

Pest Alert

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Charles H. Bronson, Commissioner of Agriculture

Citrus Black Spot (*Guignardia citricarpa*) discovered in Florida

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INTRODUCTION: Symptoms of the exotic disease citrus black spot were first detected during a Citrus Health Response Plan - Multipest Survey (CHRP-MPS) in Valencia sweet oranges in the Immokalee area on March 8, 2010. Conventional and advanced diagnostic laboratory techniques, including sequencing of the ITS region, confirmed the identity of the pathogen as *Guignardia citricarpa* Kiely (Anamorph: *Phyllosticta citricarpa* (McAlpine) Van der Aa). This marks the first report of this fungal pathogen in North America, and constitutes a major jump in the geographical range of the pathogen. Until this discovery in Florida, the nearest known infestations were in Argentina and Brazil, although infected fruit have been intercepted on travelers arriving in Miami from Cuba (Smith 2006). At present, there is no information as to how the pathogen arrived in Florida. An appropriate detailed regulatory response for this incursion is being devised and delimiting surveys are underway. Citrus black spot has been included in the list of threatening exotic citrus diseases for a very long time because of its capacity to blemish fruit and reduce yields, and because it is likely to find the Florida climate very amenable (Chung *et al.* 2009; Timmer 1999).

DESCRIPTION AND DISEASE LIFE CYCLE: Citrus black spot fruit lesions can be somewhat variable in appearance depending on age and host, but most lesions are 1-5 mm in diameter and irregularly distributed on the fruit peel (Figs. 1 - 2). A dark reddish-brown raised border encloses a light brown imbedded necrotic lesion which can contain black fruiting bodies, which are pycnidia of the anamorph, *Phyllosticta citricarpa*. This is known as the “hard spot” lesion; it is distinctive enough to serve for field identification after some training. Conidia from these pycnidia are water-splash dispersed. The pathogen can cause a smaller raised superficial lesion known as “freckle spot” or “false melanose” (Fig. 3), and also a larger, more diffuse and confluent necrotic lesion called “virulent spot” (Fig. 4). So far, mostly hard spot lesions and the less conspicuous freckle spot lesions have been observed in Florida. Leaf symptoms while on the tree are absent to relatively minor with this disease, but as quiescently infected leaves abscise and decay on the orchard floor, they provide much of the inoculum in the form of air-borne ascospore for new infections (McOnie 1967). Twigs and old peduncles can support the pathogen too, though direct damage to these parts is not a major component of this disease. Ascospores from perithecia in the decaying leaves are discharged into the air during the onset of warm, wet weather, mostly during late spring and summer. Irrigation can provide the moisture for spore release. Fruit are susceptible to infection from petal fall through the summer. Appressoria form on the leaf and fruit tissues that receive inoculum and remain wet for 12-24 hours; though symptomless, these events on the plant start the infection cycle again. Infections remain latent for many months, becoming visible as the fruit begin to ripen. Fruit lesions can become especially noticeable in storage or during shipment.

HOST RANGE: *Guignardia citricarpa* is known to infect only citrus. Among the commercial citrus varieties, late maturing oranges, lemons, mandarins and grapefruit are the most susceptible. Proximity to an infected lemon block can precede a general epidemic in all commercial citrus varieties (Kotzé 1981). Formerly, confusion between *G. citricarpa* and



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another species of *Guignardia* that can occupy citrus and many other plant species as a saprophyte or endophyte was misinterpreted as an avirulent form of the black spot pathogen. Modern molecular methods now distinguish the saprophytic/endophytic form as the cosmopolitan *Guignardia mangiferae* (Bayen *et al.*, 2002; Peres *et al.* 2008). Older literature needs to be understood with this fact in mind (Baldassari *et al.* 2008).

GEOGRAPHIC RANGE: Black spot was first observed in Australia in 1895 and has gradually spread to other citrus-producing regions in New Zealand, southeast China, far eastern Russia, Hong Kong, Indonesia, Java, Philippines, Singapore, Kenya, Mozambique, South Africa, Uganda, Zambia, Zimbabwe, Argentina, Brazil and Vanuatu. The pathogen is known from citrus production areas with warm, humid to semi-arid climates.

SURVEY TIPS: During the summer and especially at harvest, spots on fruit would be a good survey target. Hard spot lesions can be useful for field identification. Look for fruit drop in severe cases. Foliage may appear remarkably undamaged by this disease.

DISEASE MANAGEMENT: Timely applications of protectant and systemic fungicides can reduce fruit damage considerably. As many as five applications coupled with sanitation (removal of leaves, twigs, fruit) may be required for best control.

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Figure 1. Typical black spot lesions on Valencia sweet orange caused by *Guignardia citricarpa*.

(Photograph courtesy of T. Schubert, DPI)



Figure 2. Close-up view of hard spot lesion containing pycnidia of the *Phyllosticta citricarpa* stage of *Guignardia citricarpa*.
(Photograph courtesy of M. Thomas, DPI)



Figure 3. Freckle spot symptoms of black spot alongside larger confluent hard spot lesions.
(Photograph courtesy of T. Schubert, DPI)



Fig. 4. Virulent spot symptoms of citrus black spot along with a few hard spot lesions. This necrosis is quite shallow on the peel. (Photograph courtesy of T. Schubert, DPI)