BACKGROUND INFORMATION

PART 2

What is Citrus Greening?

Citrus greening (caused by the bacterium *Candidatus* Liberibacter asiaticus) is one of the most serious citrus plant diseases in the world. It is also known as Huanglongbing (HLB) or yellow dragon disease. Once a tree is infected, there is no cure. While the disease poses no threat to humans or animals, it has devastated millions of acres of citrus crops throughout the United States and abroad. Citrus greening is spread by a bacteria-infected insect, the Asian citrus psyllid (*Diaphorina citri* Kuwayama or ACP), and has put the future of America's citrus at risk. Infected trees produce fruits that are green, misshapen and bitter, unsuitable for sale as fresh fruit or for juice. Most infected trees die within a few years.

Global History

1919	First reported in southern China
1921	First report of disease in the Philippines, but it was thought to be related to zinc deficiency
1928	A disease named "yellow shoot" or "greening," depending on region, was observed in South Africa
1937	The first description of HLB in South Africa was assumed to be mineral toxicity
1941-1955	Most extensive work on greening in southern China was conducted
1956	Lin Kung Hsiang (researcher from China) concluded that greening is a graft transmissible infectious disease, not related to physiological disorders (e.g. nutrient deficiencies, water logging, etc.) or soil borne diseases (e.g. phytophthora, etc.)
1960's	HLB first appeared in Thailand
1965	Researchers in South Africa demonstrated HLB was transmissible by graft inoculation and by the African citrus psyllid, *Trioza erytreae*
1967	Philippine researchers demonstrated 'mottle leaf' or 'citrus dieback' could be transmitted by the Asian citrus psyllid, *Diaphorina citri*
1995	The official name of the disease became huanglongbing (HLB) at the International Organization of Citrus Virologists (IOCV) at the 13th conference of the Organization in Fuzhou (Fujiam, China)
1998	Asian citrus psyllid arrived in Florida
2004	The disease was confirmed to be in Brazil
2005	The disease was confirmed to be in Florida
2012	First occurrence of Asian citrus psyllid/HLB in California
2017	The disease was confirmed to be present in California citrus

Florida History

2005	August - Citrus greening was first confirmed in south Miami-Dade county
	October 25 - Four counties confirmed positive (Dade, Broward, Palm Beach, Hendry)
	September 16 - Federal order issued to restrict the interstate movement of all citrus greening and Asian citrus psyllid host plant material from Florida's quarantined areas
2006	March 14 - Regulations for citrus nurseries were established
2007	December - Federal order issued was revised to include all counties with confirmed greening
2008	January 11 - Federal order issued to quarantine the entire state of Florida
	August 7 - Thirty-two counties confirmed positive (Sumter)
2009	February 16 - Thirty-three counties confirmed positive (Putnam)
2018	HLB is known to be present in all citrus growing areas of Florida

Timeline from the University of Florida **https://crec.ifas.ufl.edu/extension/greening/history.shtml**

BACKGROUND INFORMATION

Pathogen

Candidatus Liberibacter species are phloem-limited plant pathogens that are mainly transmitted to plants by psyllids. An infected psyllid feeds on a healthy tree and injects the bacterium into the **phloem**. Plant food sugars are made by photosynthesis and are carried through its phloem system bidirectionally to flowers, fruits, roots, and seeds. Once a tree is infected with the bacterium, there is no known cure for the disease. This is partly because the bacterium is inside the vascular system of the plant (systemic) and is therefore very difficult to access.

Diagnosis

The first sign of the disease is leathery leaves with yellow veins and blotchy marks, and the fruit remains green. Polymerase chain reaction (PCR), a common laboratory technique used to make many copies of a particular DNA region, is one way to positively confirm citrus greening.

Dogs have been trained to efficiently sniff out the bacterium *Candidatus* Liberibacter asiaticus in infected plants. The trained dogs can distinguish the citrus greening bacteria from other similar bacteria, resulting in highly reliable detection. While the number of trained dogs is currently limited, it is expected that they will eventually be used for early detection in all citrus-producing states.

Management Approach

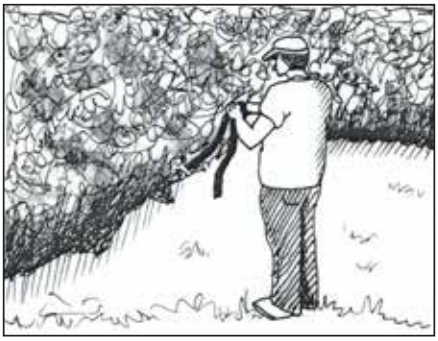
There are several management approaches currently in various stages of use and/or development. Groves can be managed:

- as if they already have greening with an integrated approach using disease-free nursery stock.
- by reduction of the inoculum by frequent disease surveys.
- by removal of symptomatic trees.
- by suppression of the Asian citrus psyllid.

Pruning only symptomatic (diseased) branches is ineffective. Tree removal, including the stump and roots, is the only way to ensure that infected trees will not spread the disease to other trees. New citrus trees (which should not be planted in the same area as the infected tree[s]) should be purchased from a certified nursery or propagated from clean bud wood.

Scouting (monitoring) is recommended four times a year, unless a grove already has greening. If there is currently greening in a grove or close by, scouting more than four times a year is recommended. Symptoms are most easily seen from September through March. During the spring growth, scouting becomes more difficult and scouts have to look further into the tree canopy. Scouting methods include using a tractor or pickup mounted platform (for taller trees), ATV's (for medium-sized trees), or walking (for young trees).

Scouting for Citrus Disease



Grove conditions also affect pest management. Scouting is more difficult in a grove that has not been well-maintained. Nutritional deficiencies can cause greening symptoms to blend and go unnoticed. Excessive weeds and unmanaged areas in between the rows of trees cause scouts to watch where they are walking more than scouting. Tree size increases scouting work as well.

In the United States, trees that appear to have citrus greening are identified with a special tape (used only to identify the citrus greening disease) that is attached to the suspected branch; the tape is marked with the inspector's name and date. Ideally, scouts mark the end of the row and the number of suspect trees in that row. Safety concerns include grove conditions, chemical spray applications, weather, and potential for slips and falls.