

Strawberry disease control guide

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It is important to identify diseases of strawberries quickly and correctly, keeping costs, labour and pesticide volumes as low as possible. This guide will help commercial producers to recognise the main strawberry diseases in NSW and to select appropriate control measures.

MAJOR DISEASES OF STRAWBERRIES

Anthracnose (black spot)

Cause

The fungi *Colletotrichum spp.*

Occurrence

This is a major disease of strawberries, affecting most parts of the plant. It can cause serious losses throughout the season.

Figure 1. Anthracnose fruit rot (black spot). Mature fruit showing firm sunken spot.



Symptoms

Fruit rot. Ripening fruit develop round, firm, sunken spots that usually turn dark brown or black, or remain light tan. The spots can enlarge until the whole fruit is affected. White fungal growth and pink spore masses develop on the spots in humid conditions. Figure 1.

Black leaf spot (*C. acutatum*)

The spots are about 1–2 mm in diameter and are usually black, but may remain light grey. Leaves can become heavily spotted without dying. This symptom usually appears after stolons (runners) and petioles are affected.

Dark, sunken lesions can girdle the petioles and stolons, killing leaves and unrooted offshoots.

Crown rot (*C. gloeosporioides*)

A reddish brown, firm rot or streaking develops in the crowns of wilted plants. The crown can become infected when fungal spores from stolon or petiole lesions are splashed into the centre of the plant.

Sources of infection

Infected planting material, stolons, crowns, leaves and fruit. Plant debris and weed can also be a source.

Spread

Splashing water from rain and overhead irrigation.

Favoured conditions

Warm, humid and wet periods.

Control

Difficult to control. Apply protective fungicides from flowering to fruit harvest during warmer months, particularly in ratoon crops. Remove and burn affected plants.

Grey mould

Cause

The fungus *Botrytis cinerea*.

Occurrence

This disease occurs on a wide range of flowers, vegetables and fruit, including strawberries.

Symptoms

The fungus will attack flowers, fruit, petioles, leaves and stems. Flowers and fruit stalks infected during flowering die rapidly. Green and ripe fruit develop brown rot. This spreads over the whole fruit, which becomes covered with masses of dry, greyish spores. The rot may start on any portion of the fruit, but is found most frequently on the calyx end or on the sides of fruit touching other rotten fruit. Figure 2.



Figure 2. Grey mould. Berry and fruit stalk with masses of grey spores.

Sources of infection

The fungus over-winters on plant debris and infects flower parts, after which it either rots the fruit or remains inactive until the fruit ripens further. Spores, which are produced continuously throughout the fruiting season, germinate to infect plants.

Spread

By wind and splashing water from rain or overhead irrigation.

Favoured conditions

Low temperature, high humidity and frequent rain.

Control

Apply protective fungicide beginning at or before flowering and continuing until harvest. Fungicide groups should be alternated to avoid a build up in resistance. Mulching, removal of debris and better air circulation between plants can help minimise losses.

Leaf spot

Cause

The fungus *Mycosphaerella fragariae*.

Occurrence

Leaf spot is one of the most common diseases of strawberries, occurring worldwide in most cultivars.

Symptoms

Initially, small, deep purple, round to irregularly shaped spots appear on the upper leaf surface. These enlarge to between 3–6 mm in diameter. They retain a dark red margin, but the centres turn brown, then grey and finally white. Spots may join and kill the leaf. The fungus also attacks the petioles, stolons, fruit stalks and fruit as shallow black spots. Figure 3.

Figure 3. Leaf spot (upper left), leaf scorch (upper right), leaf blotch and gnomonia fruit rot (lower left), leaf blight (lower right) - Watercolours by Margaret Senior



Sources of infection

Living and dead infected leaves from current and previous strawberry crops.

Spread

Splashing water from rain and overhead irrigation.

Favoured conditions

Extended wet periods, particularly in late spring.

Control

Remove and burn trash from the previous crop. Avoid overhead irrigation.

Leaf scorch

Cause

The fungus *Diplocarpon earlianum*.

Occurrence

This is a widespread disease. The extent of the damage is often dependent on the age of the strawberry plant. If plants are kept for more than one year the disease may reappear in following crops causing severe yield reduction.

Symptoms

Small, irregular, purplish blotches, 1–5 mm in diameter appear on the leaf. The blotches have brownish centres (not white or grey as in leaf spot). The entire leaf blade becomes purplish to reddish as the blotches join. Dark, glistening fruiting structures of the fungus appear scattered over the surface of the lesions. The leaf dries up with curled margins and assumes a burnt (scorched) appearance. Figure 3.

Petioles, fruit stalks, flowers and fruit are also attacked. Symptoms on the fruit and petiole include elongated, sunken, reddish streaks.

Sources of infection

Living and dead infected leaves from current and previous crops.

Spread

Wind and splashing water from rain or overhead irrigation.

Favoured conditions

Warm conditions. The disease is most severe at temperatures from 20 °C–25 °C.

Control

Short cropping periods help to prevent build-up of the disease. Remove and burn trash from the previous crop. Avoid overhead irrigation. Apply protective fungicide before fruiting in spring.

Gnomonia fruit rot and leaf blotch

Cause

The fungus *Gnomonia comari*.

Occurrence

In most cultivated strawberry varieties. *Gnomonia* fruit rot is more serious than leaf blotch.

Symptoms

Plants become infected between flowering and harvesting. Fruit is usually attacked at the base. The calyces of flowers and immature fruit are rapidly killed, and the fruit shrivels. When the calyx is killed in ripe and near ripe fruit, a firm brown rot slowly spreads from it and eventually covers the whole fruit. Leaf spot occurs as purplish to brown dead spots on younger leaves. Petioles and fruit trusses can also be affected.

Sources of infection

Trash from previous and current strawberry crops.

Spread

Splashing water from rain or overhead irrigation.

Favoured conditions

Warm, humid conditions, particularly in late spring.

Control

Apply protective fungicide and avoid overhead irrigation.

Leaf blight

Cause

The fungus *Phomopsis obscurans*.

Occurrence

This disease occurs worldwide. Strawberry varieties differ only slightly in susceptibility.

Symptoms

Large, circular spots (5–15 mm in diameter) appear on leaflets. Infected leaflets show three colour zones: a purple, red or yellow outer zone gradually shading to normal green leaf colour; a light brown inner zone; a dark brown centre. Usually only fully expanded leaves are attacked. During wet weather, spots become numerous enough to kill the leaves. Figure 3.

Sources of infection

Trash from previous and current crops.

Spread

By wind and splashing water from rain or overhead irrigation.

Favoured conditions

Extended wet periods, particularly in autumn.

Control

Remove and burn trash from the previous crop. Apply protective fungicides and avoid overhead irrigation.

Powdery mildew

Cause

The fungus *Sphaerotheca macularis*.

Occurrence

The disease affects all cultivated strawberries worldwide. No variety is resistant, but each differs in susceptibility.

Symptoms

An early symptom of the disease is upward curling of the leaf margins. This is followed by irregular, purple blotching on the upper leaf surfaces, often along major veins. The leaves feel brittle. This disease does not produce the masses of greyish white spores typical of powdery mildew on other crops. Powdery mildew can attack fruit at any stage.



Figure 4. Powdery mildew. Dull immature and mature berries with prominent seeds

Flowers do not set and eventually die. Immature fruit remain hard and do not ripen. Ripe or near ripe fruit become dull with prominent seeds. Figure 4.

Sources of infection

Trash from previous and current strawberry crops.

Spread

By wind.

Favoured conditions

Warm, humid conditions.

Control

Remove and burn trash from the previous crop. Apply protective fungicides and avoid overhead irrigation.

Fusarium wilt

Cause

The fungus *Fusarium oxysporum*.

Occurrence

This disease was first observed in south-eastern Queensland and is found in other countries. The disease only affects strawberries and most varieties are affected.



Figure 5. Fusarium wilt. Affected crown with brown discoloration of water conducting tissues

Symptoms

Infected plants wilt and die rapidly, particularly when carrying a heavy crop. The crown shows a distinct reddish brown discoloration. As the disease advances, the lower crown can decay. Figure 5.

Sources of infection

Soil where affected crops have been grown. The pathogen can survive in the soil for many years.

Spread

By infected planting material and trash.

Favoured conditions

High temperatures.

Control

Improve drainage. Remove affected plants, including roots, and burn to prevent the spread of the disease. Plant only certified plants. Soil fumigation can help reduce the level of infection.

Phytophthora crown rot

Cause

The fungus *Phytophthora nicotianae*.

Occurrence

One of the main root pathogens affecting a wide range of crops.

Symptoms

The young leaves wilt suddenly and quickly spread to the entire plant.

Affected plants collapse and die within a few days. The crown has a reddish to brown colour and shows signs of rotting, usually starting from the top of the crown. Symptoms can appear within a few days of planting, or in spring when the plant is under stress. Initial symptoms are similar to Fusarium wilt. Figure 6.



Figure 6. Phytophthora crown rot. Wilting of younger leaves. Affected plant collapses and dies within a few days.

Source of infection

Can be introduced with planting material or from a reserve in the soil from trash from previous crops.

Favoured conditions

Found in a wide range of climates. The disease prefers poorly drained soils, high temperatures and plants under moisture stress.

Control

Improve soil drainage by growing plants on raised beds. Remove affected plants and burn to prevent the spread of the disease. Use clean certified plants. Soil fumigation can provide some control of the disease.

MINOR DISEASES OF STRAWBERRIES

Verticillium wilt

Cause

The fungus *Verticillium dahliae*.

Occurrence

This disease occurs through the temperate zones of the world. It affects a wide range of crops like tomato, potato and cotton. Most strawberry varieties are susceptible.

Symptoms

Plants carrying a large crop will suddenly wilt, usually on a hot day in late spring or summer. Some plants do not recover, and die within a week. In surviving plants, older leaves take on a scorched look while younger leaves remain pale in colour and turgid until they also die off. Fruit on affected plants do not mature, remain small and have paler appearance. Figure 7.

Source of infection

Soils in which susceptible crops have been grown. The pathogen can survive in moist soil for many years.

Figure 7. Verticillium wilt. Older leaves show early scorching while younger leaves remain pale green and turgid until they die.



Spread

By water, trash from susceptible crops, weeds, root contact between plants, soil and farm machinery.

Favoured conditions

A period of stress such as sudden increase in temperature, dry conditions or heavy crop load on plants.

Control

Difficult to control. Remove and destroy affected plants. Improve drainage in and around plantings to prevent waterlogging. Control weeds that are susceptible to the disease and avoid planting in sites after susceptible crops were grown. Pre-plant soil fumigation can give adequate control.

Rhizopus fruit rot

Cause

The fungus *Rhizopus stolonifer*.

Occurrence

Rhizopus fruit rot is mainly a post-harvest or storage problem, but it can also infect ripe fruit in the field.



Figure 8. Rhizopus fruit rot.

Symptoms

The fungus invades strawberries only through wounds in the fruit. Infected fruit become slightly discoloured and gradually turn light brown. They soften rapidly as tissues are broken down by enzymes; then collapse, allowing the juice to leak out.

Under humid conditions, the fruit become covered with dense, fluffy, white strands tipped with large, black sporangia. Figure 8.

Favoured conditions

Damaged and overripe fruit exposed to warm temperature and high humidity.

Spread

By spores; easily spread by wind and insects living on crop trash and in the soil.

Control

Cool fruit as soon as possible after harvest (0–5 °C) . Avoid handling overripe fruit because they are susceptible to skin damage. Apply protective fungicides.

Rhizoctonia root rot

Cause

The fungus *Rhizoctonia solani*.

Occurrence

Common in many parts of the world.

Symptoms

Plants suddenly collapse just before or during the early part of the fruiting season. The undersides of the leaves turn purple and tend to curl upwards. Infected crowns may show a brown discoloration of the internal basal tissues. Young feeder roots develop red to black lesions and are eventually killed. Pythium root rot (*Pythium* spp.) can show similar field symptoms

Spread

By infected nursery runners and soil infected with trash material.

Favoured conditions

Cool, wet conditions and poorly-drained soils.

Control

Avoid planting in known infected sites. Soil fumigation can provide adequate control.

Tan brown rot

Cause

The fungus *Discobainesia oenotherae*

Occurrence

This disease is primarily a field problem affecting fruit in warm and humid growing areas.

Symptoms

Tan brown rot begins as small, tan, slightly sunken spots. These enlarge more quickly on ripe fruit than on immature green berries. The tan brown colour does not change as the lesion penetrates deep into the fruit. Affected areas can be removed intact. Figure 9.

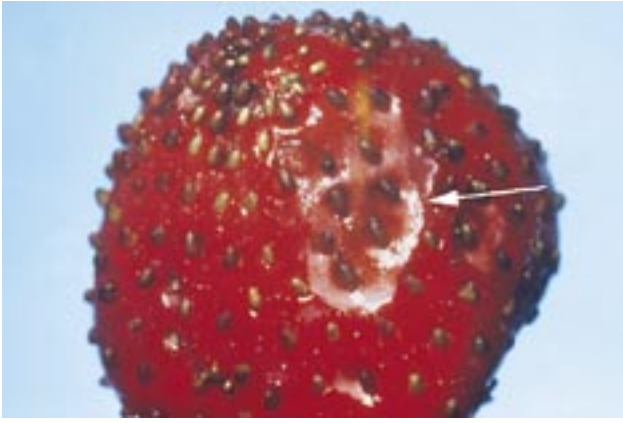


Figure 9. Tan brown rot. Sunken tan spots on mature fruit.

Favoured conditions

Warm, humid conditions and long periods of rain.

Spread

By splashing rain and insects.

Control

Cultural practices such as mulching to keep fruit off the ground, good weed control and removal of dead leaves can reduce the incidence of the disease. Rapid cooling of fruit from the field can also help control the disease.

Mild yellow edge virus

Cause

Phytoplasma-like organisms.



Figure 10. Mild yellow edge virus. Left plant showing yellowing of leaf margins and cupping. Plant remains stunted.

Symptoms

In combination with other viruses, it can cause yellowing of leaf margins, cupping of young leaves, premature reddening of older leaves, stunting of plants and reduction in yield. The plant takes a dwarfed appearance.

Symptoms are more distinct in the cooler months of the year. Figure 10.

Spread

By plant sucking insects.

Control

Plant certified virus-tested runners. Control aphids and thrips, which may be carriers of viruses.

A range of plant protection fungicides and soil fumigants are registered in New South Wales for the control of strawberry diseases. Always read the label and follow the directions. For advice on their use and application contact your nearest NSW Agriculture district horticulturist or accredited resellers or refer to agricultural chemical information software such as Infopest®

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FURTHER READING:

Agfact H3.AC.1 Strawberry fertiliser guide

Agfact H3.3.4 Strawberry weed control guide

DISCLAIMER

The information contained in this publication is based on knowledge and understanding at the time of editing (27/04/2004). 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 Agriculture or the user's independent adviser.

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