

Nursery diseases at planting: What to watch for

By Ozgur Batuman and Megan Dewdney

Citrus nurseries work very hard and put forth considerable effort to reduce pest and disease problems. However, there continues to be problems with certain diseases, because the nursery environment for growing citrus trees is ideal for many pests and diseases.

Basic principles of good nursery sanitation practices together with screening and removing suspected or infected plants should be implemented in all nurseries to minimize the risk of introducing and spreading pests and diseases. The main goal of a nursery should be providing the highest quality trees to growers, with no exception. Growers should pay extra attention

to assure that all trees received are of acceptable quality before planting them in their groves.

A few diseases that are frequently problematic in nursery production systems are Asiatic citrus canker (*Xanthomonas citri* subsp. *citri*), citrus bacterial spot (*Xanthomonas alfalfae* pv. *citromelonis*) and phytophthora root and crown rot (*Phytophthora nicotianae* and *P. palmivora*).

CITRUS CANKER AND BACTERIAL SPOT

Citrus canker and bacterial spot are diseases caused by two separate bacteria that find the nursery environment perfect for spread. Young, rapidly

growing leaves are highly susceptible to these diseases, especially when damaged, as occurs in routine nursery operation. Overhead irrigation or other forms of water splash can further spread bacteria and force them into the leaves through openings such as stomata. Both disease symptoms generally are not easily visible until two weeks post-infection, so it can be difficult to associate an infection outbreak with an event during nursery operations.

Even at two weeks, the citrus canker symptoms are subtle, appearing as chlorotic spots. Corky, raised lesions don't usually appear until about 20 days after the infection event (Figure 1). Bacterial spot lesions are flatter and often have large yellow halos. Current regulations require destruction of plant material and sanitation in an affected greenhouse when citrus canker is found. It is also the only way that the disease is likely to be quickly eliminated in a greenhouse environment once introduced.

Citrus bacterial spot was initially regulated in Florida similarly to citrus canker, however, the low disease potential in groves was recognized and the disease was deregulated. Thus, care must be taken to differentiate between citrus bacterial spot and citrus canker in nurseries.

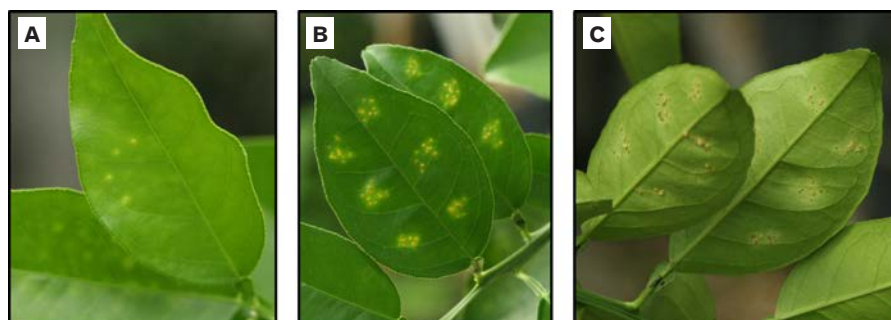


Figure 1. Citrus canker lesions on citrus leaves in the nursery include early chlorotic spots at two weeks post-inoculation (A) and raised necrotic spots on the upper side (B) and corresponding lower side of leaves at 20 days post-inoculation (C).

PHYTOPHTHORA ROOT AND CROWN ROT

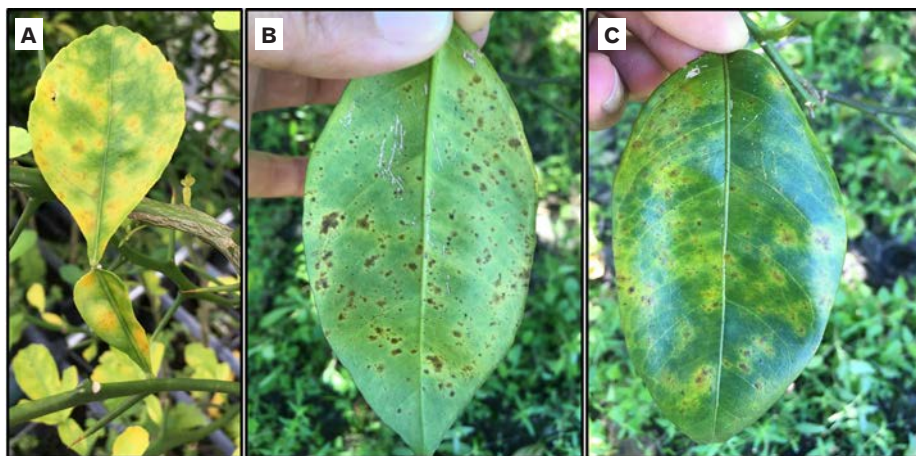
Phytophthora root and crown rot are the most important pathogens in the nursery and affect all aspects of nursery tree production, from seed germination to finishing with high-quality trees. Once in the nursery, the organism is disseminated by equipment, tools, utensils, people, irrigation water and bins that have come in contact with contaminated plants or surfaces like the floor.

If surface water is used to irrigate young trees, it can also be a source of inoculum and should be monitored quarterly for contamination. Both root rot and crown rot affect the foliage. The leaves turn pale yellow and develop yellow veins. Root balls of the infected trees are weak and with sparse feeder roots in the pot (Figure 2). Phytophthora is a common cause of trees struggling to establish in the field.

Planting trees that are likely to fail can be prevented if growers inspect the roots and general appearance of resets



Figure 2. Phytophthora root rot and crown rot symptoms are shown on citrus leaves and roots in the nursery, including yellow vein and general chlorosis on Valencia (A), trifoliolate leaves (B) and a compromised root bowl with sparse feeder roots (C).



Photos by O. Batuman

LEFT: Figure 3. Greasy spot symptoms on citrus leaves from greenhouse experiments for demonstration purposes include early chlorotic and necrotic spots (A) and later greasy necrotic spots on lower sides (B) and corresponding upper sides (C) of leaves.

before transplanting. Growers should not accept and plant weak, wilted or pale-yellow trees with compromised root structures.

OTHER DISEASES

Other diseases that are occasionally seen in nurseries include greasy spot (Figure 3), alternaria brown spot and citrus scab on tangerines. These fungal foliar diseases are avoidable in the greenhouse setting because they require free water on leaf surfaces for several hours. If citrus black spot were to be found in the nursery, eliminating water on leaf surfaces would be essential. If sources of leaf wetness are eliminated, then there should be few problems with foliar diseases, including canker.

If preventive measures fail, copper formulations could be used to protect young tissues from infection by fungi. Growers should evaluate trees for foliar disease symptoms and avoid accepting and planting trees with any noticeable foliar symptoms.

Another rare disease in nurseries is huanglongbing (HLB), which is a serious disease of citrus trees caused by the phloem-limited bacterium *Candidatus Liberibacter asiaticus* and vectored by the Asian citrus psyllid. The Florida Department of Agriculture and Consumer Services Department of Plant Industry (FDACS-DPI) and nurseries make considerable efforts to use pathogen-free budwood and keep nurseries free of HLB.

The most likely means of disease



Photos by O. Batuman

Figure 4. Twisting and distortion of the leaves (notching) was caused by psyllid feeding damage in greenhouse inoculation experiments. Note that these pictures are used for demonstration purposes of notching (black arrows) on expanding or matured leaves, which remains a telltale sign of psyllid feeding damage.

introduction into a nursery would be by a psyllid incursion. In case of an unexpected breach, nursery producers should always be scouting for psyllid feeding on young shoots. Visible symptoms including twisting and distortion of the leaves (notching) due to toxins present in saliva that are injected during ingestion. After leaves mature, notched leaf symptoms remain visible on trees as a telltale sign of past exposure to psyllids (Figure 4).

No such HLB incidences have been reported from any of the well-maintained citrus nurseries in Florida. However, growers should look for signs of both psyllids and feeding damage (notched leaves) on trees and avoid accepting such trees as they might be already infected with HLB, especially if these trees are coming from out-of-state nurseries. Growers should not purchase and bring any citrus trees from out-of-state nurseries.

WHAT TO LOOK FOR WHEN RECEIVING TREES

Nurseries and growers should vigilantly inspect trees to avoid shipping diseased trees out of the nursery or planting them in the grove. Thus, you must look for pest and disease symptoms on trees. When shipping or receiving citrus trees, do the following inspections and take action to prevent introduction and spread of common (and potentially new) diseases in Florida.

- Avoid shipping, accepting and transplanting suspected or symptomatic trees. Use only pest- and disease-free trees.
- Look for unexpected irregularities on trees. These include variations in tree vigor (i.e., lack of uniformity in size and general appearance) as well as biotic (i.e., pest and pathogen) and abiotic (i.e., temperature, chemical or mechanical) stress symptoms.

Avoid accepting and transplanting stressed trees. This is a sign of weak care in the nursery and these trees might be struggling to adapt to planting conditions more seriously after transplanting in the grove compared with healthier trees.

- Inspect the root health and structures in the pots. Select random trees with and without obvious stress symptoms on trees and look for damaged, dying or compromised root structures. If you see uneven or compromised roots among trees, avoid accepting and transplanting such trees. These trees most likely will die in one to three years or will remain unproductive for many years.
- If you see any foliar disease or pest symptoms on trees, do not assume that these are pests and pathogens that you may have in your grove anyway. New introductions of exotic pests and pathogens happen on an almost daily basis in Florida. Furthermore, some disease symptoms look similar and are difficult to differentiate by visible symptoms or visual inspection. Some pathogens do not show easily discernible disease symptoms. You must seek appropriate and reliable diagnosis help from experts like your local Extension agents, Extension specialists or FDACS-DPI. The FDACS-DPI helpline number is 352-395-4600.

Do not take a chance! In the HLB era, planting strong and healthy resets must be a priority. Healthy trees will have a better chance of surviving when they are challenged by HLB-carrying psyllids. If you have any suspect trees or you are not certain about trees' health that you are going to transplant, you can seek help from an expert, preferably before shipping or transplanting into a grove. 🍊

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