

Sclerotinia rot of soybean

Background

Two species of *Sclerotinia* cause stem and base rot of soybeans in Australia, *Sclerotinia sclerotiorum* and *Sclerotinia minor*, the first one being far more common than the second.

Sclerotinia sclerotiorum has been found on soybeans in all growing districts from southern Queensland to southern New South Wales, whereas *S. minor* is confined mainly to growing regions in southern New South Wales and northern Victoria, apart from one record in the Burnett district of southern Queensland.

Both *Sclerotinia* species can cause significant losses due to reductions in seed yield and quality.

In Australia, *S. minor* occurs on almost 60 hosts while *S. sclerotiorum* has been recorded on over 140 hosts including the pulse crops soybean, mungbean, faba bean, cowpea, navy bean and chickpea, oilseed crops including canola and sunflower, horticultural crops such as potato, cauliflower, cabbage, broccoli and melon, and many ornamental and weeds species.

There is no host specialisation in either *S. sclerotiorum* or *S. minor*, meaning that an individual isolate can attack any known host.



Figure 1: Sclerotinia stem rot caused by *S. sclerotiorum*.

Photo: Dr M Ryley

Symptoms

The first signs of infection by both *Sclerotinia* species in a soybean crop are dead leaves at the top of scattered, yellowing plants, which most commonly occur from flowering to early pod fill after a period of mild (12-24°C) wet weather.

When the canopy is pulled back beside an infected plant, a white, fluffy, fungal growth will be found at either the bases of the stems (*S. minor* and rarely *S. sclerotiorum*) or on stems 10-50 cm above the ground (*S. sclerotiorum*).

In crops infected by *S. sclerotiorum* a cloud of very fine particles (spores of *Sclerotinia*) may be seen when the canopy is opened near plants displaying symptoms. Beneath the white fungal growth on the stems, soft water-soaked lesions at first tan-coloured but later white will be found. These lesions grow rapidly in both directions and can extend into leaf petioles, leaves and pods. Hard, black, round-irregularly shaped bodies (sclerotes) develop on/in the cottony growth, while sclerotes inside the stem tend to be long and cylindrical-shaped.

The sclerotes of *S. minor* are smaller (usually < 4 mm long) than those of *S. sclerotiorum* (most commonly 4-10 mm long). Ultimately, the affected stems become soft, readily collapse and tend to shred easily. The surfaces of infected pods become white and inside the pods a white fungal growth and sclerotes usually develop.

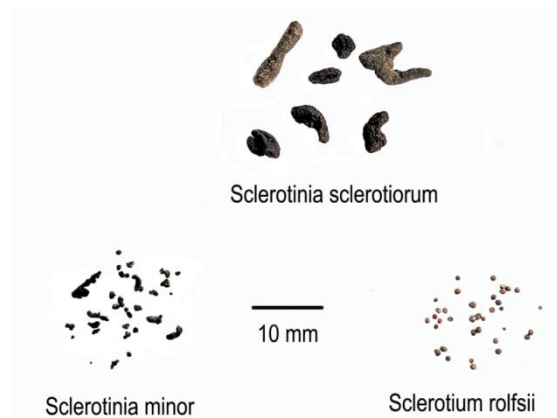


Figure 2: Comparison of sclerotes of *Sclerotinia sclerotiorum*, *Sclerotinia minor* and *Sclerotium rolfsii*.

Photo: Dr M Ryley

Biology and epidemiology

Sclerotes of both *Sclerotinia* species are capable of surviving in soil and residues for many years.

During mild, wet weather, the sclerotes of both species germinate and those near soybean plants produce fungal strands (hyphae) which can grow a short distance and invade the bases of plants, ultimately causing sclerotinia base rot. This mode of infection is far more common for *S. minor* than for *S. sclerotiorum*.



Figure 3: Sclerotinia base rot caused by *S. sclerotiorum*.

Photo: Dr M Ryley

Sclerotinia base rot can be confused with another fungal disease, sclerotium base rot (caused by *Sclerotium rolfsii*), but there are several features by which they can be separated.

- Firstly, the fungal growth of *Sclerotium* at the bases of infected plants consists of coarse thread-like strands often arranged in a fan-shaped pattern rather than the fluffy growth of *Sclerotinia* species.
- Secondly, the sclerotes of *Sclerotium* are tan coloured, round and much smaller (1-2 mm in diameter) than those of both *Sclerotinia* species, being similar in appearance to seeds of crucifers such as broccoli and cabbage.
- Finally, Sclerotium base rot most often occurs in moist, residue-laden soil during warm, dry weather, unlike Sclerotinia base rot which is favoured by moderate, wet weather.

Under a dense soybean canopy, sclerotes of *S. sclerotiorum* on or just below the soil surface germinate to produce a cup-shaped fruiting body (apothecium) which is 2-4 mm wide. Sac-like structures called asci develop on the upper surface of apothecia and spores inside the asci are forcibly ejected in response to slight changes in relative humidity in the crop canopy.



Figure 4: Germinated sclerote of *S. sclerotiorum* with a single cup-shaped apothecium at the end of a stalk.

Photo: Dr M Ryley

The spores are spread in the wind to stems, branches, flowers and pods where they germinate on their surfaces.

The resultant fungal strands which grow from the germinated spores must colonise dead flower petals or leaves before they can infect the green stems.

Lesions develop at nodes where the dead flower petals and leaves have lodged between the stem and leaf petioles. Healthy plants can become infected from contact with lesions on adjacent *Sclerotinia*-infected plants.



Figure 5: Black Sclerotes of *S. sclerotiorum* on a stem lesion.

Photo: Dr M Ryley

Management options

Once *Sclerotinia* has been found in a soybean crop it is impossible to manage, because there are no effective registered fungicides to eradicate or control the disease.

Consequently, effective management relies on pre-plant practices which will minimise the risk of infection.

These practices are;

- **Paddock selection** - avoid paddocks where *Sclerotinia* has been identified only any host in the previous 4 years; although sclerote numbers decline over time, some viable sclerotes may still be present even after 4 years
- **Planting seed** - sow only clean, sclerote-free seed sourced from a crop with no known *Sclerotinia* infection
- **Planting practices** - use plant densities and planting times recommended for your district to avoid a dense, closed canopy at flowering, and lodging
- **Weed control** - manage broadleaf weeds which are potential hosts of both *Sclerotinia* species in fallows and early in the crop
- **Irrigation** - do not irrigate during flowering to minimise the risk of sclerote germination and high canopy humidity, particularly in crops which have a dense canopy
- **Varietal selection** - almost all Australian soybean varieties are highly susceptible to *Sclerotinia* species; the varieties Zeus and Manta have better tolerance than other varieties suitable for growing in the north coast district of NSW, although this “tolerance” is thought to be due to a more open plant structure rather than true genetic resistance.

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Further reading

Mungbean and Soybean Disorders: The Ute Guide. The Grains Research & Development Corporation, Queensland Department of Primary Industries.

Compendium of Soybean Diseases, 4th edition (eds GL Hartman, JB Sinclair, JC Rupe). The American Phytopathological Society, St Paul MN, USA.

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