# Managing sclerotinia stem rot in canola

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## Summary of recommended strategies:

- **Use good quality seed that is free of sclerotia.**
- **Avoid sowing canola next to paddocks that were infected with Sclerotinia in the previous three years.**
- **Check for Sclerotinia symptoms in broadleaf crops if considering sowing canola into the same paddock the following year.**
- **Preventative strategic sprays of foliar fungicides at early to mid flowering. Fungicides should only be considered for very high yielding crops in districts prone to Sclerotinia.**

## Introduction

The disease sclerotinia stem rot is caused by the fungus *Sclerotinia sclerotiorum*, which can occur on many common broadleaf crop and weed species, particularly canola and lupins. Cereal crops and grass weeds do not host the disease. The fungus can be soil-borne or carried with seed. In Australia, the disease is highly sporadic requiring specific environmental conditions to develop and disease incidence can vary greatly from year to year, but is most damaging with prolonged humid or wet conditions during flowering. The sporadic nature and inconsistent relationship between the level of stem infection and yield loss make it difficult to reliably make foliar fungicide application decisions. Several forecasting tools developed overseas have been evaluated in Australia, but have been found to be inappropriate due to differences in climate and length of flowering. Yield loss is often difficult to predict, but can be up to 24% under Australian conditions, depending on the percentage of plants infected and the crop growth stage when infection occurs.

Current management options before sowing are limited to sowing clean seed, isolating canola from last year's infected paddocks, and crop rotation. The use of foliar fungicides at flowering is the only management option post-sowing.

## Sclerotinia stem rot life cycle and symptoms

Sclerotinia survives as hard, black bodies resembling rat droppings called 'sclerotia'. Sclerotia require prolonged periods of moist soil to germinate and form golf tee-shaped fruiting bodies that release spores in late winter (*see Figure 3 over page*). The spores infect canola flower petals under humid or wet conditions.

The disease spreads to the plant stems when infected flower petals fall and become lodged between the main stem and side branches accompanied by humid or wet weather. Initial symptoms are water soaked, light-brown discoloured patches (lesions) on stems or leaves that expand and become greyish-white (*see Figure 2 over page*). If a lesion completely girdles the main stem, the plant quickly wilts and dies. Infected canola plants will ripen earlier and stand out among green plants. The bleached stems tend to break and shred. In wet or humid weather, a white growth resembling cotton wool can develop on infected plant tissue (*see Figure 1 below*). Sclerotes develop inside stems and sometimes on the surface of infected tissue (*see Figure 4 on back*). The sclerotia may be later released onto the ground during harvesting or collected in the harvested seed. It appears that if the onset of the infection occurs late in the season, yields may be unaffected.

*Figure 1. White fungal growth caused by Sclerotinia developing on infected stem tissue. Note the formation of sclerotes on the surface of the infected stem.*

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## Sclerotinia-prone regions and incidence

In Australia, it is not clear what levels of stem infection lead to yield loss due to the long flowering period of canola and weather variability in late winter and spring. Sclerotinia stem rot has emerged as a disease in wetter seasons in parts of Australia, particularly those with wet springs, for example southern NSW and north-eastern Victoria, the Victorian Western District around Geelong and parts of Western Australia. These regions have experienced seasons with high levels of sclerotinia stem rot affecting yields.

## Warning signs

A canola crop is considered at risk of developing sclerotinia stem rot if:

- It is grown in a high rainfall area.
- The crop is grown in low lying parts of the landscape such as the floor of valleys which stay cooler and wetter for longer than nearby hill slopes.
- An intensive rotation with other broadleaf crop species, including summer crops of sunflower and soybean has been followed.
- Sclerotinia has been present within the past three years in that paddock or an adjacent paddock.

The following conditions should be a warning for a Sclerotinia outbreak in canola. Note that all three must occur for infection to take place:

1 Wet conditions for at least 10 days at the soil surface in mid to late winter and temperatures of 11 – 15°C to germinate sclerotia and trigger spore release.

2 Extended wet periods during flowering, for petal infection.

3 Extended wet periods during petal drop, the lodging of petals on stems and subsequent stem infection. Stem lesion development is favoured by humid/wet conditions and mild (20 – 25°C) temperatures.

*Figure 2. A typical sclerotinia stem rot stem lesion*

## Management options

### BEFORE SOWING

**1. Clean seed**

Sow only good quality seed that is free of sclerotia. If using 'farmer saved' seed for sowing it should be graded to remove any sclerotia. Carefully inspect seed before sowing. Ungraded seed used for sowing can inadvertently transfer sclerotia into the soil, which can later initiate the disease.

**2. Crop isolation and rotation**

Avoid sowing canola into or next to paddocks that were heavily infected with Sclerotinia in the previous three years. The spores are airborne and can be blown some distance into surrounding paddocks. Although rotation does not effectively control Sclerotinia, close rotation of susceptible crops such as lupin, may increase fungal inoculum build-up. In addition, it is preferable that crops be sown on the western side or 'up wind' from old canola stubbles.

**3. Wider row spacing and seeding rate**

The use of wider row spacings and lower seeding rates can increase ventilation within the crop canopy and reduce moisture within the canopy microclimate required for infection by Sclerotinia. Avoid the temptation to sow crops at high seeding rates and follow the recommended plant population targets for your region.

### AFTER SOWING

**4. Consider fungicide use**

If favourable environmental conditions occur (see Warning signs) fungicides are the only available option for managing sclerotinia stem rot after sowing. A number of products are currently registered in Australia to manage sclerotinia stem rot of canola.

Due to the sporadic nature of the disease, it is uneconomical to apply fungicides routinely - and to be effective they need to be applied before the plant becomes infected. This can be difficult; as fungicides should be applied before petal infection occurs.

Research overseas has shown that strategically applied foliar fungicides (1 or 2 applications) can be effective in reducing the level of sclerotinia stem rot and subsequent yield loss in crops with a high yield potential and at high risk of developing the disease.

If you decide to spray, the current recommendation is to apply a foliar fungicide between 20% and 50% flowering. If the crop is not growing in an area prone to Sclerotinia, it is unlikely that a foliar fungicide application will be economic.

*Table 1: Fungicides currently registered in Australia to manage sclerotinia stem rot of canola*

**Registered Fungicides (April 2008)**

| | Cost (Litre*) | Litres used (ha) | Total cost (ha[a]) |
|---|---|---|---|
| **Active ingredient – Iprodione (250g/L)** | | | |
| Rovral® Liquid – Bayer CropScience | $25.95 | 2 | $70.90 |
| Chief® 250 - Farmoz | $28 .00 | 2 | $78.00 |
| Iprodione Liquid 250 - Ospray | $27.50 | 2 | $74.00 |
| Corvette® Liquid – Crop Care | $24.00 | 2 | $67.00 |
| **Active ingredient - Procymidone (500g/L)** | | | |
| Fortress® 500 – Crop Care | $55.20 | 1 | $74.20 |
| Sumisclex® 500 - Sumitomo | $53.00 | 1 | $72.00 |
| Sumisclex® Broadacre - Sumitomo | $42.00 | 1 | $61.00 |

** Figures quoted are approximate only as of March 2008. A Cost of aerial application of fungicide estimated to be $19.00/ha*

Using the long-term average price of canola of $390/t, a yield response of close to 0.2 - 0.3 t/ha is needed to cover the costs of using a fungicide (Table 2). When prices are higher, spraying becomes more economic at lower levels of expected yield loss.

**The life cycle of Sclerotinia stem rot**

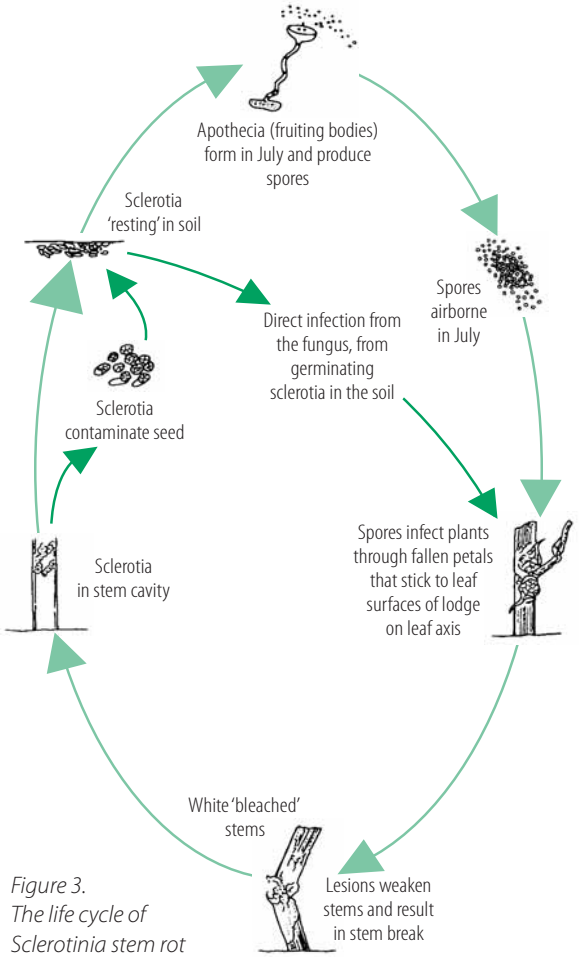


*Figure 3. The life cycle of Sclerotinia stem rot*

*Table 2: The expected gains or losses of applying Rovral® at $70.90/ha to control Sclerotinia, based on yield responses and price of canola*

| % Yield loss | Expected yield loss (t/ha) at 2 t/ha | Price received per tonne | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | $300 | $400 | $500 | $600 | $700 | $800 | $900 |
| 5 | 0.1 | -$40.90 | -$30.90 | -$20.90 | -$10.90 | $0.90 | $9.10 | $19.10 |
| 10 | 0.2 | -$10.90 | -$13.10 | $29.10 | $49.10 | $69.10 | $89.10 | $109.10 |
| 15 | 0.3 | $19.10 | $49.10 | $79.10 | $109.10 | $139.10 | $169.10 | $199.10 |
| 20 | 0.4 | $49.10 | $89.10 | $129.10 | $169.10 | $209.10 | $249.10 | $289.10 |
| 25 | 0.5 | $79.10 | $129.10 | $179.10 | $229.10 | $279.10 | $329.10 | $379.10 |
| 30 | 0.6 | $109.10 | $169.10 | $229.10 | $289.10 | $349.10 | $409.10 | $469.10 |

Note that a 15% yield loss would represent 30% stem rot in the crop, which is considered a high disease level. From 1998 to 2003, only 3% of 169 surveyed crops had more than 30% stem rot incidence. Similarly only 8% of the surveyed canola crops from 1998 to 2003 had more than 20% stem rot incidence, representing a 10% yield loss.

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## What doesn't work

- Burning stubble does not effectively control sclerotinia stem rot. Temperatures reached during burning are not high enough to kill sclerotia.
- Current Australian canola varieties are not known to have resistance to sclerotinia stem rot.
- Crop rotation will not control the disease as it has a wide host range (including broadleaf weeds) and sclerotia survive in the soil for more than 10 years. But crop rotation can help in reducing disease severity.
- Triazine herbicides can prevent spore formation but do not prevent growth of the fungus.
- Deep ploughing of stubble is not recommended. Although the burial of sclerotia to 8 cm below ground level can reduce sclerotia, live sclerotia can be ploughed up the following year. Cultivation also increases the risk of soil erosion and can damage soil structure.

## Estimating yield loss in your crop

Determining the amount of sclerotinia stem rot in your crop each year will give you an indication of the level of yield loss due to the disease and indicate what management practices should be followed in subsequent years (crop rotation, crop separation, etc.)

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 in the paddock, 50 m to each leg. Take 25 samples along each leg of the W. To randomly select plants, every 5 paces, select the plant immediately at the point of your foot, regardless if it has stem rot or not. Do not selectively pick plants with symptoms of disease as this will give a false estimation.

In Canada a common "rule of thumb" used to estimate yield loss due to sclerotinia is:

**Yield loss =**
**half the percentage of the number of plants infected**

For example:

10% yield loss =
20% plants collected are infected with sclerotinia

*Figure 4. Sclerotia forming inside an infected canola stem*

## Future Research

Research into sclerotinia stem rot in Australia is continuing with studies focusing on optimising the use of foliar fungicides to manage the disease and the development of an Australian forecasting model that can be used to predict disease epidemics.

## Further Reading

Hind-Lanoiselet T. and Lewington F. (2004) Canola concepts: Managing Sclerotinia. NSW DPI Agnote DPI 490 [http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/148359/canola-concepts-managing-sclerotinia.pdf]

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