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Black spot or early blight of tomatoes

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PLANT DISEASES

BLACK SPOT OR EARLY BLIGHT OF TOMATOES

Progress Report on Investigations

By R. F. DOEPEL, B.Sc. (Agric.), Plant Pathologist

BLACK spot disease is one of the most important limiting factors to tomato production in the Geraldton district of this State. All above ground parts of tomato plants are affected and, under weather conditions favourable to the disease, serious defoliation and reduction of fruit yields are experienced.

In a preliminary experiment conducted during 1952 to evaluate certain new fungicides for control purposes, Phygon-XL gave outstanding results and several others proved equal to the standard Bordeaux mixture and copper oxychloride sprays.

Black spot, early blight or target spot of tomatoes is a disease of long standing in Western Australia. It is caused by the fungus *Alternaria solani* which also attacks potatoes and other related plants. On tomatoes the disease is widespread in all commercial areas but it has proved most serious in the Geraldton district where early, main and late winter crops are grown. The moderate winter temperatures and high humidities of this locality favour the disease which causes great economic losses particularly in years of heavy rainfall. Not only is the yield and quality of the crop affected but also

serious wastage occurs in fruit transported overland to Melbourne markets and to a lesser extent to local markets.

SYMPTOMS AND EFFECTS OF THE DISEASE

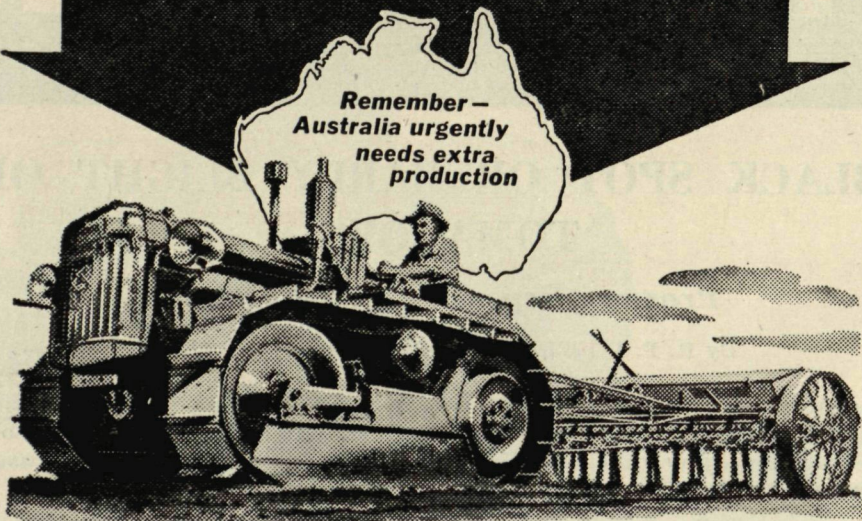
Young plants attacked in the seedbed develop a collar rot of the stems at ground level (Plate 1), a condition commonly referred to by growers as "black leg". If such plants escape notice and are transplanted into the field they become unthrifty and are often broken over by wind. If the soil is hilled up around the stems to induce adventitious rooting they may survive, but seldom develop into first-class plants.

On the foliage, the disease usually appears first on the lower leaves shortly after the plants are set out in the field, and becomes obvious as irregular, dark brown spots often surrounded by a

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Plate 1.—Seedling affected with collar rot.

yellowish margin (Plate 2). The spots may enlarge up to half an inch in diameter and, if numerous, cause affected leaves to die and hang downwards in a withered condition from the stem.

The fungus also attacks the stems and laterals and produces dark brown oval cankers (Plate 3).

Fruits are affected at all stages of development and a typical black rot is produced (Plate 4). The decay is most commonly observed on the stem end of the fruit adjacent to the stalk scar.

CONTROL MEASURES

The following measures are recommended for reducing losses due to collar rot and for delaying the appearance of foliage infection in the field.

Seed should be immersed in hot water (122° F.), with 0.25% commercial formalin (1 fluid oz. or 2 tablespoonsful in 2½ gallons of water) added, for 25 minutes, then removed and spread out thinly to dry in the shade. Prior to planting the seed should be dusted with an organic mercury dust (¼ to ½ level teaspoonful per lb.) to guard against decay by soil-borne fungi. As a supplement to these measures, new soil should be used for the seedbed each year.

Because the fungus lives over in plant refuse in the soil all crop remains should be burnt at the end of the season and the land rested from tomatoes for at least three years.

Plants should be sprayed at regular intervals with fungicides to protect the foliage and fruit from attack by the disease. For many years copper sprays such as Bordeaux mixture and copper oxychloride have been used by growers at Geraldton but the control achieved has not been wholly satisfactory, particularly in years very favourable for disease development.

Bordeaux mixture is also liable to cause damage to foliage and fruit and the use of lime of variable quality to neutralise the copper sulphate adds to the hazard of its field application.

FOLIAGE BLIGHT CONTROL— TESTING OF SPRAYS, 1952

Promising control of early blight of tomatoes by using organic fungicides has been obtained by overseas workers in recent years. Although worthy of trial it was only last year that several

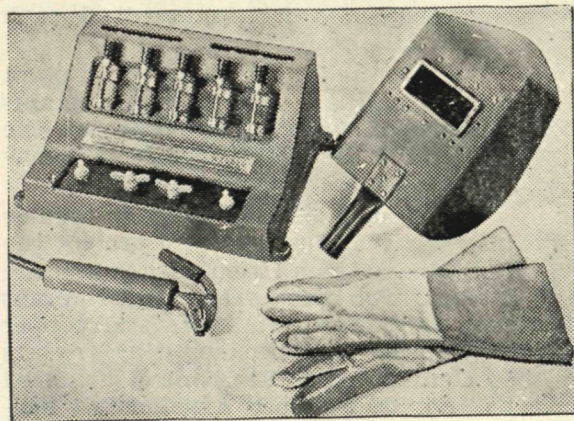
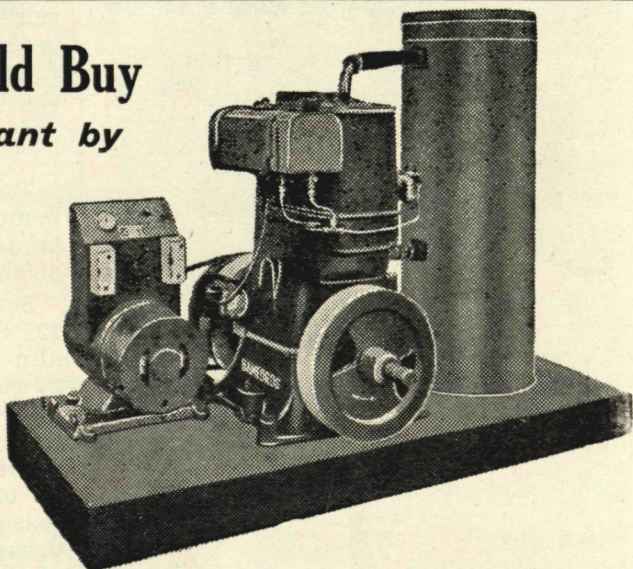
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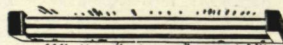
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of these newer spray materials became available (mainly in small quantities) for testing in this State.

The opportunity was therefore taken to compare their control value with the standard copper sprays in a comprehensive spray experiment initiated under the direction of the Government Plant Pathologist (Mr. W. P. Cass Smith) on a tomato garden at Geraldton.

EXPERIMENTAL DESIGN AND TREATMENTS

For the experiment two rows of well-grown tomato plants were selected from a main crop planting of the Geraldton variety located in the Belvedere district. The plants, which had been set out in the field on May 8 were pruned to two stems, staked and manured according to normal practice in that area.

The experiment was of randomised block design, each of the eight treatments consisting of four replications with a plot size of 12 plants. Unsprayed buffer plants were located between plots in the rows to encourage the build up and spread of the disease through-



Plate 2.—Leaf showing typical spots and withering of affected leaflets.

out the crop. Treatments and spray strengths are listed as follows:—

Treatment				Strength of Spray
1.	Control	....	....	Unsprayed.
2.	Bordeaux mixture	....	....	4 lb. bluestone - 2 lb. lime - 40 gallons water.
3.	Zinc-Bordeaux mixture	....	....	3 lb. bluestone - 1 lb. zinc sulphate - 2 lb. lime - 40 gallons water.
4.	Cuprox	....	....	1½ lb. - 40 gallons water.
5.	Zinc copper chromate	....	....	1 lb. - 40 gallons water.
6.	SR.406	....	....	1½ lb. - 40 gallons water.
7.	Ziram	....	....	¾ lb. - 40 gallons water.
8.	Phygon - XL	....	....	¾ lb. - 40 gallons water.

Spraying was commenced on June 18, when the disease had developed on the lower leaves of the plants, and was continued at regular 10-11 day intervals until October 2. A total of 12 experimental sprays was applied throughout the growing period. Dispersible sulphur and DDT emulsion were added to all sprays in the latter half of the schedule to control rust mite and grubs respectively. Control plots received only a combined spray of sulphur and DDT.

Plot Records.

The effect of sprays in checking defoliation (death of leaves) caused by the disease was assessed on three occasions during the growing period; the final assessment being made on September 11 after nine sprays had been applied to the plots. During August and September the disease developed considerably in the crop, being very severe in unsprayed control plots and on buffer plants.

The fruit was picked as it matured and plot records for each treatment



Plate 3.—Canker on stem at leaf petiole junction.

were kept of the weights of marketable (1st grade) and unmarketable (2nd grade) fruits.

The following table sets out yields and defoliation ratings for the various treatments:—

Treatment.	Fruit Yields.		Average Defoliation (4 plots, 12 plants per plot).
	1st Grade (average for 4 plots)*.	Total (4 plots), 1st and 2nd Grade.	
	lb.	lb.	%
1. Control	15.75	122	63
2. Bordeaux	31.00	176	26
3. Zinc-Bordeaux	26.75	173	23
4. Cuprox	32.75	181	36
5. Zinc Copper Chromate	31.75	175	28
6. SR. 406	32.25	183	30
7. Ziram	29.00	169	30
8. Phygon-XL	40.00	222	16

* Factor for significance between treatments at 0.01 level = ± 7.1531

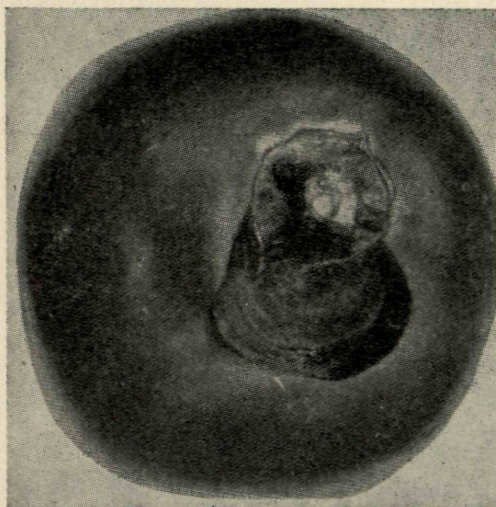


Plate 4.—Black spot of tomato. The decay usually occurs near the stem end scar.

—After Doolittle.

DISCUSSION

Defoliation caused by the disease was markedly reduced by all fungicidal spray treatments resulting in yields considerably higher than that of the unsprayed (control) plots.

The several organic fungicides were equal to the standard copper sprays in controlling the disease and one treatment, namely Phygon-XL, gave a significantly higher yield of first grade fruit than the remaining treatments.

Rust mite damage appeared less noticeable in the plots sprayed with Phygon-XL and the possible insecticidal value of this material will be further investigated.

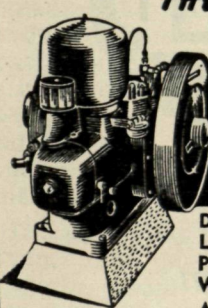
Phygon has been reported as producing an objectional discolouration of tomato fruits in overseas countries and although regarded as a promising material further tests would be necessary before general recommendations are made for this State.

ACKNOWLEDGMENTS

Appreciation is expressed of the co-operation and invaluable assistance given by Mr. J. Henneberry on whose tomato garden the experiment was conducted.

Many thanks are also due to officers of the Agriculture Department stationed at Geraldton for their help in conducting the experiment.

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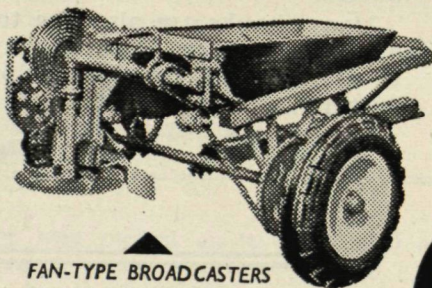
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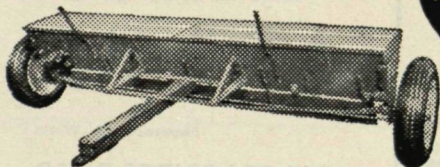


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