

Grapes

By Certis Biologicals

Grape crops face a variety of diseases that can appear due to seasonal and environmental changes, and understanding the symptoms can help growers to stop disease pressure before it affects crop yield.

Let's dig into root causes of fungal diseases in grapes, how you can solution for them using prevention and control, and how all of these measures will enable you to grow healthier grapevines, strengthen the health of crops, and increase yield in the long run.

Downy Mildew

Downy mildew is caused by the fungus *Plasmopara viticola*, which attacks all green parts of the vine, specifically targeting the leaves.

- The main symptoms include yellow to reddish brown, with angular or oily lesions.
- The fungus sporulates and appears as a delicate and dense white and cotton-like growth in the lesions, which causes infected shoot tips to thicken and curl into white sporulation, which eventually causes the leaves to turn brown and die.

In grapes, young berries are highly susceptible to powdery rot, and the fruit will appear gray when infected (called gray rot), and then become covered in a "downy" felt of fungus spores.

Downy mildew should be treated with a preventative product such as LifeGard® WG, and then grapevines can be sprayed with an effective fungicide just before blossoms open, and then 7-10 days later, followed by intervals of 10-14 days and a final application a few weeks later, depending upon label instructions and disease pressure.

Powdery Mildew

The fungus *Uncinula necator* causes powdery mildew, which has a narrow host range and attacks only grape crops and a few closely related species.

- The early signs include chlorotic spots on the upper leaf surface, and later as webby, white mycelium on the lower leaf surface.
- The fungus then takes on a "powdery" or dusty-like appearance that may take over the entire surface of the berry.
- On mature fruit, it appears as black or brown web scarring, and other symptoms may include red blotchy areas.

Preventative treatment will help prevent diseases as the crops grow, and fungicide treatments should begin promptly and repeated at appropriate intervals.

Bunch Rot / Botrytis

Bunch rot comes from the fungus *Botrytis cinerea*, and can occur anytime during the growing season due to common environmental causes, and it can overtake grape crops quickly.

- Early season shoot blight may occur prior to fruit ripening following prolonged warm, moist weather typically caused by spring rains.
- The fungus then causes patches of soft brown tissue, which kills the infected plant part.
- Individual berries can become infected due to infections from leaf axils, and then clusters can turn brown or reddish.
- Typical signs show epidermal cracks that form, and fungal growth produces mycelium and spores that results in a gray, velvet-like appearance of the berries.

Practice canopy management such as shoot thinning, hedging, and leaf removal of basal leaves to reduce incidence and severity of disease, but do not remove excessive leaves in warmer growing areas, as this can lead to sunburned fruit.

A fungicide will be more effective with good coverage, which is also affected by canopy and growth. Apply sprays before rainfall, at bloom, or at veraison. It's important also to control insect populations, as entry wounds from their feeding promote *Botrytis* infections.

Leafy Spot / Phomopsis

Leafy spot, or leafspot, is caused by the fungus *Phomopsis viticola* that was formerly known as "dead-arm."

- Early signs show small dark spots and yellowing on the edges of leaf blades and veins.
- Spots typically occur 3-4 weeks following a rain because moisture is required for infection, and leaves may die if too many spots build up.
- If basal leaves develop heavy infection, they may become distorted and never fully develop in size.
- Spots can also occur on the shoot and cause the shoots to crack and infect further, showing a scabby appearance, which can move to the flower cluster stems.
- Summer heat diminishes lesions, but rain can cause spots to occur on clean berries, which causes them to shrivel and mummify.

Be on guard to find the presence of lesions on spurs and canes in areas of the vineyard that might be exhibiting poor budbreak. Liquid lime sulfur can help at 10gallons/acre in 100 gallons of water before rainfall in winter to reduce overwintering *Botrytis* or powdery mildew spores to grow.

If disease symptoms show in spring, use foliar treatments if rainfall is predicted

after budbreak. Some contact products may need to be reapplied after significant rainfall to protect shoots up to 18 inches in length.

Black Rot / *Xanthomonas* spp

Black rot can be one of the most damaging diseases in grapes if it is not managed early in the season. It is caused by the fungus *Guignardia bidwellii* and can infect leaves, shoots, berries, tendrils, cluster stems, and more in grapes.

- Disease development favors warm, humid weather and symptoms first appear as small yellow spots on plant leaves.
- The spots become lesions, which have a dark reddish-brown border and tan or brown centers.
- Eventually, the spots become black in the lesion in a ring pattern, and the spores from these infect new plant tissue, thus spreading the disease when temperatures are warm.
- Fruit symptoms on grapes typically appear after the berries are larger than a pea size, when brown spots appear and then the fruit shrivels and turns black into a raisin-like appearance (fruit “mummies” which develop new spores that can spread through the air into new tissues).

Sanitation plays an important role in the control of black rot, so be sure to check the leaves throughout the season to prune leaves with lesions in the spring if they appear, because they will cause further infection if they are not removed. Also, check the vineyard ground for mummies to ensure that the disease does not get carried through the air to infect other vines or plants.

Use preventative measures to control disease, and fungicides can be sprayed during the period of early bloom through 3-4 weeks after initial bloom.

Shoot Blight / *Sclerotinia* spp.

Shoot blight occurs in grapevines from the fungus *Sclerotinia sclerotiorum*, which is a fungal pathogen of 400+ plant species that feeds on dead tissue and thrives when rainfall and cool weather occur in early spring.

- The disease can reduce yield by damaging or killing fruit-bearing shoots in the current season and in future years, and it can often be mistaken for *Botrytis* shoot infection in the early stages.
- It initially appears as light brown lesions on the shoot and develops at the shoot base or at a node.
- Symptoms develop into long cankered lesions surrounded by water-soaked tissues at the base of new shoots, and infection travels down the stems, making them break easily when bunches begin to develop.
- Distal shoots may wither, appear with white fungal growth after moist, warm conditions, and can form black sclerotes on the outside of the

shoot.

- The disease mainly infects the shoots, but can spread to the berries.

Warm conditions slow the spread of Sclerotinia shoot infection. If these symptoms occur in spring, the disease is unlikely to cause significant yield loss, but preventative measures should be taken to ensure that the berries stay disease-free throughout the growing season.

Blight

Bacterial blight in grapevines is caused by the bacterium *Xylophilus ampelinus* which survives in the vascular tissues of infected plants. It is a highly damaging systemic disease that affects commercial cultivars.

- It affects the leaf, petiole, stem, root, shoot, or flowers.
- Symptoms include linear reddish-brown streaks that expand upwards on the shoot.
- The streaks then darken, crack, and develop into cankers.

Understanding the symptoms will help you be able to treat disease pressure as it arises, but it's also important to put preventative methods into practice throughout the growing season to decrease disease pressure in grapes.

Disease-causing fungi can rapidly colonize a plant surface, so preventive fungicides are effective prior to the onset of diseases. Preventive fungicides have an upfront cost, but they also reduce the incidence of disease and minimize the need for costly post-infection practices after plants have been infected, which can also lead to greater loss in yield and profits.

LifeGard® WG is a biological stimulator that induces a natural immune response in the plant that reduces the occurrence and severity of disease. **Double Nickel® LC** is a technologically advanced broad spectrum biological fungicide and bactericide that can control or suppress over 90 different fungal and bacterial diseases and is tested to be effective on grapes. These products are ideal for organic production or in an integrated disease management program.

Grape

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Description

The Common or European grapevine (*Vitis vinifera*) is a long stemmed, woody vine (liana) which produces high value berries, or grapes. The vines can reach lengths in excess of 30 m and can live for many years with proper management. The leaves of the grape vine are alternately arranged on the stem and are long and broad with 5–7 lobes, typically reaching sizes of 5–20 cm (2.0–7.9 in). Flowers are produced in clusters and fruit. The fruit is a berry known as a grape and grows in clusters from the vine. In wild species, the fruit is 6 mm (1/5 in) in diameter and ripens to dark purple to black with a pale wax bloom. In cultivated plants, the berry is usually much larger, up to 3 cm (1.2 in) long and can be green, red or purple.

Vitis vinifera is native to the Mediterranean region, central Europe, and southwestern Asia but is cultivated on every continent except Antarctica. Most grape cultivation centers on the use of *Vitis vinifera*, however, in North America the related species *Vitis labrusca*, *Vitis riparia* and *Vitis rotundifolia* are also grown. *Vitis amurensis* is native to Asia and has been hybridized with *Vitis vinifera* to produce cold tolerant grapevine varieties.

Vineyard in Italy

Young grapes

Grape vine and trellis

Grape buds

Nebbiolo grapes

Cultivated purple grape

Uses

Grapes are the most widely produced commercial fruit crop in the world. They are often eaten fresh but are also commonly used to produce wine. Grapes can also be processed into jams, and preserves, juices, grape seed oil, grape seed extract, raisins and vinegar.

Propagation

Requirements The first consideration when attempting to cultivate grape is to select a variety based on the prevailing local climate, with the best production occurring in hot, dry regions. American varieties tend to be the most cold hardy while the European hybrids perform best in hotter, drier regions. Generally, vines should be grown in full sun, in a well draining soil and in a location where there is good circulating air to reduce incidence of disease. Low lying areas should be avoided when selecting a planting site as this can lead to water accumulation during periods of wet weather. Vines prefer a soil with a slightly acidic to neutral pH between 6.0 and 7.0 and require a trellis system to support the weight of the fruit on the vines.

Preparation Grape vines are usually planted as dormant bare root vines in Spring. Young plants can be purchased from nurseries and garden centres for planting in the home garden. Grape vines require a trellis and this should be built before the vines are planted in the ground. For information on constructing a suitable trellis see: <https://www.plantvillage.com/posts/192-grape-how-to-build-a-trellis-for-grape-vines?locale=en>. The trellis helps support the weight of the fruit and protects the vines from damage while also increasing air circulation and reducing diseases in the canopy. You may also consider a more decorative method of supporting the vines, such as an arbor.

Planting New vines should be planted out in Spring after all danger of frost has passed. Dig a hole for each plant approximately 30 cm (12 in) deep and 30 cm (12 in) wide, spaced 1.8– 3.0 m (6–10 ft) apart and plant the vine at the same level as the nursery. It is important not to cover the graft union in soil. Tamp the soil around the plants and add any remaining soil. The newly planted vines should be cut back to have only 2 or 3 new buds and watered lightly.

Training In order for grape vines to develop strong root systems and support heavy loads of fruit, new vines should not be allowed to produce fruit for the first 2–3 years after planting. The vine will produce new shoots, of which several should be allowed to grow while the others are cut back. This allows the vine to fill out with leaves which provide energy for an extensive root system. The new shoots should be attached to the trellis. At the beginning of the second year of growth, select 2–3 of the strongest canes on each plant and cut back the rest. Allow 3 or 4 shoots to develop on each cane and attach to the trellis. Remove any flower clusters that form.

Pruning Pruning is an essential

component of healthy grape production and should be carried out annually in early Spring while the vines are still dormant and before the buds begin to swell. From the third year onwards, most of the previous years growth should be removed. The more buds that are left on each shoot, the more fruit it will produce but care must be taken to ensure that too many are not left as the fruit may not ripen as a result. Fruit clusters can be removed as required throughout the growing season.



Grape trellis schematic for French grapes

Grapes can be grown on arbors or porches

Grape trellis schematics

References

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Common Pests and Diseases

Diseases

Category : Fungal

Anthracnose (Bird's eye rot) *Elsinoe ampelina*

Grape anthracnose symptoms on leaves - not that leaf galls are caused by mites

Grape anthracnose symptoms on fruit

Grape anthracnose symptoms on fruit

Symptoms

Dark red lesions on grapes; sunken gray lesions with a darker edge on grapes; lesions on the leaves causing leaf to curl; lesions on shoots may cause a ring of damage which will kill parts of the plant; lesions may also be present on tendrils, fruit stems, and leaf stems

Cause

Fungus

Comments

Disease favors warm weather

Management

Plant less susceptible cultivars; application of Bordeaux mixture or other appropriate fungicide while vines are dormant may be necessary

Armillaria root rot *Armillaria mellea*

Symptoms

Weak, short shoots; white fungal mats under the bark at the soil line; unproductive vines; rapid wilting

Cause

Fungus

Comments

No known Armillaria resistant grape varieties

Management

Fumigation may be necessary in soils known or suspected to have carried the disease

Botrytis bunch rot (Gray mold) *Botrytis cinerea*

Bunch rot symptoms on fruit

Bunch rot symptoms on fruit

Symptoms

Brown lesions on the stem early in the season; grapes covered with a gray to tan powder; stems and grape clusters shrivel

Cause

Fungus

Comments

Disease favors high levels of moisture and high temperatures.

Management

Plant less susceptible varieties; reduce amount of vegetative growth on vines; do not over fertilize; use suitable trellises to increase air circulation in canopy and expose grape clusters to sun; disease usually merits chemical control

Dieback (*Eutypa dieback*.) *Eutypa lata*

Symptoms

Stunted, withered leaves curled into a cup shape; dark cankers on wood; cross section of wood reveals wedge-shaped discoloration

Cause

Fungus

Comments

Affects older vines that are five to six years old

Management

No resistant varieties known; disease practically impossible to control without chemicals in areas where alternative hosts are available; use of an appropriate fungicide on pruning wounds can prevent the fungus from entering the plant; fungicide should be applied at time of pruning

Esca (Black Measles or Spanish Measles) *Phaeomoniella aleophilum*, *Phaeomoniella chlamydospora*

Symptoms

Symptom appears on leaves, trunk, canes and berries. On leaves we will see intervenial striping looks like tiger strips. White cultivars shows chlorotic and necrotic strips whereas red cultivars shows red areas and necrotic strips. On berries we will see superficial spots and later may coalesce making berries appear black. Trunk/arm/cordons shows dark brown black vascular streaking and oozes dark sap when we cut trunk. Some time this measles is associated with numerous secondary wood rotting fungi which decorate the vineyard completely.

Cause

Fungus

Comments

The leaf and berry symptoms may occur together in single cane or may show symptom on only one parts. The severe infestation of measles kill grapevine in a single year which is commonly called apoplexy. The symptoms are common in 5 to 7 year old vineyard. The prune wounds helps in pathogen entrance and establishment.

Management

Till date there is no effective method to control this disease. Remove the infected berries, leaves and trunk and destroy them. Protect the prune wounds to minimize fungal infection using wound sealant (5% boric acid in acrylic paint) or essential oil or suitable fungicides.

Leaf blight (Isariopsis Leaf Spot) Pseudocercospora vitis

Symptoms

On leaf surface we will see lesions which are irregularly shaped (2 to 25 mm in diameter). Initially lesions are dull red to brown in color turn black later. If disease is severe this lesions may coalesce. On berries we can see symptom similar to black rot but the entire clusters will collapse.

Cause

Fungus

Comments

Common in tropical and subtropical grapes. The disease appear late in the season. Cynthiana and Cabernet Sauvignon are susceptible to this pathogen.

Management

Fungicides sprayed for other diseases in the season may help to reduce this disease.

Leaf spot (Phomopsis cane) Phomopsis viticola

Phomopsis cane and leaf spot symptoms

Phomopsis cane and leaf spot symptoms

Phomopsis cane and leaf spot symptoms

Symptoms

Dark lesions with yellow edges on canes and leaves; canes appear bleached and may have dark discoloration; small distorted leaves; lesions in shoots cause cracking

Cause

Fungus

Comments

Disease emergence favorable with rain directly following budbreak

Management

Use pathogens free planting material; if disease is present prune out dead and infected wood and plow under soil; apply an appropriate fungicide

Powdery mildew *Erysiphe necator*

Powdery mildew symptoms on fruit

Powdery mildew symptoms on fruit

Powdery mildew symptoms on cane

Powdery mildew symptoms on leaf

Symptoms

Red patches on canes; yellow patches on top surface of leaves; white powdery growth on leaves; white powdery growth on fruit

Cause

Fungus

Comments

Disease favors mild temperatures and high humidity

Management

Plant vines in sites with good air circulation and sun exposure; use a training system that promotes air circulation through the canopy; apply sulfur or copper based fungicide

Category : Bacterial

Black rot *Guignardia bidwellii*

Black rot symptoms on fruit

Black rot symptoms on fruit

Symptoms

Brown lesions on the leaves that develop black dots (pycnidia); grapes have light spots that eventually form pycnidia; grapes harden and turn black, while still remaining on the vine

Cause

Fungus

Comments

Disease favors rainy weather; spores may ooze out during rain

Management

Remove all mummified fruit from vines during dormant pruning; cultivate soil

during bud break to bury mummies and reduce inoculant; application of appropriate fungicides can help control the disease

Crown gall *Agrobacterium vitis*

Galls on grape vine caused by crown gall

Galls on grape vine caused by crown gall

Symptoms

Galls on vines; wilting and yellowing of canopy; drying grapes; collapsing plants

Cause

Bacterium

Comments

Bacteria enter via wounded areas; spread from infected rootstock

Management

Sanitize all equipment regularly; avoid injuring plants; plant disease free stock, heat treatment of planting material can help eliminate pathogens prior to planting

Pierce's disease *Xylella fastidiosa*

Glassy-winged sharpshooter: a vector of Pierce's disease

Symptoms

Yellow to red leaf edges; dry leaves with leaf death in concentric rings; leaves dropping but petiole remaining attached to vine; fruit dry and shriveled

Cause

Bacteria

Comments

Disease transmitted by sharpshooters and spittlebugs

Management

Application of appropriate insecticide in areas adjacent to plantation can help reduce the number of sharpshooters reaching vines in spring; remove symptomatic vines while dormant; monitor vines with mild symptoms and remove when symptoms become pronounced

Category : Other

Young vine decline *Phaeoacremonium* spp.

***Togninia minima*,**

Togninia californica

Symptoms

Small yellow spots between leaf veins; leaves dropping; round brown or purple lesions on fruit; dry cracked fruit

Cause

Fungi

Comments

Fungus can enter the plant through propagation wounds

Management

Avoid stressing vines; provide adequate irrigation and do not over-fertilize; do not harvest fruit until vines are at least 3 years old

Pests

Category : Insects

Black vine weevil *Otiorhynchus sulcatus*

Black vine weevil

Symptoms

Feeding damage to stems, leaves, buds and/or flowers; loss of plant vigor

Cause

Insect

Comments

Larvae live in soil and feed on roots

Management

Consider growing a cover crop such as red fescue

Grape cane girdler *Ampeloglypter ater*

Symptoms

Holes encircling cane; punctures in cane

Cause

Insect

Comments

Greatest injury to vines during establishment

Management

Prune out infested shoots below girdle before adult insects emerge in summer; spraying may be required to control adult populations

Grape mealybug *Pseudococcus maritimus*

Grape mealybugs on fruit

Grape mealybug damage to fruit cluster

Symptoms

Sooty mold growing on fruit

Cause

Insect

Comments

Sporadic pest; sugary secretions by the insect drop onto fruit and encourage growth of mold

Management

Control ant populations to encourage populations of mealybug natural enemies;
apply appropriate insecticide

Japanese beetle *Popillia japonica*

Adult Japanese beetle

Symptoms

Leaves skeletonized (only veins remaining); flowers and buds damaged; plant damage may be extensive; adult insect is a metallic green-bronze beetle with tufts of white hair protruding from under wing covers on each side of the body; adult beetles are approximately 13 mm in length; larvae are cream-white grubs which develop in the soil

Cause

Insect

Comments

One beetle generation every 1-2 years; pheromone traps may actually attract more beetles to home gardens and should generally be avoided; beetle overwinters as larvae in soil; beetle has an extensive range of over 300 host plants

Management

If beetles were a problem in the previous year, use floating row covers to protect plants or spray kaolin clay; adult beetles can be hand picked from plants and destroyed by placing in soapy water; parasitic nematodes can be applied to soil to reduce the number of overwintering grubs; insecticidal soaps or neem oil can help reduce beetle populations