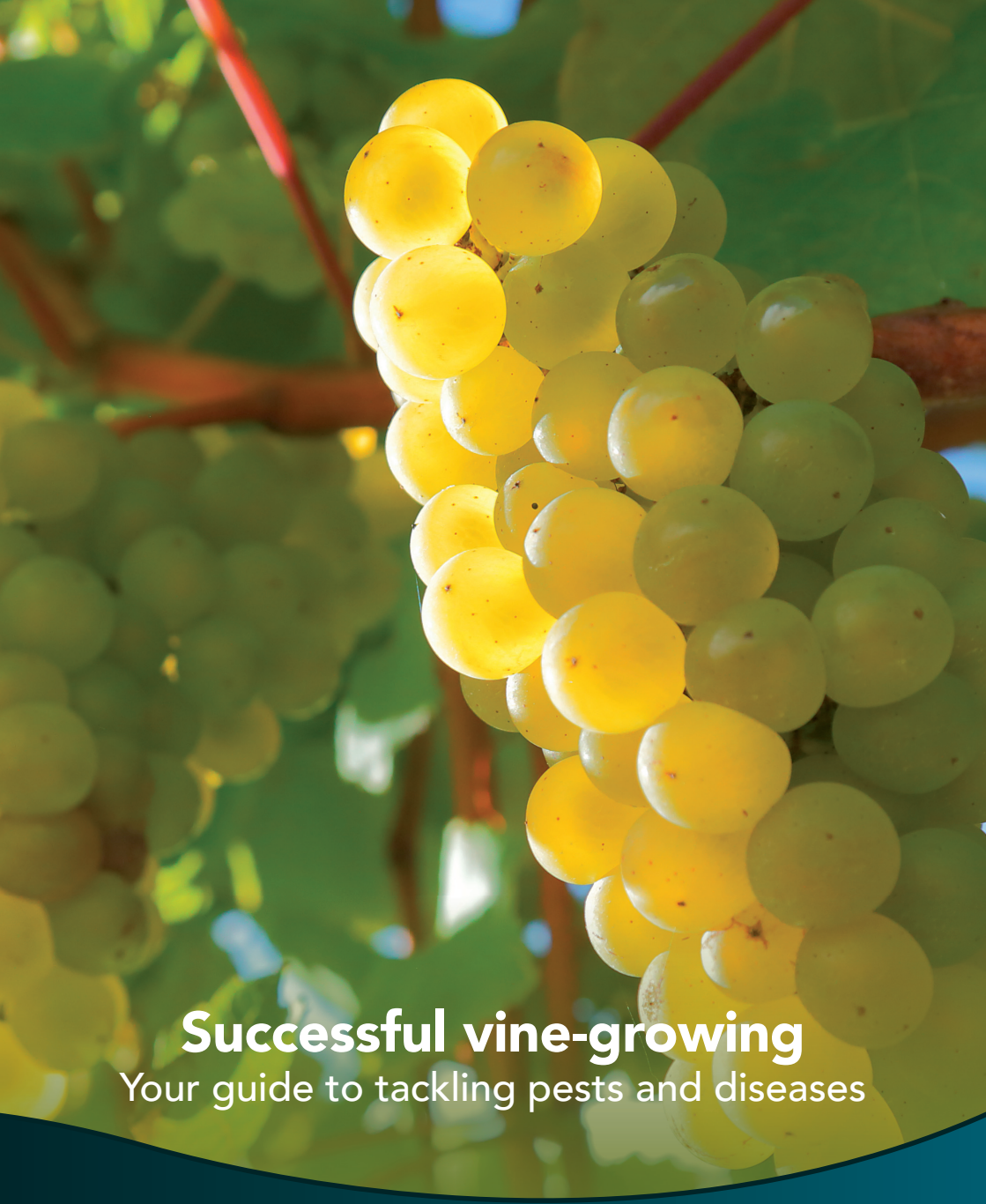


Successful vine-growing

Your guide to tackling pests and diseases

Certis Belchim
GROWING TOGETHER



Sandridge Barton Vineyard

Get closer to a great vintage.

Weather conditions, your winemaking skills and the ability to harness science & technology go towards producing a premium product.

It's just as important, though, to make the most of your vines and grapes *in the vineyard*.

You can't avoid pests and diseases, of course – all growers have them. Left unchecked, they can cause severe losses in the current crop and in following years.

But with Certis Belchim you can keep them under firm control.

As viticulture experts, we provide biorational and conventional solutions you need to secure and enhance your crop. And we've the expertise to help develop innovative IPM strategies.

Discover more in this guide to pests, diseases and other vital factors to consider in vine-growing.

And remember: do follow the recommendation of a BASIS-qualified advisor and ensure a suitably qualified person applies products using approved application machinery.

IN THIS GUIDE

	Pages
Key vine diseases & products	4-9
When to use Certis Belchim products	10-11
Further vine diseases	12-13
Key vine pests & products	14-15
Weeds and grapevine suckers	16-17
Hygiene and slugs	18
Nutrition	19
How we can help	19
Don't forget	20

KEY VINE DISEASES & PRODUCTS

Downy mildew *(Plasmopara viticola)*

Downy mildew can cause total crop loss following favourable disease conditions and spread if allowed to overwinter as tough oospores in leaf litter and soil.

The pathogen can attack and infect vines from mid-May to late autumn. It is an obligate parasite and so requires living tissue to survive. Wet weather and temperatures above 10°C in early spring cause germination of zoospores, the pathogen's mobile phase. This timing typically coincides with bud break on the vine. These zoospores use rain-splash to establish themselves in the canopy.

Symptoms include yellow patches or spots on the upper leaf surface, with white fungal growth on the underside of the leaf following long periods of mild and humid weather. Symptoms normally occur five to seven days after infection.

The disease can lead to premature defoliation and yield loss through reduced green leaf area. It can also spread to developing fruit, producing white furry mycelium, causing the berries to dry out.

Susceptible varieties

Chardonnay and Pinot Noir can be particularly prone to downy mildew.

Using cultural control

Carry out a bag test on suspected infected leaves. Remove them from the plant and place in a plastic bag somewhere warm and dark. The next day, check for white downy sporulation on the underside.

Consider the nutrient status of plants and the vineyard's general health. Reduce sources of inoculum, such as leaf wetness and litter left on the ground, by managing vineyard trellising and airflow.



Downy mildew infection on leaf

Protect against downy mildew with Cuprokylt

Protectant fungicide Cuprokylt controls downy mildew, anthracnose and bacterial diseases in table and wine grapes.

As a rule, make three applications during the growing season starting from BBCH15, 5th leaf unfolded to fruit ripening. Adapt applications to disease pressure evolution and always alternate with fungicides from other FRAC groups. Apply after harvest at BBCH91 or after wood maturity to help protect plants from pathogen infections following early frosts.

Cuprokylt formulation
50% w/w copper oxychloride.

Prevent with Frutogard

Frutogard prevents downy mildew in three complementary ways:

- Algae extract activates phytoalexins in the plant that have antimicrobial effects
- Potassium phosphonate has indirect and direct fully systemic effects
- Amino acids activate the plant's defence proteins with an anti-fungal effect

Together, these 'prime' the vine before fungal pathogen attacks, reducing the spread, growth and incidence of infection. The triple-action formula also provides diversity (FRAC P07 (U33)) for resistance management, making it valuable in IPM programmes.

Frutogard shows effects within three hours of application. It's active for up to ten days.

Apply up to six times a year from before to end of flowering.

Frutogard formulation
Suspension concentrate (SC) containing 342 g/l potassium phosphonate and 370 g/l algae extract *(Ascophyllum nodosum)*.



Downy mildew on bunches*



KEY VINE DISEASES & PRODUCTS

Powdery mildew *(Erysiphe necator syn. Uncinula necator)*

The ultimate effect of powdery mildew is that it can cause fruit to split, leading to secondary infection by *Botrytis cinerea* and development of microorganisms that reduce wine quality and yield.

Initial symptoms show as chlorotic spots on the upper surface of the leaf, eventually producing greyish-white fungal growth. Severe infection can lead to leaf distortion and gradual desiccation. Infection can also spread to developing fruit, which can split, shrivel or not ripen.

The fungus overwinters within infected buds, which germinate to form mildewed 'flag shoots' in spring, or as minute fruiting bodies (cleistothecia) that lodge in the bark on the vine. These then release spores (ascospores) to infect new foliage and young clusters. Uncontrolled infections may result in an avalanche effect the following year.

The subsequent spores (conidia) produced on infected tissues are identical to those on flag shoots; further spread throughout the season occurs regardless of the initial source of infection.

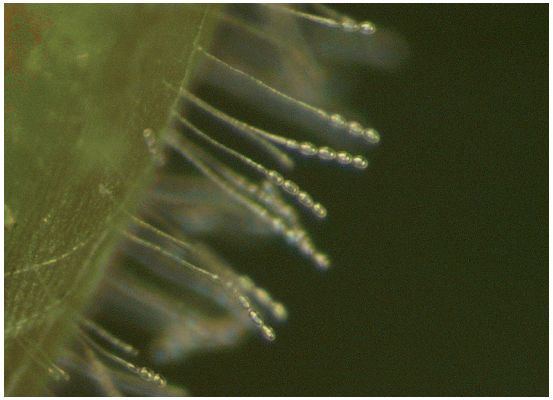
Susceptible varieties

Bacchus, Pinot Noir and Rondo are more prone to powdery mildew; Orion and Seyval Blanc are more tolerant.

Using cultural control

As with downy mildew, trellis management, planting direction and leaf defoliation or pruning are key to improve airflow and reduce humidity and temperature.

In addition, avoid drought stress to vines – this will make them less susceptible to disease.



Powdery mildew conidia*

Prevent with Amylo-X

Protectant bio-fungicide Amylo-X controls powdery mildew and other fungal plant diseases and is effective against a range of plant pathogens on foliage and other plant parts.

Amylo-X works by producing antibiotic compounds that disrupt cell-wall production of the target. The active colonises the plant parts to which it is applied, preventing establishment of disease-causing fungi and bacteria.

Make at least two applications pre-flowering and during flowering for optimal performance. Programmes of up to six applications, and just before bunch closure, will also help prevent *Botrytis*.

Amylo-X formulation
250 g/kg *Bacillus amyloliquefaciens* subsp. *plantarum* strain D747 in a water-dispersible granule.

Prevent and cure with Cosine

Cosine prevents development of powdery mildew and provides curative activity. It prevents haustorium formation and development, growth of secondary hypha and conidiospore formation. Rainfast within an hour, Cosine has good translaminar movement and, at 22 - 25°C, has vapour action which increases important canopy coverage.

Cosine formulation
An emulsion in a water formulation containing 50 g/l cyflufenamid.

Cure with Karma

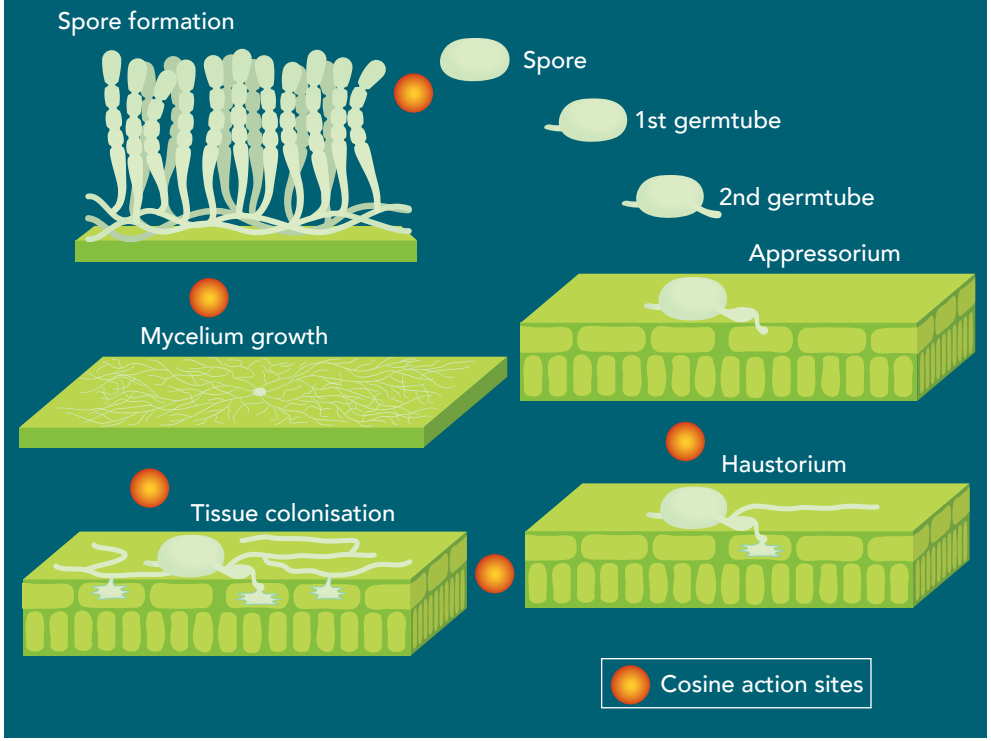
Karma controls powdery mildew with a multi-site contact MoA. It disrupts potassium ion balance in fungal cells through adjustment in osmotic pressure, carbonate and bicarbonate ions and pH.

The formulation contains a built-in adjuvant system: in the absence of rain it can also provide limited preventative control by disrupting the release of hydrolytic enzymes that fungi use to infect plants.

For a powdery mildew 'stop' (eradicant) strategy, start applications before bunch closure (BBCH79). For prevention, apply Karma around first leaf unfolded (BBCH11) up to inflorescence (BBCH53).

Karma formulation
A water-soluble powder (SP) with 850 g/kg of potassium hydrogen carbonate.

Cosine acts on the whole mildew lifecycle



KEY VINE DISEASES & PRODUCTS

Grey mould *(Botrytis cinerea)*

Grey mould is a major limiting factor in UK grape production. The fungus can infect stems, leaves and flowers and is ubiquitous in growing environments.

However, berry or fruit infection – known as 'grey rot' – is most common and damaging. Infected ripe berries soften and shrivel, become 'mummified' in the grey fungus and drop off onto the ground. The fungus then overwinters in the mummified grapes and other tissue. In spring, the wind disperses conidia to infect new-season growth.

On leaves, symptoms appear first as 'burns' typically 2-3 cm from the edges. These are limited and not particularly damaging but indicate disease in the canopy.

Infections occur primarily following bird damage, hail or strong winds and can cause wounds that let in disease. Disease thrives at 15-20°C and high relative humidity (>90%). Severe infections are likely in wet summers and/or autumns and dense vineyards.

Grapevine flowers are particularly at risk after cap fall, which creates small wounds. Berries are most at risk after veraison (ripening) as higher sugar levels encourage disease spread.

Susceptible varieties

Varieties producing thin-skinned and tightly-packed bunches are most at risk. These include Chardonnay, Pinot Noir, Müller Thurgau and Riesling.

Using cultural control

Crop hygiene is key to tackling *Botrytis*. You need to ensure thorough cultural practices as the fungus overwinters on old plant tissues. Reduce infection risk by crop pruning, canopy management and trellising to ensure good air circulation. Don't forget to remove leaves around clusters.



Grey mould on bunches*

Protect with Amylo-X

Protectant bio-fungicide Amylo-X controls *Botrytis* and other fungal plant diseases.

Amylo-X can maintain lower disease levels close to harvest: it produces no taint in wine quality and can be applied as late as BBCH89.

Certis Belchim trials have shown that optimal application timing for successful disease prevention is from BBCH53 to BBCH62, with a minimum two applications seven days apart.

Amylo-X formulation
250 g/kg *Bacillus amyloliquefaciens* subsp. *plantarum* strain D747 in a water-dispersible granule.

Cure and prevent with Karma

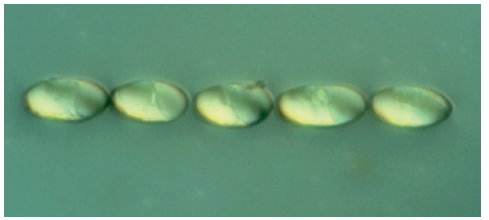
Use Karma to eradicate *Botrytis* in your vines. As a formulated product, it makes tank-mixing easy.

Karma is especially useful at harvest to stop disease symptoms: it's rain-fast, crop safe and has a 0-day harvest interval with no impact on wine quality.

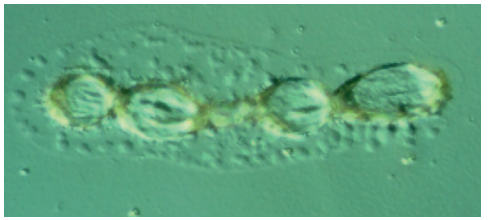
Karma controls *Botrytis* with a multi-site contact MoA. It disrupts potassium ion balance in fungal cells through adjustment in osmotic pressure, carbonate and bicarbonate ions and pH.

Apply early for maximum protection. For prevention, apply through the end of flowering to bunch closure (BBCH69-BBCH79) before disease symptoms are visible.

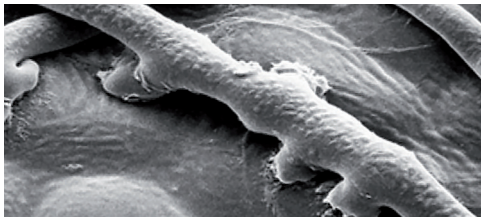
Karma formulation
A water-soluble powder (SP) with 850 g/kg of potassium hydrogen carbonate.



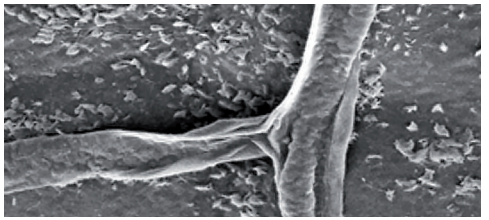
Untreated powdery mildew spores (enlarged)



Treated powdery mildew spores (enlarged)



Untreated powdery mildew mycelium

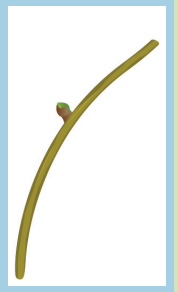
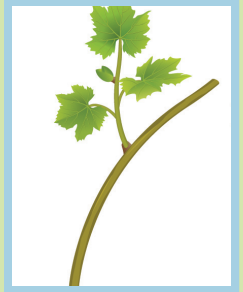
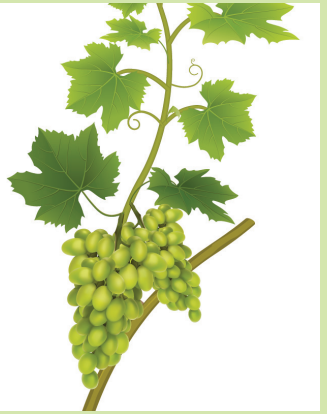


Treated powdery mildew mycelium



Jonathan Blackham, Albury Vineyard

WHEN TO USE CERTIS BELCHIM PRODUCTS

	April	May	June	July	August	September	October
Growth stage	Woolly bud	Shoot development	Inflorescence development & flowering	Fruit development	Maturation	Veraison & berry ripening	Harvest & senescence
							
Activity	Debudding Suckering Weeding	Wire lifting	Flowering Wire lifting	Nouaison First leaf removal & shoot trimming	Canopy management & green harvesting	Checking maturity Early variety harvests Second leaf removal	Vinification
Application							
Cuprokylt							
Frutogard							
Amylo-X							
Cosine							
Karma							
Finalsan							
Eradicoat Max							

Fungicides: pages 4-9 **Insecticide: page 15** **Herbicide: page 16**

FURTHER VINE DISEASES

It's not just downy mildew, powdery mildew and *Botrytis* that can cause problems in your vines. You need to be aware of these diseases, too.

Phomopsis leaf and cane spot *(Phomopsis viticola)*

Phomopsis viticola creates pale leaf spots, cracks and girdling on shoots and bleached canes. Prevalent in cool wet weather, its severity increases with prolonged leaf wetness. The disease overwinters in the buds, bark and canes of infected vines and can enter fruit when green, lying dormant until ripening when it can cause fruit to rot. The good news is that if you spray two-three times for downy mildew with Cuprokylt or Frutogard during the susceptible period (up to 15 cm shoots), your vineyard should be covered.



Phomopsis*

Dead arm disease *(Eutypa lata)*

Eutypa dieback symptoms don't usually appear until vines are at least six years old. They're most evident during spring when healthy shoots are 20-40 cm long. Shoots arising from infected wood appear stunted with small, chlorotic, distorted leaves. These become necrotic and tattered as the season progresses. Fruit fails to develop or grows very poorly. No other pathogens are known to cause these shoot symptoms. Good, healthy vineyards are generally free from *Eutypa;* it only appears in old vineyards and unmanaged crops.

Grape trunk diseases (GTDs)

In most vineyards, fewer than 5% of vines are affected. However, if left unchecked, the disease may spread rapidly. Young vines can die when the infection moves down the trunk to the graft union.

Infection is from the pruning wound, typically at the retained spur with Guyot pruning. The problem appears worse in vineyards less than ten years old. Older vines appear more tolerant. *Botryosphaeria* is a severe problem in the UK and there is no established cure. As a vineyard manager, you need to pay attention to cultural control and improve hygiene.



Botryosphaeria*

Esca diseases seriously compromise vine yield and longevity. As with other trunk diseases, they:

- **Attack grapevine wood tissue, inducing necrosis**
- **Affect the vine physiology**
- **Lead potentially to plant death**

It has become clear that in Esca diseases the main fungal agents (primarily vascular pathogens) invade the vines not only through wounds in the field but as a result of nursery practice.

There are two main visible forms: a chronic (or slow) form, involving characteristic 'tiger-stripe' discolouration of the leaves; and an acute (or apoplectic) form, characterised by sudden drying of the leaves during heat, causing the vine to die rapidly.

Control Esca diseases with Vintec

Bio-fungicide Vintec controls *Phaeomoniella chlamydospora* and *Togninia minima* woody diseases in outdoor wine grapes. It contains a strain of *Trichoderma atroviride* SC1 (TaSC1) that has evolved and adapted to protect woody species from attack by pathogenic diseases.

Once TaSC1 is established in the vine it has a direct effect on the pathogen by degrading the spores and mycelia of the target. It can also inhibit the pathogen's growth with its natural exudates.

Growers can apply Vintec soon after pruning to protect open wounds vulnerable to infection, ideally when the ambient temperature is 10˚C or above. If required, they can make a further application from the dormant period up to flowering.

Vintec is currently the only product approved for use in the UK. It's suitable for organic registered vines and has UK organic certification.

Vintec formulation
Water-dispersible granule containing 1 x 10^{13} colony-forming units (CFU) active spores of *Trichoderma atroviride* strain SC1 per kg.



Esca disease in vines



Pruning wound ready for treatment

KEY VINE PESTS & PRODUCTS

Spotted Wing Drosophila *(Drosophila suzukii)* – SWD

A fruit fly, SWD is an invasive pest of soft and stone fruit crops. If left uncontrolled, it can result in complete crop loss. Unlike the common fruit fly *(Drosophila melanogaster)*, which is attracted only to ripe and over-ripe fruits, SWD is attracted to under-ripe fruits and finds its way into fruit crops before and during harvest.

The pest can cause severe problems in grapevines when conditions are right; the damage they cause allows *Botrytis* and sour rots to develop in ripening bunches.

Late-harvested and thin-skinned varieties are particularly at risk. It's therefore important that you monitor for SWD in the vineyard. You can reduce risk by enhancing vine row airflow with leaf stripping. Crop hygiene can be key to limiting spread and damage: take care to remove rotted and mummified bunches.

It's crucial to monitor areas surrounding the vineyard and check for wild berries in wind-breaks and hedgerows; monitoring traps and pheromones can help and are widely available. In addition, target spray timing to when grapes begin to ripen and change colour (veraison).



Spotted Wing Drosophila

Light brown apple moth and European grape berry moth

The light brown apple moth *Epiphyas postvittana* is less important in grapevines than in apple and other tree fruits, but first-generation caterpillars can damage opening flowers and increase the risk of *Botrytis;* the second generation can harm the fruit cluster, again leading to the risk of *Botrytis* infection.

To control moths successfully, it's essential to trap them and ensure good timing application of suitable insecticides.



Light brown apple moth

Grape erineum mite *(Colomerus vitis)*

Although not economically important, in some years a severe infestation can lead to lower yields. This results from earlier attacks on the flower formation.

This mite's morphology is similar to that of the bud mite. It is microscopic, worm-like, and white-yellow. It overwinters between outer bud scales and tissue and feeds on leaves during spring and summer.

The upper leaf surface blisters and the lower leaf surface appears hairy and white, almost resembling fungal growth. The lower leaf surface turns from white early in the season and progresses to yellow or brown later on.



Grape erineum mite

Other pests

Scale insects, capsids, thrips, leafhoppers, black vine weevils and spider mites can all cause some limited leaf scarring, leading to *Botrytis* infection. They can also act as vectors for other pests and diseases and damage roots.



Knock down with Eradicoat Max

Apply Eradicoat Max at the first signs of pest attack. It's a fast-acting contact insecticide that blocks the spiracles (insects' breathing holes), which causes suffocation. There's a secondary mode of action where moisture is wicked away from the pest, causing dehydration. Eradicoat Max has short persistence in the crop and a 1-day harvest interval.

Eradicoat Max is a new formulation of maltodextrin with thinners that reduce sticky deposits, together with anti-foaming agents that improve mixing and efficacy.

You can achieve high levels of control with multiple applications and thorough coverage using a fine-to-medium spray. Pay particular attention to the underside of leaves or affected parts of vines. Ensure the crop dries within one hour of application.

Expect to see the maximum effect within two to four hours of application. You will only see further mortality following repeat applications at four- to seven-day intervals, and you can make a maximum 20 applications per year.

Eradicoat Max formulation
Soluble concentrate formulation containing 476 g/l (40% w/w) maltodextrin.

WEEDS AND GRAPEVINE SUCKERS

Weeds

Weed control in vineyards is critical to establishment and vigour of new vines, as well as growth and yield of established vines.

The effect of competition from weeds can be most severe in the first three years of planting; weedy vineyards can hold back the crop, delaying production of a viable crop for a further year or two.

It's often difficult to adopt a herbicide programme in the first three years of planting. Translocated herbicides may harm young plants due to uptake, leading to potential loss of significant investment.

Residual herbicides also pose a risk, especially after planting and in the first year of growth; these may severely distort the balance between root and vegetative canopy growth.

Grapevine suckers

Suckers are undesirable shoots that originate below ground and can then be seen on the rootstock of the vine.

Take care to remove suckers as they compete for energy, nutrients and water with the upper canopy, the part of the vine that will produce fruit. Removal of these shoots is called 'suckering'. It's typically a mechanical or hand operation that can be time-consuming and damaging – sometimes leaving an open wound on the trunk.

Treat with Finalsan…

Apply Finalsan contact herbicide from early spring to control weeds. Apply in mild, dry conditions for results in 24 hours.

Finalsan has desiccant properties with no risk of uptake by newly planted vines. It offers no persistence and is fully biodegradable in plants and soil.

The active, pelargonic acid, penetrates the waxy leaf cuticle and destroys cell membranes. This exposes the contents to the elements, resulting in rapid desiccation.

…for weeds

Finalsan is most effective when applied to actively growing, small young weeds – up to 5-10 cm or no later than 5th true leaf. To control more difficult weeds, such as grasses and thistles, make at least two applications using a 17% concentration, with a maximum two-week interval.

As there's no translocation activity, good coverage of the weed target is essential for best results.

Finalsan formulation

A non-selective bio-herbicide in an emulsifiable concentrate formulation containing 186.7 g/l pelargonic acid.



Gusbourne Vineyards

HYGIENE AND SLUGS

Hygiene

It's vital to ensure thorough hygiene in every aspect of crop production, from removal of leaf debris, prunings, rotten fruit and dead plants, to pruning tools, general equipment, staff clothing and clean water.

Use an approved disinfectant to promote general crop health and reduce the spread of diseases and pests in the crop and across your facilities.

Clean up with Jet-5

Use Jet-5 to disinfect all surfaces including glasshouses, tools, pots, trays, benches, equipment, paths, buildings stores and irrigation systems. Gain excellent contact action with no residues on hard surfaces.

The active breaks down into CO_2 and water with an acidic scent to indicate its use as part of your hygiene protocol. Jet-5 is ideal in Integrated Hygiene Management and useful for notifiable micro-organisms in Defra listings. It's proven to be reliable with low risk to staff, bystanders and the environment.

Jet-5 formulation
Biocide containing (5% w/w) peroxyacetic acid, recognised as a food grade sanitiser with organic status.

Slugs and snails

Focus control on the vineyard boundary and adjacent areas to reduce migration into the vineyard. And be aware that slug and snail population density can vary substantially.

Plants and organic matter provide food and shelter, so it's important to minimise these habitats with suitable cultivation and soil hygiene as part of your Integrated Pest Management strategy.

Reduce crop damage with Sluxx HP

Use the Sluxx HP deep blue pellet against all relevant slug species and garden snails. Slug feeding ceases almost immediately following consumption and the formulation has excellent anti-moulding properties.

Sluxx HP's active, ferric phosphate, occurs naturally in the environment. It is transformed into iron and phosphate by micro-organisms in the soil and becomes part of the soil and its nutrients.

You won't see excessive slime secretions on or around the crop. Slugs usually retreat underground to die, so you won't see dead slugs either. However, you will be able to measure Sluxx HP's efficacy by the decrease in feeding damage.

Sluxx HP formulation
Granular bait formulation containing 29.7 g/kg (2.97% w/w) ferric phosphate.

NUTRITION

Prevent deficiencies with WUXAL Calcium

With a very high calcium content, WUXAL Calcium provides crop-specific foliar nutrition to prevent or eliminate general calcium deficiencies or physiologically implied calcium deficiencies in vines.

As well as safe and highly effective calcium supply, WUXAL Calcium offers supplementary foliar nutrition with nitrogen, magnesium and all the micronutrients required to achieve optimal plant growth, increase yield and improve quality.

Timing	Rate of use
In periodical admixture to insecticide sprays beginning after blossom	5 l/ha
From the beginning of berry softening onwards repeated at 14-day intervals	5 l/ha

Increase phosphate levels with WUXAL Top P

WUXAL Top P is a specific foliar fertiliser for all special and intensive crops in horticulture and agriculture with increased phosphate requirements that cannot be met by soil fertilisation. With the addition of nitrogen, potassium and fully chelated micronutrients, WUXAL Top P helps ensure balanced nutrition in cultivated plants.

Number and timing of applications	Rate of use
2-3 applications before and after bloom	2 l/ha

HOW CERTIS BELCHIM CAN HELP

- ***The expertise of a skilled horticulture team, at your disposal***
- ***Benefit from our experience in viticulture in the UK and internationally***
- ***Get full information and guidance on best use of our biorational and conventional products***
- ***Pick up advice on developing sustainable IPM programmes***

DON'T FORGET

- ✓ *Cultural control*
- ✓ *Hygiene*
- ✓ *Diseases: downy mildew, powdery mildew, Botrytis*
- ✓ *Pests: SWD, grape erineum mite*
- ✓ *Weeds and suckers*
- ✓ *Slugs and snails*
- ✓ *Nutrition*



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*State of Western Australia (Department of Primary Industries and Regional Development, WA).
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