Preparation for Citrus Variegated Chlorosis: Diagnostics and the NPDN

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Abstract: The National Plant Diagnostic Network (NPDN) has been involved in detection and diagnosis of many new plant diseases, including preparation for the exotic disease known as citrus variegated chlorosis (CVC). CVC is a particular strain of the xylem-limited sharpshooter-transmitted bacterium, Xylella fastidiosa. Most citrus diseases are known to the network, and CVC disease knowledge base is growing, including detection methods and control on sensitive media. Serological and molecular methods of detection are also available, but like other microscopic and cultural diagnoses, do not allow reliable distinction between CVC and other Xylella diseases known in the U.S. Citrus diagnostic services are located in Florida and other states focusing on the spread of CVC. Detection methods are critical for early diagnosis, encouraging collaboration between university, government, and private diagnosticists.

Detection in the U.S.: Citrus variegated chlorosis has been confirmed in Brazil, Argentina, and Paraguay, but has not been detected outside of South America. However, the vector species, sharpshooters and other xylem-inhabiting insects of the sharpshooter family, are known to be present in the U.S. Exclusion and early detection are our only options, increasing the importance of rapid and accurate diagnosis, and encouraging collaboration between university, government, and private diagnosticists.

Biology of the pathogen: CVC causing species of Xylella are xylem-inhabiting bacteria. Similar strains of X. fastidiosa cause various diseases of grape, prune, pear, and leaf shoot diseases of almonds, coffee, oak, grape, and riparian. These strains are associated with sharpshooter vectors and spread in the phloem, but they can also be transmitted from xylem to xylem in grapevines. The strain causing CVC is xylem-limited, but it can also be transmitted in citrus from another xylem-limited vector and then the plant can continue to be infected by sharpshooter vectors. Sharpshooter vectors can become infected by feeding on infected plants, but they do not move the pathogen between hosts. The CVC strain is transmitted primarily vertically through seed and is spread by movement of infected nursery stock.

Symptoms: Symptoms of CVC include yellowing, vein chlorosis, and leaf blisters. The symptoms are most pronounced in older tissues. Symptoms may appear initially on only one limb or branch and then spread to the whole tree. If the affected limb is pruned out, the remaining part of the canopy may remain symptomless for some time. In Brazil, 30% of trees in groves infected with CVC were removed, and the remaining grove was considered to be disease-free.

Diagnosis: Field diagnosis of CVC is difficult, since symptoms caused by CVC can be confused with other health conditions (diseases, nutritional deficiencies). However, the causative bacterium can be identified by light and electron microscopy, and an additional method is to use plant tissue in a phloem chamber to test for disease. Since a number of Xylella diseases exist in the U.S., and CVC is an emerging disease, it is important to use both microscopic and cultural methods of detection to accurately diagnose CVC. Microbiologists should be familiar with the methods used to detect CVC, and should have access to media that will allow for the isolation of CVC bacteria.

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X. fastidiosa is a hardy bacterium that can survive for extended periods without a host. It is transmitted vertically through seed and is spread by movement of infected nursery stock. The CVC strain is transmitted primarily vertically through seed and is spread by movement of infected nursery stock.

Vectors of the disease: CVC causing species of Xylella are xylem-inhabiting bacteria. Similar strains of X. fastidiosa cause various diseases of grape, prune, pear, and leaf shoot diseases of almonds, coffee, oak, grape, and riparian. These strains are associated with sharpshooter vectors and spread in the phloem, but they can also be transmitted from xylem to xylem in grapevines. The strain causing CVC is xylem-limited, but it can also be transmitted in citrus from another xylem-limited vector and then the plant can continue to be infected by sharpshooter vectors. Sharpshooter vectors can become infected by feeding on infected plants, but they do not move the pathogen between hosts. The CVC strain is transmitted primarily vertically through seed and is spread by movement of infected nursery stock.

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