

ABOUT GRAPE PHYLLOXERA

Of the pests and diseases endemic to Australia, our greatest biosecurity threat is grape phylloxera. This tiny insect pest destroys vines by feeding on their roots.

Grape phylloxera (*Daktulosphaira vitifoliae*) is a devastating soft bodied insect pest of grapevines worldwide, affecting *Vitis* species (commercial grapevines and ornamental vines). Phylloxera is native to eastern North America, first affecting native European *Vitis vinifera* in the late 19th century.

There have been several hundred genetic strains of phylloxera documented worldwide, with Australia identifying 115 endemic strains.

At present, these endemic strains are confined to a number of geographic indications (GI) regions in parts of Victoria and New South Wales (<https://vinehealth.com.au/pests/pests-and-diseases/phylloxera/phylloxera-strains/>). In some regions only a single strain has been detected, but in others, multiple phylloxera strains have been found.

Until now, phylloxera in Australia have been considered as genetically identical to their parents, reproducing asexually. This suggests the historical introduction of these separate strains of phylloxera and has important implications for management of this pest. Recent surveys in the King Valley, Victoria have identified the presence of closely related phylloxera strains, indicating that some sexual reproduction may have occurred.

The grapegrowing states of South Australia, Western Australia and Tasmania are recognised as phylloxera free.



In Australia, grape phylloxera is currently confined to parts of Victoria and New South Wales. Commercial vine plantings in Australia are predominantly own-rooted *Vitis vinifera*, highly susceptible to phylloxera. Preventing its movement to currently uninfested areas is therefore of utmost importance.

A LACK OF AVAILABLE CHEMICAL OR BIOLOGICAL CONTROLS FOR PHYLLOXERA MEANS PULLING OUT INFESTED BLOCKS AND REPLANTING WITH NEW VINES THAT HAVE BEEN GRAFTED ONTO PHYLLOXERA-RESISTANT ROOTSTOCK IS THE ONLY CONTROL OPTION. THE COST OF GRAFTED VINE MATERIAL ALONE IS 3 - 5 TIMES THAT OF OWN ROOTED VINE MATERIAL.

LIFECYCLE

The phylloxera lifecycle involves egg, nymph and adult stages. Adult phylloxera are 1mm long, yellow to brown in colour and predominantly reproduce asexually in Australia. Phylloxera feed on leaves and/or grapevine roots causing death of the European grapevine, *Vitis vinifera*, within 5-6 years on average,

dependent on which endemic strain is present. Phylloxera have been found to survive for up to 29 days without food. Adults can lay around 200 eggs per cycle and are capable of several breeding cycles per season, depending on the virulence of the phylloxera strain, nutrition and environmental conditions. Populations peak between November and March.



Phylloxera adults, nymphs and eggs. Photo courtesy Agriculture Victoria (Rutherglen).

FEEDING

The roots of *V. vinifera* are extremely susceptible to attack by phylloxera strains present in Australia. Phylloxera feed by puncturing the root surface, causing the vine to form galls or nodosities on root hairs and swellings (tuberosities) on older roots. On the root hairs, these galls have a characteristic hook-shaped form and this damage stops the growth of the feeder roots, ultimately killing the vine. In addition, feeding wounds on

the roots leave them prone to developing root rot. Depending on the phylloxera strain, leaf galls may occur on the leaves of suckers of American *Vitis* rootstocks. Grapevines grafted to phylloxera tolerant rootstocks or nursery plantings may show signs of phylloxera insects on the roots and damage in the form of nodosities, however visual symptoms in the canopy do not occur, which makes detection difficult. Grafted vines can sustain populations of phylloxera, which can spread to ungrafted vines.



Galls on grapevine roots. Photo courtesy Agriculture Victoria (Rutherglen).

KNOW YOUR STRAIN

It's important to know which phylloxera strain has been found on your property, in your region or in a region close to you. This enables an appropriate rootstock selection to be undertaken when planting, based on knowledge of phylloxera strain-rootstock interactions. Identifying phylloxera down to the strain level can also help link new infestations to their source. Endemic phylloxera strains are of different virulence, likely suited to slightly different environmental conditions, and until recently, were identified as genetically different. Current rootstock testing uses up to seven of our various endemic

strains including G1, G4, G7, G19, G20, G30, G38. Phylloxera strain-rootstock interaction research has shown that other than own rooted *Vitis vinifera* which is susceptible to all endemic phylloxera strains, many rootstocks are tolerant to phylloxera where the phylloxera can still feed and reproduce on the roots but in lower numbers than on own roots and therefore the vine is not debilitated. Very few rootstocks convey true resistance where the phylloxera cannot develop beyond the first instar to the adult and cannot therefore lay eggs. The level of the resistance conferred by a particular rootstock is dependent on the strain(s) of phylloxera feeding on the roots.



SIGNS OF INFESTATION

Early signs of a phylloxera infestation include slow and stunted shoot growth and early yellowing of leaves as they lose function. Excessive weed growth undervine is common. Leaf yellowing will normally be seen in two to three neighbouring vines – usually, but not always, within the same row. In the mid stages of infestation, an infested vineyard area looks like an ‘oil spot’ in its

spreading pattern as the phylloxera move from vine to adjacent vine and from row to row, spreading out from the roots of the vine where it was first introduced. Smaller satellite spots also occur when phylloxera has been accidentally moved on clothing, footwear or vineyard machinery. Phylloxera causes considerable losses in both quality and yield, the magnitude of which is related to vine variety, phylloxera strain, soil moisture and seasonal temperatures.



HOW DOES PHYLLOXERA SPREAD

Movement of phylloxera in Australia is most often attributed to crawlers. These are easily picked up by clothing, footwear, equipment and vehicles (including harvesters), or in soil and vine material (leaves and shoots), and spread to other vineyards and regions causing widespread damage. Crawlers can naturally spread from vine to vine by crawling along the soil surface, in the canopy, or crawling below

ground from root to root. They may also be carried by wind with an estimated spread of 25 metres. Natural spread within a vineyard has been estimated at between 100-200 metres a year. Eggs and wingless adults can also be spread in soil, in leaves with leaf galls and on planting material (cuttings, rootlings, potted vines). Other movement vectors include grapes and grape products (unfiltered juice, grape marc).



WHERE IS PHYLLOXERA IN AUSTRALIA

Grapegrowing regions are delineated by phylloxera status. Phylloxera Exclusion Zones have been surveyed and found free or are declared free historically. Phylloxera Risk Zones are of unknown status. Phylloxera Infested Zones contain vineyards known to be infested, currently confined to areas in Victoria (North East, Maroondah, Nagambie, Mooroopna, Upton and Whitebridge) and New South Wales (Sydney region and Albury/Corowa). The major

grapegrowing states of SA, WA and TAS have not become infested with phylloxera. QLD is also thought to be free of phylloxera. To prevent the spread of phylloxera from infested areas, each state has a series of regulated movement requirements documented in their Plant Quarantine Standard or equivalent. Many of these are sanctioned based on a prescribed disinfestation treatment involving for example, dry heat, hot water, filtration or chemical application.



For further information, refer to Vinehealth Australia's website www.vinehealth.com.au or phone (08) 8273 0550.