citrus research international

CITRUS BIOSECURITY THREATS
FACT SHEETS

www.citrusres.com

Fact sheet produced by CRI's Biosecurity Division, January 2024

CITRUS BIOSECURITY THREAT:
Asian Citrus Psyllid (ACP)

The insect

ACP adults is the most efficient vector of the most destructive citrus disease in the world, Huanglongbing (HLB), associated with the bacterium '*Candidatus* Liberibacter asiaticus'.

ACP can also transmit African greening '*Ca*. Liberibacter africanus' (Claf), as well as '*Ca*. Liberibacter americanus'.

The combined presence of ACP and HLB poses the greatest threat to citrus production worldwide.

Description

ACP adults are about 3-4 mm long and 1 mm wide, with a light brown head, yellow-brown, mottled body, green-brown or pink-brown abdomen, and grey-brown legs.

The wings are transparent, mottled with white and light brown spots and a broad dark brown band extending around the periphery of the outer half of the wing, slightly interrupted near the apex.

The terminal segments of the antennae are black, with two darker segments in the middle of the antennae.

ACP adult

ACP nymphs with long white waxy secretions (left) and adults (right)

Signs of presence

Eggs are laid on tips of young, tender twigs and flush, and on or between unfurling leaves in buds and leaf axils. Immature stages (nymphs and eggs) are bright yellow/orange in colour.

Orange psyllid eggs (left) and nymphs (right)

Nymphs feed on young tender leaf growth and cause the new leaf tips to die back. Affected shoots can become stunted and twisted, causing the growing tips to appear rosetted. Infestation causes curling of leaves, notching and premature leaf drop. Adults and nymphs produce honeydew, causing black sooty mould to grow. Heavy infestations can cause blossom and fruitlet drop.

However, their main danger is the spread of HLB.

Possible confusion with

ACP can easily be confused with indigenous *Diaphorina* species that are morphologically similar. Distinction of ACP amongst these look-alikes requires expert identification.

Adult psyllids could also be confused with aphids, but are highly active and jump at the slightest disturbance, compared to aphids which are less active. Psyllid nymphs can be confused with soft scale insects (such as soft brown scale), but the psyllid nymphs have clear body parts, compared with scales, and can excrete waxy filaments.

Host range

Mainly plants in the family Rutaceae, including:

- All *Citrus* spp.
- Orange jasmine (*Murraya paniculata*)
- Curry leaf (*Bergera koenigii*)

Current distribution

- America (North, Central & South)
- Asia
- Benin
- Cyprus (under eradication)
- Ethiopia
- Israel (under eradication)
- Kenya
- Mauritius
- Middle East
- Nigeria
- Oceania
- Réunion
- Tanzania
- Zanzibar

Method of spread

- **Natural flight**
  ACP has substantial flight capacity, being able to disperse over distances of at least 2 km within 12 days, when suitable young host material for feeding and oviposition is scarce.
- **Infested plant material**
  Eggs and nymphs can be transported over long distances on citrus plant material (budwood, trees, rootstock seedlings) and branches and foliage of other host plants, in particular orange jasmine *(M. paniculata)* and curry leaf *(B. koenigii).*
- **Fruit**
  Spreading via fruit without leaves, after the packing process, is highly unlikely.

Preventative actions

- Quarantine procedures for importation of citrus propagation material and other hosts
- Surveillance at borders and on farm with yellow or lime-green sticky traps
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

citrus research international

CITRUS BIOSECURITY THREAT:
Huanglongbing (HLB) or Asian Greening

Symptoms

The first symptom of HLB on a tree is usually a branch or twig with yellow leaves. The most characteristic leaf symptom is asymmetrical blotchy mottling. The veins are often prominent and yellow. Abundant leaf drop is common.

Chronically infected trees show sparse yellow foliage, extensive twig dieback, stunted growth, corky veins and root decline.

Fruit are poorly coloured (greening) and show colour inversion when maturing: the peduncular (twig) end of the fruit turns orange, while the stylar end is still green.

Some fruit on infected trees are reduced in size, lopsided (inside the columella is curved), low in soluble solids, high in acids, and can have a sour, bitter or salty taste.

Unseasonal and heavy flowering on diseased branches and out-of-phase flushing can also be seen.

Small, lopsided fruit

Small leaves, yellow veins, asymmetrical mottle

The tree can remain symptomless for months or years after the initial infection. Symptom development is slow and infected trees decline gradually in vigour and yield, and remain stunted or eventually die. The disease develops irregularly so that individual trees may show a mixture of normal and diseased sectors.

The disease

- HLB, associated with the bacterium '*Candidatus* Liberibacter asiaticus' (CLas), is the most destructive citrus disease worldwide.
- Tree growth, health and fruit production are severely impacted.
- Infected trees die, and symptomatic fruit are unsuitable for fresh fruit or juice markets.
- There is no cure once trees become infected. Infected trees need to be eradicated.

Sparse yellow foliage and stunted growth

Possible confusion with

Leaves may show symptoms resembling those of zinc, copper or manganese deficiencies. However, the asymmetrical blotchy mottle, typical of HLB, is in contrast with symptoms of nutrient deficiencies, which are symmetrical. Symptoms of mineral deficiency, such as yellowing, are distributed uniformly throughout the canopy, but HLB symptoms may be more scattered. HLB may also be confused with other diseases, such as citrus stubborn disease, phytoplasma infections, dieback, citrus tristeza virus, Phytophthora root rot and citrus blight.

Host range

Mainly plants in the family Rutaceae, including:

- All *Citrus* spp.
- Orange jasmine (*Murraya paniculata*)
- Curry leaf (*Bergera koenigii*)

Current distribution

- Asia
- Papua New Guinea
- America (North, Central and South)
- Ethiopia
- Kenya
- Mauritius
- Réunion

Method of spread

- **Insect vectors**

  Asian citrus psyllid (ACP) *(Diaphorina citri)* and African citrus triozid (ACT) *(Trioza erytreae)*. They feed from the phloem sap of infected hosts. Once acquired, the bacteria can persist in the vector for up to 3 months, and transmit the HLB bacteria when feeding

ACP adults are heat tolerant and not restricted to climatic regions.

Not present in SA

ACT adults are heat sensitive and restricted to cooler elevations.

Present in SA

- **Infected plant material**

  Citrus propagation material (trees, cuttings, grafts, budwood) and propagation material of other hosts
- **NOT fruit or seed transmitted**

Preventative actions

- Quarantine procedures for importation of citrus propagation material and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Prevent incursion and spread of ACP, including effective control of ACT
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

CITRUS BIOSECURITY THREAT:
Citrus Variegated Chlorosis (CVC)

Symptoms

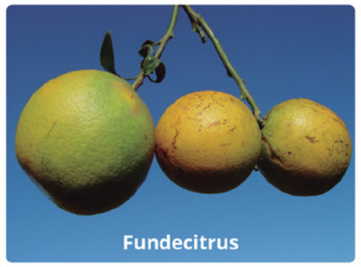
Symptoms start with irregularly spread small, chlorotic spots between the veins on the upper surface of mature leaves, with a corresponding slightly raised brownish gum-like material on the lower surface. At severe stages, the brown spots on leaves coalesce and become necrotic. Defoliation of terminal twigs and small leaves can occur. Symptoms are always restricted to one or a few branches on trees. Infected trees can show twig dieback, reduced vigour and growth, and may appear stunted, but do not normally die.

Fruit are much smaller, very firm with hard rinds, lack juice, have an acidic flavour, and ripen prematurely.

The time from infection to symptom appearance ranges from a few months to more than a year. Symptoms are easier to notice in trees between 7 and 10 years old, but many infected host plants remain asymptomatic.

Outbreaks can also remain undetected due to the non-specific nature of the symptoms.

Irregularly spread, small chlorotic spots between the veins on the upper surface of mature leaves



Fruit are much smaller than normal

The disease

- *Xylella fastidiosa* is considered one of the most dangerous plant-pathogenic bacteria worldwide.
- CVC is caused by the subspecies *Xylella fastidiosa* subsp. *pauca.*
- The bacterium resides in the xylem of the plant and is transmitted by xylem-feeding leafhoppers, known as sharpshooters.
- Infection leads to a significant decline in tree health and subsequently fruit production.
- Symptomatic fruit are unsuitable for the juice or fresh fruit market.
- There is no known treatment for CVC once trees become infected. Infected trees need to be removed.

Possible confusion with

Plants infected with CVC show foliar symptoms similar to zinc deficiency, anthracnose and greasy spot. Fruit symptoms can be confused with sunburn.

Host range

- All *Citrus* spp.
- Sweet oranges are the most susceptible
- Wide range of non-citrus hosts, of which many are ornamental plants

Current distribution

- Costa Rica
- Argentina
- Brazil
- Ecuador
- Paraguay
- France
- Italy
- Spain

Method of spread

- **Insect vectors**

  Wide vector range. Xylem-feeding hemipteran insect vectors in the suborder Auchenorrhyncha (Cicadomorpha), which includes insects commonly known as spittlebugs/froghoppers, leafhoppers, sharpshooters and cicadas. Insects become infected when feeding on the xylem of an infected plant (including asymptomatic plants), and can immediately transmit the pathogen to a healthy plant. The vectors remain infectious until the time of their next moult.
- **Infected plant material**

  Citrus propagation material (trees, cuttings, grafts, budwood, rootstock seedlings) and propagation material of other hosts.
- **Host plant material containing living infected insect vectors**
- **NOT fruit or seed transmitted.**

Preventative actions

- Quarantine procedures for importation of citrus propagation material and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

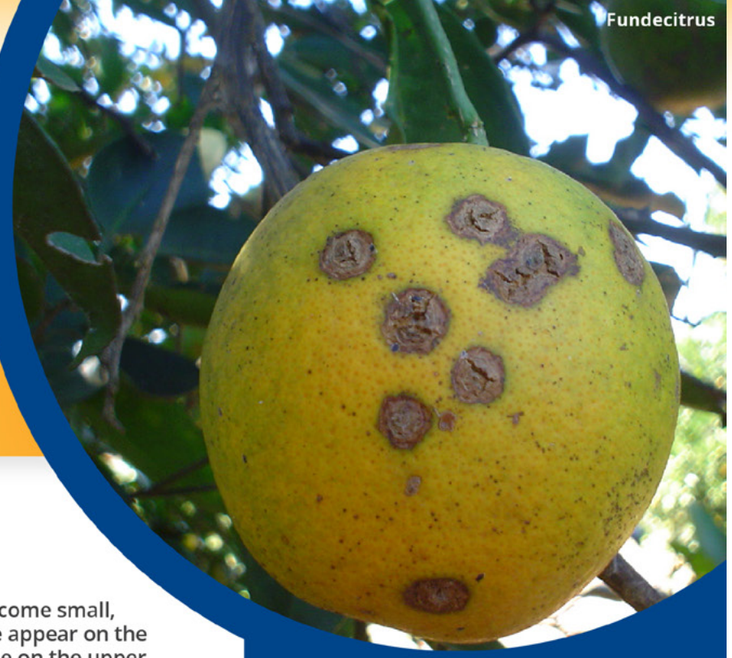
For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

CITRUS BIOSECURITY THREAT:
Citrus Canker



Symptoms

Leaf lesions first appear as pin-point spots that become small, light yellow, slightly raised pustules. Initially, these appear on the lower leaf surface and subsequently become visible on the upper leaf surface.

Young lesions are usually translucent and initially circular but may develop irregularly. Lesions become tan or brown, and as they develop become spongy or corky, and later crater-like with a raised margin and sunken centre, that may crack and/or drop out. The lesions become surrounded by characteristic yellow halos. The water-soaked, oily or greasy margin that develops around the central necrotic tissue is characteristic.

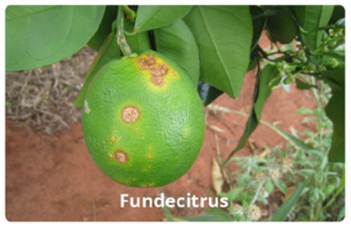
Lesions on young twigs and stems are superficially similar to those on leaves, but there may be little or no chlorosis. Lesions are generally irregularly shaped and may be sunken.

Fruit lesions are also superficially similar to those on leaves. The yellow halo may or may not be present. Old lesions are distinctly crater-like and appear as irregularly shaped, dark-brown, scabby masses on the fruit surface.

Tan raised pustules on the lower leaf surface

Spongy or corky lesions on the twig

Raised, corky lesions on the leaf surface



Crater-like lesions with yellow halos surrounding them

The disease

- Citrus canker is caused by the bacterium *Xanthomonas citri.*
- It is a serious disease that results in severe economic losses, either in terms of damage to trees, reduced market value of blemished fresh fruit, reduced access to export markets, or the costs of its control.
- Fruit are not suitable for consumption or processing.
- Trees infected with canker become weak and unproductive.
- There is no treatment. Infected trees need to be removed.

Possible confusion with

Citrus canker can be confused with citrus scab, caused by *Elsinoë fawcettii* (lemon scab, present in SA), but scab lesions are drier than canker lesions and lack the characteristic yellow halo.

Host range

- All *Citrus* spp.

Current distribution

- Mexico
- America (North, Central, South)
- Asia
- Oceania
- Italy
- Many African countries

Citrus canker (left) vs scab (right)

Citrus scab lesion (left) vs canker lesion (right) on fruit

Method of spread

- **Infected plant material**
  Citrus propagating material (trees, budwood, cuttings, grafts, rootstocks)
- **Fruit**
  Movement of diseased fruit (lesions on marketable fruit), infected cull fruit, and processed fruit pulp
- **Seed**
  Only poorly sanitised rootstock seed extracted from canker-infected fruit

Preventative actions

- Quarantine procedures for importation of citrus propagation material and fruit
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

citrus research international

CITRUS BIOSECURITY THREAT:
Citrus Sudden Death (CSD)

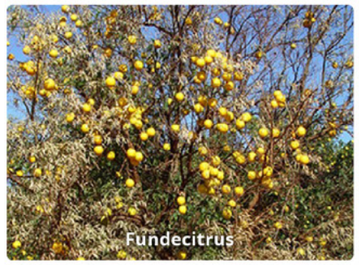
Symptoms

Foliar discolouration and leaf dullness throughout the canopy of the plant, loss of leaf turgidity, accompanied by partial defoliation initially, and total defoliation at more advanced stages. Fruit usually appear normal, but remain attached to the dying or dead trees.

Less sprouting, fewer new shoots, absence of internal shoots, and finally tree death.

The characteristic symptom of the disease is a yellow to orange stain that develops in the phloem at the bud union of a susceptible rootstock, indicating blockage of the phloem vessels.

Death of a large portion of the root system that progresses from the root tips through roots of increasing size until the main scaffold roots are affected and die. Trees can die within 1 to 12 months after the first appearance of symptoms, depending on the time of year (more rapid disease progression in the spring) and cultivar (more rapid disease progression in late-maturing cultivars).

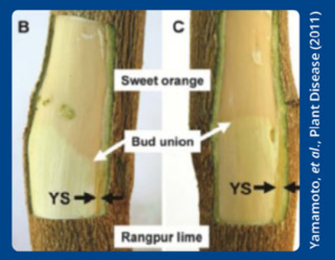


Loss of leaves, fruit remain attached and normal

General foliar discolouration

The disease

- The causal agent of this disease has not been confirmed, but is associated with citrus sudden death-associated virus (CSDaV).
- It is an infectious bud union disease of Rangpur lime, Volkamer lemon and Rough lemon rootstocks.
- Infected trees on susceptible root-stocks can die in less than 12 months.
- There is no known treatment. Infected trees need to be eradicated.



Characteristic yellow to orange stain in phloem of infected *C. limonia* rootstock

Possible confusion with

Symptoms are similar to the quick-decline symptoms caused by citrus tristeza virus, Valley Bushveld Decline and Citrus Blight.

Host range

- All *Citrus* spp. are hosts but disease expression is only on the specified rootstocks.
- Sweet oranges *(Citrus sinensis),* Ponkan and Cravo mandarin *(C. reticulata)*, tangor Murcott (*C. sinensis* × *C. reticulata*) and others, when grafted on Rangpur lime (*C. limonia*), Volkamer lemon (*C. volkameriana*) and Rough lemon (*C. jambhiri*) rootstocks

Current distribution

- Brazil

Method of spread

- **Infected plant material**
  Citrus propagating material (trees, cuttings, grafts, budwood)
- **Viruliferous, airborne insect vectors, possibly aphids, but not confirmed**

Preventative actions

- Quarantine procedures for importation of citrus propagation material
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

citrus research international

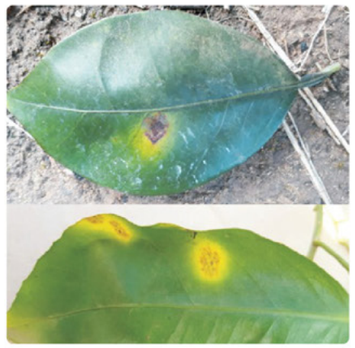
CITRUS BIOSECURITY THREAT:
Citrus Leprosis (CL)

Symptoms

Round to elliptical local lesions are seen on leaves, twigs and fruit.

Leaf lesions, both on the upper and lower sides, are usually not raised, round to elliptical and pale-green to yellow with a dark-brown central spot about 2-3 mm in diameter, surrounded by a chlorotic halo, in which 1 to 3 brownish rings frequently appear surrounding the central spot. Larger lesions may form by the fusion of 2 or more adjacent lesions. Severe infections lead to premature leaf fall.

On fruit, lesions are flat to slightly depressed necrotic spots, 5-15 mm in diameter, with a yellow halo, and distributed over the whole fruit rind. Gum exudation may be seen on the lesions. On green fruit, the lesions are initially chlorotic and darken to brown or black and become slightly depressed. A yellow halo can be observed around the lesions as they mature. In severe infections, fruit drop occurs, mainly in cases where the lesions are close to the peduncle. On stems, lesions are cortical, grey or brown or sometimes dark-reddish, later turning into crusty scabs.



Leaf symptoms

Fruit symptoms

Twig symptoms

The disease

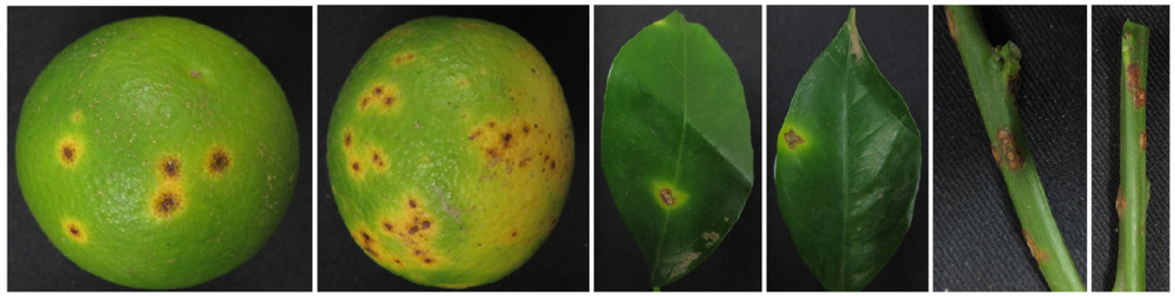
- CL is associated with at least 7 distinct viruses, belonging either to the cytoplasmic type (CL-C) or the nuclear type (CL-N).
- The more common cytoplasmic types include citrus leprosis virus C (CiLV-C) and citrus leprosis virus C2 (CiLV-C2), and the nuclear types include citrus leprosis virus N (CiLV-N), citrus chlorotic spot virus (CiCSV), citrus bright spot virus (CiBSV) and strains of the orchid fleck virus (OFV). OFV was detected on citrus in the Sundays and Gamtoos River Valleys of the Eastern Cape province of South Africa (under eradication).
- Severe losses in yield may occur, both in quantity due to fruit drop, and quality due to cosmetic damage.
- In severe cases, CL can cause 100% yield loss, mainly oranges and mandarins.

Host range

- All *Citrus* spp.
- Other non-citrus hosts, including *Cymbidium*, spp., *Solanum violaefolum*, *Swinglea glutinosa*, *Bidens pilosa*, *Ageratum conyzoides* and *Commelina benghalensis*

Current distribution

- Some of the types of the virus are present in Mexico, Hawaii, Central and South America, and South Africa (OFV)

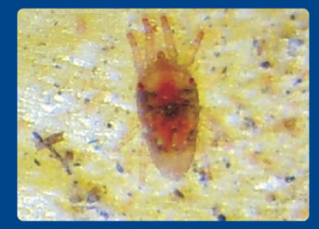


Method of spread

- **Insect vectors**

  Various species of false spider mites of the genus *Brevipalpus* (Tenuipalpidae)

  The mites feed on the foliage, stems and fruit. All active stages of the mites can acquire and transmit the viruses. Given the non-systemic nature of the disease, mites have to feed on lesions to acquire the virus.
- **NOT fruit or seed transmitted**



Brevipalpus californicus

Preventative actions

- Quarantine procedures for importation of citrus propagation material, citrus fruit and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

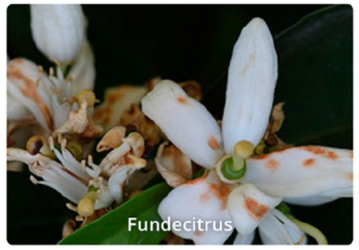
Fact sheet produced by CRI's Biosecurity Division, January 2024

CITRUS BIOSECURITY THREAT:
Post Bloom Fruit Drop (PFD)

Symptoms

The first symptoms may appear two to seven days after infection. Initially, peach to orange-coloured lesions are formed on the petals of open flowers (floral rot or blossom blight), later turning reddish-brown and necrotic. Although unopened and even pinhead flower buds may be affected, petals on open flowers are more susceptible to infection. Whole flower clusters may be infected, resulting in entire branches with orange to brown petals clinging to inflorescences.

Flowers affected by PFD start developing into yellowish fruitlets, but fruit development ceases prematurely. The fruitlets abscise, and the remaining calyces and floral disks, commonly called buttons, persist on the twigs for the life of the twig. These persistent buttons are uniquely characteristic to the disease and are not known to be produced by any other disorder. Leaves surrounding infected inflorescences are usually twisted and distorted, with twisted laminae and enlarged veins.



Peach to orange-coloured lesions on flower petals

Affected yellowish fruitlets

Abscission of fruitlets and retention of the calyces and floral disks, leaving the "buttons"

The disease

- *Colletotrichum abscissum*, belonging to the *Colletotrichum acutatum* complex, is the causal agent of PFD.
- PFD is a destructive disease of citrus and causes damage to blossoms (floral rot or blossom blight) and increases post-bloom fruit drop.
- The disease results in up to 80% early fruit drop in favourable climatic conditions.
- PFD is very difficult to control.

Host range

- All *Citrus* spp.

Current distribution

- Brazil
- USA

Method of spread

- **Infected plant propagation material**
  Citrus propagation material (trees, cuttings, grafts, budwood, rootstocks)
- **Airborne spores are wind dispersed from infected tissue**

Preventative actions

- Quarantine procedures for importation of citrus propagation material
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

CITRUS BIOSECURITY THREAT:
Pseudocercospora Leaf and Fruit Spot

Symptoms

Leaf symptoms initially appear as green-yellow patches. At maturity, the leaf spots are circular with a pale-brown or greyish centre. With the onset of the rainy season, the centres turn brown to blackish-brown when sporulation is dense. The lesions are usually surrounded by a dark-brown margin and a prominent yellow halo. Occasionally, the centre falls out, creating a shot-hole spot. Several lesions can coalesce, causing generalised chlorosis, premature abscission, and defoliation of the affected tree. Young leaves and fruit appear to be more susceptible than older mature leaves.

On young fruit, brown necrotic lesions form. These are usually circular to irregular, with a slightly sunken brown centre, with a surrounding ring of raised tumour-like growths, surrounded by a yellow halo. During wet weather, the lesions sporulate and become black.

In young fruit, a generalised necrosis sometimes forms, resulting in premature abscission of the fruit, or diseased fruit ripen prematurely and drop or dry up and remain on the tree. Affected fruit have longitudinal and transversal cracks in the rind with the internal locules exposed.

Leaf spots without sporulation

Leaf spots turn blackish-brown with sporulation during humid conditions

Fruit lesions with yellow halos

Severe fruit lesions

The disease

- This leaf and fruit spot disease is caused by the fungus *Pseudocercospora angolensis.*
- Severe infection of trees can result in premature abscission of young fruit and leaves.
- The juice content of diseased fruit is markedly reduced, making them unsuitable for fresh consumption or processing.
- Yield losses of 50-100% can occur and production may cease where the disease is endemic.

Stem symptoms are seldom found. When infection of stems occurs, the lesions are dark-brown and usually occur as extensions of petiole lesions. Several lesions at the stem tip results in dieback. Lesions on other parts of the stem coalesce, become corky, and crack. At the base of the dead stem there is usually profuse growth of secondary shoots.

Host range

- All *Citrus* spp.
- African cherry orange *(Citropsis tanakae)*; Round kumquat *(Fortunella japonica)*

Current distribution

- Yemen
- Various countries in Africa, as far south as Angola, Mozambique, Zambia and Zimbabwe

Method of spread

- **Infected plant propagation material**
  Citrus propagation material (trees, cuttings, grafts, budwood, rootstock seedlings) and propagation material of other hosts
- **Infected fruit**

Preventative actions

- Quarantine procedures for importation of citrus propagation material, fruit and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

citrus research international

CITRUS BIOSECURITY THREAT:
Peach Fruit Fly

The insect

- *Bactrocera zonata* is one of the most harmful species of Tephritidae.
- Economic impacts may result from direct yield losses from infested fruit, market access loss and quarantine restrictions.
- The pest can easily spread, adapt to temperate conditions, and establish outside tropical climates.

Description

Adults are about 6 mm long, and red-brown with yellowish thoracic markings. Wing patterns of the peach fruit fly are in general reduced and mostly yellowish or brownish.

Adult peach fruit fly

Oviposition punctures in fruit

Signs of presence

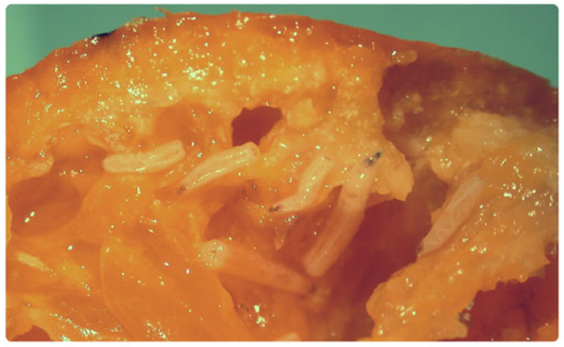
Fruit flies may be detected as eggs or larvae in fruit, or as adults caught in traps. Infested fruit have tiny oviposition punctures. In juicy fruit, fluid exudes from the oviposition puncture in the form of a droplet that later dries up, leaving a brown, resinous deposit. Larvae bore tunnels inside the fruit, leading to deterioration and rotting of the fruit.

Host range

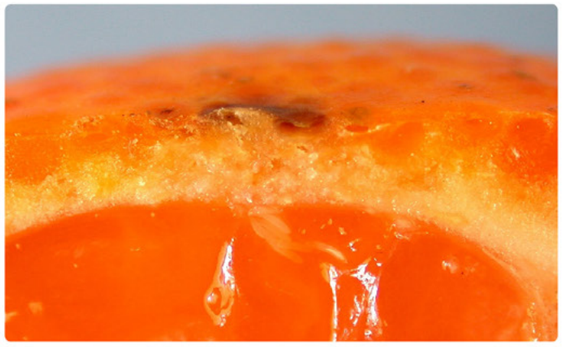
The peach fruit fly is a polyphagous species attacking about 40 species of fruit, including peach, mango, guava and some *Citrus* types.

Current distribution

- Asia
- Cyprus
- In Africa it is present in Egypt, Libya, Sudan, Mauritius and Réunion



Fruit fly larvae are white and in general have a cylindrical maggot-shape, 5-15mm in length



Fruit fly eggs

Method of spread

- **Natural flight**
  The peach fruit fly is a strong flier and highly mobile. It naturally spreads by means of adult flight.
- **Movement of infested fruit**
  The transport of infested fruit, via trade and travellers, is the main means of movement and dispersal.
- **Host plants with roots**
- **Packaging**
  The peach fruit fly will also spread if present on fruit packaging material.

Preventative actions

- Quarantine procedures for importation of citrus fruit and other hosts
- Host plants transported with roots should be free from soil, or the soil should be treated against puparia
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

CITRUS BIOSECURITY THREAT:
Mal Secco


Ercan Canihos

Symptoms

Typical symptom is the yellowing and clearing of small veins on leaves. Epinasty of young leaves is followed by wilting, drying up and leaf shedding.

In spring, shoot chlorosis is followed by dieback of twigs and branches. On the affected twigs, immersed, flask-shaped or spherical fruiting bodies appear as black points within lead-grey or ash-grey areas on withered twigs. Growth of sprouts from the base of the affected branches, and suckers from the rootstock, is a common response of the tree to mal secco. Initially, individual branches or sectors may be infected. Gradually, the infection moves downwards from shoots to the limbs, trunk and roots, affecting the entire tree, which eventually dies.

Upon cutting into the infected twigs, or after peeling off the bark of the branches or the trunk of the infected trees, typical salmon-pink or orange-red discolouration of the wood can be observed. This internal symptom is associated with gum production within the xylem vessels. On fruit, browning of vascular bundles can be observed in the area of insertion of the peduncle.

Although most of the symptoms of mal secco are not specific, the syndrome of the disease is quite characteristic. In addition to the more common form of mal secco, two different forms of the disease can be distinguished. "Mal fulminante" is a rapid fatal form of the disease apparently caused by root or stem infection, which leads to a systemic invasion of the functional xylem by the pathogen, and sudden wilting of branches or the whole tree. "Mal nero" is a result of chronic infection of mature trees, most likely originating from the roots, leading to browning of the heartwood without any external symptoms at first. However, when the pathogen invades the outer functional xylem, infected trees collapse suddenly.


Migheli *et al.*, Plant Disease (2009)

Characteristic salmon-pink discolouration of the wood

The disease

- Mal secco is caused by the fungus *Plenodomus tracheiphilus*.
- It is a destructive vascular disease of citrus, and the most destructive fungal disease of lemons in the Mediterranean and the Black Sea region.
- Up to 100% of trees in a lemon orchard can be affected, and yield losses of more than 60% have been reported.
- The disease reduces the quantity and quality of lemon production due to reduction of canopy volume or death of the tree.
- Mal secco is difficult to control.


Migheli *et al.*, Plant Disease (2009)

"Mal nero" - chronic infection leads to browning of heartwood


Migheli *et al.*, Plant Disease (2009)

Vein clearing and chlorosis of lemon leaves affected by mal secco disease


Migheli *et al.*, Plant Disease (2009)

Withered twig of lemon with fruiting bodies of *P. tracheiphilus* in ash-grey area of twig

Host range

- Almost all *Citrus* spp. are susceptible, but lemon *(Citrus limon)* is the most affected
- Rootstocks affected include Rough Lemon and Carrizo and Troyer citranges
- Kumquats *(Fortunella)*, trifoliate orange *(Poncirus, Poncirus trifoliata)*, x *Citrofortunella microcarpa*

Current distribution

- Europe (around the Mediterranean Basin and the Black Sea)
- Asia
- Countries in Africa (Algeria, Egypt, Libya, Tunisia, Uganda)

Method of spread

- **Infected plant material**
  Citrus propagation material (trees, cuttings, grafts, budwood, rootstock seedlings)
- **NOT seed transmitted**
- **NOT fruit transmitted**

Preventative actions

- Quarantine procedures for importation of citrus propagation material and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm!

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024

citrus research international

CITRUS BIOSECURITY THREAT:
Yellow Vein Clearing Disease

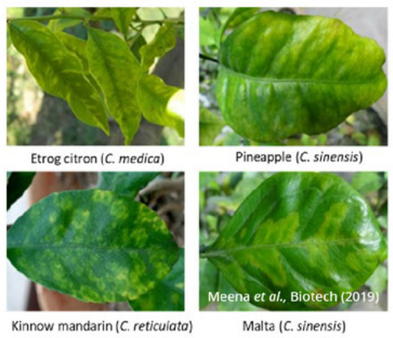
Symptoms

Symptoms are most prominent on lemons, with foliar symptoms of vein clearing and leaf crinkling, with irregular, elongated chlorotic spots, predominantly visible on young growth. Veins on the underside of the leaf become water-soaked and turn brown. Foliar symptoms are accompanied by leaf drop.

On other citrus types, irregular ringspots may be seen on leaves, and mosaic-like patterns on fruit.

In severe infections, trees die back and fruit are malformed, causing reduced fruit quality.

Symptoms are more visible in the cooler periods of spring and autumn and less noticeable in hot environments. Yellow vein clearing disease can be asymptomatic on some citrus cultivars.



Vein clearing and flecking on 'Etrog' citron and atypical chlorotic ringspots on 'Pineapple' sweet orange, 'Malta' sweet orange and 'Kinnow' mandarin, similar to symptoms associated with ICRSV

The disease

- Yellow vein clearing disease is caused by citrus yellow vein clearing virus (CYVCV).
- The disease is associated with poor tree vigour, reduced yields and decreased marketability of fruit.
- There is no treatment once trees become infected. Infected trees need to be eradicated

Vein clearing and flecking on 'Eureka' lemon

Possible confusion with

Atypical chlorotic ringspot, similar to those induced by Indian chlorotic ringspot virus (ICRSV), were recorded on 'Kinnow' mandarin and 'Malta' sweet orange.

Defoliation of CYVCV infected tree >

Host range

- All *Citrus* spp.
- Severe symptoms are observed on 'Eureka' lemon and sour orange
- Grapevines and a range of herbaceous plants and weed species

Current distribution

- Turkey
- China
- India
- Iran
- Pakistan
- California, U.S.A.

Method of spread

- **Infected plant propagation material**
  Citrus propagation material (trees, cuttings, grafts, budwood, rootstock seedlings) and propagation material of other hosts
- **Viruliferous insect vectors**
  Aphids: *Aphis craccivora* on non-citrus hosts, *Aphis spiraecola* on citrus and non-citrus hosts
  Whitefly: *Dialeurodes citri*
- **NOT fruit or seed transmitted**

Aphis craccivora

Aphis spiraecola

Dialeurodes citri

Preventative actions

- Quarantine procedures for importation of citrus propagation material and other hosts
- Plant certified disease-free citrus trees
- Awareness and surveillance to ensure early detection and rapid implementation of control measures
- Do not bring illegal plant material into South Africa and onto your farm

For more information on this disease, or if you find anything unusual, contact Wayne Kirkman from CRI's Biosecurity Division: waynek@cri.co.za, 084 458 0349

www.citrusres.com

Back to Top ^

Fact sheet produced by CRI's Biosecurity Division, January 2024