Manipulating vineyard weeds with herbicides

Dean R. Donaldson ❑ Clyde L. Elmore ❑ Sherri E. Gallagher ❑ John A. Roncoroni

Weed populations were determined by randomly distributing plastic rings over the test area and then identifying the plants in each ring. Below: a combination of two herbicides applied during the winter dormant period provided selective control of weeds and maintained a low-growing winter annual population.

Vineyard weeds vary from location to location but often include a broad complex of 15 to 25 species. Most vineyard managers control weeds by applying herbicides or by plowing a strip down the crop row. Weeds between the rows are controlled by discing or mowing (mechanical or chemical) in a total weed control program. In some vineyards, annual or perennial grass or broadleaf cover crops are planted between the rows.

Vineyard trial

We established a field trial in 1984 to study the effects of applying selective postemergence herbicides in the winter to control some of the "native" vegetation, leaving desired species. Selective management of vegetation might eliminate the expense of planting a cover crop. Selecting for low-growing species could also reduce mowing. Vegetative cover (mulch) could be generated to decrease soil erosion, reduce water evaporation, and suppress summer weed growth. If winter annual species were selected, there would be little water use in competition with the crop.

Postemergence herbicides were applied on December 6, 1984, to young native weeds growing between vine rows of a 1983 planting of Pinot Meunier grapes at the Napa Valley M & H Yountville Vineyards. The same location was treated again on December 12, 1985, and February 20, 1987.

In March 1985 and 1986 and April 1987, we evaluated the species composition of the plots by randomly placing 100 polyvinylchloride (PVC) rings, each enclosing 50 square centimeters (8-inch diameter) of soil area, in each replication. Species within each ring were identified and totaled on a presence/absence basis. A percent presence for each species was established, giving a frequency distribution of weed species present (table 1). Large and small weeds were counted equally. In

TABLE 1. Presence of plant species in spring after three years of winter treatments of selective postemergence herbicides

Herbicide*	Rate	Principal species and % presence†				
	lb ai/ac or %					
sethoxydim (Poast) + non-phytotoxic oil	0.5 + 0.25%	98 ABG	78 CC	59 FIL	22 LR	
fluazifop (Fusilade) + X-77	0.5 + 0.25%	87 ABG	86 CC	42 FIL	30 LR	
bromoxynil (Brominal)	1.0	91 ABG	86 CC	54 RYE	48 FIL	
2,4-D (Weedone 638)	1.0	87 ABG	82 CC	43 RYE	27 MEC	25 FIL
MCPP (Mecoprop)	1.0	93 ABG	71 FIL	37 RYE		
sethoxydim + bromoxynil + non-phytotoxic oil	0.5 + 1.0 + 0.25%	92 CC	86 ABG	66 FIL	25 CD	
fluazifop + bromoxynil + X-77	0.5 + 1.0 + 0.25%	91 ABG	89 CC	29 FIL	28 CD	
sethoxydim + 2,4-D + non-phytotoxic oil	0.5 + 1.0 + 0.25%	99 ABG	88 CC	29 FIL		
fluazifop + 2,4-D + X-77	0.5 + 1.0 + 0.25%	97 ABG	91 CC	35 FIL		
paraquat + X-77	0.5 + 0.25%	57 MUS	31 LR	17 CL	16 CC	
untreated control	—	69 ABG	65 CC	47 RYE	52 FIL	

NOTE: Principal species and percent presence at the beginning of the study (1984) — ABG 97, FIL 89, CL 88, CC 83, RYE 61, WOT 57, and RM 44.
* Each treatment was replicated four times in a randomized block field design. Herbicides were applied in 50 gallons of water per acre using a backpack sprayer at 30 psi pressure.
† Mean of 100 (50-square-centimeter) rings taken from four replications measuring percent presence of each species:
ABG = annual bluegrass, *Poa annua*
CC = common chickweed, *Stellaria media*
CL = clover (bur [*Medicago hispida*] and Spanish clover [*Lotus purshianus*])
CD = curly dock, *Rumex crispus*
FIL = filaree (white-stem [*Erodium moschatum*] and red stem [*E. cicutarium*])
LR = London rocket, *Sisymbrium irio*
MUS = short pod mustard, *Brassica geniculata*
MEC = mouse-ear chickweed, *Cerastium vulgatum*
RM = red maids, *Calandrinia ciliata*
RYE = Italian ryegrass, *Lolium multiflorum*
WOT = wild oats, *Avena fatua*

TABLE 2. Suitability and percentage of cover remaining on vineyard floor after two single annual winter treatments (Dec. '84 and '85) with selective postemergence herbicides

Herbicides	Suitability*	Cover†
		%
sethoxydim	2.25 bcde	95
fluazifop	2.5 bcd	99
bromoxynil	1.25 de	95
2,4-D	2.5 bcd	85
MCPP	1.0 e	100
sethoxydim + bromoxynil	3.0 bc	88
fluazifop + bromoxynil	5.0 a	89
sethoxydim + 2,4-D	4.5 a	73
fluazifop + 2,4-D	5.0 a	79
paraquat	2.25 bcde	30
untreated control	1.0 e	100

* Suitability rating characteristics: remaining plant cover <6 inches tall, good soil protection, easy to manage, self-regenerating and no-care required. Means separated using DMR (P 0.05). Ratings on scale of 1 to 5: 1 = unacceptable; 5 = excellent.
† Visual % cover evaluation. 100 = complete cover.

addition to ring counts, we visually evaluated the soil cover percentage. An estimate of cover crop suitability in each treatment was based on the following desirable characteristics: (1) less than 6 inches in height, (2) providing good soil protection, (3) easy to manage, and (4) self-regenerating by seed (table 2).

Plots were mowed after evaluation and the site was maintained during the summers by standard vineyard practices.

Results

Selective postemergence herbicides shifted native weed populations quickly and economically to species that offered erosion control but would not compete with the crop. The percentage of the desirable species annual bluegrass and chickweed (common and mouse-ear) was retained or increased in the population by all except the paraquat and MCPP treatments. Annual bluegrass, a low-growing winter annual, was prominent (greater than 80 percent presence) in all treatments, except where paraquat (Gramoxone) was used. Annual bluegrass and common chickweed produced seed before spring mowing or disking.

Wild oat and Italian ryegrass were effectively controlled by sethoxydim or fluazifop. Foxtail fescue (*Festuca megalura*) increased after treatment with fluazifop, and a greater increase was recorded in fluazifop-bromoxynil or fluazifop-2,4-D combination treatments.

Broadleaf species were partially controlled with bromoxynil, MCPP, or 2,4-D. Combinations of sethoxydim or fluazifop plus 2,4-D gave the broadest control of undesirable species. Suppression of white-stem filaree was most effective with the 2,4-D treatment and less so with fluazifop (60 vs 33 percent) in 1985. Common groundsel (*Senecio vulgaris*), present at low levels, was controlled with bromoxynil, 2,4-D, MCPP, and combinations of these materials.

Curly dock, a perennial broadleaf, showed increases in plots treated with fluazifop, sethoxydim, bromoxynil, and combinations. Similar increases occurred in untreated areas. The herbicides 2,4-D and MCPP decreased curly dock populations when applied in the winter.

Because of a dramatic decline in red maids, cornspurry (*Spergula arvensis*), California burclover, and wild oat in the control treatment (possibly due to a timely mowing before viable seed production) our results are not indicative of herbicidal effects on these species. Many species, although present in low numbers initially (curly dock, London rocket), may become prevalent over the years depending on the selective treatments used. At this trial site, combination treatments of fluazifop plus bromoxynil or 2,4-D and sethoxydim plus 2,4-D most effectively preserved soil cover with shallow-rooted annual weeds (annual bluegrass, chickweed, and filaree).

Conclusions

A single application of postemergence herbicide applied to young vineyard weeds in December effectively changed the makeup of the surviving weed population. By varying the herbicide treatment, growers can choose the species and degree of weed cover remaining. This selective postemergence herbicide technique would be cost effective where desired species exist and where cover crop seeding is impractical because of soil type or an excessive slope.

Dean R. Donaldson is County Director, Cooperative Extension, Napa County; Clyde L. Elmore is Extension Weed Scientist, University of California, Davis; Sherri E. Gallagher is Agricultural Field Assistant, Cooperative Extension, Napa County; and John A. Roncoroni is Staff Research Associate, Botany Extension, UC, Davis.