1. PaDIL Species Factsheet

Scientific Name:
*Xanthomonas axonopodis pv. citri* (Hasse 1915) Vauterin et al. 1995
(Bacteria: Xanthomonadales)

Common Name
Citrus canker (canker A)

Image Library
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- Museum Victoria

- CRC National Plant Biosecurity

- Plant Health Australia

- Department of Agriculture, Fisheries and Forestry

- Department of Agriculture and Food, Western Australia
2. Species Information

2.1. Details

Specimen Contact: Dr Jose R. Liberato - jose.liberato@nt.gov.au
Author: Liberato JR, Miles AK, Rodrigues Neto J & Gambley C
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2.2. URL

Live link: http://www.padil.gov.au:80/pests-and-diseases/Pest/Main/136647

2.3. Facets

Status: Exotic Regulated Pest - absent from Australia
Group: Bacteria
Commodity Overview: Horticulture
Commodity Type: Fresh Fruit, Citrus
Distribution: USA and Canada, Central and South America, Africa, South and South-East Asia

2.4. Other Names

X. campestris pv. citri (Hasse 1915) Dye 1978
X. citri (ex Hasse 1915) Gabriel et al. 1989
Xanthomonas smithii subsp. citri Schaad et al. 2005

2.5. Diagnostic Notes

Symptoms:
Citrus canker affects all aboveground plant parts, with initial symptoms on leaves appearing as tiny, slightly raised blister-like lesions. With time, foliar lesions turn grey, then tan/brown, a water soaked margin appears and the entire lesion is usually surrounded by a chlorotic margin. The centre of the lesion becomes characteristically raised, and spongy or corky. Lesions arising from stomatal infection are typically visible from both sides of the leaf (unlike these of scab – Elsinoe spp.). A shot-hole effect can also eventuate, after the centre of the lesion becomes crater-like and falls out. As the disease becomes more severe on foliage, defoliation generally occurs. A similar symptom to the above is observed on twigs and fruit, however chlorotic margins are not found on twig lesions. Severe infections can result in fruit abscission, and twig dieback due to girdling. Twigs not to be killed by girdling by the pathogen can harbour lesions for many years, with the old lesions tending to be raised corky patches in the otherwise smooth bark. Lesions can be associated with physical injuries to the host, in particular those caused by Asian citrus leaf miner (Phyllocnistis citrella Stainton) (Schubert et al. 2001).

The Bacteria:

The bacterium is an aerobic, gram-negative rod measuring 0.5–0.75 × 1.5–2.0 µm. It is motile by one polar flagellum. Carbohydrates are metabolised by oxidation. Growth on 2% sucrose-peptone agar is yellow and copiously mucoid. Gelatin, casein and starch are hydrolysed. Nitrite is not formed from nitrate, and aesculin is
hydrolysed (Hayward and Waterston 1964).

A number of strains of the pathogen have been described, based on factors such as virulence, host range, and molecular markers. The strains are referred to as A (Asiatic/Oriental canker), B (cancrosis B), C (Mexican lime canker), D (citrus bacteriosis) and E (citrus bacterial spot). The B and C strains are currently classified as X. axonopodis pv. aurantifolii. The D strain is controversial and E-strain is now classified as X. axonopodis pv. citrumelo. Schubert et al. (2001) provides a comprehensive explanation of each of the strains, and provides the relevant references for further reading.

Diagnosis:

When a typical citrus canker lesion is cut in through the centre, placed on a glass slide and covered with a drop of water, bacterial streaming can be observed under a light microscope. This indicates that a bacterium is associated with the lesion. It is then necessary to determine if the bacterium is Xanthomonas axonopodis pv. citri. A detailed summation of identification techniques can be found in the European and Mediterranean Plant Protection Organisation (2005).

Note: Additional synonyms are listed by Hayward & Waterston (1964), the Crop Protection Compendium (2005) and the European and Mediterranean Plant Protection Organisation (2005).

2.6. References

3. Diagnostic Images

Lesions on fruit of citrus tangelo variety Minneola (Copyright DPI&F, for use contact email address)
**Host Symptoms:** DPI&F Archives DPI&F

Lesions on grapefruit (Copyright DPI&F, for use contact email address)
**Host Symptoms:** DPI&F Archives DPI&F

Lesions on fruit (Copyright DPI&F, for use contact email address)
**Host Symptoms:** DPI&F Archives DPI&F

Lesions on fruit (Copyright DPI&F, for use contact email address)
**Host Symptoms:** DPI&F Archives DPI&F

Lesions on shoot (Copyright DPI&F, for use contact andrew.miles@dpi.qld.gov.au)
**Host Symptoms:** A.K. Miles DPI&F

Lesions on shoot of citrange Troyer (Copyright DPI&F, for use contact email address)
**Host Symptoms:** DPI&F Archives DPI&F
Lesions on leaf of citrus tangelo variety Minneola (Copyright DPI&F, for use contact email address)

**Host Symptoms:** DPI&F Archives DPI&F

Lesions along the mines of the Asian citrus leaf miner (Copyright DPI&F, for use contact email address)

**Host Symptoms:** DPI&F Archives DPI&F

Lesions on the upper leaf surface (Copyright DPI&F, for use contact email address)

**Host Symptoms:** DPI&F Archives DPI&F

Raised lesions on upper leaf surface

**Host Symptoms:** Jose R. Liberato DPI&F

Raised lesions on lower leaf surface

**Host Symptoms:** Jose R. Liberato DPI&F

Detail of lesions

**Host Symptoms:** Jose R. Liberato DPI&F
Detail of lesion

Host Symptoms: Jose R. Liberato DPI&F

Lesions on fruit (Copyright DPI&F, for use contact andrew.miles@dpi.qld.gov.au)

Host symptoms - fruit: A.K. Miles DPI&F

Papua New Guinea, Rabaul, Nov 2004, G. Maynard

Host symptoms - leaves: Glynn Maynard Department of Agriculture, Fisheries and Forestry (DAFF)

Papua New Guinea, Rabaul, Nov 2004, G. Maynard

Host symptoms - leaves: Glynn Maynard Department of Agriculture, Fisheries and Forestry (DAFF)

Papua New Guinea, Rabaul, Nov 2004, G. Maynard

Host symptoms - leaves: Glynn Maynard Department of Agriculture, Fisheries and Forestry (DAFF)
Lesions on lower leaf surface (copyright, for use contact julio@biologico.sp.gov.br).

**Host symptoms - leaves:** J. Rodrigues Neto

**Instituto Biologico**

Lesions on the upper leaf surface (copyright, for use contact julio@biologico.sp.gov.br).

**Host symptoms - leaves:** J. Rodrigues Neto

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Lesions on the upper (left) and lower (right) leaf surface (copyright, for use contact julio@biologico.sp.gov.br).

**Host symptoms - leaves:** J. Rodrigues Neto

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Lesions on leaf margin (copyright, for use contact julio@biologico.sp.gov.br).

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Lesions on leaf (copyright, for use contact julio@biologico.sp.gov.br).

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Bacterial streaming. Leaf piece mounted in water

**LM:** Jose R. Liberato DPI&F

Bacterial streaming. Leaf piece mounted in water

**LM:** Jose R. Liberato DPI&F

Bacterial streaming. Leaf piece mounted in water

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Bacterial streaming. Leaf piece mounted in water

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Bacterial streaming. Leaf piece mounted in water
LM: Jose R. Liberato DPI&F
4. Other Images

![Images of citrus scab]

Flatten citrus scab lesions (Elsinoe fawcetii) on upper leaf surface. Citrus scab is caused by the fungus Elsinoe fawcetii and is easily confused with citrus canker.

**Citrus scab**: Jose R. Liberato DPI&F

Raised scab lesions (Elsinoe fawcetii) on lower leaf surface. Citrus scab is caused by the fungus Elsinoe fawcetii and is easily confused with citrus canker.

**Citrus scab**: Jose R. Liberato DPI&F

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