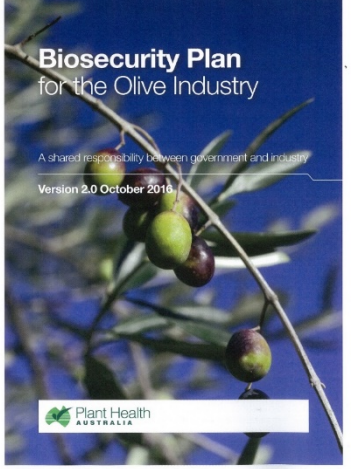


BIOSECURITY, INCLUDING PESTS & DISEASES NOT PRESENT IN AUSTRALIA

Robert Spooner-Hart, Len Tesoriero, Craig Elliot

Hort Innovation
Strategic levy investment

AUSTRALIAN OLIVE ASSOCIATION

WESTERN SYDNEY UNIVERSITY

This is No. 3 in a series of 9 tutorials on IPDM in olives

The others are:
1. Principles and practices of Integrated Pest and Disease Management
2. Monitoring for pests, diseases and beneficial species, including symptoms and possible causes, identification/diagnostic services.
4. Black scale: biology, damage and management
5. Olive lace bug: biology, damage and management
6. Apple Weevil: biology, damage and management
7. Anthracnose: life cycle, conditions conducive, symptomatology and damage, and management
8. Peacock spot: life cycle, conditions conducive, symptomatology and damage, and management
9. Cercospora leaf mould: life cycle, conditions conducive, symptomatology and damage, and management

It is an output from the Hort Innovation project OL17001 An Integrated Pest and Disease Management Extension program for the Olive Industry

BIOSECURITY IN AUSTRALIA

- Prior to Federation, states were responsible for their own quarantine. They continue to play an important collaborative role under the new legislation.

- The first national Quarantine Act commenced in 1908: but was repealed in June 2016 by the Biosecurity Act 2015.

- The Biosecurity Act commenced 2017 and is administered by Biosecurity Australia, an arm of the Australian Government Department of Agriculture, Fisheries and Forestry.

- Two useful NSW DPI Factsheets under Biosecurity Regulation 2017 relating to the olive industry are:
  - Abandoned and neglected horticultural enterprises https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0015/724110/Abandoned-and-Neglected-Horticultural-Enterprises.pdf
  - Your requirements when visiting a farm https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/724978/factsheet-your-requirements-when-visiting-a-farm.pdf

BIOSECURITY ON YOUR OLIVE GROVE

- It is strongly recommended that you develop and actively follow a biosecurity management plan for your property(ies)

- While biosecurity management plans are not mandatory, if one is in operation, it is a legal requirement to obey relevant signs, procedures and measures outlined in the plan. Note the offence will not apply if a biosecurity management plan is not in place or is not being implemented.

- You can access the document FARM BIOSECURITY ACTION PLAN FOR OLIVE GROWERS, which includes a Grove Biosecurity Checklist from AOA's website https://australianolives.com.au/wp-content/uploads/2018/06/Biosecurity-Olive_Reduced-File.pdf

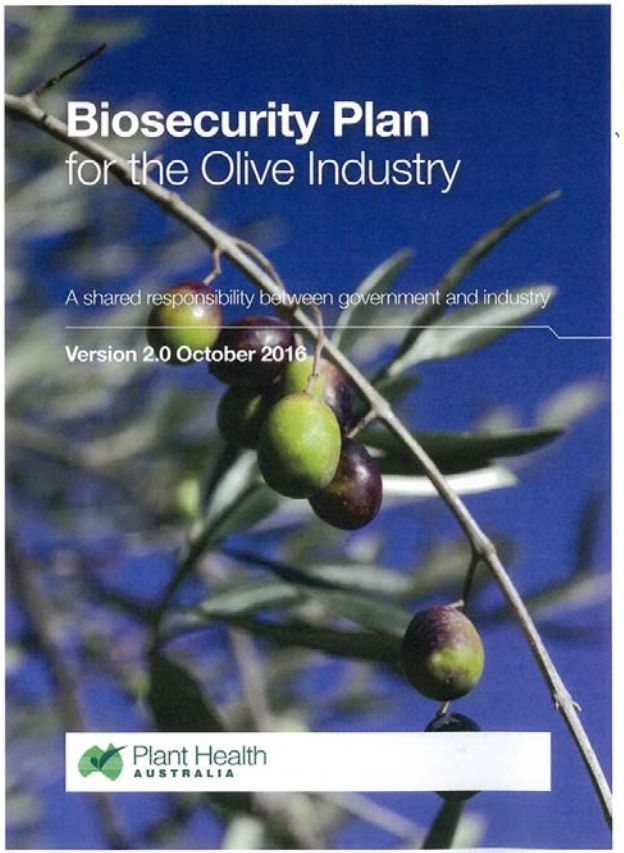
PLANT HEALTH AUSTRALIA (PHA)

- PHA is the national coordinator of the government-industry partnership for plant biosecurity.

- The Australian Olive Association is a member of PHA and signatory to the Emergency Plant Pest Response Deed.

- AOA represents the biosecurity interests olive producers and the industry.

- The Biosecurity Plan for the Olive Industry (2016) was developed by PHA in collaboration with government and industry expertise. It “outlines industry, risk mitigation identification and categorisation of pests and contingency plans”



For a copy, contact PHA on 02 6215 7700 or email admin@phau.com.au.

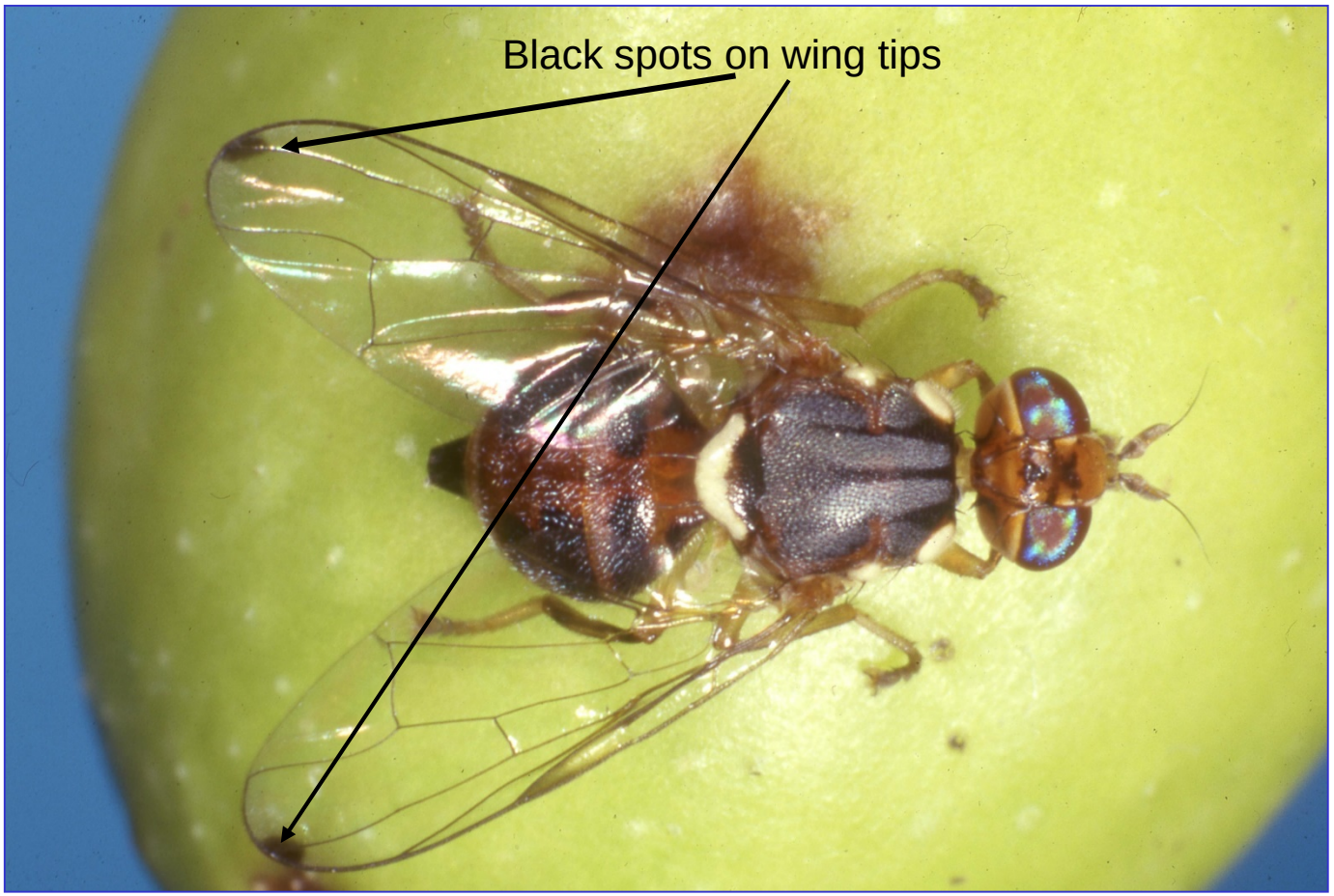
THE 5 HIGH PRIORITY PESTS IDENTIFIED IN THE 2016 BIOSECURITY PLAN

- **Olive fly (*Bactrocera oleae*)**
- **Olive moth (*Prays oleae*)**
- **Leaf scorch (*Xylella fastidiosa* subsp. *multiplex* (with vectors))**
- **Olive quick decline (*Xylella fastidiosa* subsp. *pauca* (with vectors))**
- **Verticillium wilt (defoliating strain) (*Verticillium dahliae*)**

Olive Fly *Bactrocera oleae*

- It is widely distributed in the Mediterranean basin, northern and southern Africa, Western Asia, India, Pakistan. Since the late 1990s, also present in California (arrived from Mexico).
- It is the most important and destructive pest of olives, and difficult to control
- It will attack green fruit (unlike Queensland fruit fly or Med fly). There are numerous generations (up to 3 or even more) are possible.
- Pupation normally occurs in the fruit (unlike Queensland Fruit fly or Med fly that always pupate in soil), only pupating in soil in the final generation when fruit are on the ground (for overwintering)

Images of olive fly gratefully received from Dr A Loni, University of Pisa



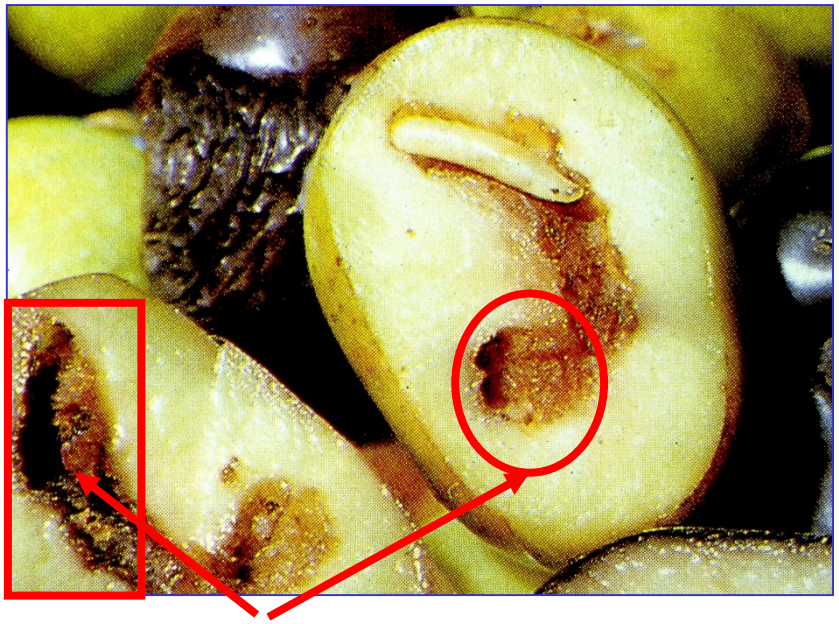
Adult female olive fly ovipositing on green olive
Note black spots on wing tips (distinguishes it from Queensland fruit fly)

Fruit showing oviposition marks

Images A. Loni
Uni Pisa

2nd instar larva (maggot) tunnelling into fruit

Larval tunnelling can be extensive



3rd instar larva with pupation chamber (marked)

Exit wounds when adult flies emerge

Yellow sticky traps, or food or sex-pheromone baited traps can also be used, mainly for monitoring or possibly for mass-trapping

Olive Moth, Olive kernel borer *Prays oleae*

- Caterpillars damage flowers, fruit and leaves
- It is present in the Mediterranean, Northern Africa, some other European countries but not central Asia or North or South America
- Its host range is relatively limited to olives and olive family relatives.
- Adult moth moths small (6 mm long, 13 mm wingspan), silvery grey, with long antennae. Larvae can grow to 8 mm with colour light brown to green. The pupa is protected by loose silk webbing.

Adult olive moth

The 1st of 3 generations of caterpillars feed on flowers. Frass (faecal pellets and webbing) may be present.

Caterpillars of the 2nd generation are the most harmful, burrowing into fruit and feeding near the kernel, causing severe fruit damage and fruit drop.

Caterpillars of the third generation feed on leaves, including causing leaf mining and shoot bud damage.

Xylella fastidiosa

- *Xylella fastidiosa* is a bacterial pathogen that infects over 360 different plant species - including olives.
- There are several strains (subspecies) of this bacterium; some are limited to certain plant hosts
- At least two strains affect olives and are considered a biosecurity risk as they have not been detected in Australia
- They are: *X*. *fastidiosa* subsp. *pauca* and *X. fastidiosa* subsp. *multiplex*
- As their name suggests – they are fastidious bacteria – referring to the difficultly in culturing them in a laboratory
- They only live in the plant xylem (water-conducting) vessels inhibiting the uptake of water and nutrients which leads to disease symptoms that look like water stress – called ***leaf scorch***
- A particular strain of *X*. *fastidiosa* subsp. *pauca* causes trees to dieback - killing them – called ***Olive Quick Decline Syndrome***

Two diseases caused by Xylella fastidiosa subspecies

Leaf scorch

OQDS in Italy

Photo: David Monteleone, NY Times

Olive Quick Decline Syndrome (OQDS)

- OQDS is caused by a strain of *X*. *fastidiosa* subsp. *pauca* – called the CoDiRO strain – this subspecies *pauca* was previously known from South America on citrus (causing *variegated chlorosis* disease) and on coffee (causing leaf scorch)
- OQDS was first reported in the Apulia region in southern Italy in 2013, but the causal bacterium may have been first introduced around 2008 and growers report symptoms starting to appear between 2008 and 2010.
- It is genetical similar to a strain previously recorded in Costa Rica and thought to have arrived in Italy on an ornamental plant
- As of 2018, 25 alternative hosts had been identified for the CoDiRO strain
- The CoDiRO strain does not infect grapes or citrus
- The CoDiRO strain causes leaf scorch on oleander, cherry & almonds, and infects the weed *Polygona myrtifolia* (myrtle leaf milkwort)
- The olive varieties *Leccino* and *Favolosa FS-17* are more tolerant while *Kalamata*, *Coratina* and *Cellina* are the worst affected
- More recently, other *Xylella* subspecies have been detected in France (mainland and Corsica), Spain, Portugal, Israel and Iran. Infected plants have been intercepted repeatedly at the border of a number of European countries.
- Further strains of *X*. *fastidiosa* subsp. *pauca* were reported causing OQDS in SE Brazil in 2019 – also suggests bacteria moved in from nearby native vegetation

Xylella fastidiosa in olive xylem

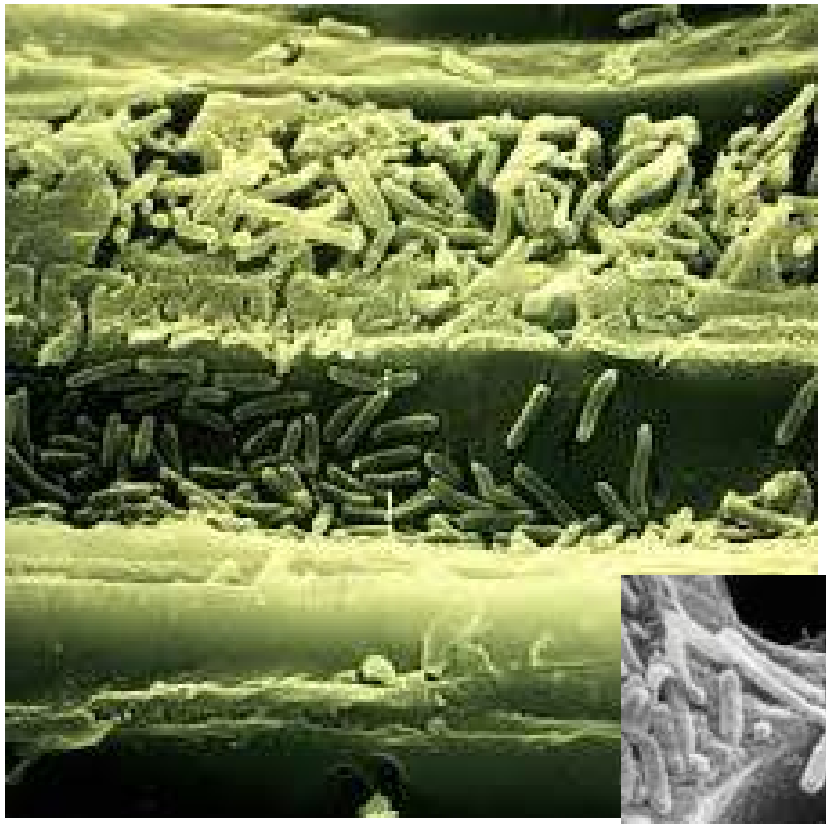


Photo: University of Georgia

Photos: www.olivetimes.com

How is *X. fastidiosa* spread?

- Nearly all introductions of *X. fastidiosa* occur with the movement of infected plant material. Once present, xylem-feeding insect vectors are the primary pathway which spread it through a country or region. Insects acquire the bacteria when feeding on infected plants and, carrying it in their foregut and infect new plants as they continue to feed.
- Insects of the Cicadellidae (sharpshooters and leafhoppers) and Cercopoidea (spittlebugs) families are the primary vectors overseas.
- Neither the meadow spittlebug (the primary vector for OQDS in Italy) nor the glassy winged sharpshooter (the primary vector of Pierce's disease of grapes and leaf scorch of several hosts in North America) are present in Australia. Meadow spittlebugs are present in NZ.
- It is currently unknown if any of Australia's xylem feeding insects can acquire and transmit Xylella – current research (2020) may resolve this

Glassy sharpshooter, *Homalodisca vitripennis,* known to transmit *Xylella* in USA. A high quarantine risk pest for Australia (for many crops).

What does the future look like?

- There is no known cure or treatment for *X. fastidiosa* infections
- Current research (2020) is exploring ways to reduce the biofilm created in xylem tissue. If successful, this could reduce or even eliminate the effects of infection.
- Research into potential biocontrols of exotic insect vectors is also occurring to identify control options if they enter Australia.

What you can do to protect against Xylella

- Only source from suppliers (including nurseries) who can prove that their plant products are ‘high health’
- Follow all biosecurity and quarantine laws to ensure you don’t introduce infected plants into Australia
- Quarantine all incoming plants and organic material away from your production areas where you can monitor for any unusual disease symptoms or insects.
- Ensure you and any staff know what Xylella symptoms and its insect vectors look like and follow the ‘see it, secure it, report it’ approach
- Report any unusual symptoms or insects immediately to your local biosecurity or agriculture department or to 1800 084 881
- Monitor the research on genetically tolerant olive cultivars and consider your selection of new plantings

Verticillium dahliae (defoliating strain)

- *Verticillium dahliae* is soil-borne fungal pathogen that infects roots and travels up the xylem into the trunk and lower branches causing them to wilt
- It is widespread around the world and has a wide host range affecting crops such as cotton, potatoes, eggplants and various stonefruit trees – as well as olives in Australia
- One strain of this fungus has been distinguished as the ‘defoliating strain’ (DS) on cotton in the USA. It causes wilt and death of olive trees in California and parts of Europe.
- DS has not been recorded in Australia and is therefore a biosecurity threat.

Verticillium wilt of olives

Defoliating strain of *V. dahlia* causing olive tree wilt in California
Photos: L Burgess

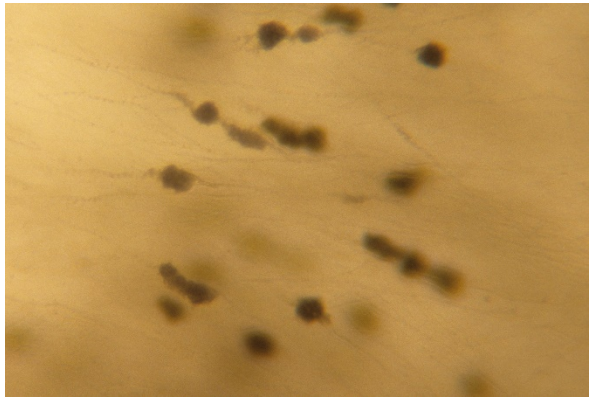
Symptoms of Verticillium wilt (DS)

- Leaves drop when green or turn brown - often with a downward rolling along leaf margins – symptoms appear from autumn to late spring
- Only some limbs or branches of a tree may be affected giving the tree a patchy or one-sided appearance (called *flagging*)
- The surface of affected branches may have dark markings or be symptomless
- When an affected branch is cut longitudinally - brown streaks can be seen in the vascular tissue
- Trees (particularly younger ones) often die or linger with reduced vigour

Verticillium wilt (DS) infection

- *V. dahliae* survives as microsclerotia in the soil - they are released from decaying infected plant tissue – microsclerotia can survive for many years in soil
- Roots are infected and the fungus moves into xylem vessels where it produces small spores (conidia) that move up the trunk and branches with xylem fluid.
- Microsclerotia have been found in infected flower inflorescences

Dark microsclerotia of *V. dahliae* are microscopic (<1/100th of a mm)



WHAT HAPPENS IN THE EVENT OF A BIOSECURITY PEST OR DISEASE OUTBREAK?

- The Emergency Plant Pest Response Deed (EPPRD) will be activated by the Federal and State governments and affected industries.
- For Xylella, this could potentially involve a broad cross-section of horticulture sectors including olive growers. The EPPRD, and the nationally agreed biosecurity emergency response plan (PLANTPLAN), will provide a decision-making and response framework to manage the outbreak.
- For olive fly, this would only involve the olive industry.

If you suspect a new pest, call the Exotic Plant Pest Hotline on 1800 084 881

REVIEW QUESTIONS

- Q1: How can you identify whether damage is caused by Queensland fruit fly or olive fly?

- Q2: How does Xylella normally get introduced into a new region? How does it spread after it is introduced?

ANSWERS

- Q1: Unlike Queensland fruit fly, olive fly frequently attacks green olives. Larvae tunnel through fruit and normally pupate in fruit. Adult olive fly has distinct black markings on their wing tips.

- Q2: Most Xylella introductions have occurred with the movement of infected plant material. It is then spread by xylem-feeding insects such as leaf hoppers or spittle bugs.

QUESTIONS TO CONSIDER AFTER READING THIS TUTORIAL

- Do you have a Farm Biosecurity Plan? When was it last revised?
- Do you have a copy of the most recent (2016) Biosecurity Plan?
- Are you and your staff familiar with the 5 identified Olive Industry Biosecurity threats, and their symptoms of damage?

FURTHER READING

AOA Farm Biosecurity Action for Olive Growers
https://australianolives.com.au/wp-content/uploads/2018/06/Biosecurity-Olive_Reduced-File.pdf

Plant Health Australia 2016. The Biosecurity Plan for the Olive Industry (v2.0)

Hort Innovation
Strategic levy investment

OLIVE FUND

This project has been funded by Hort Innovation using the olive research and development levy, co-investment from the Australian Olive Association and Western Sydney University and funds from the Australian Government.
For more information on the fund and strategic levy investment visit horticulture.com.au