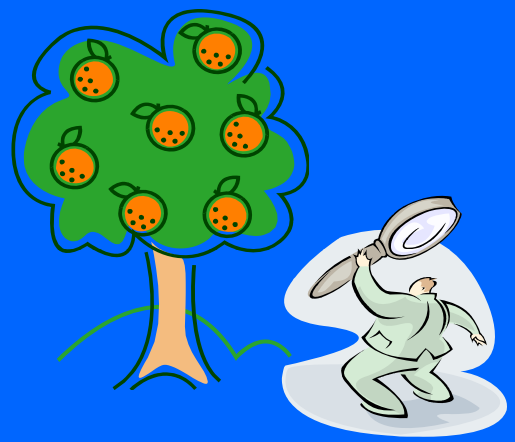
PATHOLOGY TRAINING

Citrus

Health

Response

Program




Citrus Greening
HLB
likubin
黄龙病
blotchy mottle
Huanglongbing
dieback
Yellow branch
Yellow Dragon Disease
vein phloem degredation
yellow shoot
Candidatus Liberibacter

Why is Huanglongbing important?

- **In areas where the disease is endemic, citrus trees live 6-8 years, and most never bear usable fruit. So producing citrus is no longer economically feasible in the area.**

- **The disease has 6 month - 3 yr latency period before symptoms develop.**

An adequate cure for infected trees is not known to exist

HLB is caused by:

- A bacterium – *Candidatus Liberibacter*
- Three important species are described.
  - *Candidatus Liberibacter asiaticus*
    - heat-tolerant, produces symptoms in either warm or cool climates
  - *Candidatus Liberibacter africanus* (Africa)
    - heat-sensitive, produces symptoms in cool climates
  - *Candidatus Liberibacter americanus* (Brazil 2004)
    - characterization still under study

ALL THREE SPECIES RECENTLY SUCCESFULLY CULTIVATED

Phytopathology Vol. 99, No.5, 2009

Asian type found in Miami-Dade County in August 2005.

More about the bacterium

- Is present only in the phloem
- Moves very slowly
- Is not uniformly distributed in the plant, causing “sectoring” of the symptoms

Insect Vectors

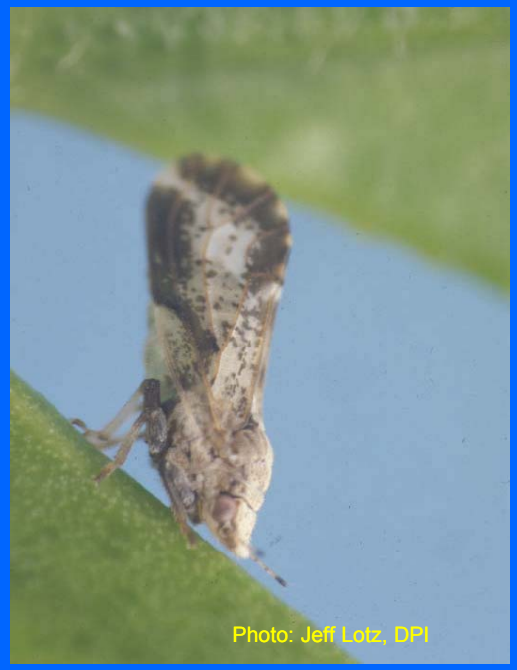


Photo: Jeff Lotz, DPI

Asian citrus psyllid
***Diaphorina citri* Kuwayama**
– Found in Florida June 1998


Photo: Stephen M. Garnsey

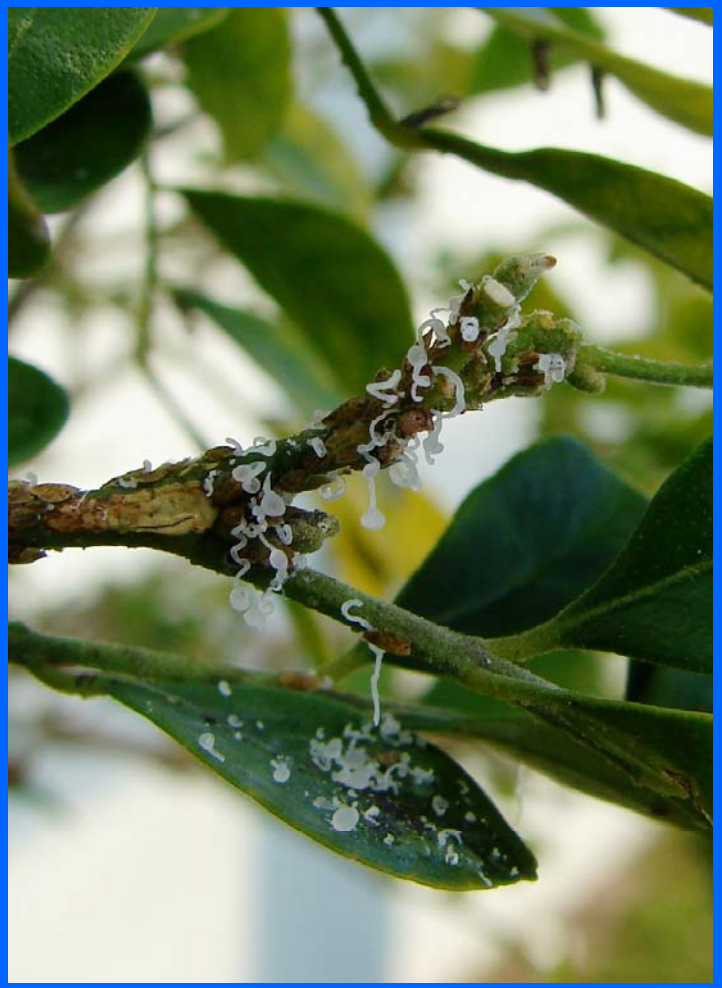
African citrus psyllid
***Trioza erytreae* Del Guercio**
» Not found in Western Hemisphere

Asian Citrus Psyllid (ACP) Detection

Eggs and nymphs can be found on new growth

Adults are found on stems and on the lower side of the leaves

Asian Citrus Psyllid (ACP) Detection



Waxy tubules direct the honeydew from the nymphs.

ACP Damage

Burnt tips of citrus foliage

Leaf notching

Sooty mold associated to honeydew

HLB Detection:

Classic symptom:

Leaf

blotchy

mottle

Blotchy mottle Asymmetrical

Mottle symptom can be seen through leaf and on both sides.

Upper side

Lower side

Look on both sides of the leaf.

Leaf miner can mimic HLB chlorotic symptoms

HLB symptoms vs. nutritional mottling

√ **Blotchy Mottle effect crosses leaf veins whereas a deficiency related mottle does not. Veins can turn yellow**

Mottle between veins, veins stay green

Taking a closer look

- Blotchy mottle symptoms may not be visible to just an exterior canopy evaluation.
- Examine the tree closer by parting branches to view older leaves within the canopy.
- Pay close attention to bud sports or re-growth after pruning.

This classic blotchy mottle symptom get the lab's attention quickly.

Classic Blotchy Mottle

Citrus aurantiifolia **Key lime**

Citrus aurantiifolia **Persian lime**

Citrus sinensis **Sweet orange**

Citrus aurantium **Sour orange**

Citrus macrophylla **Alemow**

Citrus limon **Lemon**

Citrus x paradisi **Grapefruit**

Citrus maxima **Pummelo**

Citrus hystrix **Kafir lime**

Poncirus trifoliata **Trifoliate orange**

Citrofortunella microcarpa **Calamondin**

Other symptoms on leaves

Vein yellowing

Corky veins

Thicker leaves

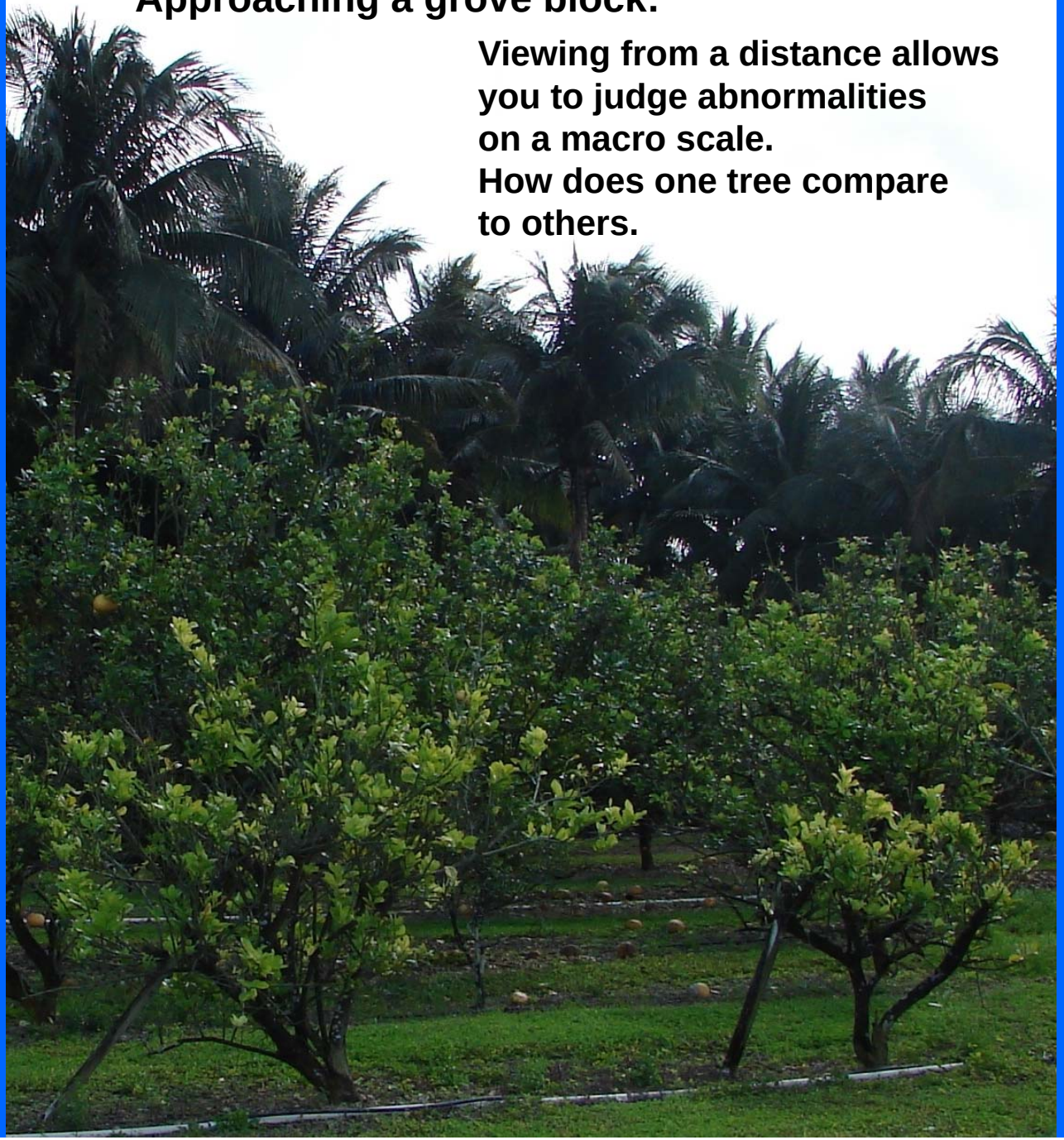
Zinc-like deficiency

“Rabbit ears”

“Rabbit ears”

“Green islands”

Approaching a grove block:



Viewing from a distance allows you to judge abnormalities on a macro scale.
How does one tree compare to others.

Symptoms on the tree

Yellow shoot

Twig dieback

Severe leaf drop

Premature fruit drop

Off season blossom

Fully mature leaves, away from the tips and on branches on the inside of trees, show the most reliable symptoms and are better defined during the cooler months of the year.

From J.M. Wallace, The Citrus Industry, Volume IV, 1978.

Fruit symptoms

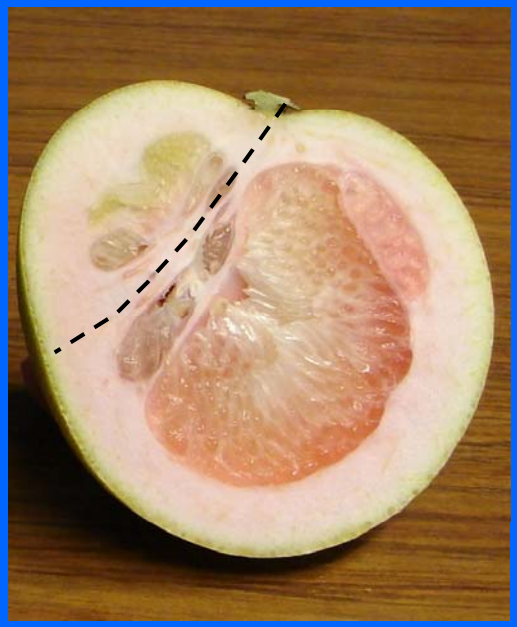
- poorly colored, hence the name “greening”
- lopsided and hard
- seeds abort
- juice is high in acids and low in soluble solids
- abnormally bitter to the taste

Small fruit

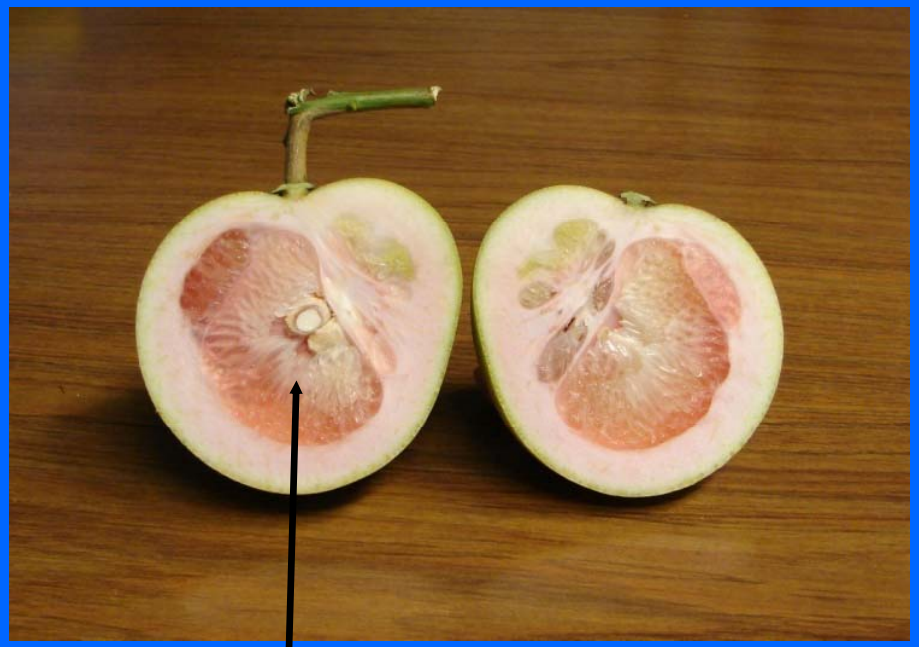
Color inversion

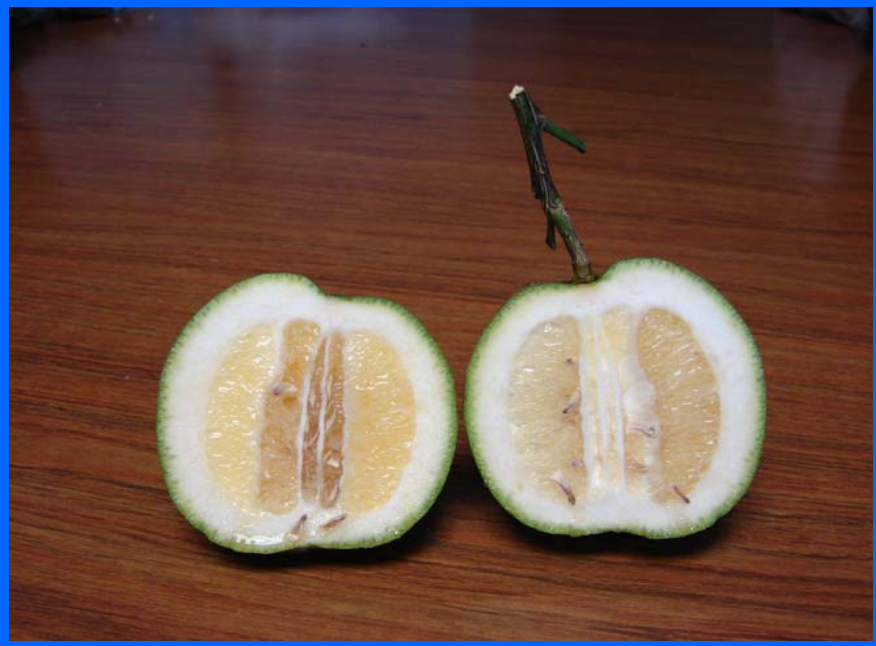
Lopsided fruit

Curved columella



Seed abortion





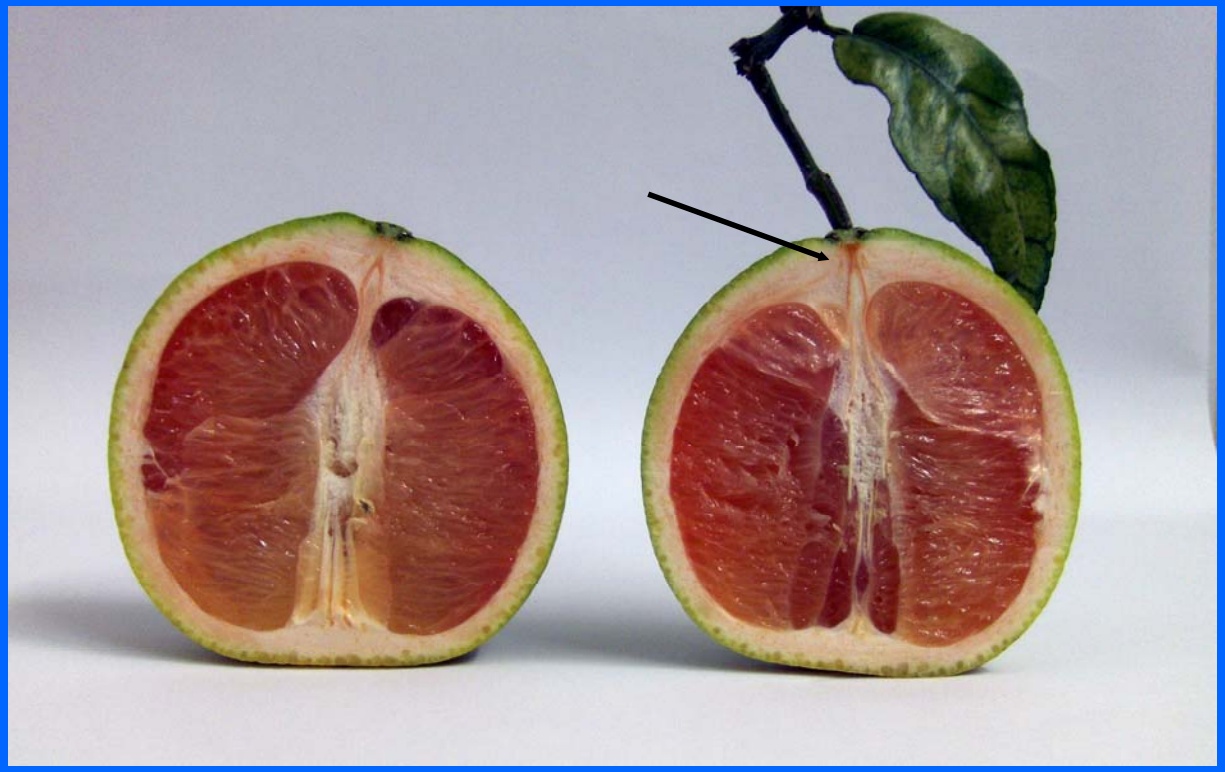
Normal seed

(light color)

Aborted seed

(dark color)

Another symptom on fruit



Orange-brown stain
of the vascular columella


THE
END