WESTERN SOCIETY OF WEED SCIENCE

Research Progress Report

FORWARD

This is the 1973 Annual Research Progress Report of the Western Society of Weed Science. It consists of summaries and abstracts of weed science research concerning recent weed investigations and submitted voluntarily by the membership for personnel engaged in research, extension, regulatory and commercial work. It will be supplemented by the Proceedings of the Western Society Weed Science Meetings following the March 1973 conference of the Society in Spokane.

The Research Committee consists of seven Research Project Chairmen and a Committee Chairman. The assembling and summarizing of information in each of the seven areas has been the responsibility of the Project Chairman. Time permitted only cursory editing and correcting obvious errors. Information contained in the Research Progress Report should be considered tentative and NOT FOR PUBLICATION. Abstracts should not be reproduced without permission of the authors. Reports printed in the Progress Report does not constitute prior publication.

This report does not contain recommendations for herbicides, nor does it imply that the uses discussed in the text are registered by the Environmental Protection Agency. An occasional use of registered trade names has been done for information purposes only and does not imply endorsement of commercial product by 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 American has been used. The common names of herbicides has followed the report of the Terminology Committee of the Weed Science Society where possible; an attempt was made to give the full chemical name of numbered compounds if possible.

FORWARD (continued)

To all those who have contributed reports of their research and findings, the Research Committee extend their gratitude and the Chairman extends his thanks to the Chairman of each of the Research Projects for editing and assembling their sections and meeting the deadlines imposed upon them. Sincere appreciation is extended to Bill Varga and Blaine Jones in reading and organizing the final Report and the Carrie Nielson for her sacrafice in preparing and typing the manuscript.

John O. Evans
Chairman, Research Committee
Western Society Weed Science

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PROJECT 1. PERENNIAL HERBACEOUS WEEDS

Donald E. Baldridge, Project Chairman

SUMMARY

Twenty-three reports were submitted by fifteen authors from four states and covered results obtained on thirteen perennial herbaceous weed species. These reports are summarized by weed species as follows:

Field bindweed (*Convolvulus arvensis* L.). Dicamba at 1, 2 and 4 lbs. per acre gave 90 percent or better control when layered below surface in Wyoming with trifluralin and fenac also giving better than 90 percent control. Shank injected fenac was not as effective as surface applications. Combinations of fenac and dicamba showed greater activity than corresponding rates of either herbicide alone. Rates of 1, 3-D soil fumigant down to 200 lbs. per acre gave near commercial control in California, but had to be followed with a subsequent treatment for seedling control. Glyphosate was very effective at rates of 2 to 4 lbs. per acre, but when the rate was reduced to 1.5 lbs. per acre or less control was not satisfactory.

Bracken fern (*Pteridirem aquilenum*). Asulam at 3, 6 and 9 lbs. per acre gave 95 to 100 percent control of bracken fern one year after application in western Oregon as compared to 20 percent control from a 4 lb. per acre application of dicamba. Evaluation prior to twelve months after application may be premature.

Broadleaf dock (*Rumex obtusifolius*). Asulam at 2 and 4 lbs. per acre provided excellent control of this species in Oregon. Only a few plants remained at the 2 lbs. rate and none in those plots treated with 4 lbs. per acre. Alfalfa and tall fescue appeared to have adequate tolerance to asulam.

Ladysthumb (*Polygonum persicaria*). Asulam was less effective in controlling ladysthumb than dock, but acceptable control was obtained with either 2 or 4 lbs. per acre rates, with more than one application needed for complete control.

Tansy ragwort (*Senecio jacobaea*). Asulam gave better than 90 percent control at both the 2 and 4 lb. per acre rates, with early post being more effective than bud stage applications. Glyphosate was more effective at the bud stage, but not quite as good as asulam in an Oregon trial. Glyphosate did give excellent control of velvetgrass in this test.

Pepperweed (*Lepidium latifolium*). Metribuzin and karbutilate gave from 50 to 60 percent control of perennial pepperweed under limited rainfall in California as compared to 30 to 40 percent control from bromocil and terbacil respectively.

Musk thistle (*Carduus nutans*). Glyphosate at 1 lb. per acre gave 95 percent kill of this species in Wyoming with all plants being eliminated by increasing the rate to 1.5 lbs. per acre. Seedlings would have to be controlled with second applications because of short soil life of glyphosate.

Johnsongrass (*Sorghum halepense*). Glyphosate was more effective than MSMA on a pound for pound basis in the control of Johnsongrass. Glyphosate was very effective in controlling this species at the 2 lb. per acre rate, but only gave 10 to 30 percent control at the 0.5 to 1 lb. per acre rates. A combination of glyphosate and MSMA offered no advantage over glyphosate alone.

Quackgrass (*Agropyron repens*). Glyphosate at the rate of 4 lbs. per acre gave 90 to 98 percent control of a very old dense sod of quackgrass in Oregon as compared to 60 to 80 percent control with a 2 lb. per acre rate. A June application (heading) was more effective than either an April (titlering) or October (approaching dormancy) application.

Bermudagrass (*Cynodon dactylon*). Two applications of glyphosate at the rate of 4 lbs. per acre or more were required to achieve a high level of control of bermudagrass in California. The addition of amitrole or dalapon did not result in a higher level of control. Both asulam and bromorxnil desiccated the short tissue but did not reduce the stand and were ineffective in controlling this apecies.

Dallisgrass (*Paspalum dilatatum*). Dallisgrass control with a single application of 2 to 8 lbs. per acre of glyphosate was 95 to 99 percent as compared to 25 to 50 percent control from dalapon and MSMA.

Desert saltgrass (*Distichlis stricta*). The application of 4 to 8 lbs. per acre of bromacil, karbutilate or metribuzin did not provide acceptable protection to an asphalt shoulder from saltgrass in California. Control greatly improved with a second winter application particularly with bromacil.

Purple nutsedge (*Cyperus rotundus*). The initial control of purple nutsedge was best where the herbicides were mechanically incorporated into the soil. Terbacil, atrazine and San-6706 were more effective than linuron or prometryn. Dichlobenil was more effective than EPTC but not as good as terbacil, when number of shoots per plant were used as a measure of control.

Evaluation of subsurface layering of herbicides for control of field bindweed (*Convolvulus arvensis* L.). Alley, H. P., G. A. Lee, and A. F. Gale. A Noble blade was fitted with nozzles and other necessary adaptations for subsurface layering of herbicides. The herbicides listed in the following table were layered approximately 6.0 inches deep in 63 gpa water.

The field bindweed was in the bud stage of growth at time of treatment. Soil moisture was near field capacity and afforded no problems to the layering unit.

Visual evaluations of the percent reduction of field bindweed regrowth was made 8/29/72 approximately three months after the treatments were made.

All treatments resulted in 90 percent or better reduction in bindweed regrowth except EPTC which showed no activity. At time of evaluation no differences between the activity of trifluralin at 1.0, 2.0, or 4.0 lb/A could be detected. The emerging bindweed plants were stunted and showed considerable chemical damage. Plots where dicamba was layered at 1.0, 2.0, and 4.0 lb/A resulted in 90 percent or better reduction in stand and the emerging plants were badly damaged.

The combinations of trifluralin + fenac were no more effective than respective rates of the individual herbicides. The addition of 2.0 and 3.0 lb/A of 2,4-D amine to the 1.0 lb/A rate of dicamba did not add to the percentage reduction of field bindweed obtained by the layering of 1.0 lb/A dicamba. The same was evident with the trifluralin + dicamba combination. (Wyoming Agricultural Experiment Station, Laramie SR-435.)

Bindweed control - subsurface layering of herbicides[1/]

Treatment	Rate/A	% Control	Observations[2/]
trifluralin	1.0	95-98	Some small bindweed emerging. Buckwheat not controlled. Bindweed stunted and weak.
trifluralin	2.0	95-98	No difference noted between rates at evaluation.
trifluralin	4.0	95-98	
fenac	2.0	90	Bindweed stunted - weak.
fenac	4.0	90	Bindweed stunted - weak.
trifluralin + fenac	2.0 + 2.0	90	Bindweed plants severely damaged.
trifluralin + fenac	2.0 + 4.0	98	Bindweed plants small - brittle - badly damaged.
dicamba	1.0	90	Several small bindweed emerging.
dicamba	2.0	90	Several small bindweed emerging.
dicamba	4.0	94	Several small bindweed emerging.
dicamba + 2,4-D amine	1.0 + 2.0	90	Same as dicamba 1.0 lb/A
dicamba + 2,4-D amine	1.0 + 3.0	90	Same as dicamba 1.0 lb/A
EPTC	4.0	0	No activity.
trifluralin + dicamba	1.0 + 1.0	90	Small bindweed emerging.

1/ Treatments applied with Noble blade 6/9/72 approximately 6 in. deep.

2/ Visual observations made 8/29/72.

Comparison of injection and surface application of herbicides for control of field bindweed (*Convolvulus arvensis* L.) on winter wheat fallowed land. Alley, H. P., G. A. Lee and A. F. Gale. Preliminary research conducted in 1969-70 and reported in the 1971 WSWS Research Progress Report prompted further evaluation and comparison of soil-injected and surface applications of fenac, dicamba, and combinations of the two compounds for field bindweed control.

A winter wheat production area which was heavily infested with field bindweed was selected for the study site. The experimental area has been cultivated prior to establishment and treatment of the plots. The area was free of any vegetative growth and was in good tilth for injection of the herbicides. The plot area received no further mechanical treatment until after evaluations were made.

The soil injected treatments were applied with a unit constructed for experimental purposes. The unit had seven nitrogen injection shanks set on one-ft. centers. All injected treatments were applied in a total volume of 30 gpa water to an average depth of 8 in. Surface treatments were applied with a truck-mounted spray unit in a total volume of 17 gpa water. The plots were 14 ft. wide, 130 ft. long, and randomized with three replications.

Visual evaluations were made 6/9/72, approximately 11 months following the 7/7/71 treatment. The injection of fenac resulted in poor field bindweed control, whereas, the surface applications of an equivalent rate showed greater herbicidal activity. Although both the surface-applied and soil-injected dicamba gave outstanding reduction in vegetative regrowth of field bindweed, the surface treatment appeared to be the better treatment.

Results obtained from the 1971-72 study, and reported herein, are reversed from the 1969-70 studies. The preliminary studies (1969-70) indicated that fenac was more effective than dicamba when applied as an early summer treatment. Data obtained from the 1971-72 replicated series of plots indicate greater activity from dicamba than fenac.

Combinations of fenac and dicamba showed greater activity than corresponding rates of either herbicide alone, especially on the bindweed plants emerging on the treated plots. (Wyoming Agricultural Experiment Station, Laramie SR-434.)

Stand reduction of field bindweed resulting from soil injected and surface applied fenac and dicamba

Treatment[1]	Rate lb/A	% Reduction in stand	Observations
fenac (inj)	3.0	30	Very little activity - some malformation of bindweed leaves
fenac (inj)	4.5	35-40	Very little activity - some malformation of bindweed leaves
fenac (inj)	6.0	50	Very little activity - some malformation of bindweed leaves
fenac (surf)	6.0	75	Bindweed plants small, badly damaged
fenac (surf)	9.0	85	Bindweed plants small, yellow, badly damaged
fenac (surf) (gran)	9.0	50	Bindweed plants small, yellow, badly damaged
dicamba (inj)	2.0	85-90	Activity present on bindweed annuals growing actively
dicamba (inj)	4.0	90	Only stubs of bindweed present, annuals growing actively
dicamba (surf)	4.0	95	Surface application appears better than injection
dicamba (surf)	6.0	98	Very good - only limited amount of bindweed regrowth
fenac + dicamba (inj)	2.0 + 2.0	90	Only stubs of bindweed present, annuals present
fenac + dicamba (inj)	4.0 + 2.0	95	Good treatment - only stubs of bindweed present

[1] Herbicides injected with fertilizer shanks set on 12 in. center, 8 in. deep. Surface treatments applied with truck-mounted rig.

Bindweed Control with 1,3-D soil fumigants. Lange, A. and J. Perez. Earlier studies with deep injection of 1,3-D soil fumigants showed that rates of 500 to 2000 lbs. gave excellent long term control approaching eradication of bindweed. The object of this rate study was to determine the most efficient rate for bindweed control.

The DD fumigant was injected 17" deep at 2 foot centers in dry Oxalis clay loam with hand fumigun injector on 6/15/72. The crops were seeded 7/18, about 1 month later and rated 8/23/72 and 9/11/72.

The results substantiated the early spring results that 500 lbs/A of 1,3-D fumigants will control perennial bindweed when injected near 1½ feet on 2 foot centers. The results further showed that lower rates down to 200 lbs/A gave considerable reduction perhaps sufficient to reduce bindweed competition for crops.

It is further clear that under these conditions seedling bindweed must be controlled with a persistent preemergence or preplant incorporated herbicide. The selection will depend on the crop to be planted.

Milo showed no effects of seeding one month after fumigation, however, there was a slight reduction in the early growth of safflower at 2 months after planting at 400 and 500 lbs/A. More work of this nature with many crops is needed. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of DD fumigant on the control of perennial and seedling bindweed and injury to crops planted 4 weeks after fumigant injection at 17" depth and 12" centers.

		Average[1/]					
		Perennial	Seedling	Phytotoxicity[2/]		Vigor[3/]	
Fumigant	lbs/A	Bindweed	Bindweed	Milo	Safflower	Milo	Safflower
DD	200	7.5	0.5	0.8	1.5	8.8	7.5
DD	300	8.8	0.5	1.0	2.2	8.0	6.5
DD	400	9.8	0.5	0.2	2.0	7.5	4.0
DD	500	10.0	1.8	2.5	1.2	8.0	5.5
Check	-	2.5	0.0	1.0	2.5	0.0	5.8

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

2/ Phytotoxicity rating where 0 = no effect, 5 = half stand or half damaged, 10 = complete kill or loss of stand. Rated 8/23/72.

3/ Vigor rating where 0 = no stand or no growth; 5 = half stand or half size; 10 = most vigorous plants. Rated 9/11/72.

Comparison of effectiveness of glyphosate with other herbicides for control of field bindweed. Alley, H. P. and G. A. Lee. Glyphosate (N-(phosphonomethyl) glycine] at 0.5, 1.0 and 1.5 lb/A, picloram at 1.0 lb/A, dicamba at 2.0, 4.0 and 6.0 lb/A, and 2,4-D LVE at 2.0 lb/A was applied to field bindweed (*Convolvulus arvensis* L.) on 6/9/72 when the plant was in the early flowering stage of growth.

All treatments were one sq. rd. in size, randomized with three replications. Treatments were applied with a knapsack sprayer in 40 gpa water.

Evaluations made 8/29/72 showed a yellowing and leaf burning on the field bindweed plants treated with glyphosate with very little if any kill apparent. There seemed to be no difference between the 0.5 and 1.5 lb/A rate at time of evaluation. Picloram at 1.0 lb/A gave a 90 percent, dicamba at 2.0, 4.0, and 6.0 lb/A 98 to 100 percent, and 2,4-D LVE at 2.0 lb/A a 75 percent reduction in the top growth of field bindweed.

It appears that the rates of application of the glyphosate were too low for effective reduction in top growth of bindweed. (Wyoming Agricultural Experiment Station, Laramie SR-439).

Herbicides and combinations for bindweed control and residual activity in the soil. Lange, A. Fall applied translocated herbicides often give good bindweed control the following spring. The 4 lb/A rate of 2,4-D gave commercial bindweed control until about 5/11/72. By 9/11/72 the plots had regrown, however, dicamba was still giving control at 4 and 8 lb/A. The residual activity from dicamba on barley at one month was excessive. However, when milo was seeded 7/18/72 and evaluated in the fall the injury was minimal compared with the weed competition. Had the plots received adequate water the response of milo might have been much different.

None of the combinations of the common herbicides with maleic hydrazide greatly altered the control of bindweed.

Glyphosate produced a striking effect on bindweed, reflected more in the excellent growth of barley than the later bindweed ratings. It is apparent that bindweed requires more than one application of glyphosate. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The residual effect of herbicides on milo planted 10 months after treatment. (A36-10-502-B10-71)

		Average 1/				
				Seedling Bindweed Control	Barley Vigor	Milo Vigor
	lb/A	Bindweed Control				
Herbicide	ai	5/11/72	9/11/72	5/11/72	5/11/72	9/11/72
2,4-D	1.0	5.0	1.8	0.7	5.2	7.8
2,4-D	4.0	7.0	2.0	2.0	7.5	7.5
2,4-D	8.0	8.0	3.2	3.0	8.2	6.8
Dicamba (Banvel-D^{R})	1.0	8.5	4.8	0.0	3.2	7.5
Dicamba	4.0	9.5	7.2	4.0	0.5	8.8
Dicamba	8.0	10.0	8.2	6.5	0.0	8.8
MSMA	1.0	3.2	2.8	0.0	3.2	6.5
MSMA	2.0	1.2	5.0	0.0	3.7	6.8
MSMA	4.0	2.2	4.5	1.2	4.2	7.2
MSMA	8.0	3.2	4.2	0.0	4.5	8.2
Broadside^{R}	4.0	1.2	4.8	0.0	3.2	7.2
Broadside^{R}	8.0	1.7	4.5	0.0	5.5	7.8
2,4-D	1.0	3.2	2.2	2.3	5.5	8.2
maleic hydrazide	2.0					
2,4-D	2.0	5.2	2.0	1.5	4.5	8.0
maleic hydrazide	4.0					
Dicamba	1.0	9.0	4.5	2.0	1.7	8.2
maleic hydrazide	2.0					
Dicamba	2.0	9.5	5.5	0.7	0.7	7.8
maleic hydrazide	4.0					
MSMA	2.0	1.7	5.8	1.7	6.0	8.2
maleic hydrazide	2.0					
MSMA	4.0	1.7	6.2	0.0	4.2	7.0
maleic hydrazide	4.0					
Broadside^{R}	4.0	3.2	3.2	1.5	6.2	7.0
maleic hydrazide	4.0					
Maleic hydrazide	2.0	0.0	0.0	0.0	1.2	5.2
Maleic hydrazide	4.0	0.5	1.0	0.0	4.7	6.2
Maleic hydrazide	8.0	3.7	1.2	1.2	5.2	6.5
Glyphosate	4.0	4.4	4.5	0.0	9.0	7.2
Check	-	0.2	0.5	0.0	6.2	2.0

1/ Treated 11/19/71, seeded 12/15/71 and 7/18/72, evaluated 9/11/72. Average of 4 replications, where 0 = no effect, 10 = 100% control. Water restricted so growth not optimum on milo and barley.

Control of bracken fern with one foliar application of asulam. Smyth, E. P. Four trials were established in western Oregon for the control of bracken fern (*Pteridium aquilinum*) with asulam (sodium salt of methyl sulfonylcarbamate) and dicamba in June and July of 1971.

Foliar treatments of asulam were applied at rates of 3.0, 6.0 and 9.0 lb/A and dicamba at 4.0 lb/A. All treatments included a surfactant applied at 1% of the total spray volume. The bracken fern stage of growth was full frond development, each frond completely unrolled. Applications were made with a hand carried spray boom and CO_2 backpack sprayer at 20 gpa.

The tests were evaluated in October 1971 and again in October 1972, fifteen months after application. The results listed in the following table were reported initially as percent frond desiccation and later as percent control. Due partially to the slowness of asulam and the dense rhizome system produced by bracken fern, evaluations prior to twelve months after application are premature.

All rates of asulam provided 95 to 100% control of bracken fern one year after application. Dicamba exhibited good frond desiccation three months after application, however, provided only 20% control at one year. Stem counts on 1972 bracken fern regrowth, from one non-replicated trial, revealed 0 to 4 live stems in the asulam plots, 72 stems in the dicamba and 126 stems in the untreated check. Plot area for each treatment was 300 square feet. (Rhodia Inc., Chipman Division, Product Development Department).

Bracken fern desiccation and control
with asulam and dicamba plus surfactant 1/
1971 - 1972

Herbicide	Rate lb/A	% Desiccation October 1971 2/	% Control October 1972 2/
Asulam + R-11	3.0 + 1%	68	95
Asulam + R-11	6.0 + 1%	83	98
Asulam + R-11	9.0 + 1%	80	99
Dicamba + R-11	4.0 + 1%	67	22
Untreated Check	-0-	25 3/	0

1/ Foliar applications of 20 gpa made in June and July of 1971.
2/ Average ratings from 3 trials and 3 replicates for each trial.
3/ Natural frond desiccation due to plant senescence.

Broadleaf dock and ladysthumb control. Burr, R. J. Broadleaf dock (*Rumex obtusifolius*) and ladysthumb (*Polygonum persicaria*) are two of the most troublesome weed problems in coastal area pastures. Most of these pastures contain white clover as a prime forage species, which precludes the use of dicamba as a selective control measure.

Two replicated experiments were established in Tillamook county, near Cloverdale, Oregon, to evaluate the effectiveness of asulam for broadleaf dock and ladysthumb control. Asulam was applied on July 5, 1972, when the established broadleaf dock was in the early bloom stage and the ladysthumb was in early bud, at 1, 2, and 4 lb/A. One location was in a pasture that had been planted on May 15, 1972 with H-1 perennial ryegrass, Fawn tall fescue, and New Zealand white clover. The tall fescue and ryegrass were 4 to 6 inches tall and the white clover had 1 to 2 trifoliate leaves when asulam applications were made. Also, at this location most of the broadleaf dock was in the seedling stage of growth with 2 to 4 leaves.

Asulam at 2 and 4 lb/A provided excellent control of broadleaf dock, with complete control of the seedlings even at 1 lb/A, at both locations. The established dock plants that were not killed were initiating growth from axillary buds and appeared to be recovering. However, very few dock plants remained in the 2 lb/A plots and there was 100% control at 4 lb/A.

Asulam was less effective in controlling the ladysthumb. Both 2 and 4 lb/A rates provided acceptable control, but those plants that remained had initiated new growth. More than one application would be required to eliminate this weed.

Tall fescue and perennial ryegrass seedlings did show initial chlorosis, but had recovered by October 10, 1972 when evaluations were made. It appears that these species do have adequate tolerance to asulam, but further evaluations should be made. Weed species present in the plots which were not controlled included creeping buttercup (*Ranunculus repens*), hedge mustard (*Sisymbrium officinale*), barnyardgrass (*Echinochloa crusgalli*), and nightshade (*Solanum* sp.).

Similar trials on broadleaf dock control in alfalfa in Klamath county indicated very good control of the dock with asulam at 2 lb/A. Complete dock control was obtained with asulam at 4 lb/A with no apparent alfalfa injury. (Dept. of Agronomic Crop Science, Oregon State Univ., Corvallis.)

Tansy ragwort control. Burr, R. J. Tansy ragwort (*Senecio jacobaea* L.) is a livestock-poisoning weed that caused more than 1.2 million dollars in livestock losses in Oregon in 1971. Approximately 4 million acres in western Oregon are infested with this weed. 2,4-D low-volatile (LV) ester at 3.0 lb/A provides effective control, but there are many areas where this treatment does not have adequate selectivity. Such areas include alfalfa hay fields, grass-clover pastures, clover fields, and conifer reforestation sites. Because of the lack of adequate selective controls and the large impact on Oregon's economy, alternate control methods for tansy ragwort were evaluated.

Replicated trials were established at two locations near Corvallis on April 18, 1972 to evaluate the effectiveness of glyphosate (*N*-(phosphonomethyl)- glycine), asulam, BAS 3512H (3-isopropyl-1*H*-2,1,3-benzothiadiazin-(4)3*H*-one-2,2-dioxide), 2,4-D (LV ester), MCPA (LV ester), and dicamba for tansy ragwort control. The effects of these herbicides on common velvetgrass (*Holcus lanatus* L.) also were evaluated. At the time of this application, tansy ragwort was present as 2- to 4-inch seedlings and as 3- to 6-inch rosette plants. The common velvetgrass was 4 to 6 inches tall. At one location, plots also were sprayed with asulam or glyphosate when the tansy ragwort was in the bud stage and common velvetgrass was in full flower. All plots were evaluated on July 10, 1972.

Asulam was applied at 2 and 4 lb/A both early postemergence and at bud stage of the tansy ragwort. At least 98% tansy ragwort control was obtained from all applications. Earlier applications were slightly more effective, but seed formation was prevented by bud stage applications. Glyphosate was more effective as a bud stage application at 1 and 2 lb/A. Some tansy ragwort plants recovered in the early postemergence plots where glyphosate was applied at 1 and 2 lb/A. 2,4-D LV ester at 3.0 lb/A gave 100% tansy ragwort control when applied on April 18. MCPA LV ester and dicamba were less effective than 2,4-D for tansy ragwort control. The only herbicide not showing activity on tansy ragwort was BAS 3512H.

Glyphosate was the only herbicide giving excellent common velvetgrass control at both locations, with later applications giving 100% control. Asulam killed many of the velvetgrass plants and severely retarded maturity of those that remained, although later asulam applications had less effect on the common velvetgrass.

Asulam was the most promising herbicide for tansy ragwort control in these trials and should be evaluated further at rates of 2 lb/A and less. (Dept. of Agronomic Crop Science, Oregon State Univ., Corvallis.)

Control of perennial pepperweed (*Lepidium latifolium* L.) with four nonselective soil-active herbicides under limited rainfall. McHenry, W. B.[1], D. E. Bayer[2], N. L. Smith[1], and R. K. Glenn[2]. Good to excellent control of hoary cress (*Cardaria draba* (L.) Desv.) with terbacil has been reported. An experiment was initiated along the shoulder of a gravel road to measure the efficacy of two uracil herbicides, bromacil and terbacil, on perennial pepperweed. Karbutilate and metribuzin were also included. A plot size of 300 sq. ft. was employed; all treatments were replicated four times using a knapsack sprayer fitted with a 3 nozzle boom. The soil was a clay loam. A low rainfall season occurred resulting in only 1.3 in. following treatment on February 15, 1972.

Perennial pepperweed control with four nonselective soil-active herbicides following limited rainfall.

Herbicide	Formulation	Acre rate		Control(10=100%)	
		A.i.	Formul.	5/11/72	7/25/72
bromacil	80% ai (wp)	4 lb	5 lb	1.5	2.8
bromacil		8	10	3.3	2.3
bromacil		12	15	4.3	2.8
karbutilate	80% ai (wp)	4	5	2.0	3.5
karbutilate		8	10	2.3	4.8
karbutilate		12	15	3.0	4.8
metribuzin	70% ai (wp)	4	5.7	3.3	3.8
metribuzin		8	11.4	4.8	5.5
metribuzin		12	17.2	6.0	6.2
terbacil	80% ai (wp)	4	5	1.0	1.8
terbacil		8	10	2.3	2.5
terbacil		12	15	3.8	4.0
control	--	-	-	-	-

Under conditions of very limited rainfall and minimal leaching, metribuzin and karbutilate reduced the perennial pepperweed stand about the same magnitude. The two uracil herbicides were less effective but should be tested further under improved leaching conditions. (Agricultural Extension 1/ and Agricultural Experiment Station 2/, Botany Department, University of California, Davis).

Musk thistle (*Carduus nutans* L.) control in Wyoming. Lee, G. A. and H. P. Alley. Musk thistle was treated with glyphosate [N-(phosphonomethyl) glycine] at .5, 1.0 and 1.5 lb/A on June 1, 1972. The plants were 12 to 14 inches tall and in the pre-bud stage at the time of treatment. Glyphosate was applied in 40 gpa of water carrier. Plots were evaluated September 8, 1972.

Glyphosate at .5 lb/A resulted in severe retardation of growth and leaf burning; however, the stems remained green. The apical meristematic region was severely affected resulting in flower production from the axillary buds. Approximately 50 percent of the plants contained secondary flower stalks at the time of evaluation.

Glyphosate at 1.0 lb/A gave 95 percent kill of plants in the treated area. Approximately 10 percent of the remaining plants exhibiting green tissue produced axillary flowers.

Musk thistle plants were eliminated by the 1.5 lb/A rate of glyphosate. The treated area was void of standing dead stalks. In all areas treated with glyphosate regardless of rate, an extremely heavy stand of musk thistle seedling rosettes were present at the time of evaluation. Additional control measures must be utilized to control seedlings since glyphosate is extremely short lived in the soil. (Wyoming Agriculture Experiment Station, Laramie, SR-446).

Comparison of glyphosate and MSMA alone and in combination for the control of johnsongrass (*Sorghum halepense* (L.) Pers.). McHenry, W. B. 1/, D. E. Bayer 2/, L. L. Buschmann 3/, N. L. Smith 1/ and R. K. Glenn 2/. An established johnsongrass stand on a farm ditchbank was selected for an experimental site to compare the efficacy of glyphosate [N-(phosphonomethyl) glycine] and MSMA. The formulations of both herbicides contained surfactant. The plot size used contained 200 sq. ft.; all treatments were replicated four times. Glyphosate + MSMA combinations were tank mixed and applied simultaneously using a knapsack sprayer. A uniform spray volume of 40 gpa was employed in all herbicide treatments; application dates were June 15 and July 28, 1972. The effects of these two treatment dates and subsequent retreatments will be evaluated with more reliance in 1973. Stand reduction from the first two treatments was substantiated in part by rhizome sampling on the 1972 evaluation dates reported and the data are believed to be a reliable index of kill.

Johnsongrass control with glyphosate, MSMA and glyphosate + MSMA

Herbicide	Formulation	Acre rate A.i.	 Formul.	Control (10=100%) 7/28/72	 9/22/72
glyphosate	3 lb ae/gal	0.5 lb	0.2 gal	0.3	1.0
glyphosate		1.0	0.3	0.5	2.0
glyphosate		2.0	0.7	7.3	9.6
MSMA	6 lb ai/gal	4.0	0.7	0.0	1.0
glyphosate + MSMA		0.5 +0.5	0.2 +0.1	0.3	0.8
glyphosate + MSMA		0.5 +1.0	0.2 +0.2	1.3	1.8
control	--	-	-	0.0	0.0

The response of johnsongrass to glyphosate in this experiment was the most promising of the foliage-applied herbicides tested to date. What appeared to be tolerant johnsongrass strains appeared in nearly all plots treated with glyphosate at 0.5 and 1.0 lb/A; there was no suggestion of this at 2 lb/A. Stand reduction with MSMA following two applications was comparable to somewhat less than results observed in previous field experiments. Stand reductions with glyphosate-MSMA combinations at the rates employed offered no advantage over the results observed with glyphosate alone. (Agricultural Extension 1/ and Experiment Station 2/, Botany Department, University of California, Davis; Agricultural Extension, Sutter County 3/, Yuba City).

A comparison of the movement of MSMA and glyphosate in johnsongrass. Lange, A. Flowering johnsongrass was sprayed at two ditchbank locations 5 miles apart on 7/25/72. At 4, 24, 48 and 96 hours plots were cut to ground level. At 2-3 weeks after treatment the regrowth was rated on the basis of 0-10.

The results showed MSMA required about 24 hours to move into the johnsongrass in the first trial and considerably less in the second trail, i.e., closer to 4 hours. Whereas the glyphosate moved somewhat more rapidly and more effectively in something less than 24 hours in both trials. Only part of the glyphosate at the 1.5 lbs/A rate had moved into the johnsongrass in 4 hours in effective amounts.

The higher rate of both herbicides moved in more effectively than the lower rate.

Glyphosate was more effective than MSMA on a pound-for-pound basis. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Table 1. The effect of cutting johnsongrass off at ground level 4-96 hours after treatment

		Average 1/			
Herbicide	lb/A	4 hrs.	24 hrs.	48 hrs.	96 hrs.
Glyphosate	1.5	5.3	1.7	3.7	1.3
Glyphosate	3.0	3.7	0.0	1.3	0.0
MSMA	3.0	6.7	4.0	7.0	3.7
MSMA	6.0	6.3	2.3	5.3	2.7
Check	-	10.0	9.7	9.0	9.0

1/ Average regrowth from 3 replications where 0 = no regrowth, 10 = most vigorous regrowth 20 days after treatment. (Evaluated 8/14/72, treated 7/25/72 at 9 a.m.)

Table 2. The effect of cutting johnsongrass off at ground level 4-96 hours after treatment

		Average 1/			
Herbicide	lb/A	4 hrs.	24 hrs.	48 hrs.	96 hrs.
Glyphosate	1.5	7.3	3.0	2.7	3.7
Glyphosate	3.0	3.3	0.3	1.7	0.7
MSMA	3.0	6.7	1.0	1.0	0.3
MSMA	6.0	2.7	1.0	0.7	0.0
Check	-	8.0	8.3	8.0	7.7
Check	-				9.0

1/ Average vigor of regrowth, where 0 + no regrowth, vigorous regrowth at 11 days. (Treated 7/25/72, 1 a.m., Evaluated 8/5/72)

A comparison of 5 postemergence herbicides for the control of johnsongrass and bermudagrass. Lange, A. Newly potted johnsongrass and bermudagrass transplanted from the field into gallon cans were sprayed April 1, 1972 in 100 gpa water. The regrowth was rated for control where 0 = no effect and 10 = complete kill of above ground tissue or no regrowth.

Glyphosate was effective on both species when applied at 2 lbs/A but not at ½ lb/A. Asulam was more effective than MSMA on johnsongrass in this test. Neither chemical was effective on bermudagrass. A single application of paraquat affected both species but did not give complete control of ½-2 lbs/A. The ½ lb/A appears to have done as much damage as the 2 lbs/A rate which suggests small repeated applications should be evaluated under field conditions.

MSMA in a single application was only partially effective on johnsongrass and ineffective on bermudagrass. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

A comparison of 5 herbicides on newly potted johnsongrass and bermudagrass cuttings. (A36-73-502-2-72)

		Average 1/ control i.e., on regrowth	
Herbicide	lb/A	Johnsongrass	Bermudagrass
Paraquat	½	7.5	4.0
Paraquat	2	5.5	3.0
Glyphosate	½	2.0	0.0
Glyphosate	2	10.0	7.0
Asulam	½	3.5	0.0
Asulam	2	10.0	0.0
2,4-D	½	1.0	0.0
2,4-D	2	1.5	0.0
MSMA	½	3.0	0.0
MSMA	2	5.5	1.0
Check	-	1.0	0.0

1/ Average of two replications where 0 = no effect; 10 = complete kill.

Quackgrass control with glyphosate. Appleby, A. P., P. D. Olson, and D. R. Colbert. Glyphosate (N-(phosphonomethyl)glycine) has shown bright promise for control of many annual and perennial weeds. Plots were established in the spring of 1971 with one of the formulations of this material, MON 0468, to evaluate its effectiveness against quackgrass (*Agropyron repens*). Rates of glyphosate of .5, 1, 2 and 4 lb/A were applied on April 30, 1971, June 8, 1971, and October 21, 1971. MON 0027 surfactant at 1% v/v was added to each treatment. Treatments were applied in 34 gal of water per acre. On the first date, quackgrass was 9 inches tall with two to three tillers per plant. On June 8, the quackgrass was

2 to 3 feet tall and was beginning to head. Fall qpplication plots were mowed on September 16 and treated on October 21 when the quackgrass was 4 inches tall and beginning to show signs of winter dormancy.

Ratings of quackgrass control, taken on July 12, 1972, are shown in the following table. Quackgrass control from the 4 lb rate was quite good when applied in April or June, especially considering the fact that the quackgrass population was extremely high. The experimental area was a solid sod of quackgrass that had been growing in that area for many years. The plots were undisturbed between the time of application and evaluation in 1972. Control was slightly better from the June treatment than from the April treatments. Control from the first two applications, especially at the higher rates, was much greater than from the October treatment although it must be pointed out that quackgrass sprayed in October was regrowing from being mowed in September.

The front half of each plot was treated with 2 lb/A of glyphosate as MON 2139 on June 19, 1972. At the time of evaluation on July 12, 1972, 100% of quackgrass top growth was killed from the 1972 treatment. Some *Equisetum arvense* was surviving both the 1971 and the 1972 treatments. No other plants survived the glyphosate applications but the sprayed plots were invaded soon after the death of the quackgrass with a wide variety of broadleaf annual weeds, indicating that the glyphosate was rapidly inactivated in soil. (Dept. of Agron. Crop Sci., Ore. St. Univ., Corvallis.)

Glyphosate on Quackgrass--Timing Study
Corvallis, Oregon
Applied 1971, Evaluated July 12, 1972

Treatment	Rate Lb a.i./A	% Quackgrass Control I	II	III	Avg
April 30, 1971					
1. MON 0468	½	10	10	10	10
2. MON 0468	1	0	0	0	0
3. MON 0468	2	65	85	40	63
4. MON 0468	4	95	80	90	88
June 8, 1971					
5. MON 0468	½	20	0	30	17
6. MON 0468	1	45	20	40	35
7. MON 0468	2	85	75	85	82
8. MON 0468	4	98	90	90	93
October 21, 1971					
9. MON 0468	½	50	40	20	37
10. MON 0468	1	40	40	65	48
11. MON 0468	2	65	50	70	62
12. MON 0468	4	75	50	75	67
13. Check	0	0	0	0	0

Response of bermudagrass (*Cynodon dactylon* (L.) Pers.) to glyphosate, glyphosate + amitrole, and glyphosate + dalapon. McHenry, W. B. 1/, D. E. Bayer 2/, and N. L. Smith 1/. Foliage-applied herbicide treatments were established on a canalbank densely populated with established bernudagrass. Plot size was 240 sq. ft.; all treatments were replicated four times. Treatments were applied at a spray volume of 40 gpa with a knapsack sprayer fitted with a three nozzle boom. The glyphosate [N-(phosphonomethyl)glycine] formulation used (MON 2139) contained surfactant and none was added to any of the treatments. Although the winter rainfall was less than 50% (8.6 in.) of normal, good shoot vigor suggested that percolation of canal water into the berm was augmenting moisture reserves from rainfall. The otherwise typical dry summer ended with 0.8 in. of rain in September and 2.6 in. during October.

Control of bermudagrass on a canalbank with glyphosate applied alone and in combinations with amitrole and dalapon on April 28 and August 10, 1972.

Herbicide	Formulation	Acre rate a.i.	 Formul.	Control (10=100%) 8/10/72	 11/1/72
glyphosate	3 lb ae/gal	2 lb	0.7 gal	2.3	3.0
glyphosate		4	1.3	4.3	9.0
glyphosate		6	2.0	4.5	9.9
glyphosate		8	2.7	6.3	9.9
glyphosate + amitrole	amitrole:90% ai	2 + 4	0.7 gal +4.4 lb	2.3	2.5
glyphosate + dalapon	dalapon:74% ae	2 + 10	0.7 gal +13.5 lb	1.3	1.0
control	--	-	-	0.3	0.0

Two applications of glyphosate at 4 lb ai or more were required to achieve a high level of control. The addition of amitrole at 4 lb/A or dalapon at 10 lb/A to glyphosate did not effect a higher level of control. (Agricultural Extension 1/ and Agricultural Experiment Station 2/, Botany Department, University of California, Davis).

Response of bermudagrass (*Cynodon dactylon* (L.) Pers.) to glyphosate on a non-crop site. McHenry, W. B. and N. L. Smith. A preliminary trial was initiated October 15, 1971, on a roadside bermudagrass stand to measure the potential of glyphosate [N-(phosphonomethyl)glycine] for the control of this persistent perennial grass. Retreatments were made May 2, 1972, and August 10, 1972, using the same application rates. The plots, located on a clay loam soil, were 340 sq. ft.; two replications were employed. All glyphosate applications were made at 50 gpa using a knapsack sprayer. The glyphosate formulation used (MON 2139) contained surfactant. Rainfall during the 1971-72 winter was less than 50% (8.6 in.) of normal creating an early season soil moisture depletion. Moisture stress is presumed to have reduced glyphosate transport in the bermudagrass.

Bermudagrass control on a roadside with glyphosate (50 gpa)

Herbicide	Formulation	Acre rate		Control (10=100%)		
		A.I.	Formul.	4/11/72	8/11/72	11/1/72
glyphosate	3 lb ae/gal	1 lb	0.3 gal	0	0.5	0
glyphosate		2	0.6	0	4.0	6.0
glyphosate		4	1.3	0.5	8.0	9.8
glyphosate		8	2.6	3.0	6.0	9.9
control	--	-	-	0.0	0.0	0.0

Although growing conditions were presumably less than optimum for a translocatable herbicide because of low soil moisture, glyphosate greatly reduced the bermudagrass stand following two and three applications. Inadvertent shallow disking in one replication, perhaps 2 in. deep, sometime prior to the second treatment, May 2, 1972, appeared to markedly increase the stand reduction by 20-50% in that replication. (Agricultural Extension, Botany Department, University of California, Davis).

Response of bermudagrass (*Cynodon dactylon* (L.) Pers.) on a roadside to asulam and bromoxynil. McHenry, W. B. and N. L. Smith. A dense stand of bermudagrass along a Yolo county road was selected as a site to compare asulam + 1% surfactant (Surfax R) + non-phytotoxic oil (Chevron Spray Stock Z R) and relatively high rates of bromoxynil + 1/2% surfactant (Surfax R). The bermudagrass vigor at the initiation of the experiment was good, typical at least of bermudagrass on roadsides and other noncrop sites where soil moisture derived from winter rains is gradually reduced during the summer season. Treatments were made June 21, 1971 (50% bloom) and May 2, 1972 (10% bloom). Plot size was 360 sq. ft.; all treatments were replicated three times. The soil was a clay loam; spray volume was 200 gpa.

Bermudagrass response to asulam and bromoxynil

Herbicide	Formulation	Acre rate		Control (10=100%)		
		A.i.	Formul.	9/17/71	5/2/72	7/26/72
asulam 1/	3.3 lb ai/gal	4 lb	1.2 gal	0	0	0
asulam 1/		8	2.4	0	0	0
bromoxynil 2/	2 lb ai/gal	4	2.0	0	0	0
bromoxynil 2/		8	4.0	0.3	0	0
control	--	-	-	0.0	0	0

1/ asulam treatments included 1% surfactant (Surfax R) + 2% oil (Chevron Spray Stock Z R)

2/ bromoxynil treatments included 1/2% surfactant (Surfax R)

Although both asulam and bromoxynil desiccated the shoot tissue, no stand reduction was effected. (Agricultural Extension, Botany Department, University of California, Davis).

Response of dallisgrass (*Paspalum dilatatum* Poir.) to dalapon, glyphosate, and MSMA. McHenry, W. B. and N. L. Smith. Established dallisgrass growing above the water line on a canal berm was treated October 18, 1971, with dalapon + 1/4% surfactant (X-77 R), glyphosate [N-(phosphonomethyl)glycine], and MSMA + 1/4% surfactant. Plot size was 100 sq. ft. and the experiment contained two replications. Spray volume for all herbicide treatments was 50 gpa. The soil was a heavy clay. All plots were treated with atrazine 20 lb ai/A on December 17, 1971, for the control of annual weeds and dallisgrass from seed. The relatively high rate is typically required to reduce the effect of high leaching loss at the water line.

Dallisgrass control with dalapon, glyphosate, and MSMA

Herbicide	Formulation	Acre rate		Control (10=100%)		
		A.I.	Formul.	4/7/72	5/11/72	7/26/72
dalapon	74% ae	20	28 lb	5.5	7.5	2.0
glyphosate	3 lb ae/gal	2	0.7 gal	10.0	9.9	9.5
glyphosate	(included	4	1.3	9.9	9.9	8.5
glyphosate	surfactant	8	2.7	9.9	9.9	9.5
MSMA	6.6 lb ai/gal	8	1.2	2.0	2.5	0.0
control	--			0.0	0.0	0.0

Dallisgrass control with the single glyphosate application was remarkable compared to standard dalapon and MSMA treatments. The response to dalapon and MSMA agreed with the results from previous testing. The winter maintenance application of atrazine may have preferentially enhanced the glyphosate response. (Agricultural Extension, Botany Department, University of California, Davis).

Control of desert saltgrass (*Distichlis stricta* (Rorr.) Rydb.) on a roadside with bromacil, karbutilate, and metribuzin. Mullen, R. J. 1/, W. B. McHenry 2/, and N. L. Smith 2/. The strong rhizomatous growth of saltgrass, like that of bermudagrass (*Cynodon dactylon* (L.) Pers.), under asphalt destroys the structural integrity of the pavement shoulder through the heaving action caused by shoot emergence. Previous field experiments with a number of soil-active herbicides tested for the control of saltgrass have not demonstrated effective or economical control of this species.

An experiment was initiated along a Contra Costa county roadside heavily populated with saltgrass January 8, 1971, with bromacil and karbutilate employing four replications. Metribuzin was included in a single replication for purpose of preliminary observation. All herbicides were reapplied at the original rates January 21, 1972. Plot area was 260 sq. ft.; the soil was a sandy loam containing 1.8% organic matter. Applications were made with a knapsack sprayer and each plot covered twice.

Desert saltgrass control with bromacil, karbutilate, and metribuzin applied January 8, 1971 and January 21, 1972

Herbicide	Formulation	Acre rate		Control (10=100%)		
				7-21-71	5-19-72	
		A.i.	Formul.	Over-all	Over-all	Edge
bromacil	80% ai (wp)	4 lb	5 lb	3.0	5.8	7.1
bromacil		6	7.5	3.3	6.0	10.0
bromacil		8	10	4.8	7.5	10.0
karbutilate		4	5	1.0	4.3	6.8
karbutilate		6	7.5	2.8	5.3	7.8
karbutilate		8	10	2.8	5.0	9.3
metribuzin		4	5.7	0.0	0.0	0.0
metribuzin		6	8.6	2.0	1.0	0.0
metribuzin		8	11.4	1.0	3.0	0.0
control		-	-	0.0	1.5	0.0

Saltgrass stand reduction following one winter application of bromacil, karbutilate, or metribuzin at the relatively low, economical rates employed did not provide acceptable protection to the asphalt shoulder. Stand reduction, and the resultant pavement protection, improved greatly following the second annual application, particularly in the instance of bromacil. Increased saltgrass control immediately adjacent to and in the asphalt shoulder was consistently greater at all rates than in the remainder of the treated plots in the instance of bromacil and to a lesser degree with karbutilate. The increased control at the pavement margin is presumed to be caused by stronger leaching force from pavement runoff during rains. Metribuzin was not effective at the rates tested.

These results with bromacil and karbutilate on desert saltgrass agree closely with experimental field results on roadside stands of bermudagrass. (Agricultural Extension, San Diego County 1/, previously Contra Costa County; Agricultural Extension, Botany Department 2/, University of California, Davis).

Response of purple nutsedge to two applications of six herbicides mechanically incorporated or irrigated into the soil. Hamilton, K. C. Response of purple nutsedge (*Cyperus rotundus* L.) to two soil applications of six herbicides were studied in two tests at Tucson. In the spring of both 1969 and 1970, 192 plants were established from tubers of a single nutsedge plant. Plants were spaced 10 by 15 ft. apart. During the first year, plants were maintained vegetatively by mowing. Low rates of trifluralin plus diuron or simazine were applied to the soil (sand 60%, silt 25%, clay 15%, organic matter 1%) to control annual weeds. Irrigation was similar to that used for cotton.

Herbicides were applied to the soil and incorporated by flood irrigation or by disking in March and July of 1970. In the second test in 1971, herbicides were incorporated by flood irrigation or by a power-driven mulcher in April and a disking in July. Eight lb/A of each herbicide was applied in the spring; 2 lb/A were applied to the same plots in July. Herbicides tested were terbacil, linuron, atrazine, prometryne, San-6706, (4-chloro-5-(dimethylamine)-2-(*a*,*a*,*a*-trifluoro-*m*-tolyl)-3 (2*H*)-pridazinone), and karbutilate. Plots contained four plants and treatments were replicated four times. The number of shoots on each plant was estimated before treatment and in the spring of the following year. Plants average 100 and 70 stems per plants when treatments started in 1970 and 1971, respectively.

Initial control of purple nutsedge was best where herbicides were mechanically incorporated. In the first test, terbacil, atrazine, and San-6706 had only 1 or 2 plants with regrowth the following year (see table). In second test, with each method of incorporation terbacil again had only 1 or 2 plants with regrowth the following year. The plants treated with terbacil had the fewest shoots the year after treatment. Linuron and prometryne were the least effective herbicides in all tests. (Arizona Agr. Exp. Sta., Univ. of Arizona, Tucson).

Purple nutsedge plants with topgrowth and number of shoots per growing plant after two applications of herbicides mechanically incorporated or irrigated into the soil.

Treatments		Plants with topgrowth		Shoots per growing plant	
Incorporation method	Herbicides applied at 8 and 2 lb/A	4/13/71	3/28/72	4/13/71	3/28/72
Mechanical	terbacil	1	1	1	1
	linuron	11	14	7	8
	atrazine	1	8	5	5
	prometryne	11	11	14	8
	San-6706	1	4	1	2
	karbutilate	5	5	15	3
Irrigation	terbacil	1	2	2	2
	linuron	10	12	57	37
	atrazine	2	11	60	15
	prometryne	8	12	76	17
	San-6706	2	14	30	9
	karbutilate	0	9	0	4

Response of purple nutsedge to two soil applications of herbicides.

Hamilton, K. C. Response of purple nutsedge (*Cyperus rotundus* L.) to two soil applications of 10 herbicides was studied in 1970 and 1971 at Tucson. Plants were established from tubers of two purple nutsedge plants in the spring of 1969. Plants were spaced 10 by 15 ft. apart and maintained vegetatively by mowing during the first year. In 1969 low rates of diuron, simazine, and trifluralin were applied to the soil (sand 60%, silt 25%, clay 15%, organic matter 1%) to control annual weeds. Irrigation was similar to that used for cotton.

Herbicides were applied to the soil and disked in 4 to 6 inches deep on March 31 and July 30, 1970. Herbicides tested were alachlor, delachlor, cycloate, fluorodifen, MBR-4400, (ethyl-N-trifluoromethylsulfonyl-2,4-dichlorocarbanilate), NC-8438, (2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonyl), R-1856, (t-butyl dipropylthiocarbamate), R-7465, 2-(a-Napthoxy)-M,M-diethylpropionamide), R-12001, S-isopropyl-5-ethyl-2-methylpiperidine-1-carbothioate), San-6706, (4-chloro-5-(dimethylamino)-2-(a,a,a,-trifluoro-m-tolyl)-3(2H)-pyridazinone. Plots contained four plants and treatments were replicated four times. The number of shoots on each plant was estimated before each application and in the spring of 1971.

All treatments temporarily inhibited regrowth of purple nutsedge. The most effective herbicides were San-6706, NC-8438, R-12001, and R-7465 (see table). Two applications of these herbicides reduced the number of plants with topgrowth and reduced the number of shoots per plant by 90 to 95%. Alachlor, delachlor, fluorodifen, cylcoate, MBR-4400, and R-1856 reduced the number of shoots per plant but did not affect the number of plants with topgrowth. (Arizona Agr. Exp. Sta., Univ. of Arizona, Tucson.)

Purple nutsedge plants with topgrowth and number of shoots per plant after soil applications of 10 herbicides

Treatments twice in 1970		Plants with topgrowth			Shoots per growing plant		
Herbicide	lb/A	3/25/70	7/30/70	4/13/71	3/25/70	7/30/70	4/13/71
alachlor	4	16	16	16	137	108	85
cycloate	4	16	16	16	130	51	38
delachlor	4	16	16	16	129	103	81
fluorodifen	4	16	16	16	125	93	70
MBR-4400	4	16	16	16	142	88	79
NC-8438	4	16	15	7	114	24	7
R-1856	4	16	13	16	112	21	24
R-7465	4	16	16	14	141	44	22
R-7465	6	16	16	9	109	22	5
R-12001	4	16	13	12	111	25	16
San-6706	4	16	16	6	119	20	2
San-6706	6	16	16	7	150	30	4

Response of purple nutsedge to two soil applications of six herbicides.

Hamilton, K. C. Response of purple nutsedge (*Cyperus rotundus* L.) to two soil applications of six herbicies was studied in two tests at Tucson. In the spring of both 1969 and 1970, 192 plants were established from tubers of a single nutsedge plant. Plants were spaced 10 by 15 ft. apart. During the first years, plants were maintained vegetatively by mowing. Low rates of trifluralin plus diuron or simazine were applied to the soil (sand 60%, silt 25%, clay 15%, organic matter 1%) to control annula weeds. Irrigation was similar to that used for cotton.

Herbicides were applied to the soil and incorporated by disking in March and July of 1970. In the second test in 1971, herbicides were incorporated by a power-driven mulcher in April and a disk in July. Herbicides tested were EPTC, vernolate, pebulate, butylate, R-1856, (*tert*-butyl dipropylthiocarbamate) and R-12001, (S-isopropyl-5-ethyl-2-methyl-piperdine-1-carbothioate). Each herbicide was applied at 8 lb/A at all dates. Plots contained four plants and treatments were replicated four times. The number of shoots on each plant was estimated three or four times during the treatment year and in the spring of the following year. Plants average 70 and 200 stems per plant when treatments started in 1970 and 1971, respectively.

All treatments controlled purple nutsedge for at least 8 weeks. In the first test, there was not regrowth in the second year from plants treated with two 8 lb/A applications of butylate, R-1856, and R-12001 (see table). In the second test, the best control was with butylate. In both tests, EPTC, vernolate, and pebulate reduced the number of stems per plant but were less effective than the other herbicides. (Arizona Agr. Exp. Sta., Univ. of Arizona, Tucson).

Purple nutsedge plants with topgrowth and number of shoots per growing plant after two soil applications of six herbicides.

Treatments Twice/year		Plants with topgrowth		Shoots per growing plant	
Herbicide	lb/A	4/13/71	3/28/72	4/13/71	3/28/72
EPTC	8	7	16	7	72
vernolate	8	7	16	5	78
pebulate	8	11	16	7	82
butylate	8	0	5	0	7
R-1856	8	0	16	0	31
R-12001	8	0	14	0	19

Response of purple nutsedge to two soil applications of EPTC and dichlobenil. Hamilton, K. C. Response of purple nutsedge (*Cyperus rotundus* L.) to two soil applications of three rates of EPTC and dichlobenil was studied in two tests at Tucson. In the spring of both 1969 and 1970, 192 plants were established from tubers of a single nutsedge plant. Plants were spaced 10 by 15 ft. apart. During the first years, plants were maintained vegetatively by mowing. Low rates of trifluralin plus diuron or simazine were applied to the soil (sand 60%, silt 25%, clay 15%, organic matter 1%) to control annual weeds. Irrigation was similar to that used for cotton.

Herbicides were applied to the soil and incorporated by disking in March and July of 1970. In the second test in 1971, herbicides were incorporated by a power-driven mulcher in April and a disk in July. Both herbicides were applied at 4, 6 and 8 lb/A at all dates. Plots contained four plants and treatments were replicated four times. The number of shoots on each plant was estimated three or four times during the treatment year and in the spring of the following year. Plants averaged 90 and 170 stems per plant when treatments started in 1970 and 1971, respectively.

All treatments controlled purple nutsedge for 8 weeks. Regrowth occurred 10 to 14 weeks after treatment with most treatments. Dichlobenil was slightly more effective than EPTC (see table). The high rate was more effective than the 4 lb/A rate. In the 1970, 8 lb/A of dichlobenil prevented regrowth of 75% of the plants the following year. In 1971, no treatment reduced the number of plants with regrowth. Although all treatments temporarily inhibited purple nutsedge, no treatment repeated twice in a single year prevented regrowth of some purple nutsedge plants the following year. (Arizona Agr. Exp. Sta., Univ. of Arizona, Tucson).

Purple nutsedge plants with topgrowth and number of shoots per growing plant after two soil application of EPTC and dichlobenil.

Treatments Twice/year		Plants with topgrowth		Shoots per growing plant	
Herbicide	lb/A	4/13/71	3/28/72	4/13/71	3/28/72
EPTC	4	14	16	16	47
EPTC	6	12	16	11	77
EPTC	8	5	16	12	58
dichlobenil	4	8	15	12	23
dichlobenil	6	8	15	11	23
dichlobenil	8	4	16	6	21

PROJECT 2. HERBACEOUS WEEDS IN RANGE AND FORESTS

L. E. Warren, Chairman

SUMMARY

In Northern Arizona, control of blue grama sod to allow planting wheatgrass was achieved with 2 lb. of dalapon as sodium salt. Survival of wheatgrass was best in the treated plots on more moist sites. Reseeded blue grama was also improved; strip undercutting gave good recovery also.

Control of perennial grasses with atrazine, dalapon, ter-acide and pronamide as well as scalping 1½' around each tree provided improved survival of Ponderosa pine seedlings in Central Washington. Herbicide treatments were most effective.

Several residual herbicides were applied in fall and spring to old pastures to allow replanting various grasses and sainfoin. Good grass yields were obtained with several treatments.

Control of broom snakeweed was achieved with 2,4-D, picloram and silvex and dicamba and resulted in good increases of forage.

Fringed sagebrush was controlled with 2,4-D, picloram and silvex in June or July, but picloram did not control rubber rabbitbrush. Increases in forage were observed with nearly all treatments.

Fair to good control of threetip sagebrush with 2,4-D, 2,4,5-T, or silvex gave good increases in forage production. Low rates of picloram + 2,4-D gave poor control of sagebrush but forage yields were increased somewhat.

Blue grama sod recovery after stand reduction for range interseeding. Lavin, Fred, F. B. Gomm, and T. N. Johnsen, Jr. Blue grama sod was thinned with dalapon and by strip-undercutting to aid in interseeding grasses and shrubs. The site was in pinyon-juniper woodland 35 miles northwest of Flagstaff, Arizona.

Dalapon (sodium salt) was broadcast in a water carrier at a rate of 2 lb/A and at a volume of 20 gpa. Undercutting was done at a 2-inch depth and left 8-inch wide strips of live vegetation between 16-inch undercut swaths. Untreated controls were used for comparisons. All plots were planted by either surface or furrow drilling. A split plot experimental design with three replications was used and repeated for three years.

Both the sod treatments and furrow drilling increased native blue grama production over the nontreated-surface drilled combination within two years. This increase indicated that sod renovation may improve forage production of dry, high elevation blue grama rangelands in the Southwest. Production from the dalapon treatments was at a disadvantage. Dalapon was broadcast over the entire plot and depressed all grass growth the first year whereas the other treatments were applied to the plot in strips and did not damage all of the sod. (USDA, Agricultural Research Service, Western Region, c/o Rocky Mountain Forest & Range Experiment Station, Flagstaff, Arizona, 86001).

Herbage production of blue grama

Treatment & planting method		Yield (lb/A), years after treatment		
		1	2	3
Untreated:	surface	364	329	353
:	furrow	467	503	546
Dalapon :	surface	125	473	424
:	furrow	166	592	606
Strip-undercut:	surface	541	881	731
:	furrow	420	907	814

Dalapon for nontill interseeding of blue grama sod. Johnsen, T. N., Jr., F. B. Gomm, and Fred Lavin. To reduce competition for Luna pubescent wheatgrass planted in pinyon-juniper woodland north of Flagstaff, Arizona blue grama sod was sprayed with the sodium salt of dalapon a year before planting. Applications were made during the summer at 2 lb/A in a volume of 20 gpa. Two different locations were used, one a high elevation, moist site, (16-18" precipitation per year), the other a lower elevation dry site. Sprayed and unsprayed plots were planted by two methods in a split plot design with three replications.

Excellent control of blue grama was obtained at both locations. Planted wheatgrass seedlings emerged at both locations but were killed by drought on the drier site. Excellent stands established at the moist site on the dalapon sprayed plots, the best stands being on the dalapon sprayed-furrow drilled combination.

Plowed seedbed preparation was not included in the experimental design but was done in a fallow trial adjacent to the study plots with the same species, with the same planting methods, and at the same time as the study plantings. Comparisons indicated that dalapon spray applied one growing season in advance of seeding may be as effective as plowing for establishing range plantings. In addition nontill seedbed preparation greatly decreases the chance for soil erosion and weed invasion that are often major problems with plowing.

Seedbed preparation and planting method effects on Luna pubescent wheatgrass interseeded in blue grama sod on a moist pinyon-juniper site

Seedbed treatment	Drilling method	Seedlings per row foot
Nontreated	Furrow	0.6
"	Surface	0.1
Dalapon	Furrow	7.5
"	Surface	3.5
Plow, nonfallow	Furrow	5.7
" "	Surface	3.8
Plow, fallow	Furrow	5.9
" "	Surface	5.8

Results indicate that competition reduction is essential for successful interseeding of blue grama sod and that dalapon treatment one growing season before planting is an effective method for obtaining adequate reduction. (USDA, Agricultural Research Service, Western Region, c/o Rocky Mountain Forest & Range Experiment Station, Flagstaff, Arizona 86001).

Picloram residues in overland water flows. Johnsen, Thomas N., Jr. Picloram residues in water were determined as a part of studies on the effectiveness of picloram applied to chapparal and pinyon-juniper woodlands in semi-arid portions of Arizona. Most of these areas have only intermittent streams which flow only after major storm periods. The herbicide was applied by helicopter at rates ranging from 0.75 to 3.5 lb/A picloram on areas ranging from about 10 to over 280 acres in size. Water samples were collected as single-stage flood and grab samples. Picloram contents were determined by biological assays and electron capture gas chromatography with sensitivities which varied from 4 down to 0.1 parts per billion of picloram.

The highest concentrations of picloram occurred during the initial flow periods after application. Subsequent samples contain markedly less picloram. The longest time picloram was detected after application was about 4 years with an application of 3.5 pounds of picloram per acre. Lower rates were detectable for shorter periods. A rapid reduction in the amount of picloram found downstream of treated areas occurred, 4 miles being the furthest downstream picloram was detected. Picloram occurs at about the same concentrations during each individual flow period, however, the concentration may vary from period to period. Picloram disappeared within 72 hours from large still pools in streams. There was some evidence of picloram break-down due to exposure to sunlight. There was no evidence of picloram accumulating in the waterways. (USDA, Agricultural Research Service, Western Region, Rocky Mountain Forest & Range Experiment Stn., Flagstaff, Az. 86001).

Survival of ponderosa pine seedlings following control of competing grasses. Stewart, R. E. Orchardgrass, timothy, and hard fescue (*Festuca ovina duriuscula*) were seeded to stabilize denuded soils following extensive wildfires on the Wenatchee National Forest in eastern Washington. Competition from these introduced grasses and the dominant native grass, pinegrass (*Calamagrostis rubescens*), has reduced the survival of ponderosa pine seedlings planted after the fire. During April of 1972, 4 lb/A atrazine, 5 lb/A dalapon, 2 lb/A terbacil, and 2 lb/A pronamide applied immediately before planting were compared with scalping (mechanical removal of vegetation for 1.5 feet around each tree) and no treatment (control) as methods for increasing ponderosa pine seedling survival.

Herbicides were applied with knapsack sprayers to plots on five areas. Two areas were on drier sites with heavy, residual soils. The remaining areas were on wetter sites with light, pumice soils. Results at the end of the first growing season indicate that preplant sprays of atrazine, dalapon, terbacil, and pronamide do not damage ponderosa pine seedlings at the rates tested. Both scalping and chemical treatments increased seedling survival with best survival associated with herbicidal sprays. Dalapon produced more consistent grass control, but seedling survival was slightly higher on plots sprayed with atrazine. (Pacific N. W. Forest and Range Expt. Sta., Forest Service, U. S. Dept. of Agric., Roseburg, Oregon.)

This publication reports research involving pesticides. It does not contain recommendations for their use nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

Wyoming threetip sagebrush (*Artemisia tripartita* Rydb. subsp. *rupicola* Beetle) control and effect upon associated vegetation. Gesink, R. W., G. A. Lee, and H. P. Alley. Little information exists concerning the control of Wyoming threetip sagebrush, an undesirable shrub which dominated several thousand square miles of Wyoming rangeland. This low-growing shrub is characteristic of the montane and sub-alpine zones and occurs abundantly east of the continental divide on the slopes of the Owl Creek, Wind River, and Larmie Mountains.

The study was established in 1971 on a heavily infested loamy rangesite in southeastern (15-19 in. precip. zone) Wyoming. Herbicide treatments were applied to a series of small (1 sq. rod) plots in a split plot design and to large (1 acre) plots as individual trials. Applications were made on June 21, 1971 (2-3 in. growth stage) and July 8 (3-5 in. growth stage). The line interception method was utilized for making a vegetation survey at the time of treatment and in 1972 evaluations were made to determine herbicide effectiveness and response of associated grasses and forbs.

Silvex at 2 lb/A was the most effective treatment and provided 90 and 85 percent control of threetip sagebrush for the first and second treatment dates, respectively (Table 1). Silvex was also found to be effective at the 1 lb/A rate, particularly on the first treatment date. 2,4,5-T at 2 lb/A was less effective than silvex, but still resulted in fair control for both treatment dates. 2,4-D (butyl ester) at 2 lb/A provided 60 to 70 percent control for the first treatment date, but dropped to 30 to 40 percent for the second date. 2,4-D (butyl) at 1 lb/A, 2,4-D PGBE at 1 lb/A, and picloram + 2,4-D at 0.25 + 0.50 lb/A were ineffective treatments, regardless of treatment date. The variation in control between large and small plots is attributed to volume of spray applied. Treatments were applied to the small plots in a total volume of 40 gpa water carrier and to the large plots in a total volume of 17 gpa.

All treatments, with the exception of picloram + 2,4-D, resulted in significant increases in total herbage production as measured 1 yr. after treatment (Table 2). In regard to total grass production, all treatments were significantly higher than the nontreated check. Additionally, all treatments reduced production of forbs.

The grass which responded most favorably to the treatments was *Poa* species. The other grass species also exhibited increased production as a result of shrub control; however, responses were quite variable depending upon specific herbicide treatment. Although increases in vigor of established grasses due to treatments were apparent, no substantial changes in basal cover occurred during the first year after treatment. (Wyoming Agricultural Experiment Station, Laramie. SR 449).

Table 1. Percent control of Wyoming threetip sagebrush 1 year after treatment

		Treatment dates			
		Rod plots		Acre plots	
Treatment	Rate/A	6/21/71	7/8/71	6/23/71	7/8/71
2,4-D (PGBE)	2 lb	95	70	80	60
2,4-D (PGBE)	1 lb	50	40		
2,4-D (Butyl ester)	2 lb	60	40	70	30
2,4-D (Butyl ester)	1 lb	30	20		
silvex PGBE	2 lb	90	85	90	85
silvex PGBE	1 lb	95	73		
2,4,5-T PGBE	2 lb	85	85	75	70
2,4,5-T PGBE	1 lb	77	40		
picloram + 2,4-D	0.25 lb + 0.50 lb	40	15	40	15
picloram + 2,4-D	.125 lb + 0.25 lb	20	10		

Table 2. Oven-dry herbage yields in pounds per acre for grasses and forbs on threetip sagebrush study area 1 year after treatment

Treatment	Rate/A	Poa sp.	Agsm[1/]	Kocr	Mufi	Misc[2/] grass.	Gr. tot.	Forbs	Total
untreated		79	84	43	51	37	294	101	395
2,4-D (PGBE)	2 lb	183	101	124	98	34	540	23	563
2,4-D (Butyl ester)	2 lb	188	164	69	69	41	531	23	554
silvex PGBE	2 lb	261	129	95	71	29	585	30	615
2,4,5-T PGBE	2 lb	194	98	147	78	113	630	33	663
picloram + 2,4-D	0.25 lb + 0.50 lb	105	121	153	67	46	492	3	495

[1/] *Agropyron smithii, Koeleria cristata, Muhlenbergia filiculmis.*

[2/] Miscellaneous grasses include *Bouteloua gracilis, Hesperochloa kingii,* and *Stipa comata.*

Fringed sagebrush (*Artemisia frigida* Willd.) and rubber rabbitbrush (*Chrysothamnus nauseosus* (Pallas) Britt.) control and effect upon associated vegetation. Gesink, R. W., G. A. Lee, and H. P. Alley. A study was initiated in 1971 to evaluate the effectiveness of various herbicides for the control of rubber rabbitbrush and fringed sagebrush. The study was established on a sandy range site on the high plains (10 to 14 in. precip. zone) of southeastern Wyoming. Vegetation on the study area is dominated by thickspike wheatgrass (*Agropyron dasystachum*) and a complex of the two shrub species. Distribution of vegetation on the study site is strongly influenced by soil type which occurs in a surface configuration of a micro-mound (Bosler soil series), micro-intermound (Rodo soil series) complex. Herbicide treatments were applied to a series of small (sq. rod) plots in a completely random design and to large (1 acre) plots as individual trials. Applications were made to large plots on June 1 and 17, 1971 and to small plots on June 17, 1971. A vegetative survey utilizing the line interception method was made at the time of treatment and in 1972 evaluations were made to determine vegetation responses to the herbicides during the first year after treatment.

The study showed that fringed sagebrush was effectively controlled on both treatment dates with either picloram, silvex, or 2,4-D (Table 1). Rabbitbrush was controlled only with silvex or 2,4-D and time of treatment was critical; picloram was ineffective for both treatment dates (Table 2).

The most effective treatment for rabbitbrush was 2,4-D on the second treatment date after plants had produced 3 to 4 inches of new growth. 2,4-D did not provide satisfactory control on the first treatment date. Effectiveness of silvex was similar to 2,4-D in respect to treatment date, however, the level of control was somewhat less. Picloram alone or in combination with 2,4-D was ineffective for the control of rabbitbrush, regardless of treatment date.

Evaluation of 1971 and 72 transect data indicated that basal cover of grasses did not significantly change during the first year as a result of herbicide treatments. The vigor, however, of a number of previously established grasses did increase and this is evident from production data (Table 3). Response of grasses and forbs to treatments was greatly influenced by variation in soil type throughout the study site; therefore, production estimates were taken in a manner that would reflect influence of soil type. Both soils consist of coarse mountain outwash, however, the Bosler series is the deeper and apparently more productive of the two soils. As a result of herbicide treatments, herbage production was greater on the Bosler series as compared to Rodo series. Silvex and 2,4-D provided the greatest production increases on the Bosler series and this was, in a large part, due to significant increases in thickspike wheatgrass, the dominant grass on this soil type. Increases in grass production on the Rodo soils as a result of silvex and 2,4-D treatments were considerably less than on the Bosler. One reason for this was that thickspike wheatgrass was not the dominant species on the Rodo soils. The picloram and picloram + 2,4-D treatments did not provide significant increases in herbage production on either soil type. Significant increases in forb production as a result of 2,4-D and silvex treatments were observed on the Rodo soils. This was due to the increased abundance of lambsquarter which occurred on these plots in the areas where shrubs had been eliminated. This increase in lambsquarter due to 2,4-D and silvex treatments did not occur on the Bosler soils. Forb production was low on plots treated with picloram and picloram + 2,4-D, regardless of soil type. (Wyoming Agricultural Experiment Station, Laramie, SR-447).

Table 1. Percent control of fringed sagebrush 1 year after treatment.

		Percent control		
Treatment	Rate/A	Sq. rod 6/16/71	1 Acre 6/1/71	1 Acre 6/17/71
2,4-D (LVE)	2.0 lb	98	90	95
2,4-D (LVE)	1.0 lb	97		
silvex PGBE	2.0 lb	100	98	100
silvex PGBE	1.0 lb	100		
picloram - K salt	0.25 lb	100	95	100
picloram K salt	0.125 lb	88		
picloram + 2,4-D	0.25 + 0.50 lb	100	100	100
picloram + 2,4-D	0.125 + 0.25 lb	100		

Table 2. Percent control of rubber rabbitbrush 1 year after treatment

		Percent control		
Treatment	Rate/A	Sq. rod 6/16/71	1 Acre 6/1/71	1 Acre 6/17/71
2,4-D (LVE)	2.0 lb	98	50	99
2,4-D (LVE)	1.0 lb	98		
silvex PGBE	2.0 lb	90	15	80
silvex PGBE	1.0 lb	15		
picloram K salt	0.25 lb	13	15	15
picloram K salt	0.125 lb	10		
picloram + 2,4-D	0.25 + 0.50 lb	18	20	30
picloram + 2,4-D	0.125 + 0.25 lb	10		

Table 3. Oven-dry herbage yields in pounds per acre for grasses and forbs on fringed sagebrush - rabbitbrush study area 1 year after treatment

Treatment	Rate/A	Soil type	Agrop. dasyst.	Other[1/] grasses	Grass total	Forbs	Total
untreated		Rodo	89	101	191	37	228
untreated		Bosler	215	55	271	46	317
2,4-D (LVE)	2 lb	Rodo	73	215	289	101	389
2,4-D (LVE)	2 lb	Bosler	371	65	436	45	480
silvex PGBE	2 lb	Rodo	112	180	292	163	455
silvex PGBE	2 lb	Bosler	367	100	467	47	514
picloram	0.25 lb	Rodo	85	143	228	6	234
picloram	0.25 lb	Bosler	293	61	354	0	354
picloram + 2,4-D	0.25 lb + 0.50 lb	Rodo	113	177	290	9	299
picloram + 2,4-D	0.25 lb + 0.50 lb	Bosler	279	91	370	22	392

[1/] Other grasses include *Agropyron smithii*, *Bouteloua gracilis*, *Koeleria cristata*, *Poa secunda*, and *Stipa comata*.

Broom snakeweed (*Gutierrezia sarothrae* (Pursh.) Britt. & Rusby) control and effect upon associated vegetation. Gesink, R. W., G. A. Lee, and H. P. Alley. A study was established in 1971 to evaluate various herbicides for use in improving snakeweed-infested rangeland. A heavily infested and overgrazed sandy range site on the high plains near Laramie was selected as the study site. The herbicides were applied to both large (acre) and small (sq. rod) plots on June 11, June 24, and July 9, 1971. Treatments on small plots consisted of three replications, randomized in a split plot design. Treatments on large plots were not replicated. The line interception method was utilized to make vegetation measurements at the time of treatment. Evaluations were made in 1972 to determine herbicide effectiveness for control of snakeweed, changes in cover and species composition of associated grasses and forbs, and effect of herbicides upon herbage production.

Picloram at 0.25 lb/A and picloram + 2,4-D at 0.25 + 0.50 lb/A were consistently the most effective treatments and provided 85 - 90% control, regardless of treatment date (Table 1). Picloram treated plants did not exhibit phytotoxic symptoms during the growing season the herbicide was applied. This indicates a slow absorption of picloram by snakeweed plants which may be via the root system. The growing season following herbicide treatments, plants were either dead or exhibited severe injury. The 2 lb/A rate of silvex and 2,4-D provided 70 - 90% control for the first treatment date (3-4 in. vegetative growth stage); however, this level of control dropped off drastically for the later treatment dates. The potential of silvex and 2,4-D is critically influenced by timing of application and this matter is still under investigation.

The first year after treatment no substantial changes in basal cover of grasses occurred as a result of herbicide treatments and shrub elimination. Increased vigor of established perennial grasses, however, was apparent and this is reflected in production figures (Table 2). Production of blue grama was significantly higher on picloram-treated plots than on silvex, 2,4-D, and non-treated plots. As compared to the non-treated plots, production of blue grama on silvex and 2,4-D treated plots was somewhat higher; however, the increases were not significant. All herbicide treatments provided a high level of snakeweed control on the first treatment date, but only the picloram treatments resulted in significant increases in blue grama production. Both production data and visual observations indicate that picloram stimulated blue grama growth. The increase in forbs as a result of silvex and 2,4-D treatments was due primarily to an abundance of lambsquarter which occurred on these plots in areas where snakeweed had been eliminated. Picloram treatments maintained a low level of forbs during the 1972 season; this may also have accounted for some of the increased grass production on these plots. Increases in production among "other" grass species was due to increased vigor of primarily western wheatgrass, needle and thread, and Indian ricegrass. Silvex and 2,4-D treatments provided about 140 lb/A more total herbage than nontreated checks; however, a substantial portion of this increase was due to abundance of lambsquarter. Picloram treatments provided about 300 lb/A more herbage than untreated plots and this was due, for the most part, to increases in grass production. (Wyoming Agricultural Experiment Station, Laramie, SR-450).

Table 1. Percent control of broom snakeweed 1 year after treatment

		Treatment dates					
		Rod plots			Acre plots		
Treatment	Rate/A	6/11	6/24	7/9	6/12	6/24	7/9[1]
silvex PGBE	2 lb	90	0	0	80	15	0
silvex PGBE	1 lb	30	0	0			
2,4-D (LVE)	2 lb	90	40	0	70	15	0
2,4-D (LVE)	1 lb	75	10	0			
picloram + 2,4-D	0.25 lb + 0.50 lb	90	85	85	85	85	85
picloram + 2,4-D	0.125 lb 0.25 lb	40	31	37			
picloram	0.25 lb	85	90	90	85	85	85
picloram	0.125 lb	35	35	40			

[1] Treatment dates, 1971.

Table 2. Oven-dry herbage yields in pounds per acre for grasses and forbs on broom snakeweed study area 1 year after treatment

Treatment	Rate/A	Bouteloua gracilis	"Other"[1] grasses	Grass total	Forbs	Total
untreated		118	37	155	12	167
silvex PGBE	2 lb	188	41	229	78	307
2,4-D (LVE)	2 lb	164	71	235	80	315
picloram + 2,4-D	0.25 lb + 0.50 lb	312	152	464	8	472
picloram	0.25 lb	324	137	461	7	468

[1] "Other" grasses include *Agropyron spicatum, Koeleria cristata, Oryzopsis hymenoides, Poa secunda, Sporobolus cryptandrus,* and *Stipa comata.*

Chemical control of broom snakeweed (*Gutierrezia sarothrae* (Pursh.) Britt. & Rusby). Alley, H. P., A. F. Gale and G. A. Lee. A replicated series of plots were established in the spring of 1970 to compare the effectiveness of several herbicides for the control of broom snakeweed. The snakeweed plants were 3 to 4 in. tall at time of treatment. All treatments were applied with a knapsack spray unit in 40 gpa water.

Evaluations were made one and two years following treatment. The combination treatment of Tordon-212 and Tordon-225 at both 1 and 2 qt/A gave 100 percent control one year following treatment and maintained complete elimination over the two-year period. There was some reinfestation of snakeweed on the plots treated with silvex, dicamba, and the 2,4-D amine and 2,4-D PGBE two years after treatment. (Wyoming Agricultural Experiment Station, Laramie SR-440).

Broom snakeweed control

Treatment[1]	Rate/A	Percent control		Observations
		1971	1972	
silvex PGBE	1.0 lb	0	0	No reduction in stand of snakeweed; controlled fringed sagebrush and lupine
silvex PGBE	2.0 lb	90	80	Reinfestation of snakeweed; controlled fringed sagebrush and lupine
Tordon-212*	1 qt	100	100	Increased grass production. Controlled fringed sagebrush and lupine. No forbs in plots
Tordon-212*	2 qt	100	100	Increased grass production. Controlled fringed sagebrush and lupine. No forbs in plots
Tordon-225*	1 qt	100	100	Only fair control of fringed sagebrush
Tordon-225*	2 qt	100	100	Only fair control of fringed sagebrush
dicamba	0.5 lb	50	40	Snakeweed reinvasion
dicamba	1.0 lb	90	80	Few small snakeweed seedlings in plots
dicamba + 2,4-D amine	0.25 + 1.0 lb	75	70	No control of fringed sagebrush
dicamba + 2,4-D amine	0.5 + 1.0 lb	95	85	Fair control of fringed sagebrush
2,4-D amine	1.0 lb	35	30	Poor fringed sage control. Some recovery
2,4-D amine	2.0 lb	100	90	Fair fringed sage control. Some recovery
2,4-D PGBE	1.0 lb	35	30	
2,4-D PGBE	2.0 lb	85	80	Not as outstanding a treatment as corresponding rates of 2,4-D amine

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[1] Three replications, herbicides applied in 40 gpa water. Snakeweed plants 3 to 4 in. vegetative growth at treatment - 6/70.

[2] Visual observation made 6/21/72.

* Tradename of Dow Chemical Company.

Evaluation of fall applied herbicides upon weed and forage production on old low productive dryland pastures. Alley, H. P. and G. A. Lee. Dryland improved pastures which had been utilized for forage production and utilization studies were selected for this study. The pastures which were established in 1960 and had been grazed by sheep since their establishment were heavily infested with downy bromegrass (*Bromus tectorum* L.), Japanese bromegrass (*Bromus japonicus* Thunb) with minor infestations of tansy mustard (*Descurainia pinnata* Walt.) Britt.), and meadow salsify (*Tragopogon pratensis* L.). Forage production had declined until it was necessary to renovate and reseed to restore production. The weed infestation prevalent in the pastures afforded excellent opportunities to study the potentials of herbicides for pasture renovation.

Five separate pastures had originally been seeded to Russian wildrye (*Elymus junceus* Fisch), sainfoin (*Onobrychis viceafolia* Scop.) Siberian wheatgrass (*Agropyron sibericum* (Willd.) Beauv.), 'Amur' intermediate wheatgrass (*Agropyron intermedium* (Host) Beauv.), and pubescent wheatgrass (*Agropyron trichophorum* (Link) Richt.).

Cyanazine at 2 lb/A, GS-14254 (2-sec butylamino-4-ethylamino-6-methoxy-s-triazine) at 2.0 lb/A in the E.C. and 80W formulation, terbacil at 1.0 lb/A, atrazine at 1.6 lb/A, simazine at 1.6 lb/A in the 4L and 80W formulation, and metribuzin at 1.0 lb/A were applied 11/11/71 with a truck mounted spray-rig in a total volume of 14 gpa water.

Total herbage production was determined by clipping three 2.5 ft. diameter quadrats in each species treatment. Weeds and forage were separated, oven dried, and weighed for yield and weed control determinations.

Of the eight herbicide treatments applied only the three compounds giving 80 percent or better weed control are included in the attached table.

Simazine as the 80W or 4L formulation did not give outstanding weed control, possibly due to the lack of moisture following treatment. The 4L formulation gave better weed control than the 80W formulation. There was no apparent damage to the perennial grasses or sainfoin, except that pubescent wheatgrass exhibited some yellowing of the lower leaves where simazine was applied. The GS-14254 80W and E.C. formulations stunted the annual grass (weed) species but very little kill was recorded. Cyanazine showed very little activity on downy bromegrass or Japanese bromegrass.

Of the three outstanding treatments, atrazine gave an average of 95 percent weed control. This treatment, however, caused considerable damage to the perennial grass species. Metribuzin and terbacil showed similar activity toward annual grass weed species. Metribuzin took out and severely damaged the perennial grasses indicating a very close tolerance regarding rates of application.

Production of the perennial grass species were increased from a low of 20 lb/A of Amur wheatgrass on the untreated plots to 692 lb/A where metribuzin a 10-fold increase in perennial grass production where herbicides were used. (Wyoming Agriculture Experiment Station, Laramie, SR-442).

Weed and forage production resulting from fall applied herbicides to dryland pasture

Treatment[1]	Rate/A	lb forage/A	lb weeds/A	% Weed reduction[2]
terbacil	1.0			
Russian wildrye		232	172	81
Sainfoin		906	140	70
Siberian wheatgrass		1120	60	89
'Amur' intermediate wheatgrass		512	66	93
Pubescent wheatgrass		546	200	78
average		633	128	82
atrazine 80W	1.6			
Russian wildrye		116	166	82
Saninfoin		0	0	100
Siberian wheatgrass		552	0	100
'Amur' intermediate wheatgrass		586	26	97
Pubescent wheatgrass		386	32	97
average		338	45	95
metribuzin	1.0			
Russian wildrye		580	86	91
Sainfoin		280	186	60
Siberian wheatgrass		886	12	98
'Amur' intermediate wheatgrass		692	20	98
Pubescent wheatgrass		460	100	89
average		580	81	87
Check				
Russian wildrye		40	920	--
Sainfoin		40	460	
Siberian wheatgrass		280	540	--
'Amur' intermediate wheatgrass		20	900	--
Pubescent wheatgrass		--	920	--

[1] Treatments applied 11/11/71 with ground operated spray-rig in 14 gpa water.

[2] Evaluations and clippings made 6/22/72.

Evaluation of the effect of spring applied herbicides upon weed and forage production on old low productive dryland pastures. Alley, H. P. and G. A. Lee. Dryland improved pastures which had been utilized for forage production and utilization studies were selected for this study. The pastures which were established in 1960 and had been grazed by sheep since their establishment were heavily infested with downy bromegrass (*Bromus tectorum* L.), Japanese bromegrass (*Bromus japonicus* Thunb) with minor infestations of tansy mustard (*Descurainia pinnata* (Walt.) Britt.) and meadow salsify (*Tragopogon pratensis* L.). Forage production had declined until it was necessary to renovate and reseed to restore production. The weed infestation prevalent on the pastures afforded excellent opportunities to study the potentials of herbicides for pasture renovation.

Five separate pastures had originally been seeded to Russian wildrye (*Elymus junceus* Fisch), sainfoin (*Onobrychis viceafolia* Scop.), Siberian wheatgrass (*Agropyron sibericum* (Willd.) Beauv.), 'Amur' intermediate wheatgrass (*Agropyron intermedium* (Host) Beauv.), and pubescent wheatgrass (*Agropyron trichophorum* (Link) Richt.).

Cyanazine at 2 lb/A, Sumitol (2-sec. butylamino-4-ethylamino-6-methoxy-s-triazine) at 2.0 lb/A in the E.C. and 80W formulation, terbacil at 1.0/A, atrazine at 1.6 lb/A, simazine at 1.6 lb/A in the 4L and 80W formulation, and metribuzin at 1.0 lb/A were applied 4/5/72 with a truck mounted spray-rig in a total volume of 17 gpa. At time of treatment the downy bromegrass was 3/4 to 1.0 in. tall and tansy mustard in a 2 in. rozette state of growth.

Total herbage production was determined by clipping three 2.5 ft. diameter quadrats in each species treatment. Weeds and forage were separated, oven dried, and weighed for yield determinations.

Of the eight herbicide treatments applied in the spring, only the two compounds included in the attached table resulted in sufficient weed control activity to warrant production and weed control determinations.

Terbacil at 1.0 lb/A and metribuzin at 1.0 lb/A, as a spring treatment, resulted in an average of 86 and 79 percent control of the prevalent weed species across all pastures.

Production of the perennial grass species was increased from a low of 20 lb/A of 'Amur' intermediate wheatgrass on the untreated plots to 392 lb/A and 546 lb/A, respectively, on the metribuzin and terbacil treated plots. There was better than an average seven-fold increase in perennial grass and sainfoin production resulting from the two treatments. (Wyoming Agriculture Experiment Station, Laramie SR-438).

Weed and forage production resulting from spring applied herbicides to dryland pastures

Treatment[1]	Rate/A	lb forage/A	lb weeds/A	% weed reduction[2]
terbacil	1.0			
Russian wildrye		126	112	87
Sainfoin		452	80	82
Siberian wheatgrass		1126	146	73
'Amur' intermediate wheatgrass		546	46	94
Pubescent wheatgrass		360	32	96
average		522	50	86
metribuzin	1.0			
Russian wildrye		380	52	94
Sainfoin		560	180	60
Siberian wheatgrass		1000	140	74
'Amur' intermediate wheatgrass		392	266	70
Pubescent wheatgrass		472	12	98
average		561	130	79
Check				
Russian wildrye		40	920	--
Sainfoin		40	460	--
Siberian wheatgrass		280	540	--
'Amur' intermediate wheatgrass		20	900	--
Pubescent wheatgrass		0	920	--

[1] Treatments applied 4/5/72 with ground operated spray-rig in 17 gpa water

[2] Evaluation and clippings made 6/22/72.

PROJECT 3. UNDESIRABLE WOODY PLANTS

Robert D. Martin, Chairman

SUMMARY

Eight papers were received from six authors. Various rates of paraquat were used to control western Juniper at the Squaw Butte Branch of the Oregon Agricultural Experiment Station. 1000 ppm level of application provided satisfactory scale dessication. Morning or evening application results were similar. The problem of coverage in application was attempted to be improved with some success with an adjuvant. In southern California, a study involved using picloram, fenuron, and Tandex pellets to control scrub oak regrowth. Best control was received with a heavy application of Tandex. Total herbage production at the end of 30 months was nearly the same except the heavy application of Tandex. Grass production was higher after picloram and fenuron application. In the northwest various chemicals were used to control grapeleaf blackberry. Application of 2,4,5-T and silvex were successful in June but not in March. Ammonium thiocyanate was tried as an additive in salmonberry control. By itself it was not effective, only slightly improved control with 2,4,5-T and silvex but significantly improved control when added to amitrole. A study on the stratification of deerbrush and snowbrush ceanothus seeds showed a minimum of 8 weeks stratification was necessary to insure a high germination percentage. Heat makes deerbrush ceanothus seeds permeable at the hilum. When higher humidities occur these hilar fissures close allowing deerbrush seeds to remain dormant but viable in forest soils for years after dissemination.

Treatments of granular karbutilate, fenuron and picloram gave fair to good reduction of shrub live oak in Arizona. Grasses were damaged least by picloram and most by karbutilate and fenuron at high rates.

Use of paraquat for juniper control. Rittenhouse, L. R. This report is aimed at summarizing 3 years study on control of western juniper (*Juniperus occidentalis* Hook. subsp. *occidentalis*) with paraquat plus ½% X-77^{TM} (alkylarylopolyoxyethylene glycols, free fatty acids, isopropanol). As early as 1963, Sneva showed that paraquat would desiccate juniper scales (Unpub. data). In 1970, paraquat was applied to a juniper stand at rates of 1, 2, and 3 pounds per acre via fixed-wing aircraft in June and August. Visible damage was observed only on the area sprayed in June at 2 and 3 lbs/A. In 1972, these trees showed only slight spray damage.

In 1971, a rate and date of application was initiated. The terminal 18" of attached healthy branches were immersed in paraquat solutions of 0, 10, 100, 1000, and 10,000 ppm on the 20th of May, June, July, and August. Maximum scale desiccation occurred from applications on May and June 20 at 1,000 and 10,000 ppm (Table 1). Applications on July and August 20 were less effective at 1,000 ppm, but a high degree of desiccation was observed at 10,000 ppm. Applications were also made morning and evening on May 20 to determine the influence of time-of-day of applications. Rates were 0, 500, and 10,000 ppm. Differences in percentage scale desiccation were similar to those presented above and time-of-day of application had no influence (Table 2).

On July 4, 1972, entire young and old trees were wetted with paraquat solutions of 0, 500, 1,000, 5,000, and 10,000 ppm using a hand-held nozzle. Young trees were more susceptible than old trees (Table 3). As in previous work, solutions over 1,000 ppm appeared to desiccate juniper scales satisfactorily (Table3). There was no level x age interaction.

At this time there is no question that paraquat will desiccate juniper scales (more time is needed to evaluate possible resprouting problems), but coverage in application of the chemical is still a problem. A pilot study of the use of foam as an adjuvant or drift control agent was made August 9, 1972. Solutions contained Foamspray™ (alkyl-omega-hydroxypoly (oxyethylene) sulfate, 1, 3, propane diol, coconut fatty acid, ethanol, isopropanol) with and without 0.5% X-77. Foamspray did seem to replace X-77 as an adjuvant, but did not improve coverage appreciable, based on ocular observation (Table 4). (Oregon Agric. Expr. Sta., Squaw Butte Branch, Burns, Oregon.)

Table 1. The influence of date and level of paraquat application on percentage desiccation of juniper scales.

	Level, ppm				
Date	0	10	100	1,000	10,000
May 20	0	1	5	95	100
June 20	0	0	2	94	100
July 20	0	0	0	50	99
August 20	0	0	0	12	98

Table 2. The influence of time-of-day of application of paraquat on percentage scale desiccation at three levels on May 20, 1971.

	Level, ppm		
Time	0	500	10,000
Morning	0	60	100
Evening	0	72	100

Table 3. The influence of various levels of paraquat on percentage scale desiccation of young and old trees applied July 4, 1972.

	Level, ppm				
Tree Age	0	500	1,000	5,000	10,000
Young	0	88	98	99	99
Old	0	65	84	88	92

Table 4. The influence of Foamspray as an adjuvant and drift control agent on percentage scale desiccation.

	Paraquat Level, ppm		
	0	5,000	10,000
with X-77	0	85	92
without X-77	0	85	95

Control of scrub oak regrowth with a broadcast application of herbicide pellets. Plumb, T. R. A test was started in December 1968 at the North Mountain Experimental Area in southern California to compare the effectiveness of hand broadcast application of three pelletized herbicides in killing sprouting scrub oak (*Quercus dumosa* Nutt.) plants. Scrub oak is normally "resistant" to foliage sprays of 2,4-D and 2,4,5-T. Fenuron (3-phenyl-1,1-dimethyl urea; 25% active), picloram (4-amino-3,5,6-trichloro picolinic acid; 10% active), and Tandex [M-(3,3-dimethylureido) phenyl-tert-butylcarbamate; 10% active] were applied at 3 rates (Table 1). The test plots were 40 feet square and each treatment was replicated at least 3 times. Plant kill, based on the average effect on 60 tagged plants, is recorded in Table 1.

Neither fenuron nor Tandex had killed any plants (except one) by August, 8 months after treatment. However, the high rates had severely affected the plants and most of them had lost their leaves and had resprouted along the stems. On the other hand, the high rate of picloram had already killed 50% of the plants.

At 24 months, the low and medium rate of fenuron were still ineffective, only the high rate showed moderate plant kill. The mid and high rates of picloram were somewhat more effective than fenuron. Both the mid and high rates of Tandex gave excellent control with 97-98% of the plants apparently dead.

Plants were still dying 36 months after treatment. The 30 lb ai rate of fenuron had now given acceptable plant control with 82% of the plants dead. The lower rates had given unsatisfactory kill. The picloram effect had increased slightly over that at 24 months, while the kill from the low rate of Tandex had increased to 71%. Eight lbs ai of picloram was slightly more effective than the same amount of Tandex but little increase in kill was obtained with the higher rate of picloram compared to 100% kill with both the 16 and 24 lb rates of Tandex.

There were obvious differences in the effect that these herbicides had on the herbaceous plant cover. The weights per acre of grass and of total herbs at 11 and 30 months are recorded in Table 2. Tandex is a nonselective soil sterilant. Almost no herbaceous plants grew on any of the plots the first year; these plots were not sampled at that time. However by 30 months, a heavy stand of grass had developed on the plots which received 8 lb of Tandex, but only scattered plants were present on plots which received the higher rates. Fenuron was less effective than Tandex in inhibiting herbaceous plant growth, and both grass and especially broadleaved plants were present on the low rate plots within a year after treatment. This had thickened considerably at 30 months. Picloram eliminated most broadleaved herbaceous plants, but it had little affect on the grass. The greater amount of herbaceous growth on the treated plots than on the controls is assumed to be due to reduced competition from the woody plants. (U.S. Department of Agriculture, Forest Service, Forest Fire Laboratory, Riverside, California.)

Table 1. Percent of dead scrub oak plants at three dates after broadcast application of pelletized herbicides

Herbicide	Pounds ai per acre	Percent dead plants		
		8 months	24 months	36 months
Fenuron	10	2	5	35
(25% active)	20	0	5	37
	30	2	57	82
Picloram	4	18	23	44
(10% active)	8	27	63	75
	12	50	73	78
Tandex	8	0	39	71
(10% active)	16	0	97	100
	24	0	98	100
Control	0	0	0	0

Table 2. Production in pounds per acre of grass and total herbaceous plants at two dates after broadcast pellet application

Herbicide	Pounds ai per acre	Pounds per acre (dry wt.)			
		11 months		30 months	
		Grass	Total herbs	Grass	Total herbs
Fenuron	10	111	673	1,470	5,600
	30	trace	5	3,130	3,870
Picloram	4	886	908	4,330	4,330
	12	859	996	2,870	3,000
Tandex	8	not sampled	not sampled	4,200	4,600
	24	not sampled	not sampled	0	0
Control	0	951	1,396	2,130	2,130

Chemical control of grapeleaf blackberry. Stewart, R. E. Grapeleaf blackberry may form a dense ground cover following disturbance on forest lands in the Oregon Coast Range. A well-established cover retards the establishment and subsequent growth of conifer seedlings. On March 18 and June 3, 1971, 2,4,5-T, silvex, dichlorprop, MSMA, and dicamba were applied alone and in various combinations at 1 lb ae per acre to 1/100-acre plots of grapeleaf blackberry. March sprays were applied in diesel oil and June sprays in water carriers at a volume equivalent to 200 gallons per acre using knapsack sprayers.

Results were measured at the end of the second growing season, 14 to 17 months after treatment. March sprays did not produce satisfactory control of grapeleaf blackberry. In contrast June applications of 2,4,5-T and silvex produced 85 and 80 percent reduction in cover, respectively. Addition of dicamba to 2,4,5-T or silvex did not increase control sufficiently to justify the added cost. (Pacific N. W. Forest and Range Expt. Sta., Forest Service, U. S. Dept. of Agric., Roseburg, Oregon.)

This publication reports research involving pesticides. It does not contain recommendations for their use nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

Evaluation of ammonium thiocyanate as an additive for salmonberry control. Stewart, R. E. Ammonium thiocyanate NH_4SCN (Ammonium thiocyanate), has been used as an additive to enhance effectiveness of phenoxy herbicides on various range plants. It is also used with amitrole (as amitrole-T) for control of salmonberry on forest lands in Oregon and Washington. However, the effectiveness of NH_4SCN for this use is unknown. Recent tests indicate that 2,4,5-T and silvex may produce control of salmonberry equivalent to that obtained with amitrole-T. Perhaps addition of NH_4SCN to 2,4,5-T or silvex will produce better results.

A study was started during the 1972 growing season to evaluate combinations of ¼ lb or 3/4 lb aehg NH_4SCN with amitrole, 2,4,5-T, and silvex for salmonberry control. Herbicides were applied to drip point as foliage sprays in May and July to individual plants using knapsack sprayers. Amitrole was applied in a water carrier at 1 lb aehg alone or in combination with NH_4SCN; 2,4,5-T and silvex were applied in diesel oil-in-water emulsion carriers at the same rates.

Initial results were observed in late September, 1972. They indicate that: (1) NH_4SCN by itself is not effective on salmonberry, (2) NH_4SCN may slightly increase effectiveness of 2,4,5-T and silvex, and (3) a combination of NH_4SCN and amitrole doubles initial defoliation and increases topkill tenfold compared to amitrole applied alone. Final results will be obtained at the end of the 1973 growing season. (Pacific N. W. Forest and Range Expt. Sta., Forest Service, U. S. Dept. of Agric., Roseburg, Oregon.)

Ecology of deerbrush ceanothus seeds. Gratkowski, H. A two-month laboratory study has provided new knowledge concerning behavior of deerbrush ceanothus seeds (*Ceanothus integerrimus* H. & A.) in forest soils. Seeds were pre-treated by scarification or heating, and daily changes in moisture content were measured as the seeds were subjected to controlled changes in relative humidity.

A high percentage of mature deerbrush seeds are hard seeds with seed coats impermeable to moisture. Such seeds may lie dormant but viable in forest soils for years after dissemination. When wildfire or logging slash fires sweep an area where the seeds are present in forest soil, the seeds become permeable. The seeds then absorb moisture, stratify in the cold, wet soil during winter, and germinate the following spring producing a new stand of brush seedlings to occupy the burned area.

Heat makes deerbrush seeds permeable only at the hilum. Earlier detailed studies showed that hilar fissures of varnishleaf ceanothus were irreversibly opened by heat, and these data indicate a similar effect occurs in deerbrush seeds. This allows imbibition and germination.

Like varnishleaf seeds, hilar fissures of mature deerbrush seeds open and the seeds lose moisture when exposed to lower relative humidities than any with which they have previously reached equilibrium. Exposed to a higher humidity, they regain only a small portion of this moisture before the fissures close and the seeds again become impermeable. This reduction in moisture content probably reduces respiration rates and conserves stored food. This response is probably the major adaptation that allows deerbrush seeds to remain dormant but viable in forest soils for years after dissemination. (Pacific N. W. Forest and Range Expt. Sta., Forest Service, U. S. Dept. of Agric., Roseburg, Oregon).

Stratification of deerbrush and snowbrush ceanothus seeds. Gratkowski, H. A laboratory-greenhouse study has provided an indication of minimum stratification requirements to insure germination of a high percentage of deerbrush (*Ceanothus integerrimus* H. & A.) and snowbrush ceanothus (*C. velutinus* Dougl.) seeds. This information was requested by Pacific Northwest foresters seeding these species in cuttings to serve as a nurse cover and reduce browsing of young conifers.

Both species serve as nurse crops for very young tree seedlings in southwestern Oregon. Both species are also browsed by deer and other wildlife, but deerbrush is especially desirable. Presence of some of the shrubs in reforested cuttings may reduce browsing of young trees.

Both deerbrush and snowbrush ceanothus seeds exhibited similar stratification requirements. No seeds germinated with 0 to 2 weeks stratification, and only a few seeds germinated after 4 weeks cold, moist storage. However, a minimum of 8 weeks stratification is required to insure a high percentage of germination. In a replicated experiment, maximum numbers of seedlings were obtained with seeds stratified for 10 weeks at approximately 3° Centigrad. (Pacific N. W. Forest and Range Expt. Sta., Forest Service, U. S. Dept. of Agric., Roseburg, Oregon).

Comparison of soil applied herbicides on shrub live oak. Johnsen, Thomas N., Jr. Karbutilate, fenuron and picloram have all given good control of shrub live oak. There is some indication that high concentration formulations may give adequate brush control with a minimum of damage to other plants. Several formulations of these herbicides were tested, including: karbutilate as Tandex 4%; Tandex 10%; Tandex 60%; funuron as Dybar 25% and Dybar 50%; and picloram as Tordon 2K and Tordon 10K. Applications were made by hand broadcasting the herbicides at rates of 4 and 8 pounds active ingredient per acre. One-tenth acre sized plots separated by at least 15-foot wide buffer strips were treated in a randomized block design. Two replications were used due to limitations on materials and land available. In August 1969 applications were made on clay soils at the Beaver Creek Watershed, Arizona.

Little differences between shrub live oak responses to the herbicides and their formulations were observed. Grasses were damaged least by picloram and most by the high rate, low concentration karbutilate and fenuron treatment. Numerous forbs appeared on the higher concentration karbutilate and fenuron plots, especially with the lower rate of application. There was evidence of karbutilate movement off of the lower concentration formulation plots, but not off of the higher concentration plots.

Shrub live oak response to soil applied herbicide formulations broadcast August 1969

Herbicide, Formulation	Rate, lb/A	Live crown reduction (percent)				
		10/69	6/70	10/70	11/71	11/72
Karbutilate (4%)	4	5	30	80	85	80
	8	5	50	93	95	95
Karbutilate (10%)	4	3	20	60	73	60
	8	5	65	90	90	85
Karbutilate (60%)	4	5	20	80	80	50
	8	5	55	95	95	97
Picloram (2%)	4	3	45	60	78	80
	8	3	45	70	90	85
Picloram (10%)	4	3	50	57	68	60
	8	5	88	90	85	85
Fenuron (25%)	4	5	30	90	83	35
	8	5	40	93	90	80
Fenuron (50%)	4	3	35	72	77	80
	8	5	45	96	75	80
Untreated	0	0	3	3	0	10

(USDA, Agricultural Research Service, Western Region, Rocky Mountain forest & Range Ext. Station, Flagstaff, Az. 86001).

The effect of repeated herbicide treatments on the control of creosotebush. Gould, W. L. and C. H. Herbel. Creosotebush (*Larrea divaricata*) is a common species in the desert flora of the southwestern United States. It has invaded extensive areas of productive grassland and is often found in nearly pure stands. The phenoxy herbicides have been quite ineffective on it in New Mexico, and dicamba, picloram and 2,3,6-TBA have shown only slight toxicity at rates up to 2 lb/A.

A series of 12-acre plots of creosotebush were aerially sprayed with various herbicides or herbicide combinations in early September, 1968. Summer rainfall was above normal, and the plants were in a vigorous condition. Preliminary evaluations in August, 1969, indicated a high degree of toxicity from the 1968 treatments. Previous work had shown a large increase in creosotebush control from repeated herbicide treatments when the toxicity of the initial treatments was relatively low. Repeated treatments containing dicamba ± 2,4-D or 2,4,5-T were applied aerially on September 3, 1969 across the 1968 plots to determine whether a similar increase in toxicity would result on brush showing severe damage. The herbicide treatments and degree of control obtained are presented in the table. Results from the second treatments were inconsistent in their effect across the various initial treatments. In some treatments the toxicity was doubled by the second treatment, while in other treatments there was no increase in toxicity. Dicamba alone gave the highest degree of control in some plots, and the combination of herbicides was more effective in other plots. The greatest control from 1968 treatments was obtained with dicamba at 3 lb/A. No additional toxicity was noted from any 1969 treatments. Probably this is because the plants were almost completely defoliated at the time they were sprayed in 1969. (New Mexico Agricultural Experiment Station and Crops Research Division, Agricultural Research Service, Las Cruces, New Mexico.)

Percent control of creosotebush from single and repeated herbicide treatments

1968 Treatments		1969 Treatments (lbs/A)			
Chemicals	Rate lbs/A	Dicamba 1	Dicamba+2,4,5-T 1+1	Dicamba 2,4-D 1+2	Untreated
2,3,6-TBA+ ATC[1]	3+0.1	74	89	63	55
2,3,6-TBA+ATC	2+0.1	60	82	36	35
2,3,6-TBA+ 2,4,5-T+ATC	2+2+0.1	69	77	42	36
2,3,6-TBA+ 2,4-D+ATC	2+2+0.1	53	65	68	52
2,3,6-TBA+ 2,4-D+2,4,5-T +ATC	2+2+1+0.1	76	82	57	40
Dicamba+2,4-D	2+4	65	79	69	54
Dicamba+2,4,5-T	2+2	63	87	92	69
Dicamba	3	76	68	76	78
Picloram+ 2,4,5-T	2+2	81	54	54	61
Picloram+2,4-D	2+4	74	68	58	57
2,4,5-T+ MSMA	4+½	44	65	54	26
Average		67	74	61	51

[1] ATC = ammonium thiocyanate

PROJECT 4. WEEDS IN HORTICULTURE CROPS

Alex G. Ogg, Project Chairman

SUMMARY

Again many reports were submitted on weed control in Horticultural crops. Over thirty reports were submitted covering many horticulture crop and non-crop areas. Many herbicides, herbicide combinations, and herbicide programs were tested. Results were variable depending to some extent on the location and variety of climatic conditions represented in the reports.

Tomatoes (direct seeded). One report concerned the control of dodder in tomatoes. CDEC was reported to control dodder satisfactorily without injury to the direct seeded plants. Several herbicides were tested for annual weed control and the methods of incorporation played a large role on the success of the treatment. Diphenamid at 4 lb/A gave excellent control of weeds when sprinkled into the soil but inadequate control when mechanically mixed into the surface. R-7465 did not express the differential response with method of incorporation as did diphenamid. Herbicides expressing considerable phytotoxicity toward the direct seeded tomatoes were isopropalin, U-27267 and nitralin. Secor provided excellent weed control when applied as a postemergence application. If the transplants were not well established at the time of application or if the rate was too high, crop injury occurred as indicated by the reduced yield. Sencor provided the most outstanding weed control when applied as a postemergence treatment.

Tomatoes (transplanted). Visual injury was not evident when a variety of treatments were made to transplanted tomatoes but reduction in yield was evident with most compounds probably resulting from phytotoxicity at the higher rates.

Onions. The competitive influence of certain weeds was demonstrated by removing a planted stand of weeds in onions at various intervals after planting; as much as 92 percent yield reduction was observed when London rocket was allowed to compete for the first 16 weeks of the season. Several promising herbicides were compared with chloroxuron and nitrofen for onion weed control. Acceptable weed control was obtained with 1 lb/A oxadiazon with increased crop safety when the wettable powder formulation instead of the emulsifiable concentrate was used. Methazole with crop oil provided weed control but was injurious to the crop. IMC-3950 applied as a postemergence treatment failed to provide annual weed control equivalent to oxadiazon and nitrofen used in the same manner.

Grapes. An herbicide screening trial in California demonstrated the need for repeated application of the herbicides dalapon, glyphosate, asulam, MSMA and paraquat. Directed sprays to prevent herbicide application to the vines made it possible to use these materials. Glyphosate was considerably more effective on bermudagrass than was dalapon at the rates tested. One report from California described a new technique for incorporating soil applied herbicides within the vine row.

Turf. Research personnel from Colorado State University submitted a report of an extensive study on the long term effects of herbicides on development of Kentucky bluegrass turf. The herbicides tested were 2,4-D, bensulide, DCPA, dicamba, bandane and silvex. Several bluegrass varieties were evaluated. The reader is directed to the paper for self-analysis of a rather complex series of trials involving several years of testing.

A new dichondra lawn was evaluated for phytotoxicity response to fumigation with methyl bromide. The funigant did not show damage to the new lawn except when combined with higher rates of R-7465. The methyl bromide also failed to give satisfactory control of pigweed. Postemergence treatments of bromoxynil, 2,4-D, dicamba and their combinations was shown to be effective on several difficult-to-control broadleaved weeds in established bluegrass turf.

One research report was submitted on each of the following crops; asparagus, cucumbers, peas, strawberries, carrots, walnut and blackberries. In addition, one paper from the University of Wyoming reported the preformance of several materials for preharvest vine removal in potatoes. DNBP with or without a nonphytotoxic oil resulted in excellent vine removal; there was no reported advantage in adding the oil. Ametryne was also an effective material to kill the vines without reducing potato quality.

Glyphosate, a promising new compound gave excellent weed control under a variety of conditions; among the weeds controlled were purple nutsedge, bermudagrass, johnsongrass and milkweed.

Control of dodder in direct seeded tomatoes. Ashton, F. M., R. D. Kukas, W. S. Seyman and L. L. Buschmann. Due to a large increase in the number of fields being infested with dodder (*Cuscuta* spp.) in the last few years, trials were initiated for controlling dodder in tomatoes. In an attempt to find an immediate answer, these initial experiments utilized only those herbicides which were registered for use on tomatoes and had been reported to control dodder. The first trial (T-4-72) was applied to a field where dodder was present the previous year in Santa Clara County on May 8, 1972. The treatments were : chlorpropham + PPG-124 (p-chlorophyl-N-methyl carbamate)(as Furlow^{R} 20 G and 4 EC) at 4 and 8 lb/A; chlorpropham (10 G and 4 EC) at 4 and 8 lb/A; and DCPA (75 WP and 5 G) at 10 lb/A. The EC formulations were directed sprays. They were sprinkle irrigated after herbicide application to tomatoes about 3 inches in height. Quite severe tomato injury was observed in all of the treatments except the granule formulations of chlorpropham at 4.0 lb/A and DCPA at 10.0 lb/A. There was no dodder present in the plots.

The other trials (T-672, T-7-72, T-8-72) were conducted relatively late in the season in Sutter County where a field was severely infested with dodder. Large preemergence plots of CDEC and CDAA were applied so several layby treatments could be applied after the preemergence treatments when the tomatoes were 5 to 7 inches tall. The results of both the preemergence and layby treatments are given in table 1. CDAA at 6 lb/A injured the tomatoes quite severely and did not satisfactorily control dodder so layby treatments were not applied to the CDAA plots. CDEC at 6.0 lb/A controlled the dodder until the tomatoes were large enough for the layby treatments. There was only one dodder plant found in all of the layby treatments and it was in the DCPA at 10 lb/A; this was presumably due in part to the season long control of dodder by CDEC, but all applications were quite late in the season relative to normal planting time.

Since injury to young tomato plants (3 inches high) was noted in trial T-4-72 another trial, T-7-72, was established on tomatoes 4 to 5 inches tall to determine if larger tomatoes were more resistent to the herbicides. The treatments were: chlorpropham + PPG-124 (Furlow^{R} 20 G and 4 EC) at 2, 4 and 8 lb/A and DCPA (75 WP) at 10 lb/A. A light rain followed but it was not sprinkler irrigated for 2 weeks after application. The results showed that very little tomato injury with these treatments. The dodder was removed before application and there was not enough germination to obtain a rating on control.

In trial T-8-72 the dodder was attached to the small tomatoes in the 2-leaf stage so treatments were applied to see what rates of chloropropham + PPG-124 would be needed to control the dodder comparing both granule and EC formulations. The results are given in table 2. The attached dodder was not removed from the plots before application. Extensive tomato injury was observed with the higher rates on the first evaluation date. When evaluated again in August the only treatment resulting in objectional crop injury was the 8.0 lb/A rate of the granule formulation of Furloe^{R}. The 8.0 lb/A rate of the granule formulation and the 4.0 lb/A rate of the emulsifiable concentrate reduced the dodder populations when compared to the controls, but the tomato injury was quite severe at the early evaluation for both treatments and the 8.0 lb/A rate of granule in the August evaluation.

These results suggest that CDEC is the only herbicide with full registration (as of 1972) which controls dodder without injury to direct seeded tomatoes. Layby treatments of chlorpropham (alone or as Furlow^{R}), granule or EC formulations, require the plants be relatively large at the time of application to prevent excessive injury. This also applies to DCPA as a WP but the granule formulation appears to be selective to small tomato plants. Dodder control by the layby treatments was not determined in these experiments because of the absence of this weedy species; however, previous reports indicate that chlorpropham and DCPA control dodder. (University of California at Davis, Santa Clara County, and Sutter County).

Table 1. Control of dodder in direct seeded tomatoes by a preemergence treatment followed by a layby treatment.

			Preemergence	
Treatment	Formulation	Rate (lb/A)	Phytotoxicity (June 27, 1972)	Attached Dodder[2] (June 27, 1972)
CDEC	4 E.C.	6.0	0.0	0.0
CDAA	"	3.0	4.3	9.7
Control	---	---	0.0	17.0
			Preemergence (CDEC) + layby	
			(Aug. 10, 1972)	(Aug. 10, 1972)
Furloe^{R}	20 G	2.0	0.0[1]	0.0
"	"	4.0	0.0	0.0
"	4 E.C.	2.0	0.0	0.0
"	"	4.0	0.0	0.0
DCPA	75 W.P.	10.0	0.0	0.0
"	5 G	10.0	0.0	0.3
CDEC	20 G	6.0	0.0	0.0
Control		--	0.0	0.0

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[1] Phytotoxicity is an average of 4 replications where 0 = no injury and 10 = dead plant.

[2] Dodder are represented as actual counts.

Table 2. Control of dodder in direct seed tomatoes with postemergence treatment.

Treatment	Formulation	Rate (lb/A)	Phytotoxicity[1/] (July 10, 1972)	Phytotoxicity[1/] (Aug. 10, 1972)	Attached Dodder[2/] (July 10, 1972)
Furloe^R	4 E.C.	1.0	1.0 ab[3/]	0.7 ab	5.3 a-e
"	"	2.0	2.3 b-d	0.7 ab	3.3 a-c
"	"	4.0	6.3 ef	1.0 a-c	1.7 ab
"	20 G	2.0	1.3 a-c	0.3 a	4.0 a-d
"	"	4.0	4.7 e	1.0 a-e	4.0 a-d
"	"	8.0	8.0 f	6.3 e	1.0 a
Control	--	--	0.0 a	2.0 a-d	6.5 a-e
Hand Weeded	--	--	0.0a	1.0 a-c	10.5 e

[1/] Phytotoxicity is an average of 3 replications where 0 = no injury and 10 = dead plant.

[2/] Dodder are actual counts presented as an average of 3 replications.

[3/] Means with the same letter are not significantly different at the 0.05 level.

2,4-D taste test in established asparagus. Ashton, F. M., R. D. Kukas and B. L. Benson. The sodium salt formulation of 2,4-D is registered for weed control in established asparagus but is not always readily available. A taste test was desired to add to the performance and residue data for possible registration of an amine formulation. Therefore, a trial was initiated, in cooperation with the Vegetable Crops Department, to compare the sodium salt formulation with the amine formulation (Formula 40^R) of 2,4-D to determine if there is a difference in flavor, appearance, or texture of cooked asparagus spears. The rates used were selected by taking the highest Federally cleared rates for the sodium salt formulation and also twice this rate. The asparagus spears ranged in size from emerging to 5 inches in height when sprayed on May 7 and 8, 1972. All of the spears that were 7 inches in length or longer were cut at 2 and 4 days after spraying. The asparagus was cooked and tested by 13 different taste panelists giving each treatment a rating which ranged from 0 (same as reference) to 9 (extremely different from reference). The results contained in table 1 are comprised of an average of 13 taste panelists preference with 2 replications. There was no significant difference in flavor at the 2 or 4 day intervals among the 2,4-D formulations or untreated control. The appearance of the 5.0 lb/A rate of 2,4-D amine samples were significantly different from the other treatments at the 2 day cutting interval. This was also evident in the field where the asparagus spears showed considerable bending from the 5.0 lb/A rate of amine and a small amount of bending was noticed with the 2.5 lb/A rate of amine. At the 4 day interval, there was no significant difference between the treatments in appearance. In texture, the 2.5 lb/A amine treatment was significantly different at the 2 day interval and the 5.0 lb/A rate at the 4 day interval. It was concluded that there was no change in flavor regardless of the formulation of 2,4-D applied. The appearance of the spears may show bending, depending on the rate of 2,4-D amine applied, at the 2 day interval with no effect at the 4 day interval. This research was supported in part by the California Asparagus Growers' Association. (Departments of Botany and Vegetable Crops, University of California at Davis).

Table 1. Effect of 2,4-D amine and sodium salt on appearance, texture and flavor of asparagus.

Treatment	Rate lb/A	2 Days After Application	4 Days After Application
	Appearance[1]		
2,4-D Amine	5.0	2.19 b[2]	1.18 a
2,4-D Na Salt	5.0	1.45 ab	0.99 a
2,4-D Amine	2.5	1.85 ab	0.72 a
2,4-D Na Salt	2.5	1.64 ab	0.88 a
Control	--	0.88 a	0.76 a
	Texture[1]		
2,4-D Amine	5.0	1.41 ab	1.38 ab
2,4-D Na Salt	5.0	0.95 a	1.45 b
2,4-D Amine	2.5	1.80 b	1.03 ab
2,4-D Na Salt	2.5	1.30 ab	0.92 a
Control	--	1.19 ab	1.03 ab
	Flavor[1]		
2,4-D Amine	5.0	2.57 a	1.80 a
2,4-D Na Salt	5.0	1.80 a	2.03 a
2,4-D Amine	2.5	2.30 a	1.65 a
2,4-D Na Salt	2.5	1.84 a	1.42 a
Control	--	1.88 a	1.49 a

[1] Consists of 2 replications (sprayed on two different days) and an average of 13 taste panalists for each tasting period. Ratings: 0 same as R (blind reference, untreated), 1-3 slightly different from R, 4-6 moderately different from R, 7-9 extremely different from R.

[2] Means with the same letter are not significantly different at the 0.05 level.

Evaluation of herbicides for weed control in thornless evergreen blackberries. Collins, R. L. Pronamide at 2.24 and 4.48 kg/ha, R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] at 2.24 and 4.48 kg/ha, methazole at 2.24, 4.48 and 6.72 kg/ha, terbacil at 3.36 and 6.72 kg/ha were evaluated for grass and broadleaf weed control in thornless evergreen blackberries near Cornelius, Oregon.

All herbicides were applied on April 13, 1972 as a directed spray to the base of blackberry plants on Woodburn silt loam soil. Annual bluegrass (*Poa annua*) 4-5 cm. high was present under the dormant blackberries at application. The blackberries were sprinkler irrigated. Plot size was 25.29 sq. meters and replicated three times. Herbicides were applied in 151.40 liters water/ha.

The first evaluation was on May 1, 1972 for annual bluegrass and ryegrass (*Lolium* sp.) control. Only terbacil at 3.36 and 6.72 kg/ha and methazole at 6.72 kg/ha gave acceptable control. Terbacil, methazole, and pronamide all caused some very slight injury to the new canes emerging from the crowns. The terbacil and methazole injury was exhibited in the form of leaf margin chlorosis. The pronamide injury was exhibited in the form of downward leaf cupping. R-7465 showed no injury.

The second evaluation was on July 11, 1972. Pronamide at 2.24 and 4.48 kg/ha, methazole at 6.72 kg/ha, R-7465 at 4.48 kg/ha, and terbacil at 3.36 and 6.72 kg/ha gave satisfactory control of barnyard grass (*Echinochloa crus galli*) and ryegrass. Methazole and terbacil at all rates, were the only herbicides which gave control of the broadleaf weeds pigweed (*Amaranthus retroflexus*) groundsel (*Senecio vulgaris*), and common sowthistle (*Sonchus oleraceus*).

None of the herbicides showed any significant crop injury on this date. (Consultant, 229 N. E. 17th St. Hillsboro, Oregon)

Weed control and crop tolerance ratings

Treatment	kg/ha	Ave grass cont. 5/1	Ave grass cont. 7/11	Ave. BL cont. 7/11	Crop tol. 5/1	Crop tol. 7/11
pronamide	2.24	3.6	8.6	0.0	1.0	0.0
pronamide	4.48	4.6	10.0	1.0	1.0	0.0
methazole	2.24	6.0	2.0	10.0	1.0	0.0
methazole	4.48	7.3	6.3	10.0	1.0	0.0
methazole	6.72	8.6	8.3	10.0	1.0	0.1
R-7465	2.24	1.3	0.0	0.0	0.0	0.0
R-7465	4.48	3.0	8.0	5.3	0.0	0.0
terbacil	3.36	9.6	10.0	10.0	0.8	0.1
terbacil	6.72	10.0	10.0	10.0	1.0	0.3
check	-	0.0	0.0	0.0	0.0	0.0

0 - no effect 10 - complete elimination

Growth of onions as affected by growth of London rocket (*Sisymbrium irio* L.) and ridgeseed spurge (*Euphorbia glyptosperma* Engelm.). Menges, R. M. Ridgeseed spurge (*Euphorbia glyptosperma* Engelm.) and London rocket (*Sisymbrium irio* L.) were seeded 1 and 4 plants per 30 cm of row at planting of onions (*Allium cepa* L.) and were removed after 2, 4, 8, 12 and 16 weeks to study the growth relationships of the weeds and onions in warm, irrigated soils. The growth of ridgeseed spurge has no significant effect on the growth of onions. The growth of London rocket, however, reduced the yield of onions 31 and 92 percent in the first 4 and 16 weeks after planting, respectively. Stand and bulb-size reduction apparently contributed to the yield reduction. Only London rocket grew aggressively under these conditions, which included a soil temperature range of 12 to 30° C. Earliness of stage of onion growth was more critical in determining the effect of weed competition than was density of weed population. (So. Region, Agr. Res. Serv., U.S. Dept. of Agr., Weslaco, Tex. 78596.)

Potato vine killing treatments and effect on tuber quality. Lee, G. A., K. E. Bohnenblust, and H. P. Alley. Studies were conducted at the Torrington Agriculture Substation to compare the effectiveness of various vine killing herbicides and to determine the subsequent effect on specific susceptibility of three potato varieties (Shurchip, Red LaSoda and Russet Burbank). DNBP + oil at 3.0 + 2.0 qt/A and DNBP at 3.0 qt/A were applied in 40 gpa of water carrier. Ametryne at 1.6 lb/A was applied in 90 gpa of diluent. Potato vines were clipped with hand-shears so that 20-30 percent of the leaves remained. Chemical and mechanical treatments were made on August 31, 1972. Tubers were harvested September 15, 1972.

DNBP + oil at 3.0 + 2.0 qt/A and DNBP at 3.0 qt/A resulted in 80 to 85 percent vine kill for all potato varieties. There appeared to be no benefit by the addition of the nonphytotoxic oil. Ametryne at 1.6 lb/A gave 87, 93 and 85 percent vine kill for Shurchip, Red LaSoda and Russet Burbank, respectively. The specific gravity was higher in the nontreated check plots than in either the herbicide treated areas or clipped areas regardless of potato variety. The lowest specific gravity was recorded in Red LaSoda tubers from the area treated with DNBP at 3.0 qt/A.

The Shurchip variety generally had less skinning damage than the other varieties regardless of vine kill treatment, whereas Red LaSoda was the most susceptible to skinning. No treatment resulted in sufficient stem-end discoloration in any variety to reduce the tuber quality. (Wyoming Agricultural Experiment Station, Laramie SR-452).

Effect of chemical and mechanical treatments on vine removal and potato quality

Treatment	Rate/A	% Vine kill			Specific Gr.			Stem-end discoloration		
		Shur-chip	Red LaSoda	Russet Burbank	Shur-chip	Red LaSoda	Russet Burbank	Shur-chip	Red LaSoda	Russet Burbank
DNBP + oil	3.0 + 2.0 qt	85[1]	85	85	1.075[2]	1.070	1.075	0[3]	1	0
DNBP	3.0 qt	80	85	85	1.076	1.068	1.078	0	0	0
ametryne	1.6 lb	87	93	85	1.079	1.072	1.078	.5	0	0
clipped		--	--	--	1.078	1.074	1.080	1	0	.5
Check		--	--	--	1.084	1.075	1.082	.5	0	0

[1] Percent vine kill determined by visual observation.

[2] Specific gravity determined by potato hydrometer method.

[3] Stem end discoloration ratings: 0 = normal, no discoloration; 10 = severe vascular discoloration.

Tillage-herbicide field test in cucumbers. Peabody, Dwight V., Jr. Since the production of field corn has lent itself to the management techniques given the generalized title of "non-tillage", production of other crops might also be facilitated by non-tillage farming methods. Therefore, three general systems were compared as to their effect on control of annual weeds, establishment of cucumber stands and yield of cucumbers.

Minimum tillage (two pre-plant diskings) and non-tillage areas had been seeded to a rye cover crop the preceeding fall. These areas were treated with various rates of paraquat and glyphosate and then planted with an "Allis-Chalmers No-till Corn Planter" fitted with cucumber plates. Excellent contact activity on the over-wintered rye crop and emerged summer annual weeds was attained and good stands of seedling cucumbers were present in all non-tillage and limited tillage treatments. However, the dead vegetation in these treatments provided excellent cover for slugs and very few seedling cucumbers ever reached the first true leaf stage of growth. In the "stale seed bed" treated block where conventional tillage methods (plow, disc and harrow) were completed two weeks prior to planting, slug infestation was minimal. Pre-emergence weed control by the contact herbicides paraquat and glyphosate were then supplemented by various post-emergent herbicides of which asulam was the outstanding example. Cucumbers showed high tolerance to post-emergent applications of asulam even at rates as high as 4 lbs. ai per A and control of both annual broadleaved and grassy weeds was excellent. Yield of cucumbers from plots treated with the combination of pre-emergent paraquat or glyphosate plus post-emergent asulam ranged from 12 to 15 tons per acre. (Wash. State Univ., N. W. Wash. Res. & Ext. Unit, Mr. Vernon.)

Herbicide evaluation field test in green peas. Peabody, Dwight V., Jr. Five compounds each at two rates of application were compared to each other and to the standard dinoseb treatment as selective herbicide treatments in green peas grown for processing. The low (0.25 lbs. ai per A) postemergent application of metribuzin resulted in outstanding control of the annual broadleaved weed population present, and mean yields of green peas from plots receiving this treatment outyielded the dinoseb treated plots by 1600 pounds per acre. Metribuzin at double this rate (0.5 lbs. ai per A) did not cause a significant reduction in yield of green peas. (Wash. State Univ., N. W. Wash. Res. & Ext. Unit, Mt. Vernon.)

A technique for incorporating herbicides in tree and vine rows. Kempen, H. M. and E. Surber. Results from a July 11, 1972 trial indicate that herbicides needing incorporation down the tree or vine row could be incorporated by using a power rotary tiller (Rotary Corrugator TM). The machine throws soil forward which is then deflected 2 to 6 feet into the tree or vine row. Herbicide sprays are either directed into the vine or row and covered with a prescribed layer of soil, or sprays can be mixed into the covering soil.

Previous studies have shown that a layer of trifluralin will prevent field bindweed emergence but that spray blade applicators leave an "island" of bindweed at each plant. This technique should overcome that and enable growers to obtain annual weed control also.

Results in tabular form show safety on Ruby Cabernet grapes and efficacy on susceptible weeds. (University of California AES, Bakersfield and Superior Farming Company, Bakersfield).

Herbicides incorporated with a rotary tiller on grapes. Bakersfield, California[1].

Treatment	lb/A	Yellow nutsedge control 8/19/72	Grape injury[2] 8/19/72	10/10/72
Untreated		0	0	0
Trifluralin	4	0	0	0
Dichlobenil	4	10	0 to 5	0
Dichlobenil plus trifluralin	4 + 1	10	0 to 3	0
EPTC	3	9.5	0	0
Alachlor	2	9.7	0	0

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[1] Treated 7/11/72, plot size 1300' x 4' wide; ratings are 0 to 10; 0 = no effect; 10 = kill; average of 2 evaluations. Herbicide was incorporated in 2" of soil, partially covering spring planted Ruby Cabernet rootings. Hairy nightshade control was evident in all but the trifluralin and check treatments. Cross cultivation followed weed evaluations 8/19/72.

[2] Dichlobenil injury was restricted to a portion of the field where a horse corral once existed; injury symptoms were limited to stunted shoots with purpled or light yellow or blotchy yellow leaves.

<u>The long time effect of herbicides on development of thatch in Kentucky bluegrass turf.</u> Fults, Jess L. The herbicides tested included 2,4-D, bensulide, DCPA, dicamba, bandane and silvex. Bluegrass varieties included Merion, Newport, Delta, Park and Windsor as well as common. All were established from seed in September of 1963 or 1964. The plot of Windsor-sodded was established in October 1965. Herbicides, at recommended rates, were applied once a year in late spring or early summer in 1966, 1967, 1968, 1969, 1970 and 1971. No herbicides were used in 1972. All plots were originally laid out and treated the first time in July 1966. The experimental design was a randomized block with split plots. The first split was with and without fertilizer. These were further split into two heights of cut 1½ inches and ½ inch. The herbicide treatments were placed across the fertilizer and height of cut treatments. Plots receiving fertilizer were treated with 1.6 to 2 lbs of N per 1000 sq ft. Fertilizer used was either 45 percent urea, 21 percent ammonium sulfate, or 16 percent diammonium phosphate. Fertilizer was used July 13 and August 21, 1966,

April 15, 1967, May 1, 1968, September 10, 1969, April 10, 1971, September 23, 1971 and April 15, 1972. Size of the main plots (each variety) was 17 ft + 40 ft = 680 sq ft; within each variety, herbicide treatment sub-plots were 29 inches x 40 ft. The sub-sub-sub plots were 29 inches x 5 ft.

Five sod samples were taken in each sub-sub-sub plots to a depth of 6 inches on September 21, 1972. The thickness of thatch in milimeters was measured on each sod sample and the average of each set of 5 was used for the analysis of variance to determine the significance of mean differences. Two different kinds of main comparisons were made - one to determine differences between herbicides and one to determine differences between varieties. The data are shown in Tables 1 and 2.

As indicated in Table 1: Without fertilizer and when height of cut was either 1½ inches or ½ inch, the F values were too small to compare herbicides. With fertilizer and height of cut of 1½ inches, Bandane (at P.05) had significantly thicker thatch than all other treatments; DCPA, silvex, control and dicamba did not differ between themselves but were significantly greater than 2,4-D or bensulide; silvex, control, dicamba, and 2,4-D did not differ among themselves but were greater than bensulide; at the P.01 level bandane was significantly greater than all other treatments; all other treatments did not differ significantly between themselves.

As indicated in Table 2: Without fertilizer and a height of cut of 1½ inches, F values were too small to compare means. Without fertilizer and a height of cut of ½ inch, (at P.05 level) Windsor-sod and Merion were not significantly different but Windwor-sod was significantly greater than all other varieties; at P.01 level, Windsor-sod, Merion and Windsor-seed did not differ between themselves but Windsor-sod was significantly greater than all other varieties. With fertilizer and a height of cut of 1½ inches (P.05 level), Merion, Windsor-sod, Newport and Windsor-seed did not differ between themselves, but Merion was significantly greater than common, Delta and Park. With fertilizer and a height of cut of ½ inch, at both the P.05 and P.01 levels, Merion was significantly greater than all other varieties; Windsor-sod, Newport, Windsor-seed, Park, Delta and common did not differ significantly between themselves. (Weed Research Laboratory, Botany Department, Colorado Agricultural Experiment Station, C,S,U., Fort Collins, Colorado 80521).

The effect of fertilizer height of cut and herbicide on the development of thatch in Kentucky bluegrass turf.[1] Cummulative effects 1966 to 1972.

Table 1.

Fertilizer	Height of cut	Herbicide	Average thickness thatch	Duncan multiple range test		Remarks
				P.05	P.01	
	inches		mm			
None	1½	--	--	--	--	F value too small to compare means
None	½	--	--	--	--	F value too small to compare means
Yes	1½	Bandane	35.34	a	a	F values greater than required at both P.05 and P.01
		DCPA	30.42	b	b	
		silvex	28.74	bc	b	
		control	27.77	bcd	b	
		dicamba	27.77	bcd	b	
		2,4-D	26.43	cd	b	
		bensulide	25.11	d	b	
Yes		Bandane	25.37	a	a	F values greater than required at both P.05 and P.01
		DCPA	24.00	a	a	
		control	20.23	b	b	
		dicamba	19.71	b	b	
		silvex	19.00	b	b	
		2,4-D	18.91	b	b	
		bensulide	18.09	b	b	

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[1] Varieties used included Merion, Newport, Delta, Park, Windsor, and common from seed; and Windsor established from sod.

The effect of fertilizer, height of cut and variety on the development of thatch in Kentucky bluegrass turf treated with herbicides.[1/] Cummulative effects 1966 to 1971.

Table 2.

Fertilizer	Height of cut inches	Herbicide	Average thickness thatch mm	Duncan multiple range test P.05	Duncan multiple range test P.01	Remarks
None	1½	--	--	--	--	F value less than required. Can't compare means
None	½	Windsor, sod	19.60	a	a	F value greater than required at both P.05 and P.01
		Merion	15.37	ab	ab	
		Windsor, seed	11.54	bc	abc	
		Delta	8.77	c	bc	
		Park	6.77	c	bc	
		Common	6.14	c	c	
		Newport	5.23	c	c	
Yes	1½	Merion	32.26	a	a	F value greater than required at both P.05 and P.01
		Windsor, sod	30.31	ab	ab	
		Newport	30.06	ab	abc	
		Windsor, seed	29.37	abc	abcd	
		Common	27.40	bcd	bcd	
		Delta	26.40	cd	bcd	
		Park	25.80	d	d	
Yes	½	Merion	25.94	a	a	F value greater than required at both P.05 and P.01
		Windsor, sod	21.66	b	b	
		Newport	21.57	b	b	
		Windsor, seed	19.31	b	b	
		Park	19.23	b	b	
		Delta	18.94	b	b	
		Common	18.66	b	b	

[1/] Chemical treatments used included Bandane, DCPA, control, dicamba, silbes, 2,4-D and bensulide.

Control of annual weeds with eight herbicides and herbicide combinations in walnuts var. Hartley. Elmore, C. L., D. Holmberg, E. Roncoroni and A. Lange. A preemergence herbicide trial was established on five year old Hartley walnuts on January 12, 1972 using 25' x 8' plots replicated four times. Experimental design was a randomized complete block. Application was made with a knapsack sprayer at 30 psi in 100 gpa water. Paraquat at 0.5 lb/A plus the surfactant X-77 at 0.5% v/v was added to all treatments. The orchard had been disced prior to application and then followed by furrow irrigation outside the treated strip. The soil was a Yolo clay loam. Evaluations of the heavy weed population were taken 2 and almost 3 months after application.

Almost all herbicides and combinations gave acceptable control of the winter annual weed complex present in this trial. R-7465 (2-(αNaphthoxy)-N,N-diethylpropionamide) did not control shepherdspurse or henbit well. Oxadiazon was quite weak on common chickweed however it controlled all other weeds. All the combination treatments gave better than 80 percent control of a broad spectrum of annual weeds through 3 months.

No phytotoxicity was observed from any treatment. (University of California, Davis, Woodland, Davis, Parlier).

Table 1. Control of annual weeds with several herbicides and herbicide combinations in a furrow irrigated walnut orchard 2 months after application

		weed control (10 = 100%)								
Herbicide	Rate/Acre	scarlet pimpernel	common chickweed	annual bluegrass	common groundsel	shepherds-purse	filaree	henbit	miners lettuce	total
simazine + nitralin	2 + 4	10.0	10.0	10.0	10.0	10.0	10.0	9.4	10.0	9.8
simazine + nitralin	4 + 8	10.0	10.0	10.0	10.0	10.0	10.0	9.9	10.0	9.9
R-7465	4	10.0	8.0	10.0	10.0	6.5	10.0	1.5	9.1	5.5
R-7465	8	10.0	8.0	10.0	10.0	8.9	10.0	5.2	10.0	6.5
simazine + R-7465	2 + 4	10.0	9.7	9.9	10.0	10.0	10.0	9.1	10.0	9.2
simazine + R-7465	4 + 8	10.0	9.8	9.9	10.0	10.0	10.0	9.7	10.0	9.5
oxadiazon	2	10.0	0.2	9.9	10.0	10.0	10.0	10.0	10.0	3.8
oxadiazon	8	10.0	1.2	10.0	10.0	10.0	10.0	10.0	10.0	4.8
simazine + oxadiazon	2 + 4	10.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0	8.7
simazine + oxadiazon	4 + 8	10.0	9.5	10.0	10.0	10.0	10.0	10.0	10.0	9.9
simazine + oryzalin	2 + 4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
oryzalin	4	10.0	8.6	10.0	9.5	9.0	10.0	10.0	10.0	8.8
simazine + diethamine	1 + 2	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
simazine + diethamine	2 + 4	10.0	10.0	9.9	9.9	10.0	10.0	10.0	10.0	9.9
SAN 9789 + oxadiazon	2 + 4	10.0	8.2	10.0	10.0	10.0	10.0	10.0	10.0	9.1
SAN 9789 + oxadiazon	4 + 8	10.0	8.8	10.0	10.0	10.0	10.0	10.0	10.0	9.4
simazine + CGA 10832	1 + 2	10.0	10.0	10.0	10.0	9.9	10.0	10.0	10.0	9.5
simazine + CGA 10832	2 + 4	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.9
control	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2. Control of annual weeds with several herbicides and herbicide combinations in a furrow irrigated walnut orchard 3 months after application

Herbicide	Rate/Acre	weed control				
		shepherdspurse	henbit	mustard	cheeseweed	total
simazine + nitralin	2 + 4	10.0	9.9	9.6	10.0	9.0
simazine + nitralin	4 + 8	10.0	9.6	10.0	10.0	9.6
R-7465	4	4.0	0.8	0.8	9.8	4.2
R-7465	8	5.2	2.0	8.5	10.0	4.8
simazine + R-7465	2 + 4	10.0	8.5	9.2	10.0	8.8
simazine + R-7465	4 + 8	9.9	8.8	9.9	10.0	8.8
oxadiazon	2	10.0	10.0	9.8	10.0	3.2
oxadiazon	8	10.0	10.0	10.0	10.0	4.2
simazine + pxadoazpm	2 + 4	10.0	9.9	10.0	10.0	8.2
simazine + oxadiazon	4 + 8	10.0	10.0	10.0	10.0	9.6
simazine + oryzalin	2 + 4	9.8	10.0	10.0	10.0	9.6
oryzalin	4	7.2	10.0	10.0	10.0	7.2
simazine + diethamine	1 + 2	10.0	10.0	10.0	10.0	9.9
simazine + diethamine	2 + 4	10.0	10.0	10.0	10.0	9.9
SAN 9789 + oxadiazon	2 + 4	10.0	10.0	10.0	10.0	8.2
SAN 9789 + oxadiazon	4 + 8	10.0	10.0	10.0	10.0	8.5
simazine + CGA 10832	1 + 2	10.0	10.0	9.9	10.0	9.6
simazine + CGA 10832	2 + 4	9.0	10.0	8.6	10.0	8.2
control	-	0.0	0.0	0.0	0.0	0.0

weed control: 0 = no effect; 10 = complete control

Postemergence broadleaf weed control in turfgrass. Elmore, C. L., L. Frey and N. L. Smith. Two trials using six postemergence herbicides and herbicide combinations were applied April 21, 1972 in two locations on an established Kentucky bluegrass, bentgrass turf. Both tests were designed to give phytotoxicity information as well as control for the two principal weeds *Soliva sesselis* and *Ranunculus muricatus*. Additional weeds, *Trifolium repens* and *Plantago major* were found in sufficient quantity to evaluate control.

All treatments were applied in 100 gpa with a CO_2 pressure sprayer to plots 5 ft. x 10 ft. and replicated 4 times. The temperature was approximately 70-73° F. in the shade at application. No water was applied to the turf for 48 hours following treatment. The *S. sesselis* was in bloom stage and the *R. muricatus* was bloom to early seed stage at application. Phytotoxicity and weed control evaluations were made April 30, May 9 and 21, and June 9, 1972.

Bromoxynil effectively controlled both *S. sesselis* and *R. muricatus* in these trials. A single application of bromoxynil did not satisfactorily control white clover or broadleaf plantain.

Good control of *R. muricatus* and broadleaf plantain was achieved with 2,4-D o.s. amine. *T. repens* and *S. sesselis* were not controlled.

Dicamba controlled all weed species well except broadleaf plantain which has been consistently tolerant of this herbicide in other tests. The combination of 2,4-D plus silvex gave excellent control of all weeds at a rate of 1.0 + 0.5; however at this rate bentgrass injury was unsatisfactory.

Acceptable control was not achieved on any weed with a single application of the MCPP + Maintain R combination. Some control was apparent however of *R. muricatus* and *T. repens* at the high rates. (University of California, Davis, Sacramento and Davis respectively).

Control of four broadleaf weeds in turfgrass with six postemergence herbicides and herbicide combinations

Herbicide	rate	Soliva control				white clover		broadleaf plantain	ranunculus muricatus		phytotoxicity(10=100%)			
	lb a.i./A	4/30	5/9	5/21	6/9	5/21	6/9	6/9	5/9	6/9	4/30	5/9	5/21	6/9
bromoxynil	0.5	6.5	9.5	9.2	9.6	2.5	0.8	0.8	3.2	6.2	0.0	0.4	0.5	0.1
bromoxynil	1.0	7.8	9.8	9.8	10.0	2.5	1.3	0.8	6.0	7.5	0.0	0.6	0.2	0.0
bromoxynil	2.0	8.3	10.0	9.8	10.0	2.0	1.4	4.8	8.5	8.8	0.0	0.8	0.5	0.1
2,4-D o.s. amine	0.5	0.2	0.2	2.0	1.0	0.2	1.8	7.0	4.0	9.2	0.0	0.0	0.0	0.1
2,4-D o.s. amine	1.0	1.0	1.2	4.2	2.8	2.8	2.3	9.7	4.2	10.0	0.0	1.1	0.2	0.1
dicamba	0.125	1.0	4.0	8.2	10.0	9.2	9.7	2.8	2.8	5.8	0.0	1.4	0.8	0.5
dicamba	0.25	2.0	4.0	9.5	9.8	10.0	9.9	1.0	2.8	5.8	0.0	1.2	0.2	0.4
2,4-D + silvex	0.5 + 0.25	3.2	4.2	8.2	7.0	9.2	8.5	9.8	5.0	9.2	0.0	1.4	3.5	1.0
2,4-D + silvex	1.0 + 0.5	4.5	8.0	9.8	10.0	10.0	9.4	9.5	4.0	10.0	0.0	2.2	4.5	2.0
2,4-D + silvex	2.0 + 1.0	4.2	8.5	10.0	10.0	10.0	10.0	9.9	5.8	10.0	0.5	3.1	5.8	2.3
MCPP + Maintain R	1.0 + 0.33	1.2	1.2	3.2	1.2	6.8	4.0	2.2	2.0	3.2	0.0	0.2	0.5	0.5
MCPP + Maintain R	2.0 + 0.67	1.2	1.5	4.5	5.0	8.0	4.6	7.2	2.0	8.5	0.0	0.0	1.0	0.6
control	--	0.0	0.5	0.5	2.2	0.0	0.5	0.5	0.2	0.5	0.0	0.0	0.5	0.4

Post emergence weed control in dry bulb onions. Agamalian, H. Cultural methods involving onion production require preemergence herbicides. In addition to the above treatment, post emergence applications are essential for season long weed control. Several promising herbicides were evaluated in comparison with chloroxuron and nitrofen, which are currently labeled for onions.

Herbicide applications were made to Southport white Globe dehydrator onions in the 1 to 3 true leaf stage of growth. All herbicides were applied in a total volume of 60 gpa, using a CO_2 sprayer with 3-8002 T-Jet nozzles at 30 psi.

Major weeds present at time of treatment were common groundsel (*Senecio vulgaris* L.) red root pigweed (*Amaranthus retroflexus* L.), hairy nightshade (*Solanum sarachoides*) and purslane (*Portulaca oleracea* L.).

Weed control, crop phytotoxicity ratings and yield data are reported in the following table. Marginal weed control was obtained with oxadiazine at 0.5 lb/A. Acceptable weed control at 1 lb/A on the evaluated species, with some crop phytotoxicity is noted. Yield differences were not significant with the hand weeded control. The emulsifiable formulation of oxadiazine is more active than the wettable powder formulation. Increased crop safety was evident with the wettable powder formulation.

Comparison of methazole with non-phytotoxic oil resulted in increased weed control, but also reduced crop selectivity. This was evident with stand reduction, although yield data was not significant from the control. Formulation comparisons of RP-2929 (dimethylamino-4-thiocyanobenzene) were not as evident from the data obtained from this trial. This herbicide exhibits excellent onion tolerance, but was marginal on the weeds evaluated at this site.

Chloroxuron provided good weed control on purslane and common groundsel, but is marginal on hairy nightshade. The addition of non-phytotoxic oil to nitrofen did not enhance weed control to those species present at this trial. (University of California Agriculture Extension, Salinas.)

Annual weed control, onion phytotoxicity, and yield data comparing formulations of several post emergence herbicides.

			WEED CONTROL				
Herbicide	Formulation	lb/A	HNS	Purslane	Groundsel	Crop Phyto	Yield lb/plot
Oxadiazone	E.C.	0.5	5.5	6.7	7.2	1.25	19.1
Oxadiazone	E.C.	1.0	8.7	10.0	8.3	1.75	18.9
Oxadiazone	E.C.	2.0	9.5	10.0	9.3	2.5	18.3
Oxadiazone	W.P.	1.0	3.7	10.0	2.5	0.25	16.5
Oxadiazone	W.P.	2.0	5.5	10.0	6.0	0.5	18.3
Methazole	W.P.	1.0	6.7	10.0	--	1.0	18.0
Methazole	W.P.	2.0	8.2	10.0	--	2.0	20.9
Methazole+N.PO	W.P.	1.0	8.0	10.0	6.2	3.0	17.0
Methazole+N.PO	W.P.	2.0	9.5	10.0	8.8	4.0	16.1
RP-2929	Flowable	2.0	5.0	5.7	1.5	0.25	19.2
RP-2929	Flowable	4.0	6.0	8.7	3.0	0.5	19.6
RP-2929	E.C.	2.0	4.2	5.0	1.2	0.5	18.0
RP-2929	E.C.	4.0	5.0	7.0	1.5	0.75	18.8
Chloroxuron	W.P.	2.0	3.2	7.0	6.3	0.0	17.0
Chloroxuron	W.P.	4.0	4.0	9.0	8.8	0.5	17.8
Nitrofen	W.P.	4.0	5.0	10.0	4.1	0.5	18.6
Nitrofen+N.PO	W.P.	4.0	7.7	10.0	4.5	0.0	18.8
Control	--	--	0.0	0.0	0.0	0.0	17.0
LSD						0.05	N.S.

Weed Control: 0 = No control; 10 = complete kill
Crop Phytotoxicity: 0 = no injury; 10 = dead plants
HNS = hairy nightshade

Evaluation of postemergence herbicides on tomatoes. Agamalian, H. Applications of Sencor (4 amino-6-t-butyl-3-methylthio-1,2,4-triazin-5 4H-one) were made to tomatoes grown under furrow and sprinkler irrigation. The herbicide was applied as a non-directed spray to the tomato seedlings following thinning. The variety Calmart was in the 3 to 4 true leaf stage in the sprinkler study and approximately 12 - 14 inches tall in the furrow test.

Herbicide applications were made with a CO_2 sprayer, using a 3-8002 T-Jet nozzle boom. Volume was 60 gpa. Rates of application were 0.25, 0.5, .75 and 1.00 lb/A. The sprinkler study included pronamide and nitrofen applied under the same conditions. Applications were made preemergence to weed growth. Irrigation applications were made with twenty-four hours of application. Approximately 1.5 inches of water was applied with the sprinklers and the furrow irrigation allowed for subbing to the plant row.

Major weed species at both sites was red root pigweed (*Amaranthus retroflexus*), lambsquarters (*Chenopodium album*) was present at the furrow test site.

Increasing rates of Sencor under sprinkler irrigation, resulted in reduced plant size. Under both test sites no evidence of foliar symptoms were evident, although previous trials have shown some leaf necrosis at rates above one half pound per acre.

Crop suppression was much less at the furrow irrigation test, which may be related to tomato seedling size at time of treatment and/or the different method of irrigation. With the exception of the 0.25 lb rate there was no significant difference in yield.

The response of pronamide in the test should warrant further evaluation. Nitrofen appears to be phytotoxic to tomatoes when applied as a postemergence treatment. (University California Agriculture Extension, Salinas.)

Table 1. Effects of several postemergence herbicides on tomatoes under sprinkler irrigation.

Herbicide	lb/A	Pigweed Control 7/20	Pigweed Control 8/29	Crop Phyto 7/20	Crop Phyto 8/29	Yield Mature Green lb/Plot
Sencor	0.25	8.0	9.7	0.0	0.0	128.5**
Sencor	0.5	9.0	9.7	2.5	0.75	93.7
Sencor	0.75	9.5	10.0	2.5	1.0	84.5
Sencor	0.1	9.5	9.2	1.7	87.0	
pronamide	2.0	3.2	9.2	1.5	0.5	65.0
pronamide	4.0	4.5	9.5	2.5	1.25	72.6
nitrofen	2.0	2.0	7.5	5.5	5.5	36.8**
control	0.0	0.0	3.0	0.5	1.0	93.8
LSD	.01					43.3

Table 2. Several rates of Sencor applied postemergence to tomato under furrow irrigation

Herbicide	lb/A	Weed Control P.W.	Weed Control lqt.	Crop Phyto	Lb/Plot Yield mature green
Sencor	0.25	9.2	8.2	0.0	102.5
Sencor	0.50	9.2	9.5	0.25	116.2
Sencor	0.75	9.7	10.0	0.50	117.75
Sencor	1.00	9.2	10.0	0.75	119.5
Control	0.00	3.0	2.0	0.0	118.6
LSD	0.01				N.S.

Weed Species: P.W. = pigweed; lqt = lambsquarters

The effect of timing on late summer annual weed control under drip irrigation. Lange, A. Five new herbicides in combination with simazine were applied 11/7/71, 12/24/71 and 3/2/72 followed by sprinkler irrigation and/or rainfall. In addition to sprinkler irrigation the entire experiment received constant drip irrigation.

When evaluated 8/14/72 no detrimental symptoms were observed on grapes or young peach trees except in one replication of the simazine + San-9789 (4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2*H*)-pyridazinone) on grapes which received extra nearly daily watering during the summer from an adjacent lawn sprinkler.

The combination of simazine plus R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] and plus Oryzaline (EL 119) was weakest.

Most of the combinations gave satisfactory weed control. The most consistent was the combination of simazine 1 lb/A plus RP-17623 (2-tertiobutyl-4-(2,4-dichloro-5-isopropyloxphenyl)-5-oxo-1,3,4-oxadiazoline) 4 lbs/A.

The combination of simazine plus San-9789 (not tested in December) was also consistent.

The constantly wet conditions produced by drip irrigation resulted in poorer than usual weed control from these combinations.

Simazine plus nitralin was excellent except for the December application which received half its initial overhead water from a sprinkler followed by about half the initial water from a storm. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of timing of herbicide application on the residual (summer) weed control in young peach trees. (A36-73-501-H14-1-72)

			Average[1]	
Herbicide	lb/A	11/7/71	12/24/71	3/2/72
Simazine + Nitralin	1+4	8.0	5.8	9.2
Simazine + EL 119	1+4	6.0	7.2	5.8
Simazine + R-7465	1+4	4.8	5.5	6.0
Simazine + RP-17623	1+4	7.0	8.0	8.2
Simazine _ San-9789	1+4	7.2	-	7.8
Check	-	3.5		

Evaluated 8/14/72. Weed species - Lambsquarter, pigweed, puncture vine, bursage. No phytotoxicity was seen on drip and sprinkler irrigation.

[1] Average of 4 replications where 0 = no weed control and 10 = completely free of weeds.

Annual weed control in tomatoes. Lange, A. Seven herbicides were applied prior to transplanted and direct seeded Peto variety fresh market pole tomatoes on February 20, 1972. Half of each plot was incorporated with straight toothed power bed incorporator. The plants were planted February 27, 1972. The same variety of tomato was seeded on adjacent 30" beds which were later knocked down giving a spacing of 5 feet between rows. The entire plots was sprinkler irrigated until the first fruit was ripe and then subsequently furrow irrigated. (The soil was a Delhi sandy loam - organic matter 0.13%, sand 72%, silt 22% and clay 6%.)

The weed control varied with the method of incorporation for some herbicides, most notably diphenamid. With mechanical incorporation the 4 lbs/A rate was inadequate, but when sprinkled only, the control was excellent, however, the vigor of direct seeded tomatoes was reduced. Isopropalin on the other hand was much more effective incorporated but by the same token it was more toxic to tomatoes when incorporated. R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] was equally effective on weeds under both methods and caused some stunting of tomatoes at 2 lbs/A. U-27267 (3,4,5-tribromo-N,N,α-trimethylpyrazole-1-acetamide) also appeared equally effective with both methods but reduced growth even at the ½ lb/A rate. Nitralin gave poor weed control and may have been somewhat toxic when incorporated. IMC-3950 (S-(4-chlorobenzyl)-N,N-diethylthiol carbamate) was ineffective on the weeds. CGA-10832 (N-n-propyl-N-cyclopropylmethyl-4-triflouromethyl-2,6-dinitroaniline) was least selective giving fair weed control under both methods of incorporation, power and sprinkler.

In the transplanted tomatoes there was no effect on the size of plants but the plants in the CGA-10832 plots showed some swelling at the ground level. A few plants broke off at this point when the plants were just beginning to bear fruit. This was not observed in other treatments or the untreated check plots. Although no detrimental effects were observed there were substantial differences in yield (Table 2). The lowest yield was recorded in the partially weeded check and the high rate of U-27267. U-27267 gave excellent weed control. A reduction in fruit at the high rate probably indicates injury to plant growth. The very high yield at ½ lb/A of isopropalin and much lower yield at 1 lb/A suggests a reduction resulting from phytotoxicity at the higher rate. R-7465, on the other hand, gave yields far above the weedy check at both ½ and 1 lb/A. Diphenamid, nitralin and IMC-3950 substandard yields probably resulted from poor weed control. CGA-10932 did not give good weed control and may have been slightly toxic at the high rate since early weed control was adequate (Table 1). (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Table 1. Weed control and vigor, a measure of response to 7 herbicides on direct seeded tomatoes in a sandy soil with mechanical incorporation vs incorporated by sprinkler irrigation only. (A36-73-511-V15-1-72)

		Average1/			
		Weed Control2/		Vigor3/	
Herbicide	lb/A	Mech. incorp.	Sprk. incorp.	Mech. incorp.	Sprk. incorp.
Diphenamid	4	3.8	9.0	7.8	5.5
Paarlan	½	9.0	5.8	3.5	6.5
Paarlan	1	6.8	5.3	4.2	6.5
Devrinol	½	4.2	6.0	6.0	7.8
Devrinol	2	8.5	9.5	4.2	4.5
U27267	1	8.0	8.8	4.7	4.5
U27267	4	9.8	10.0	4.5	4.5
Nitralin	½	6.3	5.7	4.5	4.2
Nitralin	1	6.8	6.2	3.7	6.7
IMC-3950	½	0.7	2.0	5.0	6.0
IMC-3950	2	2.8	5.0	6.8	6.8
CGA-10832	½	5.8	5.2	6.0	8.0
CGA-10832	1	7.5	7.0	2.5	4.8
Check	--	2.7	1.7	5.8	5.8

1/ Average of 10 x 2 bed for weed control. Transplants showed no injury. Direct seeded included 1 bed x 10 feet of bed.

2/ Weeds largely *Chenopodium album*, puncture vine and red maids.

3/ Vigor = vigor and stand where 0 = no stand and 10 = most vigorous and greatest vigor. Evaluated 3/20/72.

Table 2. The comparative effect of 7 herbicides on the yield of tomatoes (Transplanted).

		Average1/		
		Weed Control2/		Average
Herbicide	lb/A	M.I.	S.I.	lbs.
Diphenamid	4	3.5	7.8	22.0
Isopropalin	½	7.8	2.8	37.2
Isopropalin	1	6.2	3.8	26.7
Devrinol	½	4.5	4.5	36.6
Devrinol	2	7.8	8.5	36.2
U27267	1	6.0	7.5	31.2
U27267	4	9.2	10.0	20.1
Nitralin	½	3.8	3.8	25.1
Nitralin	1	5.2	4.0	24.2
IMC-3950	½	0.5	0.5	22.0
IMC-3950	2	2.2	3.0	22.3
CGA-10832	½	3.2	2.2	28.3
CGA-10832	1	6.0	5.2	23.1
Check	-	1.0	2.0	20.6

1/ Average of 4 replication, lbs. of fruit larger than a golf ball at first harvest (6/13/72) per plot. Fruit from transplanted plant only.

2/ Weed control 4/8/72 where 0 = no effect, 10 = complete annual weed control.

Postemergence control of malva with herbicides. Jordan, L. S. and R. C. Russell. Mallow (*Malva parviflora*) is among the most common of winter annual weeds occuring in citrus orchards throughout southern California and the lower San Joaquin valley. With sufficient ground moisture, malva will begin to germinate with the first cool weather generally in October. At the time herbicides are applied in the fall treatment of the orchard some malva may already have germinated and produced seedlings 1 to 2-inches tall. Evan at this early stage of growth, malva is resistant to some of the soil-acting herbicides. In addition to these plants that may be missed at the time of spraying, are plants that will germinate from seed in soil that has been treated but in which the herbicide has not yet been activated through either rainfall or irrigation.

It has been generally observed that simazine at rates as low as 2 lb/A will effectively control malva if the herbicide is applied and activated before germination. In cases where germination has occurred before treatment or activation of the herbicide, rates as high as 4 lb/A of simazine may fail to control malva, particularly where plants have reached a growth stage of 4 to 5 inches.

During the winter season of 1972, a field screening of a number of soil-acting herbicides and herbicide combinations was conducted on an open field uniformally covered with malva. Plants were 4 to 6 inches tall at the time treatments were made. Herbicides and combinations were applied at a spray volume of 100 gallons-per-acre by means of a tractor-mounted precision sprayer.

The plot area received no rainfall or sprinkler irrigation for the first four weeks after treatment. Plot ratings taken at weekly intervals during this period indicate only contact or foliar-systematic activity of the herbicides. On March 14, approximately four weeks after treatment, the plot was irrigated by sprinklers. Subsequent ratings therefore relate to the effects of the herbicides after soil activation. A summary of these ratings is given in Table 1. One additional irrigation was made in the spring to maintain the weed crop in the plot area.

On June 6, most of the treated plots along with a set of untreated check plots were cropped with two indicator plants, sugar beets and Japanese millet to determine the persistence of herbicide residues. At the time these crops were seeded, a number of nursery plants were transplanted into the plots treated with terbutryne on subsequent plantings. These ornamentals included: variegated ivy, ice plant, olive, oleander, and xylosma. Ratings of injury to sugar beets and to Japanese millet (*Echinochloa crusgalli Fremontacea* W. F. Wight) taken on June 28 and on July 7 are shown in Table 2. None of the transplanted ornamentals located in the terbutryne treated plots showed any visible herbicide symptoms on either of these two dates. The test plots were discontinued after this final observation. (Dept. Plant Sciences, Univ. of Calif., Riverside, Ca. 92502.)

Table 1. The Effect of Herbicides and Combination Treatments on the Postemergence Control of Malva

Trmt. No.	Treatment	Rate (lb/A ai)	Control of Malva (Percent - Average of 4 replicates)						
			2/22*	2/28*	3/6*	3/13*	3/27**	4/27**	5/24**
1.	simazine	2	4	6	5	12	23	15	13
2.	"	4	16	9	18	20	35	30	26
3.	GS-14254 sumitol	2	99	100	99	99	100	99	98
4.	"	4	100	100	100	100	100	100	100
5.	terbutryne	2	96	100	100	97	96	89	87
6.	"	4	100	100	100	100	100	99	98
7.	ametryne	2	92	94	93	92	84	73	68
8.	"	4	100	100	100	100	99	98	95
9.	diuron	2	4	5	15	10	8	10	8
10.	"	4	14	16	31	30	19	20	14
11.	linuron	2	95	100	99	99	98	96	89
12.	"	4	100	100	100	100	100	99	97
13.	simazine + sumitol	2 + 1	92	96	92	87	97	91	91
14.	" "	2 + 2	96	99	99	98	99	97	97
15.	simazine + terbutryne	2 + 1	96	95	94	92	94	88	84
16.	" "	2 + 2	97	100	100	99	99	97	96
17.	simazine + ametryne	2 + 1	71	72	88	88	70	52	48
18.	" "	2 + 2	98	99	99	99	99	97	96
19.	simazine + paraquat	2 + ¼	39	32	30	20	18	21	19
20.	" "	2 + ½	64	55	50	54	54	48	45
21.	diuron + linuron	2 + 1	83	95	97	96	94	85	80
22.	" "	2 + 2	94	99	99	99	98	97	95
23.	diuron + paraquat	2 + ¼	22	15	25	25	10	20	8
24.	" "	2 + ½	45	50	45	35	15	26	18
25.	diuron + bromacil	2 + 1	60	68	75	78	100	100	100
26.	" "	2 + 2	64	84	91	91	100	100	100
27.	check	/////	0	0	0	0	0	0	0
28.	check	/////	0	0	0	0	0	0	0
29.	paraquat	2 + ¼	26	8	20	0	0	0	0
30.	"	2 + ½	39	37	44	0	0	0	0

* Rating before irrigation or rainfall
** Rating after irrigation by sprinklers

Table 2. The Effects of Herbicide Residues on Indicator Plantings of Sugar Beets and Japanese Millet at two intervals after planting

Trmt. No.	Treatment	Rate (Lb/A ai)	Rating of Injury (0 - 10) to Crop			
			6/28		7/31	
			SB	JM	SB	JM
1.	simazine	2	9.7	7.7	10.0	6.9
2.	"	4	10.0	10.0	10.0	10.0
3.	GS-14254	2	10.0	10.0	10.0	10.0
4.	"	4	10.0	9.8	10.0	10.0
5.	terbutryne	2	9.0	4.5	7.5	3.2
6.	"	4	9.8	7.8	8.3	5.3
7.	ametryne	2	9.5	7.2	18.3	5.3
8.	"	4	10.0	9.5	10.0	8.9
9.	diuron	2	10.0	8.8	10.0	7.8
10.	"	4	10.0	8.2	10.0	8.8
11.	linuron	2	8.2	6.5	7.8	4.1
12.	"	4	9.5	8.5	19.6	8.3
13.	simazine + GS-14254	2 + 1	10.0	9.8	10.0	9.8
14.	" "	2 + 2	10.0	10.0	10.0	10.0
15.	simazine + terbutryne	2 + 1	10.0	4.0	9.6	2.6
16.	" "	2 + 2	10.0	8.0	9.9	7.4
17.	simazine + ametryne	2 + 1	9.8	6.0	9.6	4.1
18.	" "	2 + 2	10.0	6.8	10.0	8.4
21.	diuron + linuron	2 + 1	9.8	9.5	9.2	9.0
22.	" "	2 + 2	9.2	8.5	9.5	8.5
25.	diuron + bromacil	2 + 1	10.0	10.0	10.0	10.0
26.	" "	2 + 2	10.0	10.0	10.0	10.0
28.	check	/////	1.5	0.5	2.0	////

Date of treatment: 2/11/72
Date of planting: 6/6/72

Nutgrass control with glyphosate and bromacil. Jordan, L. S., R. C. Russell and H. E. Davis. Treatments of glyphosate (N-(phosphonomethyl) glycine) were evaluated for the control of purple nutsedge (*Cyperus rotundus* (L.) pers.) in a date garden interplanted with citrus and in an open field. Herbicides were applied as broadcast sprays with a precision plot sprayer. In trial 1 (date garden and citrus), the nutsedge was a moderately uniform stand of nutsedge 6 to 8 inches tall. Glyphosate was applied at a spray volume of 30 gal/A and MSMA was applied at a spray volume of 100 gal/A. Plots were regularly flood irrigated. All ratings are on a 0 to 100 scale with 0 equal to no effect and 100 equal to complete control. Treatments were made 21 May and evaluated throughout the growing season. Treatment data and ratings are given in Table 1.

The second nutsedge trial in the Coachella Valley was in an asparagus field overgrown with highly uniform, mature stand of purple nutsedge 16 to 20 inches high. The area of the plots was furrow irrigated regularly. Glyphosate and 2,4-D were applied as a spray at a volume of 30 gal/A. Data on treatments and ratings are given in Table 2.

Treatments with glyphosate were evaluated in comparison with bromacil for the control of purple nutsedge (*Cyperus rotundus*) in a citrus orchard in Ventura County, California in the summer of 1972. Herbicides were applied as broadcast sprays with a precision plot sprayer to a moderately uniform stand of nutsedge 6 to 8 inches high. Glyphosate was applied at a spray volume of 25 gal/A and bromacil was applied at a volume of 100 gal/A.

Treatments were made on June 20 and evaluated 3 times throughout the summer and fall. A split-treatment of glyphosate received the 2nd application on October 12, the date of the last observation. Regrowth will be determined during the next growing season. Treatment data and ratings are given in Table 3.

Table 3. A comparative evaluation of MON-2139 and bromacil on the control of purple nutsedge.

Herbicide	Rate (1b/A)	Control of nutsedge (percent) 7/July	8/Aug	10/Oct
MON-2139	2	30	68	63
"	2 + 2*	33	57	47
"	4	27	73	73
Bromacil	4	33	82	92
"	8	33	87	92

*2nd treatment applied Oct. 12, 1972

Split applications totaling 4 lb/A of glyphosate resulted in better control than the same total amount applied once, especially earlier in the season. Late season treatments gave better control at the end of the season than earlier treatments. However, regrowth during the next growing season must be determined before final results are known. Results were better in the sandy soil and hot low desert region of Coachella Valley than in the heavier soils and cooler coastal region (Ventura). Bromacil gave excellent control at 4 lb/A. (Plant Sciences Dept., Univ. of Calif., Riverside, Calif. 92502.)

Table 1. Evaluation of glyphosate treatments at three rates with two applications for seasonal control of purple nutsedge in the Coachella Valley of California. Treatments applied May 21 and September 29, 1972

No.	Treatment Chemical	Rate	Ratings (Mean of 5 Replicates) 4JUN	16JUN	1JUL	14JUL	28JUL	11AUG	25AUG	29SEP	13OCT	22OCT	2NOV	23NOV
1.	Glyphosate	2 lb/A X2	84	76	56	66	30	22	20	30	88	88	91	93
2.	Glyphosate	4 lb/A X2	82	76	76	76	44	38	28	38	96	97	98	98
3.	Glyphosate	8 lb/A X2	92	84	75	81	62	50	52	48	98	98	99	99
4.	MSMA	4 lb/A X2	20	6	18	40	0	0	0	14	72	26	10	5
5.	Control		0	0	0	0	0	0	0	0	0	0	0	0

0 = no control; 100 = complete control of foliar growth

Table 2. Split applications and rates of glyphosate evaluated for purple nutsedge control in an open field in the Coachella Valley.

Treatment					Ratings (Mean of 5 Replicates)												
No.			Dates Treated		28JUL	4AUG	11AUG	18AUG	25AUG	1SEP	9SEP	29SEP	6OCT	13OCT	22OCT	2NOV	18NOV
1.	Glyphosate	2 lb/A X2	14JUL	18AUG	18	30	50	36	68	76	92	95	94	91	94	92	92
2.	Glyphosate	4 lb/A	14JUL		66	79	84	72	68	70	74	66	48	36	38	20	22
3.	Glyphosate	4 lb/A	18AUG		0	0	0	0	16	50	80	95	93	89	94	98	96
4.	Glyphosate	2 lb/A	18AUG		0	0	0	0	4	14	30	36	84	64	86	92	90
5.	Glyphosate	1 lb/A	18AUG		0	0	0	0	0	7	18	38	30	30	55	67	82
6.	2,4-D	4 lb/A	18AUG		0	0	0	0	6	24	18	42	28	20	20	34	42
7.	Control				0	0	0	0	0	0	0	0	0	0	0	0	0

0 = no control; 100 = complete control of foliar growth

Bermudagrass control with glyphosate. Jordan, L. S. and H. E. Davis. Three rates of glyphosate were evaluated for bermudagrass control on roadside plots adjacent to a date orchard in Coachella Valley. The loamy sand soil was irrigated by runoff from the date field. The grass was dense, vigorous and seeding when treated. No cultivation occurred during the trials. Treatments and ratings are presented in Table 1. Symptoms were slow in forming. Under the conditions of this test, 2 lb/A did not give adequate control whereas 4 and 8 lb/A gave better than 90% control at the end of the season. (Plant Sciences Department, University of California, Riverside, California 92502.)

Table 1. An evaluation of glyphosate for bermudagrass control. Plots were located on a roadside in the Coachella Valley.

Treatment			Ratings (Mean of 4 Replicates)						
No.	Chemical	Rate	1SEP72	9SEP72	29SEP72	6OCT72	22OCT72	2NOV72	24NOV72
1.	Glyphosate	2 lb/A	20	28	84	74	76	79	70
2.	Glyphosate	4 lb/A	23	58	91	92	94	92	90
3.	Glyphosate	8 lb/A	68	91	100	99	99	99	98
4.	Control		0	0	0	0	0	0	0

0 = no control; 100 = complete control of foliar growth

Control of milkweed vine with glyphosate. Jordan, L. S. and R. C. Russell. Milkweed vine (*Ampelamus albidus*) occurs as a serious orchard weed pest in a number of citrus orchards in Ventura County, California and is widespread throughout many of the citrus growing areas of Florida. As a perennial weed, milkweed vine is not controlled under our common orchard spray programs with soil-acting herbicides such as simazine and diuron. Preliminary experiments with glyphosate on the control of milkweed vine are being conducted under greenhouse conditions. Glyphosate was applied at a volume of 25 gpa. Plants were 12 to 14 inches high at the time of treatment.

A rating of the effect of the treatments on top growth of the vines was taken at 4 weeks after treatment with the herbicide. Results are shown in Table 2. Plants were cut off at ground-level following the 4-week rating so that an evaluation of the treatment's effects on regrowth can be made.

Table 2. The control of topgrowth of milkweed vine at four weeks after treatment with glyphosate (MON-2139)

Trmt. No.	Herbicide & Rate (lb/A ai) Glyphosate	Control of Milkweed Vine (percent) (Average - 5 replicates)
1.	2	4.0
2.	4	9.3
3.	8	9.7
4.	Check	0

Field studies with gyphosate on the control of milkweed vine were conducted in a citrus orchard near Santa Paula, California in the summer of 1972. Prostrate vines occurring between citrus trees were spot-treated with Glyphosate at rates of 2, 4, and 8 lb/A at a spray volume of 25 gpa. Plants treated on May 23 were evaluated for injury on June 20. Average ratings of percentage-kill of topgrowth from four replicate treatments were as follows:

Treatment	Rate (lb/A)	Ave. percent kill
Glyphosate	2	70
"	4	98
"	8	100

Subsequent ratings on regrowth were determined to be unreliable due to the close proximity of untreated vines to the treated plants. (Plant Sciences Dept., Univ. of Calif., Riverside, Calif. 92502.)

<u>Effects of herbicide programs on production and fruit quality in Valencia oranges.</u> Jordan, L. S. and R. C. Russell. Test plots were established in a Valencia orange orchard in Orange county during the fall of 1970 to measure possible long-term effects of herbicide usage on yield and on physiological factors. The test was established on vigorous 11-year-old trees with no previous herbicide history. An evaluation of herbicide effects on production and fruit quality is being conducted on an annual basis for an expected period of 5 to 6 years. Herbicides being evaluated in the test include Princip (simazine), diuron, bromacil, and diuron and bromacil (Krovar). These herbicides are applied as 80% formulations at product-rates totaling 4 lb/A each year. Comparative measurements are being made between these treatments and a noncultivated check maintained periodically with weed oil. A schedule of treatments applied during the past two years is given on next page.

Herbicide treatment	Rates (lb/A)* applied over a 2-year period			
	11/9/70	3/10/71	11/1/72	3/8/72
Simazine (Princep)	2	2	4	--
Diuron (Karmex)	2	2	4	--
Bromacil (Hyvar-X)	2	2	2	2
Diuron + bromacil (Krovar)	4	--	4	--
Weed oil	Sprayed as needed over 2 treatment seasons			

*Applied as commerical 80% formulation

A determination of the effect of herbicides on fruit size was made toward the end of the first year of treatment. Caliper measurements of 50 fruit per tree on 24 trees under each treatment program were made during August 1970. A table showing the distribution of box sizes by percent of total from each treatment is given below:

Treatment	Distribution (percent of total) of box sizes							
	210	180	163	138	113	88	72	56
Simazine (Princep)	.17	.58	2.4	11.2	25.1	35.3	18.4	6.9
Diuron (Karmex)	--	.67	3.2	11.9	23.4	34.3	19.0	7.4
Bromacil (Hyvar-X)	--	.67	2.6	10.9	26.0	36.3	17.9	6.5
Diuron + bromacil (Krovar)	.17	.75	3.4	13.9	24.7	35.8	15.6	5.8
Weed Oil	--	.58	1.5	9.6	23.4	40.6	20.3	4.1

Size measurements after one year's treatment have not yet been statistically analyzed for significance. The second year's crops was too light to properly evaluate sizes.

Fruit production records and measurement of a number of fruit quality factors have been taken over the two-year treatment period. Data from each of the two years is given in the Table 1. A statistical analysis of these data has not yet been run. Preliminary examination of the data does not indicate differences to run beyond the normal variability within treatment groups. (Dept. of Plant Sciences, Univ. of Calif., Riverside, Ca. 92502.)

Table 1. Effect of herbicides on yield and fruit quality of Valencia oranges.

Year of Evaluation	Herbicide	Rate* (lb/A)	Fruit Production (Av. boxes/tree)	Width/Length Ratio	Juice (%)	Sol. Solids (%)	Acid (%)	Solid/Acid Ratio
1971	Princep	2 + 2	6.62	0.95	56.7	10.39	0.87	11.94
	Karmex	2 + 2	6.66	0.98	55.6	10.43	0.86	12.13
	Hyvar-X	2 + 2	6.35	0.96	57.3	10.21	0.84	12.15
	Krovar	4	6.50	0.97	55.4	10.10	0.82	12.32
	Weed oil	Sprayed as needed	6.37	0.96	57.0	10.02	0.83	12.07
1972	Princep	4	3.37	1.01	54.3	11.09	0.91	12.19
	Karmex	4	3.78	1.00	54.6	11.42	0.95	12.02
	Hyvar-X	2 + 2	4.36	0.99	55.4	11.06	0.87	12.70
	Krovar	4	3.34	1.00	55.2	11.24	0.88	12.72
	Weed oil	Sprayed as needed	3.68	1.00	55.5	11.04	0.85	13.02

* Rates of commercial product: Princep = simazine, Karmex = diuron, Hyvar-X = bromacil and Krovar = diuron + bromacil.

Ecological impact of ground cover in citrus orchards. Jordan, L. S. and John R. McLaughlin. We initiated research to determine ecological and edaphic effects of ground cover and bare soil in citrus orchards. Emphasis was placed on two studies: (1) population dynamics of insects and mites in groves with and without ground cover and (2) methods of sustaining stable ground cover plant complexes.

Mites, including citrus red mite and predatory mites were more prevalent in groves with bare soil. Scale populations were higher where ground cover was absent. Parasitization of scale insects occured more frequently in ground cover areas. Citrus thrip populations were more stable in areas with ground cover. Adult thrips developed earlier in bare areas. Cover crops did not suppress thrips populations. Ground cover acts as "trap crop" for leafhoppers, but this does not protect the trees from the fall influx of the pest. Aphid populations were greater in areas with ground cover. Citrus cutworm and variegated cutworm were most numerous in ground cover areas. Aphid feeding coccinellids and lacewings distribution was not influenced by ground cover. Predacious species such as *Ceoeoris*, *Orius*, and *Nabis* were slightly more prevalent in trees with ground cover.

Cover crops will last three to five years in orchards before being crowded out by weeds or mismanagement. Adequate resistance of normally used cover crops to herbicides registered for use in groves does not exist. All ground cover will rapidly convert to a mixture of weeds. Meaningful research on effects of ground cover on orchard pests, water management or fruit quality cannot be performed until methods of stabilizing the ground cover are developed. (Plant Sciences Dept., Univ. of Calif., Riverside, Ca. 92502.)

Johnsongrass control with glyphosate and asulam. Jordan, L. S. and H. E. Davis. Treatments of glyphosate and methyl (4-aminobenzenesulphonyl) carbamate (asulam) were evaluated to compare the two herbicides and to assess the value of split applications. Treatments totaling 12 lb/A of asulam were compared to treatments totaling 3 lb/A of glyphosate. The trial was located in an open field where johnsongrass (*Sorghum halapense* (L.) Pers.) was being grown for hay. The stand was fairly uniform and highly vigorous. The plots were irrigated regularly throughout the season. Asulam and glyphosate were applied at a spray volume of 30 gal/A. Asulam was applied with 0.5 % Adsee non-ionic surfactant and 1% non-phytotoxic oil. Treatments and ratings were as indicated in the table. Asulam slowly killed the foliar growth of johnsongrass but regrowth also slowly occurred from all except the last treatment. The glyphosate performed better with split applications of a total of 3 lb/A than with a single application at the same rate. (Plant Sciences Department, University of California, Riverside, California 92502.)

An evaluation of asulam and glyphosate for johnsongrass control. The plots were located in an open field of johnsongrass at Grand Terrace in San Bernardino County, California

Treatment				Ratings (Mean of 5 Replicates)						
No.	Chemical	Rate	Dates Treated	17JUL72	1AUG72	14AUG72	28AUG72	26SEP72	17SEP72	30OCT72
1.	Asulam	4 lb/A X3	10JUL 14AUG 28SEP	0	38	67	91	72	65	71
2.	Asulam	6 lb/A X2	10JUL 31AUG	0	38	82	61	73	84	80
3.	Asulam	12 lb/A	10JUL	0	54	95	78	42	38	40
4.	Asulam	12 lb/A	31AUG	0	0	0	0	50	95	95
5.	Glyphosate	1 lb/A X3	10JUL 14AUG 28SEP	50	92	85	92	88	98	99
6.	Glyphosate	1.5 lb/A X2	10JUL 31AUG	64	93	95	82	94	93	90
7.	Glyphosate	3 lb/A	10JUL	90	99	98	91	60	36	44
8.	Glyphosate	3 lb/A	31AUG	0	0	0	0	94	89	86
9.	MSMA	4 lb/A X3	10JUL 14AUG 28SEP	94	97	74	91	56	88	86
10.	Control			0	0	0	0	0	0	0

0 = no control; 100 = complete control of foliar growth

Postemergence weed control in strawberries. Lange, A. Most commercial strawberry plantings are preplant fumigated with a mixture of methyl bromide and chloropicrin. Weeds such as cheeseweed, sour clover and filaree often escape this treatment, causing high hand weeding costs. Also, some weed seed reinfestation occurs between planting and the application of plastic mulch. Once the clear plastic mulch is in place, hand weeding becomes prohibitive.

In this study six postemergence herbicides were evaluated on Tioga and Shasta varieties planted 2 weeks prior to treatment. The air temperature was 78° F. during treatment.

The outstanding herbicides in this trial were nitrofen, C-6989 (flourdifen) and phenmedipham. Excellent broadleaf weed control was obtained at the low rate with sufficient safety at four times this rate. Bromoxynil, pyrazon and dalapon were not selective in strawberries.

All chemicals were weak on volunteer barley and good to excellent on young broadleaf weeds in the 2 to 4-leaf stage. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of 6 herbicides on the foliar condition of newly planted Tioga and Shasta strawberries and the control of annual broadleaves and volunteer barley. (501-A36-73-H2-2-7)

		Average 1/			
Herbicide	lb/A	Phyto-toxicity 3 days	Phyto-toxicity 15 days	Annual Broadleaf 2/ Control	Volunteer Barley Control
Nitrofen	2	1.5	0.0	8.8	5.0
Nitrofen	8	2.8	0.0	10.0	7.2
C-6989	2	0.5	1.0	8.5	6.0
C-6989	8	0.8	0.8	9.8	4.0
Pyrazon	2	4.2	6.5	10.0	6.0
Pyrazon	8	5.8	9.8	10.0	8.3
Bromoxynil	½	8.0	8.3	10.0	2.1
Bromoxynil	2	8.8	9.3	10.0	6.7
Phenmedipham	1	2.0	1.8	7.2	4.3
Phenmedipham	4	0.7	1.0	8.8	7.2
Chloroxuron + Nitrofen	4+4	3.0	1.2	10.0	7.0
Dalapon	2	1.9	8.0	7.2	5.0
Dalapon	4	2.4	9.0	9.2	6.4
Check	-	0.0	0.2	0.0	0.0

1/ Average of 4 replications; 0-10 rating where 0 = no effect on berries or no weed control, 10 = complete kill of berries or complete kill of weeds.

2/ Broadleaf weeds included: Fiddleneck, Shepherd's purse, Sour Clover and others in the 2-4 leaf stage.

A comparison of the preemergence activity of seven postemergence herbicides. Lange, A. Young dormant grape cuttings planted 3/24/72 were treated pm 3/26/72 with seven herbicides with known postemergence activity. The grape cuttings were of poor quality so no data was available on phytotoxicity to grape plants.

The preemergence effect was evaluated on two weed species 4/24/72. Paraquat, MSMA, dalapon and asulam showed little or no effect on puncture vine and lambsquarter. Glyphosate (MON-2139) at 2 lbs/A showed a slight effect on both weed species. A pronounced effect resulted from 2,4-D at ½ and 2 lbs/A Metoxuron (Dosenex ^{R}), which is also a preemergence herbicide, gave excellent control of both species. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of seven postemergence herbicides on the preemergence control of puncture vine and lambsquarter. (A36-73-502-3-72)

		Average[1/]	
Herbicide	lb/A	Puncture Vine	Lambsquarter
Paraquat	½	0.6	3.7
Paraquat	2	0.0	0.0
Glyphosate	½	1.3	1.5
Glyphosate	2	5.0	5.3
2,4-D	½	7.0	8.7
2,4-D	2	6.3	9.0
MSMA	½	0.0	1.0
MSMA	2	3.3	3.7
Dalapon	2	1.6	2.0
Dalapon	8	3.7	2.3
Asulam	½	0.3	2.0
Asulam	2	0.6	5.0
Asulam + wax	2	1.3	4.7
Metoxuron	2	8.7	10.0
Metoxuron	4	9.7	10.0
Check	-	1.3	1.7

[1/] Average of 3 replications, where 0 = no effect, 10 = complete control.

FOOTNOTE: The grape cuttings showed no phytotoxicity perhaps due to lack of bud development.

The control of nutsedge (*C. rotundus*) in a sandy soil. Lange, A. A heavy stand of *Cyperus rotundus* and barnyardgrass with 8-10" of top growth was sprayed 7/13/72 in a young pear orchard near Reedley, California. Two weeks after application MSMA had given a more severe burn back. By 3 months after a single application the nutsedge was regrowing in the MSMA plots and the glyphosate plots were showing almost complete nutsedge control.

EMD-70160-H- was not effective as a postemergence application. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

A comparison of 3 postemergence herbicide applications for barnyardgrass and purple nutsedge control in a young pear orchard in sandy soil. (A36-73-502-H13-1-72)

Herbicide	lb/A	Barnyardgrass 7/31/72	Nutsedge 7/31	Nutsedge 10/6/72
MSMA	3	8.0	9.0	4.7
Glyphosate	3	10.0	5.0	8.6
EMD-70160-H	3	1.0	1.0	1.3
Check	-	0.0	0.0	0.0

Applied 7/13/72, evaluated 7/31/72 and 10/6/72.

Early postemergence weed control in onion. Lange, A. Young direct seeded sweet spanish onions were seeded February 25, 1972 and treated in the "flag" stage on March 2, 1972. The weeds were largely lambsquarter and red maids in the 2-4 leaf stage.

On March 10, 1972 the weed control by oxidiazon and nitrofen was excellent. Nitrofen was much safer than oxidiazon at this early stage of development. The upper limit was 1 lb/A for chloroxuron.

IMC-3950 (S-(4-chlorobenzyl)-N,N-diethylthiol carbamate) was safe on the young onions but the postemergence activity was lacking. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Postemergence annual weed control in onions in the flag leaf. (511-V12-1-72)

Herbicide[1/]	lb/A	Weed Control	Onion Phytotoxicity
Chloroxuron	½	6.0	0.5
Chloroxuron	1	8.5	2.5
Nitrofen	1	8.5	0.0
Nitrofen	2	8.5	0.0
IMC-3950	½	1.5	0.0
IMC-3950	2	2.5	0.0
Oxidiazon	½	9.5	6.0
Oxidiazon	1	9.5	5.5

[1/] Herbicides applied postemergence when onions were in the crook and some in the loop just emerging. Weeds were in the 2-4 true leaf.

Pigweed control in a new direct seeded dichondra lawn. Lange, A. A Delhi sandy loam soil (organic matter 0.13%, sand 92%, silt 22% and clay 6%) was fumigated with methyl bromide at 1 lb/100 ft.^{2}, seeded with dichondra and sprayed with R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide], September 1, 1972 in 200 gals. of water per acre.

One month later the control of pigweed was inadequate from fumigation almost suggesting stimulation which may have been the result of reduced competition from other weeds and possibly reduced vigor of the dichondra.

R-7465 greatly increased the control of pigweed at rates of 4 lbs/A and 8 lbs/A. There was no indication of phytotoxicity on dichondra with the exception of where methyl bromide was combined with the high rate of R-7465. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of methyl bromide fumigation on the selectivity of R-7465 for pigweed control in dichondra. (A36-508-73-G5-1-71)

		Average1/			
		Pigweed Control		Dichondra Vigor	
Herbicide	lb/A	CH_3Br Fumigation	No	CH_3Br Fumigation	No
R-7465	2	6.5	6.5	6.0	7.0
R-7465	4	7.5	9.0	6.0	7.5
R-7465	8	9.0	10.0	5.0	7.0
Check	-	1.0	5.5	6.5	9.5
Average		6.0	8.0	5.8	7.8

1/ Average of 4 replications.

Bermuda control in young wine grapes. Lange, A. and J. Breece. Spring planted wine grapes growing with drip irrigation and heavily infested with bermudagrass was sprayed 6/2/72 with 2 rates each of dalapon and glyphosate. Six weeks later the plots were hand weeded. After about 6 weeks of regrowth the plots were resprayed with double the rate of the first application. The plots were evaluated 7/20/72 (after one spray) and 9/28/72 about 1 month after the second spray.

The dalapon treatments were only partially effective whereas the glyphosate gave essentially complete control. The directed sprays of dalapon showed very little effect whereas glyphosate caused considerable foliar injury and killed the young vines when sprayed over the entire grape foliage. Even the early spraying at 2 lbs/A caused some severe stunting. Those that survived did not grow after being sprayed with glyphosate.

The results indicate that 3 months between sprays may have resulted in poorer than usual bermudagrass control. Glyphosate was outstandingly effective at 1 + 2 lbs/A (applied 3 months apart). The herbicides must be direct sprayed away from the foliage of young vines. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

A comparison of two postemergence herbicides for burmudagrass control and phytotoxicity to young grape cuttings.

				Average[1] Grape Phytotoxicity			
		Bermudagrass		directed[2]		over-all[3]	
Herbicide	lb/A	7/20	9/28	7/20	9/28	7/20	9/28
Dalapon	2(+4)	1.3	3.3	0.0	1.5	-	0.0
Dalapon	4(+8)	1.0	5.0	0.0	1.6	4.0*	4.8
Glyphosate	1(+2)	2.9	9.4	0.0	3.5	-	6.3
Glyphosate	2(+4)	0.3	10.0	0.0	5.8	8.7*	10.0
Check	-	1.5	0.0	0.0	0.0	0.0	0.0

---

[1] Average of 3 replications where 0 = no effect; 10 = plants dead.

[2] Directed means directed away from the grape foliage with some herbicide reaching the foliage.

[3] Over-all refers to a 100 gpa spray over the entire foliage of young 1st year grape cuttings.

*Rating made 7/20 about 7 weeks after one single application made 6/1/72. Only one rate of each chemical was applied.

( ) herbicide rates in parenthesis refer to the 2nd application which was twice the 1st application (1st application 6/2/72, second application made 9/1/72). Ratings made 7/20/72 after a handweeding; 9/28/72 about 1 month after the second application.

A comparison of several herbicides for johnsongrass control in an old vineyard. Lange, A. and F. Swanson. A heavily infested 50 year old Thompson Seedless vineyard was treated with repeated applications of 5 herbicides beginning on 3/23/72. The regrowth was again sprayed 5/20/72 and 7/19/72.

The results clearly show the need for repeated applications of all herbicides. Dalapon was sufficiently effective to give commercial control after 3 sprays. Glyphosate was rather poor after 1 spray but after 2, spectacular control was obtained. It is questionable whether 3 applications of this material would be necessary under the conditions of this experiment which included minimum irrigation.

Asulam was somewhat less effective on a pound-for-pound basis than glyphosate or MSMA.

The results obtained with repeated applications of paraquat were somewhat better than expected and possibly reflect the low amount of irrigation and resulting low soil moisture most of the growing season.

There was very little phytotoxicity except where low hanging vines were sprayed. This injury appeared to be confined largely to the area sprayed. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of 5 herbicides on the control of johnsongrass in an old vineyard (A36-73-502-H3-5-72)

		Average Control[1]			
Herbicide	lb/A	5/17	6/12	7/17	9/7
Dalapon	3+3	3.7	3.3	3.8	2.5
Dalapon	3+3+3	5.5	4.8	5.5	7.0
Glyphosate	3+3	4.7	10.0	8.5	6.3
Glyphosate	3+3+3	3.7	9.5	8.5	9.4
Asulam	3+3	4.0	8.0	6.2	2.8
Asulam	3+3+3	3.0	7.8	5.3	6.5
MSMA	3+3	4.5	9.3	6.2	2.5
MSMA	3+3+3	3.0	8.8	5.2	8.5
Paraquat	3+3+3	4.5	6.5	1.8	5.3
Check	--	3.7	2.0	0.8	0.0

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[1] Average of 4 replications, where 0 = no control; 10 = complete kill of johnsongrass. Herbicides applied 3/23/72 and 5/20/72.

Early postemergence annual weed control in direct seeded onions. Lange, A., B. Hoyle and K. Tyler. Young onions just out of the flag stage and lambsquarter in the 4-leaf stage were sprayed 3/12/72 with eight herbicide treatments in 100 gpa of water.

Evaluated at 1 month after treatment DCPA + nitrofen gave poor control of lambsquarter, but essentially no injury. The 1 pound per acre rate of RP-17623 (2-tertiobutyl-4-(2,4-dichloro-5-isopropyl-oxphenyl)-5-oxo-1,3,4-oxadiazoline) was too high giving excellent weed control but some slight injury to the onions. Chloroxuron was somewhat weak on lambsquarter at the 2 lbs/A rate and gave no injury. Methazole gave excellent weed control with no injury at 2 lbs/A and should be evaluated further for weed control in onions. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Early postemergence weed control in onions. (A36-78-511-V12-1-72)

Herbicide	Act.	lb/A	Average[1/] Lambs-quarter	Average[1/] Onion Phyto-toxicity
DCPA + Nitrofen	75 + 80%	8+4	4.8	1.2
RP-17623	2 EC	1	10.0	3.5
RP-17623		2	10.0	3.5
Chloroxuron	50 WP	1	6.0	0.7
Chloroxuron		2	6.0	0.0
Methazole	75 WP	2	9.5	0.5
Methazole		4	10.0	2.5
Nitrofen	50 WP	2	4.5	2.8
Check		-	0.5	1.0

1/ Weeds treated 3/12/72. Average control of Lambsquarter, four replications where 0 = no control, 10 = all plants dead or missing; Onion phytotoxicity where 0 = no effect, 10 = all weeds dead.

Annual weed control in young carrots. Lange, A. Imperator carrots were seeded 2/25/72 and treated in the first true leaf stage with 3 herbicides on 3/4/72. The weeds were in the 4/leaf stage. (The soil was a Dalhi sandy loam - organic matter 0.13%, sand 72%, silt 22% and clay 6%.)

On March 10, 1972 the weed control from linuron and Maloran was excellent with very little injury. Chloroxuron was much weaker than linuron or Maloran. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Effect of 3 herbicides on the foliar condition of young carrots. (A36-73-511-V5-1-72)

Herbicide	Act.	lb/A	Average[1/] Weed Control	Average[1/] Phytotoxicity
Linuron	50 W	¼	7.5	0.0
Linuron		1	9.3	1.0
Chloroxuron	50 W	¼	0.0	0.0
Chloroxuron		1	6.3	0.5
Maloran	50 W	¼	9.0	1.0
Maloran		1	9.7	2.7
Check		-	0.0	0.0

1/ Average of 4 replications where 0 = no effect, 10 = complete kill. Carrots were in their 1st true leaf. Weeds in their 4-leaf stage. Organic matter 0.3%, sand 70%.

PROJECT 5. WEEDS IN AGRONOMIC CROPS

L. C. Warner, Project Chairman

SUMMARY

Over forty abstracts are included dealing with annual or perennial weed control in ten agronomic crops. A major portion of the abstracts compared established herbicides with combinations and or newly developed products. Other factors influencing herbicidal efficacy were also investigated such as: time of incorporation, fertility levels, crop or weed stage at the time of application, and herbicidal longevity in the soil.

Alfalfa. A number of abstracts were submitted, many of which reported excellent broadleaf and grassy weed control in established affalfa with cyanazine, matribuzin, terbacil, GS-14254 (2-*sec* butylamino-4-ethylamino-6-methoxy-*s*-triazine) simazine, 2,4-D, diuron and R-7465 [2-(alphanaphthoxy)-N,N-diethylpropionamide]. Some crop injury was reported with metribuzin, 2,4-D, GS-14254 and diuron. One California report showed oryzalin, R-7465, methazole, CGA-10832 (*N*-n-propyl-*N*-cyclopropylmethyl-4-triflouromethyl-2,6-dinitroaniline), USB-3153 (Chemistry not available), USB-3584 (N^3,N^3-Diethyl 2,4-dinitro-6-trifloromethyl-1,3 phenylenediamine), having promise applied preemergence water incorporated on newly seeded alfalfa. A study in Wyoming showed two year weed control in established alfalfa with terbacil and GS-14254.

Field and Lima Beans. A number of product combinations were evaluated that were effective in providing control of a broad spectrum of weed species. Black nightshade was effectively controlled with trifluralin, nitralin or A-820 (N-sec-butyl-4 tert-butyl-2, 6-dinitroanaline) in combination with 2,4-DB or dinoseb. In a California study on limas alachlor + trifluralin; pronamide + trifluralin and pronamide + alachlor resulted in hairy nightshade control. Single compound treatments of alachlor, pronamide, BAS-3512-H (3-isopropyl-1*H*-2,1,3-benzothiadiazin-(4)3*H*-one 2,2-dioxide) also were reported to have shown promising nightshade control.

Corn. A number of promising broad spectrum weed control compounds and combinations were reported on: cyanazine, cyprazine, atrazine + butylate, atrazine + alachlor. In addition, the antidote R-25788 (N,N-diallyl 2, 2-dichloroacetamide) was reported to have safened EPTC, venolate and butylate without loss of herbicidal efficacy. This appears to open the door for possible greater usage of these compounds in corn.

Peppermint. An Oregon abstract reported safety on peppermint when 2,4-DB amine was applied before excessive top growth.

Potatoes. Two Colorado reports show metribuzin providing excellent weed control while demonstrating good tolerance to potatoes.

Sorghum. Products showing effective weed control were propazine, terbutryn, propachlor, propachlor + cyanazine, BAS-2903 (2-chloro-N-(1-methyl-2-propynyl) acetanilide) and methazole.

Small Grains. Compounds reported showing promise in wheat for broadleaf weed control were terbutryn, chlorobromuron and bromoxynil. In another report a number of compounds provided good to excellent wild oat control but all decreased wheat yields. Two new compounds AC-50191 (chemistry not available) and AC-8477 (chemistry not available) were reported to have provided excellent wild oat control without injury to barley.

Sugar beets. The included abstracts show increased emphasis being placed on research of herbicide combinations. The various combinations reported were devised in an effort to solve specific weed problems found in each of the respective areas. A number of effective combinations were reported including some new compounds.

Herbicide Dissipation. A three day delay of water incorporation (sprinkler) did not appear to appreciably reduce the activity of nitralin or CGA-10832.

Evaluation of spring applied herbicides for weed control in dormant dryland alfalfa. Alley, H. P. and G. A. Lee. The herbicide evaluation studies were established on a heavily weed infested dryland alfalfa field 4/5/72 at Sheridan, Wyoming. The weed infestation was predominately downy bromegrass (*Bromus tectorum* L.) with a lesser population of tansy mustard (*Descurainia pinnata* (Walt.) Britt.), blue mustard (*Chorispora tenella* (Willd.) D.C.) and meadow salsify (*Tragopogon pratensis* L.). Downy bromegrass was 3/4 to 1.0 in. tall, blue mustard in the 4-leaf, and tansy mustard a 2.0 in. rozette state of growth at time of herbicide treatments. A few green leaves were appearing near the crown of the alfalfa plants.

All the herbicides and rates of application, as included in the attached table, were applied with a knapsack sprayer in a total volume of 40 gpa water. Treatments were one sq. rod in size, randomized, with three replications. Total alfalfa production, and percent weed control was determined by harvesting a 2.5 ft. diameter quadrat in each replicated plot, separating the weeds and alfalfa before evendrying, and weighing for production determinations.

Four of the 11 treatments gave 90 percent or better total annual grass and broadleaved weed control as evaluated approximately 2.5 months following treatment. An application rate of 3.0 lb/A of cyanazine was necessary to obtain 90 percent or better weed control. Lighter rates of metribuzin and GS-14254 (2-sec-butylamino-4-ethylamino-6-methoxy-s-triazine) and terbacil was equally effective. The diuron + terbacil combination was an excellent treatment and may have potential for longer period of control than terbacil alone.

The highest pure alfalfa production was harvested from plots treated with metribuzin at 1.0 lb/A. These plots yielded 1992 lb/A air-dry alfalfa as compared to 960 lb/A from the untreated plots. On plots treated with cyanazine at 3.0 lb/A, metribuzin at 0.5 lb/A, terbacil at 0.5 lb/A, both formulations of GS-14254, and diuron + terbacil the alfalfa yield was substantially increased over the nontreated states. (Wyoming Agricultural Experiment Station, Laramie SR-441).

Oven-dry production of pure alfalfa and weeds from plots treated with various herbicides

Treatment	Rate lb/A	Lb alfalfa/A	Lb weeds/A	% weed reduction[1]
cyanazine	1.0	492	686	18
cyanazine	2.0	1066	232	72
cyanazine	3.0	1366	66	92
metribuzin	0.25	400	566	33
metribuzin	0.5	1366	172	80
metribuzin	1.0	1992	100	88
terbacil	0.5	1272	100	88
Sumitol E.C.	1.6	1412	66	92
Sumitol 80W	1.6	1486	32	96
diuron + terbacil	2.0 + 0.5	1486	60	93
CIPC	3.0	726	820	2
Check		960	840	

[1] Evaluation and clippings made 6/22/72.

Longevity of weed control in established alfalfa. Alley, H. P. and G. A. Lee. The herbicides terbacil, cyanazine, metribuzin, and Sumitol (2-sec-butyl-amino-4-ethylamino-6-methoxy-s-triazine) as dormant treatments to established alfalfa has given outstanding annual grass and annual broadleaved weed control for one growing season. The longevity of control has not been thoroughly researched. The data presented in the attached table are from plots which were treated in the spring of 1971, therefore, giving weed control and alfalfa production the second season following treatment.

The predominant weed species at time of treatment were downy bromegrass (*Bromus tectorum* L.) with a lesser population of tansy mustard (*Descurainia pinnata* (Walt.) Britt.), blue mustard (*Chorispora tenella* (Willd.) D.C.) and meadow salsify (*Tragopogon pratensis* L.).

The plots were one-half acre in size and herbicides were applied with a truck-mounted spray rig in a total volume of 27.5 gpa on 4/7/71.

Alfalfa and weed yields were determined by harvesting three subsamples from each treated plot, separating the plant species, oven-drying, and recording respective weights for production and control determinations on 6/22/72.

Terbacil at 1.0 lb/A and Sumitol at 2.0 lb/A were maintaining better than 90 percent weed control after two growing seasons. The weed population common to the area had reinfested the plots treated with cyanazine and metribuzin.

The increased production of pure alfalfa was being maintained on the terbacil and Sumitol plots, whereas, the alfalfa production had declined to near that of the untreated plots on the area treated with cyanazine and metribuzin. (Wyoming Agricultural Experiment Station, Laramie SR-437.)

Longevity of weed control and alfalfa production from 1971 treated plots

Treatment[1]	Rate lb/A	Lb alfalfa/A	Lb weeds/A	% weed reduction[2]
terbacil	1.0	1552	52	94
cyanazine	1.6	752	720	14
metribuzin	1.0	1040	760	10
Sumitol	2.0	1420	66	92
Check		960	840	--

[1] Treatments applied 4/7/71.

[2] Evaluation and clippings made 6/22/72.

Evaluation of spring applied herbicides for weed control in dormant irrigated alfalfa. Alley, H. P. and G. A. Lee. Previous research has indicated that the herbicides cyanazine, terbacil, metribuzin, and Sumitol (2-sec-butylamino-4-ethylamino-6-methoxy-s-triazine) are effective for weed control in dormant alfalfa. These four herbicides were applied to a cooperator's alfalfa field near Casper, Wyoming that was heavily infested with downy bromegrass (*Bromus tectorum* L.)

Plots were one acre in size. The herbicides were applied 3/23/72 with a truck-mounted boom spray rig in a total volume of 15 gpa water. At time of treatment the downy bromegrass was starting to grow actively and had obtained a height of 0.5 to 1.0 in.

Alfalfa and weed yields were determined by harvesting four subsamples from each treated plot, separating the plant species, oven-drying, and recording respective weights for production and weed control determinations.

All treatments afforded outstanding downy bromegrass control with increased yields of pure alfalfa. The highest production (alfalfa plus downy bromegrass) was produced on the non-treated area. However, approximately 45 percent of the total yield was downy bromegrass. Production of pure alfalfa ranged from 3500 lb/A to 4760 lb/A for the metribuzin and Sumitol treatments, respectively. (Wyoming Agricultural Experiment Station, Laramie, SR-436).

Oven-dry production of pure alfalfa and downy bromegrass from plots treated with various herbicides[1]

Treatment	Rate lb/A	Lb Alfalfa/A	Lb Downy bromegrass/A	% Weed reduction[2]
cyanazine	2.0	4300	112	96
Sumitol	2.0	4760	92	97
terbacil	0.5	4580	120	96
metribuzin	0.5	3500	2912	--

[1] Cooperator's plots, irrigated alfalfa, Casper, Wyoming.

[2] Evaluation and clippings made 6/20/72.

Evaluation of several herbicides for weed control and phytotoxicity in established alfalfa. Heikes, P. Eugene. Herbicides were applied on a stand of dormant alfalfa on the Northern Colorado Research Development Center at Greeley, Colorado, March 10. Tansy mustard and dandelions were the major weeds in this field; the mustard had emerged and was in a rosette stage about 1 inch high; many of the dandelions were still dormant. The alfalfa was dormant with no new growth yet at this time. The soil surface was dry and daytime temperatures about 75 degrees F. Plots were 20 x 25 ft - 500 sq. ft. with 2 replications. The soil in this field is a loam with 1 percent O.M., 46 percent sand, 24 percent silt and 30 percent clay. The field was flood irrigated. Comparitive performance data are shown in the attached table. (Colorado Extension Service, Colorado State University, Fort Collins, Colorado).

DORMANT ALFALFA

Herbicides applied March 10, 1972

Herbicide and Rate per Acre		Percent Stand Reduction - Average of 2 Reps						
		Tansy Mustard		Dandelions		Stunt		Stand
		4/21	5/15	4/21	5/15	4/21	5/15	4/21
cyanazine	1 lb	20	40	0		0	0	0
cyanazine	1½ lbs	55	80	75		0	0	0
cyanazine	2 lbs	65	85	82		0	5	0
GS-14254	1½ lbs	55	70	67		0	0	0
GS-14254	2 lbs	70	95	91		10	10	0
GS-14254	1.2 lbs	70	100	0		0	0	0
GS-14254	1.6 lbs	80	100	30		0	0	0
GS-14254	2 lbs	93	100	65		0	10	0
terbacil	1/2 lb	80	99	85		0	0	0
terbacil	1 lb	93	100	92		0	0	0
terbacil	2 lbs	98	100	95		0	0	0
simazine	1 lb	40	75	40		0	6	0
metribuzin 1/	1/2 lb	70	89	82		0	0	0
metribuzin 1/	3/4 lb	90	100	90		0	10	0
metribuzin 1/	1 lb	93	100	96		0	10	0
metribuzin 1/	1/2 lb	45	99	98		0	necrosis of lower leaves	0
metribuzin 2/	3/4 lb	60	100	96		0	"	0
metribuzin 2/	1 lb	87	100	100		0	"	0
RH-315	1 lb	0	15	0		0	0	0
RH-315	2 lbs	0	40	52		0	7	0
2,4-D LV	1/2 lb	98	100	91		0	0	0
2,4-D LV	3/4 lb	99	100	85		10	5	0

1/ Applied March 10

2/ Applied March 24, the alfalfa had broken dormancy with 1/2 inch of new growth

Annual weed control in established alfalfa. Lange, A., L. Russo and R. Scheesley. Second year alfalfa was treated 12/1/71 with 6 herbicides and flood irrigated. The soil was a sandy loam (OM 0.2%, Sand 72%, Silt 17% and Clay 11%).

When evaluated 3/10/72, San-9789 WP (4-chloro-5-(methylamine)-2-(α,α,α,-triflouro-m-tolyl)-3(2H)-pyridazinone) appeared more active than the granular formulation. The R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] granular appeared slightly more active but the apparent difference may not be real. San-9789 and R-7465 appeared to be the most selective herbicides in this rather sandy soil

Diuron and GS-14254 (2-sec butylamino-4-ethylamino-6-methoxy-s-triazine) were excessively toxic even at 2 lbs/A when applied in December.

Nitralin did not control chickweed in this trial. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Annual weed control in established alfalfa.

Herbicide	lb/A	Chickweed	Average[1/] Alfalfa Phytotoxicity 1/10	3/10
Diuron	2	2.2	8.0	0.0
San-9789 WP	2	3.0	2.5	0.0
San-9789 WP	4	4.5	2.2	0.0
San-9789 WP	8	8.2	2.2	1.2
San-9789 Gr	2	1.5	1.0	0.0
San-9789 Gr	4	4.8	1.0	1.2
San-9789 Gr	8	5.2	1.5	1.8
GS-14254	4	10.0	7.5	0.0
GS-14254	8	10.0	8.2	0.0
R-7465 WP	4	5.2	1.2	0.0
R-7465 WP	8	8.2	1.0	0.0
R-7465 Gr	4	4.0	1.0	1.2
R-7465 Gr	8	9.8	1.8	0.0
San-9789 + GS-14254	4+2	10.0	6.8	0.5
Nitralin	4	1.8	1.0	0.0
Nitralin	8	0.0	1.2	0.0
Check	-	0.0	1.0	0.0

1/ Average of 4 replications where 0 = no effect; 10 = 100% control. Treated 12/1/71, evaluated 3/10/72 and 1/10/72.

Annual weed control in established alfalfa. Lange, A., L. Russo and R. Scheesley. Second year alfalfa was treated 12/7/71 with 6 herbicides and two combinations. Both granular and wettable powder formulations of San-9789 (4-chloro-5-(methylamine)-2-(α,α,α,-triflouro-m-tolyl)-3(2$\underline{H}$)-pyridazinone) and R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] were included. The winter rainfall was light but the alfalfa was flood irrigated. The soil was a clay loam (OM 0.1%, Sand 11%, Silt 33% and Clay 56%).

The wettable powder formulation of both San-9789 and R-7465 were more effective than the granular. The most selective herbicides appeared to be San-9789 and R-7465. The 4 lbs/A rate of San-9789 showed some chlorosis which appeared to increase up to about 3 months but then grew out of it.

Diuron, GS-14254 (2-sec butylamino-4-ethylamino-6-methoxy-s-triazine) gave excellent weed control and some chlorosis which decreased with time on this rather heavy soil.

Neither nitralin or oryzalin controlled the shepherspurse or sowthistle. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Annual weed control in established alfalfa

		Average[1/]			
Herbicide	lb/A	Shepherds purse	Sow thistle	Alfalfa Phyto-toxicity[2/]	Alfalfa
Diuron	1	10.0	10.0	2.0	1.5
San 9789 WP	1	10.0	5.2	5.0	0.0
San 9789 WP	2	10.0	9.5	2.0	0.0
San 9789 WP	4	10.0	10.0	2.2	3.8
San 9789 Gr	1	9.5	1.2	0.0	0.0
San 9789 Gr	2	10.0	3.2	0.2	0.8
San 9789 Gr	4	10.0	9.2	0.0	4.2
GS 14254	1	10.0	10.0	1.8	2.5
GS 14254	2	10.0	10.0	2.2	2.2
R-7465 WP	4	6.8	10.0	0.0	0.0
R-7465 WP	8	10.0	10.0	0.0	0.2
R-7465 Gr	4	4.8	7.5	0.0	0.5
R-7465 Gr	8	4.8	10.0	0.0	0.0
Nitralin	4	0.0	0.0	0.0	0.0
Nitralin	8	0.0	0.0	0.0	0.0
San 9789 + GS 14254	2+1	10.0	10.0	3.8	2.2
Oryzalin	2	3.0	2.5	0.0	0.0
Oryzalin	4	5.5	6.8	0.0	0.0
EPTC + Diuron	4+1	10.0	10.0	2.0	1.0
Check	-	0.0	0.0	0.0	0.8

[1/] Treated 12/7/71. Average of 4 replications where 0 = no effect; 10 = complete control or complete alfalfa kill. Evaluated 3/9/72.

[2/] Phytotoxicity 1/10/72.

Preemergence herbicides for annual weed control in alfalfa. Lange, A. Sixteen herbicides were applied immediately after seeding. The plots were then sprinkler irrigated with 2 inches of water within 2 hours of herbicide application and subsequently flood irrigation. The soil was Hanford fine sandy loam 0.6% organic matter, 58% sand, 32% silt and 10% clay.

A few herbicides gave more selective weed control than simazine in alfalfa. R-7465 [2-(alpha-naphthoxy)-N,N-diethylpropionamide] (Devrinol^R) gave excellent weed control and fair growth. Methazole (Probe^R) showed some promise at a low rate. One of the most selective was CGA-10832 (N-n-propyl-N-cyclopropylmethyl-4-triflouromethyl-2,6-dinitroaniline) and USB-3153 (chemistry not available). Low rates of oryzalin and USB-3584 (N^3,N^3-Diethyl 2,4-dinitro-6-trifloromethyl-1,3 phenylenediamine) may have some promise.

Most herbicides were too toxic. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

A comparison of 16 herbicides for preemergence weed control in alfalfa.

		Average1/				Average1/	
Herbicide	lb/A	Weed Control	Alfalfa vigor	Herbicide	lb/A	Weed Control	Alfalfa Vigor
Simazine	2	7.7	0.7	Terbutryn	2	5.3	0.0
R7465	4	9.3	7.0	Terbutryn	8	7.3	0.0
RP17623	4	9.7	2.3	DS 5168	2	4.3	0.7
SAN 9789	1	6.0	0.7	DS 5168	8	4.7	1.0
SAN 9789	2	6.0	2.3	IMC 3950	4	7.0	2.3
Oryzalin	2	8.7	6.0	IMC 3950	16	6.3	7.0
Oryzalin	8	10.0	2.0	RH315	4	3.0	3.3
Methazole	2	8.7	7.7	RH315	16	7.7	0.0
Methazole	4	9.7	0.0	USB 3153	2	9.3	9.0
CGA 10832	2	4.0	9.3	USB 3153	8	9.0	5.3
CGA 10832	8	7.3	4.3	Asulam	4	4.7	1.7
USB 3584	2	8.0	5.0	Asulam	16	4.3	1.7
USB 3584	8	8.0	0.7	Glyphosate	1	5.3	5.7
Furloe^R	4	5.0	6.0	Glyphosate	4	8.7	9.3
Furloe^R	16	8.0	0.7	Check	-	8.3	9.3

1/ Average of 3 replications, where 0 = no control, 10 = complete weed control. Vigor, where 0 = no stand, 10 = most vigorous.

Dodder control in alfalfa. Lange, A. and R. Scheesley. A heavily dodder infested field was treated 4/10/72. The soil was near field capacity and no irrigation was applied until 5/18/72. The soil was a heavy clay loam.

On 5/10/72 and 6/21/72 the plots were evaluated by visual rating.

The spectacular control obtained from DCPA was the result of DCPA application to wet soil. Furloe was also very effective at one month but was considerably less effective at 6 weeks after application whereas the DCPA continued to give commercial control as well as grass control.

Dicamba even at the lowest rate was excessively toxic to extablished alfalfa.

Methazole gave poor dodder control and produced some burning and stunting at 1 month after treatment.

Under the conditions of this experiment RH-315 (N-(1,1-dimethyl-propinyl)-3,5-dichloro-benzamide) gave very little dodder control but gave substantial grass control and no injury to alfalfa. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

Table 1. Average dodder and annual weed control one month after herbicide application to wet soil.

		Average1/		
Herbicide	lb/A	Dodder	Other Annuals	Phyto-toxicity
DCPA	6	10.0	6.8	2.5
DCPA	12	10.0	4.2	4.0
Furloe ^{R}	6	7.8	9.0	1.5
Furloe ^{R}	12	10.0	6.2	4.2
Dicamba	½	10.0	8.2	9.0
Dicamba	2	9.5	8.8	8.2
Pronamide	3	2.0	6.5	2.0
Pronamide	6	5.2	4.2	1.8
Methazole	6	3.0	7.8	5.8
R7465	6	6.8	4.5	4.5
CGA 10832	3	6.8	5.5	3.5
Check	-	5.8	6.8	2.0

1/ Average of 4 replications where 0 = no control or no effect on alfalfa. Evaluated 5/10/72.

2/ No water was applied after herbicide application.

Comparisons of three triazine herbicides for weed control in alfalfa. Norris, R. F. and R. A. Lardelli. Herbicide treatments were applied to an established stand of Eldorado alfalfa on Feb. 4, 1972 at the University of California, Davis, farm. The alfalfa was about three inches tall and just starting to grow. Well established weeds were present, including annual bluegrass (*Poa annua* L.), chickweed (*Stellaria media* (L.) Cyrillo), shepherds purse (*Capsella bura-Oastoris* (L.) Medic.), and groundsel (*Senecio vulgaris* L.). The clay soil was intermediate in moisture at application. A CO_2 hand sprayer was used for application, delivering 30 gal/A at 40 psi.

The herbicides and formulations used, the rates applied, and visual assessments of effects are shown in the accompanying table. A moderate stand of barnyardgrass (*Echinochloa crusgalli* (L.) Beauv.) developed in the summer, and control of this weed was also assessed.

No chemical caused injury to the alfalfa, except for possibly a slight reduction in growth for metribuzin treated plants. Winter weed control was generally excellent for all chemicals and rates, but small differences in activity were discerned. Metribuzin, by a slight margin, provided the most consistent weed control, even at 1.0 lb/A. GS-14254 (2-sec butylamino-4-ethylamino-6-methoxy-s-triazine), applied as the 3.5 E.C. also provided almost complete weed control, especially at 2.0 lb/A. This E.C. formulation seemed to provide slightly greater activity than either W.P., especially over the 80 W.P. Problems were experienced in mixing the latter. Cyanazine did not show a rate response, which was not explained, and was marginally less active than GS-14254.

GS-14254, except at 1.0 lb/A of the 80 W.P., provided excellent barnyardgrass control. Metribuzin at 2.0 lb/A also gave good grass control; 1.0 lb/A was marginal in activity. Cyanazine provided inadequate barnyardgrass control although displaying some activity. (Botany Department, University of California, Davis.)

Winter and summer weed control in established alfalfa.

Treatment	Formulation	Rate	Alfalfa vigor[1]	Annual bluegrass[1]	Chickweed[1]	Shepherds purse[1]	Groundsel[1]	Barnyardgrass[2]
GS-14254	80 WP	1.0	9.8	9.7	5.3	8.3	7.9	7.8
"		2.0	9.8	10.0	6.7	9.0	8.7	9.3
GS-14254	60 WP	1.0	9.9	9.9	7.3	8.8	9.0	9.3
"		2.0	9.8	10.0	8.5	9.0	9.2	9.3
GS-14254	3.5 EC	1.0	9.8	10.0	8.8	9.3	8.7	9.1
"		2.0	9.7	10.0	9.0	9.7	9.8	9.5
GS-14254	5 G	2.0	9.6	10.0	8.3	8.8	9.0	9.4
Metribuzin	75 WP	1.0	9.0	10.0	10.0	10.0	9.3	7.0
"		2.0	9.2	10.0	9.7	10.0	9.7	9.2
Cyanazine	75 WP	1.0	9.5	10.0	7.8	9.6	9.2	7.7
"		2.0	9.6	10.0	8.7	9.3	8.3	5.7
Untreated check.			10.0	2.7	0.0	0.0	0.0	4.8

1 - Assessed on 3-8-72. Vigor, 10 = normal, 0 = dead
Control, 10 = complete, 0 = none.

2 - Assessed on 9-14-72.
All data are means of 3 replications.

Influence of winter weed control on alfalfa yield and quality. Norris, R. F., C. A. Schoner Jr., and R. A. Lardelli. Few data are available relating the effects of winter weed control in alfalfa to production and quality. Work has been initiated to elucidate these relationships; results of one trial are reported here.

Diuron at 2.4 lb/A, GS-14254 (2-sec.butylamino-4-ethylamino-6-methoxy-s-triazine) at 2.0 lb/A, oil + dinitro at 50 gal/A plus 1.25 lb/A in 100 gal/A of mix, or propane flaming at 30 gal/A at 2.5 mph. treatments were made to a fourth year stand of Lahonton alfalfa belonging to Meek and LeMaitre of Woodland, California. Plot size was 0.5 acre; all treatments were applied by commercial field rig, courtesty of Washburn Agricultural Services of Davis for sprays, and Cal Gas of Sacramento for flaming. The experiment exployed a 4 times replicated randomized block design. Harvesting was by field cuber and weighing the cubes from each plot on a commercial weigh-scale. Subsamples were collected and analysed for protein.

At the time of treatment the alfalfa was esentially dormant, with a heavy population of mixed weeds, including annual bluegrass (*Poa annua* L.), wild oats (*Avena fatua* L.), foxtail barley (*Hordeum murinum* L.), shepherds purse (*Capsella bursa-pastoris* L.), groundsel (*Senecio vulgaris* L.), chickweed (*Stellaria media* (L.) Cyrillo), prickly lettuce (*Lactuca scariola* L.), and speedwell (*Veronica buxbaumii* (L.) Tenore). Winter weed control assessments are shown in table 1. GS-14254 controlled all weed species present. A severe infestation of barnyardgrass developed during the summer, and GS-14254 also provided over 90% control of this weed in August. Diuron controlled most species adequately, although less so than GS-14254, but did not affect groundsel or speedwell. Oil + dinitro gave adequate control of most weeds, but some plants of all species survived. Flaming did not control large grasses or the rosette-type broadleaved weeds.

Alfalfa yield (table 2) at the first cutting was reduced below that of the check by all treatments. Removing the weeds lowered the total yield! Quality, as measured by percent protein, was increased, especially for those plots treated with GS-14254. These latter plots outyielded the untreated check at the second and third cutting. The effects of the excellent winter weed control therefore persisted through at least three cuttings. This type of long-term benefit is also being found in two other on-going experiments. It would seem from these data, that high levels of weed control are needed to obtain maximum benefit from winter weed control treatments. The long term effects of weed control in alfalfa need much further investigation; weeds may be causing much greater losses in alfalfa than hitherto suspected. (Botany Department, University of California, Davis, and University of California Agricultural Extension Service, Woodland).

Table 1. Effect of herbicide treatments on alfalfa vigor and weed control.

			Weed Control, 3/8/72							
Treatment	Rate	Alfalfa Vigor	Annual Bluegrass	Wild Oats	Foxtail Barley	Shepherd's Purse	Groundsel	Chickweed	Prickly Lettuce	Speedwell
Diuron	2.4	8.9	9.9	7.8	7.2	10.0	2.2	9.4	7.4	1.5
GS-14254	2.0	10.0	10.0	9.5	9.9	10.0	10.0	10.0	10.0	10.0
Oil + dinitro	*	7.5	7.5	7.4	6.4	9.1	9.0	8.6	7.1	9.7
Flaming	*	7.0	7.0	6.2	2.8	6.0	7.4	7.5	2.8	5.0
Check	-	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.1

* See Text

Table 2. Effect of weed control treatments on yield and quality of alfalfa.

	Yield - tons per acre			% protein		
Treatment	4/14	5/18	6/21	4/14	5/18	6/21
Diuron	0.69	0.93	1.05	20.8	25.0	21.2
GS-14254	0.66	1.01	1.20	24.7	25.5	20.8
Oil + dinitro	0.68	0.92	1.09	23.0	25.4	21.0
Flame	0.64	0.90	1.02	24.2	23.5	21.0
Check	0.77	0.91	1.07	20.8	24.7	21.2

Preplant weed control in field beans in Wyoming. Lee, G. A. and H. P. Alley. Screening trails were conducted at the Torrington Agricultural Substation which has a predominately sandy loam soil (71 percent sand, 10 percent silt, 19 percent clay and 1.20 percent organic matter). Herbicide treatments were applied with a knapsack sprayer which delivered 40 gpa of water carrier. Each treatment was replicated three times and arranged in a randomized complete block design. The herbicides were applied May 19 and pinto beans (Wyo-166) were planted May 20, 1972.

The predominate species comprising the weed population were black nightshade (*Solanum nigrum* L.), common lambsquarter (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.), and green foxtail (*Setaria viridis* Beauv.). A lesser infestation of wild buckwheat (*Polygonum convolvulus* L.) and common purslane (*Portulaca oleracea* L.) were combined and evaluated as others. Percent bean stand and percent weed control were obtained by actual species counts within a quadrat 6 inches x 5 ft. Numbers of plants in treated plots were compared to numbers in the non-treated check plot.

Bean stands were reduced by five of the 24 herbicide treatments. GS-35911 (chemistry not available) at 2.0 lb/A resulted in a 12 percent reduction in the bean stand; however, the remaining plants did not exhibit visual phytotoxicity.

Black nightshade control of 97 percent or better was obtained with 11 of the herbicide treatments. Trifluralin at .5 lb/A, nitralin at .75 lb/A and A-820 (N-sec.-butyl-4-tert.-butyl-2,6-dinitroanaline) at 1.5 lb/A resulted in 43, 75, 87 percent control, respectively, of black nightshade. The *Solanum* control was substantially improved when EPTC at 2.0 lb/A was included with the aniline base herbicides mentioned above. Cobex (N^3, N^3-diethyl-2,4 dinitro-6-trifluoromethyl-1,3-phenylenediamine) at .25 lb/A was not a sufficient rate to give adequate control of the major weed species. Common lambsquarter was eliminated by all herbicide treatments except four. All herbicide treatments resulted in 100 percent control of redroot pigweed except Cobex at .25 lb/A. A-820 at 1.5 lb/A and AC-92390 (chemistry not available) at 1.0 lb/A were the only treatments which did not eliminate the weed species classified as others.

EPTC at 3.0 lb/A and A-820 + EPTC at 1.0 + 2.0 lb/A gave 100 percent control of green foxtail. There were 13 herbicide treatments which resulted in 90 to 99 percent control of the grass species.

At harvest time, nitralin + EPTC at .75 + 2.0 lb/A, A-820 + EPTC at 1.0 + 2.0 lb/A, AC-92390 at 2.0 lb/A and CGA-10832 (N-n-propyl-N-cyclopropylmethyl-4-triflouromethyl-2,6-dinitroaniline) at 1.0 lb/A were nearly weed free. Bean plants in these plots matured 10 to 14 days earlier than plants in the remaining plots. (Wyoming Agricultural Experiment Station, Laramie SR-454).

Weed control data on bean preplant trials at Torrington

established and evaluated 1972

Treatment	Rate lb/A	Percent bean stand	Night-shade	Lambs-quarter	Pigweed	Others	Setaria
EPTC	3.0	100+	94 a-c	100 a	100 a	100	100 a
trifluralin + EPTC	.5 + 2.0	100+	94 a-c	100 a	100 a	100	93 a-d
nitralin + EPTC	.75 + 2.0	100+	97 ab	100 a	100 a	100	99 a
A-820 + EPTC	1.0 + 2.0	100+	100 a	100 a	100 a	100	100 a
trifluralin	.5	100+	43 f	87 b	100 a	100	93 a-d
nitralin	.75	95	75 e	100 a	100 a	100	82 cd
A-820	1.5	100	87 cd	100 a	100 a	0	89 a-d
alachlor	2.5	100+	100 a	100 a	100 a	100	85 b-d
alachlor + trifluralin	2.0 + .5	100+	100 a	100 a	100 a	100	90 a-d
Cobex	.25	100+	87 cd	74 c	92 a	100	68 e
Cobex	.33	100+	94 a-c	100 a	100 a	100	82 cd
Cobex	.5	100+	91 b-d	87 b	100 a	100	89 a-d
Cobex	.66	100+	97 ab	100 a	100 a	100	92 a-d
CGA-10832[1]	.5	100+	84 d	100 a	100 a	100	81 d
CGA-10832	.75	100+	91 b-d	100 a	100 a	100	93 a-d
CGA-10832	1.0	100+	97 ab	100 a	100 a	100	99 a
CGA-10832 + EPTC	.5 + 2.0	100+	100 a	100 a	100 a	100	96 ab
CGA-10832 + EPTC	.75 + 2.0	100+	100 a	100 a	100 a	100	97 a
GS-35911[1]	2.0	88	100 a	100 a	100 a	100	90 a-d
GS-35911	3.0	93	100 a	100 a	100 a	100	85 b-d
AC-92390[1]	1.0	100+	94 a-c	100 a	100 a	0	49 f
AC-92390	2.0	89	100 a	100 a	100 a	100	93 a-d
AC-92553[1]	.75	91	87 cd	100 a	100 a	100	90 a-d
AC-92553	1.5	100+	91 b-d	100 a	100 a	100	96 ab
Check		100	0 g	0 d	0 b	0	0 g

[1] Chemical name unavailable.

* Data followed by same letter within each column not significantly different at .05 level.

Complementary herbicide treatments for field bean weed control. Lee, G. A. and H. P. Alley. Preliminary studies conducted in 1971 indicated that complementary herbicide treatments would result in effective broad spectrum weed control. Further studies were conducted at the Torrington Agricultural Substation in 1972. The location consists of a sandy loam soil type (71 percent sand, 10 percent silt, 19 percent clay, and 1.2 percent organic matter).

Preplant treatments consisted of trifluralin at 0.5 lb/A, nitralin at 0.75 lb/A and A-820 (N-sec.-butyl-4-tert.-butyl-2,6,dinitroanalin) at 1.0 lb/A. The postemergence treatments were 2,4-DB at .25 and .38 lb/A and dinoseb at 3.0 qt/A. The preplant treatments were applied on May 17, 1972. The field beans (pinto Wyo-166) were planted on May 18, 1972. When the beans reached the trifoliate leaf stage of growth, the postemergence treatments were arranged in a split-plot design while the preplant treatments were whole plots and the postemergence treatments were the subplot or split-plot portion of the experiment.

The weed population consisted of black nightshade (*Solanum nigrum* L.), common lambsquarter (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.), kochia (*Kochia scoparia* (L.) Roth), green foxtail (*Setaria viridis* (L.) Beauv.), and "others" which consisted of lesser infestations of wild buckwheat (*Polygonum convolvulus* L.) and common purslane (*Portulaca oleracea* L.). Percent weed control was obtained by actual counts of weed species within a 5 ft. X 6 in. quadrat placed over the bean row and compared to the nontreated check. The broadleaved weeds were in the 4- to 6-leaf stage at the time of postemergence applications. The green foxtail was just emerging to the 2-leaf stage when the herbicides were applied.

The bean stands were not affected to any degree by the herbicide treatments. The beans growing in plots treated with 2,4-DB at .25 and .38 lb/A did exhibit some tissue proliferation and reduction in internode length.

A-820 at 1.0 lb/A resulted in the greatest black nightshade control compared to the other preplant treatments (attached table). Trifluralin at 0.5 lb/A eliminated the other broadleaf species. 2,4-DB at .25 and .38 lb/A effectively controlled the broadleaf weeds present. However, the complementary preplant-postemergence treatments generally gave superior weed control compared to either herbicide used alone. (Wyoming Agricultural Experiment Station, Laramie SR-456).

Effect of preplant, postemergence and preplant-postemergence complementary treatments on bean stand and percent weed control at Torrington, Wyoming

			Percent control					
Treatment	Rate lb/A	Percent bean stand	Night-shade	Lambs-quarter	Pig-weed	Kochia	Others	Green foxtail
Preplant								
nitralin	.75	98	85	89	100	100	100	86
trifluralin	.5	100	70	100	100	100	100	75
A-820	1.0	92	93	100	92	100	67	87
Postemergence								
dinoseb	3 qt	100	85	89	54	100	100	84
2,4-DB	.38	94	100	100	100	80	100	29
2,4-DB	.25	100	93	100	92	100	100	54
Complementary								
nitralin +	.75							
2,4-DB	.38	100	100	100	100	100	100	94
2,4-DB	.25	92	100	100	100	100	100	93
dinoseb	3 qt	100	100	100	100	100	100	100
trifluralin +	.5							
2,4-DB	.38	100	100	100	100	100	100	94
2,4-DB	.25	97	100	100	100	100	100	99
dinoseb	3 qt	100	74	100	92	100	100	83
A-820 +	1.0							
2,4-DB	.38	97	96	100	100	100	100	96
2,4-DB	.25	100	100	100	100	100	100	97
dinoseb	3 qt	93	100	100	100	100	100	94
Check		100	-	-	-	-	-	-

Evaluation of several soil applied herbicides for weed control and phytotoxicity in dry field beans. Heikes, P. Eugene1/ and Jerri F. Swink2/. Herbicides were field tested on the Branch Experiment Station at Rocky Ford and on the Agronomy Farm at Fort Collins, Colorado. There were 33 different treatmemt replicated twice at each location. These included preplant herbicides incorporated by double-disking and once over with a spike-tooth harrow, preplant with spike-tooth harrow incorporation only, and postplant with no incorporation. All herbicides were applied broadcast with a plot sprayer in 40 gpa. Plots were 20 x 25 ft - 500 sq. ft.

Pinto bean variety, Idaho 111, was planted at both locations, immediately following application of the preplant and preemergence herbicides. At Rocky Ford, there was a dense stand of redroot pigweed, flower-of an-hour (*Hibiscus trionum*), and kochia in the checks. Visual observations were made June 13 and July 13, and weed counts were made July 20; all weeds and bean plants were counted in two 25 ft rows in each replication. Beans were harvested and yield samples collected September 5.

At Fort Collins the field had been tilled twice prior to planting and was almost free of weeds throughout the season. Several observations were made during the season but most of the checks were weed-free. The fact there was no weed competition in this field, differences in yields were due mainly to herbicide phytotoxicity.

At Rocky Ford, weeds were present and the effect of herbicides was evaluated on both weeds and crop.

The most effective herbicides in this series were trifluralin, alachlor, the combination of alachlor and trifluralin, dinitramine, CGA-10832 (N-n-propyl-N-cyclopropylmethyl-4-triflouromethyl-2,6-dinitroaniline), and the combination with EPTC, nitralin/EPTC, bensulide and flurodifin.

Trifluralin controlled pigweed and kochia; it was excellent on grasses but did not control flower-of-an-hour. Alachlor was better on flower-on-an-hour than trifluralin but not as good as EPTC. The dinitroanilines appear weak on *Hibiscus* species. Alachlor/trifluralin was outstanding in the series and was almost weed-free throughout the season. It also produced the best yields. Weed control was good with dinitramine but there was phytotoxicity at all rates; the phytotoxicity did not vary in direct relation with the rate. It was good on kochia and pigweed and provided good grass control but was weak on flower-of-an-hour. CGA-10832 was comparable with trifluralin; the combination with EPTC was excellent. EPTC has consistently been a standard bean herbicide and provided excellent weed control in these series. Nitralin/EPTC has consistently controlled most of the major weeds in dry beans; these plots were almost weed-free throughout the season. Broadleaf weed control was acceptable with linuron but poor on grasses. It left considerable puncturevine and was only fair on flower-of-an-hour. Alachlor/linuron combination was better than linuron alone, but it too was weak on puncturevine. Fluorodifen controlled pigweed but had little effect on flower-of-an-hour and in general these plots looked ragged. It was only fair on grasses and did not control late emerging weeds. Bensulide did not control flower-of-an-hour and was only fair on grasses. There was no crop injury at the lower rate but there was both stunting and stand reduction at the higher rate. The 8 lb rate of bensulide did not compare with 3 lbs of EPTC. (Colorado Extension Service, Colorado State University, Fort Collins[1/], Agricultural Experiment Station, Rocky Ford, Colorado[2/].

BEAN YIELDS

Arkansas Valley Branch Station, Rocky Ford, Colorado
Agronomy Farm, Fort Collins, Colorado

		Rocky Ford		Fort Collins	
Herbicide and Rate per Acre		lbs per Acre	% of Check	lbs per Acre	% of Check
Preplant - disk/harrow incorporated					
trifluralin	3/4 lb	2015	175.6	2279	98.5
alachlor	3 lbs	2301	200.6	2358	101.9
alachlor/trifluralin	2 + 1/2 lb	2563	223.4	2528	109.2
DS-21376	1/2 lb	1143	99.6	2223	96.1
DS-21376	1 lb	868	75.7	1045	45.1
dinitramine	1/3 lb	1953	170.3	2280	98.5
dinitramine	1/2 lb	1677	146.2	2174	93.9
dinitramine	2/3 lb	2236	194.9	2169	93.7
CGA-10832	3/4 lb	2167	188.9	2376	102.7
CGA-10832	1 lb	1539	134.2	2298	99.3
CTA-10832/GS-35911	1/2 + 2 lbs	2015	175.7		
CTA-10832/EPTC	1/2 + 1½ lbs	2345	204.4	2234	96.5
GS-35911	3 lbs	2305	200.9		
GS-35911	4 lbs	2261	197.1		
EPTC	3 lbs	2236	194.9	2344	101.3
AC-92390	1 lb	1670	145.6	2316	100.1
AC-92390	1½ lb	2076	181.0	2461	106.3
AC-92390	1 lb	2276	198.4	2408	104.1
AC-92390	1½ lb	1750	152.6	2274	98.3
nitralin/EPTC	3/4 + 1½ lbs	2316	201.9	2292	99.0
trifluralin/MC4379	1/2 + 1 lb	2251	196.2	2337	101.0
trifluralin/MC4379	1/2 + 1½ lbs	1993	173.7	2303	99.5
EPTC	3 lbs	1942	169.3	2337	101.0
Preemergence - spiketooth harrow incorporated					
linuron	3/4 lb	1786	155.7	2264	97.8
alachlor	3 lbs	2163	188.6	2477	107.0
alachlor/linuron	1½ + 3/4 lbs	2105	183.5	2311	99.8
flurodifin	4½ lbs	1202	104.8	2207	95.4
bensulide	6 lbs	1125	98.1	2424	104.7
bensulide	8 lbs	1252	109.1	2544	109.9
bensulide/linuron	6 + 3/4 lbs	2193	191.2	2319	100.2
Postplant - no incorporation					
MC-4379	1½ lbs	980	85.4	2335	100.9
MC-4379	2 lbs	1619	141.1	2222	96.0
flurodifin	4½ lbs	1343	117.1	2146	92.7
Check		1147		2314	

The evaluation of postemergence herbicides in beans. Agamalian, H. A series of four trials were established on lima beans and small whites to evaluate BAS-3512 WP and BAS-3516 EC (3-isopropyl-1H-2,1,3-benzothiadiazin-(4) 3H-one-2,2-dioxide). The herbicides were applied postemergence to beans in the first to second trifoliate leaf, and in one experiment when the beans were blooming. Weed species maturity varied from 2-3 true leaf size, to full blooming.

Application was made with 3 nozzle wand, using 9002 orifice, at 50 gal/acre. Two formulations were compared, BAS-3512 - wettable powder and BAS-3516 and emulsion. A surfactant was used in comparison with BAS-3512. The major weed species present at the sites were hairy nightshade, pigweed, lambsquarters, and nutsedge.

Data present in table form indicated excellent activity of hairy nightshade in seedling to full bloom. Lambsquarters is more tolerant, but was controlled when treated in the 1-2 leaf stage. When lambsquarters was 4 to 6" tall, it was not controlled at the 2 lb rate, the 4 lb/acre doseage did control these large weeds. Pigweed is effectively controlled especially when the weeds are less than 3" tall. Chlorotic symptoms were evident in yellow nutsedge and did result in top kill, especially at the 2 lb/acre rate. Some evidence of bindweed foliage desiccation was observed at the 4 lb/acre rate.

Crop tolerance with lima beans and small whites were similar. No injury was observed up to 2 lb/acre. The 4 lb/acre rate showed some leaf scorching of the beans. This symptom was evident at all rates tested with BAS-3512 when 0.5% surfactant was added. The symptoms were restricted to those leaves sprayed and did not result in delayed crop phytotoxicity. (University of California, Agriculture Extension, Salinas).

Table 1. The effects of post emergence herbicides on small white beans and limas at varying doseage rates.

		Crop Phyto Rating			S.W.				
			Fordhook	Stnd.	Yield				
Treatment	Lb/A	S.W.	Lima	Lima	Lb/A	HNS	Lqt.	PW	CW
BAS 3512	½	0	0	--	---	8.6	6.0	8.0	7.0
BAS 3512	1	0	0	0	1818	9.5	7.0	9.0	8.0
BAS 3512	2	0	0.2	0	1665	10.0	8.0	9.5	9.0
BAS 3512	4	0	1.5	1	1836	10.0	9.5	10.0	9.0
BAS 3512+tronic	½	0	1.7	-	---	9.5	7.0	9.0	8.0
BAS 3512+tronic	1	0	2.5	0	---	10.0	8.5	9.5	8.5
BAS 3512+tronic	2	0	2.5	0	---	10.0	9.0	10.0	9.5
BAS 3512+tronic	4	0	3.5	3	---	10.0	10.0	10.0	9.5
BAS 3516	½	0	0	-	---	9.0	7.5	9.0	8.5
BAS 3516	1	0	0	0	1631	10.0	7.7	9.5	9.0
BAS 3516	2	0	0.5	0	1472	10.0	8.6	10.0	10.0
BAS 3516	4	1	1.5	2	1514	10.0	9.5	10.0	10.0
bromoxynil	½	2	--	-	1788	5.0	9.0	3.0	5.0
control	0	0	0	0	1416	0.0	0.0	0.0	0.0

Code: S.W. = Small whites; HNS = hairy nightshade; Lqt. = lambsquarters; PW = pigweed; CW = cheeseweed

Hairy nightshade control (*Solanum sarachoides*) in Fordhook lima beans. Agamalian, H. Results from earlier tests have indicated that alachlor and pronamide will control hairy nightshade. This experiment was designed to obtain efficacy data with the combinations, and single treatments and their effects on yield.

The herbicides were applied preplant incorporated using a Marvin "L" shaped tooth implement. Depth of incorporation was 4 inches. Spray volume per acre was 100 gallons at 30 psi. Each treatment was 4 rows, 200 feet long with three replications. Treatments were made on May 24, and seeded May 25. The soil texture was a Lockwood clay loam, maximum air temperature was 72° F. The variety Concentrate 232 was seeded at 160 lbs/acre at a depth of four inches, into soil moisture adequate for bean emergence.

The initial postemergence irrigation was made when the beans were in the second true leaf stage, approximately three weeks after planting.

Weed germination following this irrigation resulted in hairy nightshade being the major species with pigweed and lambsquarters in lesser numbers. Furrow cultivation was maintained, but bed top cultivation was not allowing for full season weed competition in the untreated control.

The data indicates excellent hairy nightshade control with all treatments except trifluralin and the control.

Stand counts suggest some phytotoxicity with combinations of pronamide plus trifluralin and pronamide plus alachlor. This is evident at the higher rates. The trials were machine harvested with a self-propelled viner. Reduced yields of the above pronamide combinations at the higher rates, followed the trend with the stand reduction. This is especially so when compared with single hairy nightshade control (*Solanum sarachoides*) in Fordhook lima beans herbicide treatments of the same rates.

Evidence from this trial supports earlier data, indicating that alachlor plus trifluralin would be the most likely candidates for tank mix labeling. (University of California Agriculture Extension, Salinas).

Weed control, crop tolerance and yield data from combinations and single treatments of preplant incorporated herbicides on lima beans.

Herbicide	Rate Lb/A	HNS	PW	Lqt.	Crop Stand 100"	Crop Phyto	Green Shelled Lb/A
alachlor	4	8.2	9.0	0.0	17.2	0.3	5518
alachlor	8	9.1	10.0	3.0	16.2	0.3	5257
alachlor+trifluralin	4+0.75	9.0	10.0	10.0	17.3	0.3	5132
trifluralin	0.75	5.0	9.5	9.5	16.0	0.6	5334
pronamide	2	9.0	7.0	9.0	16.3	1.3	4992
pronamide	4	9.6	8.0	10.0	15.1	2.3	4836
pronamide+trifluralin	2+0.75	7.0	10.0	10.0	15.5	0.7	4906
pronamide+trifluralin	4+0.75	8.8	10.0	10.0	14.4	1.3	4352
pronamide+alachlor	2+2	9.1	9.0	10.0	16.4	0.3	4535
pronamide+alachlor	2+4	8.8	10.0	10.0	17.3	0.0	5198
pronamide+alachlor	4+4	9.1	10.0	10.0	14.3	1.6	4231
Control	0	0.0	0.0	0.0	16.7	0.0	4379
L.S.D.	.05				N.S.		N.S.

Weed Species: HNS = hairy nightshade; PW = pigweed; Lqt + lambsquarters

Sweep versus rotary tiller incorporation of preplant herbicides for dry beans. Norris, R. F., and R. A. Lardelli. An experiment was established at Davis, California to compare power tiller incorporation with sweep-type layering below the soil surface on activity of trifluralin, EPTC and alachlor. The Yolo loam soil was preirrigated on July 9, 1972, the herbicides applied on July 19, and the beans sowed 3" deep on July 24. Herbicides were applied using a tractor mounted compressed air sprayer through either V-type sweeps set 2" or 4" deep, or by Marvin'Rowmaster' tiller set 2" deep for alachlor and trifluralin or 4" deep for EPTC. Each sub-plot consisted of 4 beds 35' long, with one bed planted to each of kidney bean, lima bean, blackeye bean and barnyard grass (*Echinochloa crusgalli* (L.)Beauv.) plus ground cherry (*Physalis* sp.). The experiment was conducted using a completely randomized split-plot design.

Excellent stands of beans emerged under the irrigation practice used, but the weed germination was low, as seen in the counts for the untreated check.

The 4" deep bladed application provided consistently the greatest activity, on beans or weeds. The 2" deep blading provided herbicide activity equal to or better than power tiller incorporation.

Selectivity of trifluralin was good on all species of beans, with the 4" deep herbicide placement (below crop seed) being consistently more injurious. EPTC was not selective on lima beans, was marginally selective on blackeye beans and was selective on kidney beans. Blading this herbicide substantially increased crop toxicity, especially when the herbicide was 4" deep. Alachlor was selective on all species of beans; there were no statistically (at 5% level) significant differences between application methods, except 6.0 lb/A bladed 4" deep on blackeye beans by 8-16-72.

Barnyard grass control from trifluralin was unaccountably low, and application technique did not influence this. Ground cherry was not controlled by the chemical, as anticipated; again the application technique had no effect. EPTC was highly active on both weed species, with all application techniques providing essentially similar results. Alachlor also effectively controlled both species, but the 4" deep sweep application was markedly superior; 1.5 lb/A bladed 4" deep provided better weed control than 6.0 lb/A rototilled 2" deep. The 2" deep layering of alachlor was superior to power tiller incorporation, but not as good as 4" deep layering.

The blading technique appears very worthwhile pursuing in the future. (Botany Department, University of California, Davis).

Comparison of sweep versus power tiller incorporation of preplant herbicides for beans.

Treatment	Application	Bean Vigor - 8/16/72			Number per 35' - 8/16/72			Weed number per 35' - 8/16/72	
	Type	Kidney	Lima	Blackeye	Kidney	Lima	Blackeye	Barnyard Grass	Ground Cherry
Trifluralin 0.25 lbs/A	A	9.1	8.8	9.4	84.5	72.8	75.3	5.8	9.0
	B	8.8	9.7	9.4	60.3	58.8	78.5	2.8	13.8
	C	8.9	8.7	9.5	69.0	61.3	64.5	2.3	5.8
Trifluralin 0.50 lbs/A	A	9.1	9.4	9.2	92.3	84.5	68.3	2.3	15.5
	B	8.9	8.6	9.6	88.0	69.0	81.0	1.0	8.5
	C	8.6	8.1	8.5	64.5	73.0	55.0	2.0	6.0
Trifluralin 1.00 lbs/A	A	9.3	9.6	9.4	83.8	79.3	58.3	6.3	5.0
	B	8.6	8.6	9.2	65.3	60.3	70.3	1.5	7.8
	C	8.0	7.9	8.9	50.8	56.3	58.0	0.0	2.0
EPTC 1.5- lbs/A	A	8.9	8.8	8.4	84.8	77.3	73.8	4.0	0.8
	B	9.1	7.6	6.8	89.8	59.3	60.8	0.0	1.8
	C	8.2	4.8	6.3	77.5	44.5	56.8	0.0	0.0
EPTC 3.00 lbs/A	A	8.9	5.9	8.5	89.5	56.0	70.5	0.5	1.0
	B	8.5	6.6	5.6	100.0	61.0	51.0	0.0	1.0
	C	7.4	3.1	1.3	81.8	43.8	18.8	0.0	0.0
EPTC 6.00 lbs/A	A	8.0	3.1	5.9	86.3	49.8	48.8	0.0	0.0
	B	7.4	3.8	2.0	61.0	54.0	26.3	1.3	1.0
	C	7.0	1.6	0.0	82.8	25.5	1.5	0.0	0.0
Alachlor 1.50 lbs/A	A	9.1	8.8	9.0	83.3	66.0	77.0	8.0	4.8
	B	8.5	9.4	8.6	75.5	70.5	58.8	4.5	7.0
	C	8.8	9.2	9.0	66.5	61.8	58.8	0.0	0.3
Alachlor 3.00 lbs/A	A	8.5	9.3	7.6	68.0	81.8	75.5	6.5	2.8
	B	8.4	8.6	8.0	71.8	71.0	71.5	1.0	0.5
	C	8.3	8.6	8.0	64.3	71.8	70.5	0.0	0.0
Alachlor 6.00 lbs/A	A	7.5	8.1	7.4	83.0	74.0	84.0	7.3	2.3
	B	8.1	8.9	8.1	82.0	88.8	70.3	0.0	2.0
	C	7.4	7.9	6.8	64.5	75.3	61.5	0.0	0.0
Untreated Check	A	9.2	9.6	9.1	96.8	74.3	62.0	8.0	10.5
	B	9.5	9.3	9.7	81.8	72.5	77.5	10.8	12.8
	C	9.3	9.4	9.6	81.8	70.8	74.5	11.0	4.8

All data are means of 4 replications,
Vigor: 10 = normal, 0 = dead

A: Power tiller incorporation
B: 2" deep sweep
C: 4" deep sweep

Weed control in corn with post-direct treatments. Lee, G. A. and H. P. Alley. Severe weed infestations may exist as a result of inclement weather preventing farmers from applying herbicides when weeds are in the optimum growth stage. Trials were conducted into the corn row after annual weeds had surpassed optimum growth stage.

The weed infestation consisted of black nightshade (*Solanum nigrum* L.) in the 8 to 10 leaf stage, common lambsquarter (*Chenopodium album* L.) in the 6 to 8 leaf stage, redroot pigweed (*Amaranthus retroflexus* L.) and green foxtail (*Setaria viridis* (L.) Beauv.) in the 4 to 6 leaf stage. Herbicide treatments were directed into an 8-inch band with nozzles mounted on skids which were pulled between the corn rows. The herbicides were applied in 63 gpa of water carrier on a band basis. Herbicides were applied when the corn was 12 to 14 inches tall on June 15, 1972. Plots were evaluated June 27, 1972.

No corn plants died as a result of herbicide treatments. The slight deviations in percent corn stand can be attributed to variation in the crop population prior to herbicide applications. However, MC-4379 [Methyl-5-(2',4'-dichlorophenoxy)-2-nitrobenzoate] at 1.5 and 2.5 lb/A and MC-7181 (chemical name unavailable) at .5 and 1.0 lb/A resulted in lateral necrotic areas on the corn leaf blades approximately halfway between the base and the tip.

Cyanazine + oil at 2.0 lb/A + 1.0 gpa, cyanazine at 2.0 lb/A, and cyprazine at 1.0 lb/A resulted in 90 percent or better control of black nightshade and common lambsquarter. Cyprazine + oil at 1.0 lb/A + 1.0 gpa and MC-7181 gave 100 percent control of common lambsquarter. MC-4379 and MC-7181 at all rates eliminated redroot pigweed. They were the only herbicide treatments that effectively controlled this species.

Cyanazine at 2.0 lb/A with and without oil resulted in 86 and 84 percent control of green foxtail, respectively. No herbicide treatment gave adequate control of the grass species since it had surpassed the growth stage of herbicidal susceptibility.

Of the herbicides evaluated, no treatment resulted in adequate control of all weed species present. No treatment appears to provide an acceptable control program for those situations where weed surpass the optimum stage for herbicidal control. (Wyoming Agricultural Experiment Station, Laramie, SR-444).

Percent weed control with post-direct treatments on corn

Treatment	Rate (lb/A)	Percent corn stand	Percent control[1]			
			Night-shade	Lambs-quarter	Pigweed	Setaria
cyprazine	1.0	96	90 ab[2]	98 a	70 b	58 b
cyprazine	.75	98	97 a	86 ab	50 c	65 ab
cyprazine + oil	1.00 + 1 gal	100	80 ab	100 a	75 b	66 ab
cyprazine + oil	.75 + 1 gal	96	87 ab	72 ab	25 d	52 bc
cyanazine	2.0	98	94 a	94 a	75 b	84 a
cyanazine + oil	2.0 + 1 gal	96	98 a	98 a	50 c	86 a
alachlor + atrazine	2 + 1	98	89 ab	92 a	75 b	27 c-e
alachlor + atrazine + oil	2 + 1 + 1 gal	96	66 bc	77 ab	0 e	42 b-d
MC-4379	1.5	94	23 e-g	80 ab	100 a	59 b
MC-4379	2.5	96	49 cd	54 bc	100 a	43 b-d
MC-7181	.5	99	36 d-f	79 ab	100 a	21 d-f
MC-7181	1.0	100	44 c-e	100 a	100 a	51 bc
dicamba	.125	100	39 d-f	20 cd	0 e	11 ef
dicamba	.25	96	19 fg	26 cd	50 c	5 ef
nontreated check		100	0 g	0 d	0 e	0 f

1/ Data are averages of three replications.

2/ Data followed by the same letter within each column are not significantly different at .05 level.

Preplant weed control in corn in Wyoming. Lee, G. A., H. P. Alley and A. F. Gale. Screening trials were conducted at the Torrington Agricultural Experiment Station which has predominately a sandy loam soil (71 percent sand, 10 percent silt, 19 percent clay and 1.2 percent organic matter). Plots were established May 8, 1972 and corn (Northrup King PX-480T) planted May 9, 1972. The treatments were replicated three times and arranged in a randomized complete block. The herbicides were applied full coverage with a knapsack sprayer in 40 gpa of water carrier.

The weed population consisted of black nightshade (*Solanum nigrum* L.), common lambsquarter (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.) and green foxtail (*Setaria viridis* (L.) Beauv.). Percent stand of corn and percent weed control was obtained by actual species counts within a 5 ft. X 6 in. quadrat.

Atrazine + butylate at 1.0 + 3.0 lb/A resulted in a 22 percent reduction in corn stand; however, the plants which were present at the time of evaluation appeared normal. All herbicide treatments resulted in some corn stand reduction except atrazine + alachlor at .5 + 2.0 lb/A.

No herbicide treatment resulted in complete elimination of all weed species present. Atrazine + butylate at 1.0 + 3.0 lb/A and atrazine + alachlor at .5 + 2.0 lb/A resulted in 90 percent or better control of black nightshade. All herbicide treatments eliminated common lambsquarter except cyanazine + butylate at 1.0 + 3.0 lb/A and atrazine + alachlor at .75 + 1.5 lb/A. Although control of redroot pigweed ranged from 87 to 100 percent for the various herbicide treatments, no statistically significant differences were detected. Atrazine + butylate at 1.0 + 3.0 lb/A, atrazine + alachlor at .5 + 2.0 lb/A and AC-92390 (chemical name unavailable) at 1.5 lb/A resulted in 92 percent or better control of green foxtail. Comparison of total average control revealed that only three treatments gave 91 percent or better control. (Wyoming Agricultural Experiment Station, Laramie, SR-443).

Effect of preplant herbicide treatments on percent corn stand
and percent weed control at Torrington, Wyoming

Treatment	Rate lb/A	Percent corn stand	Percent control				
			Night-shade	Lambs-quarter	Pigweed	Green foxtail	Total avg.
cyprazine		85	83 a-c[1]	100 a	100 a	81 a-c	91
cyanazine + butylate	1.0 + 3.0	94	84 a-c	80 b	94 a	79 a-c	84
cyanazine	2.0	96	83 a-c	100 a	100 a	74 a-c	89
cyanazine	3.0	92	69 de	100 a	94 a	65 b-d	82
atrazine + butylate	.5 + 3.0	92	73 b-d	100 a	100 a	73 a-c	87
atrazine + butylate	1.0 + 3.0	78	90 ab	100 a	94 a	92 a	94
atrazine	1.0	92	61 de	100 a	100 a	41 d	75
atrazine + alachlor	.75 + 1.5	98	77 a-d	90 ab	100 a	89 ab	89
atrazine + alachlor	.5 + 2.0	100	94 a	100 a	100 a	92 a	96
atrazine + CGA-10832	.5 + .33	89	70 b-d	100 a	100 a	75 a-c	86
atrazine + CGA-10832	.75 + .33	94	66 c-e	100 a	94 a	59 cd	80
AC-92553	.75	94	46 e	100 a	87 a	80 a-c	78
AC-92553	1.5	92	59 de	100 a	100 a	93 a	88
CGA-35911		89	75 a-d	100 a	94 a	48 d	79
Chack		100	0 f	0 c	0 b	0 e	

[1] Data followed by the same letter within each column is not significantly different at .05 level.

Comparison of seed treatment thiocarbamate antidotes in corn. Lee, G. A., H. P. Alley and A. F. Gale. Studies were conducted at the Torrington Agricultural Substation to compare the effectiveness of Protect (1,8-naphthalic anhydride) and R-25788 (N,N-diallyl dichloroacetamide) for decreasing thiocarbamate damage on corn. The location is predominately a sandy loam soil with 1.2 percent organic matter. Herbicide treatments were applied preplant and incorporated 1.5 inches deep with a flextine harrow with the exception of EPTC-AD (Aqueous Dispension) which was applied to the soil surface. Corn seed was treated with Protect and R-25788 at rates of .5 percent (weight basis). Nontreated seed was planted as a comparison for effectiveness of the antidote seed treatments. Seed-treated corn was planted across the herbicide plots in a split plot design.

Black nightshade (*Solanum nigrum* L.), common lambsquarter (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.), kochia (*Kochia scoparia* L. Roth), and green foxtail (*Setaria viridis* (L.) Beauv.) were the dominant weed species present. Lesser populations of wild buckwheat (*Polygonum convolvulus* L.) and common purslane (*Portulaca oleracea* L.) were grouped as others for comparative purposes. Percent weed control and percent corn stand were determined by actual quadrat counts. Numbers of each species in the treated plots were compared to numbers present in the nontreated check plot. Lack of space prevents the reporting of individual weed species control in this paper (accompanying table). Corn vigor was determined visually when the plants were 16 to 18 inches tall. Silage yields were taken Aug. 25, 1972 when the corn was in the early dent stage.

Although percent corn stands were generally higher in the herbicide treated areas which received no seed protectant, the vigor of the corn was reduced substantially. Comparison of Protect and R-25788 for reducing thiocarbamate symptoms in corn indicates that the latter compound was somewhat superior. The greatest contrast in vigor was observed between individual plots treated with EPTC and vernolate at 6.0 lb/A. Yields of silage corn were higher in plots which received seed treatment except in the areas treated with EPTC + 2,4-D at 3 + 1.5 lb/A.

Broadleafed weed control was 89 percent or better in all herbicide-treated plots except those treated with EPTC at 2.0 lb/A regardless of formulation. Green foxtail was effectively controlled with all herbicide treatments. (Wyoming Agriculture Experiment Station, Laramie, SR-455).

Effect of thiocarbamate herbicides, alone and in combination, on corn stand, vigor and yield and percent weed control as influenced by seed treatment antidotes

		Antidote seed treatment														
		None					Protect					R-25788				
		Corn			% Control		Corn			% Control		Corn			% Control	
Treatment	Rate lb/A	stand	vig.	yield	broad leaf	grass	stand	vig.	yield	broad leaf	grass	stand	vig.	yield	broad leaf	grass
EPTC (A.D.)	3.0	100	7[1]	19[2]	80[3]	100[4]	91	8	25	74	100	100	9	24	89	100
EPTC +2,4-D	3.0 + 1.5	91	5	27	99	100	70	7	24	100	100	82	10	24	99	100
cyprazine +EPTC	.75 + 2.0	100	6	23	100	100	84	7	24	89	100	70	9	28	100	100
cyprazine +EPTC	.5 + 2.0	93	7	23	98	100	77	9	30	99	100	86	9	35	100	100
vernolate + cyanazine	3.0 + 1.0	100	5	22	96	100	79	8	26	99	100	44	9	31	98	100
cyanazine + EPTC	1.0 + 3.0	96	7	24	95	100	72	9	30	99	100	82	9	27	98	100
vernolate	6.0	96	2	13	99	100	77	7	17	98	100	58	9	31	100	100
vernolate	3.0	100	6	20	98	100	63	8	25	99	100	89	9	27	97	100
EPTC	6.0	95	3	12	99	100	77	8	22	100	100	70	9	26	96	100
EPTC	3.0	96	5	20	78	98	84	9	24	82	98	58	9	24	83	95
check		100	10	10			79	10	13			100	10	13		
Total avg.		97	6	19	94	99	78	8	23	94	99	67	9	26	96	99

1/ Vigor based on visual observations 1 = dead; 10 = healthy and normal

2/ Yield expressed as tons of silage per acre.

3/ Total average broadleaf weed control. Species are nightshade, lambsquarter, pigweed, kochia, and others.

4/ Total average grass weed control. Species is green foxtail.

Effect of thiocarbamate herbicides + antidotes, as single applications, on corn and weed populations. Lee, G. A., H. P. Alley and A. F. Gale. Studies were conducted at the Torrington Agricultural Substation which consists of sandy loam soil (71 percent sand, 10 percent silt, 19 percent clay and 1.2 percent organic matter). The objective of the study was to determine the effect of R-25788 (N,N-diallyldichloroacetamide), either as a commercial preparation or tank mix, on the herbicidal activity of EPTC and vernolate as well as the phytotoxicity towards the corn crop. The herbicide treatments were replicated three times and arranged in a randomized complete block design. The herbicides + antidote were applied in 40 gpa of water carrier. Plots were established May 8, 1972. All plots were incorporated with a flex-tine harrow to a depth of 2 inches. The area received .44 inches of precipitation within two hours after herbicide application. Corn (Northrup King PX-480T) was planted May 12, 1972.

Weed species infesting the area were black nightshade (*Solanum nigrum* L.), common lambsquarter (*Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.) and green foxtail (*Setaria viridis* (L.) Beauv.). The percent control was obtained by actual species counts within a quadrat 5 ft. X 6 in. Three subsamples were taken per replication.

The greatest percent reduction was recorded in plots treated with EPTC + R-25788 at 3.0 + .25 lb/A and vernolate + R-25788 at 3.0 + .12 lb/A; however, the corn remaining exhibited no phytotoxic damage at the time of evaluation. Corn plants from plots treated with EPTC + R-25788 or vernolate + R-25788, regardless of application rate, were substantially more vigorous than plants from areas which were treated with thiocarbamate herbicides without the antidote. The most severe symptoms on corn from plots treated with EPTC + R-25788 or vernolate + R-25788 were slight stunting and moderate wrinkling of the lower leaves. Plants growing in areas which were treated with EPTC or vernolate alone were moderately to severely stunted with leaves "onion rolled" to an extreme of undifferentiated leaf blade tissue.

Herbicidal activity of EPTC or vernolate was not inhibited by the addition of R-25788. All EPTC + R-25788 and vernolate + R-25788 treatments, regardless of rate resulted in 90 percent or better control of all weed species present. (Wyoming Agricultural Experiment Station, Laramie, SR-457).

Percent corn stand, corn vigor and percent weed control as affected by combinations of thiocarbamate herbicides plus antidotes.

Treatment	Rate lb/A	% corn stand	Vigor rating	Percent control Night-shade	Lambs-quarter	Pigweed	Green foxtail
EPTC + R-25788[2]	3.0 +	100	10[1]	100	100	100	98
EPTC + R-25788[2]	4.0 +	92	10	100	100	100	100
EPTC + R-25788[2]	6.0 +	94	9	100	100	100	100
vernolate + R-25788[2]	3.0 +	100	10	97	100	100	100
vernolate + R-25788[2]	4.0 +	100	9	97	100	100	100
vernolate + R-25788[2]	6.0 +	100	9	97	100	100	100
EPTC + R-25788	3.0 + .03	100	10	99	96	100	100
EPTC + R-25788	3.0 + .12	98	10	98	100	96	100
EPTC + R-25788	3.0 + .25	89	10	96	100	100	99
EPTC + R-25788	6.0 + .03	100	8	98	100	100	99
EPTC + R-25788	6.0 + .12	100	9	99	100	100	97
EPTC + R-25788	6.0 + .25	100	10	97	100	100	98
vernolate + R-25788	3.0 + .03	100	10	90	95	100	95
vernolate + R-25788	3.0 + .12	89	10	95	100	100	90
vernolate + R-25788	3.0 + .25	94	9	95	100	100	93
vernolate + R-25788	6.0 + .03	100	10	93	100	100	98
vernolate + R-25788	6.0 + .12	100	8	96	100	100	95
vernolate + R-25788	6.0 + .25	96	8	95	100	100	97
EPTC	3.0	100	7	98	100	100	99
EPTC	6.0	100	5	100	100	100	100
vernolate	3.0	100	6	93	98	100	82
vernolate	6.0	92	3	93	100	92	87
Check		100	10	--	--	--	--

[1] Scale 1 to 10 with 1 = dead; 10 = healthy normal corn.

[2] Commercially mixed herbicide and antidote combination.

Evaluation of several preplant preemergence and postemergence herbicides for weed control and phytotoxicity in corn. Heikes, P. Eugene. Herbicides were evaluated at four locations in Colorado; two sites were irrigated with center pivot sprinklers and two were row irrigated. The soil at three of the locations is classified as sandy loam with 0.5 to 0.6 percent O.M. and sand ranging from 62 to 76 percent. The fourth location was a loam soil with 1 percent O.M. and 46 percent sand.

Weed species: The major weed species in these fields were sandbur, redroot pigweed, kochia, lambsquarters and foxtail species. Sandbur is a major weed problem in Eastern Colorado and two of the sites were selected specifically because of their sandbur history.

Application of herbicides and soil incorporation: All herbicides were applied broadcast with a plot sprayer in 40 gpa. Preplant herbicides were incorporated with the farm equipment at hand and corn was seeded the same day. Preemergence herbicides were applied immediately after planting and postemergence herbicides were applied when the corn was 6 to 8 inches high. Plots were 20 x 25 ft. - 500 sq. ft. with two replications at each location.

Outstanding preplant herbicides were atrazine, atrazine/butylate, butylate, alachlor and alachlor/atrazine. Atrazine provided good sandbur control with minimum crop injury at 2 lb/A. Broadleaf weed control was excellent. Atrazine plus butylate at 1 plus 3 lb/A was better than butylate alone at 4 lb/A. The combination provided better control than of redroot pigweed, kochia, and other broadleaf weeds. Broadleaf weed control was better where alachlor was applied preplant incorporated than where surface applied. Incorporation did not improve sandbur control but provided better control of redroot pigweed and lambsquarters. Alachlor/atrazine at 2 + 1¼ lb/A was the outstanding combination in the series with almost 100 percent control of sandbur and no crop injury. This combination was consistent at all locations. A combination of cyprazine and S-ethyldiethylthiocarbamate (Prefox) showed promise as a preplant soil incorporated corn herbicide. This combination was as good as atrazine for control of broadleaf weeds and was better than atrazine for grass control. It provided broad spectrum weed control and showed reasonably good crop tolerance.

Preemergence herbicides were applied on the soil surface immediately after planting with no incorporation. Alachlor at 3 lb/A performed better under sprinkler irrigation than furrow where surface applied. It was weak on sunflowers, lambsquarters and kochia at one site, but in general provided acceptable weed control. Alachlor/atrazine at 2 + 1¼ lb/A was better on broadleaf weeds than alachlor alone and about the same on grasses. The surface application was inferior to the ppi application, mainly on sandburs. Alachlor/cyanazine at 1½ + 1¼ lb/A was fair on broadleaf weeds and was equal to 2 lbs of atrazine for control of sandburs. There was no visible corn injury; this combination appears to be less toxic to corn than the same rate of cyanazine alone. Cyanazine was evaluated at 1½, 2 and 3 lb/A; at the 1½ lb rate, sandbur control was poor and it left some redroot pigweed and sunflowers. At the 2 lb rate there was severe stunting and some stand reduction at 1 sand soil site with sprinkler irrigation, and at 3 lbs, there was severe stunting and severe stand reduction. It appeared that 1½ lb/A is maximum on sand under sprinkler irrigation for minimum crop injury, but this rate provided marginal weed control. Weed control was good at 2 and 3 lb/A. The crop injury seemed to be more associated with sprinkler irrigation than soil type. Cyanazine caused more crop injury in sand with sprinkler irrigation at comparable rates than did atrazine. Combinations with alachlor or butylate appeared to reduce crop phytotoxicity. Soil incorporation increased phytotoxicity. Dicamba/alachlor at 0.4 + 1 lb/A looked like a promising combination but left late emerging grasses and was only partially effective on sandburs. This combination appeared to have good crop tolerance.

Alachlor-atrazine at 2 + 1 lb/A was applied postemergence in a water/oil carrier at a ratio of one gallon of herbicidal oil to 19 gallons of water; the combination was also applied in a water carrier without oil. Sandbur control was significantly better where the water/oil carrier was used; there was little difference in broadleaf weed control. There was no crop injury either with or without oil. Propachlor/atrazine was applied in the same manner - water/oil carrier and water alone, at 2.3 + 1 lb/A. This was inferior to the alachlor combination for control of sandbur; it effectively controlled broadleaf weeds. Cyprazine at 3/4 lb a.i. per acre was one of the better postemergence herbicides; broadleaf weed control was excellent and it provided acceptable control of sandbur. Cyanazine was evaluated at 1, 1½ and 2 lb/A postemergence; all rates caused stunting from minor to major. It appeared to take 2 lbs for acceptable weed control but crop tolerance appeared marginal at this rate. Dicamba/atrazine at 0.4 + 1 lb/A controlled broadleaf weeds but was weak on sandbur. This combination was acceptable where sandbur was not the major weed. (Colorado Extension Service, Colorado State University, Fort Collins).

Increasing selectivity of vernolate and EPTC in sweet corn with protective chemicals. Olson, P. D., A. P. Appleby, and D. R. Colbert. In the spring of 1972, a field trial in sweet corn (*Zea mays* L. var. Jubilee) was conducted to determine the effect of R-25788 (N,N-diallyl-2,2-dichloroacetamide) and R-28725 (chemistry name unavailable) on selectivity of vernolate and EPTC. The sweet corn variety, Jubilee, is known to be more sensitive to EPTC than most varieties. Vernolate was tested alone at 4, 8 and 12 lb a.i./A and in combination with R-25788 at 4 + 1/3, 8 + 2/3, and 12 + 1 lb a.i./A as a tank mix. EPTC was tested alone at 4, 8 and 12 lb a.i./A and with R-25788 at 4 + 1/3, 8 + 2/3, and 12 + 1 lb a.i./A as a formulated mix. EPTC was also tested at 4, 8 and 12 lb a.i./A in all possible combinations with R-28725 at 1/32, 1/16, 1/8 and 1/4 lb a.i./A as tank mixes. All treatments were applied pre-plant and incorporated. There were two dates of planting, one immediately after treatment and one 8 days later. Two visual evaluations were taken of corn growth reduction, 10 days apart. Visual evaluations on corn ear deformation were taken twice, 26 days apart. One weed control visual evaluation of barnyardgrass (*Echinochloa crusgali*) and pigweed (*Amaranthus retroflexus*) control was taken.

All rates of EPTC and 8 and 12 lb/A of vernolate caused substantial growth reduction in corn when applied without the protectants. Vernolate at 4 lb/A caused only slight growth reduction but caused some ear deformation. Addition of R-25788 to either EPTC or vernolate essentially eliminated shoot injury and reduced ear deformation to very low levels, particularly with vernolate.

Addition of 1/8 or 1/4 lb/A of R-28725 reduced shoot and ear injury from 4 lb of EPTC to insignificant levels. The high rate, 1/4 lb/A, was required with 8 lb of EPTC and was not sufficient to eliminate ear injury from 12 lb of EPTC.

Delaying planting by 8 days reduced corn injury somewhat and did not seem to reduce the protective effect of the two products.

Weed control was excellent from all EPTC and vernolate treatments, indicating that the protectants were active only on the corn and not on the weed species present.

Vernolate alone appeared somewhat more selective in corn than EPTC alone. (Dept. of Agron. Crop Science, Oregon State University, Corvallis).

Blade and sweep application of preplant herbicides in field corn. Orr, J. P. and C. L. Elmore. Two trials were established to compare several herbicides for weed control and phytotoxicity with two application methods: (1) applied with 2 V-type sweeps yielding a 20 inch band at 2 inches deep. Ground speed was 3 mph in 32 gpa water. (2) applied with an 80 inch blade, having nozzles spaced 6 inches apart, 2 inches below the surface, at a speed of 3 mph in 40 gpa water.

The corn was planted through the treated area in an Egbert muck soil (organic matter 14%, sand 20%, silt 51% and clay 29%). The trials were sub-irrigated with spud ditches. Each trial was four times replicated.

Yellow nutsedge (*Cyperus esculentus*) and barnyard grass (*Echinochloa crus-galli* (L.) Beauv.) were evaluated as well as vigor reduction of the corn (see table). Stand reduction was also evaluated in the blade applied herbicide trial.

Both methods of application were effective in incorporating these preplant herbicides for corn. Alachlor showed more activity on yellow nutsedge and barnyard grass when bladed and appeared to be safer to the corn than when applied with sweeps. Butylate and EPTC were both equally effective with both methods. S-6044 (cyprazine + ethyl N,N-diethylthiolcarbamate) was effective either applied with sweeps or a blade. When bladed, MBR-8251 (1,1,1-Trifluoro-4'-(phenylsulfonyl) methanesulfono-o-toluidide) gave good yellow nutsedge and barnyard grass control.

Severe corn injury was observed with EPTC. Somewhat less injury (manifested as foliar twisting) was observed with S-6044, MBR-8251 and much less with alachlor. The antidote R-25788 (N,N-Diallyl 2,2-dichloroacetamide) safened EPTC and butylate in these trials. (University of California, Farm Advisor, Sacramento, and Weed Control Specialist, Davis).

Yellow nutsedge and barnyard grass control and corn phytotoxicity from several preplant herbicides applied with sweeps or a subsurface blade

Herbicide	rate lb/A	yellow nutsedge		barnyard grass		vigor reduction		stand injury
		(1)*	(2)	(1)	(2)	(1)	(2)	(2)
butylate + R-25788	6 + 0.25	8.5	9.3	8.8	9.3	0.0	0.0	0.3
butylate + R-25788	8 + 0.33	9.5	9.5	8.7	9.6	0.0	0.0	0.0
butylate	8	9.0	6.8	8.5	8.5	0.0	0.0	1.5
EPTC	6	8.6	9.1	8.8	9.5	3.0	9.7**	7.0
EPTC + R-25788	6 + 0.5	8.7	8.8	9.1	9.3	0.0	0.5	2.0
alachlor	6	7.2	8.8	6.7	9.3	2.0	0.0	2.0
alachlor	8	7.7	9.0	7.7	9.2	1.7	0.5	1.5
butylate + atrazine	6 + 2	8.7	9.5	8.7	8.6	0.0	1.0	0.7
S-6044	6	8.0	6.3	9.0	9.5	2.7**	0.3**	3.5
S-6044	8	-	9.2	-	9.1	-	0.3**	4.5
MBR-8251	6	-	8.7	-	8.5	-	1.5**	1.2
control	-	0.8	-	3.5	-	0.4	-	-
control	-	-	5.7	-	5.2	-	0.0	0.0
control	-	0.0	0.0	0.0	0.0	0.0	0.5	0.0

* (1) sweep applied; (2) blade applied

** twisting of the corn plants

weed control and injury--0 = no effect, 10 = complete control or dead plants

Postemergence weed control in field corn. Norris, R. F., R. A. Lardelli and F. R. Kegel. Crop rotations used in California limit the use of herbicides having long soil residual characteristics; atrazine in corn falls into this category. Further evaluations of herbicides with shorter soil residual, or lower rates, were made in 1972. A postemergence trial was established on April 26, 1972, near Thornton in San Joaquin county. The corn was in the 2 to 4-leaf stage; the primary weeds were barnyard grass (*Echinochloa crusgalli* (L.) Beauv.) 2 to 3" tall and 2-to 4-leaf redroot pigweed (*Amaranthus retroflexus* L.) with scattered lambsquarters (*Chenopodium album* L.) and purslane (*Portulaca oleracea* L.). Herbicides were applied with CO_2 handsprayer, delivering 50 gal/A at 36 psi. Plots were 4 rows by 25 ft, layed out in a randomized block design. Ten ft of each of the center two rows were harvested for yield estimates.

Chemicals applied, rates used, and evaluations are shown in the accompanying table. The grass stand was not completely uniform and caused some variability in the evaluations. Following herbicide application the field was allowed to become very dry before irrigation; corn in weedy plots stressed quite badly, that in weeded plots did not.

All herbicides, except terbutryn or cyanazine plus oil, showed good selectivity to corn. Plants receiving treatments with alachlor showed some abnormal unrolling of the young leaves; this was outgrown rapidly. Cyanazine plus oil did not kill any corn plants, but it did scorch some leaves and cause a temporary stunting. Terbutryn also scorched many corn leaves badly and caused considerable early reduction in vigor. This was rapidly being outgrown at the 6-16 evaluation date. Two lb/A of terbutryn did not kill any corn; 4.0 lb/A killed approximately 10% of the population. The relatively low vigor noted for the corn in the checks was a reflection of moisture stress.

Control of the broadleaved species was generally good for all treatments. Atrazine plus oil cyanazine plus oil terbutryn at 4.0 lb/A, atrazine (0.5 or 1.0 lb/A) plus alachlor or propachlor exceeded 95% control at the 6-16 assessment.

Barnyard grass control ranged from poor to good. All chemicals showed at least partial activity, and even when actual control was low the weed vigor was severely reduced in most cases. The only treatments that provided better control than atrazine plus oil were atrazine plus alachlor, expecially at 1.0 plus 3.0 lb/A respectively, and the terbutryn treatments. Terbutryn at 4.0 lb/A was the only treatment in this trial that provided a high degree of barnyard grass control.

All treated plots that were harvested yielded more corn than the untreated check. This showed that although only partial grass control was obtained the reduction in competition was beneficial. Cyprazine at 2.0 lb/A, atrazine plus propachlor at 1.0 plus 3.0 lb/A, and terbutryn at 4.0 lb/A all slightly outyielded the handweeded check. This possibly reflected the early removal of competition by the chemical treatments. The fact that terbutryn at 4.0 lb/A was the highest yielding treatment (although not by much) was most striking in view of the severe early injury it had caused to the corn. Directed sprays of terbutryn would seem to hold special promise. (Botany Department, University of California, Davis, and University of California Agricultural Extension Service, Stockton).

Postemergence weed control in field corn - Thornton.

Treatment		Corn vigor		Barnyardgrass control		Broadleaved weed control		Yield lbs/A
		5-11	6-16	5-11	6-16	5-11	6-16	9-6-72
Atrazine + oil*	1.5 + 1.0 gal/A	9.1	8.9	4.0	8.1	9.5	9.8	4470
Atrazine + propachlor	0.25 + 3.00	9.4	9.0	2.3	2.8	8.0	7.5	--
Atrazine + propachlor	0.50 + 3.00	9.6	9.3	4.3	7.6	9.3	9.7	4730
Atrazine + propachlor	1.00 + 3.00	9.6	9.1	4.0	6.6	8.8	9.6	4950
Atrazine + alachlor	0.25 + 3.00	9.5	8.9	5.3	4.5	8.0	8.7	--
Atrazine + alachlor	0.50 + 3.00	9.6	9.1	4.3	5.9	8.4	9.5	4740
Atrazine + alachlor	1.00 + 3.00	9.4	9.1	6.8	7.0	9.8	9.3	4590
Cyprazine	0.75	9.8	9.2	3.3	5.0	4.8	7.6	--
Cyprazine	1.00	9.8	9.0	4.0	5.8	9.8	7.6	5090
Cyprazine	2.00	9.4	8.6	3.3	3.3	9.0	10.0	--
Terbutryn	2.00	7.1	8.9	6.9	7.2	9.5	8.9	4320
Terbutryn	4.00	5.1	8.9	9.0	9.5	10.0	9.8	5230
Terbutryn + oil*	2.0 + 1.0 gal/A	5.9	7.1	7.1	5.9	9.8	8.8	--
Cyanazine	2.00	9.1	8.8	3.5	4.9	5.0	7.9	--
Cyanazine + oil*	1.0 + 1.0 gal/A	8.3	6.5	3.5	3.6	8.5	6.6	--
Cyanazine + oil*	2.0 + 1.0 gal/A	7.4	7.9	5.0	4.5	9.8	9.4	4910
Handweeded check		8.6	8.4	10.0	10.0	10.0	10.0	5040
Untreated check		8.4	7.4	0.8	1.0	0.0	1.3	3390

Vigor: 10 = normal, 0 = dead. Control: 10 = complete, 0 = none.
All data are means of 4 replications.
* Orchex N-795.

Corn and grain sorghum selectivity to preplant incorporated herbicides. Norris, R. F. and C. L. Elmore. Preplant treatments were made on June 23, 1972 at Davis, California using a tractor mounted compressed air sprayer. The EPTC and butylate treatments were incorporated 4" deep with a Marvin 'Rowmaster' incorporator; all other treatments were incorporated 2" deep. The Yolo loam soil had been preirrigated, but required further irrigation to obtain germination. Corn was planted on one bed, grain sorghum on the other in 2 bed plots 30 ft. long.

An excellent stand of both crops emerged, but too few weeds developed to permit assessment of control. The herbicides, rates applied, and visual assessments of crop growth are shown in the accompanying table.

Atrazine and propazine, used as standards, showed only slight injury to either crop. Butylate as a standard for corn showed no injury at 4.0 lb/A, and only a slight vigor suppression at 12.0 lb/A. Grain sorghum did not tolerate butylate; all plants were killed or severely stunted at all rates. R-25788 did not materially affect the action of butylate on sorghum, but did slightly increase corn tolerance.

EPTC reduced corn stand and vigor, and caused severe twisting and leaf deformation. Grain sorghum did not tolerate this herbicide. Adding R-25788 to EPTC completely removed the toxic effects of the herbicide on corn, but had no effect on the toxicity to milo. This species selectivity and the complete removal of EPTC injury to corn was very dramatic. Symptoms of leaf injury were noted in the field for the 3.0 lb/A EPTC plus 0.25 lb/A R-25788 but none was noted for the higher 6.0 plus 0.5 lb/A rates. The corn vigor data reflected this at both assessment dates. The fixed ratio of 1 to 0.08 is possibly not optimum for all EPTC rates. The antidote R-25788 itself did not appear to possess activity against either species.

Alachlor and propachlor showed fairly good selectivity on corn, although twisting of some plants and general stunting were observed, and recorded ~~as~~ slight stand reductions, for the 4.0 lb/A rate of both chemicals. Alachlor was not selective to grain sorghum but propachlor at 2.0 lb/A was well tolerated by this crop; 4.0 lb/A of propachlor, however, caused considerable twisting and deformation of grain sorghum plants. The range of tolerance appeared marginal.

Cyanazine showed good selectivity to corn at both rates tested, but was not selective to grain sorghum. The grain sorghum plants showed severe leaf tip scorch and necrosis; many plants eventually died.

U-27,267 (3,4,5-tribromo-N,N-α-trimethylpyrazol-1-acetamide) appeared fairly selective to both crops; some stunting and leaf tip scorch was noted at 4.0 lb/A.

Herc-22234 (chemistry name unavailable) did not appear to be selective to either species; many plants showed twisting and deformation, even at 1.5 lb/A.

CGA-17482 (chemistry name unavailable) selectivity to corn was marginal; the plants were shorter and darker green in color. Milo showed no tolerance to this compound.

Ac-92161 (chemistry name unavailable) had no selectivity to either crop at the rates tested; plants showed twisting and leaf scorch. (Botany Department, University of California, Davis).

Selectivity of preplant herbicides to corn and grain sorghum.

Treatment	Rate lbs/A	7-7-72	7-28-72	7-7-72	7-28-72	7-7-72	7-28-72	7-7-72	7-28-72
Atrazine	2.0	9.7	9.0	9.3	9.0	9.3	9.3	7.5	8.9
Propazine	2.0	9.8	10.0	9.3	9.5	8.0	8.8	8.2	9.2
Cyanazine	2.0	10.0	9.8	9.3	9.3	9.0	8.1	5.7	7.8
Cyanazine	4.0	9.7	9.9	9.2	9.3	7.0	6.6	2.5	7.7
Propachlor	2.0	10.0	9.8	9.5	9.3	10.0	9.9	9.5	10.0
Propachlor	4.0	9.3	9.5	8.8	9.9	8.3	8.7	6.7	8.7
Alachlor	2.0	9.2	9.1	8.5	8.3	1.3	2.3	0.2	4.3
Alachlor	4.0	8.0	8.8	7.3	8.6	1.7	1.0	0.1	2.0
U-27267	2.0	8.7	9.8	9.3	10.0	9.7	9.7	9.8	9.7
U-27267	4.0	8.8	9.2	8.5	8.0	6.2	6.5	6.0	7.3
Hercules-22234	1.5	9.0	9.3	7.3	7.3	6.0	7.0	2.7	5.6
Hercules-22234	3.0	9.7	6.5	5.7	7.5	8.7	8.2	3.0	7.5
EPTC	3.0	8.5	7.2	5.8	7.0	0.0	0.0	0.0	0.0
EPTC	6.0	7.0	6.6	2.7	3.7	1.7	0.0	0.2	0.0
EPTC + R-25788	3.0 + 0.25	9.7	9.5	8.5	8.6	0.0	0.0	0.0	0.0
EPTC + R-25788	6.0 + 0.5	9.5	9.8	9.3	9.5	0.7	0.0	0.1	0.0
Butylate	4.0	10.0	10.0	9.7	9.7	5.5	1.6	0.3	0.3
Butylate	6.0	9.3	9.8	8.7	9.6	5.0	0.2	0.3	0.2
Butylate	12.0	10.0	10.0	8.8	8.7	3.0	0.0	0.1	0.0
Butylate + R-28788	12.0 + 0.5	9.7	10.0	8.8	9.6	0.0	0.0	0.0	0.0
R-25788	0.5	9.7	9.7	9.7	9.2	9.0	9.0	8.7	9.5
CGA-17482	4.0	9.7	9.5	8.3	8.4	0.0	0.0	0.0	0.0
CGA-17482	6.0	9.0	9.3	7.3	8.3	1.3	1.0	0.3	2.7
AC-92161	2.0	9.0	6.0	5.3	6.5	7.3	5.5	2.3	4.7
AC-92161	4.0	9.0	8.3	5.7	7.3	8.0	3.7	1.7	4.7
Untreated Check	-	10.0	9.8	10.0	9.7	10.0	9.9	9.7	9.5

1: Evaluation of Stand 0 = no stand; 10 = good stand

2: Evaluation of Vigor 0 = dead plants; 10 = vigorous

Metribuzin and potato injury in Colorado. Zimdahl, R. L., J. H. Arvik and J. Foster. This experiment was conducted in the unique environment of Colorado's San Luis Valley (elevation 7500'). A randomized block design with four replications was used. All treatments were applied with a bicycle type plot sprayer in 28 gal. of water/A. Preemergence treatments were applied May 16 and postemergence on June 8. Air and soil temperatures were 73 (Air) and 53 (Soil) and 60 (Air) and 65 (Soil) on each date. The soil surface was dry on both dates. When the postemergence treatments were applied, the potatoes were 1½ to 4 inches tall and pigweed (*Amaranthus retroflexus* L.) had 8-10 leaves. Russett Burbank potatoes were planted May 11 and harvested September 22. The soil was a loamy sand with 0.3% organic matter and a pH of 8.3.

No severe injury symptoms were seen. We expected severe injury from the 4 lb rate and some injury at 2 lbs. We also did not expect to see the difference between pre and postemergence weed control.

In Northern Colorado, metribuzin has always given excellent preemergence weed control but it has not been as satisfactory in the San Luis Valley. The table shows the weed control ratings and yields. The only important weed in the plot was pigweed. The harvested potatoes were graded and inspection of the data showed that the major portion of yield was U.S. #1 4-10 oz. and B size. The differences seen in these data were very similar to those shown by the total yield data and only total and U.S. #1 4-10 oz. are shown.

These plots were not cultivated at all. Thus, the disturbance of a preemergence application by cultivation was not a factor in the poor weed control. The San Luis Valley is a unique environment and we look first to climatic or irrigation (furrow) practices to account for the failure of preemergence weed control. Two years data clearly indicate that metribuzin should be used postemergence in the San Luis Valley.

The yield difference between pre and postemergence is related to weed control, not injury. One quarter pound is insufficient at either time but one-half up to 2 lbs appear to be equal for weed control. The highest rate (4 lb a.i.) caused slight yield depression postemergence but none preemergence. We have no explanation for the unexpected lack of injury from the higher rates especially in view of the injury routinely obtained from the same rates in Northern Colorado.

Metribuzin rate and timing study

1972

Time of application and rate	Pigweed control[1] rating	Yield[2] cwt/a	
		U.S. #1	Total
Preemergence			
0.25	3.3	100	211
0.5	4.2	130	251
0.75	3.6	130	255
1.0	4.3	127	249
2.0	4.5	111	232
4.0	6.8	127	257
Postemergence			
0.25	6.0	125	239
0.5	7.5	147	281
0.75	7.9	139	259
1.0	8.4	136	247
2.0	9.4	126	250
4.0	9.7	106	224
Check	---	110	225

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[1] 0 = No control 10 = Complete control
Rating shown is an average of three dates of observation on four

[2] Yield determined by harvesting 40 feet of two center rows of each four row plot. Average of four replications.

Evaluation of several soil applied herbicides for weed control and phytotoxicity in potatoes. Heikes, P. Eugene. Herbicides were applied to a stand of potatoes near Wiggins, Colorado. This field was irrigated with a center pivot sprinkler. It was a sandy loam soil with 0.5% O.M. and 75% sand. The major weeds were common ragweed, redroot pigweed and purslane. The potatoes were planted in 30 inch rows; plots were 4 rows x 25 ft with 2 replications. Visual observations were made June 26 and plant counts were made July 10; at this time the potatoes were 12 to 14 inches high, early blossom stage and spread about half way across the rows. All potato plants were counted in 2 rows x 25 ft for stand reduction and all weeds were counted in and between 2 rows x 25 ft.

These potatoes were planted May 22; herbicides were applied June 2. At this time none of the potatoes had emerged but there were about 1 inch sprouts on the seed pieces. Soil incorporated herbicides were incorporated with a finger-weeder; this mixed the soil about 1 to 1½ inches deep. The surface applied herbicides had no mechanical incorporation. The plot area was sprinkler irrigated 14 days after the herbicides were applied. The potatoes were not cultivated or hilled throughout the season.

Metribuzin looked especially good in this series; in 1 replication there was minor stunting and stand reduction at the 3/4 lb rate; the 1/2 lb rate provided 100% weed control with no crop injury. Weed control was good with linuron at 1 lb per acre, but there was some crop injury at the 1½ lb rate. Linuron/metribuzin at 2 + 1/2 lb per acre provided good weed control but no better than 1/2 lb of metribuzin alone. There was no significant difference in weed control between 3 and 6 lb rates of EPTC; the 6 lb rate caused minor stunting and stand reduction. Trifluralin, nitralin and EPTC combinations were acceptable but did not compare with metribuzin or linuron. Nitralin at 1½ lbs per acre was better than 3/4 lb of trifluralin and both herbicides were better when combined with EPTC at 3/4 + 2 lbs and 1/2 + 2 lbs per acre. Trifluralin caused significant crop injury at 3/4 lb per acre. Most of the soil incorporated herbicides were weak on purslane and common ragweed. Most of the surface applied herbicides provided better weed control than the soil incorporated. (Colorado Extension Service, Colorado State University, Fort Collins).

Potato Herbicide Evaluations - 1972

		Broadleaf Weeds 6/26	Common Ragweed 7/10	Redroot Pigweed 7/10	Purslane 7/10	Stunt 7/10	Stand 7/10
Soil Incorporated							
EPTC	3 lbs	93	90	98	94	0	0
EPTC	6 lbs	94	96	98	88	10	3
trifluralin	3/4 lbs	81	70	98	78	5	11
trifluralin/ EPTC	3/4 + 2 lbs	85	95	94	58	5	0
nitralin	1 1/2 lbs	90	95	99	68	0	0
nitralin/EPTC	3/4 + 2 lbs	67	62	98	88	0	0
alachlor	3 lbs	67	68	100	94	0	0
CGA-10832	3/4 lb	59	55	64	81	0	0
CGA-10832/EPTC	1/2 + 2 lbs	67	73	100	88	0	0
AC-92553	2 lbs	60	52	79	99	0	0
Surface Applied							
metribuzin	1/2 lb	100	100	100	100	0	0
metribuzin	3/4 lb	100	100	100	100	5	7
linuron	1 lb	98	98	96	100	0	0
linuron	1 1/2 lbs	100	100	100	100	5	7
alachlor/ linuron	2 + 1 lb	100	100	97	100	0	0
alachlor/ metribuzin	2 + 1/2 lb	100	100	96	100	0	0
chlorbromuron	1 1/2 lbs	95	95	94	94	0	4
alachlor	3 lbs	97	100	100	100	0	0

Evaluation of postemergence applications of 2,4-DB for peppermint selectivity and annual broadleaf weed control in Oregon. Colbert, D. R. A. P. Appleby. The peppermint weed control research in Oregon was centered around the feasibility of using postemergence applications of 2,4-DB in established peppermint. A number of field trials were established in both central Oregon (Madras) and western Oregon (Corvallis) to study 2,4-DB applications with the following objectives:

A. To evaluate fall, winter, and spring postemergence applications of 2,4-DB ester for annual broadleaf weed control and peppermint selectivity.
B. To compare spring postemergence applications of 2,4-DB ester and amine for peppermint tolerance.
C. To obtain yield data from spring postemergence applications of 2,4-DB amine applied on four different dates.

In both western and central Oregon, peppermint appeared to have good tolerance to fall (October) and winter (February) applications of .25, .50, and 1.0 lb a.i./A of 2,4-DB ester. Both applications gave good control of wild lettuce (*Lactuca sp.*), small-podded false flax (*Camelina microcarpa*), and annual sowthistle (*Sonchus oleraceus*). Winter applications of the 2,4-DB ester showed some early mint injury but by harvest time, there was no apparent visual injury.

Postemergence applications of .25, .50, and 1.0 lb a.i./A of the ester and amine formulations of 2,4-DB were applied on two dates in the spring in western Oregon for peppermint tolerance. The dates of application were April 27 and June 6, 1972. More injury was observed from both formulations from the second date of application with the ester somewhat less damaging to the mint than the amine. Further comparisons are necessary to verify this difference.

Four locations were established, two in western Oregon and two in central Oregon, to determine the effect of postemergence applications of .25, .50, and 1.0 lb a.i./A of 2,4-DB amine on mint yields. These experiments included four dates of application in the spring and early summer. On these four dates of application, the growth stages of the peppermint were as follows: (a) first application ½-1" in height, (b) second application ½-2" in height, (c) 1-3" in height on the third date, and (d) on the last date the mist was 3-10" in height. All experiments were evaluated visually for mint injury with two locations, one each in western and central Oregon being selected for harvest. Green forage weight and oil yields per acre were measured. Visible mint injury was slight from the first two dates of application. As the mint reached more than 2-4 inches in height, injury increased. There was no significant effect on oil yield from the first three dates of application but yields were significantly lower from the fourth date. From the results of these trials, a rate of 0.5 lb per acre of 2,4-DB amine appears to be safe on peppermint if applied before the mint has excessive top growth. (Dept. of Agron. Crop Sci., Ore. St. Univ., Corvallis.)

Evaluation of several preemergence and postemergence herbicides for weed control and phytotoxicity in sorghum. Heikes, P. Eugene. Herbicides were evaluated at three locations. A grain sorghum variety was flat planted and all farms were irrigated. Soils were loam, silty clay loam and clay, ranging from 1 to 1.4 percent organic matter. The major weeds in these fields were kochia, redroot pigweed, Russian thistle and foxtail sps. There was a stand of flower-of-an-hour at one site. All herbicides were applied with a plot sprayer in 40 gpa. Plots were 20 x 25 ft. - 500 sq. ft. with two replications at each location.

Propazine at 1.2 and 1.6 lb/A controlled most broadleaf weeds but left foxtail sps. and barnyard grass. It controlled stinkgrass. Terbutryn was evaluated at 2 and 2.4 lb/A; it was not significantly better than propazine. Combinations of terbutryn and propazine were no better than either herbicide alone. A combination of propachlor + atrazine at 3 + 1 lb/A gave fair grass control and was equal to 1.6 lbs of propazine for control of broadleaf weeds. Atrazine at 1 lb/A or above has consistently caused sorghum injury in Colorado. Propachlor + cyanazine at 3 + 1 lb/A, showed considerable promise for control of grasses and broadleaf weeds. It left sandbur at one location, but in general this combination shows considerable promise. Propachlor at 6 lb/A gave near perfect grass control including sandbur and gave good broadleaf control with no crop injury. Propachlor has consistently been one of the better sorghum herbicides. A combination of propachlor at 4 lb/A applied preemergence plus 2,4-D at 1/4 lb/A postemergence has given weed control equal to 6 lbs of propachlor alone. BAS-2903 (2-chloro-N-(1-methyl-2-0ropynyl)acetanilide) at 4 lb/A was comparable with 6 lbs of propachlor, with no crop injury. Linuron and linuron/propachlor combinations provided good broadleaf weed control but were generally weak on grasses. Crop injury was encountered at one location. Methazole at 2 and 3 lb/A showed considerable promise as a sorghum herbicide; broadleaf weed control was excellent but it left some late emerging grasses. It showed reasonable good crop tolerance.

Alachlor + atrazine was evaluated at 1½ + 1 lb/A and propachlor + atrazine at 2.4 + 1 lb/A in water carrier and water plus oil carrier consisting of one gallon of herbicidal oil in 19 gallons of water. Alachlor plus atrazine controlled most broadleaf weeds but was weak on grasses. There was some sorghum stunting at one location and stand reduction at another location. There was more crop injury with the oil emulsion than water alone. There was less crop injury with the propachlor combination; this injury would probably be tolerable and would not affect yield. There was more injury with the oil emulsion than in water alone. There was very little difference in weed control between the water and water/oil emulsion carrier. This combination appears to be safer on sorghum than the alachlor combination. Propachlor plus cyanazine was evaluated at 3 + 1 lb/A; weed control was good to excellent. There was stunting at one location and minor stand reduction at another, but this looks promising as a postemergence combination for sorghum and it is doubtful if the crop injury would significantly affect yield. BAS-3512-H (3-isopropyl-1H-2,1,3-benzothiadiazin-(4) 3H-one 2,2-dioxide) was evaluated at 2 lb/A; this has looked outstanding as a postemergence sorghum herbicide in two years of testing. It is exceptionally good on grasses but may be somewhat weak on broadleaf weeds.

Cyanazine at 1 and 1½ lb/A caused stunting at one location and stand reduction at another location. The 1 lb rate appeared to be maximum for safe crop tolerance; weed control was marginal at this rate. Cyprazine gave good weed control but caused stunting and stand loss at one location. This herbicide did not show good crop tolerance for sorghum applied postemergence. (Colorado Extension Service, Colorado State University, Fort Collins).

Herbicides in row-planted, border-irrigated wheat. Arle, H. F. and K. C. Hamilton. Preemergence and postemergence applications of herbicides were studied in row plantings of wheat grown with border-irrigation at Mesa, Arizona during the past year. Mustard (*Brassica japonica* (Thunb.) Sieb.) was seeded on the test areas. On November 16, 1971, Siete Cerros wheat was planted in rows spaced 12 inches apart. On November 17, linuron, terbutryn, chlorbromuron, and VSC-438 (2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione) were applied to the soil (sand 40%, silt 40%, clay 20% and organic matter 1%) as preemergence treatments. The area was then border-irrigated. On December 8, linuron, terbutryn, chlorbromuron, bromoxynil, and amine of 2,4-D and barban were applied to emerged wheat (4 inches tall) and mustard (0.5 inches tall). Herbicides were applied in 40 gpa of water containing 0.25% of a blended surfactant. Treatments were replicated four times on 13 by 30-ft plots. Development of wheat and weeds was observed every few weeks, and plots were harvested by combine in June, 1972.

Preemergence applications of 0.75 lb/A of linuron and terbutryn injured seedling wheat (see table). Best weed control was obtained with the higher rate of linuron and chlorbromuron, but preemergence applications of herbicides were less effective than postemergence applications. Wheat treated with terbutryn and the higher rate of linuron yielded less than the untreated check.

Postemergence applications of linuron, terbutryn, and chlorbromuron discolored wheat foliage. 2,4-D caused stunting, malformed roots and heads, and delayed maturity of wheat. All herbicides except barban controlled mustard. Wheat treated with bromoxynil or 2,4-D yielded higher than the untreated checks. (Cooperative investigations of Agricultural Research Service, U.S. Department of Agriculture, Phoenix, and Arizona Agric. Expt. Sta., Tucson).

Response of wheat and mustard to preemergence and postemergence applications of herbicides at Mesa, Arizona

Treatments		Percent crop injury and weed control estimated 1/12/72		Yield of grain[a]
Herbicide	lb/A	Wheat	Mustard	lb/A
Preemergence				
Linuron	.37	11	69	4,060 ab
Linuron	.75	35	95	3,580 bc
Terbutryn	.37	11	35	3,480 bc
Terbutryn	.75	24	45	3,260 c
Chlorbromuron	.37	5	62	4,500 a
Chlorbromuron	.75	10	90	4,090 ab
VCS-438	.75	10	78	4,150 a
Untreated check		0	0	4,340 a
Postemergence				
Linuron	.37	11	100	4,230 c
Terbutryn	.37	10	100	4,730 ab
Chlorbromuron	.37	9	100	4,740 ab
Bromoxynil	.37	1	100	4,940 a
Bromoxynil	.75	1	100	5,070 a
2,4-D, amine	.75	0	100	5,070 a
barban	.37	0	0	4,380 bc
Untreated check		0	0	4,570 bc

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[a] For each method of application, values followed by the same letter are not significantly different at the 5% level of probability.

Wild oat (*Avena fatua* L.) control in barley. Zimdahl, R. L. Two field experiments were established in our continuing program to evaluate herbicides for wild oat control in barley. All treatments were replicated four times in 6 by 30 foot plots in a randomized block design. Granular formulations were applied with a salt shaker and liquids were applied in 28 gpa of water with a bicycle type plot sprayer. Soils were loams with less than 2% O.M. and a pH of 7.8.

No herbicides increased the yield of barley over the untreated check in either trial. Three herbicides depressed yield. NC-8438 (e-ethoxy-2, 3-dihydro-3,3-dimethyl-5-benzofuranyl methane sulphonate) applied preemergence killed all of the barley while controlling only 35% of the wild oats. MBR-8251 (4-phenylsulfonyltrifluoromethanesulfono-0-toluidide) reduced yield 50% and did not control wild oats. SD-30053 (Alanine, N-benzoyl-N-(d,4-dichlorophenyl) ethyl ester) injured barley in 1970 but not in 1971. This year barley maturity was markedly delayed and yield was only 20% of the check. However, wild oat control was excellent although, as in other years, the wild oat plant was not killed. Nitrofen and BAY-KUE-2236 (1,1-dimethyl-3-(m-chloro-p-trifluoromethoxyphenyl) urea) did not control wild oats adequately.

The treatments, control ratings and yields are shown in the table. Triallate was most effective when incorporated preplant and was not noticeably better than Barban. Triallate granular has performed better in past years but has never been as consistent as the ec. used preplant. Postemergence applications of triallate (g) did control wild oats when applied at the 3-4 leaf stage. Earlier and later treatments have been less effective.

AC-92553 (N-(1-Ethylpropyl)-2,6-dinitro-3,4-xylidine) at 1.0 lb and AC-92390 (N-sec-Butyl-2,6-dinitro-3,4-xylidine) at 2.0 lb were applied preemergence, 92390 was the best with 56% control of wild oats. AC-50191 (chemical name unavailable) at 0.5 lb and AC-8477 (chemical name unavailable) at 0.5 and 1.0 lb/A gave 95% control of wild oats with no barley injury. The AC compounds applied at the 4-5 leaf stage of the wild oat were superior to triallate or Barban. They greatly reduced the yield of wild oats and did not affect barley yield. All of the herbicides from American Cyanamid were tested by Coors Brewing Company for seed germinability. When compared to the check no effect was observed. Additional experiments with these herbicides are planned for 1973.

In past years the better herbicide treatments have increased yield when compared to the check. Our harvest preceded the field harvest by several days and this could account for the lack of significant differences. In spite of this the benefit of cleaner grain with the best herbicide treatments (i.e., wild oat control) should not be overlooked in evaluating these compounds. (Weed Res. Lab., Colo. St. Univ., Ft. Collins.)

Blue mustard (*Chorispora tenella* (Willd.) D.C.) control in winter wheat. Zimdahl, R. L. and P. R. Rahn. Blue mustard is becoming more evident each year as one of the primary early competitors in winter wheat. This paper reports the results of the third year of a program to develop a chemical control. Herbicides were applied in water with a bicycle plot sprayer as Fall and Spring postemergence treatments in a randomized block design with four replications. The Fall treatments were post to the wheat on October 14 but pre on blue mustard whereas the Spring treatments applied March 22 were post on crop and weed. The soil was a clay loam with 2.9% O.M. and a pH of 7.4.

The results of this experiment are summarized in the table. A direct comparison of weed control ratings and yields in the table is misleading. The control ratings are for blue mustard but some of the plots especially in the spring post area were heavily infested with field bindweed (*Convolvulus arvensis* L.). Thus, the yield figures are not necessarily indicative of herbicidal efficacy.

Comparison of the spring and fall treatments shows that fall applications were superior. We intended to apply the phenoxys and bromoxynil on wheat in the fall but did not because so few blue mustard plants had emerged. Blue mustard had emerged on an adjacent fallow strip and all of the treatments applied to the wheat were applied there in the fall. At application blue mustard was in the 2-3 leaf stage. The data show very good control from diuron, linuron, chlorbromuron, and metribuzin--all soil active herbicides. Cyanazine did not work as well. Bromoxynil when applied alone or in combination with 2,4-D ester, dicamba, or diuron was less effective. Bromoxynil is a contact material and the irregular germination of blue mustard precluded better control. However, our earlier work has shown that bromoxynil will only work well on very small seedlings and application should not be delayed past the 2-3 leaf stage.

The soil residual materials were somewhat less effective, when applied post to the wheat. Metribuzin was the best herbicide but did injure wheat, especially at 0.75 lb a.i./A. The visual injury ratings often indicate better control than the yield data. This anomaly is explained by the heavy field bindweed infestation. The check plots had competition from field bindweed and blue mustard whereas those plots with good control still suffered from bindweed competition. As blue mustard control decreased the total level of plant competition in the plot increased. Thus, even with quite good blue mustard control wheat yields were not very high.

The spring post treatments were applied on blue mustard in the 6-8 leaf stage and this is too late for the most effective control. Diuron and linuron did work better than anything else but not as well as the fall application. Even the hand weeded check plots did not yield as well as the fall treatments showing the importance of eliminating early competition. Because of injury problems in two consecutive years, metribuzin is not promising.

After three years work on this weed we conclude that early post or fall preemergence applications of 1 to 1.25 lb a.i./A of diuron or linuron will give the best results. The only alternative is a very early spring application of a bromoxynil-2,4-D combination at about 0.25 + 0.5 lb a.i./A. The 2,4-D mixture has caused less injury than the dicamba combination and given better control than bromoxynil alone. The disadvantage of this treatment is that its success hinges on contact action and early application which are not enhanced by erratic emergence and the vagaries of spring weather. (Weed Res. Lab., Colo. State University, Fort Collins.)

Treatments, weed control ratings, and yields
Blue mustard control in winter wheat

Herbicide	Rate lbs ai/A	Visual rating				Yield of[3] wheat bu/A
		Blue mustard[1] control		Wheat injury[2]		
		3/23	4/10	3/23	4/10	
Fall Postemergence						
Diuron	1.0	8.9	8.1			14.3
Linuron	1.0	8.0	7.1			11.6
Chlorbromuron	1.0	7.4	4.9			13.3
Metribuzin	0.5	9.8	9.9	5.2	6.9	14.2
Metribuzin	0.75	10.0	10.0	7.6	7.5	10.2
Cyanazine	0.5	7.2	5.9			14.1
Cyanazine	1.0	8.8	7.6	1.5	0.5	9.0
Spring Postemergence		4/2	4/10	4.23	4/23	
Bromoxynil	0.375	4.5	7.6	6.6		10.1
Bromoxynil + 2,4-D ester	0.25 + 0.5	5.5	7.4	8.4		10.9
Bromoxynil + Dicamba	0.25 + 0.152	4.5	4.9	3.1	2.8	5.8
Metribuzin	0.5	2.5	7.2	6.9	2.5	7.4
Bentazon	0.75	1.8	0.0	1.8		9.2
Bentazon	1.0	3.0	1.0	1.8		6.0
Diuron	1.25	3.0	7.5	7.8		10.4
Linuron	1.25	3.5	7.9	8.4		11.0
Check						8.2
Check - Hand weeded						12.1

[1] 0 = No control, 10 = complete control of blue mustard. Values are averages of four replications on each observation date.

[2] 0 = No injury, 10 = complete kill of wheat. Values are averages of four replications on each observation date.

[3] Yields were obtained by harvesting two adjacent eight foot rows per plot, and are averages of four replications.

Competition from Italian ryegrass in winter wheat. Appleby, A. P., D. R. Colbert, and P. D. Olson. Italian ryegrass (*Lolium multiflorum* L.) is not only an important crop in western Oregon, but is also a serious weed in winter cereals. In seriously infested fields, dramatic increases in grain yield have been obtained with the application of chemical control methods. Since recommended practices usually fail to provide perfect ryegrass control, information on other factors involved may be of economical importance in the management of winter wheat. Trials have been established to determine the influence of nitrogen levels, wheat varieties, and ryegrass densities on wheat yields. Two trials were conducted in 1972 and are in general agreement with results obtained in previous experiments. In one experiment, a split-split plot design was used with two varieties, Nugaines and Druchamp, as main plots, nitrogen levels as sub-plots and ryegrass densities as sub-sub plots. Spring nitrogen levels were 50, 100, and 150 lb of N/A as urea. Ryegrass densities were 0.1, 0.9, 3.3, and 7.0 plants per square foot. Nugaines is a semi-dwarf variety and Druchamp is a tall variety. All treatments were replicated six times.

In the other experiment, a comparison was made among two tall varieties, Nugaines and Hyslop. A split plot design with five replications was used, with varieties as main plots and ryegrass densities as sub-plots. Ryegrass densities of 0, 3.8, and 9.3 plants per square foot were established. Fertilizer level was uniform over the entire experimental area.

Conclusions drawn were: (a) ryegrass competition can drastically reduce yields in all varieties with significant reductions in yields occurring even at an average ryegrass density of 0.9 plants per square foot, (b) yields of tall varieties are reduced less than yields of short varieties by increasing ryegrass competition, and (c) at high ryegrass densities nitrogen fertilizer is wasted or even detrimental to wheat yields. The ryegrass apparently responds equally or to a greater extent than does the wheat to nitrogen fertility. (Dept. of Agron. Crop Sci., Ore. St. Univ., Corvallis.)

Table 1

Italian Ryegrass Competition in Winter Wheat
Hyslop Agronomy Farm - Corvallis, Oregon
1971-72

Variety	Spring Nitrogen Level	Ryegrass Population	Average Grain Yield Bu/A	% Yield Reduction Due to Ryegrass Competition
Nugaines	50	0	33.5	0
		Low	31.8	5.0
		Medium	27.9	16.7
		High	23.5	30.0
Nugaines	100	0	39.1	0
		Low	32.4	17.1
		Medium	26.8	31.4
		High	22.3	42.9
Nugaines	150	0	39.1	0
		Low	33.5	14.3
		Medium	27.9	28.6
		High	21.8	44.3
Druchamp	50	0	40.2	0
		Low	38.5	4.2
		Medium	34.1	15.3
		High	34.1	15.3
Druchamp	100	0	51.9	0
		Low	47.5	8.6
		Medium	45.2	12.9
		High	37.4	28.0
Druchamp	150	0	54.2	0
		Low	48.6	10.3
		Medium	46.4	14.4
		High	36.9	32.0

LSD$_{05}$ (varieties) = 3.6 bu/A

LSD$_{05}$ (nitrogen levels) = 4.1 bu/A

LSD$_{05}$ (ryegrass densities) = 2.0 bu/A

Table 2

Italian Ryegrass Competition Study in
Four Wheat Varieties
Hyslop Agronomy Farm - Corvallis, Oregon
1971-72

Variety	Ryegrass Population	Average Grain Yield Bu/A	% Yield Reduction Due to Ryegrass Competition
Druchamp	0	51.0	0
Druchamp	Medium	41.6	18
Druchamp	High	36.8	32
Yamhill	0	64.7	0
Yamhill	Medium	48.2	26
Yamhill	High	44.7	31
Nugaines	0	50.2	0
Nugaines	Medium	38.0	24
Nugaines	High	31.4	38
Hyslo	0	57.2	0
Hyslop	Medium	42.3	26
Hyslop	High	34.9	39

LSD_{05} (varieties) = 6.2 bu/A

LSD_{05} (ryegrass densities) = 2.8 bu/A

LSD_{05} (ryegrass densities W/N same variety) = 5.7 bu/A

The effects of glyphosate as chemical fallow preceeding fall planted grains. Evans, J. O. Several dosages of glyphosate were evaluated for controlling quackgrass (*Agropyron repens* (L.) Beauv.) prior to fall planting of Gaines wheat. Foliar treatments were applied to an established stand of quackgrass of plots 6 x 50 foot in a randomized block design with 4 replications. The herbicide was applied in 20 g/A of water and at a pressure of 30 pounds.

Comparisons were made between treatments made (1) when the quackgrass was six inches tall, (2) when it was 12 inches tall, and (3) when the quackgrass was fully headed; on May 26, June 12 and July 20, 1972 respectively. Conventional tillage programs were suspended to evaluate the regrowth of quackgrass during the growing season and prior to fall seedbed preparation and planting. Each plot received a single treatment at the appropriate growth stage of the quackgrass. Plant phytotoxicity ratings were obtained for each treatment 45 days after the date of application. The number of live shoots was counted in three randomly drawn one-square foot quadrants per plot. The recovery of quackgrass was evaluated by counting all plots on September 20. Glyphosate effectively controlled quackgrass at all rates evaluated; although the 0.5 lb/A dosage was less effective than the higher rates especially when applied at the 6 inch growth stage. Dosages of 1.0 lb/A or higher were very phytotoxic to quackgrass and only minor recovery was noted in September regardless of the stage of growth at the time of treatment. Quackgrass appeared to be more sensitive to glyphosate if treatments were postponed until the foliage was 12 inches high; at this stage of quackgrass growth, the 0.5 lb/A dosage was noticeably better than the same treatment made at an earlier growth stage. It was impossible to detect visual differences among the three higher dosages (1.5, 2.0 and 4.0) regardless of stage of growth of the quackgrass when treated. The intermediate growth stage appears to be the most favorable stage to make glyphosate applications. The quackgrass is apparently more sensitive at this stage of growth due to the greater quantity of foliage and more favorable leaf orientation. (Utah State University, Logan).

Response of quackgrass to foliar applications of glyphosate at various growth stages - 1972
Logan, Utah

Treatment	Rate (lb/A)	Growth Stage treated (height)	Weed response Live shoots (Percent of control) 45 days after treatment	September 20
Glyphosate	0.5	6 inches	68	74
"	1.0	"	89	94
"	1.5	"	97	99
"	2.0	"	98	100
"	4.0	"	98	100
Glyphosate	0.5	12 inches	92	95
"	1.0	"	95	95
"	1.5	"	93	91
"	2.0	"	99	95
"	4.0	"	98	99
Glyphosate	0.5	(Fully headed)	80	93
"	1.0	"	97	99
"	1.5	"	99	100
"	2.0	"	95	100
"	4.0	"	100	95
Control	-	-	0	0

Tillage-herbicide field test in spring barley. Peabody, Dwight V., Jr. Since the production of field corn has leant itself to the management technique given the generalized title of "non-tillage", production of other crops might also be facilitated by non-tillage farming methods. Consequently a field test was undertaken in which non-tillage, limited tillage and conventional tillage techniques were compared as to their effectiveness on weed control, the establishment of barley stands and the yield of grain. In mid-April, glyphosate + diuron and paraquat + diuron treatments were applied to an over-wintered rye cover crop approximately one foot high. Three weeks later one-half of these preplant treatments were disked twice (minimum tillage). In addition, another adjacent area was plowed-disked-harrowed to a conventional seed bed and on May 5, 1972, all three areas were seeded to the spring barley variety, Luther, with a standard grain drill. Conventionally prepared seed bed weed control treatments included a postemergence dinoseb application and a preemergence diuron application.

Under non-tillage and minumum tillage seed bed preparations, fairly good barley stands were established even though annual weed control was not outstanding. Nevertheless, plots receiving the standard postemergence dinoseb treatment applied to the barley grown under conventional seed bed preparation, and with excellent annual weed control, yielded less than the non-tillage methods which had only fair weed control.

It was also observed that barley grown under the non-tillage method matured approximately one week earlier than barley growing in plots managed in the conventional (plow-disc-harrow) method. Despite the respectable grain yields obtained with the non-tillage system in this field trial, grain drills adapted for use in soils that have not been tilled remain the primary prerequisite for success in non-tillage farming. (Wash. State Univ., N. W. Wash. Res. & Ext. Unit, Mt. Vernon.)

Herbicide evaluation field test in spring barley. Peabody, Dwight V., Jr. Five compounds each at two rates of application were compared to each other and to the standard dinoseb treatment as selective herbicide treatments on spring barley. The low, (0.25 lb/A) postemergent application of metribuzin resulted in outstanding control of the annual broadleaved weed population present and mean grain yields from plots receiving this treatment outyielded the dinoseb treated plots by 400 lb/A. Metribuzin, at double this rate (0.5 lb/A), did not cause a significant reduction of barley grain yield. (Wash. State Univ., N. W. Washington Res. & Ext. Unit, Mt. Vernon.)

Herbicide combinations in sugar beets. Hamilton, K. C. and H. F. Arle. Herbicide combinations were evaluated in sugar beets (US H9B) planted to a stand in two rows, 12 inches apart, on vegetable beds spaced on 40-inch centers at Mesa, Arizona. Before bedshaping, barley and mustard (*Brassica japonica* (Thunb.) Sieb.) seed was disked into the soil. Preplanting herbicides (see table) were applied on October 4, 1971, and disked into the soil (sand 45%, silt 40%, clay 15%, and organic matter 1%) immediately before bedshaping. Planting sugar beet seed close to the soil surface was followed by a germination irrigation. Postemergence herbicide applications were made on October 20 (sugar beets and mustard - 1 inch, barley - 4 inches tall). Herbicides were applied in 40 gpa of water. Treatments were replicated four times, and tops of weeds were removed twice with a stalk chopper. Development of sugar beets and weeds was observed every few weeks. Sugar beets were harvested June 30, 1972.

Preplanting applications of propham had little effect on sugar beet emergence and seedling development. Preplanting treatments containing cycloate, NC-8438 (2-ethoxy-2,3-dihydro-3,3-dimethyl-S-benzofuranyl methanesulphonate) and pyrazon stunted sugar beets. Greatest crop injury was caused by the early postemergence application containing phenmedipham. Best season-long weed control resulted from combinations of NC-8438 followed by phenmedipham, propham followed by phenmedipham and pyrazon, and propham and cycloate followed by phenmedipham. All herbicide combinations resulted in significant yield increases (11.4 to 20.2 T/A) compared to the cultivated check. (Cooperative investigations of Arizona Agr. Exp. Sta., Tucson, and Agricultural Research Service, U.S. Department of Agriculture, Phoenix).

Response of weeds and sugar beets to herbicide combinations at Mesa, Arizona

Treatments					Percent weed control and crop injury estimated 11/3/71			Yield of beets[a]
Preplant		Postemergence						
Herbicide	lb/A	Herbicide	lb/A	Date	Barley	Mustard	Sugar beets	T/A
Cultivated check					0	0	0	5.5 c
propham	3 -	phenmedipham	1	10/20	98	100	46	24.1 a
propham	3 -	phenmedipham pyrazon	1 3	and 10/27	95	99	5	25.7 a
propham	3 -	dalapon pyrazon	1.8 3	and 10/20	98	99	10	16.9 b
propham & pyrazon	2 - 2	phenmedipham	1	10/20	99	100	32	22.8 a
propham & cycloate	2 - 1	phenmedipham	1	10/20	99	100	18	25.0 a
cycloate & pyrazon	1 - 2	phenmedipham	1	10/27	85	99	19	23.7 a
cycloate	2 -	phenmedipham	1	10/27	94	100	45	21.5 ab
cycloate	2 -	dalapon pyrazon	1.8 3	and 10/27	96	100	25	20.2 ab
cycloate	2 -	pyrazon	3	10/20	86	100	31	20.8 ab
NC 8438	1 -	phenmedipham	1	10/27	97	100	10	25.2 a
NC 8438	2 -	phenmedipham	1	10/27	99	100	16	24.7 a

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

Evaluation of preplant power incorporated herbicides in sugar beets. Evans, J. O. and Douglas Watts. This trial was established in 1972 to evaluate new herbicides and to substantiate results obtained from the more promising materials in 1971. The trial was conducted on a heavy loam soil with 2% organic matter and pH of approximately 8.0 near Bothwell, Utah. The soil moisture and tilth were excellent with an air temperature of 60 degrees Fahrenheit at planting time. The herbicides were applied and beets planted on April 1, 1972. The trial area received 1.42 inches of precipitation during the first and second week after planting. Sugar beet stand counts were taken on May 15, and weed stand counts were taken on May 26. Plots were six rows wide and fifty feet in length. The experiment was set up as a randomized block design with four replications. Treatments were applied in a seven inch band and incorporated with a hooded Eversman Power incorporator to a depth of two inches. The incorporator was equipped with press wheels to firm the soil in the band. The beets were simultaneously planted in the treated band using a six row Milton planter set to plant three pounds of seed per acre at a soil depth of 1.5 inches.

Compressed air was used as a pressure source and injected at the bottom of the tank to insure good agitation and even application of herbicides. Beet stand counts were obtained by averaging four random counts per plot with each count being 100 inches in length. Weed counts were obtained by averaging four random counts per plot; each count being the weeds in 100 inches of row and the width of the incorporator band.

Prevalent weed species were redroot pigweed (*Amaranthus retroflexus* L.), lambsquarter (*Chenopodium album* L.) and kochia (*Kochia scoporia* L.).

Cycloate at 3 lb/A preformed quite poorly on the broadleaved species present in this years trial. By increasing the rate to 4 lb/A the weed control increased to around 65 percent. Pyrazon at 5 lb/A gave approximately 65 percent control of the broadleaved weeds. Cycloate plus NC-8438 (2-ethoxy-2,3-dihydro-3,3-dimethyl-S-benzofuranyl methanesulphonate) gave the best over all weed control of any herbicide mixtures included in this trial. This particular mixture has a broad spectrum of weed control and also has longer herbicidal activity than cycloate alone. The addition of R15302 (chemistry name unavailable) to cycloate did not improve the effectiveness of cycloate. The higher rate of R15302 increased sugar beet injury. The combinations of NC-8438 plus U27267 (3,4,5-tribromo-N,N-α-trimethylpyrozol-1-acetamide), pyrazon plus Herc22234 (chemistry name unavailable) and cycloate plus U27267 all gave satisfactory redroot control. All of the new herbicide candidates tested show promise for chemical weed control in sugar beets. The compound NC8438 has shown a great deal of promise primarily due to its broader spectrum of weed control. The 8 lb/A rate of NC-8438 is double the recommended rate but in the tests observed there was some stand reduction but little sugar beet injury at this high rate. Two other experimental compounds, U27267 and Herc22234, gave good weed control but neither of them are broad spectrum herbicides. Both compounds controlled redroot but gave very little control of kochia or grasses at the higher rate; some sugar beet injury was evident with these two herbicides. (Utah State University, Logan; U. & I. Sugar Co., Salt Lake City).

Response of sugar beets and weeds (percent control) to preplant incorporated herbicides

Bothwell, Utah - 1972

Treatment	Rate (lb/A)	Sugar beets		Redroot Pigweed	Lambs-quarters	Kochia	Total Weeds
		Stand*	% of Control				
Cycloate	3.0	16.8	98.0	0.0	44.9	4.8	3.5
"	4.0	15.1	88.0	58.8	53.6	57.1	58.1
"	5.0	17.0	99.1	69.3	59.4	14.3	64.5
Pyrazon	4.0	17.3	99.1	47.2	62.3	23.8	47.3
"	5.0	16.5	96.2	72.4	10.1	47.6	63.9
NC8438	2.5	14.5	84.6	85.2	24.6	21.4	77.6
"	3.0	14.5	84.6	89.1	50.0	33.3	73.8
"	3.5	15.5	90.4	93.0	47.8	33.3	84.0
"	8.0	12.0	70.0	100.0	56.5	69.5	89.1
U27267	1.5	16.5	96.2	69.3	30.4	57.1	64.2
"	2.5	15.1	88.0	67.0	33.3	71.4	63.6
Herc22234	2.0	15.6	91.0	87.2	56.5	52.4	81.5
"	4.0	14.5	84.6	82.9	33.3	33.3	74.1
CGA18796	2.0	16.4	95.6	28.2	0.0	42.9	22.4
"	4.0	16.4	95.6	93.8	79.7	76.2	91.0
BAS72461	1.5	16.8	98.0	48.3	13.0	14.3	42.2
"	3.0	12.6	73.5	94.6	82.6	52.4	90.4
Cycloate + pyrazon	3.0+3.0	16.7	97.4	61.9	44.9	23.8	57.5
" " "	3.0+4.0	13.7	79.9	51.8	44.9	52.4	51.1
Cycloate + NC8438	3.0+2.5	12.5	72.9	98.8	91.3	71.4	96.2
" " "	3.0+3.0	14.2	82.8	95.7	88.4	0.0	86.9
Cycloate + R15302	3.0+0.5	15.5	90.4	0.0	0.0	9.5	0.0
" " "	3.0+1.0	14.9	86.9	56.1	82.6	47.6	58.5
Cycloate + U27267	3.0+2.25	14.6	85.1	88.3	0.0	0.0	68.0
Pyrazon + Herc22234	4.0+1.0	14.0	81.6	32.0	0.0	42.9	24.6
" " "	4.0+2.0	14.5	84.6	88.3	76.8	23.8	82.7
U27267 + NC8438	2.25+2.5	15.4	89.8	96.9	59.4	9.5	86.9
" " "	2.25+3.0	16.0	93.3	93.8	71.0	76.2	90.1
Control	---	16.7	100.0	0.0	0.0	0.0	0.0

*stand counts are average of 4 counts made per plot on 100 inches of row.

Preemergence weed control in sugar beets. Agamalian, H. and G. Wheatley. A post-plant preemergence application was made to double row beets planted in 40" beds. Variety US H9 was seeded in the experiment. Sprinkler irrigation followed herbicide application by 48 hours. Approximately 2 inches of moisture was applied. The soil texture was a Salinas clay loam. Application of herbicides was made using a CO_2 plot sprayer, with 3-8002 nozzle orifices at 30 psi.

Evaluation on sugar beet stand, weed control, crop phytotoxicity, and yield were obtained and are presented in the following table.

Summary: Evaluation on the three weed species present indicated CGA 18976 (Chemistry name unavailable) appears to be slightly less effective on pigweed than pyrazon (Pyramin) at the 4 lb/A rate. Although shepherdspurse and cheeseweed activity are quite comparable. Crop tolerance is comparable. Hercules 22234 (chemistry name unavailable) provided good weed control at 2 and 4 lb/A rates. On these species 1 lb/A was not effective. Good crop tolerance is indicated. Notram (2-ethoxy-2,3-dehydro-3,3-dimethyl-5-benzofuranyl methanesulphonate) was effective on pigweed and cheeseweed but gave only marginal control on shepherdspurse. Crop phytotoxicity at the 4 and 8 lb/A rate was evident, (a leaf distortion, clasping leaves) but did not affect final yield or stand when compared to the weeded control.

Bolero (S-(4-chlorobenzyl)-N,N-diethylthiol carbamate), appears to be expremely weak on the three species tested in this study. Combinations of Hercules 22234 and pyrazon show good crop tolerance, but did not enhance broadleaf weed control of those species present in this study. (University of California Agriculture Extension, Salinas).

Table 1. Evaluations of several preemergence herbicides on broadleaf weed control in sugar beets.

Herbicides	Rate Lb/A	Beet stand Per 100"	Weed Control/Specie PW	SP	CW	Crop Phyto	Lbs. Sugar/ Plot
CGA-18976	2	24.7	3.0	9.2	1.7	1.0	5.8
CGA-18976	4	27.7	4.5	9.7	6.7	0.2	7.9
CGA-18976	8	31.2	7.5	9.5	8.2	0.0	10.8**
Pyrazon	4	27.5	6.2	10.0	6.5	0.0	6.6
Pyrazon	8	30.0	8.2	10.0	8.7	0.0	8.8*
Hercules 22234	1	24.5	6.2	4.7	3.0	0.0	7.2
Hercules 22234	2	25.0	8.0	8.7	2.2	0.2	8.1*
Hercules 22234	4	27.7	9.5	9.0	4.2	0.0	8.9**
Bolero	4	27.5	3.0	3.0	2.2	0.5	5.6
Bolero	8	26.5	4.7	5.5	1.7	0.5	7.6
Notran	2	26.5	9.5	3.5	7.7	0.0	9.0**
Notran	4	30.2	10.0	6.7	8.5	1.5	8.2*
Notran	8	24.2	10.0	9.7	9.2	3.2	10.4
Hercules 22234+Pyr	2+2	25.5	8.2	10.0	5.0	0.0	8.6*
Hercules 22234+Pyr	2+4	25.7	9.0	10.0	6.7	0.0	8.4*
Weeded Control	0	26.0	8.0	8.0	6.0	0.0	5.9
Non-weeded Control	0	25.0	0.5	0.7	0.0	2.7	5.3
L.S.D.	.05						2.7*
L.S.D.	.01						3.6**

weed control: 0 = no effect; 10 = complete control
weed specie: P.W. = pigweed; S.P. = shepherdspurse; C.W. = cheeseweed
Cooperator: Spreckels Sugar Company, Spreckels, CA.

Preplant incorporated herbicides for barnyard grass control in sugar beets. Norris, R. D., J. P. Orr, and R. A. Lardelli. Barnyard grass (*Echinochloa crusgalli* (L.) Beauv.) is one of the most important weeds occuring in spring and early summer sown sugar beets in California. A trial was established near Elk Grove, Sacramento county, California on April 19, 1972 to evaluate new herbicides for control of this weed. Herbicides were applied to a silty clay loam using a CO_2 backpack sprayer and incorporated using the cooperator's 6-row incorporator set 3" deep. Plot size was one bed by 40 ft, in a randomized block design.

A somewhat variable stand of beets emerged alone with a dense stand of barnyard grass. Scattered broadleaved weeds also germinated. The herbicides applied, rates used, and evaluations are shown in the accompanying table.

Sugar beet stand was too variable to assess accurately; no herbicide caused any consistent effects on the sugar beet stand. Assessments of sugar beet vigor were also difficult due to stand variation. Hercules-22234 (chemistry not released) was the most selective herbicide in this trial, causing very little vigor reduction (1 replicate was low; the means were therefore lower than the visual impression). Cycloate or pebulate caused about a 20% early vigor loss, which was being outgrown at the second evaluation. NC-8438 (2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate) caused a similar reduction in vigor to the thiocarbamates; joining together of leaf tips and margins was evident on some plants, especially at the higher rate. U-27267 (3,4,5-tribromo-N,N-α-trimethyl-pyrazol-1-acetamide) was selective at the 3.0 lb/A rate, but caused severe retardation of some sugar beet plants at 6.0 lb/A.

All herbicides, except pyrazon, provided control of barnyard grass. Hercules-22234 controlled essentially all grass plants at all rates tested. The control provided by this herbicide was most striking, especially when coupled with essentially no crop injury. NC-8438, cycloate and 4.0 lb/A of pebulate all provided similar grass control early, but the control from NC-8438 improved between the 5-11 and 5-25 evaluations whereas that from the triocarbamates decreased. These chemicals did not kill all grass plants, but those that did emerge were severaly twisted and dwarfed, and offered no competition to the beets. Grass control by U-27267 required 3.0 lbs/A and improved with time.

Broadleaved weeds were counted and, although the numbers were low, provided information on their control by these chemicals. NC-8438 gave the most effective control of the species present. U-27267 was noticeably weak on nightshade (*Solanum villosum* Mill.), which accounted for the low overall control. Hercules-22234 likewise showed essentially no activity against nightshade except at 6.0 lbs/A. The other chemicals gave variable control of all species present.

Postemergence treatments of phenmedipham, EP-475, SN-503 and pyrazon plus dalapon were applied. Broadleaved weed control was good; little or no control of the barnyard grass was achieved. (Botany Department, University of California, Davis, and University of California Extension Service, Sacramento).

Preplant incorporated hervicides for weed control in sugar beets, Elk Grove

TREATMENT	RATE	BEET STAND		BEET VIGOR		GRASS CONTROL		BROADLEAVED WEEDS	
	lb/A	5-11-72	5-25-72	5-11-72	5-25-72	5-11-72	5-25-72	Count	%Control
								5-25-72	
CYCLOATE	4.0	8.3	6.0	7.3	7.3	8.2	5.3	10.3	70
PEBULATE	4.0	8.7	8.7	8.3	8.9	8.7	7.3	15.7	54
PEBULATE	6.0	9.3	9.2	8.3	9.6	9.3	7.5	12.7	64
PYRAZON	4.0	9.3	9.8	8.0	9.5	6.3	6.0	6.7	81
NC-8438	2.0	9.3	10.0	9.0	9.5	4.0	5.0	18.3	47
NC-8438	3.0	9.3	10.0	9.2	10.0	7.0	8.5	3.7	90
NC-8438	4.0	6.7	8.3	6.3	8.3	8.2	7.3	5.3	85
NC-8438	8.0	8.0	8.0	7.0	8.6	9.9	9.6	2.3	93
NC-8438/PYRAZON	2.0+4.0	9.0	8.9	7.3	8.6	7.3	7.7	2.0	94
U-27267	1.5	9.3	9.7	9.0	9.7	2.7	1.0	6.0	83
U-27267	3.0	8.7	9.5	8.3	9.4	4.0	8.3	15.3	56
U-27267	6.0	7.0	8.3	5.7	6.2	9.1	9.5	23.0	34
HERCULES 22234	1.5	9.3	9.2	8.5	8.0	9.5	9.7	31.3	10
HERCULES 22234	3.0	8.8	7.5	8.3	8.5	9.9	9.9	23.0	34
HERCULES 22234	6.0	8.0	8.0	7.0	7.7	10.0	9.9	5.3	85
UNTREATED CHECK		9.7	9.8	10.0	9.5	0.0	0.0	35.0	

Stand or vigor: 10 = normal, 0 = none.
Control: 10 = complete, 0 = none.

All data are means of 3 replications.

Timing of postemergence herbicide treatments in sugar beets. Norris, R. F., R. A. Lardelli, F. R. Kegel, and J. Brickey. Relative crop phytotoxicity, and degree of weed control, resulting from postemergence herbicides used in sugar beets varies according to stage of crop and weed growth at application. Several tests were conducted in 1972 to determine the extent of this variation; results of two tests are summarized here.

The herbicides tested were phenmedipham (1.5 lb/A), EP-475 (1.5 lb/A) or pyrazon plus dalapon with 0.5% X-77 (4.0 plus 2.2 lb/A). Trial locations were at Staten Island in San Joaquin county and at Woodland in Yolo county. Three growth states at application were investigated, based on sugar beet growth: a) cotyledon stage, true leaves less than 5 mm., b) 2-leaf stage, first true leaves expanded with second leaf pair still less than 10 mm., c) 4-leaf stage, second pair of leaves well developed. Treatment dates were, at Staten Island: a) 3-17-72, b) 3-23-72, and c) 3-30-72 and at Woodland: a) 5-17-72, b)5-24-72, and c) 5-31-72. The Staten Island plots were 1 bed by 40 ft., replicated 3 times and applied with a knapsack sprayer. The Woodland plots were 2 beds (4ft.) by 20 ft., replicated 4 times, and applied with a CO_2 handsprayer. Wild radish (*Raphanus sativus* L.) and redroot pigweed (*Amaranthus retroflexus* L.) were the predominant weeds at Staten Island. At Woodland the chief weeds (sown) were redroot pigweed and prostrate pigweed (*Amaranthus blitoides* S. Wats.), and were counted jointly.

EP-475 controlled pigweed effectively at all growth stages. There was a modest decrease in activity when the weeds were larger but the vigor of the remaining plants was very low; they were offering very little competition. Sugar beet injury from EP-475 was slight or none, even at the cotyledon stage and seemed marginally less than from phenmedipham. This trend for EP-475 being more selective to beets than phenmedipham has been observed in several trials in 1972. EP-475 satisfactorily controlled wild radish at Staten Island, even when sprayed at the late growth stage. Phenmedipham controlled pigweed when they were young (cotyledon to early 2-leaf pigweed) but control dropped substantially as the plants became larger at treatment. At the 4-leaf application in Woodland essentially no effect was observed, yet at the cotyledon stage 86% control was achieved. Wild radish control was excellent on young plants, but declined to a phenmedipham, showed activity against considerably larger weed seedlings. This is potentially a substantial advantage from the point of view of the grower. Both chemicals controlled young volunteer alfalfa at Woodland, but could not kill older plants; phenmedipham was possibly more active than EP-475. Pyrazon plus dalapon provided control of young weeds at Woodland, but lost activity on older seedlings. (Botany Department, University of California, Davis; University of California Agricultural Extension Service, Stockton, and Spreckels Sugar Co., Woodland).

Effect of timing of postemergence treatments on sugar beets and weeds.

Treatment and rate.	Growth stage	Staten Island - 4-11-72.				Woodland - 6-16-72.					
		Sugar beet Vigor	Wild radish control	Pig-weed count[1]	% pig-weed control	Sugar beet count[2]	Sugar beet vigor	Pigweed count[3]	Pigweed % control	Vol. alfalfa count	Vol. alfalfa % control
Phenmedipham	Cot.	8.2	10.0	6.7	76	12.0	8.0	17.8	86	0.0	100
1.5	2-1f.	8.8	9.0	10.5	68	10.2	6.4	58.0	3	32.0	77
	4-1f.	8.6	3.0	15.3	36	20.5	7.9	83.0	0	13.0	41
EP-475	Cot.	9.0	9.7	1.3	95	10.5	8.5	9.0	93	1.5	99
1.5	2-1f.	8.2	9.9	1.1	97	12.2	8.6	15.2	75	27.5	41
	4-1f.	9.0	7.5	5.3	78	18.0	7.1	16.8	79	49.5	0
Pyrazon + dalapon	Cot.	-	-	-	-	12.2	8.6	35.0	72	25.5	82
4.0 + 2.2	2-1f.	-	-	-	-	9.0	6.9	40.2	32	45.0	2
plus 0.5% X-77	4-1f.	-	-	-	-	16.2	7.2	101.5	0	31.0	0
Untreated check	Cot.	9.5	0.0	27.6	-	10.8	6.5	125.8	-	141.2	-
	2-1f.	9.2	0.0	32.4	-	8.0	5.9	60.0	-	46.2	-
	4-1f.	9.5	0.0	24.0	-	16.2	6.8	79.0	-	22.2	-

1 - Number per ft^2.

2 - Number per 2.0 m. of row.

3 - Number per m^2.

All data from Staten island are for 3 replications, from Woodland for 4 replications.

Vigor - 10 = normal vigor, 0 = dead. Control - 10 = complete, 0 = none.

Comparisons of preplant and preemergence herbicides for sugar beet weed control in the Imperial Valley. Norris, R. F., R. A. Lardelli, and D. W. Cudney. Data on safety and efficacy of herbicides evaluated in other locations in California, and most of the USA, do not necessarily apply to the irrigated desert conditions in the Imperial Valley. Herbicides for sugar beet weed control were evaluated under these conditions in the 1971-72 cropping season.

Herbicides were applied with a CO_2 backpack sprayer at 27 gal/A and 30 p.s.i. The growers's 4-bed incorporator was used, set 3" deep, for incorporation. Plot size was 2 beds, 4 rows of beets, by 50 ft, replicated 4 times. The soil was silty clay. Ten feet of the middle two rows were harvested for yield estimate.

The herbicides used, rates applied, and results are shown in the accompanying table. Nitrofen and benthiocarb (IMC-3950) were applied preemergence after the crop was sown; all other treatments were preplant incorporated. The main weed was canary grass (*Phalaris canariensis* L.) with scattered knotweed (*Polygonum* sp.), annual yellow sweetclover (*Melilotus indica* (L.) All.), nettleleaf goosefoot (*Chenopodium murale* L.) and sowthistle (*Sonchus oleraceus* L.)

The 6.0 lb/A rate of U-27267 (3,4,5-tribromo-N,N-α-trimethylpyrazol-1-acetamide) was the only treatment to reduce beet stand. The slightly lower stand at harvest in the checks reflected difficulty experienced in thinning the beets under the weedy conditions. U-27267 also caused the greatest beet vigor reductions. These were manifested as severe early general stunting which could still be seen as small leaves and multi-crowned appearance at harvest. NC-8438 (2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate), especially at the 6.0 lb/A rate caused some early beet vigor reduction, but this was not longer evident after 4 months. The injury took the form of leaf puckering and leaf fusion; very similar in appearance to cycloate symptoms. No other treatment caused more than a trace of crop phytotoxicity.

Cycloate and NC-8438 provided selective grass control; U-27267 did not provide selective grass control, and benthiocarb, nitrofen or pyrazon all failed to control grasses adequately. Pyrazon, nitrofen and U-27267 gave substantial selective broadleaved weed control; cycloate and NC-8438 were substantially weaker and benthiocarb appeared inactive. The best combination weed control and selectivity was provided by 1.5 lb/A of NC-8438 plus 4.0 lb/A of pyrazon.

Yield data correlated well with relative levels of weed control, except for 6.0 lb/A of U-27267 where the stand loss was sufficient to cause reduced yield. Cycloate and nitrofen, overall, continue to provide adequate weed control for Imperial Valley sugar beets, with NC-8438 looking quite promising. (Botany Department, University of California, Davis, and University of California Agricultural Extension Service, El Centro).

Weed control, beet stand and yield in Imperial Valley

Treatment		10/26/71				6/8/72		
		Beet Stand'	Beet Vigor	Grass Control	Broadleaved Control	Beet Stand'	Clean Tons/A	Sucrose lbs/A
Cycloate	4.0	28.0	7.8	9.7	3.3	18.8	41.2	11,010
Pyrazon	4.0	29.5	8.0	4.3	6.5	22.3	43.8	11,330
Pyrazon + TCA	4.0 + 7.0	28.0	7.9	3.5	5.5	--	--	--
NC-8438	1.5	28.5	8.4	8.9	4.3	21.3	40.8	11,000
NC-8438	3.0	35.3	8.3	8.5	4.5	28.3	43.8	12,020
NC-8438	6.0	29.8	7.8	9.7	7.5	22.3	44.0	12,000
NC-8438 + Pyrazon	1.5 + 4.0	30.3	8.0	9.0	8.3	23.0	44.1	12,030
NC-8438 + Pyrazon	3.0 + 4.0	29.8	7.3	9.8	8.1	23.0	45.0	11,780
U-27267	1.5	29.8	8.0	3.8	8.8	--	--	--
U-27267	3.0	29.8	6.8	7.9	9.0	22.0	43.8	11,980
U-27267	6.0	19.0	5.3	10.0	9.8	5.5	19.0	4,729
Benthiocarb	3.0	32.5	8.5	2.8	1.5	--	--	--
Benthiocarb	6.0	32.5	8.4	4.3	1.3	--	--	--
Nitrofen	4.0	34.5	9.0	4.8	6.0	24.3	44.7	11,700
Untreated Check		32.0	8.6	2.0	0.3	18.8	37.6	10,290
Untreated Check		27.5	8.8	2.5	0.0	19.3	36.3	9,680

All data are means of 4 replications

'Based on count per 20' row

Vigor: 10 = normal, 0 = dead
Control: 10 = complete, 0 = none

The effect of timing on the activity of dinitro analine herbicides. Lange, A. Trifluralin and two related herbicides, nitralin and CGA10832, (N-(Cyclo-propylmethyl)-α,α,α-trifluoro-2,6-dinitro-N-proply-p-toludine), were applied over newly planted rows of corn, milo and beans on 5/29/72 - 5/31/72 and sprinkler irrigated 5/31/72 immediately after the last herbicide treatment. Trifluralin in several previous tests has shown a need for incorporation soon after herbicide application. The short intervals were, therefore, only established with nitralin and CGA10832.

Trifluralin was active when sprinkled immediately.

Nigralin was more active than CGA10832 as shown in the vigor rating of the crops and the control of puncturevine. The 3-day delay did not appear to appreciably reduce the activity of nitralin or CGA10832. The treands were not consistent with the possible exception of milo. (San Joaquin Valley Agric. Research & Extension Center, Univ. of Calif., Parlier, Calif.)

The effect of time before sprinkler irrigation on the activity of herbicides.

			Average1/			
		Days Before Sprinkler	Vigor			Control Puncture
Herbicide	lb/A	Irrigation	Corn	Milo	Bean	vine
Nitralin	2	3	2.0	3.6	6.6	7.6
CGA 10832	2	3	7.1	6.6	5.3	6.3
CGA 10832	4	3	4.6	1.3	3.3	9.5
Nitralin	2	1	5.0	4.6	10.0	9.2
CGA 10832	2	1	8.6	5.0	9.0	8.0
Nitralin	2	0	1.6	2.6	4.6	8.6
CGA 10832	2	0	5.8	4.3	3.3	6.8
Trifluralin	2	0	4.0	1.0	5.3	9.3
Check	-	-	2.8	7.6	7.6	0.0

1/ Average of 3 replications, where 0 = no effect; 10 = complete kill of crop or weed species.

Nonselective control of annual weeds with six soil-applied herbicides. McHenry, W. B. and N. L. Smith. Four potential non-crop herbicides, cyprazine, GS-14254 (2-sec-butylamino-4-ethylamino-6-methoxy-s-triazine), metribuzin, and tebuthiuron [1-(5-t-butyl-1,3,4-thiadiazol-2-yl)-1,3-dimethylurea] were compared with two registered herbicides, bromacil and simazine. The vegetation on the treatment date (March 3, 1972) was 4-6 in. tall. Therefore, to assure equal preemergence potential, amitrol at 1 lb ai/A plus 1/4% surfactant (Surfax R) was applied with each of the soil-active herbicides. The plots consisted of 225 sq. ft., and all treatments were replicated four times. The soil was a clay loam. By the evaluation date (May 11, 1972) 1 in. of rain had fallen since treatment.

Table 1 Principal annual vegetation at the experimental site

Broadleaf species

redstem filaree, Erodium cicutarium (L.)
turkey mullein, Eremocarpus setigerus Benth.
wild radish, Raphanus sativus (L.)
yellow starthistle, Centaurea solstitialis (L.)

Grass species

foxtail fescus, Festuca megalura Nutt.
Italian ryegrass, Lolium multiflorum Lam.
ripgut brome, Bromus rigidus Roth
wild barley, Hordeum leporinum Link
wild oat, Avena fatua L.

Performance evaluations were made for over-all annual weed control on May 11, 1972.

Table 2 Efficacy of six soil-active herbicides in controlling annual weeds

Herbicide	Formulation	Acre rate		Control (10=100%)
		A.I.	Formul	5/11/72
bromacil	80% wp	1	1.25 lb	9.1
bromacil		2	2.5	9.8
cyprazine	1 lb/gal	1	1 gal	9.6
cyprazine		2	2	9.9
cyprazine		4	4	10.0
GS-14254	60% wp	1	1.7 lb	8.1
GS-14254		2	3.3	8.6
GS-14254		4	6.7	9.4
metribuzin	70% wp	1	1.4	9.9
metribuzin		2	2.9	9.9
metribuzin		4	5.7	10.0
simazine	80% wp	1	1.25	8.8
simazine		2	2.5	8.6
tebuthiuron	80% wp	1	1.25	8.1
tebuthiuron		2	2.5	9.6
tebuthiuron		4	5.0	9.9
control	-	-	-	0.0

All treatments provided weed control acceptable for most non-crop weed control needs. Bromacil, cyprazine, metribuzin, and tebuthiuron appeared to be somewhat more active than GS-14254 and simazine under the atypical low rainfall conditions which occurred this year. GS-14254 and simazine were notably weaker in controlling Italian ryegrass. (Agricultural Extension, Botany Department, University of California, Davis).

Comparison of seven nonselective foliage-applied herbicides for general annual weed control. McHenry, W. B., L. S. Frey, and N. L. Smith. A field experiment was conducted on a highway right-of-way to compare the efficacy of glyphosate (MON 1139, N-(phosphonomethyl)glycine), amitrole, asulam, cacodylic acid + MSMA (Broadside R), paraquat, and weed oil. All treatments with the exception of glyphosate and weed oil included 1/4% surfactant (Surfax R). An emulsifier (Emulsifying Agnet A R) was included at 1% with the weed oil-water mix. Knapsack-applied treatments on 15 ft. square plots replicated 4 times were employed. The soil was a clay-loam. Height of weeds when treated averaged 6 in. All treatments were initially applied March 7, 1972, 80° F. Because of generally poor weed control, cacodylic acid + MSMA and weed oil treatments were repeated April 24, 1972.

Table 1 Principal annual vegetation at experimental site

Broadleaf species

coast fiddleneck, *Amsinckia intermidia* Fisch. & Mey.
redstem filaree, *Erodium cicutarium* (L.) L'Her.
shortpodded mustard, *Brassica incana* (L.) F. W. Schultz
wild mustard, *Brassica kaber* (DC.) L. C. Wheeler

Grass species

Italian ryegrass, *Lolium multiflorum* Lam.
rattail fescue, *Festuca myuros* L.
ripgut brome, *Bromus rigidus* Roth
wild barley, *Hordeum leporinum* Link
wild oat, *Avena fatua* L.

Seasonal precipitation prior to applying the treatments was approximately 50% of normal (7 in.); by the last evaluation date, May 8, 1972, an additional 1 in. of rain had fallen. While the vegetation exhibited no obvious signs of moisture stress on the initial treatment date, within 1 month the plants shifted rather rapidly from a vegetative stage to flowering. The apparently declining soil moisture following treatment is believed to have reduced the efficacy of at least the translocated herbicides. Glyphosate at 1 and 2 lb ae/A achieved the highest control values; paraquat at 1 lb ai/A was the second most effective treatment. Redstem filaree appeared to be tolerant of diquat and to glyphosate at 1 lb ae/A or less. Control ratings from the initial applications of the cacodylic acid + MSMA mixture and the weed oil (50% oil + 50% water) declined and were retreated at the same rates April 24, 1972. Even with unseasonably warm days (73°-82° F.), the second application did not result in acceptable control.

Asulam did not suppress vegetative growth or flowering although the plants very slowly became almost completely chlorotic over a 4-5 week period. (Agricultural Extension, Botany Department, University of California, Davis, Sacramento, Davis).

Table 2 Control of annual weeds with 7 foliage-applied herbicides applied March 7, 1972

Herbicide	Formul.	Acre rate		Spray	(Weed control - 10 = 100%)				
		A.I.	Formul.	volume	3/17/72	3/24/72	4/3/72	4/24/72	5/8/72
amitrole	90%	1 lb	1.1 lb	100 gpa	3.0	3.0	4.5	3.3	5.5
amitrole		2	2.2	100	4.3	4.8	5.5	4.5	6.8
asulam	3.3 lb/gal	1	0.3 gal	100	0.0	0.5	1.5	2.0	2.8
asulam		2	0.6	100	0.0	0.5	1.0	2.8	3.8
asulam		4	1.2	100	0.0	0.3	1.8	4.0	5.8
cacodylic acid + MSMA	1.25 3 lb/gal	1.25 + 3[1/]	1 gal	100	1.0	2.3	1.8	0.8	3.8
cacodylic acid + MSMA		2.5 + 6[1/]	2	100	3.0	5.5	4.0	1.8	5.3
cacodylic acid + MSMA		3.75 + 9[1/]	3	100	5.8	7.8	7.0	4.0	7.5
glyphosate	3 lb/gal	0.25	0.08 gal	40	2.0	5.3	6.8	4.5	5.3
glyphosate		0.50	0.16	40	4.0	8.0	8.8	7.0	8.0
glyphosate		1	0.33	40	3.5	8.5	9.8	8.5	9.0
glyphosate		2	0.67	40	5.3	9.2	9.9	9.7	9.9
paraquat	2 lb/gal	0.50	0.25 gal	100	8.3	8.6	8.0	4.8	4.8
paraquat		0.75	0.38	100	8.8	8.9	8.9	7.0	7.5
weed oil	100%	100[1/] gal		200	4.0	4.3	2.8	0.3	4.8
control	-	-	-	-	0.0	0.0	0.0	0.0	0.0

[1/] Retreated April 24, 1972

PROJECT 6. AQUATIC AND DITCHBANK WEEDS

D. Schachterle, Project Chairman

Glyphosate for control of ditchbank barnyard grass. Kempen, H. M. Glyphosate was applied at different dosages and gailonages in comparison to a proprietary mix of MSMA, cacodylic acid and surfactant. Barnyard grass was the dominant weed species present. Two stages of growth existed; maturing plants which were 2 feet above the water line of the drain ditch, and 6 to 8" tall seedling barnyard grass (*Echinochloa crus-galli*) at the edge of the recently receded waterline. Other weed species present were creeping spikerush (*Eleocharis palustris*) and pepperwort, (*Mursilea macranata*). The temperature was 95 F with no cloud cover present.

Control of the vigorous young barnyard grass was excellent at 1/2 lb/A, but was total at 1 lb/A or more. Considerably less effective was the MSMA-cacodylic acid-surfactant treatment.

On maturing barnyard grass, 1 lb/A gave fair control whereas 2 lb/A killed the plants. The MSMA-cacodylic acid-surfactant treatment killed the tops of the grass which then induced more axillary shoot growth from the base of the plant than occurred in the check.

Glyphosate also killed clover fern at 1 lb/A or more and gave 90% control of topgrowth of spikerush at 2 lb/A or more. Aquatic species including burhead were not injured by sprays which were purposely sprayed onto the margin of the drain ditch. (Agricultural Extension Service, University of California, 2610 M. Street, Bakersfield, California).

Glyphosate for control of ditchbank barnyard grass

			Barnyard grass control[1]		Other weeds[1]	
Treatment	lb/A	GPA	Maturing	6 to 8 inch	Spikerush	Pepperwort
Glyphosate	1/2	35	8.0	9.6	6	--
"	1	70	9.5	10.0	-	10
"	2	35	10.0	10.0	9	10
"	4	70	10.0	10.0	8	10
Broadside R	2 gals/	100	7.0	6.0	7	10
Glyphosate	1/2 gal/	100	7.7	9.3	6	--
"	2 gals/	100	9.9	10.0	8	10
Untreated	---	---	6.7	0.0	0	0
LSD .05			.57	1.12		

[1] Control rated 0 to 10: 0 = no effect; 10 = kill; average of 3 replications on barnyard grass. Spikerush and pepperwort were not present in all replications.

PROJECT 7. CHEMICAL AND PHYSIOLOGICAL STUDIES

Robert F. Norris, Project Chairman

SUMMARY

Seven progress reports were received this year dealing with metabolism of monuron in *Citrus*, effects of 2,4-D, dicamba or picloram on growth, carbohydrate content, and protein content of forage grasses and winterfat, and of resistance of a biotype of common groundsel (*Senecio vulgaris* L.) to s-triazine herbicides.

Monuron, monomethylmonuron and demethylated monuron were identified in *Citrus* seedlings, but the identity of three water-soluble metabolites could not be determined.

Preemergence applications of picloram were extremely toxic to bluegramma grass, postemergence application to two-leaf stage seedlings also caused severe injury, and mature plants were only moderately sensitive.

Picloram, dicamba, or 2,4-D were applied to Kentucky bluegrass, western wheatgrass and smooth bromegrass in 1971; carry-over effects were observed in 1972 for picloram, but dicamba and 2,4-D effects had been outgrown unless attributable to weed control. Various carbohydrate fractions, and % protein content, were assayed and found to vary between species and with some herbicide treatments.

Picloram or 2,4-D applied pre- or postemergence to winterfat (*Eurotia lanata* (Pursh.) Moq.) seedlings in the greenhouse were extremely toxic.

A biotype of common groundsel was found to be resistant to simazine, atrazine, prometone, prometryne and GS-14254. Normal or resistant biotypes tolerated 30 ppm of terbutryn. Although several physiological processes were examined the mechanism of resistance was not determined.

Effect of picloram upon germination and development of blue grama (*Bouteloua gracilis* (HBK) Lag.). Gesink, R. W., H. P. Alley and G. A. Lee. A number of studies concerned with the chemical control of various undesirable range plants have demonstrated that blue grama is sometimes injured by treatments with picloram. Information concerning the effects of herbicides on other than undesirable species is necessary for the proper management of rangeland. In view of the need for this type of information, a greenhouse study was initiated to study the effects of various rates of picloram upon blue grama at various stages of growth. Uniform stands of blue grama were obtained by seeding into 15 x 23 in. greenhouse flats. The 6 in. deep flats contained a sandy loam soil.

The study consisted of three experiments which included applications of picloram at the preemergence, two-leaf, and mature growth stages. The picloram treatments (0.25, 0.50, 1.0, 2.0, and 4.0 lb/A) for each experiment consisted of four replications (four flats) in a completely random design. All treatments were applied in 60 gpa of water. Evaluations were made by a rating system where "100%" indicated complete mortality or a 100% reduction in stand of grass on a greenhouse flat; "0" indicated no reduction in grass stand and no evidence of phytotoxicity. Evaluations for each experiment were made 4 weeks after date of treatment.

The preemergence treatment caused a considerable reduction in germination. For the 0.25, 0.50, and 1.0 lb/A rates of picloram there was 75, 45, and 25% germination, respectively. The 2.0 and 4.0 lb/A rates resulted in less than 5% germination. The grass seedlings which did emerge exhibited epinasty and rapid growth of coleoptiles, and severe chlorosis during the first week following emergence. Evaluations after 4 weeks demonstrated that a reduction in number of seedlings occurred after germination. After 4 weeks the 0.25 lb/A rate resulted in a 73% stand reduction as compared to untreated grass. Rates of 0.5 lb/A or greater caused very severe reduction and elimination of grass stands. Treatments at the two-leaf stage caused less injury than preemergence treatments. Very large reductions occurred when the two-leaf stage plants were treated with 1.0 lb/A or greater. The least susceptible growth stage was maturity, where an application of 2.0 lb/A or greater resulted in reductions of more than 50%.

Field observations have indicated that blue grama is injured to some extent by applications of picloram at 0.5 lb/A. There is also evidence to indicate that growth stimulation of blue grama sometimes occurs with 0.25 lb/A treatments. Stimulation of growth has also been observed where picloram treatments of 0.25 lb/A were applied on the same area during two consecutive years. (Wyoming Agricultural Experiment Station, Laramie, SR-448).

Response of blue grama to picloram at three growth stages

Picloram treatment	Response ratings[1/]		
	Preemergence	Two-leaf	Mature
0.25 lb/A	73%	15%	6%
0.50 lb/A	92	30	17
1.0 lb/A	97	80	30
2.0 lb/A	99	90	50
4.0 lb/A	100	100	72

[1/] Rating system where "100%" indicated complete mortality or 100% reduction of grass stand; "0" indicated no reduction in stand and no phytotoxicity. Each rating is an average of four replications.

Metabolism of monuron by citrus. Jordan, L. S. and A. J. Dawson. The study of metabolism of monuron by *Citrus* has evolved into a two-phased program. The first phase involves the sequential demethylation of the parent herbicide and eventual production of p-chloroaniline. These products are soluble in organic solvents and have been observed to occur in several plant species. The second phase of the program involves characterization of here-to-fore unknown water soluble products which contain some part of the monuron molecule. The results of the study are as follows:

Organic-soluble products observed to date:

Monuron - identified by co-chromatography
Monomethyl monuron - identified by co-chromatography and infrared spectroscopy.
Demethylated monuron - identified by co-chromatography.
p-chloroaniline - presence of this compound is not confirmed.

Water soluble products observed to date:

Three separate, unidentified products, all with molecular weights below 700, have been observed in roots, stems and leaves of citrus seedlings. The solvent fraction containing all three unknown products has given a negative reaction to a "spot" test for carbohydrates and a positive reaction to ninhydrin, a "spot" test for peptide linkages. High concentrations of monuron and both organic-soluble demethylated compounds produced a negative result when treated with ninhydrin.

The following enzyme preparations have been used, without success, in an attempt to free a recognizable product from the water soluble unknowns:

beta-glucosidase
ficin
peptidase
papain
alpha-glucosidase
sulfatase
acid phosphatase

The following processes have resulted in a "free" organic soluble product with a Rf value which does not correspond to known standards during TLC analysis.

1) enzyme: Clarase (mixture)
2) 5 N HCl, 35°C, 4 hours (this treatment converted 50% of available radioactivity from the water soluble to the chloroform soluble form).

(Plant Sciences Dept., Univ. of Calif., Riverside, C., 92502).

Response of three grass species to picloram, dicamba, and 2,4-D - second year evaluations. Gesink, R. W., G. A. Lee, and H. P. Alley. This is the second year of a study first reported in 1972. A replicated series of sq. rod plots were established June 6, 1971 to study the effects of various herbicides upon forage and seed production, protein and carbohydrate levels, and possible phytotoxic effects on three grass species.

Various rates of 2,4-D, dicamba and picloram were applied to established stands of Kentucky bluegrass (*Poa pratensis* L.), western wheatgrass (*Agropyron smithii* Rydb.), and smooth bromegrass (*Bromus inermis* Leyss) which were heavily infested with Canada thistle and dandelion. The applications were applied in a total volume of 40 gpa water and replicated three times.

The effects of herbicides upon protein and carbohydrate levels are reported by G. A. Lee *et al.* (Res. Prog. Report, 1973). Response of the grasses in regard to forage and seed production during the 1971 and 72 seasons is presented in Tables 1 and 2. In 1972 production of bluegrass was again higher on all treated plots than on controls; this was due to the continued weed control on treated plots during the 1972 season. Production on the control plots was considerably less in 1972 than in 1971 and this appeared to be due to an increased abundance of yellow sweetclover during the second year. It was reported in 1971 that none of the herbicide treatments appeared to have phytotoxic effects upon bluegrass. The second year, however, the picloram treatments caused slight visual phytotoxicity; this is not evident from forage production figures but is reflected in seed production.

The western wheatgrass area contained the greatest infestation of yellow sweetclover compared to the other grass species. As a result of this infestation, forage production on untreated wheatgrass plots decreased to 772 lb/A in 1972 as compared to 1960 lb/A in 1971. Picloram and dicamba provided 100% weed control on the wheatgrass plots during both 1971 and 72 seasons and as a result grass production was quite high on these plots. The 2,4-D treated plots also produced rather high amounts of forage even though some weed species were present. The picloram treatments caused some visual phytotoxicity to western wheatgrass. Injury from picloram was more apparent the second year and this is reflected in both forage and seed production figures. Phytotoxicity from dicamba occurred for the most part, only during the first season.

Highest production from smooth bromegrass during 1972 was observed on the dicamba treated plots. During the first season dicamba caused considerable injury to bromegrass, but in 1972 injury was not evident. Production on picloram treated plots was greatly reduced during both years and this was due to the severe phytotoxic effect on bromegrass. Grass injury from picloram was evident during both seasons, but occurred more severely during 1972. Production on 2,4-D treated areas was found to be quite similar to the nontreated plots during both seasons.

During 1971 there was no apparent effect on bluegrass seed production resulting from herbicide treatments. During 1972, however, picloram at 1.0 and 1.5 lb/A resulted in 10 and 25% seed reduction, respectively. This reduction in seed corresponds with observations concerning phytotoxic response of bluegrass to picloram. Dicamba caused severe seed reduction in western wheatgrass during 1971, but in 1972 the reduction was considerably less at 20%. Picloram caused 50% reduction in wheatgrass seed during 1971 and this increased to 90% in 1972. Smooth bromegrass seed was reducted by all herbicide treatments during the first season, but during 1972 reduction was evident only on the picloram treated areas. (Wyoming Agriculture Experiment Station, Laramie, SR-451).

Table 1. Oven-dry herbage yields of grass and weed species expressed as pounds per acre

		bluegrass		thistle		dandelion		clover	
		1971	1972	1971	1972	1971	1972	1971	1972
untreated		830	461	1130	1294	337	185	108	1059
2,4-D	2 lb/A	1293	1088	353	714	19	0	0	172
dicamba	6 lb/A	1520	1204	35	47	19	0	0	26
picloram	1 lb/A	1667	1443	0	0	0	0	0	0
picloram	1.5 lb/A	1360	1113	0	0	0	0	0	0

		wheatgrass		thistle		dandelion		clover	
		1971	1972	1971	1972	1971	1972	1971	1972
untreated		1960	772	303	520	106	875	141	1068
2,4-D	2 lb/A	1753	1577	82	220	10	0	0	165
dicamba	6 lb/A	1480	1842	0	0	0	0	0	0
picloram	1 lb/A	1600	1132	0	0	0	0	0	0
picloram	1.5 lb/A	1387	1347	0	0	0	0	0	0

		bromegrass		thistle		dandelion		clover	
		1971	1972	1971	1972	1971	1972	1971	1972
untreated		2460	2208	155	473	9	0	16	790
2,4-D	2 lb/A	1780	2026	22	120	0	0	0	75
dicamba	6 lb/A	1247	3000	0	10	0	0	0	0
picloram	1 lb/A	1367	939	0	0	0	0	0	0
picloram	1.5 lb/A	1347	1073	0	0	0	0	0	0

Table 2. Percent reduction in seed produced on grass plots in 1971-72

		bluegrass		wheatgrass		bromegrass	
Treatment	Rate/A	1971	1972	1971	1972	1971	1972
2,4-D	2 lb	0	0	0	0	30	0
dicamba	6 lb	0	0	80	20	99	0
picloram	1 lb	0	10	50	90	95	95
picloram	1.5 lb	0	25	50	90	95	95

Effect of picloram, 2,4-D and dicamba on carbohydrate levels in above- and below-ground portions of three grass species. Lee, G. A., H. P. Alley and R. W. Gesink. Measurements of carbohydrate levels were made in the above- and below-ground portions of Kentucky bluegrass (*Poa pratensis* L.), western wheatgrass (*Agropyron smithii* Rydb.) and smooth bromegrass (*Bromus inermis* Leyss) plants 48 and 79 days after treatments with picloram at 1.0 and 1.5 lb/A, 2,4-D at 2.0 lb/A and dicamba at 6.0 lb/A. Starch, sucrose and other reducing sugars fraction, fructosan fraction and total nonstructural carbohydrates were determined with the "Clarase 900" enzyme method.

Although the starch, sucrose and other reducing sugars fraction ranged from 11.9 to 15.4 percent in the above-ground portions and 11.0 to 13.8 percent in the below-ground portions of the grasses, there were no significant differences between species at 48 days after treatment with herbicides (accompanying table). Approximately the same ratios of fructosans occurred in the below-ground portions of the three species with highest and lowest levels contained in Kentucky bluegrass and smooth bromegrass, respectively. A significant interaction in the data for the below-ground portions indicates that each species reacted independently to the herbicide treatments. Western wheatgrass plants from the nontreated check plot contained significantly lower amounts of fructosans than plants from areas treated with picloram at 1.0 and 1.5 lb/A and 2,4-D at 2.0 lb/A. Picloram at 1.0 lb/A and 2,4-D at 2.0 lb/A resulted in significantly lower levels of fructosans in smooth bromegrass and Kentucky bluegrass. Below-ground portions of Kentucky bluegrass from areas treated with picloram at 1.5 lb/A and dicamba at 6.0 lb/A contained significantly higher levels of TNC (Total Nonstructural Carbohydrates) than western wheatgrass and smooth bromegrass. TNC levels in the below-ground portions of Kentucky bluegrass, smooth bromegrass and western wheatgrass from the nontreated areas were 49.5, 39.4 and 31.0 percent, respectively, which were significantly different from each other.

Samples of the three grass species obtained 79 days after herbicide treatment had no significant differences in the starch, sucrose and other reducing sugar fraction in the above- or below-ground portions. Fructosan levels in the above-ground portions of Kentucky bluegrass from plots treated with picloram at 1.0 lb/A were significantly higher than levels in the other grass species. The above-ground portions of western wheatgrass from areas treated with picloram at 1.5 lb/A contained significantly higher levels of fructosans than bluegrass or bromegrass. Fructosan levels were significantly different in the above-ground portion of all three grass species treated with 2,4-D at 2.0 lb/A. Above-ground portions of Kentucky bluegrass contained significantly greater levels of fructosans than those of western wheatgrass from plots treated with dicamba at 6.0 lb/A. Smooth bromegrass from the nontreated areas contained significantly higher fructosan levels than the other two species. No significant differences in TNC percentages in the above-ground portions of Kentucky bluegrass and western wheatgrass were detectable among herbicide treatments. However, TNC levels in the above-ground portions of smooth bromegrass plants obtained from plots treated with 2,4-D and the nontreated check were significantly higher than in plants harvested from the other herbicide treated areas. The below-ground portions of Kentucky bluegrass contained higher levels of TNC than either western wheatgrass or smooth bromegrass. (Wyoming Agricultural Experiment Station, Laramie, SR-453).

Effect of herbicide treatments on carbohydrate fractions in above- and below-ground portions of three grass species

	Starch, sucrose reducing sugars fraction		Fructosans fraction		Total non-structural carbohydrates	
	above-ground	below-ground	above-ground	below-ground	above-ground	below-ground
48 days after treatment						
Kentucky bluegrass						
picloram 1.0 lb/A	13.0^{a}[1]	11.7^{a}	26.3^{cd}	31.0^{a}[2]	39.3^{cd}	42.7^{c-e}
picloram 1.5 lb/A	13.5^{a}	12.2^{a}	27.5^{cd}	38.5^{b}	41.0^{cd}	50.7^{e}
2,4-D 2.0 lb/A	13.0^{a}	12.1^{a}	29.8^{d}	30.7^{a}	42.9^{d}	42.8^{c-e}
dicamba 6.0 lb/A	12.3^{a}	11.2^{a}	27.9^{cd}	38.4^{b}	40.3^{cd}	49.7^{e}
check	13.6^{a}	12.8^{a}	28.1^{cd}	36.6^{b}	41.7^{d}	49.5^{e}
Western wheatgrass						
picloram 1.0 lb/A	13.0^{a}	13.5^{a}	22.9^{ab}	30.2^{b}	35.9^{b}	43.6^{de}
picloram 1.5 lb/A	13.2^{a}	13.1^{a}	21.9^{a}	29.7^{b}	34.9^{ab}	39.4^{b-d}
2,4-D 2.0 lb/A	13.4^{a}	13.8^{a}	24.9^{b}	28.8^{b}	38.3^{bc}	42.2^{c-e}
dicamba 6.0 lb/A	12.1^{a}	12.9^{a}	24.2^{b}	25.7^{ab}	36.3^{bc}	38.5^{b-d}
check	13.3^{a}	11.2^{a}	25.1^{bc}	20.3^{a}	38.4^{b-d}	31.0^{a}
Smooth bromegrass						
picloram 1.0 lb/A	11.9^{a}	11.0^{a}	19.2^{a}	18.1^{a}	31.1^{ab}	29.1^{a}
picloram 1.5 lb/A	14.1^{a}	12.3^{a}	23.2^{b}	21.2^{ab}	37.3^{bc}	33.9^{ab}
2,4-D 2.0 lb/A	15.0^{a}	12.3^{a}	20.4^{a}	19.5^{a}	35.4^{ab}	31.7^{a}
dicamba 6.0 lb/A	11.4^{a}	13.1^{a}	17.6^{a}	22.8^{ab}	29.1^{a}	35.9^{a-c}
check	15.4^{a}	13.5^{a}	27.6^{c}	25.9^{b}	43.0^{d}	39.4^{b-d}
79 days after treatment						
Kentucky bluegrass						
picloram 1.0 lb/A	14.6^{a}[1]	12.8^{a}	29.2^{ef}	32.8^{g}[1]	43.5^{bc}	45.1^{bc}
picloram 1.5 lb/A	14.5^{a}	13.8^{a}	26.3^{cd}	33.2^{g}	41.2^{a-c}	49.9^{b-d}
2,4-D 2.0 lb/A	15.3^{a}	11.8^{a}	30.9^{f}	28.7^{f}	46.3^{cd}	40.5^{a-c}
dicamba 6.0 lb/A	13.9^{a}	12.6^{a}	27.4^{d}	37.5^{h}	40.9^{ac}	50.2^{cd}
check	13.6^{a}	14.8^{a}	25.1^{b-d}	39.3^{h}	38.7^{a-c}	54.1^{d}
Western wheatgrass						
picloram 1.0 lb/A	12.8^{a}	12.2^{a}	22.5^{ab}	22.1^{b}	35.3^{ab}	34.3^{a}
picloram 1.5 lb/A	13.2^{a}	12.5^{a}	30.5^{f}	33.9^{g}	36.2^{a-c}	36.4^{a}
2,4-D 2.0 lb/A	13.3^{a}	13.0^{a}	24.8^{b-d}	24.7^{cd}	38.1^{a-c}	37.7^{a}
dicamba 6.0 lb/A	12.6^{a}	13.2^{a}	21.0^{a}	25.2^{de}	33.5^{a}	38.4^{a-b}
check	13.5^{a}	12.4^{a}	24.5^{a-d}	26.2^{de}	38.0^{a-c}	38.6^{a-b}
Smooth bromegrass						
picloram 1.0 lb/A	13.5^{a}	14.2^{a}	21.5^{ab}	24.8^{cd}	34.9^{ab}	39.1^{a-c}
picloram 1.5 lb/A	14.9^{a}	13.9^{a}	23.5^{a-c}	22.1^{b}	28.4^{a-c}	36.0^{a}
2,4-D 2.0 lb/A	17.4^{a}	13.5^{a}	37.7^{g}	26.5^{e}	55.1^{de}	40.0^{a-c}
dicamba 6.0 lb/A	14.7^{a}	12.7^{a}	24.3^{a-d}	23.3^{bc}	39.0^{a-c}	36.0^{a}
check	17.5^{a}	13.1^{a}	39.9^{g}	20.1^{a}	57.4^{e}	33.2^{a}

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[1] Figures with the same letter in the same column are not significantly different at the .05 level.

[2] Significant interaction -- figures with the same letter for each species are not significantly different at the .05 level.

Effect of picloram, 2,4-D and dicamba on percent protein in above- and below-ground portions of three grass species. Lee, G. A., H. P. Alley and R. W. Gesink. Protein levels were measured by the Micro-Kjeldahl technique in the above- and below-ground portions of Kentucky bluegrass (*Poa pratensis* L.), western wheatgrass (*Agropyron smithii* Rydb.) and smooth bromegrass (*Bromus inermis* Leyss) plants 48 and 79 days after treatment with 2,4-D at 2.0 lb/A, dicamba at 6.0 lb/A and picloram at 1.0 or 1.5 lb/A.

No significant differences were detected in percent protein in above- or below-ground portions of Kentucky bluegrass plants regardless of herbicide treatment at 48 days after application (attached table). Western wheatgrass plants from areas treated with dicamba at 6.0 lb/A contained significantly higher levels of protein in the above-ground portions than plants from the nontreated check. There were no significant differences in percent protein 48 days after chemical application in the below-ground portions of western wheatgrass when comparing all herbicide treatments. The above-ground portions of smooth bromegrass plants from the plots receiving no herbicide and 2,4-D at 2.0 lb/A contained significantly lower levels of protein than plants from the other herbicide treated areas. Although no significant differences were detected, the protein levels were lower in the below-ground portions of smooth bromegrass plants in the nontreated check than from plants harvested from the herbicide treated areas. When comparing protein levels in the above-ground portions of all species treated with various herbicides, smooth bromegrass plants from the nontreated check plots contained significantly less protein than western wheatgrass from plots treated with picloram at 1.0 and 1.5 lb/A.

At 79 days after treatment, the below-ground portions of Kentucky bluegrass plants which received no herbicide contained significantly lower protein levels than western wheatgrass plants from plots treated with picloram at 1.5 lb/A and dicamba at 6.0 lb/A.

Protein levels appear to increase with plant stress. In nearly all cases the protein levels were higher in the above- and below-ground portions of plants treated with herbicides regardless of species. (Wyoming Agricultural Experiment Station, Laramie, SR-445).

Effect of herbicide treatments on protein levels in above- and below-ground parts of three grass species

Grass species	Herbicide treatment		Percent protein 48 days after treatment		Percent protein 79 days after treatment	
			above-ground	below-ground	above-ground	below-ground
Kentucky bluegrass						
	picloram	1.0 lb/A	5.60^{a}1/	4.24^{a}	6.31^{ab}	4.79^{ab}
	picloram	1.5 lb/A	6.33^{a}	4.41^{a}	6.23^{ab}	4.91^{ab}
	2,4-D	2.0 lb/A	6.11^{a}	4.01^{a}	5.73^{ab}	4.37^{ab}
	dicamba	6.0 lb/A	6.01^{a}	4.14^{a}	5.87^{ab}	4.49^{ab}
	check		5.94^{a}	4.15^{a}	5.82^{ab}	3.75^{a}
Western wheatgrass						
	picloram	1.0 lb/A	7.40^{bc}	5.27^{a}	7.25^{ab}	6.81^{ab}
	picloram	1.5 lb/A	7.88^{bc}	5.70^{a}	7.41^{ab}	7.27^{b}
	2,4-D	2.0 lb/A	7.51^{bc}	5.37^{a}	7.18^{ab}	6.24^{ab}
	dicamba	6.0 lb/A	8.21^{c}	6.00^{a}	7.63^{b}	6.99^{b}
	check		7.30^{b}	4.87^{a}	6.24^{ab}	5.80^{ab}
Smooth bromegrass						
	picloram	1.0 lb/A	7.33^{bc}	5.07^{a}	7.72^{b}	6.24^{ab}
	picloram	1.5 lb/A	7.79^{bc}	5.10^{a}	7.69^{b}	6.21^{ab}
	2,4-D	2.0 lb/A	5.95^{a}	4.96^{a}	6.09^{ab}	4.57^{ab}
	dicamba	6.0 lb/A	7.89^{bc}	5.35^{a}	7.64^{b}	5.25^{ab}
	check		5.81^{a}	4.06^{a}	5.30^{a}	4.58^{ab}

1/ Figures with the same letter in the same column are not significantly different at the .05 level.

Effect of picloram and 2,4-D amine on the seedling stages of winterfat (*Eurotia lanata* (Pursh.) Moq.). Jons, V. L. and J. L. Nelson. Recent field studies at the University of Wyoming on the use of herbicides to control undesirable range weeds indicated that mature winterfat (*Eurotia lanata* (Pursh.) Moq.) plants were highly susceptible to the chlorophenoxy herbicides, but resistant to picloram at 0.25 lb/A. Therefore, a greenhouse study was conducted to elucidate the effect of picloram, in comparison with 2,4-D, on winterfat seedlings. The objective of this trial was to determine the feasibility of using picloram to control undesirable plants in winterfat nurseries.

Picloram at 0.5 lb/A and 2,4-D amine at 2.0 lb/A was applied preemergence and to seedlings one, two and three weeks after planting. There was a nontreated control for each application date. Each treatment was replicated nine times in a randomized complete block design.

Picloram at 0.5 lb/A killed all winterfat seedlings (attached table). Also, 2,4-D treatments at 2.0 lb/A killed all seedlings unless applied preemergence. The 33 seedlings that emerged one to two weeks after application were about two-thirds the height of the control plants at evaluation time. Perhaps, these late seedlings came from slow germinating seeds and developed when some of the 2,4-D had dissipated. Results of this study indicate that winterfat seedlings are highly susceptible to both picloram and 2,4-D. It appears that this species may attain resistance at a more mature stage of growth. (Wyoming Agricultural Experiment Station, Laramie, SR-433.)

Effect of picloram and 2,4-D amine on winterfat seedlings

Treatment[1/]	Rate (lb/A)[2/]	Total winterfat seedlings treated	% Killed[3/]
Picloram			
Preemergence	0.5	225[4/]	100[5/]
One week	0.5	119	100
Two weeks	0.5	100	100
Three weeks	0.5	131	100
2,4-D amine			
Preemergence	2.0	225[4/]	85[5/]
One week	2.0	116	100
Two weeks	2.0	126	100
Three weeks	2.0	125	100
Nontreated control			
Preemergence	0.0	225[4/]	0
One week	0.0	123	0
Two weeks	0.0	124	0
Three weeks	0.0	125	0

1/ Preemergence treatment made one day after planting, other treatments were from the day of planting.

2/ Active ingredient per acre.

3/ Based upon observation 4 weeks after treatment.

4/ Number of seeds planted.

5/ % kill based upon number of seeds planted.

Differential sensitivity of two biotypes of *Senecio vulgaris* L. to several *s*-triazine herbicides. Radosevich, S. R. and **A. P. Appleby**. Seeds were obtained from Dr. G. F. Ryan, Western Washington Experiment Station, Puyallup, of a biotype of common groundsel (*Senecio vulgaris* L.) which had been shown to be resistant to atrazine and simazine. Studies were conducted to determine whether this biotype was also resistant to other triazine herbicides and to investigate possible mechanisms of resistance. The herbicides tested were simazine, atrazine, prometone, terbutryn, prometryne, and GS-14254 [2-(sec-butylamino)-4-(ethylamino)-6-methoxy-s-triazine]. Groundsel plants grown from seeds collected in the Corvallis area were effectively controlled by 0.5 ppm of atrazine and simazine, 1 ppm of GS-14254 and prometone, and 4 ppm of prometryne. Plants grown from seeds collected near Puyallup failed to show any sumptoms of photosynthesis inhibition at the highest rates tested; i.e., 4 ppm for simazine and 30 ppm for atrazine, GS-14254, prometone, and prometryne. Both biotypes were resistant to terbutryn at 30 ppm. Studies carried out in a nutrient culture indicated that resistance was not based upon morphological differences such as depth of rooting, time of emergence, etc., but rather was physiological in nature.

Photosynthesis, as measured by CO_2 uptake, was completely inhibited by simazine in susceptible plants but resistant plants were unaffected. Photosynthesis in the susceptible biotype resumed when the herbicide was removed after 24 hours.

Absorption and metabolism of simazine were explored as possible explanations for the herbicide tolerance exhibited by the resistant biotype. Both biotypes absorbed the herbicide equally well and no differences in simazine breakdown were found which could explain the mechanism of resistance. Plants of both biotypes were subjected to radioactive simazine for up to 96 hours. The greatest concentration of ^{14}C activity (80-90%) was located in the chloroform-soluble fraction of the foliage tissue of each biotype. The ^{14}C in this fraction of the plant extracts was determined by thin-layer chromatography to be ^{14}C-simazine. Small amounts of ^{14}C activity (10-15%) were isolated in the water-soluble fraction of the plant extracts but time course studies revealed no differential increase in water-soluble simazine metabolites between the two biotypes.

The mechanism of resistance in the resistant biotype was not determined. Apparently, this mechanism is different from other resistance mechanisms in crops such as corn and sorghum. One working hypothesis whicy may be advanced is that the resistant biotype has the ability to rapidly form a conjugate with simazine which is broken during the extraction procedures. (Dept. of Agron. Crop Sci., Ore. St. Univ., Corvallis).

NOMENCLATURE AND ABBREVIATIONS

Tables 1 and 2 below are nomenclature and abbreviation lists of the Weed Society of American (Nomenclature Weeds 19(1), 1971). Authors are urged to use this terminology and abbreviation whenever applicable.

Table 1. Common and Chemical Names of Herbicides[1/]

Common name	Chemical name[2/]
A	
alachlor	2-chloro-2',6'-diethyl-*N*-(methoxymethyl) acetanilide
ametryne	2-(ethylamino)-4-(isopropylamino)-6-(methylthio)-*s*-triazine
amitrole	3-amino-s-triazole
asulam	N-(4-aminobenzenesulphonyl)-methylcarbamate
ATC	ammonium thiocyanate
atrazine	2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine
B	
bandane	polychloro dicyclo pentadiene isomers
barban	4-chloro-2-butynyl *m*-chlorocarbanilate
bensulide	*O,O*-diisopropyl phosphorodithioate *S*-ester with *N*-(2-mercaptoethyl)benzenesulfonamide
bentazon	3-isopropyl-2,1,3-benzo-thiadiazinone-(4)-2,2-dioxide
benthiocarb	
bromacil	5-bromo-3-*sec*-butyl-6-methyluracil
bromoxynil	3,5-dibromo-4-hydroxybenzonitrile
butylate	*S*-ethyl diisobutylthiocarbamate
C	
cacodylic acid	hydroxydimethylarsine oxide
CDAA	*N,N*-diallyl-2-chloroacetamide
CDEC	2-chloroallyl diethyldithiocarbamate
chlorbromuron	3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea
chlorflurenol	methyl 2-chloro-9-hydroxyfluorene-9-carboxylate
chloroxuron	3-[*p*-(*p*-chlorophenoxy)phenyl]-1,1-dimethyl=urea
chlorpropham	isopropyl *m*-chlorocarbanilate
CIPC (see chlorpropham)	
cobex (see dinitramine)	
cyanazine	2-[[4-chloro-6-(ethylamino)-*s*-triazine-2yl]amino]-2-methylpropionitrile
cycloate	*S*-ethyl N-ethylthiocyclohexanecarbamate
cyprazine	2-chloro-4-cyclopropylamino-6-isopropylamino-1,3,5-triazine

Table 1. Common and Chemical Names of Herbicides (continued)

Common name	Chemical name
D	
dalapon	2,2-dichloropropionic acid
DCPA	dimethyl tetrachloroterephthalate
delachlor	N-isobutoxymethyl-α-chloroaceto-2,6-dimethyl-anilide
dicamba	3,6-dichloro-*o*-amisic acid
dichlobenil	2,6-dichlorobenzonitrile
dichlorprop	2-(2,4-dichlorophenoxy)propionic acid
dinitramine	N^4,N^4-diethyl-α,α,α-trifluoro-3,5-dinitrotoluene, 2,4-diamine
dinoseb	2-*sec*-butyl-4,6-diphenylacetamide
diphenamid	*N*,*N*-dimethyl-2,2-diphenylacetamide
diuron	3-(3,4-dichlorophenyl)-1,1-dimethylurea
DNBP (see dinoseb)	
E	
EPTC	*S*-ethyl dipropylthiocarbamate
F	
fenac	(2,3,6-trichlorophenyl)acetic acid
fenuron	1,1-dimethyl-3-phenylurea
fluorodifen	*p*-nitrophynyl-α,α,α-trifluoro-2-nitro-*p*-tolyl ether
furloe (see chlorpropham)	
G	
glyphosate	(*N*-(phosphonomethyl)-glycine)
I	
isopropalin	2,6-dinitro-*N*,*N*-dipropylcumidine
K	
karbutilate	*tert*-butylcarbamic acid ester with 3-(*m*-hydroxyphenyl)-1,1-dimethylurea
L	
linuron	3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea
M	
maleic hydrazide	1,2-dihydro-3,6-pyridazinedione (1,2,3,6-tetrahydro-3,6dioxopyridazine)(6-hydroxy-3-(2H)-pyridazinone)
MCPA	[(4-chloro-*o*-tolyl)oxy]acetic acid
MCPP (see mecoprop)	
mecoprop	2-[(4-chloro-*o*-tolyl)oxy]propionic acid
methazole	2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione
metribuzin	4-amino-6-*tert*-butyl-3-(methylthio)-*s*-triazin-5(4H)one
methyl bromide	
monuron	3-(*p*-chlorophenyl)-1,1-dimethylurea
MSMA	monosodium methanearsonate

Table 1. Common and Chemical Names of Herbicides (continued)

Common name	Chemical name
N	
nitralin	4-(methylsulfonyl)-2,6-dinitro-*N*,*N*-dipropylaniline
nitrofen	2,4-dichlorophenyl *p*-nitrophenyl ether
notram	
O	
oryzalin	3,5-dinitro-*N*^{4},*N*^{4}-dipropylsulfanilamide
oxadiazon	
P	
paraquat	1,1'-dimethyl-4,4'-bipyridinium ion
pebulate	*S*-propyl butylethylthiocarbamate
phenmedipham	methyl *m*-hydroxycarbanilate *m*-methylcar= banilate
picloram	4-amino-3,5,6-trichloropicolinic acid
prometone	2,4-bis(isopropylamino)-6-methoxy-*s*-triazine
prometryne	2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine
pronamide	*N*-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide
propachlor	2-chloro-*N*-isopropylacetanilide
propazine	2-chloro-4,6-bix(isopropylamino)-*s*-triazine
propham	isopropyl carbanilate
pyrazon	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
S	
silvex	2-(2,4,5-trichlorophenoxy)propionic acid
simazine	2-chloro-4,6-bis(ethylamino)-*s*-triazine
T	
tandex (see karbutilate)	
TCA	trichloroacetic acid
tebuthiuron	
terbacil	3-*tert*-butyl-5-chloro-6-methyluracil
terbutryne	2-(*tert*-butylamino)-4-= (ethylamino)-6-(methylthio-*s*- = triazine
triallate	*S*-(2,3,3-trichloroallyl) diisopropyl= thiocarbamate
trifluralin	*α*,*α*,*α*-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine
2,4-D	(2,4-dichlorophenoxy)acetic acid
2,4-DB	4-(2,4-dichlorophenoxy)butyric acid
2,4,5-T	(2,4,5-trichlorophenoxy)acetic acid
V	
vernolate	*S*-propyl dipropylthiocarbamate

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[1] Herbicides no longer in use in USA are omitted. Complete listing, including these, is in WEEDS 14(4), 1966.

Table 1. Common and Chemical Names of Herbicides (continued)

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[2] As tabulated in this paper, a chemical name occupying two lines separated by an equal (=) sign is joined together without any separation if written on one line.

[3] This herbicide usually is available as mixed isomers. When possible, the isomers should be identified, the amount of each isomer is the mixture specified and the source of the experimental chemicals given.

Table 2. Abbreviations of terms used in weed control

Abbreviations	Definitions
A	acre(s)
ae	acid equivalent
aehg	acid equivalent per 100 gallons
ai	active ingredient
aihg	active ingredient per 100 gallons
bu	bushel(s)
cfs	cubic feet per second
cu	cubic
diam	diameter
fpm	feet per minute
ft	foot or feet
g	grams(s)
gal	gallon(s)
gpa	gallons per acre
gph	gallons per hour
gpm	gallons per minutes
hr	hour(s)
ht	height
in	inch(es)
l	liter(s)
lb	pound(s)
mg	milligram(s)
mi	mile(s)
min	minute(s)
ml	milliliter(s)
mm	millimeter(s)
mp	melting point
mph	miles per hour
oz	ounce(s)
ppmv	parts per million by volume
ppmw	parts per million by weight
ppt	precipitate
psi	pounds per square inch
pt	pint(s)
qt	quart(s)
rd	rod(s)
rpm	revolutions per minute
sp gr	specific gravity
sq	square
T	ton(s)
tech	technical
temp	temperature
wt	weight
w/v	weight per volume. Do not use this abbreviation. Instead give specific units (examples: g/l or lb/gal)
NCWCC	North Central Weed Control Conference
NEWCC	Northeastern Weed Control Conference
SWSS	Southern Weed Science Society
WSSA	Weed Science Society of America
WSWS	Western Society of Weed Science

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