrush control[1/] 6/75	10/75
bentazon	2	34	8	10
bentazon	4	34	8	10
bentazon	2	43	9	10
bentazon	4	34	9.5	10
bentazon	2	84	--	10
bentazon	4	84	--	10
bentazon + WK[2/]	2 + .5%	84	--	10
bentazon + WK	4 + .5%	84	--	10
bentazon	2	114	--	10
bentazon	4	114	--	10
bentazon + WK	2 + .5%	114	--	10
bentazon + WK	4 + .5%	114	--	10
control	--	--	0	0
control	--	--	0	0

1/ Weed control ratings: 0 = no control, 10 = 100% control. Average of 4 replications.
2/ Surfactant WK

Dicamba in sorghum. Hamilton, K. C. The response of RS-610 sorghum to over-the-top application of dicamba was studied at Marana, Arizona in 1974 and 1975. In May, sorghum was planted in rows 40 inches apart and irrigated up. Dicamba (0.25 lb/A in 20 gpa with 0.5% blended surfactant) was applied over-the-top of sorghum 2, 4 and 6 weeks (and combinations of these times) after emergence when plants averaged 6, 18 and 29 inches tall. Treatments were replicated four times on four-row plots. The tests were cultivated as needed. Development of sorghum was observed every few weeks and sorghum was harvested in October or November.

All applications of dicamba over-the-top of sorghum temporarily reduced root development and caused sorghum leaves to appear stressed for moisture. Applications of dicamba 6 weeks after emergence delayed maturity. Three applications of dicamba stunted sorghum. In both years, lowest yields were obtained from sorghum treated 6 weeks after emergence (table). Yield of sorghum treated 2 and 4 weeks after emergence was not significantly different from the yield of the untreated check. (Arizona Agr. Exp. Sta., Tucson)

Yield of sorghum after over-the-top applications of dicamba at Marana, Arizona in 1974 and 1975.

Treatment time after emergence (weeks)			Yield of grain[1/] lb/A		
			1974	1975	Average
Check untreated			5,380 ab	4,620 abc	5,000 ab
2			5,490 a	5,010 a	5,250 ab
	4		5,710 a	5,230 a	5,470 a
		6	5,010 bc	4,470 bc	4,740 bc
2	4		5,380 ab	4,970 ab	5,180 ab
2	4	6	4,730 cd	4,690 abc	4,710 bc
	4	6	4,510 cd	4,190 c	4,350 c
2		6	4,250 c	4,140 c	4,190 c

1/ In a column, values followed by the same letter are not significantly different at the 5% level.

Influence of preplant soil incorporated herbicides on sugarbeet stand and weed control in Utah. Evans, J. O. and F. J. Francom. Preplant incorporated herbicides have been observed to retard the germination and/or early growth of sugarbeets, especially when the crop is planted in cold, wet soil, as was experienced in most sugarbeet growing areas in the state in 1975. Frequent spring snow storms during April delayed planting and prolonged the lower soil temperatures well into May noticeably stressing the beets. Opportunity for additional stress was presented by exposure to rather hot dry May weather characteristic of Utah prior to the beets being well rooted in the soil. These conditions provided an evaluation of the potential for beet injury of presently registered herbicides and several new compounds that have or are near to a temporary release. All treatments were applied as a broadcast spray using a bicycle sprayer immediately ahead of a tractor equipped with an Eversman power rotovator and a beet planter. The experiment was established on May 17 and designed as a randomized block with four replications. The crop was sprinkler irrigated but due to heavy rainfall for about three weeks after planting, no sprinkling was done until the crop and weeds were well established. Since moisture was abundant most treatments demonstrated good weed control; it was noted that the weeds emerged somewhat after the crop probably due to unfavorable germination temperatures. An adequate weed stand was present, however, one month after planting to provide a reliable evaluation. Considerable beet injury was observed in all plots containing any level of ethofumesate; this had not been observed in previous testing of the compound. Primarily, the injury was expressed by stunting the sugarbeets and they appeared to fall behind the growth rate of the other treatments. Within two months, these beets recovered and no injury was observed later during the season, nor was the yield of the beets lowered when compared to any other treatment. Weed control in the ethofumesate plots was excellent, especially in combination with cycloate at 3 lb/A and with HERC 22234 at 2.0 lb/A. Ethofumesate and HERC 22234 applied alone exhibited a weakness in controlling lambsquarters. Both adequately controlled this weed when they were combined with cycloate. (Utah Agricultural Experiment Station, Logan)

Influence of preplant incorporated herbicides on sugarbeet stand and weed control in Utah.

Treatment	Rate lb/A	Crop response injury index	Crop response yield (T/A)	Weed Control (%) Redroot pigweed	Weed Control (%) Lambs-quarters	Weed Control (%) Wild oats
cycloate	3.0	1.0	18.7	97	91	70
cycloate	4.0	0.5	18.6	97	95	83
NC 8438	2.5	5.0	19.3	100	45	91
NC 8438	3.5	2.5	18.9	91	55	94
HERC 22234	3.0	0.5	18.7	100	19	83
HERC 22234	4.0	0.5	17.9	97	39	88
cycloate + NC 8438	2.0 + 2.0	2.0	18.4	97	73	90
cycloate + pyrazon	3.0 + 4.0	0.2	17.9	95	91	49
cycloate + HERC 22234	3.0 + 2.0	0.2	20.6	99	84	93
NC 8438 + HERC 22234	2.0 + 2.0	3.5	20.0	100	69	96
cycloate + R37878	2.0 + 2.0	1.2	18.3	84	52	38
cycloate + R37878	2.0 + 3.0	1.4	17.6	75	59	51
cycloate + R11913	2.0 + 1.0	0	17.4	66	38	59
cycloate + R11913	3.0 + 1.0	0	18.3	90	79	66
Control	--	0	17.8	0	0	0

Injury index = 0-10 scale; 0 = no effect, 10 = complete kill.

Herbicide combinations in sugarbeets. Hamilton, K. C. and H. F. Arle. Herbicide combinations were evaluated in sugarbeets (var. USH9B) planted on beds 30 inches apart at Mesa, Arizona. Barley and mustard seed were disked into the soil (sand 40%, silt 40%, clay 20%, organic matter 1%) before herbicides were applied. Other weeds in the area were junglerice, tumble pigweed, purslane, spiny sowthistle and annual yellow sweet clover. On September 11 and October 9, 1974 preplanting herbicides (table) were applied and disked into the soil before shaping beds. In September and October, planting sugarbeet seed in dry soil was followed by a germination irrigation in alternate furrows. Several rains also occurred after each planting. Postemergence applications were on October 9 and November 4 for the September and October plantings, respectively, when sugarbeet plants and weeds were 1 to 6 inches tall. Sugarbeets had two leaves and weeds had two to six leaves when treated. Herbicides were applied in 40 gpa of water. Treatments were replicated four times on five-row plots 30 feet long. Tests were cultivated eight times and tops of weeds were removed three times with a stalk chopper. Plots weeded by hand after frost were weeded four times starting December 4. Plots hand weeded all year were weeded five or six times. Development of sugarbeets and weeds were observed every few weeks and sugarbeets were harvested on July 3, 1975. Samples were saved for sucrose analysis.

In both planting dates, preplanting applications of ethofumesate, H 22234, and cycloate stunted sugarbeets and reduced stands. In the October planting, propham stunted sugarbeets. The September planting made rapid growth and covered the furrows before frost while October planted beets were small and less competitive. In both plantings, best season-long weed control was with preplanting applications of ethofumesate followed by postemergence applications of phenmedipham and pronamide. There was no significant difference in yield between the checks hand weeded all year and the five herbicide combinations treatments. The yield with a given treatment was similar for each planting date. Weed competition until frost did not reduce yield when sugarbeets were handweeded from frost until harvest. Treatments did not affect the sucrose content of sugarbeets. (Arizona Agr. Exp. Sta., Tucson and Phoenix)

Response of weeds and sugarbeets to herbicide combinations at Mesa, Arizona.

Treatments				Percent weed control and crop injury estimated 11/13/74			Yield of beets[1/]
Preplant Herbicide	Rate lb/A	Postemergence Herbicide	Rate lb/A	Broadleaf	Grass	Sugar beets	T/A
September planting							
cultivated check				0	0	0	11 c
handweeded after frost			(73 hr/A)	0	0	0	37 a
handweeded all year			(75 hr/A)	100	100	0	36 ab
propham	3	phenmedipham and pyrazon	1 3	88	90	0	24 b
H 22234	3	phenmedipham and pyrazon	1 3	94	88	55	26 ab
cycloate	2	phenmedipham and pyrazon	1 3	95	87	45	29 ab
NC 8438	1	phenmedipham and pronamide	1 1	100	100	58	35 ab
NC 8438	1	phenmedipham and pyrazon	1 3	99	98	60	31 ab
October planting							
cultivated check				0	0	0	4 c
handweeded after frost			(90 hr/A)	0	0	0	35 ab
handweeded all year			(122 hr/A)	100	99	0	38 ab
propham	3	phenmedipham and pyrazon	1 3	100	86	23	26 ab
H 22234	3	phenmedipham and pyrazon	1 3	99	72	45	25 ab
cycloate	2	phenmedipham and pyrazon	1 3	100	96	22	29 ab
NC 8438	1	phenmedipham and pronamide	1 1	100	99	30	40 a
NC 8438	1	phenmedipham and pyrazon	1 3	100	99	48	31 ab

1/ Values for a date of planting followed by the same letter are not significantly different at the 5% level.

Evaluation of postemergence herbicides for annual broadleaf and grassy weeds in sugarbeets. Evans, J. O. A near perfect stand of redroot, lambsquarters and barnyardgrass resulted when it became necessary for a beet grower to abandon one planter in favor of another capable of handling the extremely wet fields experienced in Utah in 1975. The substitute planter was not equipped for herbicides and because it was late in the spring the beets were planted without preplant or preemergence chemicals. On June 20 the trial was initiated with the beets in the two true-leaf stage and the broadleaved weeds one-half to three-fourths of an inch tall and containing 2 to 4 true leaves. The barnyardgrass was one inch high and in the two leaf stage. Four replications of the treatments were made on plots 4 beet rows wide and 35 ft long. A bicycle sprayer equipped with 8003 nozzle tips was used to deliver the herbicides in 20 gpa water. Several materials possessed economic potential as post treatments, the most promising treatment was the three-way combination of phenmedipham, desmedipham, and HOE 23408 at 0.75, 0.75, and 1.0 lb/A, respectively. This combination proved especially effective against the broadleaved weeds with better than 95% control of both types. The grassy weed control was slightly less effective but still very acceptable. Desmedipham and HOE 23408 also proved to be a potent combination, completely capable of controlling the three species at the dosage evaluated. HOE 23408 is noticeably weak on the broadleaved weeds but extremely active on barnyardgrass and wild oats. Desmedipham appeared to express a slight advantage over phenmedipham in this trial and the combination performed better than either herbicide alone. (Utah Agricultural Experiment Station, Logan)

Influence of postemergence herbicides on sugarbeets and weed growth in Utah, 1975.

Treatment	Rate lb/A	Injury index**	Crop Response (T/A)	Redroot	Weed Response-Injury Index* Lambsquarters	Barnyardgrass
phenmedipham	1.0	0	17.3	2.8	9.3	3.0
desmedipham	1.0	0	18.0	10.0	9.0	3.4
phenmedipham + desmedipham	0.75 + 0.75	0	17.4	9.7	9.7	2.8
phenmedipham + HOE 23408	1.0 + 1.0	0	18.8	1.9	9.4	8.5
desmedipham + HOE 23408	1.0 + 1.0	0	17.0	10.0	8.9	9.3
phenmedipham + desmedipham + HOE 23408	0.75 + 0.75 + 1.0	0	18.9	10.0	9.6	8.6
pyrazon plus	12.0	1.1	18.0	6.0	4.9	6.1
HOE 23408	1.0	0	17.0	1.0	2.1	4.1
HOE 23408	2.0	0	17.9	1.0	3.8	6.9
HOE 23408	4.0	1.6	16.9	1.5	4.9	9.3
dalapon	3.0	0	18.2	0	1.5	7.0
R-37878	3.0	2.7	13.6	9.0	7.9	0.8
Control	--	0	18.2	0	0	0

*Injury index on a 0-10 scale: 0 = no effect, 1-3 slight injury, 4-6 = moderate injury, 7-9 = severe injury, 10 = complete kill.

**Evaluations made 14 days after treatment.

Postemergence screening trial in sugarbeets. Robert F. Norris and Renzo A. Lardelli. Postemergence control of barnyardgrass is a problem which currently has no economically viable answer. Several compounds offering potentially increased postemergence weed control in sugarbeets have been developed recently. A trial was established to evaluate these new materials, either alone or in combination with existing chemicals.

Sugarbeets were sown on June 4, 1974 at the Davis Agronomy farm. A CO_2 back pack sprayer was used to apply treatments on June 28, when the sugarbeets had 2 to 4 leaves and barnyardgrass was 2 to 8 inches tall, tumbling pigweed was cotyledon to 2 to 4 inches tall and scattered groundcherry and purslane were 2 to 4 inches tall.

The weeds and sugarbeets were several days older than desirable, and hence larger, at the time of application; this undoubtedly reduced the level of activity attained. No treatment consistently reduced sugarbeet vigor, with the possible exception of dalapon plus X-77. Selectivity, with these new herbicides, would not appear to be a problem in these fairly large beets under summer conditions.

Dalapon showed some grass control, but not sufficient to be commercially satisfactory. The count was lower than the visual impression. Some plants were killed, but those surviving would have probably recovered. Adding pyrazon did not increase kill of the rather large broadleaved weeds, but did seem to reduce the dalapon activity. This inhibition was similar to that observed when mixing pyrazon with some preplant herbicides.

Desmedipham proved superior to phenmedipham in this mainly pigweed problem; grass control was poor.

HOE-22870 and HOE-23408 gave selective and identical control of barnyardgrass. Under the conditions of this test 4.0 lb/A were required to achieve any substantial activity and 8.0 lb/A were best. These results were striking as this is the first time selective postemergence control of rather large barnyardgrass has been achieved. The remaining grass plants were very severely stunted, except at the lowest rate, and offered no competition; the growing points appeared to have died with only some older leaves still alive. In many instances grass seedlings with 2 to 4 leaves, and even a few with small tillers, had been completely killed. These herbicides would appear to offer the potential for postemergence control of barnyardgrass; many variables have yet to be investigated.

Adding X-77 to HOE-22870 did seem to increase the activity somewhat as seen by visual rating, but this was not reflected in the counts. Mixing HOE-22870 with desmedipham did not achieve complete control of the weeds but even with these rather large weeds 1.0 lb/A of desmedipham plus 4.0 lb/A of HOE-22870 gave very useful levels of control; this control would have probably been sufficient to save a field.

BAS-84361X did not offer enough activity on this weed spectrum to be of much potential for summer weed control, although selectivity did not seem to be a problem. (Botany Department, University of California, Davis)

Postemergence screening trial in sugar beets.

Treatments	Rate lb/A	1/15/74 Beet vigor	Barnyard-grass	Broad-leaved	7/17/74 Grass count[1/]
			-----control------		
pyrazon + dalapon + X-77	4.0 + 2.2 + 0.5%	9.3	3.0	1.3	52
dalapon + X-77	4.0 + 0.5%	8.0	5.5	1.5	19
phenmedipham	1.0	9.3	3.0	3.8	31
phenmedipham	1.5	8.8	3.3	3.8	35
desmedipham	1.0	9.8	3.5	7.4	42
desmedipham	1.3	9.0	2.8	6.4	46
HOE-22870	1.0	9.8	3.0	3.5	35
HOE-22870	2.0	9.4	4.0	1.0	30
HOE-22870	4.0	8.8	7.8	0.8	11
HOE-22870	8.0	8.5	8.3	1.0	3
HOE-22870 + X-77	1.0 + 0.5%	9.0	4.8	1.5	30
HOE-22870 + X-77	2.0 + 0.5%	8.5	6.8	1.8	35
HOE-22870 + X-77	4.0 + 0.5%	8.0	7.8	2.0	19
BAS-84361X + Cittowett	2.0 + 0.25%	9.5	2.3	1.3	14
BAS-84361X + Cittowett	4.0 + 0.25%	8.8	4.0	3.0	32
desmedipham + HOE-22870	1.0 + 2.0	9.0	4.0	6.4	34
desmedipham + HOE-22870	1.3 + 2.0	9.0	3.5	6.6	46
desmedipham + HOE-22870	1.0 + 4.0	9.1	6.5	6.9	33
desmedipham + BAS 84361X + Cittowett	1.0 + 2.0 + 0.25%	9.0	4.3	6.8	46
desmedipham + BAS 84361X + Cittowett	1.3 + 2.0 + 0.25%	9.0	4.0	6.8	40
desmedipham + BAS 84361X + Cittowett	1.0 + 4.0 + 0.25%	9.0	5.0	6.8	22
HOE-23408	1.0	9.5	4.0	1.8	40
HOE-23408	2.0	9.3	4.8	2.5	22
HOE-23408	4.0	9.0	7.0	1.3	13
HOE-23408	8.0	8.3	8.5	3.3	8
Untreated check		8.8	0.8	1.0	56

All data are means of 4 replications.
Vigor: 0 = all plants dead, 10 = normal growth. Control: 0 = no control, 10 = complete control.
[1/] Counts are for area of 20 sq ft per plot.

Postemergence weed control in sugarbeets. Robert F. Norris and Renzo A. Lardelli. Postemergence weed control in spring sown sugarbeets is an area in which current herbicides are not always adequate, especially if annual grasses are present. This trial was designed to test some of the recently developed herbicides for their potential in solving this problem.

A trial was established in Yolo County, Calif. in a field planted on May 5, 1975 in a silty clay soil. Herbicides were applied using a CO_2 back pack sprayer with 8002 E nozzles, set at 30 psi and delivering 40 gpa. Two applications were made, on May 26 and June 2, 1975, when the sugarbeets had 1 to 3 leaves and were 3 to 5 inches tall, respectively. Barnyardgrass was at the 1 to 3 leaf stage at the early application, and 5 to 6 inches tall at the later treatment; lambsquarters were at similar stages of growth. Plot size was two beds by 10 ft, with three replications. The high temperature on the day of the early application was 93 F and at the second application only 75 F.

This trial clearly demonstrated that early treatment provided better weed control than later treatment. This difference may have been accentuated by the lower temperature at the second treatment and the closeness of evaluation (one week) following the later application. Cultivation precluded further evaluation. Grass control, especially as a result of the HOE-23408 treatment, might have improved as general chlorosis of the grass plants and apparent death of the growing point was observed although the plants had not died. Beet injury following the early treatment was much worse than from the later treatment. Desmedipham was slightly more injurious than phenmedipham. HOE-23408 alone caused almost no beet phytotoxicity although adding 0.5% X-77 increased beet injury. The best weed control was provided by the mixture of desmedipham at 1.5 lb/A plus HOE-23408 at 2.0 lb/A, but the combination caused considerable early beet injury. Although weed control was not complete, the possibility of barnyardgrass and lambsquarters control postemergence was encouraging. (Botany Department, University of California, Davis)

Postemergence weed control in sugarbeets.

Treatment	Rate lb/A	Application date	Sugarbeets Stand	Sugarbeets Vigor	Control Barn-yard-grass	Control Lambs-quarters
phenmedipham	1.50	May 26	57	63	47	65
		June 2	70	65	20	20
desmedipham	1.50	May 26	73	75	57	67
		June 2	60	67	53	48
HOE-23408	2.00	May 26	77	80	62	7
		June 2	80	73	53	0
HOE-23408	4.00	May 26	85	88	53	0
		June 2	85	82	67	0
desmedipham + HOE-23408	1.00 + 2.00	May 26	60	72	57	43
		June 2	63	68	63	33
desmedipham + HOE-23408	1.00 + 4.00	May 26	40	47	77	50
		June 2	75	55	75	50
desmedipham + HOE-23408	1.50 + 2.00	May 26	38	43	82	77
		June 2	58	45	68	42
desmedipham + HOE-23408	1.50 + 4.00	May 26	30	42	67	77
		June 2	62	33	50	63
pyrazon + HOE-23408	4.00 + 2.00	May 26	65	75	53	17
		June 2	73	58	38	10
dalapon + 0.5% X-77	4.00	May 26	83	77	55	13
		June 2	77	82	20	8
HOE-23408 + 0.5% X-77	2.00	May 26	58	68	78	0
		June 2	77	52	37	0
Untreated check			83	95	17	0
			77	87	7	0

All data are means of 3 replications. All assessments made on June 9th, 1975. Stand or vigor: 0 = no beets or vigor, 10 = full stand or vigor. Control: 0 = no control; 10 = complete control.

Preemergence sugarbeet herbicide screening trial. Robert F. Norris and Renzo A. Lardelli. Control of weeds, especially barnyardgrass, under preemergence conditions, remains a problem in sugarbeets grown in the Sacramento Valley. Recently developed herbicides offer the possibility of better weed control under these conditions.

A trial was established on flat planted sugarbeets on a loam soil in Sutter county. The beets were planted on Jan. 13, 1975 and treatments were applied the same day using a CO_2 back pack sprayer with 8004 E nozzles delivering 35 gpa. Plot size was two beds by 30 ft, with four replications. No irrigation was applied; heavy rains occurred from Jan. 31 to Feb. 2, when 3.6 inches of rain fell. A fairly uniform stand of beets developed; the primary weed was early germinating barnyardgrass.

The only treatments causing injury were those with pyrazon and propham; although not shown as significant in the overall statistical analyses these treatments probably did cause stand and early vigor reductions. Ethofumesate caused some growth distortion on some sugarbeet seedlings, but evaluations made two weeks later than those presented in the table indicated that beet vigor then equalled that of the untreated checks.

Barnyardgrass control under these conditions was high; all treatments were superior to pyrazon plus TCA. Ethofumesate appeared especially promising for this type of application. H-22234 was not quite as active, but provided very good grass control. Although the propham plus pyrazon provided good control the selectivity was marginal and would thus limit the potential of this mixture. Both ethofumesate or H-22234 would appear to offer good barnyardgrass control under rainfall preemergence conditions. (Botany Department, University of California, David, 95616)

Preemergence sugarbeet screening trial.

Treatments	Rate lb/A	Sugarbeets Vigor	Sugarbeets Count	Barnyardgrass Count
pyrazon + TCA	4.0 + 8.0	8.8	58	24.3 c
pyrazon + propham	3.0 + 2.0	6.5	42	10.8 ab
pyrazon + propham	3.0 + 3.0	6.4	46	2.0 a
H-22234	3.0	7.9	50	11.0 ab
pyrazon + H-22234	3.0 + 2.0	7.8	45	16.3 bc
ethofumesate	4.0	6.8	57	0.8 a
pyrazon + ethofumesate	3.0 + 2.0	7.1	46	3.8 a
endothall	6.0	6.9	54	6.8 a
Untreated check	--	8.3	54	129.3 d

All data are means of 4 replications, evaluation made 3/27/75.
Counts were made from 30 ft on 2 beds each per plot.
Data followed by different letters differ significantly at the p - 0.05 level (Duncan's multiple range test).
Vigor rating: 10 = normal vigor, 0 = dead.

<u>Influence of time of day at spraying on activity of phenmedipham and desmedipham.</u> Robert F. Norris and Renzo A. Lardelli. During recent years it has become apparent that field applications of phenmedipham made in the late afternoon were less injurious to the sugarbeets than applications made in the morning. Several trials were established in an attempt to better define this phenomenon. Results varied greatly depending on temperature conditions prevailing during growth, and immediately following herbicide application.

Sugarbeets were planted July 29 and August 8, 1974 at the University of California farm at Davis. This provided two growth stages of beets and weeds when treated on the same day. Each plot was 15 ft long consisting of two beds, replicated 4 times, and furrow irrigated. A CO_2 back pack sprayer delivering 30 gpa at 30 psi with 8002 E nozzles was used to apply the treatments on August 22. The growth stages at treatment for the younger and older plants were: sugarbeets at 2 leaf or 4 leaf; prostrate pigweed and redroot pigweed at cotyledon to 2 leaf or to 4 leaf, respectively. Temperature patterns appear critical in determining type of response in this and other similar trials.

Date	Low-Temperature-High			Temperatures at Treatment Time
8/19	52 F	92 F		
8/20	62	86		
8/21	53	93		
8/22	58	98	Treatment Day	0800 hr - 68 F 1300 hr - 84 1800 hr - 91
8/23	59	99		
8/24	57	100		
8/25	55	98		

At 1.0 lb/A of either herbicide applied to the younger beets (recommended size for treating) there was a consistent trend toward decreasing beet injury as the application was made later in the day. This was observed in the visual vigor evaluations, and also reflected in the data for percent beet kill (determined by counting the numbers of live and dead sugarbeets in the plots). Dry weight gain following treatment was determined but was too variable to establish any consistent time of day effect.

Injury was much less on the older sugarbeets and the trend for influence of time of day was less well defined, as the changes in injury were smaller. Desmedipham application (1.0 lb/A) at 1800 hr on 4 leaf beets seemed more injurious than applications at 0800 or 1300 hr, yet phenmedipham was least injurious at this time. Further experimentation will be necessary to determine if this is real or an anomaly.

Injury from the 2.0 lb/A of either herbicide was much greater. The trends for effect of time of day were again less well defined, due to the high levels of injury which could not be overcome by time of day at application. Older beets were more tolerant of the higher rate than the younger beets.

Weed control was uniformly good on plants sprayed at the younger stage and did not show any relationship to time of day at spraying. The older weeds were controlled much less well; phenmedipham at either rate was inadequate while desmedipham gave better control with a trend for more activity from morning spraying.

This trial clearly indicated that the practice of spraying postemergence treatments, especially phenmedipham, in the late afternoon when stress conditions exist, can reduce injury. It also clearly showed that spraying younger plants is advantageous over waiting a few days (9 in this case), in relation to weed control efficacy. (Botany Department, University of California, Davis, 95616)

Influence of time of day on activity of phenmedipham and desmedipham.

Parameter measured	Time of day	Phenmedipham 1.0 lb/A		Phenmedipham 2.0 lb/A		Desmedipham 1.0 lb/A		Desmedipham 2.0 lb/A		Untreated Check	
		2 lf	4 lf	2 lf	4 lf	2 lf	4 lf	2 lf	4 lf	2 lf	4 lf
Percent kill[1/]	800	22.0	2.5	84.0	4.5	19.3	8.2	70.7	3.9	0.5	2.1
	1300	10.8	5.7	61.0	4.3	10.5	3.9	76.0	1.8	0.5	2.1
	1800	2.0	1.4	73.5	2.2	4.3	27.6	86.0	28.7	1.7	2.2
Sugarbeet vigor[2/]	800	4.1	9.0	1.1	7.1	5.5	8.4	11.5	7.4	9.9	9.3
	1300	7.4	8.9	4.3	8.6	7.6	8.9	3.6	7.6	9.4	9.8
	1800	8.3	9.2	5.0	8.5	7.9	8.4	5.1	7.9	9.9	9.8
Weed Control[2/]	800	10.0	3.3	9.8	5.6	10.0	7.8	10.0	8.5	2.5	1.1
	1300	8.1	3.8	10.0	3.5	9.7	5.0	9.9	8.0	1.0	1.5
	1800	9.2	3.5	9.95	4.3	9.8	4.8	9.7	6.4	2.0	0.8

All data are means of 4 replications.

1/ Percent kill determined by counting live and dead beets in 2 m/plot.

2/ Vigor: 0 = all dead, 10 = normal growth; Control: 0 = none, 10 = complete control.

Ethofumesate applications on sugarbeets. Sullivan, E. F., L. O. Britt and K. W. Chisholm. Maximum dosage ethofumesate applications were made on sugarbeets in 1975 to determine their affect on chemical weeding persistence and sugar yield per acre. Preplant herbicides were applied at 43.7 gpa in a 7 inch band to the soil surface at planting and immediately incorporated with a tine tiller to a depth of 1.5 inches. Postemergence chemicals were applied on May 27 when sugarbeet and weed seedlings had 2-4 true leaves. GW Mono-Hy D_2 sugarbeet seed was sown in 22 inch rows one inch deep at four seeds per ft simultaneously with sowing weed seed at a shallow depth (April 26). Plots were 25 ft long by 6 rows wide. The clay soil (42% clay, 30% silt, 28% sand, 1.6% OM, pH 8.1) seedbed was smooth, had fine tilth and was firm and dry beneath. Subsoil moisture was satisfactory for germination and chemical activity. The site received 2.55 inches precipitation and 5 inches of surface-irrigation within four weeks after establishment. An additional 3.46 inches fell after postemergence application (May 27 to June 9). Average weekly temperatures during the preplant period ranged from 63-70 F maximum to 33-44 F minimum, and post-emergence ranges were 48-89 F maximum to 35-54 F minimum. Major weeds in the untreated controls were redroot pigweed, kochia, foxtail species and barnyardgrass. Plant counts were taken on June 13 within 3 by 48 inch quadrats at a randomly selected place in each of four innermost rows in each plot. In addition, a pre-harvest visual scoring was made on September 10 after two hand weedings had been accomplished during the growing season. Harvest estimates of treatment effects on sugar yield were made on September 25. Average results for weed control and sugar yield are reported herein as percentages of the untreated controls (Tables 1-3).

Results suggest that dosages of ethofumesate beyond 4 lb/A tend to decrease recoverable sugar per acre, although excellent early and late weed control was obtained. Weed control persistence from preplant ethofumesate was also excellent. No difference occurred between ethofumesate formulations. Dosages used were maximum for conditions. (The Great Western Agricultural Research Center, Longmont, Colorado. Published with approval of The Director as Abstract No. 19 H. Journal Series)

Table 1. Average effects on sugarbeets and weeds of ethofumesate and combinations applied at fixed rates at Longmont, Colorado, June 13, 1975.

Treatment	Fixed dose lb/A	Beet		Weed Control			
		Injury	Stand	Pigweed	Kochia	Grass	Total
		(Scores are seedling counts as % of control)					
ethofumesate/ethofumesate + desmedipham	4/2 + 1	30	86	100	100	100	100
ethofumesate	4	16	101	100	91	99	98
ethofumesate, 4F	4	18	94	99	93	98	98
ethofumesate + desmedipham	2 + 1	19	97	99	80	91	93
desmedipham	1	13	89	97	89	62	82
Plant count/sq ft untreated			3.1	9.1	2.8	8.1	20.0

Note: ethofumesate, 1.5E unless noted otherwise. Desmedipham and ethofumesate + desmedipham applied postemergence. Ethofumesate only applied preplant.

Table 2. Average visual effects on sugarbeets and weeds of ethofumesate and combinations applied at fixed rates at Longmont, Colorado, September 10, 1975.

Treatment	dose lb/A	Beet		Weed Control		
		Injury	Stand	Pigweed	Grass	Total
		(Scores are plant counts as % of control)				
ethofumesate/ethofumesate + desmedipham	4/2 + 1	0	100	91	100	97
ethofumesate, 4F	4	0	100	94	90	91
ethofumesate	4	0	100	94	88	89
desmedipham	1	0	100	66	53	57
ethofumesate + desmedipham	2 + 1	0	100	84	0	18
Plant count/63 sq ft untreated				8.0	20.2	28.2

Table 3. Average effects on harvest yield and quality from ethofumesate and combination treatments applied at fixed rates at Longmont, Colorado, September 25, 1975.

Treatment	Fixed dose lb/A	Root Yield	Sucrose Content	Apparent Purity	Recoverable Sugar	Beets/ Plot
		(Scores as % of check mean)				
ethofumesate + desmedipham	2 + 1	106	99.2	99.2	103	110
ethofumesate	4	102	97.6	99.2	98	112
desmedipham	1	97	101.8	99.7	98	105
ethofumesate, 4F	4	97	98.0	99.5	94	108
ethofumesate/ethofumesate + desmedipham	4/2 + 1	90	98.3	99.5	88	103
		(T/A)	(%)	(%)	(lb/A)	
Means		20.9	15.7	91.7	5460	69.8
LSD .05		NS	NS	NS	NS	NS
Check		21.2	15.8	92.2	5639	65.7
CV		10.4	2.4	0.5	11.7	10.0

HOE-23408 applications on sugarbeets. Sullivan, E. F., L. O. Britt and K. W. Chisholm. Postemergence applications of HOE-23408 alone and in mixtures were made on sugarbeets in 1975 to determine their effect on weed control and sugar yield. Plots were established on April 26. Chemicals were applied at 43.7 gpa in a 7 inch band when sugarbeet and weed seedlings had 2-4 true leaves (May 27). Plots were 25 ft long by 6 rows wide. Abundant rainfall totaling 3.46 inches fell within two weeks after treatment application. Air temperatures at application averaged 72 F and they ranged from 48-89 F maximum to 35-54 F minimum from May 27 to June 9 when plant count response observations were taken. Major weeds in the untreated controls were redroot pigweed, kochia, foxtail species and barnyardgrass. Plant counts were taken two weeks after application within a 3 by 48 inch quadrat at randomly selected sites in each of the four innermost rows. In addition, a pre-harvest visual scoring was made on September 18 after two hand weedings had been accomplished during the growing season. Harvest estimates of treatment effects on sugar yield were made on September 25. Average results for weed control and sugar yield are reported herein as percentages of the untreated controls (Tables 1-3). (The Great Western Agricultural Research Center, Longmont, Colorado. Published with approval of The Director as Abstract No. 18H. Journal Series)

Table 1. Average effects on sugarbeets and weeds of HOE-23408 and mixtures applied postemergence at a fixed rate at Longmont, Colorado, June 9, 1975.

Treatment	Fixed dose lb/A	Beet Injury	Beet stand	Weed Control Pigweed	Weed Control Kochia	Weed Control Grass	Weed Control Total
		(Scores are seedling counts as % of control)					
HOE-23408 + desmedipham	1 + 1	11	107	88	69	94	88
FMC-25213 + desmedipham	1 + 1	26	95	94	65	79	84
FMC-25213 + desmedipham	2 + 1	38	83	94	81	68	81
HOE-23408	1	5	101	10	0	72	33
HOE-23408	2	13	110	33	31	89	57
Plant count/sq ft untreated			2.8	6.2	1.6	5.9	13.7

Table 2. Average effects on sugarbeets and weeds of HOE-23408 and mixtures applied postemergence at a fixed rate at Longmont, Colorado, September 18, 1975.

Treatment	Fixed dose lb/A	Beet Injury	Beet stand	Weed Control Pigweed	Weed Control Kochia	Weed Control Grass	Weed Control Total
				(Scores are plant counts as % of control)			
HOE-23408 + desmedipham	1 + 1	0	100	59	--	92	75
HOE-23408	2	0	100	33		95	64
FMC-25213 + desmedipham	1 + 1	0.5	95	86		36	61
FMV-25213 + desmedipham	2 + 1	0.5	100	69		50	59
HOE-23408	1	0	100	18		93	55
Plant count/63 sq ft untreated				12.2		23.7	35.9

Table 3. Average effects on harvest yield and quality from postemergence applications of HOE-23408 and mixtures, Longmont, Colorado, September 25, 1975.

Treatment	Fixed dose lb/A	Root Yield	Sucrose Content	Apparent Purity	Recoverable sugar	Beets/ plot
		(Scores as % of check mean)				
HOE-23408 + desmedipham	1 + 1	127	99.2	99.7	125	109
HOE-23408	2	119	98.4	99.8	117	111
HOE-23408	1	112	99.0	99.3	109	108
FMC-25213 + desmedipham	1 + 1	111	99.3	99.5	109	94
FMC-25213 + desmedipham	2 + 1	83	94.4	98.8	76	64
		(T/A)	(%)	(%)	(lb/A)	
Means		21.0	15.4	91.7	5400	63
LSD .05		11.5	3.4	0.6	11.3	12.9
Check		19.3	15.6	92.1	5085	65
CV		7.0	2.3	0.4	7.1	8.8

Winter wheat yield as influenced by non-tillage and four downy brome herbicides. Rydrych, D. J. This study was initiated at Pendleton and Moro, Oregon to determine the effectiveness of herbicide combinations on downy brome and other annual broadleaved weeds. Treatments were made in December, 1974 when winter wheat had 2-3 tillers. All materials were applied postemergence to downy brome and winter wheat (variety Hyslop).

The weed spectrum consisted of downy brome, fiddleneck, blue mustard, tumble mustard, and jagged chickweed. Control of broadleaved weeds was almost 100% by all materials except propham-bromoxynil. Downy brome control was 95% or higher with all combinations of metribuzin, or cyanazine. Propham-bromoxynil was 80% effective on downy brome.

There is very little information available on the effect of herbicides under non-tilled conditions. Studies on this were started in Pendleton in 1971 and will continue in the future. Selective weed control in non-tilled seedbeds is more effective than in stubble mulched seedbeds. This is particularly true when downy brome is part of the weed population. Weed control on a plowed seedbed is more efficient than on a non-tilled surface.

Wheat yields for the 1975 season are recorded in the table. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Control of downy brome in winter wheat on non-tilled seedbeds in eastern Oregon, 1975.

Treatment[1/]	Rate lb/A	Wheat yield per location[2/] Pendleton	Moro
metribuzin-terbutryn	.33 + 1.00	3850	2850
metribuzin-bromoxynil	.33 + .25	3900	2900
cyanazine	1.50	4100	2350
propham-bromoxynil	.75 + .25	3600	2650
control non-tilled	--	2600	2100

1/ Propham combined with PPG 124.
2/ Average of 8 replications (lb/A)

Shield spray research in winter wheat. Rydrych, D. J. Drop nozzles and shielded nozzles were compared using paraquat for weed removal. Downy brome, bulbous bluegrass and many broadleaved weeds were controlled by both systems between the rows. Control within the rows is not possible on grass weeds. Broadleaved weeds within the row could be controlled with other herbicides. Paraquat was applied at .5 lb/A.

Drop nozzles were positioned to cover 10 inches of row in a 14 inch row spacing. The nozzles were constructed of ordinary Teejet flat-fan tips (40 gpa). Drop nozzles were found to be very effective but paraquat spray drift can be lethal on very small wheat plants. Wheat plants that are taller than 10 inches can tolerate some drift.

Shielded nozzles were positioned the same way as the drop nozzles except that metal shields were extended on each side of the fan to prevent direct contact. The safety margin with shielded nozzles was far greater than with the drop system.

Problems arise when row spacings are not precise and equipment will not fit all areas of a field. Shield spraying could be successful on small scale operations but not on the average wheat field. The weeds that remain in the wheat row reduce yields by as much as 30%. The concept works but is not practical for massive operations. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Corn cockle competition in winter wheat. Rydrych, D. J. Corn cockle is an annual broadleaved weed that is a serious competitor in the winter wheat regions of eastern Oregon. Chemical control is often erratic when the phenoxy herbicides are used for control.

More information was needed on the life cycle of corn cockle so that a more effective chemical control could be developed. A series of competition trials were started in Pendleton in 1973. Preliminary data show that control of corn cockle must be completed prior to February of each season or serious yield reductions can be expected. Corn cockle has the ability to compete with winter wheat, with great intensity, early in the season. Significant yield reduction can take place at least one month earlier than when other species such as downy brome are competing. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Control of Italian ryegrass and wild oats in winter wheat with HOE 23408. Appleby, A. P., D. R. Harper and R. L. Spinney. HOE 23408 has shown promise for controlling annual weeds in winter wheat in western Oregon. In the fall of 1974, a series of experiments was established at six locations to obtain further information on performance data and yield of wheat treated with HOE 23408.

Treatments were applied preemergence (October 22-November 5), early postemergence when the majority of the wheat was in the 2-3 leaf stage (November 25-December 16), and late postemergence when wheat had developed tillers (January 2-January 21). Treatments were applied in 25 gallons of spray solution per acre with a bicycle wheel plot sprayer. All treatments were replicated five times at each location. Ryegrass and wild oat control was estimated visually during the summer. Plots were harvested in August and yield data were subjected to statistical analysis.

Average yield results from each location and overall average of ryegrass and wild oat control are given in the table. The fall of 1974 was extremely dry and seedbeds were generally poor. Relatively few weeds were controlled during seedbed preparation, leading to extremely severe weed densities after fall rains began. This led to (a) generally poor results from preemergence herbicides, and (b) severe reduction in wheat grain production from the grass weeds.

Control from preemergence treatments was acceptable for ryegrass but poor for wild oats, even at 2 lb/A. Control of both weeds was considerably better from postemergence treatments. The rate of 1 lb/A applied early postemergence gave an average yield increase of more than 45 bu/A and nearly perfect grass control. The 2 lb/A rate gave minor injury symptoms at some locations and yields tended to be slightly lower than at the 1 lb rate but were still excellent. Late postemergence treatments were highly effective and gave yield increases approaching 40 bu/A.

None of the broadleaf weeds occurring in any of the experiments were satisfactorily controlled by HOE 23408. Combinations with broadleaf killers may be desirable and will be studied further.

Several other commercial and experimental herbicides were included in the experiments at recommended rates. Yields from these treatments were as follows: triallate - 73.4; nitrofen - 68.7; diuron - 64.8; barban - 76.5; and metribuzin (0.5 lb/A) - 73.9 bu/A.

The excellent grass control and the flexibility of timing with which HOE 23408 may be used make this compound an exciting and promising material for grass weed control in western Oregon. (Agronomic Crop Science Department, Oregon State University, Corvallis, 97331)

Winter wheat grain yields from six locations treated with HOE 23408 for Italian ryegrass and wild oat control, western Oregon, 1974-75.

Treatment	Rate lb/A	Wheat grain yields (bu/A) Locations 1	2	3	4	5	6	Avg.	% Avg. weed control Ryegrass	Wild Oats
Preemergence										
HOE 23408	0.75	125.4	29.4	39.7	110.3	79.6	76.3	76.8	76	16
	1.0	128.1	39.1	46.8	108.7	73.3	79.8	79.3	85	25
	2.0	127.5	59.5	56.3	119.7	69.3	81.7	85.7	90	64
Early Postemergence										
HOE 23408	1.0	124.4	96.0	61.5	127.9	76.8	88.7	95.9	100	96
	2.0	113.3	90.1	58.7	121.8	74.2	87.9	91.0	100	99
HOE 23408 + diuron	0.75 + 1.2	132.4	88.0	64.6	125.9	75.0	83.3	94.9	96	89
Late Postemergence										
HOE 23408	1.0	121.4	84.2	60.0	125.8	78.1	86.4	92.7	100	99
	2.0	123.2	82.6	51.7	121.4	65.5	81.9	87.7	100	100
Untreated check	0	49.5	11.5	23.5	99.8	71.2	48.5	50.7	0	0
L.S.D. $_{.05}$		11.3	14.8	--	11.3	9.3	10.3			

Chemical seedbed preparation in winter wheat. Rydrych, D. J. Seedbed preparation is often difficult to achieve in a late, wet season. Late tillage is often inadequate for the control of volunteer rye, downy brome and goatgrass. As a result, winter wheat is often planted in a seedbed that is heavily infested with downy brome and other weeds that cannot be removed by selective means.

Several experiments have been conducted in eastern Oregon for the evaluation of chemical seedbed herbicides. The results of the 1974 tests are recorded in the table.

Excellent results have been obtained with paraquat and glyphosate. Glyphosate and paraquat were applied postplant preemergence on December 21, 1973 on emerged downy brome and other weeds. Winter wheat (variety McDermid) had been seeded on December 9, 1973. Both contact herbicides were applied prior to winter wheat emergence. Metribuzin was applied postemergence to selected plots in addition to the seedbed herbicides.

Winter wheat yields were at least 50% greater where glyphosate or paraquat had been applied on the seedbed prior to wheat emergence. Combination treatments using metribuzin were also effective. The success of chemical seedbed preparation has encouraged growers to use the system when conditions are favorable. In 1974 and 1975, several hundred acres of wheat were treated with paraquat (preplant) for seedbed preparation. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Chemical seedbed preparation for the control of downy brome and other weeds in winter wheat, Pendleton Station, 1974.

Treatment[1/]	Rate lb/A	Winter wheat yield	Broadleaved[3/] weed control	Downy brome control
		lb/A	%	%
glyphosate	.50	2550	80	50
glyphosate	1.00	2660	100	53
glyphosate-metribuzin	.50 + .25	2130	70	58
metribuzin	.50	2600	100	73
paraquat	.50	2920	100	92
paraquat-metribuzin	.50 + .25	2650	100	83
Control	--	1280	0	0

1/ Glyphosate and paraquat applied postplant, preemergence on Dec. 21, 1973; metribuzin applied postemergence on March 20, 1974.

2/ Broadleaved weeds, Jim Hill mustard, false flax.

Downy brome control in winter wheat. Rydrych, D. J. Downy brome continues to be a serious weed problem in the dryland and irrigated winter wheat areas of eastern Oregon.

A series of individual and combination treatments have been tested in eastern Oregon since 1971. The major emphasis has been placed on postemergence treatments since preemergence treatments with these materials have been erratic.

Cyanazine, metribuzin and propham plus PPG 124 have been the most effective materials for the selective control of downy brome in winter wheat. The results of the 1973 trials are recorded in the table. Metribuzin was the most effective material in these tests although cyanazine improved yield considerably over the weedy controls. The Holdman and Echo soils, classified as silt loams, are low in organic matter (.97 to 1.2%) and herbicides can damage wheat.

Combination treatments are particularly effective because rates can be reduced for improved crop safety. Bromoxynil seems to be compatible with metribuzin, cyanazine, atrazine and propham and the combination either improves wheat yield or weed control. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Results of downy brome control in winter wheat at two locations in eastern Oregon.

		Locations[2/]			
		Holdman		Echo	
Treatment[1/]	Rate lb/A	Wheat yield lb/A	Downy brome control %	Wheat yield lb/A	Downy brome control %
metribuzin	.33	1640	99	1820	97
metribuzin + bromoxynil	.25 + .25	1900	98	1960	99
atrazine	.50	850	65	1680	82
atrazine + bromoxynil	.50 + .12	1530	100	1520	87
cyanazine	1.5	1490	94	1310	55
cyanazine + bromoxynil	1.25 + .25	1350	73	1670	85
propham	.50	1340	80	960	50
propham + bromoxynil	.50 + .12	1690	70	1010	40
handweeded	--	1770	100	1780	100
control	--	880	0	940	0

1/ Propham combined with PPG 124. 2/ Average of three replications.

Downy brome seed production as influenced by six winter wheat cultivars. Rydrych, D. J. Winter wheat cultivars differ in their ability to compete with downy brome. Data collected in 1973 and 1974 show that Moro and Paha were more efficient than other cultivars in suppressing downy brome seed production. Moro and Paha, however, were not the best grain producers in this series. Hyslop is an efficient short wheat that competes well with downy brome.

The data in the table show that downy brome seed yields range from 240-670 lb/A depending on the competition factor. Reduction in wheat yield from downy brome competition can vary from 1.7 to 16.9%. In each experiment the dry weight yields of wheat grain and downy brome seed were removed by hand. No herbicides were used to remove weeds. (Columbia Basin Research Center, Pendleton Station, Pendleton, Oregon)

Seed yield of downy brome as influenced by six winter wheat cultivars at Pendleton, Oregon[1/].

Cultivar[2/]	Downy brome	Winter wheat grain Weeded	Winter wheat grain Nonweeded	Percent wheat yield reduction
	lb/A	lb/A	lb/A	%
Moro	240	1810	1780	1.7
Paha	340	3250	2950	9.2
Wanser	380	2830	2430	14.1
Hyslop	470	3440	3050	11.3
Luke	620	3690	3130	15.2
Nugaines	670	3670	3050	16.9

1/ Average of 4 replications.
2/ Winter wheats that are commonly grown in the northwest.

Evaluation of single herbicide applications for weed control in fallow systems. Alley, H. P. and G. A. Lee. The study was initiated at the Archer Agricultural Substation to evaluate the effectiveness of single herbicide treatments for weed control in a wheat-fallow system. The treatments were applied on April 16, 1975 when the air temperature was 55 F, relative humidity 40%, skies clear and wind 3 to 5 mph. The soil at the experimental site was classified as a sandy loam (58% sand, 24% silt, 18% clay, 2.87% O.M., and 6.2 pH). All treatments were applied with knap sack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa total volume of water carrier.

The weed population consisted of 80% downy brome and Russian thistle, tansy mustard, redroot pigweed and volunteer wheat. Weed control was determined by visual evaluation 7/1/75, approximately 2.5 months following herbicide applications.

Complete control of the grass and broadleaved weeds infesting the experimental site was obtained with VEL-5026 at 2.0 and 4.0 lb/A, and Velpar + W.K. at 2.0 lb/A. The weakness of glyphosate toward the annual broadleaf weeds is attributed to germination and emergence after herbicide applications. All treatments eliminated the volunteer wheat infestation. (Wyoming Agric. Expt. Sta., Laramie, SR-690)

Percentage annual broadleaf and grass control in a wheat-fallow program, single herbicide.

Treatment	Rate lb/A	Percentage control Downy brome	Russian thistle	Tansy mustard	Redroot pigweed
VEL-5026	0.5	85 de[1]	0 d	60 c	100 a
VEL-5026	1.0	99 a	94 c	100 a	100 a
VEL-5026	2.0	100 a	100 a	100 a	100 a
VEL-5026	4.0	100 a	100 a	100 a	100 a
procyazine	2.0	40 g	100 a	81 b	0 c
Velpar + W.K.[2]	0.5	98 ab	95 bc	100 a	100 a
Velpar + W.K.	1.0	99 a	98 ab	100 a	100 a
Velpar + W.K.	2.0	100 a	100 a	100 a	100 a
cyanazine	1.6	0 g	100 a	100 a	100 a
cyanazine	2.4	40 f	100 a	100 a	95 b
glyphosate	0.375	80 e	0 d	0 d	0 c
glyphosate	0.5	92 b-d	0 d	0 d	0 c
C.V.		4.35%	2.52%	3.31%	2.63%

1/ Means with the same letter(s) in the same column are not significantly different at the 5% level.

2/ Surfactant W.K. at 1/4% v/v.

Evaluation of herbicide combinations for weed control in fallow systems. Alley, H. P. and G. A. Lee. The study was initiated at the Archer Agricultural Substation to evaluate the effectiveness of herbicide combinations for weed control in a wheat-fallow system. The treatments were applied on April 16, 1975 when the air temperature was 55 F, relative humidity 40%, skies clear and wind 3 to 5 mph. The soil at the experimental site was classified as a sandy loam (58% sand, 24% silt, 18% clay, 2.87% O.M. and 6.2 pH). All treatments were applied with a knapsack sprayer equipped with a three-nozzle boom calibrated to deliver 40 gpa total volume of water carrier. Plots were one sq rd, randomized with three replications.

The weed population consisted of 80% downy brome and Russian thistle, tansy mustard, redroot pigweed and volunteer wheat. Weed control was determined by visual evaluation 7/1/75, approximately 2.5 months following herbicide applications.

Complete elimination of the broadleaf and grassy weed infestation resulted from the two treatments, metribuzin + paraquat at 2.0 + 0.5 lb/A and metribuzin + glyphosate at 2.0 + 0.5 lb/A. Ten other treatments resulted in 100% control of the broadleaf weed spectrum, but were weak on the downy brome. Plots were seeded in August of 1975 to evaluate soil persistence and winter wheat yields. (Wyoming Agric. Exp. Sta., Laramie, SR-681)

Percentage annual broadleaf and grass control in a wheat fallow program (herbicide combinations).

Treatment	Rate lb/A	Percentage control: Downy brome	Russian thistle	Tansy mustard	Redroot pigweed
cyanazine + atrazine + paraquat	1.5 + .75 + 0.5	90 cd[1]	100 a	100 a	100 a
cyanazine + atrazine + paraquat	2.25 + .75 + 0.5	92 b-d	100 a	100 a	100 a
cyanazine + atrazine + paraquat	2.0 + 1.0 + 0.5	96 a-c	100 a	100 a	100 a
cyanazine + atrazine	1.5 + .75	92 b-d	100 a	100 a	100 a
cyanazine + atrazine	2.25 + .75	80 e	100 a	100 a	100 a
cyanazine + atrazine	2.0 + 1.0	90 cd	100 a	100 a	100 a
procyazine + glyphosate	1.0 + 0.5	91 cd	100 a	100 a	0 e
procyazine + glyphosate	2.0 + 0.5	90 cd	100 a	77 d	0 e
procyazine + atrazine + glyphosate	1.0 + 0.5 + 0.5	95 a-c	85 d	77 d	0 e
atrazine + glyphosate	0.5 + 0.5	65 f	35 f	23 f	85 d
metribuzin + paraquat	1.0 + 0.5	97 ab	90 c	83 c	97 ab
metribuzin + paraquat	2.0 + 0.5	100 a	100 a	100 a	95 ab
metribuzin + glyphosate	1.0 + 0.5	98 ab	90 c	20 f	90 c
metribuzin + glyphosate	2.0 + 0.5	100 a	100 a	100 a	100 a
atrazine + Velpar + W.K.[2]	0.5 + 1.0	95 a-c	100 a	100 a	100 a
cyanazine + paraquat	1.6 + 0.5	38 g	100 a	100 a	100 a
cyanazine + paraquat	2.4 + 0.5	38 g	91 c	57 e	100 a
cyanazine + glyphosate	1.6 + 0.5	98 ab	0 g	0 g	0 e
cyanazine + glyphosate	2.4 + 0.5	100 a	72 e	80 cd	90 c
cyanazine + carbetamide	1.6 + 2.0	0 h	98 ab	90 b	95 b
cyanazine + carbetamide	1.6 + 4.0	37 g	100 a	100 a	100 a
C.V.		4.35%	2.52%	3.31%	2.63%

1/ Means with the same letter(s) in the same column are not significantly different at the 5% level.
2/ Surfactant W.K. at 1/4% v/v.

Combinations of surfactant with low rates of glyphosate. Appleby, A. P., D. R. Harper and R. L. Spinney. In 1974, studies directed toward the control of winter wheat cover crop prior to planting of potatoes in northeastern Oregon showed that addition of surfactant to low rates of glyphosate significantly improved performance. A study was established in the spring of 1975 to further evaluate this possibility. Rates down to 0.25 lb/A were included along with two different surfactant rate ranges.

Treatments were applied to winter wheat on April 14, 1975 when the wheat was approximately 10 inches tall and well tillered. The surfactant used was MON 0011. One surfactant series was calculated so that each glyphosate treatment, regardless of glyphosate rate, contained exactly the same amount of total surfactant per acre. This was done by assuming that 1 gallon of Roundup commercial formulation contained 1.5 lb of MON 0011. As the rate of active glyphosate increased, the amount of surfactant included in the Roundup formulation increased; therefore, the amount of additional surfactant required decreased.

The other surfactant series was based upon the potential way in which the surfactant recommendation might be based; i.e., a standard rate of surfactant was added to each of the glyphosate rates. This meant that total surfactant, including the surfactant contained in the commercial formulation, increased as the rate of glyphosate increased.

Surfactant concentrations were calculated based on a concentration of 4 lb/gallon active surfactant in the MON 0011 formulation provided. Rates given in the table are expressed in pounds active surfactant added per acre. In treatments 9 through 12, .5 lb active surfactant per acre was equal to approximately 0.5% v/v of the surfactant formulation in 25 gpa.

Applications were made between 8:30 and 10:00 a.m. when foliage was moist. The percentage kill of the wheat cover crop was evaluated visually on July 15, 1975.

As in 1974, the addition of surfactant to low rates of glyphosate was dramatically beneficial. Complete wheat kill could be obtained with 0.375 lb a.e./A when surfactant was added, but it required at least 0.75 a.e. lb without additional surfactant. (Agronomic Crop Science Department, Oregon State University, Corvallis, 97331)

Effect of surfactant on glyphosate toxicity to winter wheat, Corvallis, Oregon, 1975.

Treatments	Glyphosate lb a.e./A	Rate of Added surfact. (lb/A)	% wheat control (avg of 4 reps)
1. glyphosate	.25		35
2. glyphosate	.375		55
3. glyphosate	.50		87
4. glyphosate	.75		99
5. glyphosate + MON 0011	.25	.375	95
6. glyphosate + MON 0011	.375	.313	100
7. glyphosate + MON 0011	.50	.250	100
8. glyphosate + MON 0011	.75	.125	100
9. glyphosate + MON 0011	.25	.5	94
10. glyphosate + MON 0011	.375	.5	100
11. glyphosate + MON 0011	.50	.5	100
12. glyphosate + MON 0011	.75	.5	100
13. Check	--		0

0 = no control; 100 = complete kill.

Postemergence wild oat control in spring wheat. McAllister, R. S. and J. O. Evans. A field experiment was established in North Logan, Utah to compare the effectiveness of several herbicides for postemergence control of wild oats in spring wheat. Each herbicide treatment was replicated four times in a randomized block design. The plots were 6 by 30 ft. The plots were treated June 5, 1975 while the wheat was in the 2-3 leaf stage and the wild oats were in the 2-3 leaf stage. Weather conditions at the time of application were clear, warm and calm. Four-tenths inch of rain fell on the third day following application. Treatments were applied using a bicycle sprayer with a compressed air pressure source, delivering 17 gpa water diluent. A very heavy wild oat pressure was present. Plots were evaluated by harvesting all plant material from one square meter in each plot on August 25 when wheat was mature, and separating each harvested sample into wheat, wild oat, and broadleaf weeds. Wheat yields, counts of wild oat panicles, and air dry weight of broadleaf weeds were compared.

HOE 23408 at 0.75, 1.0, 1.5 and 2.0 lb/A gave 87.3, 82.2, 95.1 and 97.4% control, respectively. The apparent decrease in yield of wheat with increasing rate of HOE 23408 might suggest a phytotoxic effect on the crop. Interpretation of wheat yields was complicated by increasing populations of broadleaf weeds with improved wild oat control. Difenzoquat at 0.5, 0.75 and 1.0 lb/A gave 25.0, 25.3 and 59.8% control, respectively. Mixtures of difenzoquat at 0.75 lb/A with the wetting agents Triton X-100 and Surfonic N-95 showed some advantage in wild oat control over the 0.75 lb/A rate alone, but were not as effective as the 1.0 lb/A rate alone. The performance of barban was disappointing at 0.25 and 0.375 lb/A against such a heavy wild oat pressure. However, the effectiveness of barban may have been adversely influenced by the high rate of diluent compared to the rate normally recommended. (Utah Agricultural Experiment Station, Logan, Utah)

Postemergence wild oat control in spring wheat. Treatments, wild oat control and wheat yield.

Treatment	Rate lb/A	Wild oats (panicles/m^2)	Wild oats (percent control)	Wheat yield (bu/A)
HOE 23408	0.75	88.5	87.3	64.9
HOE 23408	1.0	124.5	82.2	57.9
HOE 23408	1.5	34.1	95.1	61.3
HOE 23408	2.0	17.9	97.4	58.9
difenzoquat	0.5	524.1	25.0	30.3
difenzoquat	0.75	522.1	25.3	29.6
difenzoquat	1.0	280.6	59.8	43.6
difenzoquat + triton X-100	0.75 + 0.5%	402.8	42.3	33.9
difenzoquat + sulfonic N-95	0.75 + 0.5%	436.4	37.5	33.3
barban	0.25	633.4	9.3	23.4
barban	0.38	478.6	31.5	39.0
Check	--	698.6	0	16.9

Postemergence control of downy brome in winter wheat. Alley, H. P. and A. F. Gale. A postemergence series of individual and combination treatments were applied to a winter wheat field with a moderate-to-heavy infestation of downy brome on April 4, 1975. At time of treatment, the winter wheat (variety Centurk) was in the 4 to 6 tiller stage of growth with 4 to 6 inch leaf height and the downy brome 4 to 6 tillers with 1/2 to 1 1/2 inches leaf height. Ambient temperature at time of treatment was 50 F, 2.29 inches of moisture were received between April 1, 1975 and date of treatment, with only 0.38 inches from date of treatment through April 28, 1975. The soil at the experimental site was classified as a sandy loam, pH 7.4, 1.47% O.M., 66.0% sand, 24.0% silt and 10.0% clay.

All herbicide treatments were applied with a three-nozzle knapsack sprayer in a total volume of 40 gpa water carrier. Plots were 4.5 by 30 ft, randomized with three replications.

Non-weeded and handweeded plots were included in the series to ascertain the competitiveness of downy brome and phytotoxicity of the respective herbicides toward the production of winter wheat. Those plots where downy brome control was visually apparent were harvested and winter wheat yield determinations made. A one sq ft quadrat was harvested from each plot, weighed as harvested to determine the reduction (control) of downy brome.

Winter wheat yields, from nine of the treatments which gave 89% or better control of downy brome, were equal to or greater than the unweeded check. Winter wheat yields from five of the treatments were equal to or greater than the hand-weeded plots.

Downy brome control evaluations and wheat yield determinations indicated that cyanazine, cyanazine + metribuzin, terbutryn + metribuzin, metribuzin, LS69-1299, Velpar + surf. W.K., and propham (PPG115) should be further evaluated as potential candidates for downy brome control in established winter wheat. (Wyoming Agric. Expt. Sta., Laramie, SR-670)

Downy brome control and winter wheat yield.

Treatment[1]	Rate lb/A	Downy Brome lb/A	Downy Brome %Control[2]	Wheat Bu/A[3]	Observations
cyanazine	0.8	2593	29.6		
cyanazine	1.2	896	75.7		
cyanazine	1.6	408	88.9	19.4	
SD-29226	0.5	2497	32.1		
SD-29226	1.0	5026	0		
SD-29226	2.0	4129	0		
SD-29026	0.5	2817	23.5		
SD-29026	1.0	3200	13.1		
SD-29026	2.0	3361	8.7		
cyanazine +	1.0				
metribuzin	0.125	2977	19.1		
cyanazine +	1.0				
metribuzin	0.25	320	91.3	23.7	
terbutryn +	1.0				
metribuzin	0.25	384	89.5	20.2	
terbutryn +	0.5				
metribuzin	0.5	368	90.0	19.6	
terbutryn +	0.5				
procyazine	0.5	2689	26.9		
terbutryn +	1.0				
procyazine	1.0	2788	24.3		
terbutryn	1.0	1728	53.1		D. brome stunted
terbutryn +	1.0				
HOE-23408	1.0	3233	12.1	13.2	D. brome stunted
procyazine	1.6	2689	26.9		
procyazine	2.0	1536	58.3		
diuron	0.8	3779	0		
linuron	0.75	5986	0		
Velpar +	0.25				
surf. W.K.	1/2%	384	89.5	14.8	Hastened maturity
metribuzin	0.25	1761	52.1	14.6	
metribuzin	0.375	720	80.4	14.3	
metribuzin	0.5	400	89.4		
LS69-1299	2.0	384	89.5	14.4	
LS69-1299	4.0	0	100	17.2	Outstanding treatment
cyanazine +	1.6				
carbetamide	2.0	240	93.4	15.8	
napropamide	1.0	4193	0		
napropamide	2.0	5346	0		
propham (PPG115)	0.5	1825	50.4		
propham (PPG115)	1.0	2881	21.7		
propham (PPG115)	2.0	0	100	18.3	
Handweeded (check)		1150	69.8	18.2	
Check		3681		14.1	

1/ Treated 4/15/75. 2/ Percent control in comparison to yield of untreated (check). 3/ Harvested 7/17/75.

Evaluation of postemergence fall applications of herbicides for downy brome control in winter wheat. Alley, H. P. and G. A. Lee. A postemergence series of individual and combination treatments were applied to a winter wheat field known to have been previously heavily infested with downy brome. Herbicide applications were made 11/22/74 to winter wheat (variety Centurk) which had been planted 9/7/74. The winter wheat and downy brome was in the 3-5 tiller stage of growth. The top 1.5 inches of soil were dry with intermediate moisture below the 1.5 inch soil depth.

All treatments were applied with a three-nozzle knapsack sprayer in a total volume of 40 gpa water. Plots were one sq rd in size, randomized with three replications.

Wheat stand and vigor and percentage downy brome control evaluations were made on 6/20/75. Downy brome control was determined by counting the downy brome plants in 9 rows of winter wheat 10 ft long in each replication and comparing to the untreated check. Wheat stand and vigor are visual evaluations.

Winter wheat yields were not taken because of the limited infestation of downy brome which was less than one plant per 2 linear ft of row.

Six treatments resulted in 90% or better control of downy brome; however, 3 of these 6 treatments reduced the wheat stand from 38 to 81% and wheat vigor 38 to 50%. Metribuzin at 0.25 lb/A, procyazine at 2.0 lb/A and trifluralin at 1.0 lb/A appeared to be the outstanding treatments, reducing the infestation of downy brome 92 to 94% without serious reduction in stand or vigor of the winter wheat. (Wyoming Agric. Expt. Sta., Laramie, SR-679)

Winter wheat stand and vigor and percentage downy brome control.

Treatment[1]	Rate lb/A	Wheat: Percent stand reduction	Wheat: Percent vigor reduction	Downy Brome[2]: Percent control
cyanazine	0.8	0	5	51
cyanazine	1.2	0	5	64
cyanazine	1.6	0	5	64
cyanazine + dicamba	1.2 + 0.25	0	5	77
cyanazine + dicamba	1.2 + 0.5	3	18	84
cyanazine + metribuzin	1.0 + 0.125	5	8	78
cyanazine + metribuzin	1.0 + 0.25	8	15	85
metribuzin	0.25	5	10	94
metribuzin	0.5	58	38	95
terbutryn + metribuzin	1.0 + 0.25	7	17	83
terbutryn + metribuzin	0.5 + 0.5	55	42	98
procyazine	1.6	7	12	85
procyazine	2.0	17	15	94
terbutryn + procyazine	1.0 + 1.0	5	7	81
terbutryn	1.0	0	7	50
diuron	0.8	7	7	78
diuron	1.6	81	50	93
linuron	0.75	0	5	76
HOE-23408	1.0	0	0	62
trifluralin	1.0	0	0	92

1/ Treatments applied 11/22/74.
2/ Evaluations made 6/20/75.

Evaluation of preplant fall application of herbicides for downy brome control in winter wheat. Alley, H. P. and G. A. Lee. Three herbicides at various rates of application were applied preplant, one day prior to seeding, for evaluation of downy brome control in winter wheat (variety Centurk).

All treatments were applied with a three-nozzle knapsack sprayer in a total volume of 40 gpa water. Plots were one sq rd in size, randomized with three replications.

Wheat stand and vigor were determined by visual evaluations and percent downy brome control by counting the downy brome plants in 9 rows of winter wheat 10 ft long in each replication and comparing to the untreated check.

Winter wheat yield determinations were not taken because of the limited downy brome infestation which was one plant per 1.5 linear ft of row.

None of the preplant treatments caused serious winter wheat stand or vigor reduction. HOE-22870 at 4.0 lb/A resulted in 100% control of downy brome. Metribuzin at 0.375 lb/A and HOE-22870 at 2.0 lb/A reduced the downy brome stand by 87 and 88%, respectively. (Wyoming Agric. Exp. Sta., Laramie, SR-680)

Winter wheat stand and vigor and percentage downy brome control.

		Wheat		Downy brome
Treatment[1/]	Rate lb/A	Percent stand reduction	Percent vigor reduction	Percent control[2/]
HOE-23408	0.75	0	2	67
HOE-23408	1.0	0	3	52
HOE-23408	2.0	0	5	63
HOE-23408	4.0	0	7	64
HOE-22870	2.0	0	2	88
HOE-22870	4.0	0	0	100
procyazine	1.6	0	5	73
procyazine	2.4	0	5	81
metribuzin	0.375	8	10	87

1/ Treatments applied 9/6/74.
2/ Evaluations made 6/20/75.

PROJECT 6. AQUATIC AND DITCHBANK WEEDS

W. B. McHenry, Project Chairman

SUMMARY

Seven research progress reports on aquatic weeds and two on ditchbank weed control were received.

Aquatic Weeds

Two studies from California on tank-mixtures of diquat and copper (as copper sulfate) were directed toward (1) dissipation of the two herbicides in a salmon spawning channel and (2) the toxicities of several concentrations of the two herbicides on eggs, alevins, and fry of steelhead trout. At 0.75 mile downstream diquat concentrations dropped to near detectable limits, copper ion concentrations fluctuated inconsistently. Eggs survived all concentrations, alevins showed no symptoms up to 800 ppb diquat + 1200 ppb copper ion, and fry were significantly affected at 400 ppb diquat + 600 ppb copper ion.

A Washington study concludes that it is not feasible to effectively control sago or Richardson pondweed with acrolein without jeopardizing the safety of rainbow trout.

Two California studies with the white amur indicated that (1) this plant consuming fish ingests plant material more rapidly in flowing water compared to static conditions, and (2) in some instances supplemental weed control measures might be required to obtain effective control by the amur. A third report mentions a study in process to measure the influence of white amur fish on the growth and reproduction of bluegill.

Further studies of the competition effect of spikerush report that spikerush inhibited the spread of sago pondweed and to a somewhat lesser degree American pondweed. Competition influence on elodea was not encouraging.

Canalbank Weeds

On a California ditch populated with bermudagrass and johnsongrass, dalapon or cacodylic acid + MSMA were more effective than glyphosate applied in the spring; in the fall glyphosate provided excellent control of both perennial grasses.

From Washington the response of 22 reed canarygrass selections to 4 herbicides was reported. Differential grass responses were experienced with dalapon and amitrole but not glyphosate.

Influence of the white amur on the growth and reproduction of common bluegills. Yeo, R. R. and R. J. Dow. The white amur is a phytophagous fish that has proven to be an effective tool in the control of aquatic weeds in Arkansas and many countries. Use of this fish is currently illegal in California but experiments are being conducted to determine effects on the aquatic environment should this species be introduced into state waters.

Through direct or indirect competitive interaction the white amur may pose a threat to the game fisheries in California. It is paramount that the extent and nature of these interactions be determined by controlled experiments before any consideration is given to the relaxation of the laws prohibiting this species.

An experiment was initiated at the Aquatic Pest Control Research Facility in January, 1975 to determine the influence of white amurs on the growth and reproduction of a game fish, the bluegill. Two shallow quarter-acre ponds were each divided into four sections of equal perimeters. The ponds were earth-lined and served as experimental replicates. Each quadrant was stocked with 10 adult bluegills and either 0, 4, 8, or 16 two-pound white amurs. Both ponds had histories of dense infestations of horned and sago pondweeds. Ideally, the density gradient of white amurs should account for a corresponding gradient in the level of pondweed control. This condition did occur in one pond by the end of July, 1975, but none of the quadrants in the other pond exhibited any level of vegetation removal.

The influence of the amur on the population dynamics of the bluegill will not be evident until the bluegills have undergone two spawning seasons (two summers). By this time the bluegill numbers should reach the carrying capacity available within each particular quadrant, and possible competitive interaction between the amur and the bluegill will be most evident. Age ratios, weight, length, and population sizes of the bluegill will be determined in the fall of 1976 following a pond treatment with a pesticide. (U.S. Dept. of Agriculture, Agricultural Research Service, Botany Department, University of California, Davis, and Botany Department, University of California, Davis 95616)

Dissipation of diquat and copper ion in an artificial salmon spawning channel. Yeo, R. R. and N. Dechoretz. A mixture of diquat at 100 ppb plus copper ion, as copper sulfate pentahydrate, at 300 ppb was applied for 3 hours to a salmon spawning channel. The herbicidal solution was applied to control an infestation of *Cladophora*.

Four treatments were made in two 1-mile long channels. Duplicate 0.9L water samples were collected at 5 minute intervals for 20 minutes at 0.10, 0.25, 0.50, 0.75, and 1.0 mile. This procedure produced 8 samples per sampling site. Fluorescein dye, added to the water at the beginning of the treatment, was used to indicate when the treated water reached the sampling site. Chemical analyses were performed to determine the dissipation rate of each chemical. Although no quantitative measurements were made, visual observations indicated the treatments reduced the algae infestation appreciably. Concentrations of diquat declined sharply between 0.10 and 0.50 mile. Residues were near non-detectable levels at 0.75 mile. The dissipation of copper ion did not decrease gradually with unpredictable increases and decreases. (U.S. Department of Agriculture, Agricultural Research Service, Botany Department, University of California, Davis 95616)

Average concentrations of diquat and copper ion residue in salmon spawning channels.

Distance downstream	Residue: Diquat	Residue: Copper ion
miles	ppb	ppb
	Treatment No. 1	
.10	38	217
.25	13	134
.50	6	37
.75	5	97
1.00	2	60
	Treatment No. 2	
.10	16	100
.25	21	76
.50	9	78
.75	4	34
1.00	3	44
	Treatment No. 3	
.10	25	45
.25	29	40
.50	16	35
.75	4	49
1.00	4	49
	Treatment No. 4	
.10	49	171
.25	16	109
.50	11	92
.75	8	55
1.00	5	87

Evaluation of the toxicity of various concentrations of diquat and copper ion to eggs, alevins and fry of steelhead rainbow trout. Yeo, R. R. and N. Dechoretz. Trout eggs were placed in 21 shallow 6 x 6 x 3 inch trays. The trays were divided into groups of 3 and placed in 75 l tanks containing herbicidal solutions. The seven concentrations of diquat and copper ion tested were: 0 plus 0, 25 plus 35, 50 plus 70, 100 plus 150, 200 plus 300, 400 plus 600 and 800 plus 1200 ppb, respectively. The eggs were exposed for 3 hours in each treatment, rinsed and placed in Heath trays to incubate. The percent mortality was determined when the eggs hatched.

Similar procedures were followed in determining the effects of diquat plus copper on alevins and fry. The 75 l tanks contained mixtures with the following concentrations of diquat plus copper ion: 0 plus 0, 100 plus 150, 200 plus 300, 400 plus 600, 800 plus 1200, 4000 plus 6000 and 8000 plus 12000 ppb, respectively. After a 3 hour exposure period the young fish were placed in Heath incubating trays. The percent mortality was determined after 24 hours for alevins and 48 hours for fry.

None of the concentrations of diquat plus copper ion tested affected the hatchability of the steelhead trout eggs. There were no significant differences among the percent mortalities. Alevins did not exhibit symptoms of toxicity at 800 ppb of diquat plus 1200 ppb of copper ion. Significant toxicity occurred when fry were treated with 400 ppb diquat plus 600 ppb copper ion. (U.S. Department of Agriculture, Agriculture Research Service, Botany Department, University of California, Davis 95616)

Table 1. Average percent mortality of steelhead trout treated with different concentrations of diquat plus copper ion.

Treatment ppb			Percent mortality at hatching
diquat		copper ion	
0	+	0	8
25	+	35	12
50	+	70	11
100	+	150	11
200	+	300	10
400	+	600	11
800	+	1200	9

Table 2. Average percent mortality of steelhead trout alevins and fry after exposure to different concentrations of diquat plus copper ion.

Treatment ppb			Percent Mortality	
			Alevins after 24 hr	Fry after 48 hr
diquat		copper ion		
0	+	0	0	4
100	+	150	0	0
200	+	300	0	4
400	+	600	0	20
800	+	1200	0	88
4000	+	6000	100	100
8000	+	12000	100	100

Response of rainbow trout and two pondweeds to several concentrations of acrolein. Comes, R. D. and A. D. Kelley. Acrolein at a concentration of 100 ppb for 48 hours is used widely to control submersed weeds in irrigation canals. However, the treatment is extremely toxic to fish. Previous work indicated that it may be possible to suppress aquatic weed growth with acrolein at concentrations that would not be lethal to fish. This hypothesis was tested in a 22.8 mile section of the Roza Irrigation Canal near Prosser, Washington in 1975.

Acrolein was injected into the canal at a concentration of 45 ppb during a 10-day period beginning on April 16. Volume of water in the canal was 300 cubic feet per second and the water temperature averaged 52 F during the treatment period. Nine sago and nine Richardson pondweed plants were enclosed in screen containers at each of eight sampling and planting sites located throughout the test section of the canal (table). The young plants (4 to 5 inches tall) were started from tubers in aquaria maintained at the same temperature as the canal water. On April 17, ten fingerling rainbow trout were also placed in fish cages at each planting site. Triplicate water samples were collected once during the treatment period at each fish and pondweed site. The concentration of acrolein in the water samples was determined fluorometrically. The minimum level of detection of acrolein was 2 ppb.

Concentrations of acrolein at the seven sampling sites located downstream from the introduction site ranged from 39 ppb to <2 ppb, table. After 4 days, at least 50% of the fish were dead at all sites where the concentration of acrolein was 15 ppb or more. After 6 days, at least one fish was dead at all planting sites located below the introduction site. No measurable quantities of acrolein were detected at the two lowermost sampling sites.

With one exception, the weight of sago pondweed plants increased 9 to 22% during the 10 day treatment period. At most planting stations, the weight of Richardson pondweed decreased during this time. Because the largest decrease occurred at the check station (0 miles), it is apparent that some factor other than acrolein was responsible for the reduction in the weight of Richardson pondweed. Vigor of both pondweed species was reduced appreciably by the treatment in the upper 8 miles of the canal where the concentration of acrolein was 24 ppb or more.

This experiment was repeated four times during the irrigation season and at several water temperatures up to 74 F. High water temperature or heavy silt loads in the canal water confounded the fish toxicity data on the repeat treatments. However, the data indicated that it is not feasible to suppress the growth of sago and Richardson pondweed significantly with acrolein at concentrations low enough for the survival of fingerling rainbow trout. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Prosser, Washington 99350)

Effect of several concentrations of acrolein on the mortality of fingerling rainbow trout and on the weight and vigor of two pondweed species.

Sampling site #	Miles downstream[1/]	Acrolein conc. ppb	Total # fish dead after following days								% change in pondweed weight		Pondweed vigor[2/]	
			1	2	3	4	5	6	7	10	Sago	Richardson	Sago	Richardson
1	0[3/]	0	0	0	0	0	0	0	0	0	+14	-26	10	10
2	1.8	39	3	10	10	10	10	10	10	10	+ 9	+ 3	3	4
3	4.4	31	0	7	9	9	9	9	10	10	+15	-11	5	4
4	8.0	24	0	0	5	8	9	9	9	10	-16	- 8	5	5
5	11.1	15	0	0	3	6	8	8	8	9	+22	- 5	6	7
6	13.8	9	0	0	0	2	3	4	5	6	+12	- 1	6	9
7	17.6	< 2	0	0	0	0	1	1	1	1	+20	-16	7	8
8	22.8	< 2	0	0	0	0	0	1	1	1	+19	+33	10	10

1/ Miles below application site.
2/ Vigor ratings based on a scale of 0 to 10 where 10 is normal.
3/ 500 yards upstream from introduction site.

Effect of four herbicides on the stand of 22 reed canarygrass selections. Comes, R. D. and A. D. Kelley. In several previous studies on the control of reed canarygrass along irrigation ditchbanks we included amitrole-T at 4 lb/A as one of the standard treatments. The response to this treatment varied greatly in experiments conducted on two different canals in the Yakima Valley. These results suggested that varietal differences in response to herbicides may be present in this species. The objective of this experiment was to determine the response of different selections of reed canarygrass grown at a common site to four herbicides.

Clones of reed canarygrass collected from several states in the Pacific Northwest and from Minnesota, and plants propagated from seed produced in Iowa, were increased in the greenhouse. One-node stem sections with well developed rootlets were planted in the field in May 1973. Plants of a given selection were spaced 1 foot apart within the row and the row spacing was 2 feet. The field was fertilized and irrigated as needed during 1973, but no herbicides were applied. Amitrole-T at 4 lb/A, dalapon at 10 lb/A, and glyphosate at 1.5 lb/A were applied in May, 1974 and repeated in May 1975. TCA at 20 lb/A were applied in December, 1974. Glyphosate was applied in a volume of 40 gpa and the other herbicides were applied in 80 gpa. The experimental design was a split plot with herbicides as the main plots and selections as the subplots. Main plots were 44 feet wide (22 rows) by 15 feet long and subplots were 2 feet wide (1 row) by 15 feet long. The experiment was replicated three times. Visual estimates of the stand were used as the criterion to measure the effect of treatments. Data presented here were collected on October 22, 1975. All plots had a complete stand at the beginning of the study and all untreated plots still have a complete stand.

Two repeated applications of glyphosate eliminated the stand of all selections (table). There was considerable variation in the rate at which plants became necrotic, but this did not necessarily influence death and/or regeneration of rhizome and crown buds. For example, only 40% of the topgrowth on the Wyoming selection was necrotic 8 weeks after glyphosate was applied, whereas necrosis of all other selections was 95 to 100%.

TCA retarded the emergence of shoots for about 3 months in the spring as compared with untreated plants. However, the treatment did not reduce the stand of any selection.

Response of the selections to Amitrole-T or dalapon were significantly different (table). After two repeated applications of dalapon, the stand of reed canarygrass ranged from 28% (Iowa I) to 100% (several selections). Likewise, after two repeated applications of Amitrole-T the stand of reed canarygrass ranged from 12% (Yakima, WA) to 100% (several selections including Roza, WA). The selections designated Yakima and Roza, Washington were collected from canals that have the same water source and are only a few miles apart. They were the two selections that prompted this study. These data show that large differences exist between reed canarygrass populations and that these differences may have important implications when selecting control measures. (Western Region, Agricultural Research Service, U.S. Department of Agriculture, Prosser, Washington 99350)

Effect of four herbicides on the stand of 22 reed canarygrass selections. Data recorded October 22, 1975.

	% stand after treatment with[1/]			
Selection	Dalapon 10 lb/A	Amitrole-T 4 lb/A	Glyphosate 1.5 lb/A	TCA 20 lb/A
Wyoming	33 e	87 c	0 a	100 a
Roza, WA	100 a	100 a	0 a	100 a
Yakima, WA	100 a	12 f	0 a	100 a
Idaho	100 a	37 e	0 a	100 a
Huntley, MT	83 cd	100 a	0 a	100 a
Bozeman, MT	93 ab	35 e	0 a	100 a
Oregon	93 ab	100 a	0 a	100 a
P.T., WA	97 ab	57 c	0 a	100 a
Iowa I	28 e	93 bc	0 a	100 a
Iowa 2	70 d	97 ab	0 a	100 a
Ioreed	90 bc	100 a	0 a	100 a
Minn 2	100 a	97 ab	0 a	100 a
Minn 3	100 a	100 a	0 a	100 a
Minn 13	100 a	87 c	0 a	100 a
Minn 15	100 a	97 ab	0 a	100 a
Minn 25	100 a	100 a	0 a	100 a
Minn 27	40 e	92 bc	0 a	100 a
Minn 28	95 ab	15 f	0 a	100 a
Minn 1	97 ab	18 f	0 a	100 a
Minn 4	93 bc	93 bc	0 a	100 a
Minn 14	100 a	100 a	0 a	100 a
Minn 16	100 a	13 f	0 a	100 a

1/ Means within treatments that are followed by the same letter are not significantly different at the 5% level of probability.

Nature of competition between spikerush and other species of aquatic plants. Frank, P. A. and N. Dechoretz. Spikerush has been observed to replace populations of other aquatic plants in irrigation canals and ponds. Based on these observations a study was designed to demonstrate the effects of spikerush on 3 species of submersed aquatic weeds grown in cultures with spikerush.

A dense even stand of spikerush was established in 85 l tanks each containing a 10 cm layer of Yolo clay loam soil. The containers were 51 cm square with a depth of 35 cm. A corresponding number of containers were prepared with soil but without the spikerush sod. One 6 x 6 cm pot containing soil and 3 American pondweed winter buds was pressed into the soil of a container of spikerush sod. Three American pondweed winter buds were pressed individually 5 cm deep into the soil of a tank containing spikerush sod. These procedures were repeated in tanks containing soil without spikerush. Sago pondweed and Elodea were planted in the same manner as American pondweed except 4 fronds of Elodea were planted in lieu of reproductive organs. The purpose of the pots was to determine the effects of spikerush on daughter plant production from plants originating in the pot and not in direct contact with spikerush sod. These data were compared to the number of daughter plants produced from three original plants growing directly in the spikerush sod. The number of plants produced in bare soil constituted the control. Visual observations served to indicate the progress and rates of growth of Elodea. The experiment was terminated after 16 weeks.

Daughter plant production for sago and American pondweed was inhibited significantly by the presence of spikerush. Spikerush inhibited the spread of sago and American pondweed from the pot to the surrounding sod. However, the inhibitory effect of spikerush was more pronounced on sago pondweed production.

Elodea growth was not uniform or significant in containers with or without spikerush until 10 to 12 weeks after starting the test. Growth was vigorous in many of the cultures by the end of 16 weeks and, if anything, appeared to be best in tanks containing spikerush. (U. S. Department of Agriculture, Agricultural Research Service, Botany Department, University of California, Davis 95616)

Table 1. Reproduction of nonpotted and potted sago pondweed in spikerush sod and bare soil, 16 weeks after planting.

Substrate	Avg. no. of plants per container[1/]	
	Nonpotted	Potted
spikerush sod	9.3	5.5
bare soil	44	61

[1/] Average of 4 replications.

Table 2. Reproduction of nonpotted and potted American pondweed in spikerush sod and bare soil, 16 weeks after planting.

Substrate	Avg. no. of plants per container[1/]	
	Nonpotted	Potted
spikerush sod	27	25
bare soil	57	55

[1/] Average of 4 replications.

The efficacy of the white amur to control aquatic weeds in reservoirs in California. Yeo, R. R. and R. J. Dow. In May of 1973, 248 one year old amurs were stocked in a reservoir having a surface area of 1.5 A and a depth of 3 m. The fish averaged 12.5 cm in length and weighed an average of 113 g. Eurasian watermilfoil was the dominant plant species and heavily infested the reservoir. Throughout the summer of 1973 there was little evidence that the white amurs were effectively controlling the vegetation. The plants senesced during the winter and regrew early in 1974. This new growth was kept very short by amur grazing. The impoundment was completely devoid of vegetation by July, 1974 when the fish were removed and measured. The average length was 32.5 cm. The reservoir was restocked in September of 1974 with 32 fish. Since that time the fish have continually cropped the plant regrowth, leaving the entire reservois clear of rooted aquatic plants.

Another reservoir was stocked in May of 1973 with 86 one year old amurs. This reservoir had a surface area of 0.5 A, a depth of 1 m and was choked with Eurasian watermilfoil. The water clarity and shallow nature of this impoundment allowed good light penetration. The vegetation persisted throughout the winter. There was no trace of grazing in 1973, nor by July of 1974. This information indicated that in some situations it may be necessary to remove existing vegetation, either chemically or mechanically, before introducing the white amur. The amur would then maintain a continuous control of the regrowth as long as the fish is present in the system.

A third reservoir was stocked with 20 amurs in July of 1974. The fish averaged 680 g and were planted to control a dense growth of _Cladophora_ that annually infested this shallow 0.5 A reservoir. Large floating mats of the algae were observed prior to stocking. The amur were observed feeding on the _Cladophora_ soon after their release, and the mats disappeared within 10 days. This impoundment has remained free of all filamentous algae since, and the fish must now be fed regularly with pelletized food for them to obtain a maintenance diet. (U.S. Department of Agriculture, Botany Department, University of California, Davis and Botany Department, University of California, Davis 95616)

Influence of flowing water on the grazing habits of the white amur. Yeo, R. R. and R. J. Dow. Five water velocities were utilized to determine the effects of flowing water on the grazing efficacy of the herbivorous white amur fish. Trials were conducted in the fall of 1974 and 1975. Five fish, averaging 907 g, were placed in each of four outdoor canals during each trial. The canals were cement lined with a tapered depth of 1 m, a surface width of 3 m, and a total length of 55 m. The canals were paired with common returns joining each couple and a separate pump drove each pair. Each trial consisted of one simultaneous operation of the four canals. Each pair of canals was calibrated for different velocities during each trial. Thus, each trial consisted of two replicates of two treatments (velocities). Flow rates of 0.0, 0.45, 0.70, 0.90 and 1.00 fps were implemented in the experiment.

Sago pondweed was weighed and anchored in gravel within rectangular plastic trays. Forty trays were placed within each canal, and the reduction in the plant biomass was calculated at the conclusion of each trial.

Results of the experiment are listed in the table. Temperature was an influencing factor in the food consumption rate of the white amur. Trials III and V were conducted well into the fall when there were wide water temperature fluctuations. These colder temperatures caused a reduction in the grazing rate of the fish and accounted for overlapping values between treatments within these two trials.

The trials III and V were run to test the effects of two different velocities on the amur food consumption. The other three trials showed that flowing water produced a marked stimulatory effect on food consumption. In each of these trials the grazing rates of the fish were compared between flowing and static treatments. It has not been determined which velocity stimulates the greatest increase in amur food consumption. (U.S. Department of Agriculture, Agricultural Research Service, Botany Department, University of California, Davis and Botany Department, University of California, Davis 95616)

Percent foliage of sago pondweed grazed by white amurs in flowing and static water conditions in 1974 and 1975.

		1974									1975					
TRIAL NUMBER		I			II			III			IV			V		
DURATION (DAYS)		7			14			17			5			5		
TEMPERATURE (F) RANGE (START-TERMINATION)		80-70			75-70			60-52			71-81			75-63		
REPLICATES		1	2	$\bar{X}$	1	2	$\bar{X}$	1	2	$\bar{X}$	1	2	$\bar{X}$	1	2	$\bar{X}$
VELOCITY (fps)	0.00	43	57	50	43	100	72	21	10	16	50	48	49		--	
	0.45		--			--			--			--		27	49	38
	0.70	100	95	98		--			--			--			--	
	0.90		--			--			--		94	74	84	55	59	57
	1.00		--		90	100	95	18	71	45		--			--	

1/ $\bar{X}$ = average value of the replicates.

Ditchbank perennial weed control with glyphosate. Kempen, H. M. Applications were made 9/13/72 and 4/20/73 to compare fall versus spring treatments of glyphosate. The ditchbank was infested with bermudagrass and johnsongrass. Bermudagrass was 6/12 inches tall, seeded and dense on 9/13/72. The ditch carried water two weeks before the treatment so that soil moisture was good. Temperatures ranged from 65-90 F daily.

At the spring treatment, bermudagrass was dense and vigorous but I have no data on the soil moisture condition.

Glyphosate fall treatments provided excellent control of bermudagrass and johnsongrass but because of their control, lambsquarters were prevalent in treated plots. In untreated plots other winter annuals such as foxtail barley, redstem filaree, fiddleneck and six others outcompeted the lambsquarters.

Evaluations after spring treatments showed johnsongrass seedlings developed and became perennials during 1973. Bermudagrass seedlings did not develop. Bermudagrass and johnsongrass control was much poorer from spring treatments, especially below the water line, which fluctuated in the ditch. Cacodylic acid plus MSMA or dalapon both were superior to glyphosate in the spring comparison. However, glyphosate was much more effective on summer annual weeds.

I found no evidence of drift damage to adjacent cotton on a December planting of wheat. The use of glyphosate showed promise for effective control of all weed species present but new seedlings quickly germinated and replaced the deceased species. (Cooperative Extension, Univ. of Calif., Bakersfield)

Evaluation of glyphosate for perennial weed control on ditchbanks.

Treatment	Date applied	lb/A	Bermudagrass Control 4/20	6/7	7/2	8/14	Johnsongrass Control 4/20	6/7	7/2	8/20	Annuals[1/] 4/20	6/7
Untreated	--	--	0.0	0.0	0.0	0	0.0	0.0	3.8	2.5	10	2.3
glyphosate 4S	9/13/72	2.7	9.5	8.7	7.3	8.3	9.8	2.3	3.5	0.0	0	0.0
glyphosate 4S	9/13/72	5.4	9.4	8.8	8.8	7.8	9.7	2.8	2.5	0.0	0	0.0
glyphosate 4S	4/20/73	2.7	--	5.3	3.8	1.0	--	3.8	4.8	1.8	--	9.8
glyphosate 4S	4/20/73	5.4	--	7.0	5.5	5.0	--	6.5	4.5	1.8	--	10.0
cacodylic acid + MSMA	4/20/73	1 1/4 + 3	--	1.0	0.0	0.0	--	3.5	7.0	7.3	--	5.8
dalapon	4/20/73	10	--	3.0	5.5	0.3	--	4.3	6.8	3.3	--	5.3
LSD .05				1.7	1.3	1.6		4.1	3.2	3.4		3.9

Rated 0 to 10: 0 = no effect; 10 = 100% control.

1/ Evaluation on 4/20/73 was on lambsquarters. Competition from other weeds kept it from emerging in the check.

PROJECT 7. CHEMICAL AND PHYSIOLOGICAL STUDIES

Gary M. Booth, Project Chairman

SUMMARY

Two progress reports were received from a total of three authors.

Imbibed and non-imbibed seeds of johnsongrass were exposed to two levels of ultra-high frequency (UHF) electromagnetic energy to determine effects on germination. After 6 months, seeds unexposed to UHF showed 44% germination, 27% were decayed, whereas seeds initially exposed to 90 j/cc of UHF were nearly all decayed regardless of seed imbibtion. Non-imbibed seeds were uneffected, but 73% of the imbibed seeds were decayed after 45 j/cc of UHF. In general, the data show that UHF energy was phytotoxic to dormant johnsongrass seeds.

Field persistence of seven dinitroaniline herbicides was studied by treating isolated soil plots with field use rates. Cores taken at regular intervals were potted, millet seeds were planted in the greenhouse, and millet foliage was harvested 10 days later. The dry weight yield in the treated pots was compared to the controls to determine phytotoxicity. In general, the data showed a decreasing trend in phytotoxicity over time except for dinitramine, isopropalin, and profluralin. The May data showed total loss of phytotoxicity for all of the herbicides except dinitramine, isopropaline, nitralin, and oryzalin which suggests that the latter four chemicals may carry over in sandy clay loam soils.

<u>The effects of ultra-high frequency (UHF) electromagnetic energy on the germination of johnsongrass seeds.</u> Millhollon, R. and R. Menges. Imbibed and non-imbibed seeds of johnsongrass were placed in test tubes partially filled with air-dried sandy loam soil. Some were exposed to 45 or 90 j/cc (joules/cubic centimeter) of UHF (2450 MHz) and some were unexposed. Maximum soil temperatures were 59 and 94 C for 45 and 90 j/cc, respectively. Seeds were maintained for 6 months at 20 to 35 C with a daily exposure to 8-hr light and 16-hr dark periods. Recordings on percentage germination and decay were made weekly. After 6 months, unexposed seeds were 44% germinated, 29% non-germinated, and 27% decayed, and seeds initially exposed to 90 j/cc of UHF were nearly all decayed regardless of seed imbibition. Non-imbibed seeds

were unaffected but 73% of imbibed seeds were decayed after 45 j/cc of UHF. Data indicate that UHF energy was phytotoxic to dormant johnsongrass seeds. Exposure to UHF apparently caused injury which predisposed the seeds to attack by decay organisms. (Agricultural Research Service, U.S. Depart. of Agr., P. O. Box 267, Weslaco, Texas 78596, and U.S. Sugarcane Laboratory, Box 470, Houma, Louisiana 70360, respectively)

Field persistence of seven dinitroaniline herbicides. Zimdahl, R. L. The dinitroaniline herbicides are a rapidly expanding and widely used group of pesticides. Their primary use is in the south on cotton and soybeans, and they are used on several crops in Colorado. It has been reliably estimated that the dinitroanilines may account for 8 to 10 percent by volume of all domestic herbicide sales. These studies were conducted in conjunction with laboratory studies on soil persistence of dinitroaniline herbicides to gain a better understanding of their soil behavior in Colorado.

In the past we have employed a standard plot technique to evaluate field persistence of herbicides. The 10 x 10 ft plots have been sprayed with herbicide, using a bicycle plot sprayer. Then crops have been planted, at prescribed intervals, with a Planet Junior planter. These plots were often unsuccessful because of excessive weed problems and the difficulty of getting good crop emergence late in the season. Therefore, for this study a plot consisted of one number 10 tin can, with top and bottom removed. The 6 x 6 inch cans were driven into prepared soil on 12 inch centers in four replications. A total of 168 cans (plots) were used (seven herbicides x four replications x six harvest dates). Herbicides were applied by carefully distributing 50 ml of water (equivalent to 122 gpa) on the soil surface within each can. Each can was watered with the equivalent of 1/2 acre-inch after treatment and after each subsequent sampling date. Soil samples were taken immediately after treatment on May 20, and June 20, July 19, Aug. 9, and Sept. 19, 1974 by removing a 4 x 5 inch core from the center of each can. Samples were again taken on May 20, 1975. The cores were immediately potted with minimum disturbance and taken to the greenhouse. Thirty millet seeds were planted in each pot, and millet foliage was harvested for dry weight yield 10 days later. The dry weight yield in treated plots was compared to untreated checks. The herbicides were applied at field use rates, and leaching was not prohibited. Based on other studies with dinitroanilines, leaching was presumed to be insignificant. The design of the study permitted measurement of the persistence of phytotoxicity but precluded any statements on rate or mode of degradation. Other than the anomalous data for dinitramine, isopropalin, and profluralin in August, a reasonable decreasing trend in phytotoxicity is shown. The May data showed apparent total loss of phytotoxicity for all herbicides except dinitramine, isopropalin, nitralin, and oryzalin which may carry over in soils similar to this sandy clay loam (pH 7.8, 51%S., 26% Si, 23% C, 1.8% O.M.). We have no explanation for the increased growth from trifluralin. The data for nitralin and oryzalin are unique but not without precedent. A similar postwinter surge in activity was noted with three triazines in a field study we reported in 1968. One hypothesis is that the compounds are released from the adsorbed state by the freezing and thawing effects on soil, and thus, are made more available for plant uptake. (Weed Research Laboratory, Colorado State University, Fort Collins, 80523)

Herbicides, rates, and yields -- field persistence study, 1974-1975.

Herbicide	Rate lb/A	Dry weight yield of proso millet as % of check					
		May '74	June	July	Aug.	Sept.	May '75
butralin	2.0	22	34	33	106	100	98
dinitramine	0.5	29	28	24	106	68	63
isopropalin	1.0	29	46	56	100	54	81
nitralin	1.5	13	22	18	75	75	48
profluralin	0.75	29	40	22	103	44	97
oryzalin	0.75	14	21	27	63	90	53
trifluralin	0.75	22	29	25	59	76	134

AUTHORS

AUTHORS (continued)

CROPS

CROPS (continued)

HERBACEOUS WEEDS

(arranged alphabetically by scientific name)

HERBACEOUS WEEDS (continued)

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(arranged alphabetically by common name)

WOODY PLANTS

FISH AND INSECTS

HERBICIDE COMMON NAME OR DESIGNATION

This table was compiled from approved nomenclature adopted by the Weed Science Society of America (Weed Science 23(6), 1975 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
acrolein	acrolein	178
alachlor	2-chloro-2',6'diethyl-N-(methoxy= methyl)acetanilide	26, 62, 103, 105, 107, 109, 111, 113, 115, 117
amitrol-T	3-amino-s-triazole + ammonium thiocyanate	181
AMS	ammonium sulfamate	37
asulam	methyl sulfanilylcarbamate	21, 76, 83
atrazine	2-chloro-4-(ethylamino)-6-(iso= propylamino)-s-triazine	3, 32, 77, 109, 111, 115, 117, 158, 162
barban	4-chloro-2-butynyl m-chloro= carbanilate	101, 155, 165
BASF-84361 x	Unavailable	137
BAY-NTN-6867	0-methyl-0-(4-methyl-2-nitrophenyl)-1-methylethyl phosphoramidothioate	61, 109
benefin	N-butyl-N-ethyl-α,α,α-trifluoro-2,6-dinitro-p-toluidine	90
bensulide	0,0-diisopropyl phosphoro= dithioate S-ester with N-(2-mer= captoethyl)benzenesulfonamide	58, 65
bentazon	3-isopropyl-1H-2,1,3-benzothia= diazin-(4)3H-one 2,2-dioxide	17, 65, 129

HERBICIDE COMMON NAME OR DESIGNATION (continued)

Common Name or Designation	Chemical Name	Page
benthiocarb	S-(4-chlorobenzyl)N,N-diethyl=thiolcarbamate	49, 57
bifenox	methyl 5-(2,4-dichlorophenoxy)-2-nitrobenzoate	57, 97, 103, 117
bioxone	see methazole	
bromacil	5-bromo-3-sec-butyl-6-methyluracil	3
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile	57, 99, 153, 158
bulab-37	3',5'-dinitro-4-(di-N-ylamino) acetophenone	51
butralin	4-(1,1-dimethylethyl)-N-(1-me=thylpropyl)-2,6-dinitro=benzenamine	51, 65, 94, 107, 191
butylate	S-ethyl diisobutylthio=carbamate	109, 111, 113
cacodylic acid	hydroxydimethylarsine oxide	6, 188
carbetamide	D-N-ethyllactamide carbanilate (ester)	162, 167
CDEC	2-chloroallyl diethyl=dithiocarbamate	53
CGA-24705	2-chloro-N-(2-ethyl-6-methylphenyl)-N-2-methoxy-1-methylethyl)acetamide	62, 103, 105, 107, 109, 115, 117
chloramben	3-amino-2,5-dichloroben=zoic acid	53
chloroflurenol	methyl-2-chloro-9-hydroxy=fluorene-9-carboxylate	12
chlorpropham	isopropyl m-chlorocarbanilate	83, 84, 87, 90

HERBICIDE COMMON NAME OR DESIGNATION (continued)

Common Name or Designation	Chemical Name	Page
copper sulfate	copper sulfate pentahydrate	175, 177
cyanazine	2-[[4-chloro-6-(ethylamino)-s-triazin-2-yl]amino]-2-methyl= propionitrile	109, 111, 113, 115, 117, 153, 158, 160, 162, 167, 169
cycloate	S-ethyl N-ethylthiocyclo= hexanecarbamate	92, 132, 134
cyperquat	1-methyl-4-phenylpyridinium	25, 68, 70
dalapon	2,2-dichloropropionic acid	6, 32, 136, 137, 140, 181, 188
DCPA	dimethyl tetrachlorotereph= thalate	53, 61, 65, 83, 84
desmedipham	ethyl m-hydroxycarbanilate carbanilate (ester)	136, 137, 140, 143, 147, 150
dicamba	3,6-dichloro-O-anisic acid	10, 12, 15, 27, 30, 109, 131, 169
dichlobenil	2,6-dichlorobenzonitrile	3, 21, 26, 76
dichlorprop	2-(2,4-dichlorophenoxy) propionic acid	39
difenzoquat	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium	57, 99, 101, 165
dinitramine	N^4,N^4-diethyl-α,α,α-trifluoro-3,5-dinitrotoluene-2,4-diamine	62, 94, 103, 105, 107, 121, 122, 191
dinoseb	2-sec-butyl-4,6-dinitrophenol	72, 87, 90
diphenamid	N,N-dimethyl-2,2-diphenylace= tamide	51
diquat	6,7-dihydrodipyrido[1,2-α:2',1'-c]pyrazinediium ion	175, 177,

HERBICIDE COMMON NAME OR DESIGNATION (continued)

Common Name or Designation	Chemical Name	Page
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea	24, 87, 97, 119, 121, 122, 127, 155, 167, 169
Dowco 290	3,6-dichloropicolinic acid	10, 15, 27, 30, 56, 125
DPX-1108	Unavailable	56, 68, 70
DPX-3674	3-cyclohexyl-6-(dimethylamino)-1-methyl-5-triazine-2,4(1H,3H)-dione	3
EL-161 (common name eithalfluralin)	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoromethyl) benzeneamine	49, 51
endothall	7-oxabicyclo[2.2.1] heptane-2,3-dicarboxylic acid	142
EPTC	S-ethyl dipropylthiocarbamate	3, 62, 90, 92, 94, 97, 103, 105, 107, 109, 111, 113, 117
ethofumesate	2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methane=sulphonate	132, 134, 142, 147
fluchloralin	N-(2-chloroethyl)-2,6-dinitro-N-propyl-4-(trifluoromethyl) aniline	97
fluoromidine	6-chloro-2-trifluoromethyl-3H-imidazo(4,5-b) pyridine	105, 107
FMC-25213	r-2-ethyl-5-methyl-c-5-(2-methylbenzyloxy)-1,3-dioxane	26, 49, 51, 53, 62 68, 70, 97, 150
GK-40	Unavailable	10, 15, 27
glyphosate	N-(phosphonomethyl)glycine	2, 6, 8, 12, 17, 23, 24, 25, 37, 47, 56, 57, 68, 70, 72, 157, 160, 162, 164, 181, 188

Common Name or Designation	Chemical Name	Page
GS-14254	2-sec-butylamino-4-ethylamino-6-methoxy-s-triazine	77, 87, 97
GSA-24705	2-chloro-N-(2-ethyl-6-methyl=phenyl)-N-(2-methoxy-1-methyl=ethyl)acetamide	26
H-22234	N-chloroacetyl-N-(2,6-diethyl=phenyl)glycine ethyl ester	61, 62, 105, 132, 134, 142
H-25893	N-chloroacetyl-N-(2,6-dimethyl=phenyl)glycine ethyl ester	58
H-26905	O-ethyl-O-(3-methyl-6-nitrophenyl)-N-sec-butyl-phosphorothioamedate	26, 49, 53, 57, 68, 70, 107
H-26910	N-chloroacetyl-N-(2-methyl-6-ethylphenyl)-glycine isopropyl ester	58
HOE-22870	Unavailable	137, 171
HOE-23408	Methyl 2-[4-(2,4-dichloro=phenoxy) phenoxy] propanoate	77, 83, 101, 136, 137, 140, 150, 155, 165, 167, 169, 171
isopropalin	2,6-dinitro-N,N-dipropyl=cumidine	191
karbutilate	tert-butylcarbamic acid ester with 3-(m-hydroxyphenyl)-1,1-dimethylurea	3, 39
linuron	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea	62, 167, 169
LS69-1299	Unavailable	167
M-3724	triethylamine salt of triclopyr	10, 15, 27, 41
M-3785	3,6-dichloropicolinic acid + (2,4-dichlorophenoxy) acetic acid	10, 15, 27

Common Name or Designation	Chemical Name	Page
1,3-D	1,3-dichloropropene	20, 45
oryzalin	3,5-dinitro-$\underline{N}^4$,$\underline{N}^4$-dipropyl= sulfanilamide	66, 68, 70, 72, 191
oxadiazon	2-tert-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)-Δ^2-1,3,4-oxadiazolin-5-one	66, 72, 74, 77
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion	47, 72, 87, 127, 154, 157, 162
pebulate	S-propyl butylethyl= thiocarbamate	51, 53, 58
penoxalin	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine	51, 68, 70, 94, 103, 107, 117, 119, 121
perfluidone	1,1,1-trifluoro-N-[2-methyl-4-(phenylsulfonyl)phenyl]methane= sulfonamide	61, 65, 74, 119
phenmedipham	methyl m-hydroxycarbanilate m-methylcarbanilate	134, 136, 137, 140, 143
picloram	4-amino-3,5,6-trichloro= picolinic acid	10, 12, 15, 27, 30, 39
PPG-124	p-chlorophenyl-N-methyl carbamate	83, 84, 87, 90, 153, 158
procyazine	2-[[4-chloro-6-(cyclopropyl= amino)-1,3,5-triazine-2yl] amino]-2-methylpropanenitrile	109, 115, 117, 160, 162, 167, 169, 171
profluralin	N-(cyclopropylmethyl)-α,α,α-trifluoro-2,6-dinitro-N-propyl-p-toluidine	62, 90, 94, 103, 105, 107, 121, 122, 191
prometryn	2,4-bis(isopropylamino)-6-(methylthio)-s-triazine	122
pronamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl)benzamide	3, 59, 83, 84, 87, 93, 97, 123, 127, 134

HERBICIDE COMMON NAME OR DISIGNATION (continued)

Common Name or Designation	Chemical Name	Page
propanil	3',4'-dichloropropionanilide	57
propham	isopropyl carbanilate	90, 134, 142, 153, 158, 167
pyrazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone	132, 134, 136, 137, 140, 142
R-11913	Unavailable	132
R-25788	N,N-diallyl-2,2-dichloro=acetamide	62, 109, 111, 113, 117
R-29148	2,2,5-trimethyl-N-dichloro=acetyl-oxazolidine	109
R-31401	Unavailable	68, 70, 109, 113
R-37878	Unavailable	61, 68, 70, 132, 136
RH-2512	Unavailable	61, 68
RH-2915	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-Trifluoro=methyl benzene	56, 70, 74, 87
RP-20630	Unavailable	68, 70
RP-20810	2-isopropyl-4-(2,4-dichloro-5-propynyl oxyphenyl)-1,3,4-oxadiazole-5-one	68, 70
SD-29026	Unavailable	87, 167
SD-29226	Unavailable	49, 94, 167
SD-50093	a 1:2 mixture of atrazine + cyanazine	115, 117
siduron	1-(2-methylcyclohexyl)-3-phenylurea	3
silvex	2-(2,4,5-trichlorophenoxy) propionic acid	30, 37

HERBICIDE COMMON NAME OR DISIGNATION (continued)

Common Name or Designation	Chemical Name	Page
simazine	2-chloro-4,6-bis(ethylamino)-s-triazine	2, 6, 8, 24, 66, 68, 70, 76, 77, 97
SN-45311	Unavailable	68, 70
SN-49962	Unavailable	68, 70
TCA	trichloroacetic acid	142, 181
tebuthiuron	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea	3
terbacil	3-tert-butyl-5-chloro-6-methyluracil	3, 87, 93, 97, 127
terbutryn	2-(tert-butylamino)-4-(ethylamino)-6-(methylthio)-s-triazine	153, 167, 169
triallate	S-(2,3,3-trichloroallyl) diisopropylthiocarbamate	101, 155
triclopyr	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid	10, 12, 15, 25, 27, 30, 39, 56
trifluralin	α,α,α-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine	2, 6, 8, 17, 20, 24, 51, 60, 62, 65, 76, 94, 103, 105, 107, 119, 121, 122, 169, 181
2,4-D	(2,4-dichlorophenoxy)acetic acid	10, 12, 15, 27, 30, 37, 39, 47, 99
2,4-DB	4-(2,4-dichlorophenoxy)butyric acid	90
U-27267	3,4,5-tribromo-N,N-a-trimethyl pyrazole-1-acetamide	49
U-44078	Unavailable	68, 70
USB-3153	Unavailable	74, 77, 94
VCS-5052	2-chloro-N-(2,6-dimethyl=phenyl)-N-[(1,3-dioxolan-2-yl)methyl] acetamide	49, 68, 70, 94, 107, 117
VEL-4207	Unavailable	10, 15, 27, 30, 68, 70

HERBICIDE COMMON NAME OR DESIGNATION (continued)

Common Name or Designation	Chemical Name	Page
VEL-4359	Unavailable	10, 15, 27
VEL-5026	Unavailable	97, 117, 162
Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl-s-triazine-2,4(1H,3H) dione	160, 162, 167
vernolate	S-propyl dipropylthiocarbamate	62, 109, 111, 113

SURFACTANTS

ABBREVIATIONS USED IN THIS REPORT

A	acre(s)
a.i.	active ingredient
a.e.	acid equivalent
bu	bushel(s)
C	degrees centigrade
cm	centimeter(s)
cwt	100 pounds
F	degrees farenheit
fps	feet per second
ft	foot or feet
ft^2	square feet
gal	gallon(s)
gpa	gallons per acre
gpm	gallons per minute
ha	hectare
hr	hour(s)
in.	inch(es)
j/cc	joules/cubic centimeter
kg	kilogram(s)
l	liter(s)
lb	pound(s)
m	meter(s)
min	minute(s)
ml	milliliter(s)
mph	miles per hour

ABBREVIATIONS USED IN THIS REPORT (continued)

oz . . . . ounce(s)

ppb . . . . parts per billion

ppm . . . . parts per million

psi . . . . pounds per square inch

pt . . . . pint

sq . . . . square

rd . . . . rod

wt . . . . weight

WA . . . . wetting agent