was indeed the case, but it should be remembered that crude salts were used in all cases. The boron was applied as borax—purchased in a local grocery. The iron was supplied as technical grade copperas. All sprays were applied by means of Champion knapsack sprayers. The water used was deep well artesian water. All of these factors may have contributed zinc to the spray, and it is believed that this was the case, for several reasons.

In the first place, the symptoms of boron deficiency on the tomato plant are well known and in no way resemble this necrotic spotting. Boron deficiency shows first of all in the growing point—this showed in the older leaves first and then on younger leaves as they developed.

Iron deficiency, too, shows symptoms on the tomato which could not be confused with this spotting. Iron deficiency develops as a leaf chlorosis.

Also, it is known that the trouble was not at all severe in these plots—all plants fruited well, and no yield differences between treatments were found. It is apparent that a mild spotting such as developed in these plots is not of commercial importance. It is unfortunate that the area where these tests were conducted was not more deficient in zinc, so that yield differences would have shown up. The trouble was much more severe in some commercial fields.

We have further tests going this spring, and it is hoped that the results will be more positive. Nevertheless, all indications are that the trouble is zinc deficiency, and we are recommending zinc sprays wherever such trouble occurs in the area.

THE USE OF ZINC SALTS WITH COPPER FUNGICIDES ON TOMATOES IN DADE COUNTY

DR. GEO. D. RUEHLE
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One of the most interesting results from spray tests on tomatoes in Dade county has been the demonstration that the addition of zinc salts to copper sprays consistently increases the yields of marketable fruit. Zinc sulfate has given excellent results without injury to the plants and is considered safer to use than zinc oxide.

Zinc sulfate was first used with copper sprays on tomatoes in Dade county during the 1937-38 season. It was added to basic copper sulfate as a copper depositor at the suggestion of Mr. P. E. Kaspar. It was used at the rate of two-thirds of a pound to 50 gallons of spray. Basic copper sulfate was being tested comparatively with bordeaux mixture. Since zinc sulfate is known to possess some fungicidal properties, it was added to bordeaux mixture in one of the treatments. An increase of 35 field crates per acre of marketable tomatoes resulted from the addition of the zinc sulfate to the bordeaux mixture.

This was a promising lead and each year since 1938 the combination of zinc sulfate with certain of the copper sprays has been compared with the same copper fungicide without the addition of the zinc salt. In all tests that were carried to completion the addition of the zinc sulfate resulted in increases in yield of marketable tomatoes. These increases ranged from as low as 12 to as high as 64 field crates per acre and were definitely worthwhile considering the cost of the treatment.

In 1940, a test was conducted to determine the optimum amounts and number of applications of zinc sulfate or zinc oxide for Dade
It was found that the concentration of zinc sulfate or zinc oxide need not be greater than 2 pounds per 100 gallons of spray, and the maximum increases of yield resulted when zinc was added at each application of fungicide. Similar tests have been conducted on potatoes with somewhat similar results except that zinc oxide was found to cause serious burn of the foliage under certain conditions. While zinc oxide has not produced a serious burn on tomato foliage, the possibility of such a burn occurring under certain conditions would make it seem advisable to use the sulfate rather than the oxide salt for tomatoes.

The manner by which zinc salts increase the yield of tomatoes on our marl soils is undetermined to date. Sharp zinc deficiency symptoms such as occur on other crops in Dade county have not been observed on tomatoes produced on our marl soils. On the other hand, there is evidence that the growth of the plant is slightly more vigorous when zinc is applied as a spray. There is no evidence that control of the common foliage diseases of the tomato is materially increased by the addition of zinc to the copper spray. There was some evidence this season that the copper-zinc combination spray was slightly less toxic to foliage than the copper fungicides alone. This was particularly true on potato foliage this season which was noteworthy for the occurrence of foliage injury by all types of copper fungicides. There was also some evidence that zinc sulfate holds some promise as a partial control for bacterial spot of tomatoes, although this needs further investigation before definite conclusions can be drawn.

Summing up the evidence to date it would seem that the addition of zinc sulfate to copper sprays is a practicable means of increasing yields and returns from spraying on tomatoes grown on the marl soils of Dade county.

PREVALENCE AND CONTROL OF BACTERIAL SPOT OF TOMATOES

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Bacterial spot is a serious disease of tomatoes which has occurred in Florida for many years. According to Ramsey and Link¹ it seems to occur most frequently and seriously in Indiana, Michigan, Georgia, Tennessee, Texas, Mississippi, Florida and Mexico, but is known in other states as well.

It is known by various other names, which include scab, small pox and canker for the fruit phase, and red rust, water spot, and blight for the foliage phase. Practically all varieties of tomatoes are affected and the disease also occurs on peppers. It is caused by the organism, Bacterium vesicatorium Doidge.

Symptoms

Tomato plants may develop symptoms at any time in their life from the smallest seedlings to maturity. On fruits the first symptoms are minute dark-colored raised dots sometimes with a narrow light colored water-soaked border. As the spot enlarges it becomes brownish in color, elevated and scab-like, often with irregularly lobed margins. The epidermis finally ruptures and rolls back from the centers which become slightly sunken and dark brown in color. The spots average about 1/8 inch in diameter on mature fruit but may at times attain 1/4 inch, and they remain superficial. Their entire de-