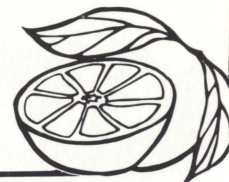




Texas Agricultural Extension Service

Texas Citrus Fungal Diseases and Nematodes

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Citrus diseases affecting the entire tree can be classified into two general categories: parasitic and nonparasitic. Parasitic diseases are caused by fungi, bacteria, viruses and nematodes. Some disease-causing agents are restricted to certain parts of the plant, such as the root, trunk or fruit, while others may affect several or all parts of the plant.

Nonparasitic diseases are physiological disorders caused by excesses or deficiencies of certain nutrients or by unfavorable environmental conditions. Among the most common nonparasitic diseases of citrus occurring in Texas are iron chlorosis, mottle leaf, salt and chronic water table injury. In addition to the economic losses that can result if not avoided or corrected, these physiological disorders often predispose the tree to attack by disease-causing organisms, such as the relationship that exists between salt and chronic water table injury and the increased occurrence of several types of gummosis, twig blight, tip-burned yellow leaves and nematode infestations. Physiological disorders are discussed in other sections of this publication.

Fungus Diseases

Cotton Root Rot

This disease, caused by the fungus *Phymatotrichum omnivorum*, affects many plant species. The fungus attacks the underground parts of the citrus tree and occasionally kills young trees. Once trees reach maturity, they are less susceptible to attack. Cotton root rot commonly causes sudden death of susceptible trees, with most of the dried

leaves temporarily retained on the tree. The best protection against cotton root rot is to use resistant rootstocks such as sour orange.



Young citrus tree killed by cotton root rot.

Rio Grande Gummosis

This is one of several well-known gumming diseases of citrus. Gum formation on the trunk or branches is a characteristic symptom. Gum exudes from blisters containing gum pockets, usually located on the trunk. The wood beneath the blister shows a pink-orange color.

Several factors such as freeze damage, high water table and salt accumulation contribute to the disease. Gummosis is believed to be a condition of weak and injured trees and is reported to be infectious. Symptoms of the disease were reproduced when healthy trees were inoculated with the fungus *Diplodia natalensis*.

No reliable cure exists for gummosis. Keeping trees vigorously growing is the best way to avoid the problem.

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Rio Grande gummosis causes amber exudate to be secreted from pockets beneath the bark.

Phytophthora Foot Rot

Foot rot, also known as brown rot gummosis, is caused by one or more species of the fungus *Phytophthora*. This disease can affect the root system, the trunk below and above ground, branches, leaves, blossoms and fruit. It is especially troublesome during prolonged rainy periods. Trees with the bud union beneath or close to the soil and trees in poorly-drained locations are highly susceptible. Foot rot is commonly found in Lower Rio Grande Valley orchards, but becomes a more serious problem under unusual conditions such as those that occur following hurricanes.

Infection of the lower areas of the trunk by *Phytophthora spp.* results in dark, water-soaked areas in the active areas of infection. Often gum



Gum exudation from lesions on the lower trunk during the early phase of *Phytophthora spp.*

exudes profusely from active lesions. The dead bark frequently breaks away from the wood in vertical strips. Callus tissue begins to form on the margin of the surrounding healthy bark if the fungus becomes inactive because of unfavorable weather conditions. The disease may become active again when conditions become favorable. If the lesion encircles the trunk, girdling occurs and results in death of the tree.

Healing is slower if infection occurs below ground level. The fungus may attack young feeder roots, causing them to decay. Infection of lateral and fibrous roots can become widespread in wet soils. This infection results in poor health of the tree, a thin canopy, failure to make new growth and poor fruit production.

Phytophthora spp. also may attack nursery stock and young orchard trees during rainy weather. Examination of the crowns of infected trees shows symptoms similar to those described for older trees.

Phytophthora foot rot can best be controlled by preventative practices, including use of resistant rootstock and planting in well-drained land. Sour orange is the most resistant rootstock for the Lower Rio Grande Valley. Other resistant rootstocks include Swingle citrumelo and Troyer and Carrizo citrange.

Budding seedlings high, avoiding wounds, and keeping soil off the lower trunk are among recommended control practices. Soil fumigation of seedbeds should be practiced in field nurseries.



Bark scaling on the lower trunk during advanced stage of foot rot.



Nematodes

Plant parasitic nematodes are very small worms that cannot be seen with the naked eye. Several plant parasitic nematodes are known to attack the root system of citrus plants, especially the citrus nematode, *Tylenchulus semipenetrans*. The burrowing nematode, *Radopholus similis*, causes a disease known as spreading decline and is a serious pest of citrus in other production areas. This nematode has been found in the Valley on ornamentals, but not in citrus orchards. Serious losses to the Texas industry could result should it ever become established in citrus groves.

The citrus nematode occurs commonly in Valley citrus orchard soils. Sour orange is rated as highly susceptible to nematode infection. Of the common rootstocks with potential use in the Valley, only Swingle citrumelo is rated as highly tolerant to the citrus nematode.

Populations of the citrus nematode usually are higher in older orchards (6 years and older). Young trees also may be injured if planted in orchard sites where nematodes previously prevailed. Other plant parasitic nematodes, mainly the lesion nematode (*Pratylenchus spp.*) often have been found associated with citrus roots.

Because the presence of the citrus nematode cannot be detected visually, positive diagnosis is based on external symptoms and laboratory examination of root and soil samples. Above-ground symptoms associated with nematode-infected trees are wilting, lack of vigor, poor fruit production and poor response to watering and fertilization. The Texas Agricultural Extension Service operates a Plant Nematode Detection Laboratory at College Station where samples can be sent for analysis and recommendations. County Extension agricultural agents can assist growers in collecting and sending samples.



A microscopic view of a swollen female citrus nematode.

Losses caused by the citrus nematode in heavily infected orchards can be reduced effectively by applying nematicides to the soil. Before treating an orchard, however, consider the overall condition of the orchard. Application of nematicides to freeze-damaged orchards grown under poor cultural conditions may not be profitable. Soil should be sampled before establishing a new orchard to determine if nematodes are present in damaging numbers. If the analysis reveals large numbers of parasitic nematodes, treating the soil before establishing trees may be profitable. Ideally, nematode-free plants should be used when establishing new orchards.

At present, products cleared for use on established citrus trees are also known to have an effect on mites and other insects. Careful attention must be paid to instructions on the label, not only for directions on how to apply the material, but also for current rates and regulations that may affect the legal use of these products.



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