Sclerotinia Stem Rot of Canola

Biology and Management

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Sclerotinia stem rot has been the most serious disease of canola in North Dakota and Minnesota in recent years, with statewide incidence (percent infected plants) as high as 21% in North Dakota in 1993 and 24% in Minnesota in 1997. Estimated statewide losses from *Sclerotinia* were as high as 15% in North Dakota in 1993 and 17% in Minnesota in 1997, with estimated losses in severely infected fields as high as 50%.

Although *Sclerotinia* has always been a threat to canola production, it has become more serious as canola production has increased. Recent wet weather favoring disease development has also contributed to a buildup of Sclerotinia.

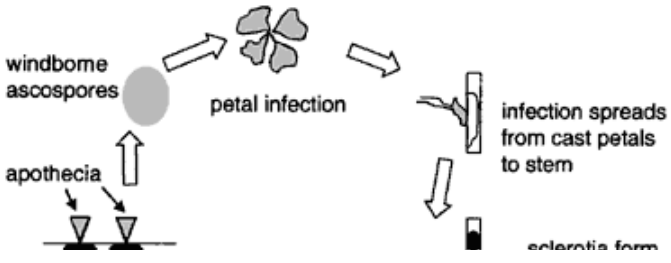
Symptoms

Sclerotinia stem rot develops late in the season, with the first symptoms showing near the end of flowering. Infections usually begin around cast petals. The infections may develop a target pattern of light brown, mushy tissues. Lesions may spread from infected leaf petioles or branches to larger stems. Infected areas eventually become bleached or white and the tissues become shredded. If the main stem is infected, plants may die early, reducing seed production, and plants may lodge. Hard, black bodies which resemble rat droppings may be produced in infected stems. These are known as *sclerotia*. They are helpful in identifying *Sclerotinia*, but are not always present in every infected stem.

Blackleg is another common disease that also may cause lodging. Blackleg produces black lesions on the stem. The internal root tissues of blackleg-infected plants turn dark gray to black, or have dark gray streaks in them. Blackleg infections near the soil surface may result in stem breakage at or near the soil surface. This contrasts with *Sclerotinia* which produces shredded white stem tissues with stem bending or breakage at a height of 6-18 inches above the soil, but no symptoms in the roots.

Biology

Disease Cycle. The Sclerotinia fungus, *Sclerotinia sclerotiorum*, produces sclerotia in the stems. Although there may not be many sclerotia produced per stem, the total production of sclerotia per acre may be quite high, up to 40 or 50 pounds. Sclerotia fall to the soil at harvest and survive on or in the soil for several years.



If the soil is at or near saturation for 10 to 14 days, the sclerotia may germinate to produce tiny mushroom-like fruiting bodies that resemble golf tees. These fruiting bodies, called *apothecia*, produce millions of airborne spores. The spores can be produced not only in canola fields, but also in fields of other crops including small grains. The spores escape from the canopy and may be wind borne to nearby fields.

The spores do not infect healthy green plant tissue, but need a food source. As canola petals die and fall onto lower portions of the plant, any spores on the petals may germinate and begin to grow, especially when the canopy stays wet for long periods of time. Once growth is established on the cast petals, infection proceeds into the surrounding tissues. Infections in canola may continue to spread as long as the canopy remains wet for many hours. *Sclerotinia* development may stop in dry weather, but it can resume once wet weather resumes.

Environment. Wet weather preceding flowering and at flowering favors disease development. At least 1-2 inches of rain are required before flowering to saturate the surface soil and stimulate formation of apothecia. The foliage in the canopy must be wet for the better part of two days for the petals to be colonized and infection to occur. If wet weather continues after infection, the infection will continue to spread. Dry weather will stop further spread. Temperatures in the 70s are more favorable than high temperatures.

Survival. The pathogen survives as sclerotia in or on the soil for several years; some may survive as long as four to six years. Each year some sclerotia die. They may die due to freezing and thawing or wetting and drying, especially if they are near the soil surface. Various soil microorganisms may colonize and kill them. The top layer of soil has the most microbial activity.

Hosts. Many broad-leaved plants are hosts of *Sclerotinia*. Sunflower, dry beans, canola, crambe, and soybeans are some of the best hosts and are likely to support the greatest buildup of sclerotia in the soil. Chickpeas and lentils are also quite susceptible but will support less buildup of sclerotia in the soil. Field peas and flax are much less susceptible. Many broad-leaved weeds are also susceptible, including lambsquarters, Canada thistle, ragweed and marsh elder. Members of the grass family including small grains and corn are immune.

Management

Crop Rotation. Crop rotation is important but the sclerotia survive for long periods in the soil, and spores may blow into canola fields from nearby fields or even from fields several miles away. Large concentrations of susceptible crops and several years with wet weather will contribute to a buildup of *Sclerotinia* in an area. Try to avoid more than one highly susceptible crop such as canola, crambe, sunflower, dry beans or soybeans in a rotation. Field peas, although a host, may be acceptable in a rotation with canola. Semi-leafless peas support less buildup of *Sclerotinia* than do the vining types. Flax and buckwheat are less susceptible. In irrigated trials at Carrington, N.D., no sclerotia were produced in flax, so flax appears to be a relatively safe crop in rotation with canola.

Tillage. Sclerotia near the soil surface break down faster than those buried deeper. However, sclerotia that are within an inch of the soil surface are capable of producing apothecia which liberate spores capable of starting new infections. Deep tillage to bury sclerotia after a susceptible crop has been grown will help to reduce spore showers that may be sources of infection the next year but may result in longer survival of sclerotia.

Fungicides. Quadris was registered for suppression of *Sclerotinia* on canola in early 1999. Other fungicides may become available within the next several years. Information on fungicides currently registered is available from county extension offices, Research Extension Centers, the Northern Canola Growers Association and the Minnesota Canola Council.

Timing. Effective suppression of *Sclerotinia* requires timely application of a fungicide. In the case of Quadris,

it should be applied at 10-25% bloom, or three to seven days after initiation of bloom. There will be 10 to 18 flowers on the main stem of Argentine canola when it is at 10-25% bloom. Some other fungicides that may be registered later may have a broader window of application.

Spray decisions. Fungicides that can be used for suppression of *Sclerotinia* are expensive and the decision to spray should be made only when: 1) yield potential is high (at least 40 bushels or 2,000 lb/A), 2) weather leading to early bloom has been wet (at least 1-2 inches of rain in the two weeks prior to early bloom), 3) more rain or high humidity is expected, and 4) *Sclerotinia* has been a problem in recent years in the field currently planted to canola or in other fields nearby. A fungicide is more likely to be needed if canola is on tight rotations.

The Canola Council of Canada has a *Sclerotinia* risk map on its Web site that is updated twice a week, beginning about mid-June. The risk map provides data for Manitoba and eastern Saskatchewan but currently does not extend south of the Canadian border. This risk map may be useful for canola growers that are near the Canadian border. The risk map is located at:

http://www.canola-council.org

The risk map site contains three maps: a map showing the growth stage of canola, a map showing areas where the soil is moist and areas where the soil is above field capacity, and a map showing the risk from Sclerotinia.

A risk assessment checklist follows. This checklist was duplicated, with permission, from the Web site of the Canola Council of Canada.

Sclerotinia Stem Rot Checklist

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When to complete the checklist:
Fill out the checklist and assess the crop shortly after first flower. First flower occurs when 75 per cent of the canola plants have three open flowers on the main stem. Usually this occurs during the last week of June or the first week of July.

How to complete the checklist:
Read each question and circle the point value assigned to the answer you choose. Count up the points for each question and enter the total for each section. Answer all the questions in this section.

Section One

1. Have you had good looking crops at flowering and poor yields at harvest even though growing conditions were favorable?	Yes-20	No-0
2. Have you seen sclerotinia stem rot in your crops in previous years?	Yes-20	No-10
3. Have you heard of sclerotinia problems in your area in the past two to three years?	Yes-10	No-5
4. Have you seen black sclerotes in your harvested seed in the past two to three years?	Yes-20	No-10

5. In previous years have your canola crops lodged?	Heavily - 20 Moderately - 10 Lightly - 0
6. Do you see large swaths at harvest but get low yield?	Yes-10 No-0
7. If you sprayed a sclerotinia fungicide in previous years, what were the results?	Better crop - 20 No difference - 0

Total points for section one = _____

If you scored 60 or more in this section you probably had sclerotinia stem rot in your canola crops. Proceed to section two with a 60 or more score.

Section Two

8. When you walk through the crop during the morning at the beginning of flowering are your boots and pant legs wet when you come out?	Yes-20 No-10
9. Have you had wet weather in the immediate area within 2 to 3 weeks prior to flowering that allowed the soil to remain moist for extended periods?	Yes-20 No-10
10. Were apothecia found in the field, around the field, or in any neighboring cereal or canola fields where canola was grown in the previous 1 to 3 years?	Yes-20 No-10
11. Do you feel it will be dry throughout the flowering stage of the crop?	Highly likely - 0 Moderately likely - 10 Not likely - 20

Total points for section two = _____

If you had a high score in section one and more than 50 for section two, you should consider applying a fungicide to protect your crop again sclerotinia stem rot.

Section Three

12. What is the condition of your stand of canola in terms of height, vigor and uniformity?	Excellent - 20 Good - 10 Fair - 5 Poor - 0
13. When you walk through your crop, how dense is the canopy?	Light - 0 Moderate - 10 Very Dense - 20
14. What is the yield potential of the stand?	10-20 bu/ac - 0 20-30 bu/ac - 10 Greater than 30 bu/ac - 20
15. In previous years, when your yield potential was 30+ bu/ac, what were the actual yields?	Greater than 30 bu/ac - 0 20-30 bu/ac - 20

Total points for section three = _____

If you have scored 50 or higher in section three, along with high scores from the first and second sections (60 and 50 plus respectively), it may be worthwhile to protect your crop against sclerotinia stem rot. If you scored less than 50 in the last section it is not likely worth applying a foliar fungicide.

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