

## Citrus Diseases Exotic to Florida: Citrus Leprosis<sup>1</sup>

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Citrus is susceptible to a large number of diseases caused by plant pathogens. Economic losses due to plant diseases can be severe, but fortunately, not all pathogens attacking citrus are present in Florida. Major citrus diseases currently present in Florida include: *Alternaria* brown spot, blight, citrus canker, greasy spot, melanose, *Phytophthora*-induced diseases (foot and root rot, brown rot), postbloom fruit drop (PFD), scab, and tristeza. An exotic, destructive disease called citrus greening (Huanglongbing) has recently been found in Florida. Any exotic diseases, if introduced, will increase production costs and decrease profitability for Florida growers. Exotic diseases could affect the viability of the industry and the varieties that could be profitably grown. Background information for each exotic citrus disease will be presented in a series of fact sheets to: 1) provide a basis for evaluating exotic pathogens that may pose potential risks to Florida citrus; and 2) create a decision-making framework to prevent their introduction and spread. This paper will discuss citrus leprosis.

### Why Are We Concerned About Citrus Leprosis?

Leprosis is a virus-induced disease causing chlorotic lesions on citrus leaves, fruit, and twigs. Leprosis is currently a highly important citrus disease in Brazil and other areas of South America. A new outbreak of leprosis has recently been reported in Panama. Prior to 1925, leprosis was once a serious disease of citrus in Florida, but it has not been observed here since. The causal agent of leprosis is transmitted by several species of *Brevipalpus* mites. It is not known why leprosis disappeared in Florida. Improved mite control procedures may have been at least partly responsible for the disappearance of the disease from Florida. A great deal of uncertainty exists about the epidemiology of leprosis and its potential to reappear in Florida.

### The Causal Agent of Citrus Leprosis

The causal agent of leprosis is a naked bullet-shaped virus that has recently been molecularly characterized. Two different types of leprosis viruses exist. One virus occurs in the cytoplasm and the other resides primarily in the nucleus of infected

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cells. The virus particles, with some difference in shape, can often be observed by electron microscopy of lesions from naturally infected citrus and from mechanically inoculated *Chenopodium quinoa* (universal virus host) plants.

### Which Cultivars Are Affected?

Leprosis primarily affects oranges, but mandarins can also be affected. The host range outside of citrus remains unclear. Leprosis virus can be mechanically transmitted to some herbaceous plants, producing local necrotic lesions. However, attempts to re-infect citrus with extracts from affected herbaceous plants have failed. It has been reported that leprosis symptoms appeared on citrus seedlings fed on by *Brevipalpus* mites collected from Spanish needle plants, but its status as a weed host has not been determined. Field symptoms produced by leprosis are similar to coffee ring spot and the virus particles associated with the two diseases have similar shapes, but no direct relationship has been established.

### What Are the Typical Symptoms Caused by Citrus Leprosis?

Leprosis symptoms can be found on leaves, fruit and twigs (Figures 1-3). Lesions are usually chlorotic at first and then may become necrotic in the center. There may be concentric patterns present and gum impregnation in mature lesions. Stem lesions may coalesce, produce bark scaling, and results in premature fruit drop, leaf abscission, and twig dieback when severe. A similar disease called zonate chlorosis occurs in Brazil, but is less severe. Zonate chlorosis produces larger chlorotic patterns that may cover a large part of affected leaves, but lacks the necrotic characteristics of leprosis.

### How is Citrus Leprosis Transmitted?

Leprosis has been transmitted experimentally by several species of *Brevipalpus* mites (*B. phoenicis*, *B. californicus*, and *B. obovatus*). Leprosis has been transmitted mechanically from sweet orange to sweet orange, and from sweet orange to several herbaceous hosts, but attempts to transmit the virus from



**Figure 1.** Chlorotic leaf lesions caused by leprosis on sweet orange.

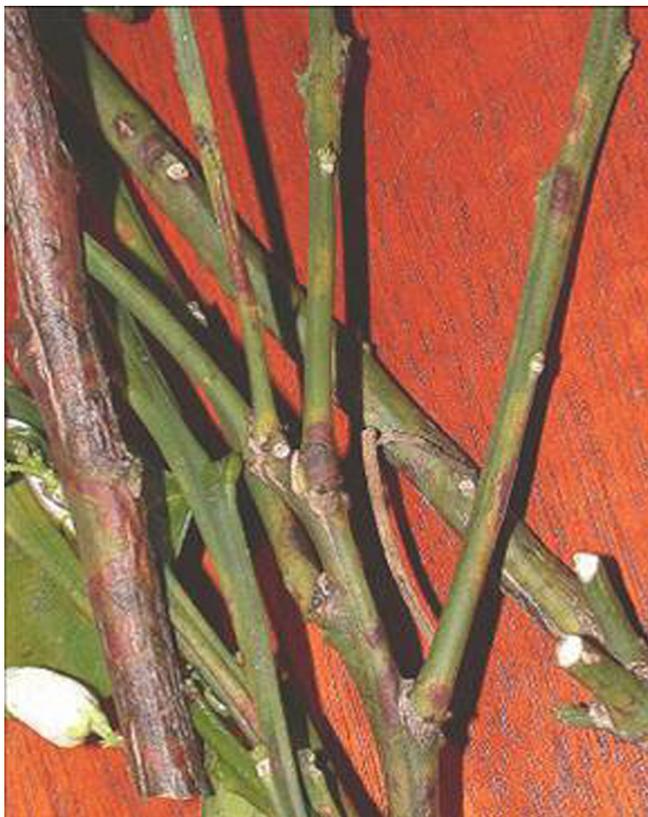
herbaceous plants back to citrus have failed. Leprosis has been very difficult to transmit to citrus by grafting due to the frequent rapid death of affected tissue after grafting. Transmission occurs only when symptomatic areas of the inoculum tissue are in contact with the receptor plant. Symptoms develop only in immediately adjacent tissues of the receptor plants.

### How Can Citrus Leprosis Be Detected and Controlled in the Field?

Symptoms of leprosis are easily visible on leaves, fruit, and twigs in the field and serve as the primary means of diagnosis. Confirmation can be done by electron microscopy of infected tissue to observe bullet-like virus particles. Although local lesions have been observed in mechanically



**Figure 2.** Leaf and fruit lesions caused by leprosis on sweet orange.



**Figure 3.** Stem lesions caused by leprosis on sweet orange.

inoculated herbaceous hosts, these are not diagnostic. Control of mite populations greatly limits the spread and development of leprosis. Pruning the affected

trees may reduce the inoculum sources. A major question is whether there are other natural hosts of the leprosis agent that serve as an inoculum reservoir or whether a reservoir can be maintained indefinitely in mites. As observed in Brazil, well managed groves are less affected than those receiving minimal care. A better understanding of the epidemiology, characteristics and host range of the leprosis virus is needed.

### What Can Growers Do?

Leprosis primarily affects oranges. Given that the climatic conditions are highly suited for establishment of the pathogen, leprosis is predicted to have an economic impact on citrus production in Florida, if found again. Preventing leprosis from re-entering Florida is much easier than trying to eradicate or control it. It is important to avoid bringing propagation materials from leprosis-infected areas into Florida. Any citrus propagating materials must be introduced by proper procedures through the Florida Department of Agriculture and Consumer Services, Division of Plant Industry.

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