WEED CONTROL IN GROUND COVERS

Clyde L. Elmore, Wesley A. Humphrey, W. B. McHenry
Agricultural Extension Service
University of California

The phrases "open spaces", "free living", and "low maintenance" have become popular expressions in American oratory, particularly in California. With increased interest in and public demand for greenbelt areas in the living environment, extensive landscaped areas are increasing rapidly. Huge quantities of ornamental plants are being planted in "open space" landscaping in new housing developments, in county and city parks and recreation areas, school grounds, highway interchanges, industrial parks and many other areas. Hand weeding costs (labor rates and plant damage) and the appearance of new herbicide uses have sparked a real interest and need for weed control in ground cover plantings.

Research by agricultural extension personnel, state division of highway personnel, chemical company representatives, and landscape contractors during the last several years, has resulted in herbicide usage becoming an accepted practice. The use of herbicides to reduce highway maintenance costs has resulted in a savings of thousands of dollars for the taxpayers of California.

Results discussed here are chiefly from University of California testing over the past three years for the control of annual weeds and include both registered and unregistered herbicides and herbicide uses. Thus, the results indicated should not be inferred as recommendations by the University of California. Herbicide labels should be checked carefully before using any herbicide on ground cover plantings.

Most selective herbicides that are presently in use do not control all annual weed species. In some areas tolerant weed species such as bur clover, sow thistle, and marestail are becoming a real problem. The weed species in an area to be planted should be known in order to select the herbicide or herbicide combinations that will most likely provide an acceptable level of weed control. The herbicides presently being used and those reported here have been divided into preemergence (before weeds emerge) and postemergence (young or established weeds) compounds.

Preemergence Herbicides:

Diphenamid (Dymid®, Enide®) is now used widely in new and established plantings of ice plant (Carpobrotus edulis). A combination of trifluralin (Treflan®) and diphenamid has been used on plantings of Algerian ivy, Hedera canariensis, Drosanthemum sp., Osteospermum fruticosom, Sedum brevifoliu, Delasperma alba, Vinca minor, Gazania uniflora and many others.

Herbicide combinations offer a broader spectrum of weed species that are controlled. Diphenamid plus trifluralin is an example. The addition of trifluralin to diphenamid also extends the residual grass control into the summer season. Bur clover, sow thistle, prickly lettuce, marestail, and common groundsel are resistant to this combination however. Diphenamid alone or the combination has effectively controlled most of the annual weeds in the interior valleys. Tolerant species are more common in the coastal regions. Trifluralin or nitralin (Planavin®) alone are weak on mustard, sow thistle, common groundsel and spepherd's purse.

Testing on ice plant with DCPA (Dacthal®) and nitralin at the South Coast Field Station (SCFS) has shown these compounds to be as selective as trifluralin, diphenamid or the combination. Field use of DCPA from about Fresno southward, in general has resulted in excellent weed control and selectivity but in heavier soils northward results with DCPA are generally less acceptable in weed control. Nitralin has given good control on both light and heavier soil types except where tolerant species occur. At the South Coast Field Station weed control with 8 lb. of DCPA per acre was only 45% after 16 weeks as compared to 80% control with nitralin at 2 lb/A. At seven weeks, however, control was similar. (Table 1).

EPTC (Eptam®) applied postplant has given good control and selectivity for 3-4 weeks at 4 lb/A when applied as a granule on rough soil and irrigated. When mechanically incorporated for optimum weed control and then planted to rooted cuttings EPTC injured a number of ground cover species. EPTC applied postplant at 16 lb. per acre gave weed control. It was found that at 4 times this rate weed control was evident for 16 weeks, however injury was noted on most test species.

An experimental Stauffer Chemical Company herbicide, R-7465, at 4 lb/A appeared to be safe on new ground cover plantings including Algerian ivy, ice plant, Drosanthemum, Sedum and provided excellent weed control at the South Coast Field Station this last year. It also appeared safe on established plantings at both U.C., Davis and South Coast Field Station. Where the principal problem weeds are annual grasses this material may have a definite place. Another new compound, RH-315 (Kerb®) tried this last year appeared to be quite injurious to most newly transplanted ornamental species at the South Coast Field Station. However, when tested on established plantings at Davis there appeared to be very little phytotoxicity at the 4 week evaluation at both 2 and 4 lb/A. Very poor control of sow thistle was noted at the South Coast trial. Linuron was also evaluated at Davis and the South Coast Field Station on established ground covers this last year and it was found that most species showed some injury to the 2 lb. rate. At the 4 lb. rate there was severe injury on almost all species. Norea (Herban®) is another preemergence herbicide that has not been included in U.C. tests thus far but has found some use in Algerian ivy.

Postemergence Herbicides:

A common practice in ice plant for the last number years has been to use the materials bittern, magnesium chloride, or ammonium sulfate as postemergence contact herbicides. Ice plant is uniquely tolerant to the

very saline solutions of these ingredients. When applied to young weeds at temperatures above 70° F. good control of most annual weeds results. Treated areas should not be irrigated for three days after application to allow maximum killing of the annual weeds. It is difficult at times in the coastal areas, and particularly in the north coast regions, to obtain temperatures of 70 plus degrees at the time of year when weed control is needed. Under most conditions, including the coastal areas, diphenamid can be used effectively on young annual weeds (particularly grasses) where supplemental irrigation can be applied.

Vinca has shown a degree of tolerance to 2,4-D amine at 1/2 lb/A. In the south coast area it would appear from this year's work that Algerian ivy may also tolerate 1/2 lb. of 2,4-D. In southern California, amitrole has found limited uses at 1 lb/A for annual weed control in ice plant. Although the ice plant may become chlorotic the plants are not normally killed. In the central and north coast regions, MH (maleic hydrazide) has sometimes effectively suppressed annual grasses and some other annual weeds in ice plant. In tests at the South Coast Field Station some MH injury has been noted, however, on most species treated.

A new herbicide, nitrofen (TOK®), has been tested the last two years and results have been quite promising on ground cover materials. Nitrofen rates of 2 to 4 lb. active material per acre applied as an early postemergence treatment has given excellent control and adequate safety on new ground cover species including Carpobrotus edulis, Drosanthemum, English ivy, Algerian ivy, Sedum, Osteospermum, ivy geranium, Cerastium, Vinca, Gazania, Hymenocyclus, and Delasperma alba. In limited testing at 16 lb. actual nitrofen per acre to measure tolerance limits, some burning occurred, however, later plant recovery was noted. In addition to post-emergent activity on young weeds, nitrofen also possesses preemergence activity if the soil is not disturbed after application. Nitrofen testing in U.C. ground cover trials thus far has been with the 2 lb ai/gal. and wettable powder formulations. Both of these formulations have given comparable results. Limited tests have suggested that a surfactant does not greatly enhance phytotoxicity with the wettable powder formulation of nitrofen. Six pounds per acre of nitrofen applied in tests at the South Coast Field Station and U.C., Davis, this past year has been found to be safe on the 14 species (Table 2). Delasperma alba ceased blooming after application of 6 lb. per acre, but normal blooming occurred a month later. Chickweed, mustard, prostrate pigweed, common ryegrass appear to be tolerant of nitrofen. Application must be made on very young weeds to control the maximum spectrum of weed species.

Repeated experimental dalapon applications at 2 or 4 pounds per acre were used successfully on Hymenocyclus, Sedum, Delasperma, Algerian ivy and Carpobrotus edulis. Symptoms of injury were evident on each species as foliar distortion or, in the case of C. edulis, a purple discoloration and distortion.

Another herbicide that might find limited use for broadleaf weed control is bromoxynil (Brominil®, Buctril®). At 1 lb. per acre tolerance was observed on many species, as well as controlling common groundsel and mustards (Table 3).

Future herbicide testing in ground cover plantings is being expanded to three principal locations in the state located in the north and south coastal regions and the central valley. Promising new herbicides and utilization of older compounds will be explored to serve the rapidly expanding use of ground cover plantings in California.

Table 1. Preemergence weed control in ground cover plantings--SCFS

Herbicide	Lb/A	3 Wks.	7 Wks.	16 Wks.
EPTC	4	6.3*	3.5	1.8
EPTC	16	8.9	8.3	7.6
Kerb	2	6.8	4.0	2.8
Kerb	8	8.0	5.9	4.5
R-7465	4	7.9	7.3	9.0
R-7465	12	7.5	7.4	8.0
Nitrofen	4	8.5	8.1	6.5
Nitrofen	16	9.0	9.6	9.2
DCPA	8	7.8	7.0	4.5
Nitralin	2	7.5	6.3	8.0
Trifluralin	2	8.5	7.3	6.5
Maleic hydrazide	4	---	3.5	4.0
Maleic hydrazide	16	---	5.5	4.8
Control	-	2.0	1.0	2.0

* 0=No control, 10=Complete control

Principal weed species: Sow thistle, purslane, prostrate pigweed, Lamb'squarters, common groundsel, field bindweed

Table 2. Phytotoxicity to established ground cover plantings--SCFS and U.C., Davis

		4 weeks after treatment							
Herbicide	lb/A	Vinca	Algerian ivy	Sedum	Delas.	Gaz.	Osteo.	Carpo.**	Hymeno.
Kerb	2	0*	0.9	0.3	0	0	0	0	0
Kerb	4	0	0	0.5	0.6	0.5	0.5	0	0.7
R-7465	2	0.2	0.3	0.2	0	0.8	0	0	0
R-7465	4	0.2	0.4	0.3	0	1.5	0.5	0	1.0
Linuron	2	4.8	2.4	4.8	7.0	2.9	0	6.0	10.0
Linuron	4	5.4	3.5	7.2	8.4	7.3	5.0	8.0	10.0
Nitrofen	2	0.2	0.6	0.2	0.5	0.2	0.2	0.3	0
Nitrofen	6	0.3	0.2	0.3	0	1.0	0	0	1.5

* 0=No effect, 10=Dead plants

1/4% X-77 was used in the Davis trial, no surfactant was used in the trial at the South Coast Field Station

** Average of 4 replications at the South Coast Field Station only.

Table 3. Phytotoxicity to various ground cover species 12 weeks after application of various postemergence herbicides at the South Coast Field Station.

	Phytotoxicity evaluations									
Species	Nitro. 4 lb.	Nitro. 16 lb.	2,4-D .5 lb.	2,4-D 2 lb.	Dicamba .25 lb.	Dicamba 1 lb.	Dalapon 2+2+2+2	Dalapon 4+4+4+4	Brom. 1 lb.	Brom. 4 lb.
Gazania sp.	2.8 *	0.8	1.8	2.8	1.2	2.5	1.5	2.8	2.0	3.0
Hymeno. sp.	0	2.6	4.0	---	3.0	---	0.3	1.0	0	0
Delas. sp.	0.2	0.2	2.0	8.8	2.2	6.3	1.2	2.3	0	0.5
Ivy geranium	1.2	0.8	1.0	---	0.5	4.0	2.8	4.5	0	2.0
Osteo sp.	0.8	0.5	3.2	4.5	1.8	4.5	3.5	5.8	0.5	3.8
Carpo. sp.	0.2	0	8.0	9.8	4.2	7.8	4.0	3.0	0.5	1.0
Sedum sp.	1.8	1.0	1.5	3.5	4.2	5.0	1.2	2.0	0.6	2.2
Algerian ivy	1.5	1.0	2.2	1.2	1.5	1.5	2.8	3.8	1.5	1.8
Vinca sp.	0.2	0	0.6	0.6	1.0	1.0	2.3	3.3	0.5	1.5

* 0=No effect, 10=Dead plants