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Weed research. 8. Weed control in the vineyard

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8.—WEED CONTROL IN THE VINEYARD


WEED control in the vineyard has been achieved by cultivation for many centuries and it is only during recent years that attention has been given to the use of herbicides for this purpose. Today there is little risk to the vine in using any one of the herbicides listed in this article, and in general the main considerations governing the use of chemicals for weed control are the cost of the operation and the effect which it is desired to achieve.

CULTIVATION

Although there are a number of different methods of cultivation the main reasons for this practice are:

(i) To prepare a seed bed for a cover crop.
(ii) To incorporate the cover crop into the soil.
(iii) To control the growth of weeds.

It can be seen therefore that, if cover crops are used, some cultivation will always be necessary. In this article we are only concerned with the suppression of weed growth. However, any increase in production can only be achieved if the entire soil management programme is satisfactory.

Weeds are any plants growing out of place. When they are growing under the trellis or between the vine rows they compete for moisture and plant nutrients, and in most cases, weeds have very high requirements of both soil moisture and plant food.

STRIP DIGGING

The control of weeds under the trellis by cultivation is not simple, and usually involves the use of a single-furrow offset mouldboard plough known as a vine strip-digging plough. By slicing a single furrow in under the trellis and repeating the operation on the other side the weeds are removed. This calls for skill and experience and even then the roots and trunks of the vines as well as the trellis posts may be severely damaged. This work requires considerable concentration by the operator and even when the plough is mounted on the tractor and operated mechanically, the work is slow and tedious.

EFFECT OF CULTIVATION ON THE SOIL

The control of weeds during the spring and summer is important because of the competition for moisture. Generally, a light cultivation with disc harrows or spring-tooth cultivator with duckfoot tynes is the most economical way to control
annual summer weeds. Under certain soil conditions it may be desirable to use a chemical treatment.

For the control of a perennial grass such as couch, or several successive germinations of pigweed ("never die") a number of cultivations are required. These cultivations may have a disastrous effect on Swan Valley soils.

The damaging effect, on nearly all soil types, of fast heavy tractors and equipment is slowly but surely being established. This damage is greatly increased if the soil is very wet or very dry, as wet soils compact easily and cultivation of dry soil breaks the soil structure and cause the formation of a "hard-pan" at the depth of cultivation. The topsoil loses its organic matter and becomes very sticky when wet.

It is now believed that decline in vineyard productivity can often be associated with the breaking down of the soil structure and the serious loss of organic matter caused by intensive summer tillage.

Cultivation itself does not conserve moisture and its main purpose is to control weeds. The trend now appears to be towards less intensive cultivation and because of this the use of herbicides could become very important.

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**RECOMMENDED TREATMENTS**

1. **Strip Digging Effect.**

   Probably the most important use herbicides can be put to in vineyards is to create a bare strip of soil immediately adjacent to the row so that there is no need to strip-dig.

   By using C.M.U. at the rate of application recommended, the growth of weeds can be eliminated from the treated area. The disadvantage of strip digging can be overcome while the cost of the treatment is probably reduced.

2. **General Spraying.**

   Although the chemicals mentioned in this article will not affect the vines it is important to consider the residual effect on the soil. Once treated with C.M.U. or soil and do not have any effect on the soil structure or moisture relationships.

   (2) The risk of physical damage to the vine trunk and roots as well as the trellis posts is removed completely.

   (3) Chemicals are easier to apply and more efficient than a single cultivation. In many cases it is cheaper to use chemicals, particularly when treating the narrow strip under the vines.

---

**ADVANTAGES OF HERBICIDES.**

The main advantages of herbicides over cultural practices are:

1. The herbicides discussed here only penetrate the surface layer of the soil and do not have any effect on the soil structure or moisture relationships.

   (2) The risk of physical damage to the vine trunk and roots as well as the trellis posts is removed completely.

   (3) Chemicals are easier to apply and more efficient than a single cultivation. In many cases it is cheaper to use chemicals, particularly when treating the narrow strip under the vines.

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Fig. 1.—A standard type of strip digging plough with an offset mouldboard.

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Amitrol for pre-emergence weed control, the soil will not support the growth of a cover crop for some time depending on a number of conditions. For this reason as well as the cost of the chemicals it is more practical to "spot-spray" weeds after they have emerged rather than kill the weed seeds as they germinate.

With perennials such as couch or kikuyu, it is difficult to obtain complete control no matter how often the weeds are cultivated. Using dalapon as recommended, these grasses can be eliminated with two sprayings.

**Method of Treatment.**

Weedkilling chemicals are normally applied at reasonably low pressures of approximately 50 lb. per square inch. The usual volume applied in vineyards and orchards is from 80 to 150 gallons per acre. Where absorption is taking place through the leaf or stem, sufficient solution should only be applied to wet the absorbing surface. One hundred gallons per acre is normally required. Any run-off is wasted.

Where it is desired to kill the weed seeds as they germinate, it is essential to obtain an even application of the chemical to a reasonably smooth and clean surface. For this reason a high volume of application of 150 gallons per acre should be used. In this case the most important requirement is to spread the recommended amount of chemical evenly over the given area. Best results are usually obtained if the soil is moist at the time of application—say within a week of the germinating rains.

Normal vineyard spraying equipment can be used to apply the chemicals mentioned, but some care is required to avoid contamination. Although these chemicals have not the same residual dangers as the hormone sprays, such as 2,4-D, the equipment, including the vat and hoses, should be thoroughly washed out after use.

Spraying the foliage of the vines should be avoided as much as possible because the actual leaves treated will be affected. By reducing the pressure of the spray unit to 50 lb. or less per square inch the damage of spray drift will be greatly reduced.

The addition of a wetting agent, such as a household detergent, to the spray solutions aids in the absorption of the herbicide into the plant.

**SUITABLE CHEMICALS**

The chemicals listed, when applied to weeds in a vineyard, will not damage the vines if used at the rate recommended and provided the solution is not sprayed directly onto the foliage.

These herbicides are not toxic but are harmful to all garden plants.
1. **C.M.U. (Chlorophenyl dimethylurea).**

   C.M.U. has proved to be very effective for the control of annual weeds when applied before or soon after germination. C.M.U. is recommended as a treatment which can replace the practice of strip digging. The recommended rate of application is two pounds of 80 per cent. C.M.U. in 150 gallons of water per acre. This means that 1 oz. dissolved in 5 gallons of water is sufficient to treat a strip 18 in. wide and 13 chains long. In this case 9 in. on each side of the vine row would be sprayed. The idea is to apply a thin film of the chemical evenly over the surface, and this will be washed slowly into the top few inches by the rain and kill the weed seeds as they germinate. For this reason it is essential to clear the surface of all trash and level the area to be treated as much as possible. C.M.U. is not highly soluble and it is important to keep the mixture well agitated.

   **Fig. 3.—Two pounds C.M.U. per acre 14 weeks after the treatment was applied. No weeds appeared on plots receiving this treatment during the past year.**

   For the control of summer growing annuals such as crabgrass or pigweed (“never-die”) in irrigated vineyards, the rate of application should be increased to 4 lb. C.M.U. per acre. (Two oz. in 5 gallons of water per 150 square yards). Best results will be obtained if the chemical is applied to the soil while the surface is still damp and before the weeds become too large. This treatment is very costly over large areas and in most cases it would be more economical to spot-spray affected areas.

2. **Dalapon (Sodium dichloropropionate).**

   This chemical is a selective grass weedkiller and has proved very effective against couch and kikuyu. The rate of application for vineyards should be 10 lb. of 85 per cent. dalapon per acre. This means that when only applying sufficient solution to wet the leaves, without run-off, a suitable solution is made by dissolving 1 oz. of dalapon in each gallon of water. A second treatment should be applied 10 to 14 days after the initial application.

   For the control of winter and summer growing annual grasses the rate of application should be reduced to 5 lb. of dalapon per acre. This means that a suitable solution is made by dissolving one half ounce of dalapon in each gallon of water.

   It should be remembered that dalapon is absorbed through the leaf of the grass and best results are obtained if the treatment is applied when the weed is making active growth.

3. **Amitrol (Amino triazole).**

   Amitrol is a general purpose weedkiller which can be used in a number of ways. Although initially it appeared to be as effective as C.M.U. for the pre-emergence
control of annual weeds, in trials last year C.M.U. proved more effective.

Amitrol is probably the most effective chemical for controlling heavy weed growth in vineyards during the spring.

For the control of weeds shortly after emergence the recommended rate is 10 lb. of 50 per cent. amitrol per acre while for heavy spring growth the rate of application should be doubled.

application is 10 lb. of active ingredient per acre. This means that a suitable solution is made by dissolving 7 fluid oz. of 15 per cent. P.C.P. in each gallon of water. P.C.P. has the advantage of having very little residual effect on the soil.

A WARNING CONCERNING 2,4-D.

Although 2,4-D is the most widely used herbicide throughout the world, it is so

Fig. 4.—Ten pounds 50% Amino triazole per acre 14 weeks after the treatment was applied. Although initially this treatment appeared as effective as C.M.U. during the second year the results were not as good.

Fig. 5.—Four times the recommended rate of application of C.M.U. Even at this high level no damage was caused to the vines.


P.C.P. is a contact herbicide which can be used for the control of annual weeds in vineyards. The recommended rate of harmful to vines that vigneronas are advised not to store it on their properties even when they intend using it away from the vineyard.
Although the symptoms of 2,4-D damage are quite obvious it is often very difficult to trace the cause of the damage. The usual ways in which damage is caused to vines are:

1. Spray Drift.

Even on an apparently still day, spray can drift some distance, particularly where the spraying pressure is high. Because of this, spraying with 2,4-D should not be undertaken in the vicinity of a vineyard.

2. Vaporisation.

The ester derivative of 2,4-D which is the most common type used, is quite volatile and, with higher temperatures, vapour may be formed. This vapour can arise from the sprayed area but more often comes from contaminated spray equipment stored in the vicinity of the vine.

3. Contaminated Equipment.

Once a spray unit with plastic or rubber fittings and hoses is used for applying 2,4-D, it is virtually impossible to remove all traces of the herbicide from the equipment. Growers should be particularly careful when borrowing or hiring spray equipment and should ensure that it has not been used for applying hormone-like herbicides.


Otherwise harmless pesticides have occasionally been found to be contaminated with a harmful herbicide. Although cases have been known where this contamination occurred during manufacture, it usually happens during storage.

5. Aerial Spraying.

Aircraft spraying crops for the control of weeds operate over a large area when turning and flying to and from the landing strip. In this way damage has been caused to other susceptible crops. It is fortunate that very little aerial spraying for weed control is undertaken in the vine-growing areas.

COST OF TREATMENT

1. Strip Digging Effect.

The cost of treating a strip of ground along a row of vines will naturally depend on the width. Experienced vigneron
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would have no difficulty in cultivating to within 9 in. of the vine row. It is therefore suggested that the width of the strip to be treated should be 18 in.—9 in. on each side of the vine row.

Using 2 lb. of 80 per cent. C.M.U. per acre, the cost of the chemical for treating a strip 18 in. wide and 10 chains long would be approximately 2s.

2. General Spraying.

Because of the cost of the chemicals discussed, it would not be economical to treat a whole vineyard for pre-emergence weed control for the summer period. Nor would this be particularly desirable because of the effect of the chemicals on winter cover crops. The cost of spot spraying will naturally depend on the density of the plants over a given area.

Using amitrol at the rate of 10 lb. per acre, it would cost approximately £9 for 100 gallons of mixture and this would treat one acre completely covered with weeds. C.M.U. at 2 lb. per acre would cost £4 10s. per acre. The cost of dalapon for the control of perennial grasses would be £9 per complete acre of grass for each treatment. However with these perennials it is most unusual to have large areas infested, and spot spraying isolated patches is most economical.

<table>
<thead>
<tr>
<th>Weed</th>
<th>Time for Spraying</th>
<th>Chemical to Use</th>
<th>Rate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial Grasses, e.g., couch, kikuyu</td>
<td>When making active growth</td>
<td>Dalapon 85%</td>
<td>1 oz. per gal.</td>
<td>Second application 10 to 14 days later. Spray regrowth as it appears.</td>
</tr>
<tr>
<td>Annual Grasses, e.g. spear, brome, veldt</td>
<td>Before emergence—within 7 days of germinating rains</td>
<td>C.M.U. 80%</td>
<td>1 oz. per 5 gals.</td>
<td>Apply to smooth bare soil surface.</td>
</tr>
<tr>
<td></td>
<td>After general emergence</td>
<td>Dalapon 85%</td>
<td>½ oz. per gal.</td>
<td>Spray when young.</td>
</tr>
<tr>
<td>Winter Broad-leaved Weeds and Grasses</td>
<td>Before emergence—within 7 days of germinating rains</td>
<td>C.M.U. 80%</td>
<td>1 oz. per 5 gals.</td>
<td>Apply to smooth bare soil surface.</td>
</tr>
<tr>
<td></td>
<td>After general emergence</td>
<td>C.M.U. 80% or Dalapon 85%</td>
<td>1 oz. per 3 gals.</td>
<td>Spray when young.</td>
</tr>
<tr>
<td>Heavy growth</td>
<td>Amitrol 50%</td>
<td>1½ oz. per gal.</td>
<td>Spray to wet leaves completely but without run-off.</td>
<td></td>
</tr>
<tr>
<td>Pigweed (never die)</td>
<td>Before or after emergence</td>
<td>C.M.U. 80%</td>
<td>1 oz. per 3 gals.</td>
<td>For pre-emergence apply when soil is moist.</td>
</tr>
<tr>
<td>Crabgrass</td>
<td>Before emergence</td>
<td>C.M.U. 80%</td>
<td>1 oz. per 3 gals.</td>
<td>Apply when soil is moist.</td>
</tr>
<tr>
<td></td>
<td>After emergence</td>
<td>Dalapon 85%</td>
<td>½ oz. per gal.</td>
<td>Apply when young.</td>
</tr>
<tr>
<td>Fathen, Nightshade</td>
<td>After general emergence</td>
<td>Amitrol 50%</td>
<td>11 oz. per gal.</td>
<td>Spray to wet leaves completely but without run-off.</td>
</tr>
<tr>
<td>Heavy growth</td>
<td>Amitrol 50%</td>
<td>3 oz. per gal.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 lists some of the more common weeds found in vineyards and the chemical recommended for their control. After selecting the herbicide to use, reference should be made to that part of the text detailing the use of the particular chemical.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Trade Name</th>
<th>Distributor</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dalapon</td>
<td>Basfapon</td>
<td>Henry York &amp; Co. Ltd.</td>
<td>85%</td>
</tr>
<tr>
<td></td>
<td>Dowpon</td>
<td>Agricultural Products Co.</td>
<td>85%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barrow Linton &amp; Co. Ltd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>David Gray &amp; Co. Ltd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elder Smith &amp; Co. Ltd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horticultural Industries Pty. Ltd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kwinana Chemical Co.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lanes Pty. Ltd.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terra Trading Co.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Westralian Farmers' Co-op.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wilcox Mofflin Ltd.</td>
<td></td>
</tr>
<tr>
<td>C.M.U.</td>
<td>David Gray's C.M.U.</td>
<td>David Gray &amp; Co. Ltd.</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>Telvar</td>
<td>Lanes Pty. Ltd.</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>Terra C.M.U.</td>
<td>Terra Trading Co.</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>Weedazol</td>
<td>Barrow Linton &amp; Co. Ltd.</td>
<td>50%</td>
</tr>
<tr>
<td>Amitrol</td>
<td>Noweed P.C.P.</td>
<td>Lanes Pty. Ltd.</td>
<td>25%</td>
</tr>
<tr>
<td>P.C.P.</td>
<td>Shell Weedkiller Q</td>
<td>Shell Chemical Co.</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Pentacide</td>
<td>Kwinana Chemical Co.</td>
<td>20%</td>
</tr>
</tbody>
</table>

Table 2 shows the proprietary lines of the chemicals discussed and the distributors known to the Department of Agriculture. All chemicals are powders except the P.C.P.
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