Morning Glory Control In Vineyards

. . . with two new soil-residual herbicides: dichlobenil and chlorthiamid

A WIDE VARIETY of annual weeds in commercial vineyards have been controlled in recent years with chemical herbicides. Although very effective on these annuals, the use of such herbicides has actually increased difficulties with perennial weeds in many plantings. An active research program has been under way at the University to develop means of controlling these persistent pests. A number of foliar-contact and hormone-type herbicides have been recommended for use against them. However, there remains an urgent need for an effective soil-residual herbicide that would be effective against perennial weeds.

Field morning glory, *Convolvulus arvensis*, is a very deep-rooted, persistant perennial weed. It is now the most serious weed in the nonirrigated vineyards of California. Although 2,4-D-type herbicides have been used effectively on morning glory in vineyards, control has not been as permanent as was earlier anticipated. Difficulties have been encountered with proper timing of spray applications with respect to the springtime growth of both the weed and the vines. A more rapid than anticipated regrowth of the morning glory stand has also occurred at times following what appeared initially to be a quite effective kill with these herbicides. In effect, the hormone herbicides have afforded only temporary control of this perennial weed.

Dichlobenil

The chemical, dichlobenil (Casoron), was first tested on grapevines in California in 1963. The relatively low toxicity of dichlobenil found in these tests and reports of its effective use in orchards in the Pacific Northwest and in Europe prompted further studies in the experimental vineyards at Davis. Chlorthiamid (Prefix), a more soluble herbicide which decomposes into dichlobenil in the soil, was also included in these studies; this herbicide has partially controlled field morning glory when applied to the soil surface in European vineyards, but it is not available in the U.S.

In the spring of 1967, a test area was chosen in a three-year-old own-rooted planting of the grape variety French Colombard which was uniformly and heavily infested with field morning glory. The vines in this block were spaced 8 ft apart in the row and the rows were spaced at 12 ft. The soil type is Yolo fine sandy loam quite deep and well drained.

At the time of application of the dichlobenil (February 24), the soil was worked into a fine mulch to a depth of 4 inches using a rotary tiller. Chlorthiamid was applied 4 days later. The soil moisture content was high but soil tilth was very good.

A treatment plot consisted of a 6-ft-wide strip in the vine row 16 ft long, with one test vine standing in the center of each plot. Three replications of each treatment were used.

The question of volatilization of the chemicals from the soil surface under the relatively high sunshine conditions at Davis prompted a comparison of subsurface, banded applications with surface applications. Dichlobenil was applied as 4 per cent granules and chlorthiamid as 7.5 per cent granules.

Field morning glory stands in control and dichlobenil plots treated at 10 lbs per acre on February 24, 1967 and photographed on June 15, 1967: left photo, surface applications to left and control plot to right; right photo, subsurface banded, to right, and control to left.

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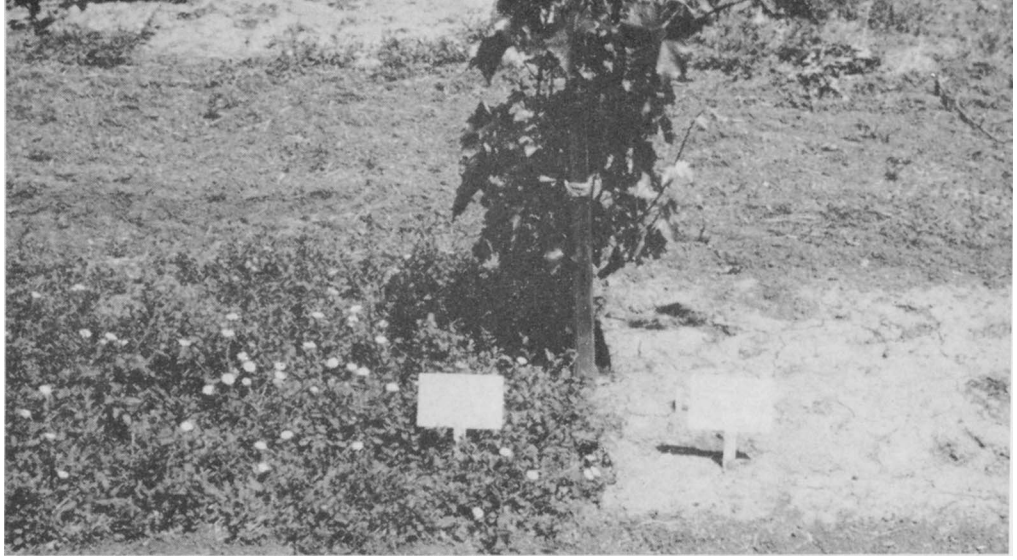


Effectiveness of subsurface, banded applications of dichlobenil for control of morning glory in vineyards is shown in photo of treated plot to right, as compared with check to left.

To make these subsurface treatments, the tilled soil was removed to a uniform 3-inch depth and the granules were broadcast by hand. The soil was then replaced and the surface lightly compacted, thus creating a uniform band of chemical 3 inches below the soil surface.

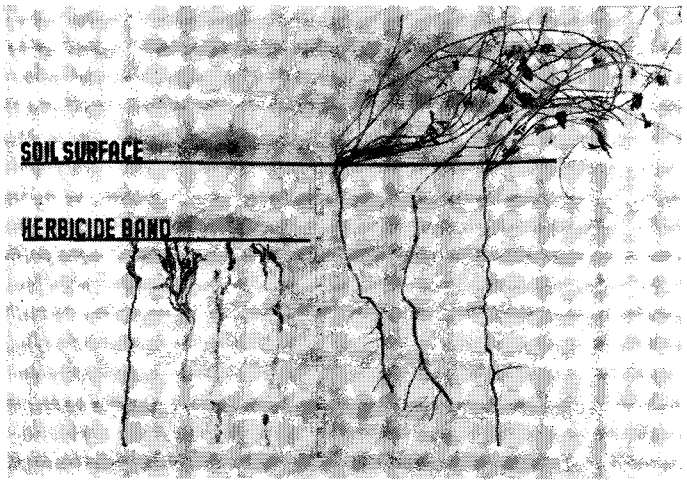
Rainfall

Spring rainfall at the site, following the February 24 applications, was as follows: 0.70 inch during the remaining days in February; 3.75 inches during March and 3.92 inches in April. Summer irrigation water was applied twice, in early July and late August, by flooding shallow furrows constructed in the 6-ft row-centers not included in the treated area. These centers were disked between irrigations and developed heavy field morning glory stands repeatedly during the summer. No irrigation water was applied over the treated soil area during the summer of 1967. Observations were taken on the development of the regrowth of field morning glory in each of the plots. Table 1 shows the pretreatment stand of field morning glory, along with the rates and manner of application of the two chemicals. The growth of the weeds following the various treatments is given either as percentage of ground cover or as the actual count of developing crowns of growth on the 96 sq ft in each plot (on October 4, 1966). The markedly effective control afforded by the subsurface, banded applications of both chemicals is evident from these data. At the 10-lb-per-acre rate, complete control was achieved for the entire growing season. The 10-lb-per-acre surface application of the more soluble chlorthiamid was considerably more effective than dichlobenil. Although morning glory regrowth was delayed in these surface-treated plots, the crowns did continue to enlarge as the season progressed.

The photographs (taken on 6/15/67) show the marked effectiveness of the banded dichlobenil treatment when compared with the untreated plot and the less-complete control of field morning glory obtained by the surface applications. In these plots it can be noted that the herbicide did delay, and to some degree stunt, the weed's spring regrowth. No symptoms resulting form any of the herbicide treatments were observed during the season on fruit, foliage, or on the nature or amount of grapevine growth.

The nearly complete effectiveness of the subsurface, banded treatments in the control of the morning glory growth above the soil surface led to an examination of the effects on the weed at and below the placement of the chemicals. A 4-ft-deep trench was dug midway between two vines across a control plot and one of the banded, 10 lb-per-acre, dichlobenil plots, on October 11, 1967. From the 24 sq ft of surface examined, the two trenches showed 254 live roots and no dead roots in the control plot, as compared with 88 live roots and 19 dead roots in the treated plot. Specific dieback with multiple branching was noted in morning glory crowns immediately

Morning glory plants from control plot (right) and plot given a subsurface, banded application of dichlobenil at 10 lbs per acre (left).



FIELD MORNING GLORY DENSITY AT SEVERAL DATES BEFORE AND FOLLOWING HERBICIDE APPLICATIONS*

Treatments 2/24/67	Ground cover 10-4-66	No. of crowns 5-10-67**	Ground cover 6-12-67	No. of crowns 10-27-67	Ground cover 10-27-67
	%		%		%
Control	25	>30	57	87	80
Dichlobenil 5 lb/Acre—Surface	23	22	22	65	57
Dichlobenil 5 lb/Acre—3" deep band	35	0	<1	11	4
Dichlobenil 10 lb/Acre—Surface	35	8	25	63	61
Dichlobenil 10 lb/Acre—3" deep band	32	0	0	1	<1
Chlorthiamid 10 lb/Acre—Surface	30	1	2	23	8
Chlorthiamid 10 lb/Acre—3" deep band	41	0	<1	1	<1

* Average of three replicates.
** Morning glory plants had just broken through the ground surface.

below the zone of chemical placement (see photo). A severe below-ground tip burning was evident on the treated plants, but this was quite localized. Less than 3 inches below this chemical band, root appearance was relatively normal. The more fleshy nature and lighter color of the treated roots probably reflects the depletion of food reserves following a full season without top growth. This can be related to the marked reduction in root population found on the profile of the trench in the treated plot.

These initial vineyard studies of the two soil residual chemicals, dichlobenil and chlorthiamid, indicate a possibility of effective control of field morning glory in a planting of vines. The subsurface banding technique of application of the chemicals may be entirely necessary to obtain uniform high control, however. Although the more soluble chlorthiamid was more effective than dichlobenil applied on the soil surface, the morning glory control afforded by this treatment was insufficient to suggest its use without follow-up treatments. The effectiveness of the subsurface, banded treatments was evident; however, it appears that this band must remain undisturbed for at least one season.

Irrigation

The usefulness of these herbicides for weed control and their safety in young vineyards is no doubt related to the method of application of irrigation water to the vines and to the soil type at the site. Irrigation applied by sprinkler or flooding over the treated soil could both reduce the effectiveness of the herbicide on the weeds and increase its danger to the vines.

Under the conditions of these trials, both chemicals appear to be safe for use on young grapevines. Additional tests, however, will be conducted on plants less than three years of age, and their reaction to higher dosage rates will be examined. These studies and others on various means of mechanical incorporation of the chemicals into the soil are now under way in the experimental vineyards at U. C., Davis.

Dichlobenil has federal registration for use on grapes but is not currently recommended by the University of California. Chlorthiamid is an experimental material.

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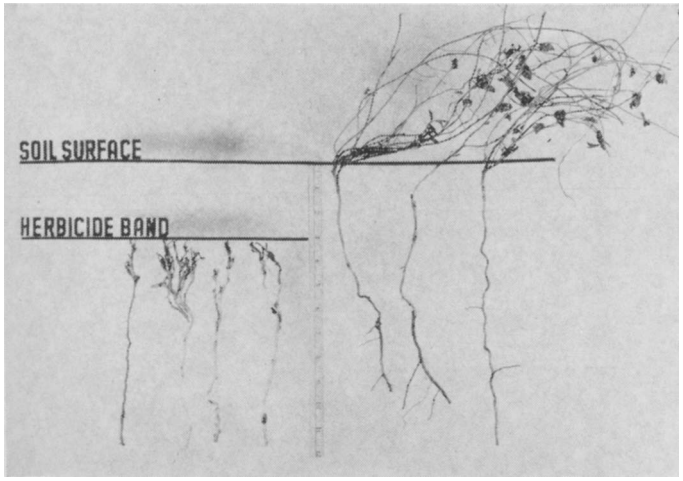

Weed competition in cole crops can be severe.

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Of the many herbicides tested recently in California cole crops, FW-925 (TOK-E-25) —applied pre-emergence without incorporation—had the largest and most consistent margin of safety for direct-seeded cole crops. Such herbicides as DCPA, Glenbar, and bensulide also gave adequate control of certain weed species, along with an excellent margin of safety. Herbicides with less safety but with a wider weed control spectrum included trifluralin and CIPC. CDEC was effective on some important weed species, but had a somewhat narrower margin of safety. Combinations of herbicides — including trifluralin and FW-925 are being tested this year in uniform trials on cole crops throughout California. This is a progress report of research with new herbicides and is not to be considered a recommendation of the University of California. Many of the materials used in these tests are not registered for use in cole crops.

ACCORDING TO recent estimates, two-thirds of the total cole crop production in western United States is produced in California, involving nearly 61,000 acres. Cole crops include broccoli, cabbage, cauliflower, brussels sprouts, turnips, rutabagas, radishes, chinese cabbage, mustard greens, kohlrabi, and collards. Largest acreage in California is in broccoli, cauliflower, cabbage, and brussels sprouts. According to a 1965 survey of weed control problems in vegetable crops, about 5% of the approximately 36,000 acres surveyed had been treated with such herbicides as CDEC (Vegadex), CIPC, or DCPA (Dacthal).

In this same survey, the principal weeds found in cole crops included burning nettle, shepherdspurse, pigweed, lambsquarter, groundsel, annual ryegrass, nightshade, cheeseweed and mustard. Chickweed, annual bluegrass, and purslane are also important weeds in coastal vegetable areas. In Monterey County, as much as 30 to 35% of the acreage is now treated with herbicides. On most of this acreage the herbicides are applied to cole crops that have been direct-seeded. Ninety-five per cent of the broccoli, cabbage, and cauliflower is currently direct-seeded in Monterey County; the other 5% is transplanted. It has also been estimated that hand weeding costs approximately $30 to $55 an acre for cole crops.

Chemical control

Most of the herbicides found safe on crucifer crops were also weak on some winter annuals such as those found in the family *Cruciferae*. Counts listed by species in table 1 show results of both good and poor control by a given herbicide on some weed species. Shepherdspurse was not controlled by benefin (Balan) or trifluralin (Treflan); whereas purslane, henbit and speedwell were controlled.

CDEC (Vegadex) applied at 6 to 8

TABLE 1. AVERAGE NUMBER OF WEEDS PER PLOT AND AVERAGE PERCENT WEED CONTROL IN CABBAGE

Herbicide	Rate	Shepherds-purse	Purslane	Hairy nightshade	Henbit	Burning nettle	Speed-well	Cheese-weed	Control
	lbs/A	Average number of weeds per plot							Average percent
Ramrod	4	42	26	13	2	3	0	1	89
"	8	2	8	6	1	3	0	1	97
CDEC	6	43	13	30	0	3	0	3	88
Trifluralin	1	93	4	13	5	8	0	0	85
"	2	26	0	4	0	0	0	3	95
Benefin	1	92	4	31	6	4	0	5	83
"	2	64	3	30	0	8	0	5	86
Bensulide	4	43	14	44	40	14	3	9	78
Glenbar	4	55	25	45	9	11	1	8	81
"	8	49	22	34	8	11	0	1	85
Check	..	86	83	82	70	38	13	19	0