

# Managing soilborne diseases in strawberries



STRAWBERRY  
INNOVATION

## What are soilborne disease organisms?

There are hundreds of soilborne plant pathogens. The most common and important ones are fungi, and they often survive in the soil for long periods, in adverse conditions and even in the absence of their preferred weed and crop hosts. Most soilborne fungal diseases have a wide host range, while others may only infect particular crops.

Many of these fungi may be present together in cultivated soils; some also in virgin soils. Once present on your farm they will remain an on-going concern for as long as you are growing susceptible crops. The fungi can infect roots, stems and other plant parts. There are many factors that influence how seriously these fungi affect crops, and if losses are sporadic or occur every year. They include the genetics of the crop variety, environmental and climatic conditions, cultural practices and the types of other microbes present in the soil or root zone.

The diseases caused by these fungi are expensive and difficult to manage, especially when fungicide applications and/or soil fumigation may not provide total eradication. Such programs generally don't provide a consistent solution for most growers. The withdrawal of methyl bromide as a soil fumigant (except under certain limited conditions) has resulted in soilborne diseases such as crown rots and charcoal rot becoming more prevalent.

## Why is their control difficult?

Inconsistent results with chemicals to treat soilborne fungi can be due to, a lack of effective chemistry, a build-up of bacteria that rapidly breakdown the chemical, and poor application (coverage, timing, placement). Despite these reasons, fungicides and chemical fumigants have remained a common approach to managing soilborne fungi. They are expensive, however, and increasing awareness of their environmental impact, have motivated many growers to explore alternative and more

## Tips for managing soilborne diseases

- Read the pest management chapter of the Australian Good Practice Guide for Strawberries available [here](#).
- Identify and understand the pathogen survival mechanisms and the crop and environmental conditions that favour disease development.
- Correctly identify the pathogen/reason for poor plant performance to assist in effective management.
- Implement farm sanitation practices to remove or reduce pathogen carryover - in weeds, crop debris and volunteer hosts.
- Consider your planting sequences. Rotation with non-host crops will limit the build-up of pathogen populations.
- Test soils for specific pathogens to identify heavily infested blocks before planting susceptible crops
- Use certified planting material and resistant varieties (if available).
- Manage soils to increase organic matter and improve soil health, while disadvantaging soilborne pathogens.
- Monitor blocks and keep records on crop and disease history to aid decision-making.
- Provide plants with optimum nutrition and water regimes.
- Remove and destroy infected plants to reduce disease spread within a crop and carryover to the next crop; similarly remove or deep-bury crop residues and allow time for them to decompose.

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sustainable and affordable, integrated crop protection (ICP) approaches. ICP when applied to pest management considers the production system as a whole, and includes all pests (diseases, insects and weeds), crop agronomy and soil health. ICP approaches aim to optimise chemical treatments and limit dependence on them.

A few alternative controls to chemicals, including biocontrol agents have been developed for controlling soilborne pathogens in Australia and overseas. Cultural practices such as rotation with non-host crops and biofumigation with Brassica green manure crops can effectively reduce populations of some soilborne fungal pathogens.



Biofumigation with brassica green manure crop

## How can I protect my farm from these soilborne fungi?

If you are raising crops susceptible to soilborne pathogens, make sure you avoid inadvertent spread of the pathogens from infested to clean blocks. They may be introduced with water, on soil attached to equipment or vehicles, or on planting material. Use accredited planting material and compost/mulch from certified suppliers, and limit people and equipment movement around your property.

## How can I manage these soilborne pathogens if I grow susceptible crops?

By knowing your crop's stages of susceptibility to the fungi and understanding the conditions that influence the pathogens' long-term survival and pathogenicity, the on-farm activities required to manage the crop and the diseases, will become clearer.

Three common fungi in strawberries and their treatment are described below.

### Charcoal rot

Initial symptoms of charcoal rot in strawberry usually occur after the plants are well established and begin to produce fruit: the older leaves wilt, turn grey green in colour, and begin to dry up. Plants will stop growing and appear to be stunted when compared to healthy plants. As the disease progresses, virtually all of the foliage will collapse and dry up with the exception of the central, youngest leaves. Fruit production of infected plants may decrease prior to the development of disease symptoms.

Once the strawberry crop is planted, there are very few options if charcoal rot starts to occur. Management strategies



Wilting symptoms of strawberry plant infected with charcoal rot (photo courtesy of Apollo Gomez)



# Managing foliar and fruit diseases in strawberries

therefore rely mainly on prevention. These include:

- Avoiding planting into infested paddocks
- Rotating strawberries with other crops (not susceptible to charcoal rot)
- Minimising stress as much as possible by planting into well-prepared beds, irrigating appropriately and managing other pests.

If your farm is free of this organism, avoid its introduction! Be meticulous about nursery and farm hygiene. Restrict equipment, livestock, water and people movement around your production areas.

## Phytophthora crown rot

Crown rot can cause heavy plant losses in a short period of time. The disease produces some wilting of leaves and eventual collapse of the plant. The roots can be affected and may turn black and rot. Fungi are spread by infected runners, water (irrigation or rain) and farm machinery. Crown rot development is favoured by warm, wet conditions and waterlogged soil.



Internal rotting caused by crown rot (photo courtesy of Apollo Gomez)



Wilting characteristic of crown rot disease (photo courtesy of Apollo Gomez)

## Fusarium wilt

Fusarium wilt causes wilting, stunting and death of older leaves. Strawberry plants can eventually collapse and die. The inside of the plant crown will become dark to orange-brown. However the main roots will not become discoloured. Plants subject to stress due to weather extremes, water stress or heavy fruit loads are likely to be most severely affected.

Because the symptoms of charcoal rot, phytophthora crown rot and fusarium wilt are so similar (they all cause wilting), it is very important to have the cause correctly identified. Wilting may not be caused by a pathogen but due to stress (such as lack of water). If the wilting is due to disease then correct identification will assist with effective management and application of appropriate fungicides.

Cultural practices that assist in managing crown rot/fusarium wilt caused by Fusarium and Phytophthora include:

- Using accredited runners
- Rotation with non-host crops
- Roguing (i.e. removing and destroying) infected plants

# Managing foliar and fruit diseases in strawberries



- Minimisation of plant stress (environmental, nutritional or due to other pests or pathogens like fungus gnats, nematodes, *Rhizoctonia* spp. or *Pythium* spp.)
- Careful irrigation management (shorter and more frequent irrigation), planting into raised beds and use of nitrate forms of nitrogen fertilisers have been shown to reduce disease severity
- Avoiding movement of soil from infected to clean areas on machinery, footwear or animals.

Chemical control options include the use of pre-plant soil fumigants and fungicides. Products registered for use in strawberries can be found on the Australian Pesticides and Veterinary Medicines Authority (APVMA) chemical database (<https://portal.apvma.gov.au/pubcris>) and permit database (<https://portal.apvma.gov.au/permits>). Always read the label and observe withholding periods.

## Helpful resources

1. Diseases of Fruit Crops in Australia (2009) Tony Cooke, Denis Persley, Susan House
2. Strawberry Problem Solver and Bug Identifier (2005) Neil Greer, Don Hutton, Noel Vock, Geoff Waite. Queensland Government Department of Primary Industries and Fisheries
3. Common insect pests of strawberries (2009) Primefacts. L. Ullio. NSW Department of Primary Industries  
[https://www.dpi.nsw.gov.au/\\_data/assets/pdf\\_file/0017/306314/Common-insect-pests-of-strawberries.pdf](https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0017/306314/Common-insect-pests-of-strawberries.pdf)

## SOURCES

Mega Pest fact sheets developed by Scholefield Robinson Horticultural Services Pty Ltd for the Innoveg Program. Reviewed and updated by Oscar Villalta, DPI (Vic), in March 2012 and Dr Len Tesoriero in March 2015.

Charcoal Rot of Strawberry by Steven T. Koike et al. 2013  
California Strawberry Commission

Common diseases of strawberries (2009) Primefacts. NSW Industry and Investment

Phytophthora crown rot of strawberry (2014) Frank Louws and Garrett Ridge. NC State Extension Publications

Apollo Gomez (2018) Research Scientist. Queensland Government Department of Agriculture and Fisheries

UC Pest Management Guidelines for Fusarium Wilt in Strawberries (2013) University of California Agriculture and Natural Resources