

Huanglongbing (HLB; citrus greening) and Nutrient Deficiency Identification

HLB FACTS

- HLB is a bacterial disease spread by an insect, the Asian citrus psyllid.
- The bacteria causes damage to the phloem (subsequently disrupts the internal movement of sugars).
- Leaf symptoms include blotchy mottle, yellow veins, or vein corking.
- Fruit symptoms include lopsided, small, and/or misshapen fruit. Fruit also has a color inversion compared with healthy fruit.
- Once a tree is infected, currently there is **no** cure.
- Symptoms cannot be reversed with fertilization.

CITRUS NUTRITION

- Citrus nutrition is essential to maintaining healthy and productive trees.
- Trees produce symptoms when lacking a needed nutrient.
- Each nutrient deficiency produces unique symptoms; therefore, visual symptoms can be used to diagnose and create a management plan.
- Common symptoms of nutrient deficiencies will be chlorosis and interveinal patterns.
- Unless severe, fruit do not show symptoms of nutrient deficiencies, except with copper deficiency.
- Nutrient deficiencies can be reversed with proper fertilization practices.

IDENTIFICATION OF HLB SYMPTOMS AND NUTRIENT DEFICIENCIES

- Nutrient deficiency symptoms can often be confused for HLB symptoms, and vice versa. Although, careful identification can easily set them apart.
- The most common HLB leaf symptom is the blotchy mottle pattern. The blotchy mottle pattern is an **asymmetrical** pattern across the midvein.
- Nutrient deficiencies will have various patterns for each deficiency, but the patterns will always be **symmetrical** across the midvein (see other side).
- Both HLB and nutrient symptoms can be seen on the upper and lower side of the leaf.



Young (new) flush is light green and will become dark green as it matures



Healthy cut fruit



Leaves with HLB symptoms



HLB symptomatic fruit



Healthy mature leaves are dark green



Healthy whole fruit



Nutrient deficient leaf



HLB symptomatic fruit & vein corking on leaves

LEAF SYMPTOMS OF HLB AND NUTRIENT DEFICIENCIES



Nitrogen



Nitrogen



Iron



Manganese

PEN TEST

The pen test is a visual diagnosis tool. This simple test helps to determine if the leaf is HLB-affected or nutrient deficient by determining if the symptoms across the mid-vein are symmetrical or asymmetrical.

TOOLS

Leaf in question

Writing utensil (permanent marker or pen)

INSTRUCTIONS

Draw a circle on each side of the midvein (vein in center of leaf).

Circles should be side by side.

DIAGNOSIS

Determine if the area within the circles are the same or if they are different.

The HLB blotchy mottle pattern will not match.

A nutrient deficiency will be the same in both circles.

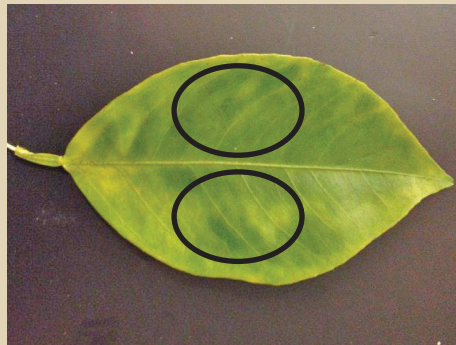
IF A VISUAL DIAGNOSIS CANNOT BE MADE, SAMPLES CAN BE SENT TO A LAB FOR TESTING. VISIT [HTTP://FPDN.IFAS.UFL.EDU](http://FPDN.IFAS.UFL.EDU) FOR LAB TESTING SITE INFORMATION.



Zinc



Magnesium



Pen test on HLB infected leaf



Pen test on nutrient deficient leaf

Photo Credit: Tripti Vashisth, Jamie Burrow, and Mongi Zekri