Pacific Pest Detector News

A Quarterly Newsletter for First Detectors

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In This Issue

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Pests in Brief

In this issue. Our newsletter has featured Panama disease (tropical race 4) and huanglongbing (citrus greening) in past issues. These diseases have recently reached the Pacific Islands, however, so we are updating them for your information. This newest, most severe race of Panama disease, TR4, was found on a banana plantation in Queensland, Australia, in March 2015; a second outbreak was reported in April. Its hosts include both cooking bananas and dessert bananas. The second disease, huanglongbing, was reported on Guam in February 2015. It is a threat to any type of citrus and to orange jasmine (*Murraya paniculata*), grown on some islands as a hedge or ornamental plant.

Courtesy of WikiMedia Commons

A jump on biocontrol. California, the second largest citrus producer in the U.S., is making strides to protect itself against huanglongbing (citrus greening disease). In December 2014, *Diaphorencyrtus aligarhensis* (photo) was released to fight the Asian citrus psyllid, the insect that carries the citrus greening disease bacterium. It is the second parasitoid to be released by the state in three years; *Tamarixia radiata* was released in 2011. Both species have been used against the psyllid in other countries. *Tamarixia radiata* was successful at suppressing the psyllid in places like Guadeloupe, the Carribbean, and Reunion Island. Interestingly, Hawaii discovered both parasitoid species attacking the Asian citrus psyllid on Oahu Island in 2012.

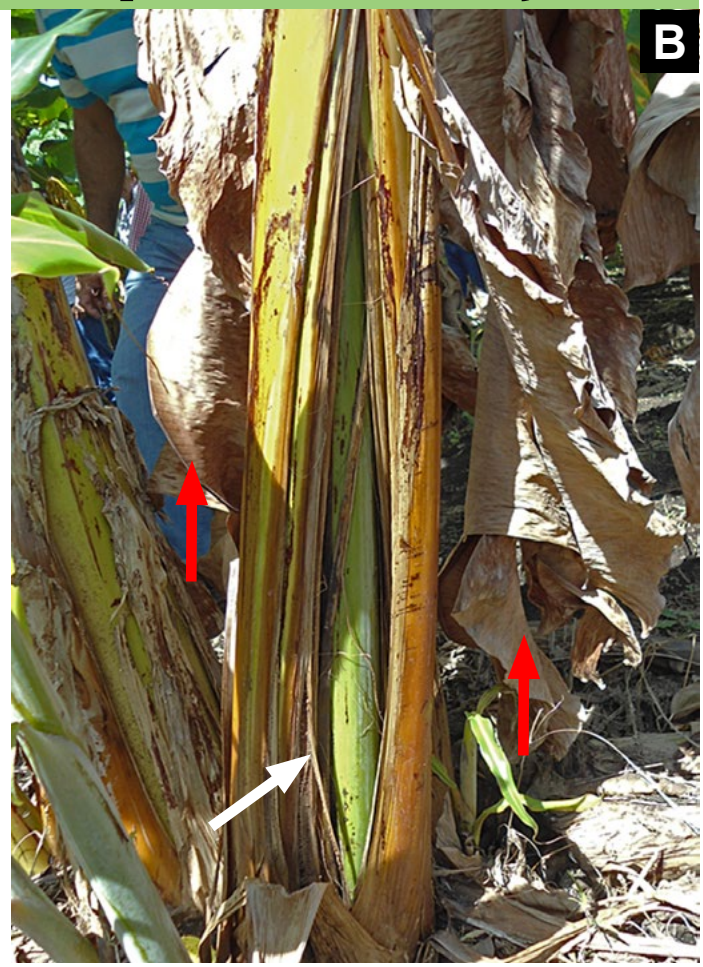
D. aligarhensis male (l), female (r). Photo M. Lewis, CSIR, UC Riverside

NOT WANTED

Panama Disease Tropical Race 4

(*Fusarium oxysporum* f. sp. *cubense* TR4)

Courtesy of G. Bromme, Musarama



Courtesy of Musarama (photographer unknown)

(A) Symptoms of Panama disease (Fusarium wilt) are first seen as a yellowing at the edges of older leaves (white arrow), followed by collapse of the petioles (red arrows). (B) Collapsed leaves eventually form a skirt of brown, dry leaves around the pseudostem (red arrows). In this photo, the leaves in front of the pseudostem have been removed so the diagnostic splitting of its base is visible (white arrow).

Origin, Distribution. *Fusarium oxysporum* f. sp. *cubense* tropical race 4 (TR4) probably originated in Sumatra and peninsular Malaysia. It is now found in Indonesia, China, Taiwan, the Philippines, Mozambique, and Jordan. The disease was reported during the past year in Lebanon and Pakistan and from Queensland, Australia, in March 2015. TR4 devastated the banana industry in the Northern Territory of Australia in the late 1990s, but is currently limited to one Queensland plantation.

Likely Locations. Anywhere in the tropics where bananas are grown. Panama disease is caused by a soilborne fungus. Once it enters an area, it can travel to other locations in soil, irrigation or rainwater, on contaminated equipment, and in infected rhizomes and suckers. Young suckers do not show symptoms of the disease until they are about four months old.

Courtesy of C. Brian, Musarama

Courtesy of A. Javellena, Musarama

Discoloration of the vascular system of plants infected with Panama disease, also called Fusarium wilt. (A) The vessels are pale yellow to light brown early in the disease, (B) then turn dark red to brownish black. The fungus can live in the soil for many years and enters plants through the feeder roots. As it moves up into the corm and pseudostem, it blocks the water-conducting cells of the plant and causes it to wilt.

Hosts. *Fusarium oxysporum* f. sp. *cubense* race 1 affects 'Gros Michel' (AAA) and 'Lady Finger' (AAB). Race 2 attacks cooking bananas (ABB) like 'Bluggoe.' Tropical race 4 devastates Cavendish (AAA) cultivars as well as all the banana varieties susceptible to race 1 and race 2. Race 3 only attacks *Heliconia* species.

Impact. Panama disease was first reported in Australia in 1876. Its greatest impact, however, was in Central America between 1940 and 1960. *Fusarium oxysporum* f. sp. *cubense* race 1 destroyed the susceptible 'Gros Michel' bananas causing losses of around $400 million (about $2.3 billion today). World trade then switched to resistant cultivars of the Cavendish group, such as 'Williams.' Cavendish bananas, however, are not resistant to tropical race 4. This race of the fungus is a threat to the multi-billion dollar global trade in bananas. It also threatens the food security of the millions of subsistence farmers, who grow about 85% of all bananas harvested worldwide.

For more information:

Panama disease overview: http://www.plantmanagementnetwork.org/pub/php/management/bananapanama/

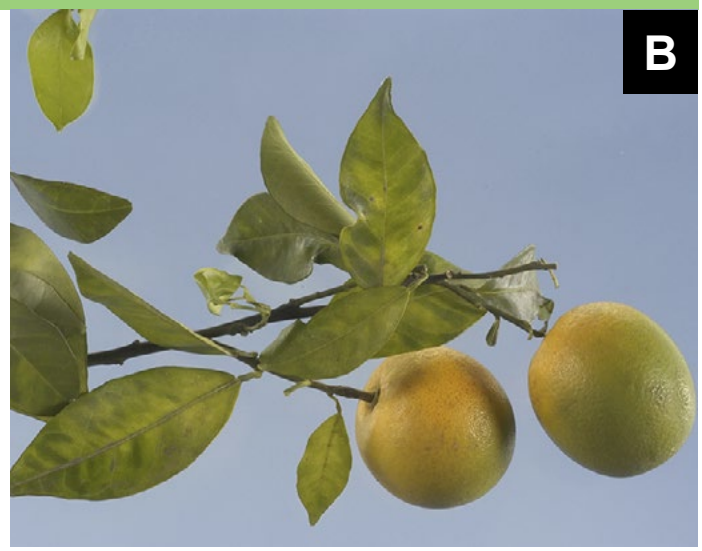
Panama disease, a history: http://www.apsnet.org/publications/apsnetfeatures/Pages/PanamaDiseasePart1.

NOT WANTED

Huanglongbing (Citrus Greening)

('*Candidatus* Liberibacter species')

Courtesy H.D. Catling, Bugwood.org



Courtesy J.W. Lotz, Florida Div. Plant Industry Archives, Bugwood.org

Courtesy J.W. Lotz, Bugwood.org

Courtesy J.W. Lotz, FL Dept. Agric. & Cons. Svcs., Bugwood.org

(A) This orange tree, severely affected with citrus greening, is stunted, with twig dieback, poor flowering and few fruits. (B) Branch with typical mottled leaves and ripe oranges that are still partially green. (C, D) Blotchy, uneven leaf mottling is a typical symptom of huanglongbing (HLB). Unlike nutrient disorders, discoloration on the left side of the leaf differs from the right side and yellowing is not present on the underside of the leaf .

Origin & Distribution. First reported in China in 1943, it is now present in countries throughout the world. The first to report HLB in the American Affiliated Pacific Islands was Guam in early 2015.

Hosts. Most *Citrus* species, plus orange jasmine (*Murraya paniculata*), box orange (*Severinia buxifolia*), and several other species in the family Rutaceae. Some weeds are also hosts of HLB; limeberry (*Triphasia trifoliata*) is widespread on Guam, making eradication of the bacterium almost impossible.

Courtesy J.W. Lotz, FL Dept. Agric. & Cons. Svcs., Bugwood.org

Courtesy J.M. Bove, Bugwood.org

Courtesy J.W. Lotz, Bugwood.org

Courtesy A. Anson, USDA, Plant Protection & Quarantine

(A) Fruits on diseased trees are often misshaped or small, green, and bitter. (B) Aborted seeds are usually small and discolored. (C) The Asian citrus psyllid transmits the HLB bacterium. The adult is 3 to 4 mm long and feeds with its body at an angle. (D) Waxy strands produced by the nymphs are diagnostic for the psyllid.

Psyllid vector. The Asian citrus psyllid (*Diaphorina citri*) is present in Hawaii, American Samoa. and Guam. Look for mottled brown adults feeding at an angle (photo C) on stems and undersides of leaves; they are quick, jumping insects. Nymphs: five instars, yellow orange, 0.25 to 1.5 mm, excrete wax (photo D).

Impact. Major threat to sustainable citrus production worldwide with yield losses of 30 to 100% in Africa; cost to fight HLB in Sao Paulo, Brazil (2009) $33.4 million, and more than 60 million trees destroyed globally since the early 1990s. In the five years following the introduction of HLB (2006-2011), Florida estimated an economic loss of >$4.5 billion and more than 8,000 full-time jobs.

For more information:

Asian Citrus Psyllid: http://entomology.ifas.ufl.edu/creatures/citrus/acpsyllid.htm

HLB: http://www.myvido1.com/AVU5EcRVlUzRGRGNXUrFVP_huanglongbing-florida-citrus-greening-rm

Pests of Concern

ARTHROPODS

Africanized honey bee (*Apis mellifera scutellata*) http://www.invasivespeciesinfo.gov/animals/afrhonbee.shtml

Asian citrus psyllid (*Diaphorina citri*) http://cisr.ucr.edu/asian_citrus_psyllid.html

coconut rhinoceros beetle (*Oryctes rhinoceros*) http://www.ctahr.hawaii.edu/adap/ASCC_LandGrant/Dr_Brooks/BrochureNo8.pdf **Oahu biweekly updates:** https://gallery.mailchimp.com/9a2eda30317f9dbc89fb881b9/files/CRB_2_13_2015.pdf

little fire ant (*Wasmannia auropunctata*) http://flrec.ifas.ufl.edu/entomo/ants/pest%20ants%20of%20fl/little_fire_ant.htm **Oahu biweekly updates:** https://gallery.mailchimp.com/9a2eda30317f9dbc89fb881b9/files/LFA_2_9_15_EM.pdf

naio thrips (*Klambothrips myopori*) http://cisr.ucr.edu/pdf/myoporum_thrips_hawaii.pdf

red imported fire ant (*Solenopsis invicta*) http://entnemdept.ufl.edu/creatures/urban/ants/red_imported_fire_ant.htm

red palm weevil (*Rhynchophorus ferrugineus*) http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/nprg-redpalmweevil.pdf

silverleaf whitefly (*Bemisia argentifolii*) http://www.entnemdept.ufl.edu/creatures/veg/leaf/silverleaf_whitefly.htm

varroa mite (*Varroa destructor*) http://entnemdept.ufl.edu/creatures/misc/bees/varroa_mite.htm

DISEASES

banana Xanthomonas wilt (*X. c.* pv. *musacearum*) http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS-93-5-0440

citrus canker (*Xanthomonas axonopodis*) http://www.apsnet.org/publications/imageresources/Pages/IW00011a.aspx

citrus greening (*Candidatus* Liberibacter asiaticus) http://www.crec.ifas.ufl.edu/extension/greening/index.shtml

coffee rust (*Hemileia vastatrix*) http://www.apsnet.org/edcenter/intropp/lessons/fungi/Basidiomycetes/Pages/CoffeeRust.aspx

downy mildews of corn http://maizedoctor.cimmyt.org/index.php?id=233&option=com_content&task=view

guava rust (*Puccinia psidii*) http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-38.pdf

iris yellow spot http://aces.nmsu.edu/pubs/_h/H-255.pdf

lethal yellowing of palm (*Candidatus* Phytoplasma palmae) http://edis.ifas.ufl.edu/pp146

moko disease of banana (*Ralstonia solanacearum*) http://www.promusa.org/tiki-custom_home.php

Panama disease of banana TR 4 (*Fusarium oxysporum* f.sp. *cubense*, tropical race 4) http://www.agric.wa.gov.au/objtwr/imported_assets/content/pw/ph/dis/fn/fs01200.pdf

papaya ringspot http://www.apsnet.org/publications/apsnetfeatures/Documents/2004/ControllingPapayaRingspotVirus.pdf

sudden oak death (*Phytophthora ramorum*) http://www.suddenoakdeath.org/

tomato yellow leaf curl http://www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-70.pdf

PLANTS

cogongrass (*Imperata cylindrica*) http://www.issg.org/database/species/ecology.asp?si=16&fr=1&sts=sss&lang=EN

fireweed (*Senecio madagascariensis*) http://www.hawaiiinvasivespecies.org/pests/fireweed.html

fountain grass (*Pennisetum setaceum*) http://www.nps.gov/plants/alien/fact/pdf/pese1.pdf

miconia (*Miconia calvescens*) http://www.hawaiiinvasivespecies.org/pests/miconia.html

Siam weed (*Chromolaena odorata*) http://plants.usda.gov/java/profile?symbol=CHOD

Pests listed in **'BOLD'** are not, to our knowledge, present in the American Affiliated Pacific Islands.

Websites

PEST INFORMATION

American Samoa: http://www2.ctahr.hawaii.edu/adap2/ascc_landgrant/technical_papers.asp#brochures

Bugwood (images): http://bugwood.org/

Crop Knowledge Master: http://www.extento.hawaii.edu/kbase/Crop/crop.htm

Hawaii Invasive Species Council: http://dlnr.hawaii.gov/hisc/

Plant Pono: http://www.plantpono.org/

Hawaii Department of Agriculture (new pest advisories): http://hawaii.gov/hdoa/pi/ppc/new-pest-advisories

Hawaiian Ecosystems at Risk (Pacific invasive species): http://www.hear.org/

Master Gardeners (national pest list): http://wiki.bugwood.org/npdn-mg-training

Western Micronesia Regional Invasive Species Council: http://guaminsects.net/gisac/index.php?title-Main_Page

DIAGNOSTIC CLINICS AND DIAGNOSTICIANS

American Samoa Community College, Land Grant: Mark Schmaedick (insects) m.schmaedick@amsamoa.edu (684) 699-1575; Ndeme Atibalentja (plant diseases) n.atibalentja@amsamoa.edu

University of Guam: Robert Schlub (plant diseases) rlschlub@uguam.uog.edu (671) 735-2089; Aubrey Moore (insects) amoore@uguam.uog.edu (671) 735-2141

Hawaii Department of Agriculture: Bernarr Kumashiro (insects) Bernarr.R.Kumashiro@hawaii.gov (808) 973-9534; Mann Ko (plant diseases) Mann.P.Ko@hawaii.gov (808) 973-9546

University of Hawaii at Manoa (diagnostic clinic): Honolulu adsc@ctahr.hawaii.edu, (808) 956-6706 ; Komohana Research Extension Center, Hilo komohana@ctahr.hawaii.edu, (808) 981-5199

ORGANIZATIONS

Guam Department of Agriculture: http://www.nasda.org/cms/7195/8617/8761.aspx

National Plant Diagnostic Network http://www.npdn.org/

Western Plant Diagnostic Network https://www.wpdn.org/index.php

Western Pacific Tropical Research Center (Guam) http://www.wptrc.org/

EDUCATION AND TRAINING

Extension Disaster Education Network http://eden.lsu.edu/Pages/default.aspx

NPDN First Detector Training Sites: http://www.npdn.org/first_detector

NPDN First Detector Newsletter: http://www.npdn.org/newsletter

Protect U.S. invasive species network http://www.protectingusnow.com/

WPDN Homepage: https://www.wpdn.org/index.php

WPDN and Pacific First Detector Newsletters: https://www.wpdn.org/newsletters

IF A LINK IS INOPERABLE, TRY COPYING AND PASTING IT DIRECTLY INTO YOUR BROWSER