



Pierce's Disease. Photo courtesy of Jack Kelly Clark, <http://calag.ucanr.edu/Archive/?article=ca.v068n01p20>



Glassy-winged sharpshooter adult. Photo courtesy of Johnny N. Dell, Bugwood.org.



Spotted-winged drosophila male. Photo courtesy of G. Arakelian - Center for Invasive Species Research, University of California.

# Know your pest: A guide to grapevine threats

AUSTRALIA'S GEOGRAPHICAL ISOLATION and commitment to biosecurity has protected our grape and wine industry from many of the devastating pests and diseases that affect viticulture throughout the world.

The climates of our grape producing regions are, however, conducive to the survival, spread and establishment of these pests and diseases, should they be introduced.

Consequences include threat to the livelihood of vineyard owners and the sustainability of wine regions and the entire industry.

"Keeping Australian vineyards free from phylloxera and other devastating pests and diseases has never been more challenging," said Inca Pearce, Vinehealth Australia CEO.

"We live in an age where interrelated biosecurity 'megatrends' are influencing risk and management, including the increased movement of people, goods and vessels around Australia and the world.

And, unfortunately, pests and diseases do not respect national and state borders. There is no room for complacency."

Australian grapegrowers annually battle endemic diseases such as powdery mildew, downy mildew, eutypa and botrytis.

But what are the major notifiable pest and disease threats not yet on our shores, as well as notifiable endemics, that all Australian vineyard owners should be aware of?

What signs should you be looking out for? And what should you do if you suspect a new pest?

## HIGH PRIORITY EXOTIC PEST AND DISEASE THREATS

### Pierce's disease (*Xylella fastidiosa*)

- Named Australia's number one unwanted plant pest in 2016;
- Caused by a bacterium that lives in the water conducting vessels (xylem) of grapevines;
- Grapevines show symptoms of water stress, such as leaf scorch and the plant progressively weakens and dies within a couple of years;
- Can be transmitted in infected propagation material and by leafhoppers such as the exotic Glassy-winged sharpshooter;
- The bacterium affects more than 350 commercial and ornamental plant species;
- Currently found in Europe, Asia, Middle East, North America, Central America and South America.

### Glassy-winged sharpshooter (*Homalodisca vitripennis*)

- A xylem-feeding leafhopper that causes direct damage to grapevines through its feeding activities, but feeding causes no visible signs of damage;
- Main vector of the exotic Pierce's disease (*Xylella fastidiosa*);
- Adults are 12-14 mm long with dark brown to black colouring and a lighter underside. The upper parts of the head and back are mottled with ivory or yellowish spots. Wings are partly transparent with reddish veins;
- Exudes copious amounts of watery excrement, often appearing as large

white spots on leaves, stems and grapes when dry;

- A strong flyer that can move rapidly between plants, as well as through plant and propagation material during their egg and nymph phases;
- Present throughout eastern and western America, Mexico, Tahiti, Hawaii and the Cook Islands.

### Spotted-winged drosophil (*Drosophila suzukii*)

- A temperate to subtropical species of vinegar fly native to Southeast Asia that attacks a range of soft-skinned fruit species;
- Adults are 2-3mm long with a wing span of around 6-8mm, golden brown with dark contiguous bands on the abdomen and prominent red eyes. Males have small dark spots on the wing tips, a feature not shared by the common vinegar fly;
- Larvae are cream or white and about 3mm long;
- Egg deposition and larval feeding can occur in maturing, firm fruit;
- Infested fruit shows small scars and indented soft spots on the surface, left by the 'stinging' (ovipositing) females. These scars also expose the fruit to secondary attack by pathogens and other insects, meaning detection of fruit rot might be the first warning sign of infection;
- Larval feeding results in the fruit collapsing around the feeding site;
- Spreads through crops by flight or longer distances with plant material;
- Present through North America, Asia and some parts of Europe.



Grape phylloxera adults, nymphs and eggs. Photo courtesy of Agriculture Victoria (Rutherglen).



Black rot necrotic lesions on a grapevine leaf. Photo courtesy of Matthew Zidek, Texas A&M Agrilife Extension Service, Bugwood.org.



Grapevine leaf rust. Photo courtesy of Yuan-Min Shen, Taichung District Agricultural Research and Extension Station, Bugwood.org.



Grapevine red blotch-associated virus. Photo courtesy of M. R. Sudarshana, USDA-ARS.



Angular leaf scorch. Photo courtesy of Rick Dunst, Double A Vineyards, US.



Bacterial blight on grapevine shoot. Photo courtesy of C.G. Panagopoulos, Agricultural University, Bugwood.org.

### Grape phylloxera

(*Daktulosphaira vitifoliae*)  
(exotic strains)

- Adult phylloxera are 1mm long and yellow in colour in summer, tending to brown in winter. They feed exclusively on leaves and/or grapevine roots causing death of the European grapevine, *Vitis vinifera*;
- Root feeding on *V. vinifera* results in distinctive hook-shaped galls (nodosities) on fleshy roots or tuberosities on older roots;
- The first signs of a phylloxera infestation include slow and stunted shoot growth and early yellowing of leaves as they lose function. Leaf yellowing will normally be seen in two to three neighbouring vines, usually, but not always within the same vine row;
- Symptoms may appear within three years, with vine death within 5-6 years depending on the phylloxera strain;
- Several hundred strains of the pest are documented worldwide;
- Exists throughout many of the world's viticultural regions.

### Black rot (*Guignardia bidwellii*)

- A fungus that affects all green tissues of the grapevine, including the fruit;
- Leaf infection is typified by minute, round, reddish-brown spots which grow to a maximum diameter of 3-7mm. As the spots enlarge, they develop black interveinal margins and

greyish-tan to reddish-brown centres that are most apparent on the upper leaf surface. Pycnidia (spore bearing structures) develop in the centre of these necrotic spots and appear as small, blackish pimples;

- On shoots, stalks and tendrils, lesions are purple to black, sunken, and typically oval or elongated. Pycnidia are commonly observed throughout these lesions with numerous cankers resulting in damage to shoot growing tips. As the canes grow, the bark tends to split along the length of the lesion;
- Infected fruit shows brown spots that have a dark ring with a sunken centre which expands to involve the entire fruit. Individual fruit then rots and eventually shrivels into a black, wrinkled mummy. These mummies are also covered with pycnidia;
- Can result in complete crop losses in warm and humid growing regions;
- Spread easily over long distances through water and wind-borne spores, as well as through propagation material and fruit;
- Present in North America, Asia, Africa, Europe and South America.

### Grapevine leaf rust

(*Phakopsora euvitis*)

- The only known rust on grapevines;
- A fungus that predominantly occurs in warm temperate and subtropical growing regions;
- Mainly affects leaves, but can also affect fruit, stems and bunch stalks;

- Causes small, dark, angular necrotic lesions on the upper surface of grapevine leaves. On the lower leaf surface, the lesions are covered by orange to yellow sporulating pustules;
- Infection causes weakening of the grapevine, resulting in early senescence and leaf drop, and a reduction in fruit quality and quantity;
- Can spread easily over long distances through wind-borne spores, as well as on clothing, equipment and through the movement of infested plant material – particularly grapevine leaves;
- Present throughout Asia, North America, Central and South America.

### Grapevine red blotch-associated virus (*Geminivirus*)

- A recently identified and described virus, first detected in California (USA) in 2008;
- Causes red blotch symptoms on leaves, as well as a significant reduction of up to 5° Brix (2.8 Baume) in grape sugar accumulation;
- Symptoms generally start appearing in autumn as irregular blotches on leaf blades and the basal portions of shoots. Primary and secondary veins on leaves turn red (unlike green veins of vines infected with Leafroll virus), and red blotches appear between the interveinal margins;
- Leaves do not roll in at the margins as for Leafroll virus;
- Spread through grafting and

- propagation material;
- Present in North America.

#### Angular leaf scorch and Rotbrenner (*Pseudopezicula spp.*)

- Both diseases are caused by two separate species of the fungus *Pseudopezicula* and have very similar symptoms; predominantly found on the leaves;
- Causes lesions on leaves which lead to premature senescence. Leaf lesions first appear as faint, yellowing spots (on white varieties) or bright red spots (on red varieties) which enlarge, changing to reddish-brown before the tissue eventually dies. The lesions are typically confined by the major veins and the edge of the leaf, and may be several centimetres wide;
- Can affect inflorescences at or pre-flowering, causing individual flowers to rot and then dry out, resulting in severe crop loss;
- Heavy rainfall and prolonged wetting periods favour pathogen spread and infection;
- Spread through water and air-borne spores and overwinters in dead leaves on the ground;
- Angular leaf scorch is present in North America. Rotbrenner is present in cool grape growing regions of Europe (particularly France and Germany).

#### Bacterial blight of grapevine (*Xylophilus ampelinus*)

- Caused by a bacterium that lives in the water conducting vessels (xylem) of grapevines;
- Can affect leaves, petioles, stems, roots, shoots or flowers. Symptoms include linear red-brown streaks that expand upwards on the shoot, darken, crack and develop into cankers. Cankers can also appear on the sides of petioles leading to one-sided (marginal) leaf necrosis and may also appear on bunch stalks. Shoots subsequently wilt, droop and dry up and young shoots may develop pale yellow-green spots on the lowest internodes. Necrotic leaf spots sometimes occur. Flowers which have not reached maturity turn black and die, roots may also be attacked resulting in retardation of shoot growth;

## TIPS FOR VINEYARD MONITORING

### Monitoring a vineyard for unusual symptoms can be done both passively and actively:

- Keep an eye out for pests and diseases when conducting any activities in your vineyard – being elevated in a tractor or harvester can give you the best view to spot anything unusual from a landscape perspective;
- Conduct active pest and disease monitoring on foot weekly through the growing season where possible. Zig-zag up and down between sets of vine rows spread across your block, importantly returning to known 'hotspot' areas in your vineyard for endemic pests and diseases. Set yourself a standard number of observations for a block or per hectare basis so you can monitor changes in levels of pests or diseases you find over time;
- Know what parts of the vine are likely to be impacted by the pest or disease you are monitoring for so you can target these;
- Know what times of the season you may see the different pests or disease so you can time your monitoring accordingly;
- Take images of what you are looking for with you into the field so you can quickly determine if you have found something new. Use your phone to capture pictures of what you see so you can show others and verify your findings;
- Record the date, row numbers and results of your inspections. Flag anything unusual so you can return to the same spot to monitor progression of the pest or disease, effectiveness of the control method and level of damage at which intervention is required.

- Infection results in a reduction of vine health and major crop loss in susceptible varieties;
- Associated with warm moist conditions, and spread is favoured by overhead sprinkler irrigation;
- Can be spread on pruning tools, propagation material and in wet and windy conditions. Local spread in vineyards tends to occur along the rows from the initial infection point. Natural dispersal is limited to the vineyard and the immediate surrounding area;
- Present in South Africa, Spain, Argentina, France, Greece, Crete, Italy, Sicily, Sardinia and Slovenia.

#### Vine mealybug (*Planococcus ficus*) and Grape mealybug (*Pseudococcus maritimus*)

- Both mealybug insects are about 3mm in length, soft bodied, covered in a white powdery wax and are slow moving;



Grape mealybug nymphs. Photo courtesy of United States National Collection of Scale Insects Photographs, USDA Agricultural Research Service, Bugwood.org.

- The vine mealybug is oblong in shape and has short filaments around the body, with no tail filament. The grape mealybug has long tail filaments;
- The mealybugs feed on sap from all parts of the grapevine, secreting honeydew. This clear, sugary excretion damages the fruit and foliage, resulting in unmarketable grapes, often due to secondary sooty mould infections;

### VITICULTURE

VOLUME 1 – RESOURCES  
2ND EDITION



## VITICULTURE VOLUME 1 – RESOURCES – 2ND EDITION

A comprehensive reference book on Australian viticulture devoted to matters that concern pre-planting decisions. Topics include grapegrowing regions of Australia, soils, climate, grapevine varieties, vineyard site selection and berry development and grape quality.

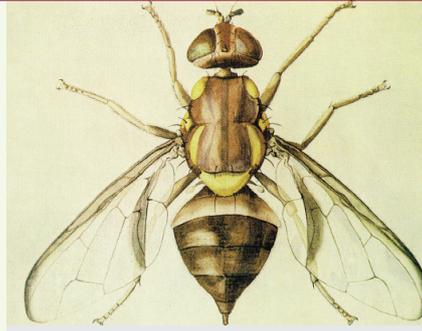
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European grapevine moth adult. Photo courtesy of Todd M. Gilligan and Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS ITP, Bugwood.org.



Queensland fruit fly (*Bactrocera tryoni*)

- Infestations can cause reduced vigour and yield and the transmission of viruses, and are typified by white waxy clusters of mealybugs in grapevine crevices, often associated with intense ant activity feeding;
- Spread mainly occurs through propagation material or via movement of fruit;
- Vine mealybug is present in Europe, Africa, the Middle East and parts of North and South America;
- Grape mealybug is present in Europe, Asia, New Zealand and North and South America.

#### Grape berry moths (*Lobesia botrana* and *Polychrosis viteana*)

- Grape berry moths feed on flowers and fruit and can cause significant yield losses;
- Both species cause nearly identical symptoms. However, it is the larvae, rather than the adults, that are responsible for the majority of the damage to grapevines;
- The European grapevine moth (*L. botrana*) adult is about 5mm long and has a light brown body, with grey to brown irregular patches on the wings. The American berry moth (*P. viteana*) is about 6mm long and has a brown body, with grey-purple bands across the wings and cream with brown spots near the wing tips;
- Larvae web together berries on a bunch, then tunnel and hollow berries out, leaving only the skin and seeds. Damage is compounded by secondary infection of rot pathogens, such as Grey mould (*Botrytis cinerea*);
- Adults can fly rapidly between host plants and larvae can spread through infested fruit and grapevine material;
- *P. viteana* is present throughout North America. *L. botrana* is present throughout Europe, North America, the Middle East and some parts of Asia, Africa and South America.

These key pest and diseases were identified through the development of the Viticulture Industry Biosecurity

Plan (IBP) where pest ratings considered the entry, establishment and spread probabilities for each pest in Australia, the likely impacts of the pest on cost of production, productivity, removal of quarantine barriers and market access, and how difficult the organism would be to control and/or eradicate.

For a complete list of exotic pest threats for the viticulture industry, refer to the Viticulture IBP (<http://www.wfa.org.au/assets/environment-biosecurity/Biosecurity-Plan.pdf>) or contact Vinehealth Australia on (08) 8273 0550 or [admin@vinehealth.com.au](mailto:admin@vinehealth.com.au).

#### HIGH PRIORITY NOTIFIABLE\* ENDEMIC PESTS

##### Grape phylloxera

- Grape phylloxera (*Daktulosphaira vitifoliae*) is one of the world's most damaging grapevine pests and is present in parts of Victoria and New South Wales (see Phylloxera Management Zones in Australia: <http://www.vinehealth.com.au/biosecurity-in-practice/maps/phylloxera-management-zones/>);
- Australia is known to currently have 83 endemic strains;
- Refer to symptoms under exotic Grape phylloxera;
- Spread is through the movement of vineyard machinery, equipment, vehicles, soil, footwear, clothing, grapes, grape products, and grapevine material.

##### Fruit flies

- The Queensland fruit fly (Qfly) (*Bactrocera tryoni*) and Mediterranean fruit fly (Medfly) (*Ceratitis capitata*) are significant threats to viticulture production and can make it more difficult to access vital export markets;
- Qfly adults are about 7mm long, reddish-brown in colour, with distinct yellow markings. Medfly adults are approximately 3-5mm long, with a light brown body and mottled wings;
- Qfly are most active from September through to May but can also be active

in warmer periods during the winter months. Medfly are most active from October through to May;

- Qfly is widespread throughout Queensland and has a limited distribution throughout south-eastern Australia. Medfly is restricted to parts of Western Australia;
- Further information can be found at [www.preventfruitfly.com.au](http://www.preventfruitfly.com.au) or <http://www.vinehealth.com.au/pests-and-diseases/fruit-fly/>

#### WHAT SHOULD YOU DO IF YOU SUSPECT YOU HAVE ONE OF THESE PESTS?

Any unusual plant pest should be reported immediately to the relevant state/territory agriculture agency through the national Exotic Plant Pest Hotline (1800 084 881).

Early reporting enhances the chance of effective containment and eradication. Your call will be forwarded to an experienced person who will ask questions about what you have seen and may arrange to collect a sample.

Every report will be taken seriously, verified and treated confidentially.

State and territory quarantine legislation specifies legal obligations for landowners and consultants to notify relevant state government departments within a defined timeframe, of particular viticulture pests.

For example, grape phylloxera is a notifiable pest in every state and territory. Suspect material should generally not be moved or collected without seeking advice from the relevant state/territory department, as incorrect handling of samples could spread the pest or render the samples unsuitable for diagnostic purposes.

State/territory agriculture department officers will usually be responsible for sampling and identification of pests.

Source: The material contained in this article has been reproduced with permission from Plant Health Australia from the Biosecurity Manual for the Viticulture Industry Version 1.0 (<http://www.farmbiosecurity.com.au/wp-content/uploads/2014/07/Biosecurity-Manual-for-Viticulture-Industry.pdf>). This manual was produced by Plant Health Australia with support from Wine Australia, Australian Vignerons, Australian Table Grape Association and Dried Fruits Australia.

\* Queensland fruit fly and Mediterranean fruit fly are not both notifiable in each state, depending on state freedom status.

Vinehealth Australia is a statutory authority operating under the *Phylloxera and Grape Industry Act (1995)* with legislative powers in South Australia. As part of its role, Vinehealth works to increase the wine industry's knowledge of biosecurity threats and their management.