Plant diseases - black spot or early blight of tomatoes

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The result of fungicidal spray experiments conducted in 1952 showed that although Phygon XL gave promising control of early blight or black spot of tomatoes, it was ineffective against the same disease on potatoes. A new Zineb type of fungicide in the proprietary form, Dithane-Z78, which gave outstanding control of early blight on potatoes in 1952, was tested against Phygon XL in a further trial on tomatoes at Geraldton. Dithane-Z78 proved equal to Phygon XL in controlling the black spot disease, both materials being superior to the standard copper oxychloride spray.

Under weather conditions favourable for the development of the black spot or early blight disease of tomatoes (caused by the fungus Alternaria solani) serious losses are experienced each year by growers in the Geraldton district.

The disease causes a spotting of the leaves which die and hang downwards in a withered condition against the stem. Fruit develop a characteristic rot most commonly near the stem end.

CONTROL MEASURES
Routine measures such as seed treatment, the use of new seedbed soil, crop rotation and destruction of diseased plant remains by burning should be adopted to delay the appearance of the disease in the field. Plants should be sprayed with fungicides at frequent intervals to check development and spread of the disease in the crop.

TESTING OF SPRAYS, 1953
Experiments on tomato black spot control were commenced at Geraldton in 1952 to test several new spray materials against the standard copper sprays used by growers. Results in that year showed that the organic fungicide Phygon XL gave superior control of the disease.

The Department of Agriculture also conducted trials with these fungicides against the same disease on potatoes at South Coogee in that year. Phygon XL proved ineffective on that crop, but a new Zineb type of fungicide, Dithane-Z78, which was not available for testing in the tomato trial, gave outstanding control.
In view of these results a further spray trial was carried out on tomatoes at Geraldton last season, under the direction of the Government Plant Pathologist (Mr. W. P. Cass Smith), to compare Phygon XL with the promising fungicide Dithane-Z78. A mixture of these two materials was included as one treatment in the experiment to test their combined effect against the black spot disease.

Since Bordeaux mixture did not differ in control value from copper oxychloride (Cuprox) in 1952, the latter material was used as the standard copper fungicide in the recent trial.

EXPERIMENTAL DESIGN AND TREATMENTS

Two rows of Geraldton smooth skin tomatoes in a commercial main crop planting located in the Belvedere district were used for the experiment. The plants were set out in the field on April 14 on land, virgin to tomatoes, that had been fallowed for one year and treated with D-D soil fumigant three weeks before being planted. As is normal practice in that district the plants were staked and pruned to two stems.

The experiment was of randomised block design, there being six replications of five treatments with a plot size of 12 plants. To encourage the build up and spread of the black spot disease unsprayed buffer plants were left between the treatment plots in the experimental rows.

Treatments and spray strengths applied, were as follows:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Strength of Spray</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control</td>
<td>Unsprayed</td>
</tr>
<tr>
<td>2. Cuprox</td>
<td>1 1/2 lb. - 40 gallons water</td>
</tr>
<tr>
<td>3. Phygon XL</td>
<td>3 lb. - 40 gallons water</td>
</tr>
<tr>
<td>4. Dithane-Z78</td>
<td>3 1/2 lb. - 40 gallons water</td>
</tr>
<tr>
<td>5. Phygon XL plus Dithane-Z78</td>
<td>6 oz. of each - 40 gallons water</td>
</tr>
</tbody>
</table>

Spraying commenced on May 20 when the plants were about 15 in. high and the black spot disease was beginning to show on the lower leaves. Spray applications were continued at approximately 10-11 day intervals until September 1. A total of 11 fungicidal sprays were applied, using a knapsack spray, to all plots in the experimental rows. Dispersible sulphur and DDT were added to the test sprays as required to guard against attack by rust mites and cutworms, respectively. Control plots received only sprays of sulphur and DDT.

PLOT RECORDS

The fruit in each treatment plot was picked when ripe and records were kept of the weights of marketable (1st grade) and unmarketable (2nd grade) fruits. Cracked, blemished and "black spot" affected fruits were included in the latter grade. Picking commenced on July 22 and was continued at 10-11 day intervals subsequently, being completed at the end of September.

The following table sets out plot yields of tomatoes for the various treatments:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fruit Yields. (Average of 6 plots).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Grade.</td>
</tr>
<tr>
<td>1. Control</td>
<td></td>
</tr>
<tr>
<td>2. Cuprox</td>
<td></td>
</tr>
<tr>
<td>3. Phygon XL</td>
<td></td>
</tr>
<tr>
<td>4. Dithane-Z78</td>
<td></td>
</tr>
<tr>
<td>5. Phygon XL plus Dithane-Z78</td>
<td></td>
</tr>
</tbody>
</table>

The effectiveness of the various fungicidal sprays in preventing blighting and death of leaves (defoliation) was assessed at intervals during the growing season, the final assessment being made on September 2. Owing to the dry weather conditions that ensued after that date new leaf growth remained free from the black spot disease.

The following table lists the progressive defoliation of plots for each treatment:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average Defoliation. (6 plots; 12 plants per plot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control</td>
<td>%</td>
</tr>
<tr>
<td>2. Cuprox</td>
<td>20</td>
</tr>
<tr>
<td>3. Phygon XL</td>
<td>7</td>
</tr>
<tr>
<td>4. Dithane-Z78</td>
<td>5</td>
</tr>
<tr>
<td>5. Phygon XL plus Dithane-Z78</td>
<td>5</td>
</tr>
</tbody>
</table>

During the months of July and August weather conditions favoured the severe development of the black spot disease which increased to epidemic amounts on the unsprayed control and buffer plants.
RESULTS

Increased yields of first grade tomatoes were obtained by spraying with fungicides for black spot disease control. The newer spray material Dithane-Z78 proved equal to Phygon XL, the most promising material tested the previous year, in giving outstanding control of the disease. Yields of first grade fruit from both these spray treatments were significantly greater than from the Cuprox treatment.

The addition of Phygon XL to Dithane-Z78 (Treatment 5) did not produce any improvement in disease control over either of these materials used separately.

Least defoliation occurred in the plots sprayed with Dithane-Z78. These plots retained their foliage until the end of the trial, whereas Control and Cuprox plots were severely defoliated several weeks earlier.

AVAILABILITY OF NEW FUNGICIDES

Dithane-Z78 (or similar Zineb fungicides) is not yet manufactured in Australia and so far has been imported in small test quantities only. However the demonstration of its effectiveness for early blight control on such important crops as potatoes and tomatoes will ensure considerable demand from growers. Accordingly it is anticipated that importations will soon be made for commercial use.

ACKNOWLEDGMENTS

Appreciation is recorded of the co-operation given by Mr. J. Henneberry, on whose tomato garden the experiment was again conducted.

The assistance from officers of the Agricultural Department stationed at Geraldton in conducting the experiment is also gratefully acknowledged.

REFERENCES


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