

Citrus Diseases Exotic to Florida: *Phaeoramularia* Fruit and Leaf Spot (PFLS)¹

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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. Citrus diseases present in Florida include: *Alternaria* brown spot, blight, canker, greasy spot, greening (Huanglongbing), 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, HLB) has recently been found in Florida. Exotic diseases, if introduced, will increase production costs and decrease profitability for Florida growers. Exotic diseases affect the viability of the industry or the varieties that could be profitably grown. Background information for each exotic citrus disease is being 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 *Phaeoramularia* fruit and leaf spot (PFLS).

Why Are We Concerned About PFLS?

Phaeoramularia fruit and leaf spot (PFLS) is a damaging fungal disease that affects citrus. PFLS was first reported in Angola and Mozambique in 1952 and has become a serious fungal disease of citrus in the sub-Saharan citrus-growing areas of Africa. The disease is now widespread in 18 other African countries and in Yemen and Southern distribution is approaching a major citrus-producing area in South Africa. Crop losses to PFLS can reach 50 to 100% if not controlled by fungicide sprays. The disease causes extensive foliar and fruit damage and seems to have potential to become a significant problem in Florida if introduced as the pathogen prefers warm and humid climates. Currently, no citrus pathologist in the U.S. has any direct experience with this disease. Knowledge of the susceptibility of specific citrus cultivars is also lacking and there are no current cooperative interactions with scientists in areas where PFLS is endemic. The suitability of the Florida climate for disease development requires clarification, but our warm, humid climate is likely to

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be favorable. Crop loss for fresh and processing fruit needs to be determined.

The Causal Agent of PFLS

The causal agent of PFLS is the fungus *Pseudocercospora angolensis* (formerly *Phaeoramularia angolensis*). The fungus has no known sexual stage and is easily isolated and cultured from infected leaves or fruit. Airborne conidia (asexual spores) are the primary inoculum. *Pseudocercospora angolensis* multiplies well in warm and humid climates based on its distribution.

Which Cultivars Are Affected?

The PFLS is restricted to *Citrus* species and has been observed on all major citrus cultivars. Grapefruit, oranges, pummelo, and mandarins are reported to be very susceptible to PFLS. Lemons and limes are also affected. No alternate host has been reported.

What Are the Typical Symptoms Caused by PFLS?

Brown or grayish spots up to 1/2" in diameter are formed both on leaves (Figure 1) and fruit (Figures 2 and 3) and are usually surrounded by yellow halos. The lesions are often flat or sunken, which differ from those of citrus canker. Premature defoliation and fruit drop can occur when infections are severe. The affected fruit produce poor quality juice, and thus are not suitable for processing or the fresh market.

How is PFLS Spread?

The spread and infection processes of *Pseudocercospora* fungus are similar to other citrus fungal pathogens whose asexual spores (conidia) are primary sources for new infection. Infection is apparently favored by wind-blown rains that occur when susceptible young leaves and fruit are present and temperatures are warm. Although similar conditions occur in Florida, more information is needed to determine how easily *Pseudocercospora*-induced disease could establish and spread in the State.



Figure 1. *Phaeoramularia* leaf spot on sweet orange leaves, displaying necrotic lesions surrounded with yellow halos. This picture was reproduced from the Compendium of Citrus Diseases (APS press) with permission.



Figure 2. *Phaeoramularia* fruit spot on orange (Courtesy A. A. Seif).

How Can PFLS Be Detected in the Field?

Diagnosis of *Pseudocercospora*-induced disease is based on field symptoms (Figures 1-3) and subsequently confirmed by isolation and identification of the causal fungus. Individual leaf lesions of PFLS would have some similarities to those induced by *Alternaria* species, but apparently are more numerous and tend to coalesce. PFLS affects virtually all citrus species, whereas *Alternaria*



Figure 3. *Phaeoramularia* fruit spot on orange, displaying sunken necrotic lesions (Courtesy A. A. Seif).

Seif, A. A. 2000. Page 29-30. *Phaeoramularia* Fruit and Leaf Spot. *In: Compendium of Citrus Diseases*. L. W. Timmer, S. M. Garnsey, and J. H. Graham (eds.) APS Press Inc., St. Paul, MN.

affects only some tangerines and hybrids. The large fruit lesions induced by *Pseudocercospora* species seem fairly distinct from those induced by existing Florida diseases.

How Can PFLS Be Controlled?

Several fungicides (copper hydroxide, chlorothalonil and flusilazole) apparently can provide control, but repeated applications (every 10 to 14 days) are required to protect fruit during the period of susceptibility that lasts several months after bloom.

What Can Growers Do?

PFLS is an exotic disease to Florida. As with all exotic citrus diseases, if introduced into Florida, PFLS will likely increase production costs and decrease profitability for Florida growers. It is illegal to bring propagation materials into Florida. Any citrus propagating materials must be introduced through the Florida Department of Agriculture and Consumer Services, Division of Plant Industry.

Additional References

Seif, A. A. and R. J. Hillocks. 1997. Some factors affecting infection of citrus by *Phaeoramularia angolensis*. *J. Phytopathology* 146:385-391.

Seif, A. A. and R. J. Hillocks. 1997. Chemical control of *Phaeoramularia* fruit and leaf spot of citrus in Kenya. *Crop Protection* 16:141-145.