Bean rust

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BLACK SPOT (Anthracnose) OF GRAPES

FURTHER EXPERIMENT WITH NEW UNGICIDES


In a preliminary experiment conducted at St. Alban’s Vineyard, Upper Swan, during the 1952-53 season, excellent control of the serious black spot or anthracnose disease of grapes was obtained with some new spray materials. The results which were reported in this Journal (1) indicated that Ziram, Thiram and Captan fungicides were superior to standard copper sprays and their effectiveness for disease control was approximately in that order. As these spray materials were tested only in large scale unreplicated plots, the experiment was repeated again at Upper Swan last season and a smaller replicated trial was also conducted at Caversham to provide fuller information. The results have confirmed the findings of the first year’s experiment in all essential details.

Black spot, or anthracnose of grapes caused by the fungus *Elsinoe ampelina* is a serious disease which is widespread both in commercial vineyards and home gardens. It affects both yield and quality of fruit and most varieties are susceptible to a greater or lesser extent.

The disease may attack any part of the current season’s growth and it first becomes obvious in the form of dark-coloured spots. On leaves and berries the spots develop greyish centres as they enlarge, and the margins become dark red or purplish black in colour (Figs 1 and 2). On canes, the spots develop into elongated or irregular cankers with pitted centres which expose the wood (Fig. 3).

As a result of infection, girdling of canes, leaf stalks, bunch stalks, and berry stalks commonly occurs, leading to the death of

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Fig. 1.—Black Spot infection on leaf showing characteristic cracking of dead tissue and the subsequent development of holes in the leaf.
distal parts beyond the lesion (see Leaf­let No. 2057 for a fuller account of the symptoms of the disease).

The fungus largely survives from season to season in cankers on canes which were not removed during pruning operations.

The fungus largely survives from season to season in cankers on canes which were not removed during pruning operations.

Fig. 2.—Black Spot infection of berries. Note the light coloured centres and the darker marginal areas.

Affected tendrils left clinging to the trellis wires are also a common means of carry-over (Fig. 4). With the advent of spring, the fungus in these cankers or spots becomes active once more, and produces myriads of minute spores which are disseminated by rain splash or heavy dews. When the spores lodge on the new spring growth, infection occurs, giving rise to the symptoms mentioned.

**FUNGICIDE EXPERIMENTS, 1953-54**

**A—Upper Swan—St. Alban’s Vineyard.**

This experiment was repeated on the same site as the experiment conducted in the previous season (1). The identical

Sultana vines and layout were used, the latter consisting of a large unreplicated trial to test four new types of fungicides against the standard copper fungicide (Bordeaux mixture). The plots in which each fungicide was tested, were contiguous and comprised three rows of 48 vines per row. For the purpose of black spot assessment, 12 vines were selected at random from the middle row of each treatment plot.

**TABLE 1.**

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. P.M.F. (Phenyl Mercuric Fixtan)</td>
<td>Bud swell, 0.5 lb. per 100 gals.</td>
</tr>
<tr>
<td>2. Thiram (T.M.T.D.)</td>
<td>Foliage, 0.25 lbs. per 100 gals.</td>
</tr>
<tr>
<td>3. Captan (S.R. 406)</td>
<td>Bud swell, 3 lb. per 100 gals.</td>
</tr>
<tr>
<td>4. Ziram</td>
<td>Foliage, 1.5 lb. per 100 gals.</td>
</tr>
<tr>
<td>5. Bluestone (Copper Sulfate) Bordeaux Mixture</td>
<td>Bud swell, 4 lb. per 100 gals.</td>
</tr>
</tbody>
</table>

For the purpose of black spot assessment, 12 vines were selected at random from the middle row of each treatment plot.

Throughout the season five applications of the fungicides were made at the following times:

10th September, 1953—(Bud swell).
30th September, 1953—(Shoots 2 to 4 inches long).
20th October, 1953, 4th November, 1953—(Before flowering).
30th November, 1953—(After fruit set).

As dry weather conditions prevailed in the early summer it was not necessary to apply a late bunch spray.

**Results (Upper Swan).**

An assessment of Black spot infection on the foliage made on 16th December, 1953, showed that on Ziram and Thiram sprayed vines the amount of disease was slight and that control was very satisfactory. Vines sprayed with S.R.406 or Bordeaux mixture showed medium infection, while those sprayed with PMF were heavily infected (see Table 2).

On 8th March, 1954, the amount of disease present on ripe bunches was assessed when yields were taken (see Table 2).
TABLE 2.
SEVERITY OF BLACK SPOT AND YIELDS.

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Severity Index (8.1) 0-100</th>
<th>Green Yield (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foliage (16-12-53)</td>
<td>Mature Bunches (8-3-54)</td>
</tr>
<tr>
<td>PMF</td>
<td>68</td>
<td>29.3</td>
</tr>
<tr>
<td>Thiram</td>
<td>16</td>
<td>0.7</td>
</tr>
<tr>
<td>Captan (S.R. 406)</td>
<td>27</td>
<td>1.5</td>
</tr>
<tr>
<td>Ziram</td>
<td>12</td>
<td>0.5</td>
</tr>
<tr>
<td>Bordeaux Mixture</td>
<td>30</td>
<td>0.4</td>
</tr>
</tbody>
</table>

It will be seen from Table 2 that black spot was much more severe in the early part of the season than at picking time when the black spot hazard was not considered high enough to warrant a late bunch spray. Except where PMF was used and the disease had built up to very serious proportions, bunch infection was negligible. Yields reflect the same trend; they were low in the PMF plot but satisfactory and comparable in plots sprayed with the other fungicides. It will be noticed also that average bunch weights for all treatments are comparable. This indicates that the marked reduction in yield of the PMF treated vines was due to the damaging effect of the disease at the flowering or fruit setting stages which prevented bunch development.

FUNGICIDE EXPERIMENTS

B—Caversham (J. Duff & Sons).

In this experiment five fungicides were compared for their effectiveness in controlling black spot. The experiment was laid out as a randomised block of seven treatments, with four replications. Each treatment plot consisted of six sultana vines. Table 3 gives details of treatments.
Table 3.

Fungicide Treatments.

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No treatment (control)</td>
<td>Bud swell 3 lb. per 100 gals.</td>
</tr>
<tr>
<td>2. Thiram</td>
<td>Foliage 1.5 lb. per 100 gals.</td>
</tr>
<tr>
<td>3. Ziram</td>
<td>Bud swell 3 lb. per 100 gals.</td>
</tr>
<tr>
<td>4. Ziram*</td>
<td>Foliage 1.5 lb. per 100 gals.</td>
</tr>
<tr>
<td>5. Captan (S.R. 406)</td>
<td>Bud swell 4 lb. per 100 gals.</td>
</tr>
<tr>
<td>6. Zineb</td>
<td>Foliage 2 lb. per 100 gals.</td>
</tr>
<tr>
<td>7. Copper oxychloride</td>
<td>Bud swell 5 lb. per 100 gals.</td>
</tr>
</tbody>
</table>

* Whereas all the other treatments received five spray applications, the fifth and final application immediately after fruit set was omitted in this treatment.

Spray applications were made at the following times:

- 14th September, 1953—Bud swell.
- 1st October, 1953—Shoots 2 to 4 inches long.
- 21st October, 1953, 5th November, 1953—Before flowering.
- 2nd December, 1953—After fruit set (Treatment 4 not sprayed).

As in the Upper Swan experiment, dry weather obviated the need for a late bunch spray application.

Fig. 4.—Black Spot infection of leaf, petiole, cane and tendril. Diseased parts left on the vine after pruning serve to carry the black spot fungus over from season to season. Affected tendrils often escape notice and remain attached to trellis wires.

Results (Caversham).

On 14th December, 1953, the severity of black spot on the foliage was assessed for each treatment and on 4th March, 1954, the severity of the disease on every bunch was assessed and bunch yields taken. Results are given in Table 4.

Table 4.

Severity of Black Spot and Yields.

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Severity Index (S.I.)</th>
<th>Yield in ounces. (6 Vines)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-100</td>
<td>Average per Plot</td>
</tr>
<tr>
<td></td>
<td>Foliage (14-12-53)</td>
<td>Mature Bunches (4-5-54)</td>
</tr>
<tr>
<td>1. No treatment (control)</td>
<td>87.5</td>
<td>18.18</td>
</tr>
<tr>
<td>2. Thiram</td>
<td>21.7</td>
<td>2.97</td>
</tr>
<tr>
<td>3. Ziram</td>
<td>22.2</td>
<td>1.22</td>
</tr>
<tr>
<td>4. Ziram (see Table 3)</td>
<td>12.5</td>
<td>0.67</td>
</tr>
<tr>
<td>5. Captan (S.R. 406)</td>
<td>27.12</td>
<td>2.08</td>
</tr>
<tr>
<td>6. Zineb</td>
<td>45.83</td>
<td>8.4</td>
</tr>
<tr>
<td>7. Copper oxychloride</td>
<td>53.32</td>
<td>5.13</td>
</tr>
</tbody>
</table>

Least difference for significance at 99 : 1 level: 3.62, 786.

From the results of the Caversham experiment presented in Table 4, the following conclusions are noteworthy:

All fungicides significantly reduced the disease both on foliage and bunches, and promoted higher yields than the untreated vines.

With the exception of Zineb, all treatments were better than copper oxychloride for controlling the disease on the foliage.

Ziram treatments (3 and 4) were the only ones which gave a greater reduction of the disease on mature bunches than the copper oxy-chloride treatment.

Control Recommendations

1. In experiments conducted during the last two seasons, Ziram and Thiram compounds have proved to be highly effective for the control of black spot or anthracnose and are now preferred to standard copper sprays. When these materials are used they should be applied as far as possible at the following stages, and concentrations.
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(b) when shoots are 2-4 inches long 1 lb. in 100 gallons.
(c) before flowering 1¼ lb. in 100 gallons.
(d) after fruit set 1½ lb. in 100 gallons.
(e) thereafter at any time when wet weather conditions favour further black spot infections.

Where possible sprays should be applied with a power outfit at a pressure of at least 200 lb. Nozzles capable of delivering a good mist should be used, and all parts of the vine and tendrils remaining on trellis wires should be well covered with spray. Ziram and Thiram proprietaries should disperse readily in water, and remain dispersed during application without excessive agitation.

2. During Pruning.—Cut out all wood showing black spot cankers, and burn the prunings.

ACKNOWLEDGMENTS
Grateful acknowledgments are made to Woodsome Estates Pty. Ltd., who provided the large area of vines and machinery for conducting the St. Albans trials; and to Mr. R. Rodda and staff who gave every assistance.

Thanks are also due to Messrs. J. Duff & Sons, who provided the necessary facilities for carrying out the experiment at Caversham and gave helpful co-operation; and to the Forests Department for statistical analysis of the results of the Caversham experiment.

BEAN RUST

In a report issued from the New South Wales Department of Agriculture last February (N.S.W. Agr. Gaz. 65:2:1954), the occurrence of rust (Uromyces phaseoli typica) was reported on the hitherto rust-resistant Westralia runner bean when grown recently at Richmond, N.S.W. This outbreak was attributed to the development of a new rust race.

The report, which received considerable local publicity, proved alarming to market gardeners here, and to the W.A. Department of Agriculture, who evolved the variety. Since the report appeared, seed of the Richmond line of Westralia was obtained from the N.S.W. Department of Agriculture. When plants from this line of seed were tested here in the glasshouse, they were highly susceptible to rust infection.

Fig. 1.—One of the plants grown from seed of the reputed Westralia seed from Richmond in a glass-house test conducted in Perth. As will be seen from the photograph, they were highly susceptible to rust infection.
Fig. 2.—One of a number of plants grown under the same conditions but from Certified Westralia seed. These plants proved rust-resistant.

they proved very susceptible to rust (see Fig. 1), but plants from certified Westralia seed produced in this State were highly resistant to the disease (see Fig. 2).

It is obvious therefore that the Richmond line of Westralia was not true to name.

Tests were also conducted in New South Wales and similar results were obtained, according to information supplied by Dr. C. J. Magee, Chief Biologist of the New South Wales Department of Agriculture, who said that “It seemed likely that the Richmond strain reputed to be Westralia was not genuine. Plants grown from genuine Westralia seed obtained from a leading firm of New South Wales seedsmen have shown no sign of rust in glasshouse tests, where the Richmond strain proved highly susceptible.”

Although the appearance of a new rust race is always to be feared, the Westralia variety apparently still maintains resistance to all known Australian races, at the present time.

In this State, because of the high rust hazard, the variety is widely grown in the autumn months in market gardens adjacent to Perth, and in winter by bean growers at Carnarvon.

According to reports, it has also proved rust-resistant in New Zealand and Rhodesia.

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