

Citrus Greening Disease (Huanglongbing)

Candidatus Liberibacter asiaticus
Ca. L. africanus
Ca. L. americanus

Primary hosts

Citrus sp. and some related plants, box thorn or Chinese box orange (*Severinia buxifolia*), wood apple (*Limonia acidissima*), white ironwood (*Vepris lanceolata*), and mock orange or orange jasmine (*Murraya paniculata*).

Symptoms

Symptoms are many and variable: yellow shoots, twig dieback, leaf drop, leaves with blotchy yellow/green coloration similar to the symptoms of zinc nutritional deficiency, enlarged veins that appear corky, excessive fruit drop, small and misshapen fruit, fruit that remains green at one end (the styler end) after maturity, fruit with mottled yellow/green coloration, small dark aborted seed inside fruit, discolored vascular bundles in the pithy center of the fruit, bitter tasting fruit, and silver spots left on fruits that are firmly pressed. (see <http://www.apsnet.org/online/feature/huanglongbing/> for symptom photographs).

The time from infection to the appearance of symptoms is variable, depending on the time of year, environmental conditions, tree age, host species/cultivar and horticultural health ranging from less than one year to several years.

The three disease agents (*Candidatus Liberibacter* spp.) are not distinguishable from each other based on symptoms produced.

Life cycle

*Candidatus Liberibacter*s are gram-negative bacteria with a double-membrane cell envelope. *Ca. L. asiaticus*, *africanus* and *americanus* are found in plants only in the phloem cells. The bacteria are transmitted by psyllids, a type of insect, as they feed. *Candidatus L. asiaticus* and *Candidatus L. americanus* are transmitted by the adults of the citrus psyllid *Diaphorina citri* Kuwayana. *Candidatus L. africanus* is transmitted by the adult psyllid *Trioza erytreae* Del Guercio. The bacteria can be acquired by the insects in the nymphal stages and the bacteria may be transmitted throughout the lifespan of the psyllid.

Eggs are laid on newly emerging leaves and hatch in 2-4 days. Five nymphal instars complete development in 11-15 days. The entire life cycle takes 15-47 days, depending upon temperature, and adults may live several months with females laying up to 800 eggs in a lifetime.

In an orchard, diseased trees are clustered together, with secondary infections produced 25 – 50m away. *Ca. L. africanus* is found at elevations greater than 700m and is less heat tolerant than *Ca. L. asiaticus*. *Ca. L. americanus* resembles *Ca. L. africanus*

in being less heat tolerant. Infections of *Ca. L. asiaticus* and *Ca. L. americanus* are more severe than *Ca. L. africanus* and can lead to tree death.

Current Geographic Distribution

Ca. L. africanus is found in eastern, central and southern Africa. *Ca. L. americanus* is found in Sao Paulo State, Brazil. *Ca. L. asiaticus* is found in Asia from Japan to S. China, SE Asia and the Indian subcontinent to Pakistan, the Arabian peninsula (not including Iran), Brazil, Cuba (2009), Dominican Republic (2009), Mexico (2009) and Florida (2005), and Louisiana (June 2008) in the U.S. The vector *D. citri*, is more widely spread in south and central America, including Mexico (at least since 2004), and in the U.S. in Texas (2001), Louisiana (May 2008), Alabama (August 2008), Georgia (August 2008), Mississippi (August 2008), South Carolina (August 2008), and California (September 2008), posing a threat to the citrus industry in these areas.

Impact in Oregon

Negligible.

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