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Citrus Canker

BY

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CITRUS CANKER

By F. A. Wolf and A. B. Massey.

About three months ago our attention was directed to the presence in the vicinity of Mobile, Ala., of a new citrus disease which has received the popular name of citrus canker. This disease was very severe in certain grape fruit groves during the previous season and threatens to become the most serious difficulty with which the grower will have to contend. For this reason investigations were immediately begun, both in the field and in the laboratory, to learn something of the nature of the disease, its cause, its distribution, and the means for its prevention and control. Sufficient information has already been collected to warrant the publication of this preliminary report for the purpose of calling the attention of those interested in this industry, both as nurserymen and growers, to the presence of this malady, so that concerted efforts may immediately be made to prevent its further spread and development.

This circular is prepared at the request of the Citrus Fruit Grower, the official organ of the Gulf Coast Horticultural Society. This society has co-operated through certain of its officers and members with the Experiment Station in furnishing materials and facilities for the prosecution of the investigations which are being made. A complete report of these studies will be published as soon as the work is completed. Special thanks are extended to Mr. J. A. Dew, Insecticide Department, Van Antwerp's Drug Co., for his hearty and arduous co-operation and to Dr. E. W. Berger, State Nursery Inspector of Florida for furnishing the photograph of the diseased grape fruit from which the illustration has been made.

Distribution of the Disease.

It has thus far been impossible to make a careful survey of the area in which citrus plantings have been made to determine the distribution within Alabama of citrus canker, but it is believed to be quite widely distributed. Diseased specimens have been received and examined from Mobile, Grand Bay, Axis, Bay Minette, Fairhope, Robertsdale, and Calvert, Alabama. It is reported in a recent bulletin (1) as having been intro-

(1). Stevens, H. E. Citrus canker. Florida Agricultural Experiment Station, Bulletin 122; 113-118, figs. 4, 1914.

duced into two localities in Florida, and beyond doubt it exists in other of the Gulf States.

Host Plants.

Citrus canker is productive of more injury to grape fruit than to any other citrus fruit. Leaves, young twigs, older branches, and fruits are all subject to attack. On Citrus trifoliata, this disease is thus far known to attack only the twigs and branches. The injury to the Satsuma seems to be slight, appearing to cause only a spotting of the leaves. The native round or sweet orange exhibits even more resistance than the Satsuma but leaves have been found upon which a few spots had formed. The kumquat is apparently free from attack.

Symptoms.

The first indication of the disease upon the leaves is the appearance of very small, circular, oily or watery dots. Within a short time these diseased areas extend through the leaf, appearing on the opposite leaf surface as small yellowish or brownish spots. The spots increase in size, becoming about one-sixteenth of an inch in diameter and are elevated (Fig. 1). These corky, elevated spots change to a light brown color, maintaining an oily border. At this stage they might, to the untrained eye, appear to be sour scab infections. They may occur singly or in case the spots are numerous they may grow together, making more or less irregular areas. They may appear on either surface of the leaf, being far more abundant, however, on the lower surface. The leaf tissue surrounding the diseased areas is paler green than the normal leaf tissue (Fig 1.) and as the spots mature it becomes chlorotic or yellowish. Oftentimes the same spot will be observed to be elevated on both sides of the leaf. Mature spots on both the Satsuma (Fig. 2.) and the grape fruit (Fig. 5.) are one-quarter of an inch or more in diameter. They are dark brown in color, becoming at length, grayish brown at the center. This grayish color is imparted by the elevation and rupture of the outer membrane of the leaf, resulting from the formation of the dark fruit-bodies (pycnidia) of the fungus within the leaf. The pycnidia are scattered or formed in more or less concentric zones (Fig. 5.). Considerable defoliation, in the case of the grapé fruit, may result at this stage.

The spots on the fruits of the grape fruit have much the appearance of those on the leaves. They are

scurfy elevations and for the most part circular in outline. The corky, diseased tissues, which remain quite superficial, become variously fissured and broken. The spots may unite by continued growth, forming irregular, scaly areas. Affected fruits are thus rendered very unsightly and unattractive (Fig. 3.).

The only species of citrus, of which the twigs and branches seem to be subject to attack, are the grape fruit and the trifoliate orange. On grape fruit stems the disease first appears as oily, light brown blisters. These enlarge, forming prominently projecting, irregular, corky outgrowths, which become, at length, fissured and cankerous (Fig. 4.). Frequently, too, there are no such outgrowths on the twigs but grayish areas, dotted with the dark fruit bodies of the fungus, as shown in Fig. 4, are formed. Stems may be completely girdled resulting in the death of the twig. Only the outer tissues of the bark are destroyed and the spots do not penetrate to the wood.

The disease is very severe upon the stems of Citrus trifoliata. The base of the thorns is most commonly the initial seat of infection. Circular spots of an oily, dark brown color are formed. These spots gradually increase in size, becoming zonate, with different shades of brown, and possess a slightly elevated, darker margin. The diseased areas may become united so that large portions of the branches are involved in a single canker, thereby girdling them and causing their death. In advanced stages of the canker, the outer membrane of the bark becomes frayed and torn, giving the grayish appearance shown in Fig. 6. This rupture exposes the corky, cankerous tisues below.

Cause of the Disease.

Several different fungi have been found associated with the spots and cankers, but it has been determined that the disease is caused by a species of Phoma*. Since several different species of Phoma have previously been reported on Citrus the specific name remains to be determined only after further study. This Phoma has been isolated in pure culture from grape fruit leaves and twigs, from Citrus trifoliata twigs, and from Satsuma leaves. Inoculations have been made with pure cultures into grape fruit twigs and

* This is beyond doubt the same organism as the one which Stevens calls Phyllosticta, but the question of proper terminology is reserved for consideration in the complete report.

leaves and into the twigs of Citrus trifoliata. The inoculations made on grape fruit twigs and leaves on April 23rd, had developed the characteristic symptoms of the disease by May 12th. The fungus fruited on the artificially inoculated trifoliate twigs about two weeks after the date of inoculation and the Phoma has been reisolated. It exhibited the same appearance and characteristic growth in culture as the organism originally isolated, which was used in making these inoculations. This leaves no doubt that the Phoma, which is being studied, is the cause of the disease.

Time of Infection.

The first appearance of citrus canker in the field, during the present season, was noted on May 11th. No infections were apparent in this grove when it was visited on May 1st. Judging from this and the period of incubation found in the artificial inoculation experiments, infection must have occurred about two weeks prior to May 11th. Infections must have taken place earlier in 1913, than in the present season, since comparable seasonal conditions came about two weeks earlier and since certain growers reported that considerable defoliation had occurred by May 11th, 1913, as a result of the attacks of citrus canker.

Control.

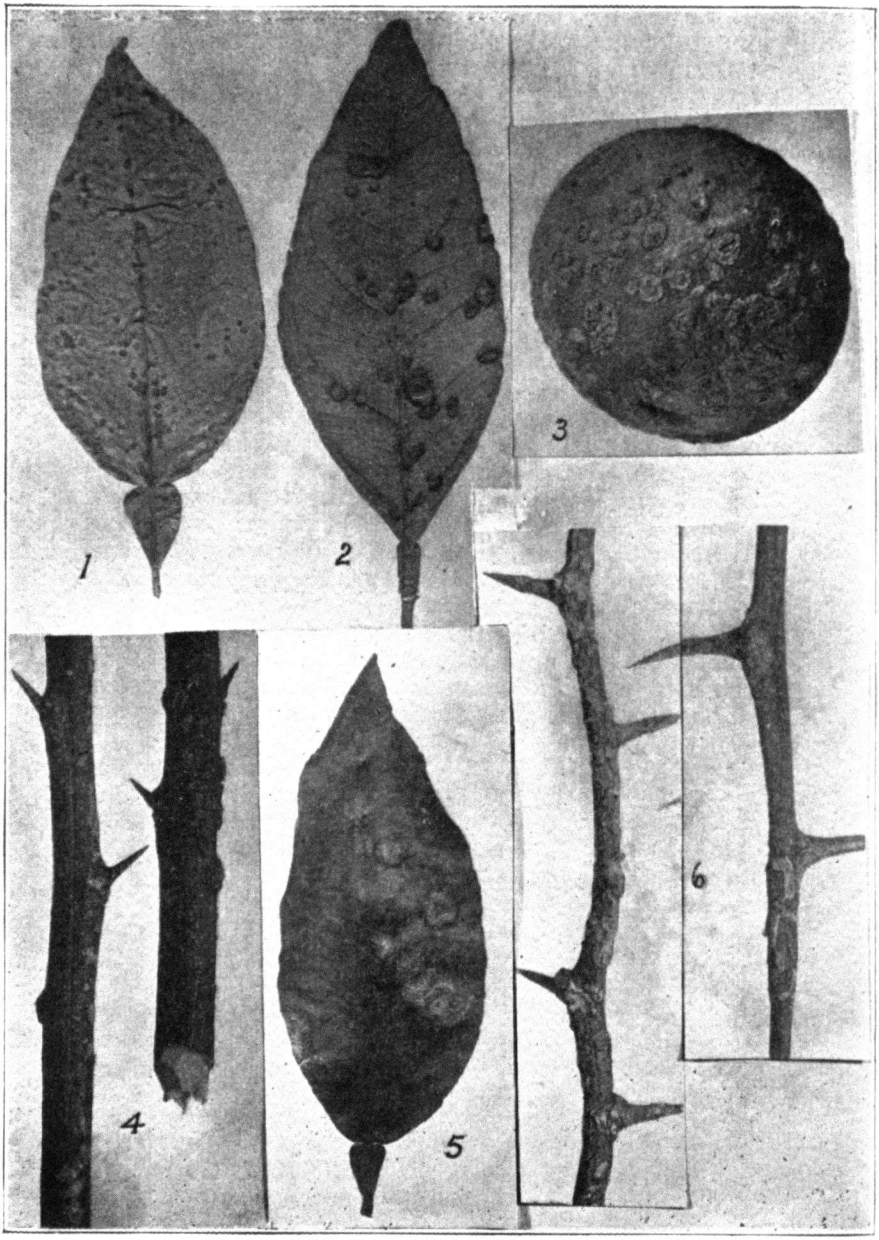
Experiments are being conducted in a grove of 98 grape fruit trees on the effectiveness of Bordeaux mixture, ammoniacal copper carbonate and soluble sulphur in the control of this disease. The plan of these experiments will not be described at this time, but suffice it to say that very encouraging indications of successful control have been obtained by the use of each of these fungicides. In case, however, it is learned that mature parts are equally as susceptible as young growth, it will be impractical to depend on the use of fungicides, since it would require repeated sprayings throughout the entire season. This point cannot be determined until the experiments have progressed further. It seems quite probable that young trees, which are only slightly attacked can be made to overcome the disease by protecting their new growth with fungicides and removing the limb cankers or covering them over with Bordeaux paste.

Every effort should be made to avoid the further dissemination of the disease in new plantings. Young grape fruit trees should be carefully examined before

being planted, to see that they are free from disease. Subsequently, the grove should be occasionally inspected, as the disease can be much more easily eradicated if it has not been permitted to become thoroughly established. If the twigs of older trees are seriously cankered it is probably advisable to prune off the diseased parts, even though this necessitates cutting back the trees rather severely. All of the disease parts which have been removed should be burned. Judging from the indications as regards the effectiveness of fungicides, the new growth of the trees, thus pruned, should be protected by spraying at intervals of several weeks.

It is quite probable that the disease will not become a menace to the Satsuma. In case it is found to be already present in older groves, it will likely be most economical to pick the diseased leaves and destroy them. Since defoliation of citrus nursery stock is required, there is little danger of the introduction of citrus canker in new plantings of Satsuma. The trees should be inspected from time to time, however, during the first year, to guard them against infection from nearby trees.

It will be a great aid in learning of the distribution of citrus canker, if any grower finding the disease will send specimens of the same to the Plant Pathologist of the Alabama Experiment Station.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