

Grape phylloxera: the world's worst grapevine pest

Dr Andrew Loch

Entomologist, Viticulture, Production Research,
Wagga Wagga

John Slack

Policy Officer Plant Biosecurity,
Orange

Introduction

Grape phylloxera, *Daktulosphaira vitifoliae*, is a small (up to 1mm long) aphid-like insect that lives and feeds exclusively on the roots of grapevines and occasionally in distinctive galls on grapevine leaves.

Phylloxera originates from eastern North America, where it lives on native grapevines. However, the insect is now present in most of the world's viticultural regions as a result of the movement of phylloxera infested grapevines especially in the late 1800s. European vines (*Vitis vinifera*) have little or no tolerance to phylloxera feeding and almost always die.

The species is thus regarded as the world's worst grapevine pest.

Lifecycle

Phylloxera undergoes several generations throughout the growing season. Eggs are laid by adults between spring and summer, which hatch into mobile first instar nymphs or crawlers. Nymphs feed on roots, grow in size, and moult four times before becoming adults. Phylloxera insects live predominantly on the surface of root galls, but occasionally crawlers move to the soil surface or canopy, from where they can disperse to new roots and vines. Winged adults, which are the forerunners of the leaf-galling cycle on American vines, sometimes develop later in the season during March and April in Australia. Recent research has shown that the species almost certainly reproduces exclusively by clonal or

asexual reproduction in Australia, and thus offspring are genetically identical to their parent. Between autumn and winter, phylloxera hibernates as first instar nymphs, sheltering under bark on roots.



Phylloxera crawlers feeding on grapevine root



Phylloxera damage (nodosities) on young fibrous roots

Feeding damage

Phylloxera sucks sap from soft vine root tissue, which leads to development of yellow, fleshy galls (nodosities) on young fibrous feeder roots, and brown, warty galls (tuberosities) on storage roots. Feeding by phylloxera over several years leads to death of fibrous feeder roots and cracking of older storage roots.

Leaf galls of phylloxera rarely occur in Australia, and tend to occur mainly in humid conditions during



late summer and only on the leaves of American *Vitis* species or hybrids.

Symptoms

Feeding by phylloxera causes an overall decline in vigour, especially the stunting of, and failed emergence of shoots. Premature yellowing of vines in March tends to occur about 1–3 years after initial infestation.

Expression of symptoms tends to be accelerated for stressed vines. Patches of vines become progressively weaker, and the area affected increases as the phylloxera population increases and spreads. Good growing conditions reduce the effects of phylloxera, especially in sandy soils. New infestation spots in the vineyard develop after 2–3 years of infestation. These spots appear to occur randomly throughout the infested vineyard, and are most likely the result of wind dispersed crawlers.

Detection

Ground surveys for phylloxera are best conducted in vineyards between December and April when phylloxera is most active. Fibrous roots near the base of vines need to be closely inspected for presence of insects and damage. Infested vines will have fleshy yellow galls on fibrous roots, with pinhead-sized yellow insects living on the surface

of the galls. Most insects are found on vines at the margins of areas of weak vines. Vines in the centre of weak patches have badly damaged root systems: fibrous roots are absent, and the older roots have cracks and warty bumps.

Aerial surveys using near-infrared photography can be employed to identify vines with symptoms of phylloxera and other pest, disease and nutrition problems.

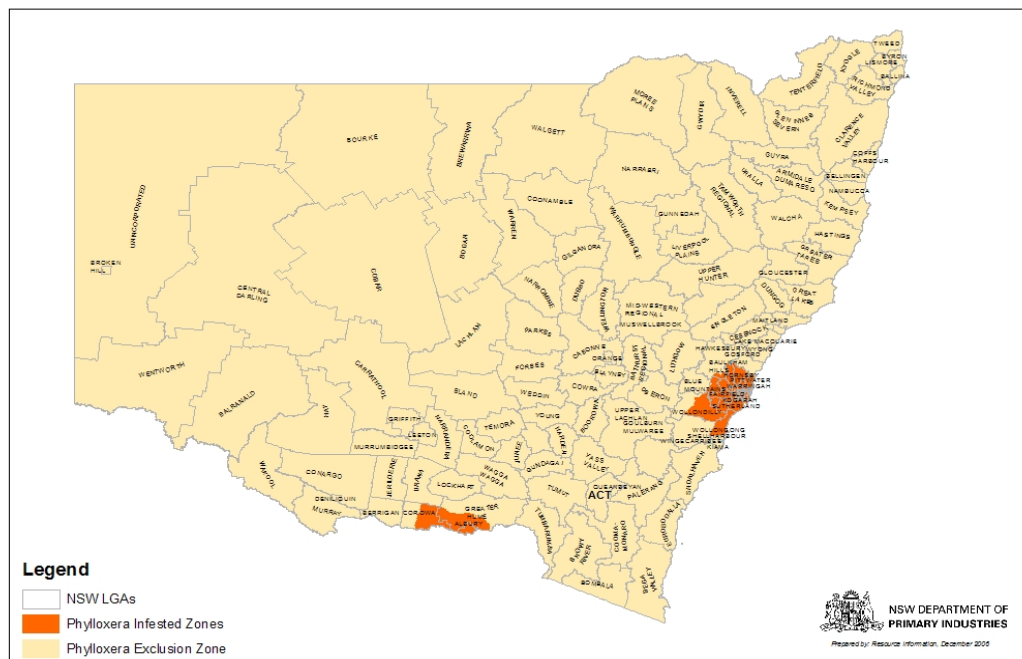
Prevention and control

At present there is no effective and economic long-term way of managing phylloxera on ungrafted vines of *V. vinifera*. The use of tolerant rootstocks is the only established, proven way of managing phylloxera.

Rootstocks can also be used to manage nematodes, and different rootstocks are available to suit local conditions. All vineyards in actual or potential danger from phylloxera should be planted with vines grafted onto tolerant rootstocks.

No insecticides are known to provide effective control of phylloxera nor are there any chemicals registered for controlling phylloxera in Australia. New infestations of phylloxera are generally a result of unintentional spread by people. Phylloxera can be transferred on grape and grapevine material, through equipment that has been used in

New South Wales Phylloxera Management Zones



Phylloxera infested zones and exclusion zones in New South Wales as at December 2006.

infested vineyards, and by people moving from infested vineyards. Signs discouraging entry into phylloxera-free vineyards should be observed at all times. Planting material should always be purchased from certified nurseries in phylloxera-free areas, and should be hot-water treated.

The most important dispersal stages of phylloxera in Australia are crawlers, and to a lesser extent winged adults. Phylloxera crawlers can be present on leaves and fruit of infested grapevines, especially during summer and autumn. Any grapes, must, harvesting machines, picking buckets, grape bins or other equipment in contact with fruit or foliage may be contaminated with phylloxera crawlers. For vineyards in phylloxera infested zones it is illegal to remove vineyard soil, vine cuttings, rootlings, potted vines, unprocessed wine grapes or non-packaged table grapes.

No viticultural equipment, including mechanical harvesters, can be removed from a phylloxera-infested zone without washing, steam cleaning or heat treatment, and inspection and certification from quarantine authorities.

Quarantine zones

Australia is one of the few countries to keep its main vineyard regions relatively free of phylloxera. Quarantine boundaries have been established in Australia to prevent movement of phylloxera from known infested areas into free or phylloxera exclusion zones. Areas of unknown status (Phylloxera Risk Zones) are also protected under legislation.

Three quarantine zones exist:

1. Phylloxera infested zones (PIZ) are zones that have vineyards infested with phylloxera. Included are the Nagambie, Mooroopna, Upton, NE Victoria (Rutherglen, King Valley, Milawa, Wangaratta and Bright) and MaroonDAH zones in Victoria, and the Albury/Corowa zone (Albury, part of the Corowa Shire within the County of Hume, and Greater Hume (excluding Culcairn and Holbrook), and the Sydney Zone (County of Cumberland and that part of the Shires of Wollondilly, Camden and Wollongong in the County of Camden);
2. Phylloxera risk zones (PRZ), which are zones that have no evidence of phylloxera infestation but could be a risk to free areas due to nil or inconclusive investigations. The whole of the State of Queensland and large areas of Victoria have PRZ status; and
3. Phylloxera exclusion zones (PEZ), which are the states of South Australia, Western Australia and Tasmania, Northern Territory, plus the majority of New South Wales (except those

declared as a PIZ above) and parts of Victoria (Sunraysia and Mid-Murray area, and Henty and West Wimmera area).

History and current status in New South Wales

Phylloxera was first discovered in New South Wales in 1884 at Camden, a small town near Sydney. After the initial discovery, further phylloxera infestations were found in several vineyards in the surrounding area, and in 1922 phylloxera leaf galls were found on a vine near Howlong.

Today, New South Wales has PIZs in Albury/Corowa and in the Greater Sydney Region. The rest of NSW is declared a PEZ, including many new and developing wine regions of the state. Rigorous phylloxera ground surveys of commercial vineyards and amenity grapevines were conducted throughout these new grape-growing areas by NSW Department of Primary Industries between 2002 and 2005. These surveys did not find phylloxera present and thus the status of these areas was upgraded from PRZ to PEZ in December 2006.

The law and phylloxera in New South Wales

Phylloxera is a notifiable pest under Proclamation P172 (Plant Diseases Act 1924) and requires the occupier of any land to notify a NSW DPI Regulatory Officer within 24 hours of first discovering or becoming ware of the pest.

Proclamation P176 (Plant Diseases Act) prohibits the introduction into NSW of soil, grapevines (including cuttings and rootlings), whole wine grapes, must, unfiltered juice and pre-fermentation marc from phylloxera-infested parts of Victoria and NSW. Permits are required for the movement of diagnostic samples, germplasm and used vineyard machinery or equipment from PIZs into NSW. A plant health certificate is required for the movement of filtered, clarified or cold settled juice, post-fermentation marc and composted garden organics into NSW from PIZs.

Vineyard soil is prohibited from entering NSW from both PRZs and PEZs, and potted vines are prohibited from entering NSW from PRZs. The movement of other grape and vine material, wine or associated machinery and equipment from interstate risk and exclusion zones is regulated by the issue of a permit or plant health certificate. Packaged table grapes are permitted into NSW from PRZs and PIZs if packed for sale as table grapes with sulphur pads, and free of soil and leaf material. Table grapes from PEZs are permitted into NSW if free from soil and leaf material.

Grapevines, vine material, wine grapes, juice, wine and vineyard machinery or equipment originating

from NSW PEZs are allowed to move freely throughout the NSW PEZ.

Growers and winemakers wishing to move any grapevine material or product, used vineyard machinery or related equipment from or to interstate must contact their nearest NSW DPI Regulatory Officer.

National phylloxera management protocols

The National Vine Health Steering Committee has developed national phylloxera management protocols, which describe recommended legislative procedures for movement of grape and vine material and associated machinery in Australia. It is available on the Internet at

<http://www.gwrdc.com.au/nvhscphylloxera.htm>

Plant Diseases Act subordinate legislation

Proclamations and Conditions of Movement relating to phylloxera are available on the Internet at

http://www.dpi.nsw.gov.au/aboutus/about/legislation/plant_diseases_legislation/proclamations

Further information on phylloxera quarantine

Plant Biosecurity & Risk Management Unit, NSW DPI, Locked Bag 21, Orange NSW 2800, Ph: (02) 6391 3412 Fax: (02) 6391 3206

Senior Inspector Regulatory, NSW DPI, PO Box 823, Murwillumbah NSW 2484, Ph: (02) 6672 2770, Fax: (02) 6672 3571

Senior Inspector Regulatory, NSW DPI, Locked Bag 4, Richmond NSW 2753, Ph: (02) 4588 2109, Fax: (02) 4588 2159

Senior Inspector Regulatory, NSW DPI, PO Box 389, Goulburn NSW 2580 Ph: (02) 4828 6642, Fax: (02) 4822 3261

Senior Inspector Regulatory, NSW DPI, Private Mail Bag, Yanco NSW 2703, Ph: (02) 6951 2639, Fax: (02) 6951 2602

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Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (January 2007). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

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