Managing White Mould (Sclerotinia) in Pulses Prior to Planting

By Bruce Barker, P. Ag.

Disease was Widespread in 2016
White mould (*Sclerotinia sclerotiorum*) is a fungal disease, and was prominent in most susceptible crops across Saskatchewan in 2016. The Saskatchewan Ministry of Agriculture’s (SMA) lentil disease survey found a high prevalence of sclerotinia with 86 per cent of the surveyed lentil crops having at least trace levels of sclerotinia infection in 2016. The severity and impact on yield has not yet been determined, but yield losses would be high where disease severity was high.

Barb Ziesman, Provincial Specialist, Plant Disease with the SMA reports that the environmental conditions across most of the province this year were very conducive for sclerotinia development. However, there likely were regional differences in disease severity and incidence due to varying environmental conditions.

Moist conditions and moderate temperatures such as occurred in 2016 favour the development of sclerotinia. The risk of sclerotinia increases when canopies are dense, and is further increased when crops are lodged. Under dense crop canopies there is less air movement, resulting in moist microclimate conditions, which favour fungal growth and disease development. Lodging also creates a conducive microclimate, and increases plant-to-plant contact, which can result in spread of the disease from plant to plant.

Sclerotinia infection in pulses leads to stem and pod rot, crop lodging, and reduced seed fill. Yield losses due to this disease can be greater than 50 per cent if inoculum levels are high and the environment favours disease development. Downgrading of the grain due to sclerotinia diseases can occur if there are sclerotia in the sample. It is not believed that the sclerotia have any toxins that would cause concerns when feeding to livestock.

Sclerotinia attacks many broadleaf crops and weeds, but is most severe on sunflowers, dry beans, and canola.

Biology
Sclerotia are rounded black resting structures and could be potentially confused with other black foreign contaminants in grain. The best way to identify a sclerotium is to cut it in half. Sclerotia have two distinct layers: a black outer layer and a white inner layer.

Information from the SMA indicates that the sclerotinia fungus spends most of its life cycle in the soil as a hard-walled resting structure called a sclerotium (plural: sclerotia). Sclerotia are hard black bodies found in crop debris and in the soil. Sclerotia can vary in size and shape depending on the host tissue they grow in. Sclerotia are resilient to adverse conditions and can survive in soil or plant tissue for three or more years.

In the spring, the sclerotia germinate to produce small, mushroom-like structures called apothecia. Once these apothecia have matured, each of them can release up to two million spores over a 5-10 day period. The spores germinate and infect plants, causing lesion development. Lesion development is favoured by humid conditions and temperatures between 20-25 degrees Celsius. Dry conditions slow or stop infection and lesion
development. Sclerotia develop within or on diseased plant tissue and are returned to the soil with crop residue or are harvested with the seed, thus completing the disease cycle.

**General Management Practices To Consider Prior to the Grower Season**

**Variety Choice:** Pulse crops with dense growth could be more impacted since moist, lodged crops favour the development of the disease, while crops with more erect growth habits will create a less conducive microclimate. Some varieties of pulse crops may be more tolerant of infection, although none are resistant.

**Crop Rotation:** Crop rotation can be used to reduce the amount of inoculum in the field and will be most effective with adequate weed control since many broadleaf weed species can also be infected by the fungus *S. sclerotiorum*. Avoid planting pulses on fields where sclerotinia infestation levels were high in the last few years. Sclerotia bodies can survive three to four years in the soil, so crop rotation is not a complete solution for managing sclerotinia.

**Manage Moisture Levels:** Plant crops into well-drained soil. Wide, uniform row spacing with optimum stand establishment may increase air movement within the crop canopy and reduce the moist soil microclimate required for sclerotia to germinate. Avoid irrigation where extended periods of high humidity occur. Irrigate early in the day, allowing plants to dry before evening.

**Contans® WG:** Contans® is a bio-fungicide with the active ingredient *Conothyrium minitans* that infects the sclerotia of *S. sclerotiorum*. Infection by the fungus *C. minitans* prevents the sclerotia from germinating to produce apothecia and mycelia structures that are capable of infecting susceptible plants. Contans® should be applied at least three months prior to an anticipated sclerotinia disease outbreak. It can be applied in the fall after a susceptible crop is grown to reduce inoculum. Contans® can also be applied pre-seed or at seeding of dry beans or soybeans and incorporated according to label directions.

Both crop rotation and the application of bio-control fungicides focus on reducing the amount of inoculum within a field. However, since the ascospores that are produced by the fungus can be carried by the wind, there is still a potential of ascospores being introduced from other fields to initiate infection. As a result, forecasting should still be conducted and the application of foliar fungicides may still be required when the risk of disease development is high. Foliar fungicides with activity on sclerotinia are registered for use in dry beans, chickpeas, field peas, lentils, faba beans, and soybeans.

**Dry Beans**

- To reduce the risk of white mould, avoid crop rotations with a history of susceptible broadleaf crops within the three previous years, and avoid planting bean crops adjacent to fields infected with the disease in the previous year.
- Avoid rotations with other crops that are highly susceptible to white mould, such as sunflowers and canola.
- Narrow-row production can also increase the risk of white mould due to limited air movement under the crop canopy.
- Plant varieties that do not produce a heavy vine. Provide adequate aeration between rows and within rows by decreasing the seeding rate or increasing the plant spacing.
Growers of dry beans should budget for an application of fungicide for the control of white mould. Some varieties and classes of beans have increased tolerance to white mould.

Chickpeas
- Chickpeas grown in conditions of high rainfall and dense crop canopies is susceptible to sclerotinia stem rot.
- Encourage good plant health by using good seed and agronomic practices that establish a healthy stand.
- This disease is more common in crop rotations that include other susceptible broadleaf crops such as canola, mustard, lentils, or peas.
- Several foliar fungicides that are used for ascochyta blight control may also control sclerotinia when targeting ascochyta.

Faba Beans
- Faba beans should follow a cereal crop in the rotation, rather than an oilseed or legume crop.
- Foliar fungicides are registered for the control of sclerotinia on faba beans.

Lentils
- Research completed at the University of Saskatchewan revealed that all lentil tissues (i.e. leaves, stems, pods, and flowers) can be infected by spores of sclerotinia. Older plants are more susceptible, and when combined with wet weather late in the growing season and a heavy plant canopy, sclerotinia is more of a problem in maturing lentil crops. Although infection may occur later, it can still cause economic loss.
- Lentil crops are at increased risk to sclerotinia infection if grown in rotation with other susceptible crops, such as canola, peas, or sunflowers.
- There are foliar fungicides registered for the control of sclerotinia stem rot on lentils.

Field Peas
- Plant peas only once every four years in the same field. Continuous production of broadleaf crops can increase some seedling diseases and sclerotinia.
- Semi-leafless pea varieties may allow for better air movement through the crop canopy, lower risk for lodging, and provide a less suitable micro-environment for the disease to develop.

Soybeans
- Rotations with non-host crops may help reduce the incidence of this disease.
- Some varieties are more tolerant of sclerotinia than others.
- Varieties with greater lodging resistance tend to also be more resistant.
- If disease is present, clean harvest equipment when moving from infected to non-infected fields to avoid disease spread.
- Foliar fungicides are registered for suppression of white mould in soybeans.
- Effective weed management can open up space in the canopy and reduce the number of alternate hosts for sclerotinia in the field.
Images 1 & 2: Sclerotia on the crop in the fall – why sclerotia is a risk to end up in your bin with the seed.