



A Brief Review of The Asian Citrus Psyllid (ACP)

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Introduction

There is a new challenge for the citrus industry, landscapers and home gardeners alike, the Asian Citrus Psyllid (ACP). These tiny insects can attack citrus trees and other host plants by sucking on the leaves and injecting a virus known as Hung Long Bing (HLB) or citrus greening disease. This disease causes the fruit to become bitter and not fully color up. In other words it stays green, hence the name citrus greening disease. The infected tree has yellow shoots, while the rest of the tree is green. In China they call this disease the yellow dragon.

ACP is considered a serious pest through out the citrus world, but where the disease HLB is not found it is very minor. Once the disease is in place, the trees decline and die or must be destroyed before the disease is spread further.

History

The Asian citrus psyllid, *Diaphorina citri* Kuwayama, is widely distributed in southern Asia. It is a devastating pest of citrus and a few other hosts in several countries, particularly India, where there has been a serious decline of citrus. This psyllid was reported in Brazil in 1942. In June 1998, the insect was detected in Florida. By September 2000, this pest had spread to the majority of citrus in Florida.

Diaphorina citri, was also found in the Rio Grande Valley of Texas. The psyllids appear to have been accidentally introduced in the spring of 2001 on potted *Murraya* originating in Florida. *Murraya* is a host to the pest. Recently ACP has been found in Mexico and some parts of southern California.

Diaphorina citri often has been referred to as "citrus psylla". This is the same common name often applied to *Trioza erytrae* (Del Guercio), the psyllid pest of citrus in Africa. To avoid confusion, *T. erytrae* should be referred to as the African citrus psyllid or the two-spotted citrus psyllid (because of a pair of spots on the base of the abdomen in the last instar stage). These two psyllids are the only known vectors of the known origin of citrus greening disease and are the only species on production citrus in the world. There are three other species of *Diaphorina* that have been reported on citrus (two in Africa, and one in India), but these do not carry the disease HLB

The HLB disease may have originated in Africa, possibly on an asymptomatic host such as *Verpris lanciolata*. It could have been transmitted by an insect to citrus in a European settlement on the east coast of Africa and then taken to the Indian subcontinent in infected plants or budwood 300 to 500 years ago, and then to China later.

Distribution

Diaphorina citri ranges primarily in tropical and subtropical Asia and has been reported from the following geographical areas: China, India, Myanmar, Taiwan, Philippine Islands, Malaysia, Indonesia, Sri Lanka, Pakistan, Thailand, Nepal, Cecum, Hong Kong, Ryukyu Islands, Afghanistan, Saudi Arabia, Reunion, Mauritius, Brazil, Mexico and now the United States. The discovery of *D. citri* in Saudi Arabia (Wooler et al. 1974) is the first record from the Near East.



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It is widespread in the western, more citrus growing coastal areas. The above regions are quarantined due to the presence of the ACP.

In the U.S. and its territories, ACP is present in Florida, Hawaii, Puerto Rico, Guam, and portions of Texas (32 counties). In late May 2008, specimens were discovered in Jefferson and Orleans Parishes, Louisiana. (USDA 2008a). In 2008 there was also a report of ACP found in Tijuana just south of the international border but the insects were not carrying the disease. (Western Farm Press 2008).

The California Department of Food and Agriculture (CDFA) detected small populations of ACP in San Diego and Imperial counties and have launched an aggressive control and quarantine program to avoid the spread of this invasive pest. (CDFA 2008). The last report for August 2009 from the CDFA reports 206 confirmed ACP sites in San Diego but no confirmed HLB. (CDFA 2009). Recently, the quarantine has been expanded to Orange County, and Los Angeles County (CDFA 2009).

Description and Identification

The Asian citrus psyllid (*Diaphorina citri*) is a member of Stenorrhyncha: Psyllidae.

Adults: Adults are 3 to 4 mm long brown mottled; head light brown (black in *T. erytrae*); forewing broadest apical half, mottled, and with brown band extending around periphery of outer half of wing, the band slightly interrupted near apex (broadest at middle, unspotted, and transparent in *T. erytrae*). Antennae have a black tip and two small light brown spots on the middle segments (nearly all black in *T. erytrae*). Living insects are covered with whitish, waxy secretion, making it appear dusty. They leap when disturbed and may fly short distances. They are usually found in large numbers on the lower leaves with heads almost touching the surface and the body raised almost to a 30 degree angle.

Nymphs: Nymphs are 0.25 mm long in first instar to 1.7 mm in fifth instar. The color is generally yellow to orange; no abdominal spots (*T. erytrae* had two basal dark abdominal spots). They have massive wing pads (small pads in *T. erytrae*) and large filaments confined to apical plate of abdomen (*T. erytrae* with fringe of fine white filaments around whole body, including the head). Nymphs are found on new growth and move slowly when disturbed.

Eggs: Eggs are approximately 0.3 mm long, elongated, almond-shaped, thicker at the base, and tapering toward the distal end. Fresh eggs are pale, but then turning yellow and finally orange at the time of hatching. Eggs are placed on plant tissue with long axis vertical to surface (long axis horizontal to surface in *T. erytrae*). They are usually laid on tips of growing shoots on and between unfurling leaves. Females may lay about 800 eggs during their lives.

Identification: Identification should be made by a taxonomist with adequate reference materials. Psyllids are most likely to be confused with aphids. Psyllids are usually active jumping insects, while Aphids are slow moving.

Survivorship: There have been many studies on the development, survivorship, longevity, reproduction and life cycles at various temperature parameters. At 50°F and 91°F (10°C and 33°C) there was no development, but between 59°F and 86°F (15°C and 30°C) development from egg to adult varied from 49.3 days at 59°F (15°C) and 14.1 days at 82°F (28°C). The longevity of the females at 59°F (15°C) was 117 days as opposed to 51 days at 86°F (30°C). Egg production increased with temperature increase. The maximum egg production of 748.3 was registered at 82°F (28°C). The optimum temperature range for the population of *D. citri* growth was 77°F-82°F (25-28°C). This included the shortest population doubling time and net reproductive rate. Temperatures 82°F-83°F (28°C) is not only the optimum temperature for this pest but also for the growth of citrus. There are nine to ten generations a year; 16 have been observed in field cages.

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Damage: Injury caused by psyllids results mainly from the large quantities of sap withdrawn from the foliage and the possible transmission of HLB. Once the tree is infected the limbs are slowly wiped out by dieback. The dieback is due to the greening disease. What is accepted as greening disease has been called citrus chlorosis in Java, leaf-mottling and leaf-mottle yellows in the Philippines, likubin (rapid decline) in Taiwan, and huang long bing (yellow dragon disease) in China.

Disease: In African citrus greening develops symptoms only under cooler conditions 68°F-77°F (20-25°C). The Asian greening develops symptoms under both cool and warm conditions up to 95°F (35°C). Early symptoms on infected citrus produce leaf yellowing on a single shoot or branch. The leaves are mottled and have a blotchy appearance. The symptoms quickly spread to other parts of the tree and dieback occurs, followed by a quick decline. Leaves tend to be small in the advanced stage of the disease and the fruit are underdeveloped, misshaped, green and bitter. Trees die with in 3-5 years.

Host Plants: Mainly *Citrus* spp., at least two species of *Murraya*, and at least three other genera all in Rutaceae.

- Orange
- Lemon
- Lime
- Chinese box orange
- Curry leaf
- Grapefruit
- Key lime
- Kumquat
- Limeberry
- Mandarin orange (*Murraya paniculata*)
- Mock orange
- Orange box wood
- Orange jasmine
- Pummelo
- Sweet orange
- Sour orange
- Tangerine
- Trifoliate orange

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