

Citrus Diseases Exotic to Florida: Satsuma Dwarf¹

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Introduction

Citrus is susceptible to a large number of diseases caused by plant pathogens. Plant diseases that affect citrus can cause severe economic losses, but, fortunately, not all pathogens attacking citrus worldwide are present in Florida. Any exotic disease, if introduced, has the potential to significantly increase production costs and thus decrease profitability for Florida growers. This series of EDIS fact sheets (available at http://edis.ifas.ufl.edu/topic_series_citrus_diseases_exotic_to_florida) presents background information for each exotic citrus disease in order to provide a basis for evaluating exotic pathogens that may pose potential risks to Florida citrus and to facilitate a decision-making framework for preventing their introduction and spread. This paper discusses Satsuma dwarf disease.

Concerns about Satsuma Dwarf

Satsuma dwarf is a virus disease that was first reported in the early 1930s in Japan. The disease causes serious problems in citrus because it reduces tree vigor and fruit yield. Satsuma dwarf has also been reported in mandarin-growing areas in China, Korea, and Turkey, where it was likely introduced through importation of infected budwood from Japan. The Satsuma dwarf virus (SDV) is believed to be transmitted by a soil-borne vector, which has not been identified but is likely a nematode or fungus. If an area becomes infested, SDV persists and infects new replants. The related diseases, citrus mosaic, Natsudaidai dwarf,

navel orange infectious mottling, and Hyuganatsu, have also been described in Japan.

Causal Agent of Satsuma Dwarf

Satsuma dwarf is caused by a new family of plant viruses. Because of the proposed soil-borne transmission of SDV, the virus was once considered within the nepovirus or comovirus group. Recent molecular analyses reassigned SDV to the genus *Sadwavirus*. Viruses that belong to this genus also include Strawberry latent ringspot virus, Strawberry mottle virus, and Black raspberry necrosis virus. Other viruses considered part of the SDV group of viruses, including Citrus mosaic virus (CiMV), Natsudaidai dwarf virus (NDV), Navel infectious mottling virus (NIMV), and Hyuganatsu virus (HV), induce similar symptoms on Satsuma mandarin and share genetic similarity to SDV.

Cultivars Affected by Satsuma Dwarf

SDV can infect a wide range of citrus cultivars. All mandarins are susceptible to infection by SDV. Orange, lemon, pummelo, and other hybrids are also susceptible. SDV can infect citrus relatives, including *Aegle marmelos*, *Aeglopsis chevalieri*, *Atalantia monophylla*, *Clymenia polyandra*, *Fortunella polyandra*, *Poncirus trifoliata*, and *Swinglea glutinosa*. Under greenhouse conditions, SDV has been mechanically transmitted into various non-citrus hosts such as sesame, *Physalis floridana*, and herbaceous plants. Naturally occurring infection of SDV has been found in

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China laurestine (*Viburnum odoratissimum*), a tree commonly used as a windbreak for citrus in Japan. This plant species is found in Florida.

Typical Symptoms of Satsuma Dwarf

Satsuma mandarin infected by SDV shows stunting and boat-shaped leaves (Figure 1). Herbaceous plants affected by SDV display local lesions and systemic mottle and necrosis, whereas China laurestine shows no symptoms. CiMV, NDV, NIMV, and HV also induce boat-shaped leaves in Satsuma mandarin.



Figure 1. Boat-shaped leaves appearing on Satsuma mandarin infected with Satsuma dwarf virus.

Credits: Dr. Toru Iwanami

Transmission of Satsuma Dwarf

SDV can be graft-transmitted, and infection in a new field or geographic area is thought to occur through infected budwood. Once introduced into a new area, SDV continues to spread to nearby trees, most likely via a soil-borne vector. Although the identity of the vector remains unknown, several studies have suggested nematodes as the potential vector of SDV. Field observations reveal that healthy trees replanted in previously infested groves may become infected, even after a three-year fallow period. In some Satsuma groves, China laurestine windbreak plants near infected Satsuma trees are often infected by SDV, indicating that field spread can occur in plants other than citrus. SDV can also be transmitted experimentally to non-citrus hosts and between citrus plants by stem slash inoculation.

Detecting Satsuma Dwarf in the Field

Field diagnosis of SDV can be detected using visual observation of plant symptoms, inoculation of citrus indicators, serological tests such as ELISA, and molecular probes. However, identification can be somewhat challenging because there are considerable variations in symptom expression and diversity within the SDV group.

Control of Satsuma Dwarf

There are no effective means to control SDV. Budwood certification and exclusion are the best strategies to prevent the introduction of SDV to new areas that are not yet affected. A rigorous budwood certification program can prevent introduction and spread of SDV through infected budwood. However, it could be difficult to prevent SDV introduction through illegal budwood importation or through other hosts that are not regulated.

What Can Growers Do?

Preventing Satsuma dwarf from entering Florida is much easier than trying to eradicate or control it. Any citrus-propagating materials must be introduced through the Florida Department of Agricultural and Consumer Services, Division of Plant Industry to ensure healthy plants and the economic viability of the Florida citrus industry.