

VEGETATION MANAGEMENT IN GRAPES

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WEEDS AND THEIR IMPACT ON MAN

Weeds can be described as those undesirable plant species that interfere with man's activities or his welfare. They are plants out of place which cost California farmers about \$700 million a year. The costs are higher when weed research, eradication, inspection, and other factors are included.

Weeds compete with crop plants for light, nutrients, water, and minerals. This weed competition reduces crop yields and may even crowd out entire plantings. It is not uncommon to have a 50-60% reduction in the 1st year's vine growth due to weed pressure.

Weeds increase the cost of labor and equipment, since weeds must be controlled if a profitable crop is to be produced.

Weeds harbor insects and diseases that can move into cultivated land, further reducing crop yield and quality.

Weeds depreciate land values because heavy infestations reduce yields and are costly to clean up. This need for land reclamation may discourage lending institutions from giving the grower a crop production loan.

Weed Identification

Before a weed problem is attacked, it must be identified. There are two useful publications available to growers for this purpose:

1. The Growers Weed Identification Handbook, by Fischer, Lange, and McCaskill
U.C. Cooperative Extension. Available from Publications-Division of
Agricultural Sciences, University of California, 1422 S. Tenth Street,
Richmond, California 94804
2. Weeds of California, by Robbins, Bellue, and Ball
Available from Documents and Publications, P. O. Box 20191, Sacramento,
California 95820

Is the weed a grass or a broadleaf, an annual or perennial? Does it occur in winter or summer? All of these factors will help determine how the weed species will be handled for control--by physical, biological, or chemical means. Perhaps a combination of methods may be needed.

Prevention

Preventive measures are often overlooked in a weed control program. Prevention simply involves taking measures to stop weeds from ever becoming established. There is an old expression that fits here:

One year's seeding equals seven years' weeding!

Sanitation is probably the simplest of preventive measures but it is frequently

overlooked. Keep irrigation water relatively free of weed seed by keeping supply ditches free from weeds. Clean up fencelines, roadsides, and areas around buildings. Make sure equipment is cleaned before using it in another field. Remember the long term goal in any of these procedures is the reduction of the weed population to the sub-economic levels; this will result in less cost for the future.

It is vitally important to prevent weed seed from forming and being cast over the ground since many weed seeds lie dormant but viable for many years in the soil. Knotweed seed can remain viable for up to 50 years, and field bindweed will germinate after 20 years.

Eradication is the total removal of the weed (all parts) so that it cannot grow. This control method is only appropriate in high value, high cash cost crops or when the infestation is restricted to a small area. The digging up of a few Johnsongrass plants in a vineyard and subsequently burning the rhizomes would be an example of eradication.

Weed Control Methods

The area of weed control brings in those measures that reduce or suppress weeds but do not eliminate them. Included in these measures are physical methods (including cultivation), chemical control, and use of biological control agents. There is no one best method of weed control.

Physical methods of weed control include any technique that uproots, buries, cuts, smothers, or burns weedy vegetation.

1. Hand pulling and hand hoeing--not too practical due to increased labor cost or labor unavailability.
2. Cultivation is probably the most common method of physical weed control. Mechanical implements are used, such as cultivators, plows, discs, mowers, harrows, and burners, to remove unwanted weed vegetation.
 - a. Such soil manipulation can sometimes have an adverse effect on crops, such as soil erosion, compaction, moisture loss, and root pruning. In addition, motorized tillage cannot completely remove weeds from within crop rows and brings additional weed seeds to the soil where ideal conditions exist for germination.
 - b. Desiccation of weeds following cultivation is more complete under hot, dry conditions.

Biological weed control involves the use of natural enemies to regulate pest populations to a sub-economic level. To date, most biological control has been done with insects and animals, although disease organisms may also have a place.

1. Biological control works best on large infestations of a specific single weed species such as the use of stem and seed weevils on puncturevine.

Chemical weed control is by far the most commonly used method for removing weed problems in agricultural commodities. The use of herbicides allows economical, selective weed control in crop production. The aim here is to remove certain weeds without significantly injuring the specific crop. Herbicides can be used non-selectively; that is, where selectivity is not intended or desirable, as in non-crop weed control. Care must be taken in herbicide selection and use or

crop injury may result.

Some advantages of chemical weed control in a vineyard include less soil compaction due to relatively infrequent equipment use compared to physical methods of control; strip spraying down the vine row, eliminating the need for close cultivation and thus reducing vine damage; and good success generally with chemicals on perennial weed problems in vineyards.

Herbicides in grapes are generally applied by a ground rig. If the treatment is not post-emergence, generally the chemical is disced in, bladed in, or applied to the soil surface, where winter rains or sprinklers can incorporate the chemical into the soil.

Timing of herbicide application

Herbicides can be applied at different times in relation to crop and/or weed stage of growth.

1. Preplant--treatments made to the soil before the crop is planted.
2. Pre-emergence--treatments made to the soil after the crop is planted but before emergence of the crop or the weeds. They do not work on established weeds.
3. Post-emergence--treatments applied to crop and weed plants after they have germinated and started to grow. Other types of post-emergence treatments are:
 - a. Layby--an herbicide treatment applied to row crops as the last equipment operation in the field.
 - b. Pre-harvest--treatments applied before crop harvest to remove weed growth that could interfere with harvest.
 - c. Post-harvest--herbicide applied to kill weeds present after crop harvest, but which is not part of the weed control program for the next crop.
4. Herbicides that are applied pre-plant, pre-emergence, and even several that are used post-emergence, must act through the soil.
5. Where danger of injury to an emerged crop exists, herbicide may have to be applied as a directed spray or as a shielded spray to insure crop protection.

WEED CONTROL IN A VINEYARD

Now that the various methods of weed control have been briefly covered, it is time to relate those methods to a vineyard situation. The method selected will be based on the identified weed problem, the time of year, soil and crop condition, moisture availability, herbicide selectivity, etc.

Winter annual weeds can be controlled by cultural (physical) means if the soil is dry enough to put equipment on. Some chemicals can be soil applied in late fall or during the winter. They are then activated by winter rainfall or, in absence of sufficient rain, sprinkled in by installed sprinklers (chemicals of this type include Karmex[®], Princep[®], and Surflan[®]).

Other soil-applied chemicals like Treflan® or Casoron® should be incorporated by discing or blading in as a subsurface layer treatment. Devrinol® can be either rainfall/sprinkler incorporated or disced in. Goal® has post-emergence activity but also is an effective pre-emergence weed control material when rainfall/sprinkler irrigation follows shortly following herbicide application. Contact chemicals can be used to kill back all growth that has developed. Chemicals of this type include paraquat and dinoseb (Sinox® and Dow General®). Roundup® also fits into this latter category but will also translocate making it active in controlling many perennial weeds.

Summer annual weeds can be removed by physical methods; or some of the previously mentioned soil-applied material will last until late spring. Contact materials should be used with caution; care should be taken not to hit desirable crop foliage.

Perennial weeds like bermudagrass, field bindweed, and Johnsongrass are serious problems in vineyards, particularly if they become established. If timely cultivation is practiced, they can be kept in check or tired out. Treflan® or Casoron® (disced in) gives good results on field bindweed. The best chemical for control of all three weed species is Roundup®.

A REVIEW OF CHEMICAL WEED CONTROL MATERIALS IN GRAPES

Treflan® can be applied pre-emergence and disced in. It works as a root and shoot inhibitor and gives good control of annual grasses and some annual broadleaved weeds. Due to its volatility, it should be incorporated 1 to 2 inches deep immediately after application. A 1-lb. rate works well on heavier soil texture, while a lower rate of 1/2 lb. per acre should be used on light textured soils.

Shallow tillage after application is necessary if the soil cracks after an irrigation or rainfall to maintain good control. Since soil incorporation is difficult in established vineyards, Treflan® is most useful in new vineyards immediately prior to planting.

Another way Treflan® can be used is as a subsurface layered treatment at 2 lb/A put in at a 4- to 6-inch soil depth with a blade. Using this method for two or three years in winter or early spring gives good field bindweed control. Two or three years' treatment may be necessary for rhizome Johnsongrass control, particularly if the treatment is disced in.

Casoron® has also looked good as a subsurface layered treatment for field bindweed control or disced in. Generally, a 3-lb./A rate has given best results. Spring application can also give control of yellow nutsedge and many annual weeds.

An innovation for thin layer incorporation of both Treflan® and Casoron® is the use of a disc with a 22- to 24-inch pan. This equipment can be used to take pre-disced/tilled, untreated soil from between the vine rows and deflects it onto the vine row which has been treated with the selected herbicide ahead of the disc, thus putting a thin layer of soil over the treated area and effecting incorporation. This technique could be the answer for vine row incorporation of herbicides in trellised vineyards or avenue plantings (rows spaced farther apart than the vines in the rows) where cross cultivation has not been possible.

Karmex® has been used for quite a while in vineyards as a late fall/early winter soil applied treatment that is rainfall or sprinkler incorporated. It works well

on germinating weeds but will not control established weeds. Established weeds should be disced or burned off with a contact herbicide like paraquat prior to Karmex[®] or Princep[®] treatment. Excessive irrigation should be avoided after treatment because there is a chance the chemical could be leached into the root zone of young vines, in particular. Karmex[®] breaks down faster in warm, moist soils. It is less safe than Princep[®] on light, coarse-textured soils low in organic matter. Use 1.6 lb/A on light soil and a 3.2-lb/A rate on heavier soils. Karmex[®] is weak on groundsel and wild oats but good on barnyard grass and crabgrass.

Princep[®] (simazine) is similar to Karmex[®] in mode of action and method of incorporation. It is late fall-winter soil surface applied after existing vegetation is cleaned off by cultivation or a contact herbicide. Princep[®] is weak on barnyard grass and crabgrass but good on groundsel and wild oats. Use low rates (1.6 lb/A) on light soils and higher rates (3.2 lb/A) on heavier ground. There have been some problems on grapes with Princep[®] on light textured soils with high calcium levels.

Princep[®] and Karmex[®] should only be used on bearing vines three or more years old with trunk diameters of 1½ inches or more.

Devrinol[®] is used as a pre-emergence herbicide that is rainfall/sprinkler incorporated. It is particularly effective on grasses. It is also good on sowthistle and yellow nutsedge but weak on species of the Nightshade family. Use a 4-lb/A rate pre-emergence and put water on fairly soon after application, via rainfall or sprinkler. A delay in water application of 10 days or more will result in poor weed control. A combination of 4 lb/A Devrinol[®] with a 2-lb/A rate of Karmex[®] or Princep[®] will give best weed control results.

Surflan[®] is a new herbicide with good activity on many annual grasses and broad-leaf weed species. A rate of 4 lb/A has shown the best results. Its best use in grapes is in combination with Karmex[®] or Princep[®]. Use 2 lb/A on light textured soil and 4 lb/A on heavier soils in combination with 1 to 2 lbs/A of Karmex[®] or Princep[®]. Excellent broad spectrum weed control will result. Surflan[®] by itself is weak on mustard and members of the thistle family. It's good on annual grasses, pigweed, and lambsquarter.

Goal[®] (oxyfluorfen) is a new herbicide currently registered on bearing grapes only. It must be applied during the dormant season (fall/winter) prior to budbreak or February 15, whichever comes first. This material is extremely effective on malva (cheeseweed) and many broadleaved weeds but is somewhat weak on chickweed and most of the annual grasses. It has contact activity and so it can be used postemergence to the weeds as well as a soil residual pre-emergence material. Due to some volatilization problems causing injury to new season's early growth, it must be applied before bud break. Combinations with Surflan[®], Devrinol[®], or paraquat will pick up most weeds. Difficult weed species like flaxleaf fleabane and mare's tail will eventually be controlled by Goal[®] with repeated use but combining it with simazine will give best results. Goal[®] is soil surface stable and is activated by as little as 1/4 inch of rainfall/sprinkler irrigation.

Paraquat and dinoseb (Dow General[®] or Sinox[®]), as well as glyphosate (Roundup[®]) at low rates (1/2 to 1 lb.), work well as contact herbicides to burn off unwanted vegetation, particularly young weeds. Paraquat and dinoseb must be handled with great care as they are quite toxic to man and animals. Care must be exercised

to keep these contact materials off green grape shoots and the green trunks of young vines as damage may result. A wetting agent (surfactant) should be added to the paraquat at one quart per 100 gallons of spray solution. Roundup® is weak at low rates on filaree and should be used at a low spray volume (10 to 40 GPA) for best results--adding 1/2% surfactant is also recommended.

Perennial weed species such as bermudagrass, Johnsongrass, and field bindweed pose increasing problems for California grape growers, particularly when they become established in a vineyard. Following are some comments on chemical materials currently used to combat these problem weed species. All materials are used as post-emergence directed sprays to protect the vines.

Roundup® is an herbicide that shows excellent control of bermudagrass, Johnsongrass, and field bindweed. Thus far there is a label registration on bearing grapes, either as a dormant spray for annual weed control or as a shielded/directed spray on established grapes during the season. Roundup® should be used as a directed spray on vines that are at least three years old. Drift or direct spray damage onto the vines can be minimized with Roundup® by using shielded sprays, low-pressure nozzles, slow sprayer speed, and a drift-reducing agent such as Nalco Trof II. Spraying will have to be done when wind is not more than 3 MPH or the air temperature is not above 80°F. All suckers should be removed prior to use. Best weed control results on perennials are achieved when the weeds are actively growing and fully developed. Good results on bindweed have been achieved by summer discing field bindweed first and then treating the vigorous regrowth with Roundup® in the fall. Chenin blanc, White Riesling, and Merlot show some sensitivity to Roundup®, so care will have to be taken with these grape varieties if Roundup® is to be used. Roundup® can be used now in non-cropped areas as a site preparation pre-plant clean-up on perennial weeds. Consult the Roundup® label for rates and application timing on perennial weeds in non-crop areas.

WEED CONTROL IN YOUNG NON-BEARING VINEYARDS

Annual weeds in new plantings can be controlled with Treflan® (trifluralin), Surflan® (oryzalin), or Devrino® (napropamide) incorporated as a preplant treatment 1 to 2 inches deep. Recommended rates are lower for sandy soils than for heavier soils. Planting the grape rootings or cuttings with the base well below the treated soil insures good root development.

These herbicides can also be incorporated around young established vines if suitable application equipment is available, although it is sometimes difficult to work the herbicides close to vines. Grapevines are very tolerant to these herbicides. The only effect of very high rates on the growth of a grape rooting appears to be greatly reduced branching of the roots in that part of the soil in which the herbicides were incorporated. Oryzalin or napropamide can also be applied to the soil surface and incorporated by sprinkler irrigation or rainfall in young plantings.

SUMMARY

Weed control is important to good crop production and profit. Many tools are at a grower's disposal to do a good job in reducing weed problems in grapes. Careful management and good judgment, as well as knowledge of the problem and potential solutions, will result in clean vineyards, good yields, and profit in the bank for a better life.

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