Control of Bacterial Spot of Tomato in Southern Florida

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There are many roadblocks in the path of the southern Florida tomato grower that constantly jeopardize his financial success. Among these are competition from Mexico, an erratic market, hurricanes, excessive rainfall, water shortages, wind, sun, frost, freeze, hail, late blight, early blight, fruit rots, several viruses, the fruit worm, the southern army worm, the cabbage looper, and the green peach aphid. My major efforts as a private consultant during the past 25 years have been devoted to coping with these problems.

One roadblock stands out above all others as an obstacle to grower success, and removing it has provided the single greatest challenge of my career. It is the disease bacterial spot (*Xanthomonas vesicatoria*). The irony of this tale is that, in my judgment, with minimal effort and cooperation, the disease long since could have been reduced to a minor role. I have devoted an entire chapter of my book *The Agricultural Consultant* (1982, Publications Development Company of Texas, Crockett) to "The Saga of Bacterial Spot."

In determining an effective control strategy for plant diseases, it is necessary to have an understanding of the life cycle of the pathogen. A vulnerable link in the life cycle of a parasitic organism is when its population density is at its lowest ebb. This condition generally occurs during the off-season between crops. Consequently, the most economical and successful control efforts frequently are those directed toward this weak link.

Common means of off-season survival include dormant (usually highly resistant) vegetative or sexual organs free in the soil, on or in plant refuse, in the infective state on volunteer plants of the same crop or on additional or alternate cultivated or wild host plants, or in the seed of the host plant. Thinking in terms of the soil as a medium of survival, when seed are the primary source, can stymie control efforts during the critical off-season period.

Such has been my experience with bacterial spot on tomato—and pepper, for that matter—during the past 25 years. Growers have insisted that the disease comes from the soil. So long as the seed were produced in the arid regions of California, the question was more or less academic. In recent years, however, production has been shifted by some seed houses to other areas, such as Taiwan. Apparently, conditions much more favorable for bacterial spot development occur in these regions; hence, the likelihood of contaminated seed is much greater.

M. W. Gardner and J. B. Kendrick showed over 60 years ago (J. Agric. Res. 21:123-156, 1921) that the bacterial spot pathogen can survive between crops on or in tomato seed. In 1963, George H. Peterson (Phytopathology 53:765-767) showed that the causal bacterium can overwinter on standing tomato refuse but persists for only 3 weeks when the refuse is plowed down. Surely, none would question that the organism can survive the off-season on volunteer tomato plants in regions favorable to their survival.

It has long been my conviction that, although the bacterium can survive by other means, by far the most important means is contaminated seed. In recent years, epidemics of bacterial spot have recurred with increasing frequency and severity in Florida. Annual losses commonly run into millions of dollars. Ruth Averett, Donald Fieldhouse, and Myron Sasser, working in Delaware, recently obtained 98% cleanup of infested seed with a sodium hypochlorite treatment. Because of the long-held belief that the "disease comes from the soil" and of seed-house representatives' insistence that seed are not involved, it has taken diligent effort to get Florida growers to demand treated seed. Fortunately, progress is at last being made.

Unfortunately, with only 98% cleanup, growing conditions in Florida provide ample opportunity for epidemic development of bacterial spot with the very low level of primary inoculum that can occur, even with treated seed as the plant source. Work at the DuPont Experiment Station in Bradenton, FL, 20-odd years ago showed that maneb mixed with fixed coppers somehow improved the effectiveness of the latter as a preventive spray against bacterial spot. L. Evans and Sasser, in their work in Delaware, found that there was a chemical reaction between the two materials resulting in a copper carbamate. They also made the significant discovery that the reaction is slow, requiring 90 minutes for its completion.

I have encouraged my growers to take advantage of this information. Several have complied, and the 90-minute copper-maneb premix has become common practice with them.

Growers employing the combination approach of seed treatment and premixed copper-maneb, on a regular preventive spray schedule, have obtained outstanding control for the past 2 years. In fact, for the first time in my experience, I have witnessed farms that survived the entire season without the discovery of a single bacterial spot lesion. And no more than a trace of the disease has been found on any farm where the dual approach was followed. It is my judgment that if the tomato industry universally would adopt the dual program, bacterial spot of tomato would succumb to the same fate as that of bean anthracnose in the United States: elimination as a serious threat to production.

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