

Citrus Greening Disease

A Hypothesis for Minimizing Full Expression of the Disease.

Dr. Carl Whitcomb, Lacebark Research, Stillwater, Ok.

Citrus greening disease is reported to be caused by the bacteria, *Candidatus liberibacter*. The pathogen is transmitted by psyllids, also known as jumping plant lice which are leafhopper-like insects with the appearance of miniature cicadas and have sucking mouth parts that penetrate plant tissues and suck plant juices much like aphids.

A search of the literature reveals two factors that may be key to minimizing onset of the disease:

1. The causal bacterium can be transferred by grafting, --- but is restricted to the phloem or outer bark.

2. From detection of the first symptoms on a branch, several years are required for the disease to spread throughout the entire tree. This slow mobility within the tree structure may prove a weakness that can be exploited.

If information about these two factors is correct, it may be possible to grow citrus trees to mature size and produce desirable fruit for a number of years, before tree growth slows due to size and aging which then allows the pathogen to expand and kill the tree.

My proposed protocol / hypothesis is as follows:

1. Plant seeds in shallow flats with a mesh bottom covered with a layer of newspaper. Place a good container growth medium about two inches deep in the flat and place seeds and allow to germinate. The flats must be suspended on a wire bench with good air circulation. As seeds germinate, transplant into 18 cell RootMaker propagation trays. Any roots that reach the bottom of the flat will be air-root-pruned and immediately branch, making transplanting more difficult. So be timely. By transplanting in this manner, the result will be 18 plants of similar size and vigor which is desirable for grafting or transplanting. See paper on web site, Growing Tree Seedlings.



Figure 1. Air pruning root tip stimulates root branching.



Figure 2. Root Production 4, 8 and 12 days following transplanting.

2. Transplant seedlings into three-gallon RootMaker containers for maximum root branching. Make the transplant at the time when the container growth medium in the 18 cell trays has been fully or approaching fully utilized by the fibrous root system, but before the roots reach the point of being overgrown and "rootbound" which slows growth. Transplanting earlier is better than later. The 4-inch rule is a key factor in developing the maximum number of roots from the primary root system developed in the 18 cell trays. [See Plant Production in Containers II, chapter 4, pages 92-93 or visit www.lacebarkinc.com web site, under paper: Growing Plants in Containers.]

[Side note: Why emphasis on RootMaker containers? I invented the RootMaker container system and the various shaping and container designs for maximum branch root stimulation. To get to those designs, many models were made and tested and rejected over many years. For example, in 1970 I used a soldering iron to create vertical slots in conventional smooth round containers. My objective was to improve drainage, which it did not, but more importantly the slots had no effect on air-root-pruning as there was nothing inside the container to guide roots into the openings. Simply making slots in sides of containers did not work in 1970 and still does not work in 2024. This fact published long ago has not stopped dozens of imitator containers that do little to stimulate root branching from being placed on the market. For more information on this topic, see chapter 6, Containers: Problems and Progress in Plant Production in Containers II. Or see www.lacebarkinc.com video Methods of Stimulating Root Branching. Roots extend in a meandering fashion relative to the position of the root tip at time of origin and for maximum effectiveness must be guided to openings for air-root-pruning to be effective.]

3. Once citrus seedlings have utilized the space in the three-gallon containers, they are ready to be transplanted into the field. Massive numbers of roots will grow out from the three-gallon root ball and explore the soil for water and nutrients in a full 360 degrees as well as downward.



Figure 3. Excellent root development and ready to plant in the field.



Figure 4. Root growth out from smooth walled container (left) vs three gallon RootMaker.

4. Maintain soil fertility at optimum levels for all elements, and soil pH in the 4 to 5 range. Remember calcium is the bully element and particularly minimizes availability of micronutrients.

5. The goal is to grow citrus trees using what I call Full Throttle --- that is maximum fibrous root system, maximum nutrition and adequate water when needed, plus weed control, especially the grasses which are the greatest restrictors of tree root development.

6. By growing Full Throttle, trees will produce an immense fibrous root system that will continue indefinitely producing more growth and faster than the disease can spread, thereby keeping the diseased tissues to a minimum. Whether this rapid growth and good fruit production will continue for 4 years, or 8 years or longer remains to be seen. Having worked with trees and developing fibrous roots and plant

nutrition for decades my seat of the pants guess is that the trees will likely remain healthy for many years.

[Side Note: Working with American elms and Dutch elm disease during the 1960's and continuing, one point became clear. If the growth and vigor of the tree could be accelerated over the typical status quo, more phloem could be produced that the pathogen could plug during a growing season. This technique has extended the lives of many elms for many years. In those cases where I had the opportunity to observe the trees for years, treated trees remained what appeared to be very healthy in spite of untreated trees dying from the disease nearby. My hypothesis is that effects of citrus greening disease can be minimized in the same way.]



Figure 5. Permanent root system resulting from steps 1, 2, and 3.