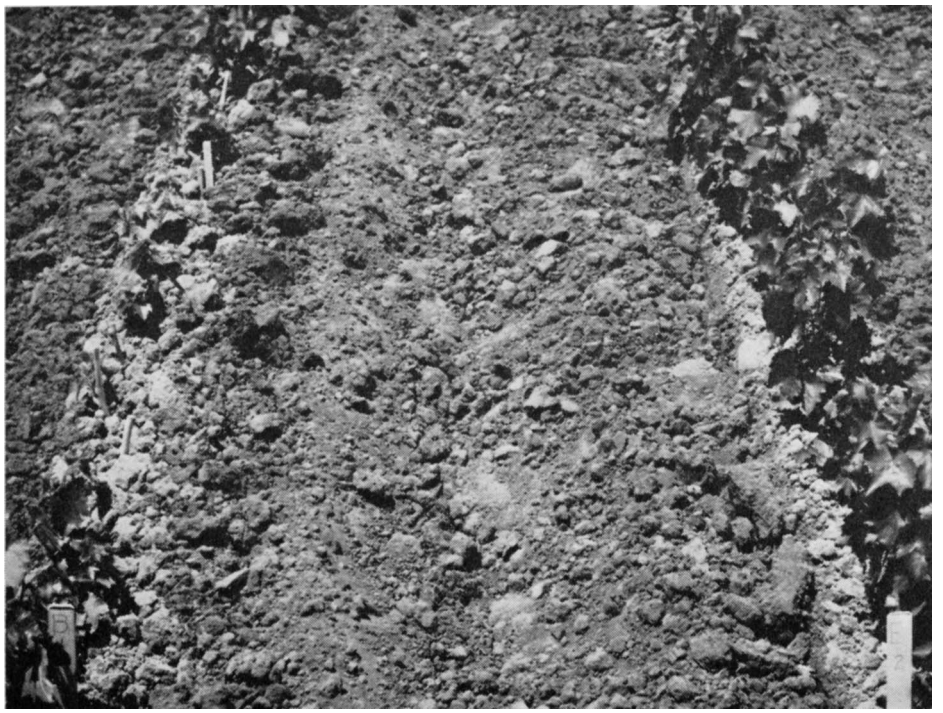

A comparison of effects of simazine (left) at 2 lbs and trifluralin (right) at 4 lbs applied on the surface and rained-in.

Under the conditions of the experiments reported, trifluralin, nitralin, DCPA, bensulide and two commercially unavailable compounds were safest on young grape vines. Fair to good weed control was obtained at safe rates except where resistant weed species were present. Shallow incorporated trifluralin will control weeds at ½ to 1 lb per acre rates, and will prove useful for weed control in grape nurseries; however, care should be taken to follow the labeled rates and directions for incorporation. Combinations of the grass herbicides such as trifluralin, nitralin, DCPA, diphenamid and bensulide with simazine and several new herbicides for broadleaf weed control are being studied further.

WEEDS COMPETE with young grape vines and can cause severe stunting. Few herbicides are labeled for use in vineyards less than three years old. Selective herbicides such as simazine (Princep) and diuron (Karmex) are recommended for use in vines three or more years old. Trifluralin (Treflan) is registered for use on young, non-bearing vines and was recently recommended by the University of California. DCPA (Dacthal) and diphenamid (Dymid or Enide), although not registered for use in grapes, have proven to be fairly safe for vines in greenhouse and nursery field plots. Mechanical cultivation generally controls weed growth between rows satisfactorily, but not in the nursery row or young vineyard vine row.

A series of experiments was conducted during the past five years to investigate the possibility of chemical weed control in plantings of young vines. Greenhouse studies conducted in 1963 and 1964 at Davis, employing a sand culture herbicide leaching technique, brought out two important points. First, several herbicides were safer on young vines than simazine and diuron. These were trifluralin, DCPA, bensulide (Prefar) and diphenamid. Secondly, in tests of the effect of simazine and diuron on 22 common varieties of grapes, a wide range of response was found among varieties.

With this information as a background, a series of 12 field trials with herbicides was conducted using both grape cuttings and one-year-old nursery rootings. Most of the common grape varieties were studied. These tests were carried out in commercial vineyards and nurseries and at the Kearney and Davis Field Stations. In general the herbicides were applied to recently prepared soil immediately following the planting of young dormant cuttings and/or rooted cuttings. In some trials, trifluralin and a few selected herbicides were incorporated by hand hoeing or mechanical tilling to a depth of two to four inches. In others, these herbicides were left on the surface and flood- or sprinkler-irrigated into the soil. These variables are given in the tables.

TABLE 1. THE EFFECT OF SEVERAL HERBICIDES ON THE WEED CONTROL AND GROWTH OF THOMPSON AND 1613 CUTTINGS (MERCED)

Herbicide	Amt. applied	Weed Control at 1 month	Phytotoxicity		Fresh Weight†	
			Thompson	1613	Thompson	1613
	lb/A	Av. rating*	Av. rating*	Av. rating*	lbs.	lbs.
Simazine	1	10	0	0.5	216	189
Simazine	2	10	0.2	1.2	203	208
Simazine	4	10	0.7	4.0	177	139*
Trifluralin	1	8.0	0	0	199	269
Trifluralin	4	9.2	0	0	189	218
DCPA	8	9.5	0	0	236	263
DCPA	16	8.7	0	0	191	278
Bensulide	4	9.0	0	0.2	212	238
Bensulide	16	9.0	0.2	0.2	204	211
Diphenamid	4	8.2	0.2	0	169	220
Diphenamid	16	9.2	0.2	0	213	245
Check	–	5.0	0	0.2	227	220
LSD	.05				NS	61

* Average of 4 replications. Weed control rating: 0 = no control, 10 = complete control. Main weed species present C. murale and C. album. Phytotoxicity rating: 0 = no effect, 3 = chlorotic pattern, 10 = all foliage dead.

† Plants cut off at ground level and weighed Sept. 22, 1965.

Control outstanding

Weed control with simazine was outstanding in most trials at both Monterey County locations. Diuron and prometryne at 1 and 2 pounds also gave satisfactory weed control. Diphenamid, DCPA, trifluralin and bensulide were particularly weak in controlling such broadleaf species as shepherd's purse, mustard and hairy nightshade, even though trifluralin and bensulide were incorporated by hand hoe.

Weed control was generally better where the soil had been prepared and cultivated and where weeds had been cleared before the pre-emergence herbicides were applied. However, standing weeds were removed in one trial by the addition of 1 pound per acre of amitrole.

In two Monterey trials there were no symptoms from rates of simazine and

WEED CONTROL IN YOUNG GRAPES

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diuron up to two pounds per acre; trifluralin up to 4 pounds per acre; diphenamid and bensulide up to 8 pounds per acre; and DCPA up to 16 pounds per acre.

In a third test, on coarse sandy soil at the Kearney Field Station, at rates similar to those in the Monterey trials, severe toxicity occurred with use of simazine and diuron under sprinkler irrigation.

Toxicity

There was sufficient toxicity to cause a marked decrease in the fresh weight of grapes harvested at the end of the growing season. Simazine appeared to be more toxic than diuron to the four varieties tested. This was in direct contrast to results of greenhouse tests. These field results suggested the soil at Kearney, although very sandy, may have influenced the availability of the diuron more than it influenced simazine since the greenhouse work was done in washed river sand. Trifluralin and DCPA showed no indications of being toxic. Prometryne caused some symptoms, but apparently prometryne broke down or became unavailable before much of it came in contact with the root system. Diphenamid caused no early injury symptoms, but blotchy chlorosis generally associated with excess diphenamid was apparent toward the end of the season. This did not, however, appear to affect the fresh weight of grapes harvested. On the other hand, some toxicity may have been masked by weed competition as has been shown in other nursery work. This rather late effect of diphenamid may be related to its low solubility and slow movement into the soil. Also it may not tie up as readily or become unavailable in the soil.

Since trifluralin will control many weed species at ½ to 1 lb per acre, when

Annual weed control with pre-emergence herbicides on young grapes, Napa County trial.

properly incorporated, it appeared to have considerable potential for weed control in grape nurseries because of its safety to grape vines. DCPA likewise showed appreciable safety on grapes but was generally somewhat weak on a number of broadleaf weed species.

In a Merced County trial, 4 lbs per acre of simazine was excessive; simazine caused some chlorosis even at 2 lbs per acre in Thompson and a reduction in total fresh weight at 4 lbs per acre. Trifluralin at 4 lbs per acre did not significantly reduce fresh weight nor did DCPA cause any reduction in fresh weight.

A heavy infestation of sandbur and puncturevine in the Borrego trial was reduced by most of the herbicides tested but was best controlled with trifluralin. Trifluralin caused considerable stunting and loss of stand under these desert conditions. Simazine caused some chlorosis at 4 lbs per acre, but gave excellent results at 1 pound per acre.

Kern County results with trifluralin incorporated at 4 inches and 8 inches showed no detrimental effects at rates of 1 to 4 lbs per acre.

The choice of a herbicide must depend on the weeds to be controlled and on which herbicide will give the most safety to young vines over the widest range of environmental conditions. A summary of the 1963–1966 simazine phytotoxicity data showed location to be important. Simazine was safe at 8 lbs per acre in one location, but even 1 lb per acre was too toxic at a second location. In one year, 1 and 2 lbs per acre were too toxic, but not the next year. This could be a reflection of differences in the irrigation practices. Except for this one experiment, rates of up to 2 lbs per acre were generally acceptable at most locations. Four lbs per acre and more were generally too high for young vines at a number of locations.

Trifluralin rates

Rates of up to 8 lbs per acre of trifluralin did not appear excessive in one trial, and lower rates were generally safe.

DCPA at 16 lbs per acre was safe, but 32 pounds per acre was excessive in some locations. Prometryne showed no advantage over simazine based on early phytotoxicity ratings. Diuron was generally similar to simazine in effect and safety. Diphenamid and bensulide were generally safe but weak in controlling weeds.

Weed control was generally better where the soil had been prepared and cultivated free of weeds before the pre-emergence herbicides were applied. Weed competition at the lower rates of herbicide application and with the shallower planted vines may have masked some phytotoxicity from herbicides. It is generally felt by nurserymen that a minimum of 70 to 75 per cent weed control is necessary in nursery plantings.

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TABLE 2. THE EFFECT OF INCORPORATION DEPTH OF TRIFLURALIN ON THE GROWTH OF PERLETTE AND THOMPSON SEEDLESS CUTTINGS PLANTED INTO TRIFLURALIN TREATED SOIL (WASCO)*

Incorp. Depth	Amt Trifluralin	Perlette				Thompson Seedless			
		Vigor			Percent of Weight	Vigor†			Percent of Weight‡
		5/12/66	7/6	10/13		5/12/66	7/6	10/13	
in.	lb A	rating	rating	rating	%	rating	rating	rating	%
4	0	7.7	5.0	7.0	100	9.7	5.5	7.2	100
	1	6.5	7.3	10.0	152	8.7	6.3	9.2	159
	2	8.0	7.0	9.5	135	7.5	6.0	9.0	137
	4	5.5	7.3	9.7	177	8.0	6.3	9.5	162
8	0	7.5	7.5	9.0	100	8.5	5.8	6.7	100
	1	6.5	8.8	9.7	119	9.2	8.5	9.7	123
	2	6.7	8.8	9.5	114	7.0	6.8	9.0	156
	4	5.7	7.8	9.2	116	7.7	6.8	8.0	143

*Applied and tilled in on December 9, 1966. Evaluations are for four replications.

† Vigor ratings: 0 = dead; 10 = normal.

‡ Weight measurements made October 13, 1966 on ten plants in each plot; comparisons of total of four replications made with the untreated check.

TABLE 3. EFFECTIVENESS OF PREPLANT INCORPORATED HERBICIDES ON WEED CONTROL IN NEWLY PLANTED VINEYARDS (FRESNO)—TREATED FEB. 25, 1966

Herbicide	Amt. applied	Weed Control Evaluations			Percent of fresh wt. 3/10/67
		5/11	6/25	7/27	
	lb/A	Average rating*			%
Trifluralin	1	10.0	9.5	8.0	96
Trifluralin	2	10.0	9.75	9.0	108
Nitralin	1	9.5	9.0	8.0	92
Nitralin	2	10.0	9.75	9.0	104
Bensulide	4	9.0	8.75	7.0	93
Bensulide	6	9.0	8.25	7.5	96
Untreated	–	2.0	3.0	0	100

* Weed control evaluations are based on a scale 0 – 10, 0 = no control, 10 = perfect control. The values are the averages of 4 replications. (12 vines). The soil was a San Joaquin sandy loam, ph 7.4, OM = 0.88% and clay 12.8%. Weeds present are: barnyard grass, crabgrass, puncture vine, lambsquarter and pigweed.

TABLE 4. THE EFFECT OF LOCATION ON RESPONSE OF YOUNG GRAPE VINES TO DORMANT APPLICATIONS OF SIMAZINE

Location	Soil Type	Percent OM	Type Irrig.	Phytotoxicity at rates of:			
				1 lb/A	2 lb/A	4 lb/A	8 lb/A
		%		Average Rating*			
Borrego	V.S.	0.2	Basin	0	0	1.5	....
Kearney (1965)	S.	0.6	Sprink.	6.0	8.0	....	....
Kearney (1966)	S.	0.6	Sprink.	0.3	0.3	1.4	....
Kearney (1967)	S.	0.6	Flood	....	....	7.3	....
Kearney (1968)	S.	0.6	Flood	....	2.8	8.8	....
Monterey	L.	2.3	Sprink.	0.5	1.0	4.3	....
Monterey	L.	2.6	Sprink.	0	0	....	....
Monterey†	L.	2.6	Sprink.	0	0	....	....
Merced	C.L.	3.0	Furrow.	0	2.1	2.5	....
UCD	C.L.	4:5	Furrow.	....	0.5	1.1	2.0

*Average of 3 to 4 replications per location. Phytotoxicity was rated where 0 = no effect; 10 = all vines dead.

† *Different location.*

TABLE 5. THE EFFECT OF LOCATION ON RESPONSE OF YOUNG GRAPE VINES TO DORMANT APPLICATION OF TRIFLURALIN

Location	Soil Type	Depth of Incorp.	% O.M.	Type Irrig.	Average Phytotoxicity@			
					1 lb/A	2 lb/A	4 lb/A	8 lb/A
			%		Average rating*			
Borrego Sp	VS	4-6"	0.2	Basin	1.3	....	3.0	....
Kern (Wasco)	VS	4-8"	....	Furrow	0	0	0	....
Kearney (1965)	S	0	0.6	Sprink.	....	....	0	....
Kearney (1965)	S	3-4"	0.6	Sprink.	0	....	0	....
Kearney (1967)	S	3-4"	0.6	Flood	0	....	0	....
Kearney (1968)	S	3-5"	0.6	Flood	....	1.0	....	....
Monterey	L	0	2.3	Sprink.	....	0	0	....
Monterey	L	0	2.6	Sprink.	....	0	0	....
Monterey	L	2-4"	2.6	Sprink.	0	....	4.0	....
Merced	CL	0	3.0	Furrow	0	....	0	....
UCD	CL	2-4"	4.5	Furrow	....	0	....	0

* Average of 3 to 4 replications per location. Phytotoxicity was rated where 0 = no effect; 10 = all vines dead.