

SCLEROTINIA STEM ROT IN CANOLA FACT SHEET

NORTHERN, SOUTHERN AND WESTERN REGIONS

MANAGING SCLEROTINIA STEM ROT IN CANOLA

A wet spring with warm growing conditions for canola can also mean ideal conditions for the fungal disease sclerotinia stem rot.

KEY POINTS

- ▶ An outbreak of sclerotinia stem rot is highly dependent on the season. Prolonged wet or humid conditions during flowering favour the disease.
- ▶ Consider past outbreaks of the disease as a guide to potential yield loss.
- ▶ Avoid growing canola in paddocks with a history of sclerotinia stem rot over the past four years, or in adjacent paddocks.
- ▶ Well-timed fungicide treatments – when canola crops are at 20 to 30 per cent flowering stage – can be highly effective in reducing the level of infection.

Introduction

Sclerotinia stem rot is a disease that attacks canola as well as many broadleaf plants. Sunflowers, soybeans, lupins, chickpeas and lentils are also susceptible; faba beans and field peas less so. Cereal crops and grass weeds are not affected. Broadleaf weeds such as capeweed and wild radish are also known hosts.

Prolonged humid or wet conditions during flowering are needed for infection, which is caused by the fungus *Sclerotinia sclerotiorum*. Disease outbreaks are dependent on seasonal conditions, but the pathogen can remain viable in soil surface layers for up to four years and up to 10 years if buried deeper.

Crop rotations provide the only option for long-term management of sclerotinia given the extended viability of the pathogen.

Preventative fungicide applications are currently the only in-crop management tool.

The disease is most prevalent in high-rainfall regions of New South Wales and in the north-eastern and western districts of Victoria. Sclerotinia is also emerging as an increasing problem in south-east South Australia. In Western Australia it was considered an issue mainly in the northern agricultural region but has begun to affect crops in most of the state's high-rainfall areas.

Infections in high-risk regions have become more severe in recent years with intensive wheat–canola rotations. This also suggests higher levels of residual inoculum in the soil. In 2013 there were reports of up to 50 per cent of canola crops being infected in NSW and northern Victoria. In WA; sclerotinia stem rot was widespread in the canola-growing regions and caused significant losses in the worst affected crops.

In Canada, where sclerotinia stem rot is also a significant issue, the 'rule of thumb' is that 0.5 per cent of potential yield is lost for every one per cent of crop infection, although a heavy disease burden with high levels of primary stem infection could result in greater yield losses.

Sclerotinia stem rot symptoms

Disease symptoms appear in the crop two to three weeks after infection. The fungus produces light brown discoloured patches on plant stems, branches and pods. These lesions expand and take on a greyish-white colour, giving the plant a bleached appearance.

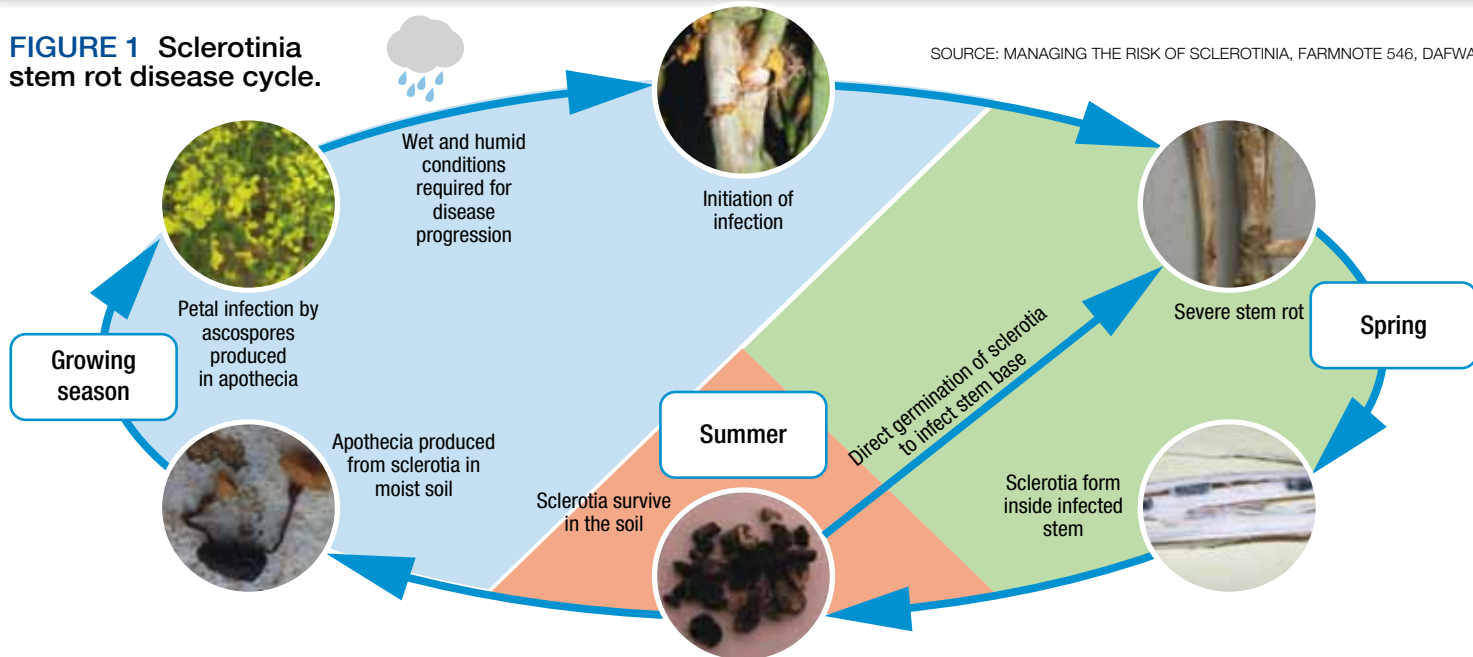
Infected canola plants ripen earlier and stand out as bleached or greyish-coloured plants among green, healthy plants. The bleached stems tend to break and shred at the base. When an infected canola stem is



PHOTO: SARAH CLARRY

Canola entering the flowering period should serve as a warning to growers of the risk of sclerotinia stem rot.

FIGURE 1 Sclerotinia stem rot disease cycle.



split open, hard, black bodies that resemble rat droppings can usually be found inside (see Photo 1). Sclerotia are the resting stage of the fungus.

In wet or humid weather, a white fungal growth that resembles cotton wool (mycelium) can also develop on the infected stems and sclerotia may develop in this white growth on the outside of the stem (see Photo 3).

Disease cycle

The sclerotia enable the pathogen to remain viable in the top five centimetres of the soil for approximately four years and up to 10 years if buried deeper. They are found in infected plants and can be incorporated into the soil following harvest, providing a source of potential infection for future years. They may also be harvested with the seed, and could be sown with seed retained for future crops.

With favourable moisture and temperature conditions in winter the sclerotia germinate in the soil and produce apothecia – small, golf-tee-shaped fruiting bodies, 5 to 10 millimetres in diameter (see Photo 2). The apothecia then release airborne fungal spores.

Approximately 10 days of wet soil conditions in mid to late winter and temperatures of 11°C to 15°C are required to soften and stimulate germination of the sclerotia and produce apothecia. Research in WA indicates the apothecia can be produced over a five to six week period, given suitable conditions, and can potentially produce spores throughout that period.

Only sclerotia in the top centimetres of the soil will germinate and produce apothecia. Sclerotia that are buried deeper will remain

dormant for extended periods and may germinate if moved closer to the soil surface. Most sclerotia will remain viable for three to four years, then survival slowly declines.

Spores of the sclerotinia pathogen cannot infect canola leaves and stems directly. They require flower petals as a food source for infection. Infected petals then drop into the canopy and lodge on leaves, leaf axils or stem branches. Under moist conditions the fungus will spread from the petal, with infection initially commencing as a tan-coloured lesion resembling a watermark (this looks very different to a blackleg lesion).

As the infection takes hold infected plant parts wilt and turn mouldy. Leaves infected by petals may also fall and lodge further down the canopy as well as spread infection through direct contact with other plants. Stem lesions will result in the production of sclerotia within the stem, which are then returned to the soil after harvest. Mist, dew and fog during flowering are all potential sources of moisture that could facilitate infection.

Sclerotia soil infections

Sclerotia can germinate in the soil, produce mycelium and directly infect canola plants in close proximity. This causes an infection at the base of the plant, which often extends into the upper taproot. This requires prolonged moist soil conditions in combination with moderate temperatures, ideally 15°C to 25°C. Direct infection of canola by sclerotia is rare but reports of this type of basal infection are becoming more common, suggesting that some paddocks have a high level of viable sclerotia present in the soil.

Outbreak conditions

Weather conditions during flowering play a major role in determining the development of the disease. For sclerotinia stem rot to develop a number of conditions must occur together:

- soil moisture and temperature conditions must favour the development of fruiting bodies (apothecia), which then release spores (10 days of wet soil conditions in mid to late winter, with temperatures of 11°C to 15°C);
- extended wet periods during flowering, which allows infection to develop from spores settling on petals; and
- extended wet periods during petal fall, with temperatures (15°C to 25°C) that allow the disease to spread from infected petals that become lodged in other parts of the plant. Dry conditions or low temperatures at this time can quickly prevent development of the disease, even if petals have initially been infected.

High-risk crops

Canola crops most at risk are those:

- in a high rainfall area, especially if the crop has been sown early at high seeding rates;
- in, or adjacent to, a paddock that has had a history of sclerotinia in the past four years;
- in low-lying parts of the landscape such as valley floors, which stay cooler and wetter for longer than nearby hill slopes; and
- in intensive rotation with other broadleaf crop species including summer crops of sunflower and soybean.

Sclerotinia is a soil-borne disease that produces air-borne spores, which makes it impossible to avoid completely. However, steps can be taken to reduce the risk of infection and disease pressure.

Management options

Crop rotation

- Close rotation of susceptible crops such as canola and lupins will build up levels of viable sclerotia in the soil. The tighter the rotation (more than one year in five) the higher the risk of disease at levels that will cause economic loss.
- Consider incorporating other lower-risk crops into the rotation, such as cereals, field peas or faba beans.
- Separate this season's paddock from last year's canola stubbles and from paddocks that have a history of sclerotinia outbreaks in other crops such as lupins, pasture, lucerne or other pulses. Separating new paddocks from potential sources of infection – ideally by at least 500 metres – can also help manage the risk of other diseases such as blackleg.

Variety selection

- There are no Australian canola varieties with known resistance to sclerotinia. Some differences in the level of sclerotinia stem rot may be observed between varieties in some seasons. This is related to the timing of flowering and rainfall events and will most likely vary between years.

Clean seed

- Select canola seed that is free of

sclerotia. This applies to growers retaining seed on-farm for sowing.

- Do not keep seed from infected crops as this increases the risk of spreading infection to previously clean areas.
- If in doubt about retained seed consider having it graded to remove sclerotia that would otherwise be sown with the seed and infect this season's crop.
- Grain receival standards allow a maximum 0.5 per cent sclerotes in the sample.

Crop management

- Follow recommended sowing dates and rates for your district. Canola crops with a bulky crop canopy are at greater risk of developing sclerotinia stem rot as the canopies retain moisture, which enhances the likelihood of infection.
- Wider row spacings or lower seeding rates may help increase air flow through the canopy, reducing the moisture that facilitates infection.
- Nitrogen applications that increase canopy bulk may inadvertently enhance the conditions for and extent of infection.
- As crops enter the flowering period, evaluate seasonal conditions, in-crop moisture and weather forecasts for the flowering period to identify the potential risk to your crop.
- If conditions are favourable for an outbreak consider the use of a registered foliar fungicide.

Weed management

- Control broadleaf weeds during the rotation. More than 400 different plant species are susceptible to the fungus

– many of them are broadleaf weeds and crops.

Fungicides

- Fungicides are the only option for managing sclerotinia stem rot after sowing.
- Growers need to weigh up yield potential, disease risk and costs of fungicide application with canola prices when deciding to apply a foliar fungicide.
- A number of products are currently registered in Australia for this purpose. Products with iprodione or procymidone as active ingredients are registered for control of sclerotinia in canola. New chemistry that combines prothioconazole and tebuconazole as active ingredients, such as in Prosaro® 420SC, provides useful registered control.
- To be effective, fungicides need to be applied before infection is evident.
- Optimal timing for application is at 20 to 30 per cent flowering stage. The aim of the fungicide is to: protect early petals from infection; to achieve penetration of the fungicide product into the crop canopy and onto lower stems and leaves; and to protect potential infection sites from falling petals.
- Main stem infections are considered to cause higher levels of yield loss compared to lateral branch infections. The aim of foliar fungicide applications is to prevent main stem infections and reduce potential yield loss.
- A high-clearance ground rig applicator, using high water rates (at least 100 litres per hectare) will improve penetration into the crop canopy. To be effective the fungicide must reach the lower crop canopy to protect potential infection sites such as leaf axis and stems.
- Fungicides generally have an active life of two to three weeks. The protection they offer may wear off during the critical infection period or where crops have an extended flowering time. A single application of fungicide applied too early may be ineffectual.
- In districts that regularly experience high levels of stem rot, or for long-flowering varieties, two spray applications could be considered. An early application at around 10 per cent flowering may be followed with a second at 30 to 40 per cent flowering.
- Foliar fungicides will have no effect on managing basal infection by sclerotinia as this infection occurs under the soil surface and beyond the activity of foliar fungicides.



Photo 1: Sclerotia form inside the stems of canola plants and can become mixed with harvested canola seed, as well as being incorporated into crop stubbles and soil.

Photo 2: Sclerotia germinate with wet soil conditions and mild temperatures producing brown apothecia on the soil surface, which release fungal spores.

Photo 3: Primary stem rot is the greatest cause of yield losses and results in the death of the entire plant.

PHOTOS: KURT LINDBECK

TABLE 1 Active ingredients of some available fungicides.

Active ingredient	Products
Prothioconazole and tebuconazole (350g/l)	Prosaro® 420SC
Iprodione (250g/l)	Rovral® Liquid, Iprodione Liquid 250, Corvette® Liquid
Procymidone (500g/l)	Fortress® 500, Sumisclex® 500, Sumisclex® Broadacre

Available fungicides

A number of fungicides are currently available in Australia to manage sclerotinia stem rot of canola. Registrations may vary from state to state and fungicides should only be applied at registered label rates. Check product labels to ensure compliance with the relevant withholding periods.

Calculating infection and losses

Identifying the level of sclerotinia stem rot in your crop each year will give an indication of the extent of yield losses that can be expected from the disease and the level of inoculum that may be present in affected paddocks.

The best time to measure the level of sclerotinia stem rot is following windrowing. Randomly check 100 plants in each paddock for symptoms of sclerotinia. Walk a 'W' shape through the paddock, 50 metres to each leg. Take 25 samples along each leg of the W. To randomly select plants, every five paces select the plant immediately at the point of your foot, regardless of whether it has stem rot or not. Do not selectively pick plants with symptoms of the disease as this will give false estimation.

The Canadian 'rule of thumb' is that 0.5 per cent of potential yield is lost for every one per cent of crop infection. A heavy disease burden with high levels of primary stem infection could result in yield losses closer to 1:1. Research is underway in Australia to verify the correlation between infection rates and yield losses.

FREQUENTLY ASKED QUESTIONS

When is my canola crop most at risk of sclerotinia stem rot?

The risk of sclerotinia is greatest in canola crops grown in districts where the disease is known to frequently occur. Crops are open to infection once flowering commences and petals begin to fall into the crop canopy. Seasons with extended wet conditions in late winter and throughout spring (during flowering and petal fall) favour disease development.

What is the best way to prevent infection?

Sclerotinia is a soil-borne and air-borne fungal disease, which makes it impossible to prevent infection if seasonal conditions are conducive. Extending the period between susceptible crops can help reduce the level of inoculum in the soil and consequently reducing the severity of infection. If you are in a district where the disease is known to frequently occur early, don't be tempted to sow canola early. Crops that flower early and produce thick crop canopies coming into spring are more prone to developing high levels of the disease.

How do I treat my crop once it becomes infected?

Foliar fungicides can be used as a preventative treatment to reduce the extent of disease, but must be applied before symptoms develop. Once the stem rot disease develops there are no further treatment options. Foliar fungicides are best applied early in the flowering period to allow penetration into the lower crop canopy.

MORE INFORMATION

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USEFUL RESOURCES

Canola Diseases and their Management: The Back Pocket Guide

www.grdc.com.au/GRDC-BPG-CanolaDiseases

Sclerotinia stem rot: the why, what and how

www.grdc.com.au/GRDC-UpdatePaper-Lindbeck2013-Sclerotinia

Foliar fungicides for managing Sclerotinia stem rot and blackleg in canola

www.agric.wa.gov.au/objtwr/imported_assets/content/fcp/cu2012_khangura_ravjit_canola_diseases_paper.pdf

PLN000005: Understanding sclerotinia in canola in the northern agricultural region of WA

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