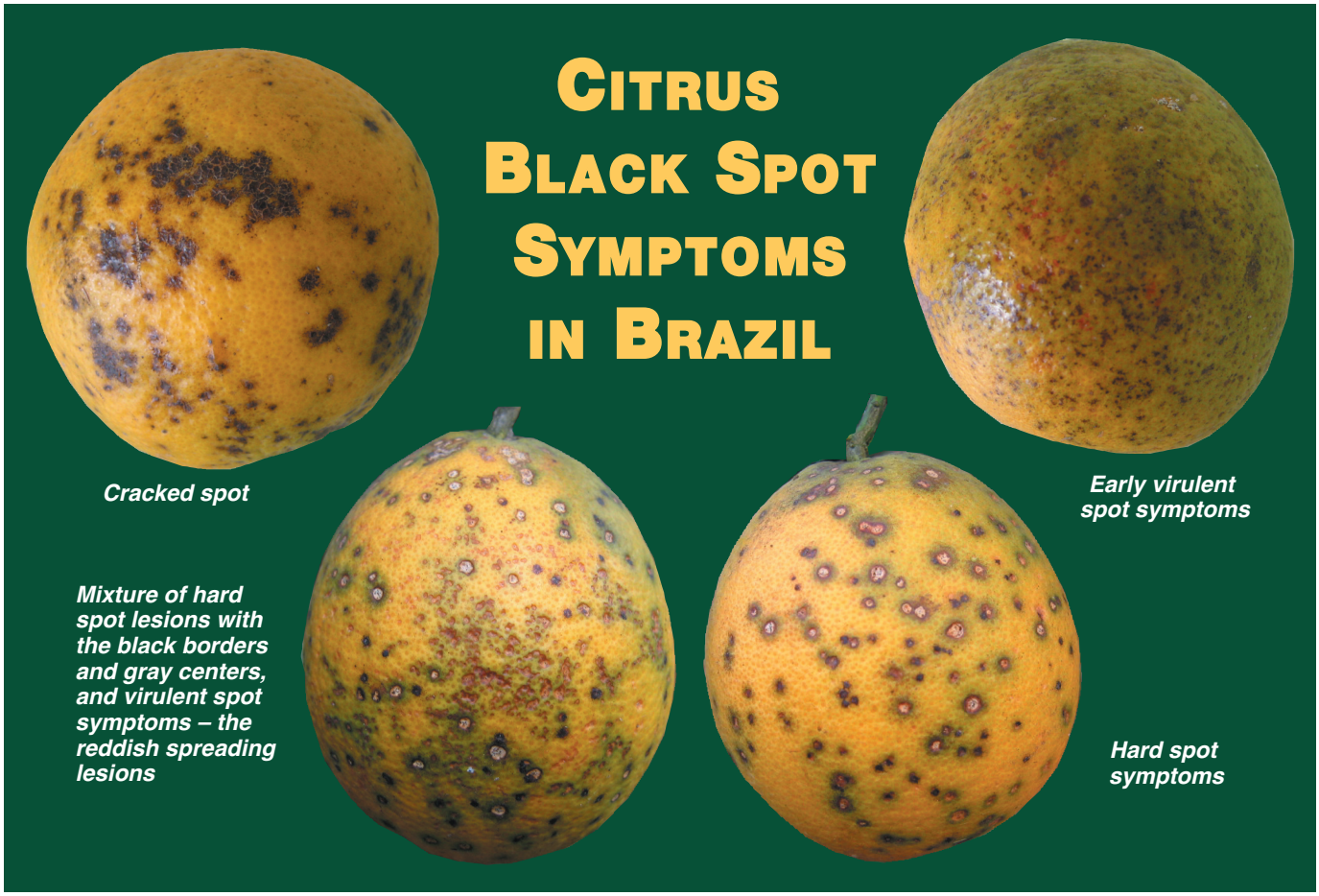


Citrus black spot and sweet orange scab

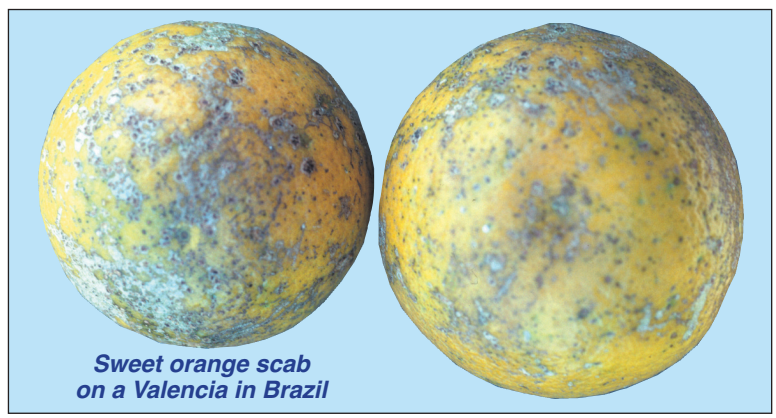
New approaches for dealing with two more exotic diseases

By L. W. Timmer, N.A. Peres and J.W. Hyun

The Florida citrus industry is currently struggling with canker and greening. But there are other diseases around the world that may cause further concern. With all the traffic and movement of people worldwide to Florida, the risk of introducing more diseases and pests is high. To avoid further problems, we need to protect the industry by developing methods and approaches to prevent introduction and for the early detection of these diseases if introduced.

One potential problem is citrus black spot, caused by the fungus, *Guignardia citricarpa*. Black spot produces several types of symptoms on fruit, such as hard spot, virulent spot, cracked spot and false melanose. Leaves can be affected as well, but only occasional spots are produced.

The life cycle is similar to that of greasy spot in that it produces airborne spores in the leaf litter beneath the tree canopy. The asexual spores are produced on hard spot lesions on fruit and those are spread by rain splash. The disease not only results in unsightly blemishes on the fruit, but fruit can fall prematurely, reducing yields. The disease is widespread in Asia and Australia and has become common in Brazil and Argentina since its discovery many years ago. Hopefully the disease won't follow canker and greening and become a problem in Florida as well.


Sweet orange scab on a Valencia in Brazil

Another potentially problematic fungal disease is sweet orange scab, caused by *Elsinoe australis*. Sweet orange scab produces symptoms similar to citrus scab, but affects only the fruit of sweet oranges and some tangerines. The scab reduces the external quality of these varieties, but does not affect yield. Sweet orange scab, which occurs only in southern South America, is controlled by fungicidal sprays used for common citrus scab on grapefruit and tangerines. However, we

would prefer not to deal with scab on more citrus types than we do currently.

IDENTIFICATION

There are complications in identifying either of these diseases. Black spot is readily identified if typical hard spot lesions are present on fruit and the fungus is sporulating in those spots. However, black spot has many symptoms such as false melanose and cracked spot that can be confused with other problems. In addition, the fungus is not easily isolated and grows rather slowly. To further complicate matters, any injuries or scars on fruit unrelated to diseases can be colonized by the saprophytic species, *G. mangiferae*, which is cosmopolitan on many plants including citrus. That species is found commonly in Florida citrus groves.

In fact, a few years ago, a load of fruit from Florida was rejected at the port in the Netherlands because it presumably had black spot. Eventually, it was demonstrated that the fungus that had been isolated was *G. mangiferae*, which posed no threat, but it required many days to do that.

Sweet orange scab can easily be confused with common citrus scab since the symptoms are very similar. The presence of scab symptoms on sweet orange fruit is not sufficient to conclude that the disease is caused by *E. australis*. The state has one pathotype of the common citrus scab pathogen, *E. fawcettii*, known as the Florida Broad Host Range pathotype. Because this pathotype can occasionally affect sweet orange fruit, it is necessary to isolate this very slow-growing fungus and conduct inoculation or molecular studies to identify the pathogen.

Rapid techniques are needed by the regulatory agencies to identify these pathogens. Without such methods, introductions of dangerous diseases can occur or costly delays and misidentification of symptoms on fruit can occur in ports of entry or in the field.

For the last several years, we have been conducting research to improve detection techniques for these pathogens. Some molecular techniques were available for detection and differentiation of *G. mangiferae* and *G. citricarpa*, but those required large amounts of tissue or lengthy extraction procedures. A polymerase chain reaction (PCR) procedure we have developed can be done using a single fruit lesion and completed in one day (N.A. Peres, et al, Plant Disease, in press). Most of this work was conducted in Brazil by N.A. Peres working as a postdoctoral fellow on a project funded by the California Citrus Research Board.

No PCR or other molecular procedures were available for distinguishing the two species causing scab. The PCR method we developed is able to identify not only the two widespread species causing scab on citrus, but also a pathotype of *E. australis* that affects natsudaidai in Korea (J.W. Hyun, et al. Plant Disease, accepted). The procedure is effective not only using mycelium of the fungus from culture, but also using lesions directly from fruit. Thus, we can now identify the pathogen on affected fruit in one day using plant material directly. Most of the work was conducted in Korea by the group of J.W. Hyun, who has a worldwide collection of isolates of *Elsinoe* from citrus. This work was funded by the Korea Rural Development Administration.

These procedures will be useful to regulatory agencies for diagnosis of diseases encountered on fruit in ports as well as for identification of suspect symptoms found in the field. In addition, they will be valuable to investigators for determining which pathogens are responsible for specific symptoms found on different plant tissues or cultivars of citrus.

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