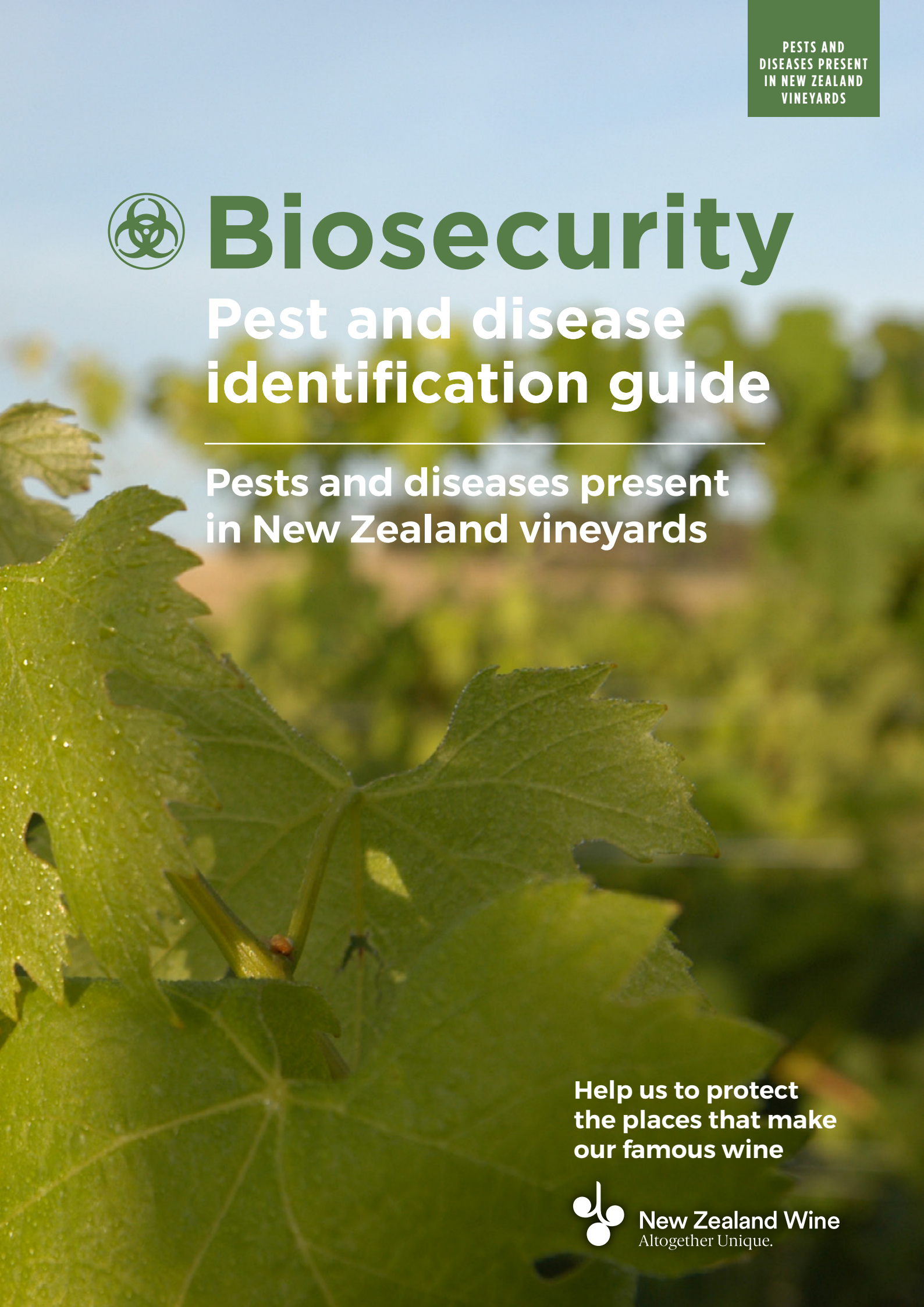
PESTS AND DISEASES PRESENT IN NEW ZEALAND VINEYARDS

Biosecurity

Pest and disease identification guide

Pests and diseases present in New Zealand vineyards



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Biosecurity

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Contents

YOUR FEEDBACK IS APPRECIATED: We want these resources to be useful for New Zealand Winegrowers members. If you have any feedback or suggested improvements, please contact the NZW biosecurity team on **biosecurity@nzwine.com**.

The pests and diseases identified in this part of the document are those identified in the New Zealand Winegrowers Spray Schedule. If you believe there should be additional pests and diseases added to this identification guide, please let us know. We will continue to review the content of the guide to provide the best information we can to members.

SEND US YOUR PHOTOS: We would be appreciative of photographs of any insects, pests and diseases that winegrowers are finding in New Zealand vineyards. You can send them to us at **biosecurity@nzwine.com**.

BACTERIA FUNGI INSECT PHYTOPLASMA WEED

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Grapevine leafroll-associated virus type 3 - GLRaV-3

Grapevine leafroll-associated virus type 3 is the most destructive virus in the leafroll group that can be spread rapidly through vineyards by insect vectors (especially mealybugs). The virus shortens the commercial lifespan of infected vines by causing a severe deterioration in fruit quality and vine performance, particularly in red wine grapes but also in many white varieties. Infected vines typically show red spots starting to form on leaf tissue in between veins in January and February, gradually increasing in size until they fill the inter-vein area. Leaf veins usually remain green or are the last part to turn red. Leaf edges may begin to roll backward.

Leaf symptom of red varieties

Leaf symptom of white varieties

NZW

Mealybug

Long-tailed mealybug
(Pseudococcus longispinus)

Main image: Alamy. Insert: Nicholas Martin, Plant and Food Research

Three mealybug species (longtailed, citrophilus and obscure) occur throughout most of New Zealand on a wide range of horticultural crops, weeds and garden plants. All three species can transmit grapevine leafroll-associated virus type3 (GLRaV-3), but only longtailed and citrophilus mealybugs are commonly found in vineyards. Mealybugs are coated in a powdery white wax and vary in size depending on life-stage. Juveniles and adults are easy to see with the naked eye, ranging from 2-5mm in length, while crawlers – the youngest life-stage – are less than half a millimetre and best observed through a hand lens. The adult male has legs and wings. It can walk and fly. Adult females and nymphs only have legs and cannot fly. Receptors in the male's antennae detect the airborne sex pheromone of a 'calling' female of the same species. The prominent waxy filaments from the posterior end are probably used when mating.

Citrophilus mealybug
(Pseudococcus calceolariae)

Main image: Q. Holdman, Wikimedia Commons. Insert: Robert Lamberts, The New Zealand Institute for Plant and Food Research

Obscure mealybug
(Pseudococcus viburni)

Alamy

Botrytis
(Botrytis cinerea)

Alamy

DarrenFahey courtesyNSW DPI

Botrytis 'bunch rot' is a common fungal disease of grapevine. White grapes infected with botrytis turn brown and black grapes become reddish. Under humid conditions, a brownish-grey mould appears on the surface of berries, or a mycelial mat develops under the berry skin. When squeezed lightly, the entire skin detaches from the berry ('slip skin'). Under dry conditions the mould may not appear. The berries then desiccate and form raisins.

Alamy

DarrenFahey courtesyNSW DPI

Powdery mildew
(Erysiphe necator)

Yuan-Min Shen, Taichung District Agricultural Research and Extension Station, Bugwood.org

Powdery mildew is a common fungal disease of grapevine. Buds infected from the previous season can develop into a flagshoot infection. These shoots have stunted zig-zag growth with distorted, upcurled leaves and are commonly seen when shoots are 2-20cm. Early symptoms on leaves are typically small (2-10mm) irregular yellow blotches on the upper surfaces and fine brown veins on the underside of leaves. These eventually produce greyish white 'dust' (spores) on both upper and lower sides of leaves as disease establishes. Infected berries will have a 'dusty' appearance early in the infection and a dark net-like pattern on the surface late in the infection.

Walt Mahaffee. Pacific Northwest Plant Disease Management Handbook

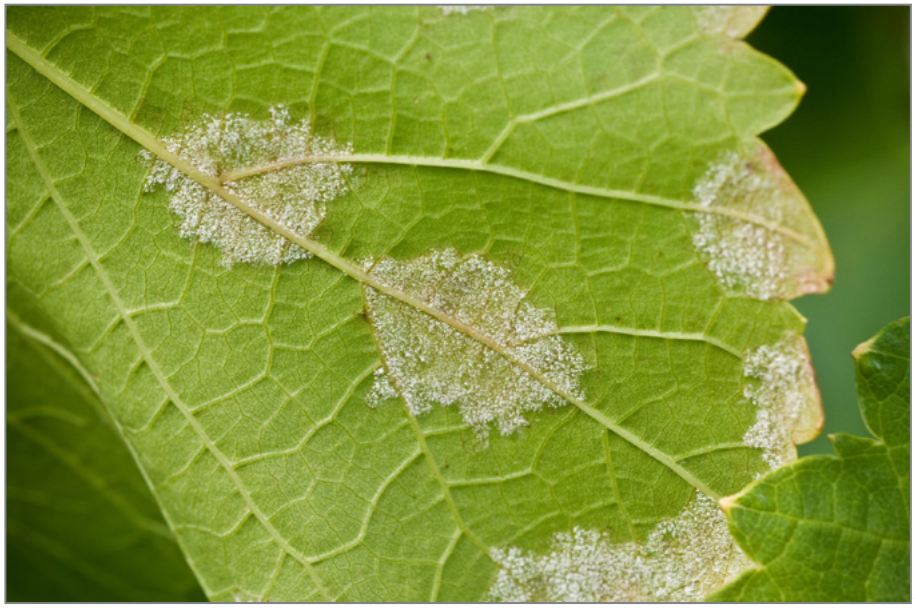
Yuan-Min Shen, Taichung District Agricultural Research and Extension Station, Bugwood.org

Julie Beale, University of Kentucky, Bugwood.org

Darren Fahey courtesy NSW DPI

Downy mildew
(Plasmopara viticola)

Alamy



Alamy

Downy mildew is caused by the oomycete *Plasmopara viticola*. Early in the infection cycle lesions can appear on any of the green parts of the vine, particularly leaves and young berries. When they first appear they look dark and shiny, like a bruise or 'oil spot', before becoming yellow and round. After damp nights, white sporulation becomes visible underneath the lesions. Young berries are very susceptible and will turn a grey colour if infected. As they mature, they become more resistant although they can still be infected via the pedicels. Infected berries do not soften and drop easily.

DarrenFahey courtesyNSW DPI

DarrenFahey courtesyNSW DPI

Black spot
(Elsinoe ampelina)

Ontario Ministry of Agriculture, Food and Rural Affairs

Plant and Pest Diagnostic Laboratory Purdue University

Ontario Ministry of Agriculture, Food and Rural Affairs

Ontario Ministry of Agriculture, Food and Rural Affairs

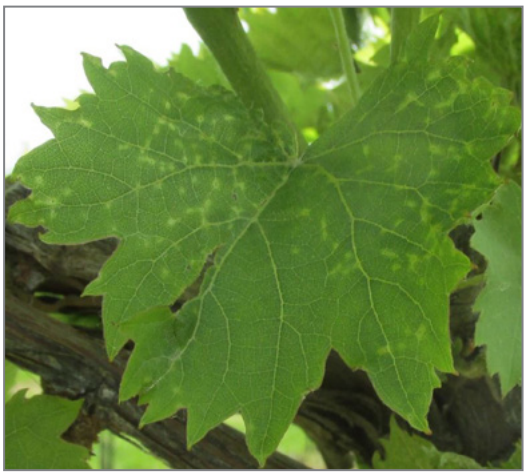
Black spot is a fungal pathogen causing small dark brown irregular lesions on the leaf. The centre initially cracks open and then drops out giving the leaf a shothole appearance. Often many lesions occur on a single leaf and these may roughly follow veins. Irregular brown or dark brown lesions develop on green parts of the shoot. They can be very deep with a slightly raised and somewhat darker edge. The fruit and rachis are also affected, developing lesions very similar to those on the shoot.

Phomopsis
(Phomopsis viticola)

Phomopsis is caused by a fungal pathogen. Small dark spots develop on leaves, often with a small yellow halo. When severe, these spots may come together to form one, and the entire leaf becomes malformed. Infected shoots develop distinctive necrosis mostly limited to the first three internodes. This necrosis is often associated with deep fissures in the young bark that run up and down the shoot, generally from 5-15mm long, surrounded by dark brown to black necrosis. Phomopsis has a life cycle of 21-30 days and spreads slowly within the vineyard, but if left unchecked it can be severely debilitating to individual vines.

D. S. Volenberg

Dean S. Volenberg University of Missouri Grape and Wine Institute



D. S. Volenberg

Dean S. Volenberg University of Missouri Grape and Wine Institute

Leafroller

The term 'leafroller' covers a group of moths including light brown apple moth from Australia and other native species. Only the larval stages are of economic importance, and larval feeding in early season rarely causes financial loss. Feeding damage within bunches close to harvest provides a site for botrytis infection in bad weather.

Leafrollers are small caterpillars up to 10mm long and are creamy or opaque. Characteristically they will drop to the ground or hang on a thread when disturbed. Adults first emerge in October and November, the second generation matures from January to February, and a third generation appears from March to April.

Wikimedia Commons

Scion

Greenheaded leafroller larva

Todd M. Gilligan & Marc E. Epstein, TortAI: Tortricids of Agricultural Importance, USDA APHIS PPQ, Bugwood.org

Greenheaded leafroller
(Planotortrix excessana)

INaturalist Steve Kerr

Plant and Food Research

Brownheaded leafroller larva

Plant Health and Environment Laboratory, Ministry for Primary Industries

Brownheaded leafroller
(Ctenopseustis obliquana)

Wikimedia Commons

Wikimedia Commons

Light brown apple moth larva

Plant Health and Environment Laboratory, Ministry for Primary Industries

Light brown apple moth
(Epiphyas postvittana)

Erineum mite
(Colomerus vitis)

Rolf Gebhardt, Wikimedia Commons

Wikimedia Commons, Author Rolf Gebhardt

The grape erinose or leaf blister mite is a tiny microscopic mite that overwinters under the dormant bud scales. It emerges in spring to feed on the undersides of the developing grape leaf. Their feeding leads to leaf blisters which are more prominent in Marlborough and to a lesser extent in Hawke's Bay. Overwintering mites will increase blind budding and high summer populations will reduce bud fruitfulness. Grape erineum mite damage appears on young leaves as dark green to pink-tinged swellings on upper areas. The underside of leaves has a concave appearance, littered with blister-like edemas covered with felted carpeting of dense, long leaf hairs.

Wikimedia Commons, Author Rolf Gebhardt

DarrenFahey courtesy NSW DPI

Lesley Ingram, Bugwood.org

Grass grub - Brown beetles
(Costelytra zealandica)

Brown beetle is the adult form of the New Zealand grass grub. Flights of grass grub generally occur in the evening at regular seasonal intervals. They can emerge from the soil at night in late October and early November. They have two flight phases, the first is a mating flight and occurs very soon after the beetles emerge from the soil, the second consists of feeding flights and may occur for 2-3 weeks. Brown beetles can cause extensive damage to grapevine foliage, especially around the edges of the vineyard.

Siobhan_Leachman, Wikimedia Commons

iNaturalistNZ, photo credit Alice Shanks

Adult brown beetle and brown beetle larva (grass grub)

Black beetle
(Heteronychus arator)

Black beetle is a pest in the northern North Island. Warm years favour black beetle populations. Adult beetles are a characteristic glossy black and about 15 mm long with females being larger than males. They undergo extensive dispersal flights in spring and autumn, but surface air temperatures must be above 17°C for flights to occur. The eggs, about 2 mm long and ovoid to spherical in shape, are laid singly in soil, close to the surface, in spring. Black beetles feed on the trunks of young vines at or just below ground level. With continued attack, they can ringbark the vine, causing wilting and collapse.

Hanna Royals, Screening Aids, USDA APHIS PPQ, Bugwood.org

Alamy

Adult black beetle and black beetle larva

Latania scale
(Hemiberlesia lataniae)

Lorraine Graney, Bartlett Tree Experts, Bugwood.org

Latania or palm scale is a species of armoured scale insect. Scale insects have a domed, waxy covering which protects the soft-bodied insect. The adult female Latania has no wings or legs and is somewhat variable in appearance depending on where it is living. If feeding on leaves, the scale cover is circular and convex, and its colour tends to be greyish-white. While on twigs, branches and fruits, the cover is usually brownish and only moderately convex. The exuviae are yellowish-brown and are a noticeable feature near the centre of the scale. Male scale covers are oval, and adult males are small insects with legs and a single pair of wings. Palm scale can be a significant pest to grapevines.

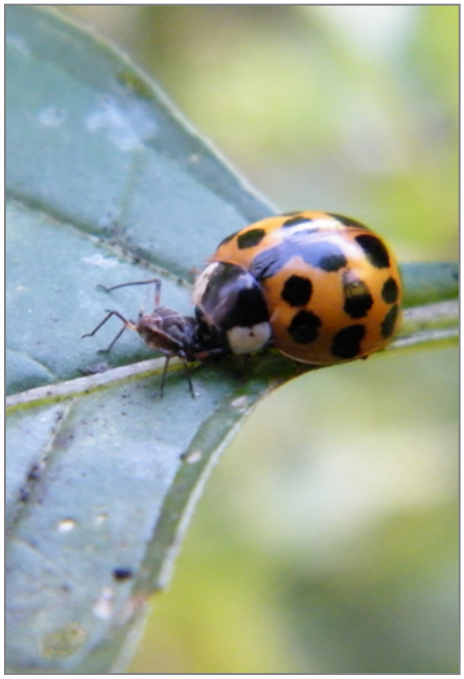
Two spotted spider mite
(Tetranychus urticae)

Alamy

Two spotted mite adults are usually less than 0.5 mm long with eight legs, and their spider-like appearance can only just be seen with the naked eye. Under a x10 hand lens, the active form appears translucent or sometimes greenish with two conspicuous black spots on the body. Damage symptoms in grapevines from two-spotted mite will include a yellow stippling across leaves. This pest is relatively rare in New Zealand vineyards but can be a problem in dry years.

Harlequin ladybird
(Harmonia axyridis)

The adult harlequin ladybird is 5-8mm long and 4-6mm wide and is well known for its very variable colouration and patterning. It can be distinguished from other ladybirds by M-shaped markings on the pronotum (the area between the head and abdomen), although this pattern is not present with darker specimens. Adults also have small bumps on the rear of the back and the larvae and pupae have a spiky skin. Harlequin ladybirds aggregate over winter in dark, concealed spaces including vineyard outbuildings. Please get in touch with New Zealand Winegrowers at biosecurity@nzwine.com if you are finding harlequin ladybirds in and around the vineyard.



Plant Health and Environment Laboratory, Ministry for Primary Industries

Alamy

Alamy

Harlequin ladybird eggs

Wikimedia Commons

Harlequin ladybird larva

Wikimedia Commons

Harlequin ladybird pupa

Grapevine trunk disease
Eutypa (Eutypa lata)

New Zealand Winegrowers

Eutypa lata is a fungal pathogen spread by airborne spores, which are released from infected dead wood during rainfall. Spores infect exposed pruning wounds, with vines being most susceptible to infection in the first two weeks after pruning. The fungus grows slowly, causing stunted shoots and progressively killing spurs, cordons and trunks and eventually the entire vine. Shoots appear stunted, and the leaves yellow, often becoming cupped and tattered around the edges. Bunches on infected shoots are small, ripen unevenly, and in severe cases wither and die. Cross-sections of cordons with stunted shoots reveal characteristic dark brown, wedge-shaped zones of deadwood which can be traced back to cankers on the outside of cordons and trunks.

Dion Mundy Plant and Food Research

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External canker on trunk evident by the flattened area where bark has fallen off

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Eline van Zijll de Jong

Grapevine trunk disease
Botryosphaeria


Botryosphaeria die back in green shoot due to trimming wound

New Zealand Winegrowers


Dead spurs along cordon that can be associated with Botryosphaeria and Eutypa

New Zealand Winegrowers

Botryosphaeria species are fungal pathogens that infect grapevines via airborne spores. Spores can enter via fresh cuts such as those made during pruning or trimming. Disease symptoms lead to a gradual decline in vigour and yield, with the most severe losses occurring in grapevines eight years and older. In cross-section, older vines will show wedge-shaped cankers in the trunk and cordons similar to those caused by Eutypa, however, central staining is only associated with Botryosphaeria. Young vines may show cankers, vascular discolouration, or dark streaking of the xylem. Bud mortality can also result from young shoots being infected. Infected spurs may not grow in the spring, or there may be growth followed by rapid wilt and collapse of the foliage. Some spurs may be dead, while others on the same cordon may produce healthy foliage.

New Zealand Winegrowers

Eline van Zijll de Jong

Bleached cane with black fruiting bodies of Botryosphaeria dieback pathogen

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Grapevine root disease
Blackfoot

Dion Mundy Plant and Food Research

Impacts of grapevine root disease resulting in patchy vineyard

Grapevine root disease is a lower trunk disease affecting young vines and is caused by Cylindrocarpon fungi. The pathogens affect the roots and then move into the trunk, which can rot quickly after infection. It may affect vines in patches within a vineyard. Affected vines often show reduced vigour, small trunks, shortened internodes, and chlorotic leaves (pale, yellow, or yellow-white). Budburst may be late and vines may die during the growing season when they fail to develop shoots. If an affected vine is dug up, roots may have dark brown soft areas or may have rotted away completely. Trunk bases below the bark have spreading regions of brown to black wood. A second crown of roots may have formed to compensate for decay in lower roots.

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Robert Lamberts Plant and Food Research

Phylloxera
(Daktulosphaira vitifoliae)

Phylloxera galls on Vitis

Wikimedia Commons; Author Beatriz Moisset

Phylloxera is a tiny aphid-like insect (up to 1 millimetre long) which feeds on grapevine root systems, affecting productivity.

Phylloxera found in New Zealand are wingless and are spread by human activity (such as the movement of machinery and implements between vineyards). While feeding on the vine, the phylloxera damages the vine root with its saliva, mimicking the plant's growth regulator. This causes one side of the root to grow faster than the other, resulting in a swollen hook-shaped root which provides an ideal protective environment for the phylloxera to multiply. Swelling eventually causes the vine to die as water and nutrients cannot be taken up from the soil. Most New Zealand vineyards are now planted with vines grafted onto phylloxera-resistant rootstocks, but leaf galling may be noticed on grafted vines if phylloxera is present.

Roots that have been damaged by phylloxera and nodes generated by phylloxera on roots of a vine

Wikimedia Commons; Author Joachim Schmid

Phylloxera nymphs feeding on the roots

Wikimedia Commons; Author Joachim Schmid

Phylloxera eggs inside a leaf gall

Wikimedia Commons; Author Joachim Schmid

Chilean needle grass
(Nassella neesiana)


CNG root system with its bulbous base

Annette Litherland Landcare Trust


Graeme Bourdôt, AgResearch


Mown vineyard with Chilean needle grass present

MDC


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Chilean needle grass (CNG) is an invasive weed present in Marlborough, Hawke's Bay and North Canterbury which aggressively outcompetes other pasture species. An erect, tufted perennial tussock that can grow up to 1m in height when left, it produces seeds from three points on the plant: the panicle seed, mid-stem seed at leaf joins, and the plant's base. CNG is easiest to identify from November to January when seedheads are a reddish-purple colour. The seedhead has a sharp tip with a barb, and the awn has a corkscrew appearance. CNG can look very similar to other pasture species, although it generally has a thinner, more pointy leaf, appears lime green in comparison to other grasses and yellows-off at the end of winter. The root system has a bulbous base. Seedheads fade to light brown later in the season, and the long, twisting awns intertwine and clump.


Ligule and hairs at leaf collar

MDC


MDC


MDC

Garden weevil
(Phlyctinus callosus)

Bugwood.org

New Zealand Winegrowers

Holly Johnson-Barrett

The garden weevil lays very small eggs in the soil during winter, which hatch within 10-14 days. Larvae live in the soil. Feeding can severely damage young vine roots and cause stunting and water stress. The larvae pupate for 3-4 weeks in the soil. Adults emerge during October and are most numerous in vineyards from November through to February. Many die off after this, although some will survive until after harvest. Adults climb into the vine canopy and feed at night on foliage, flowers, buds, and fruit, leaving round holes with scalloped edges in the leaves. They leave scars on the fruit and destroy bunches by ring-barking the stalk. Garden weevil can commonly be found sheltering under bark during the day, around posts or where canes are attached to wires and are more active at night.

Garden weevil larvae and pupae

Holly Johnson-Barrett

Department of Primary Industries and Regional Development, WA

Ripe rot

Ripe rot is frequently found in northern areas associated with vineyards that experience warm and wet conditions close to harvest. Spores are salmon pink on the fruit, often emerging around a depression or crater in the berry. This colouration can make ripe rot easy to identify. It also has a characteristic bad odour. Infection occurs early in the season, remains latent, and is then expressed with visible symptoms at grape maturity. Berries affected by ripe rot initially suffer from a loss of berry turgor, causing the berries to wilt, shrivel and drop. There are two species of the fungus responsible for ripe rot, *Colletotrichum acutatum* and *Colletotrichum gloeosporioides. Colletotrichum acutatum* is the predominant species found in vineyards.

Navideh Sadoughi

Purdue University

Sour rot

Sour rot is very distinctive, with the vinegar-like odour often noticeable from a distance. The most common starting point for infections is physical damage associated with birds or insects on ripe fruit. With the berries browning and becoming mushy in humid conditions, the fungi in the complex may be prone to visible sporulation. The best way to prevent this rot is to stop the ripe berries from becoming damaged. Cultural controls and other management that prevent botrytis bunch rot will also reduce the risk of sour rot. *Aspergillus, Penicillium* and *Rhizopus* are three groups of fungi often associated with sour rot.

Dion Mundy-Plant and Food Research