UNIVERSITY OF FLORIDA
Florida Cooperative Extension Service

Fact Sheet PP-151
October 1994

Citrus Blight[1]

K.S. Derrick[2]

Citrus blight is a major problem of citrus in Florida and is responsible for the loss of approximately 650,000 producing trees each year. Trees with blight seldom die, but show a general decline somewhat similar to drought stress. Frequently, symptoms will first develop in one sector of a tree. Infected parts of the tree appear unthrifty with a dull-green cast. As the disease progresses, the canopy thins and produces small fruit. Infected trees have off season flush and bloom patterns and frequently produce trunk and root sprouts. Blight is a disease of producing citrus trees; symptoms have never been observed on trees less than about four years old. All rootstock-scion combinations appear to be susceptible to blight, but the incidence of the disease varies with rootstock. Rough lemon, Rangpur lime, trifoliate orange and Carrizo citrange rootstocks are very susceptible. Sweet orange, sour orange and Cleopatra mandarin rootstocks have some field resistance to blight; with these rootstocks the incidence of the disease is much lower than the more susceptible rootstocks and symptoms only occur on trees more than 15 years old. Apparently there are no rootstocks that are tolerant to blight; affected trees show severe symptoms without regard to rootstock.

There are no specific diagnostic symptoms of blight that distinguish it from the various other declines of citrus. This, along with the total lack of symptoms on young trees, has hampered efforts to determine the cause of the disease. There has been considerable progress in recent years in developing diagnostic tests for identifying trees with blight. Affected trees frequently show zinc deficiency in leaves, which indicates blight interferes with the translocation of zinc. Symptoms of zinc deficiency on leaves can be due to several factors and are not exclusively diagnostic for blight. However the zinc content of the wood and bark of blighted trees is higher than that found in trees without blight from the same grove. This accumulation of zinc in wood or bark appears to be a characteristic of trees with blight and does not occur in healthy trees or trees affected with other diseases or drought stress.

The drought-like symptoms of trees with blight also suggest problems with water transport. This has been confirmed by observations that the xylem of blighted trees is constricted, resulting in low water uptake. A syringe injection test has been developed that is useful in diagnosing trees with blight. Examination of trunk wood from trees with blight by light and electron microscopy reveals numerous plugs in cells of the xylem that appear to be responsible for the reduced water uptake of affected trees. In addition, blighted trees contain several proteins not found in nonblighted trees. These proteins, which appear to be pathogenesis related, have been used to produce antisera for use in immuno-spot and western blot tests for blight.

1. This document is Fact Sheet PP-151, a series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: January 1993. Reviewed: October 1994.

2. Professor and Plant Pathologist, Plant Pathology Department, Citrus Research and Education Center (CREC), Lake Alfred, Florida, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Proper identification of a tree with blight should include several, if not all, of the following observations and tests: (1) visual observation of a general decline, (2) knowledge of the rootstock involved (for trees on sour orange tristeza must be considered, decline on sweet orange could be root rot, etc.), (3) comparison of the zinc content of trunk wood from affected and adjacent healthy appearing trees, (4) rates of water uptake by the syringe injection test of the same trees selected for zinc analysis, and (5) analysis for blight proteins by immuno-spot and western blot analysis.

Repeated attempts to transmit or propagate blight by bud grafting or reproduce the disease by reconstituting blighted trees from root sprouts and buds from diseased trees have failed. These observations have led to suggestions that the cause of blight is "abiotic". The pH of the soil, soil type and rates of fertilization have been suggested as causing blight. But blight occurs on trees on a variety of soil types, and the distribution of the initial affected trees in a grove are usually randomly distributed; further development of the disease may be in trees clumped around the original infected trees or in a random pattern. In any grove where blight is found there will be severely affected trees adjacent to healthy trees. The rate of spread of blight is fortunately quite slow. Data taken over twenty or more years tend to show constant rate of increase in diseased trees. This leads some researchers to suggest that the cause of blight is "abiotic". The repeated demonstrations that all of the symptoms and characteristics associated with citrus blight can be reproduced by root graft inoculations suggest that the disease is caused by a systemic pathogen.

Prior to the discoveries that mycoplasmas, xylem limited bacteria, and viroids cause plant diseases, pathogens that moved systematically in plants were in general assumed to be viruses. To cover all these possibilities an uncharacterized pathogen that is graft transmitted is now referred to as being virus like. The one hundred plus years that citrus blight has been in Florida predates an understanding of any of the virus like agents that infect plants. Over the years, as viruses and virus like agents were characterized and methods developed for their detection, experiments were done to determine if any of these agents were associated with blight. To date no viroid, xylem limited bacterium or mycoplasma has been shown to be the cause of the disease. There have been reports associating xylem limited bacteria with blight and that tetracycline treatments reversed the symptoms of the disease, which suggest a bacterium or mycoplasma is causing the disease. However, studies using thin-section microscopy have failed to associate xylem limited bacteria or mycoplasmas with blight and additional experiments using tetracycline treatments did not show a consistent remission of symptoms. Bacteria were not found in an examination of numerous samples of xylem fluid from roots of blighted and healthy trees with the electron microscope. However, large numbers of unusual filamentous structures were found in xylem fluid from blighted trees. The nature and function of these structures are unknown, but they seem to be constantly associated with diseased trees.

Current research on citrus blight places major emphasis on identification and characterization of the pathogen that causes the disease. Graft transmission experiments indicate the pathogen may be restricted to the roots and is rarely, if ever, present in above ground parts of the tree. Examinations of extracts from roots of blighted and healthy trees have associated several proteins and some unusual filamentous structures with blight, but no specific virus like agents have been found. In addition, serological assays for blight specific proteins are currently being used in epidemiology studies which include determination if young presymptomatic trees can be identified and removed from groves before symptoms develop.