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Plant disease - black spot (anthracnose) of grapes

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PLANT DISEASES

EARLY BLIGHT OR TARGET SPOT OF POTATOES
PRELIMINARY REPORT ON RECENT SPRAY TRIALS

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EARLY blight or target spot caused by the fungus Alternaria solani is a widespread disease of potatoes which in Western Australia is most prevalent in crops dug in autumn and early summer. The disease may attack both foliage and tubers, but the tuber rot phase of the disease has hitherto caused most concern to local growers because it causes obvious losses in storage. The less obvious but more serious effects of the foliage blight have generally been overlooked, chiefly because the disease usually develops late in the season when the crops are approaching maturity. However, recent spray trials with new fungicides have clearly demonstrated that the destructiveness of the foliage attack has been greatly underestimated, for it may cause considerable reduction in yield.

SYMPTOMS AND EFFECTS

All above-ground parts may be attacked, and under certain conditions the tubers also. Usually the disease appears first on the older leaves and gradually spreads upwards. It becomes obvious in the form of dark-brown or blackish, circular or irregular dead spots which are often concentrically zoned like a target (Fig. 1). Under humid conditions, the spots rapidly enlarge, and the disease spreads until all the foliage is involved. As a result of the foliage blight, the tops are killed prematurely with consequent reduction in yield.

On the tubers, the disease produces small to very large, pitted lesions, which frequently have a gun-metal like sheen, but are sometimes dull brown or blackish in hue. The flesh underlying these lesions is generally affected to a shallow depth only, with a dry rot, and is discoloured brownish-black. This rot is commonly referred to by growers as "storage disease" because it only becomes obvious after the tubers have been held for some time.

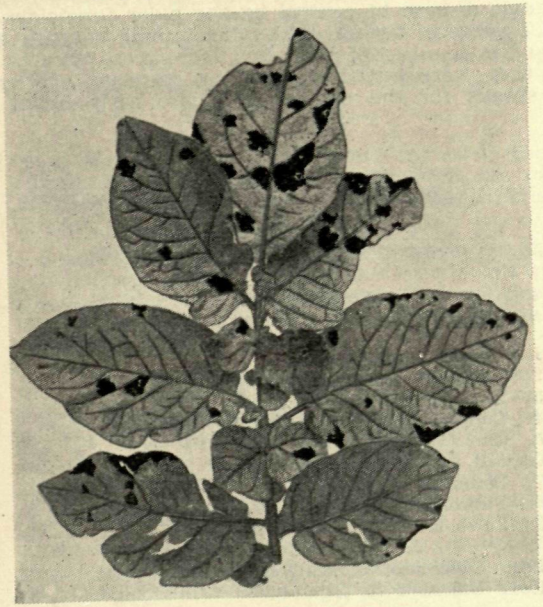

Fig. 1.—Symptoms of target spot or early blight on potato leaf. The disease kills the tops prematurely resulting in lower yields
(After Chupp)

FACTORS FAVOURING THE DISEASE

The foliage attack is favoured by warm humid weather such as is commonly experienced in the main potato areas during the autumn months and late spring—early summer. Severe epidemics frequently occur in crops maturing

at these periods particularly if growing on swamp soils, watered by sprinkler or furrow irrigation, or exposed to showery weather or heavy dews. Under these conditions, the tops may be killed several weeks before they would normally decline.

Tuber infection apparently only occurs at digging time due to contact with diseased foliage, and infection is favoured by early digging while the tubers are still in an immature state. Under these conditions, skin rubs inevitably occur during digging and bagging, which facilitate infection especially when the bagged potatoes are shaded with diseased foliage until sewn—a common but unwise practice.

Tuber infection is likely to be most serious when crops with blighted foliage are dug prematurely usually to avoid risk of flooding following heavy rains.

Fig. 2.—Showing premature defoliation caused by potato early blight, and its control by spraying with Zineb fungicide. The plot at right was unsprayed and the tops died three weeks before the sprayed foliage shown at left. As a result the sprayed plot yielded 4 tons per acre more than the unsprayed plot.

SPRAY TESTS 1952 FOR CONTROL OF POTATO EARLY BLIGHT FOLIAGE ATTACK

Early blight is generally recognised as a difficult disease to control by the older fungicides. Therefore during 1952 when small quantities of a number of new fungicides were secured, they were tested against the standard copper sprays for the control of potato early blight.

Two experiments identical in design were conducted in the South Coogee area on the properties of (1) Messrs. Newman Bros., and (2) Mr. T. Sawle. The crops at these properties were planted on 7/7/52 and 11/7/52 respectively.

Details.—A randomised block layout was used with four replications of 9 treatments (see table). Plots consisted of double rows each 20 links long with adequate buffer (unsprayed)

TABLE

Spray Treatments.	Experiment 1—Average Plot Yield 1st Grade Potatoes.	Experiment 2—Average Plot Yield 1st Grade Potatoes.
	lb.	lb.
1. Control (unsprayed)	40·0	48·7
2. Bordeaux-mixture 10 : 5 : 100*	42·3	46·7
3. Zinc Bordeau-mixture 2½ : 7½ : 5 : 100†	40·5	46·1
4. Copper Oxychloride 3½lb. : 100 gals.	41·4	45·1
5. Zinc Copper Chromate 2½lb. : 100 gals.	32·0	44·7
6. S.R. 406 4lb. : 100 gals.	41·2	52·9
7. Ziram 2lb. : 100 gals.	39·3	44·6
8. Phygon 2lb. : 100 gals.	32·4	42·7
9. Zineb 2lb. : 100 gals.	55·0	60·7
Least Difference for Significance at 99 : 1 level	10·3	13·9
Least Difference for Significance at 19 : 1 level	——	10·3

* 10lb. Bluestone, 5lb. Quicklime—in 100 gallons water

† 2½lb. Zinc Sulphate, 7½lb. Copper Sulphate, 5lb. Quicklime—in 100 gallons water.

areas between plots. The first sprays were applied in Experiment 1 on 8/9/52, and in Experiment 2 on 29/9/52, when the tops in adjacent rows were just meeting. At this time early blight was present in trace amounts only, and it was easy to secure good coverage of the bottom foliage. Subsequently the disease developed seriously at both sites so that the fungicidal value of spray treatments was thoroughly tested.

Four sprays were applied at each site, at approximately 12 day intervals. Experiment 1 plots were dug on November 13 and 14, 1952, and Experiment 2 on December 2, 1952.

Results.—It will be noted from the table of results that only one fungicide gave effective control of the disease, namely Zineb (used in the proprietary form Dithane Z. 78). Potato foliage sprayed with this material remained remarkably free of early blight, and died down naturally, fully three weeks after the unsprayed (control) foliage had completely withered. As a result, yields were increased in the order of 30 per cent., equivalent to an amount of approximately four tons per acre (Fig. 2).

Under the conditions of these experiments where the area of the sprayed plots was so small in comparison to the surrounding unsprayed and badly diseased crop, the fungicides were very rigourously tested. It seems probable that had the whole area been sprayed with Zineb, less than four applications would have given equally good control of the disease. Further experiments have been planned to test this belief.

Unfortunately proprietary Zineb fungicides such as Dithane Z.78 are not yet available commercially in Australia. In view of their potential value however, it is hoped that either they will soon be manufactured here, or their importation will be facilitated.

Acknowledgments.—The authors gratefully acknowledge the assistance given by Messrs. Newman Bros., and Mr. T. Sawle of South Coogee, who placed land and facilities at our disposal for these experiments.

BLACK SPOT (ANTHRACNOSE) OF GRAPES

PRELIMINARY TRIALS WITH NEW FUNGICIDES

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BLACK spot or Anthracnose of grapes caused by the fungus Elsinoe ampelina is a widespread and serious disease. In commercial vineyards it is often responsible for considerable reduction in yield and quality of fruit, and in home gardens also it may prove very damaging. Under commercial conditions the disease has proved difficult to control in seasons favourable for its development, despite the routine application of accepted fungicides. Fortunately, preliminary results of recent spray trials indicate that greatly improved control is likely to result in future from the use of a number of new fungicides.

Most varieties of grapes are susceptible to black spot to a greater or lesser degree, and infection may occur on any part of the current season's growth including, canes, leaves, bunch and berry stalks, and berries.

The disease first becomes noticeable as small dark spots which gradually enlarge. The spots are purplish black in colour and circular in shape but, with age, the centres may become light brown coloured and the shape may alter. Where spots are numerous they may coalesce as they enlarge with the result that a composite spot of irregular shape may be formed.

On leaves, the spots finally become angular in outline and mainly grey in colour with only a thin outer margin of black. It is common for cracks to develop across the middle of the spot or for most if not all the middle to fall out and leave a hole. When spots are numerous, such leaves may become very ragged in appearance (Fig. 1).

On canes, the spots finally enlarge into elongated or irregular cankers which open up to expose the deeper tissues (Fig. 2).

On berries the light coloured centres of the circular spots have led to the frequent use of the term "bird's-eye spot" for this phase of the disease (Fig. 3).

Girdling of canes, leaf stalks, bunch stalks and berry stalks occurs commonly as a result of the growth of the disease lesion. The sap flow is restricted at this point and death of the distal parts may result.

LIFE HISTORY

After pruning, the vine may still be harbouring the black spot fungus in a dormant state in the remaining spurs and rods and also in tendrils left clinging to the trellis wires (Fig. 4). With the advent of spring, the fungus becomes active again in the cankers and spots on these parts which escaped detection during pruning. It produces numerous minute spores which wash or splash on to the new spring growth with rains and heavy dews.

These spores germinate and infect the young green parts of the vine giving rise to the disease spots described earlier. These spots in turn

Fig. 1.—Black Spot infection on leaf showing characteristic cracking of dead tissue and the subsequent development of holes in the leaf

produce more spores which infect more and more green parts after each rain or dew.

FIELD SPRAYING TRIALS AT UPPER SWAN, 1953

For many years it has been customary for vignerons to apply either sulphuric acid or bluestone sprays in the dormant season, and bordeaux mixture or copper oxychloride sprays in the spring for the control of black spot.

Recently, numbers of new fungicides have become available for test purposes. It was decided to screen them as rapidly as possible for the control of this refractory disease by conducting in the first instance large scale, unreplicated spraying trials, and confining further more detailed investigation to any which showed sufficient promise. Fortunately some of the materials selected for the first year's trial proved so promising that it has been decided to acquaint growers immediately with the preliminary results.

Methods.—The tests were conducted on two vineyards at Upper Swan, namely, "St. Albans" and "Belhus".

Fig 2.—Cankering of canes caused by infection with Black Spot.

Results are given here for the St. Albans trial only, as circumstances at "Belhus" did not warrant or permit counts and observations being made during the last half of the season.

In the St. Albans trial four new fungicides were tested against the standard copper fungicide schedule which has been applied at this vineyard for many years (Table 1). The plots in which each fungicide was tested were contiguous and comprised three rows containing 48 sultana vines per row. Twelve vines were selected at random from the middle row of each treatment plot for the purpose of foliage assessment and bunch counts for black spot during the growing season.

TABLE 1.

Fungicide.	Strength.
1. P.M.F. (Phenyl Mercuric Fixtan)	Dormant, 0·5lb. per 100 gals. Foliage, 0·25lb. per 100 gals.
2. Thiram (T.M.T.D.)	Dormant, 3lb. per 100 gals. Foliage, 1·5lb. per 100 gals.
3. S.R. 406	Dormant, 4lb. per 100 gals. Foliage, 2lb. per 100 gals.
4. Ziram	Dormant, 3lb. per 100 gals. Foliage, 1·5lb. per 100 gals.
*5. Bluestone (Copper Sulphate) Bordeaux Mixture.... Azurine Dust	Dormant, 20lb. per 40 gals. Foliage, 4–4–40. Bunch application only.

* St. Albans normal schedule.

A total of five fungicide applications were made. The dormant application was made at bud swell and the foliage applications were made firstly, when shoots were 2 to 4in. long, secondly, before flowering and thirdly, after fruit set. These four applications are considered as a routine schedule and are only increased in number as required by the occurrence of late rains.

A further application was in fact required in mid-December following a fall of about 70 points of rain. This fifth application was made after the rain ceased with the main purpose of controlling infection of the bunches which were about half grown.

Conditions were ideal for the trial as the incidence of spring and early summer rain favoured the development of black spot. Moreover there was a fairly heavy carry over on canes from the previous season.

RESULTS

Examinations of the plots in the early part of the season indicated that PMF was giving little if any control of the disease. By contrast Ziram, Thiram and S.R.406 plots were only slightly infected and appeared to be superior to the Bordeaux Mixture plot.

On 3/12/52 an assessment of black spot on green parts (mainly leaves) was made on each of the twelve selected vines in each treatment plot. At this stage the disease was rampant in the PMF plot and of medium severity in the Bordeaux mixture plot. In the remaining treatments the disease was relatively slight. An average disease severity index for each plot is shown in Table 2.

On 11/3/53 an assessment of black spot was made on the ripe bunches. In Table 2 is given the percentage of clean bunches counted on the twelve selected vines in each treatment plot. The percentage of clean bunches is very high for Ziram, Thiram and S.R.406, relatively low for Bordeaux mixture and negligible for PMF.

TABLE 2.

Fungicide.	Severity Index for Foliage Infection at 3–12–52.	Percentage of Clean Bunches at 11–3–53.
P.M.F.	100	3
Thiram	16	90
S.R. 406	33	92
Ziram	6	93
Bordeaux Mixture	47	65

Frequent inspections during the growing season revealed no evidence of spray damage in the plots sprayed with Ziram, Thiram or S.R.406. Vines sprayed with Bordeaux mixture on the

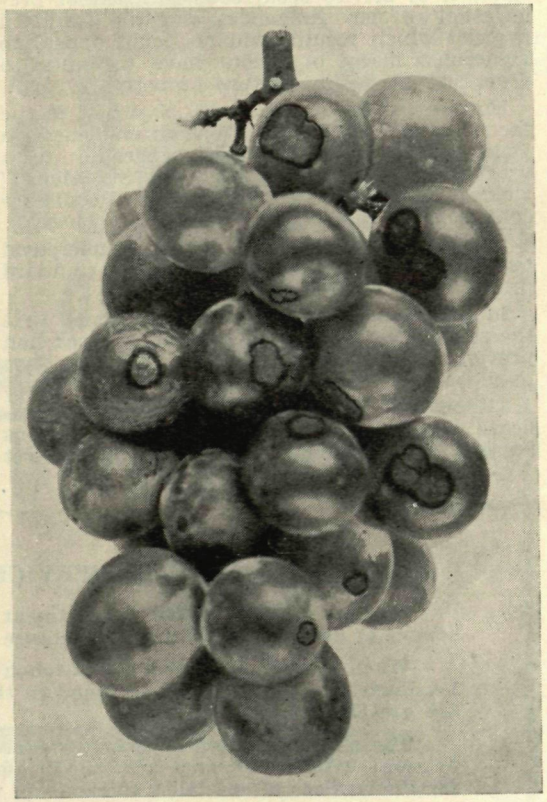

Fig. 3.—Black Spot infection of berries. Note the light coloured centres and the darker marginal areas.

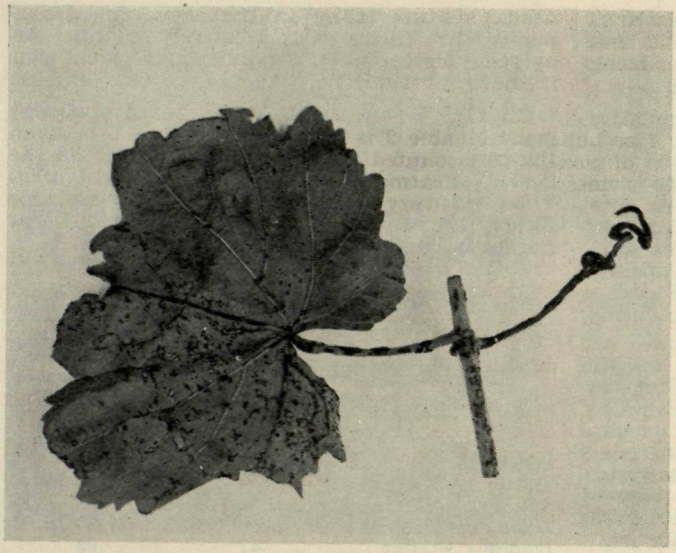

Fig. 4.—Black Spot infection of leaf, petiole, cane and tendril. Diseased parts left on the vine after pruning serve to carry the black spot fungus over from season to season. Affected tendrils often escape notice and remain attached to trellis wires.

other hand showed considerable leaf injury and as a result of the sparser foliage, some sunburn of berries occurred. The ease of preparation of new fungicides and the standard product which results, will no doubt appeal to vignerons, many of whom have difficulty in preparing bordeaux mixture properly.

However, attention must also be drawn to the fact that the influence of new fungicides on yield, cannot be determined accurately in a short term experiment, and at "St. Albans" yields bore no close relationship to the disease control value of the superior new fungicides.

The reasons for this are not fully understood but vine variability and the absence of standard pruning are probably major factors.

In this connection it may be mentioned that the sultana vines in the experimental block had previously been considered so unthrifty that they were on the point of being grubbed out.

Although as previously pointed out, the duplicate experiment at "Belhus" was for various reasons not conducted beyond the fruit-set stage, it is noteworthy that the new fungicides showed similar trends in effectiveness to those recorded for "St. Albans".

CONTROL RECOMMENDATIONS

1. During pruning, cut out all wood showing black spot cankers and destroy prunings.

2. The new fungicides Ziram, Thiram and S.R.406 have proved superior to Bordeaux mixture for the control of Black Spot in preliminary trials. Growers desirous of testing these materials should apply them at the following stage—

(a) budswell;
(b) when shoots are 2 to 4 inches long;
(c) before flowering;
(d) after fruit set;
(e) at any time thereafter when late rains threaten to cause further infections of black spot.

Spraying should be done where possible with a power unit giving 200 lb. pressure or more. The nozzles should be such that a good mist is delivered and all parts of the vine should be well covered with spray.

FUNGICIDES

Thiram (TMTD) is sold as "Lantox", "Thiotox" and "Thiurad", etc.

Ziram is sold as "Ziram 80" and "Methasan", etc.

S.R.406 is not yet available in commercial form.

Warning.

Any precautions advocated by the makers of new fungicides should be carefully heeded, in order to avoid possible allergic reactions, etc.

Acknowledgments.

Grateful acknowledgment is made of the assistance of Messrs. Copley and Barrett-Lennard Bros., who made available the areas of vines and machinery and staff to carry out the trials on St. Albans and Belhus vineyards respectively.