



crop disease guide: cereals

IT'S  
GROW  
TIME

cereals

## contents

bacterial blight .....	3
covered smut .....	5
crown rust .....	7
ergot .....	9
fusarium head blight .....	11
leaf rust .....	13
leaf stripe .....	15
loose smut .....	17
net blotch .....	19
powdery mildew .....	21
scald .....	23
septoria leaf blotch .....	25
speckled leaf blotch .....	27
spindle streak mosaic .....	29
spot blotch .....	31
stem rust .....	33
streak mosaic and spot mosaic .....	35
stripe rust .....	37
tan spot .....	39
yellow dwarf .....	41

cereals

canola

corn

soybeans

pulses

wheat · barley · oats

## bacterial blight

Bacterial stripe and Black chaff –  
*Xanthomonas campestris*

Basal glume rot and Bacterial black point –  
*Pseudomonas syringae*

wheat · barley · oats

## bacterial blight

Bacterial stripe and Black chaff –  
*Xanthomonas campestris*

Basal glume rot and Bacterial black point –  
*Pseudomonas syringae*



### symptoms

Infection appears as water-soaked spots on the upper leaves at heading. Infection starts near the leaf tip, beginning as dark green water-soaked spots or stripes developing into golden brown streaks. On heads, bacterial stripe causes dark lines, or stripes, on glumes and awns.

### how crops get infected

Bacterial blight overwinters on crop residue, seed, fall-sown cereals and perennial grasses. Subsequent infections are spread by splashing rain drops, plant-to-plant contact and insects. During periods of cool and wet weather, bacteria enters the host through natural plant openings or wounds.

### impact of disease

Severity of infection causes senescence of leaves, which leads to yield loss. Yield losses may be higher with overhead irrigation.

### what to look for when scouting

After a period of wet weather, scout for water-soaked spots on the upper leaves. Spots or streaks are translucent when held up to the light. Look for leaf lesions that are grey-green to tan-white and join to form irregular streaks or blotches. In wet weather, a milky white or yellow exudate may appear at the site of the lesions.

### how to manage the disease

Use disease-free seed and rotate crops. Fungicides are not effective on bacterial blight.

*barley · oats*

## covered smut

*Ustilago hordei*

### *symptoms*

Floral bracts and awns partially develop. Dark brown spores are contained in a membrane until plant maturity, where they are dislodged during harvest and infect new seed.

*barley · oats*

## covered smut

*Ustilago hordei*

### *how crops get infected*

Covered smut overwinters on seed surfaces. Infection occurs when seedlings emerge from the sprouting seed. The pathogen is favoured by cool soil conditions. The fungus enters the young seedling and grows systemically.

### *impact of disease*

Yield losses occur when seed is replaced in the head.

### *what to look for when scouting*

Scout near heading for stunted crops with abnormal head emergence through the sheath. After heading, scout for unusual tightly compacted heads and deformed awns with masses of dark brown spores.

### *how to manage the disease*

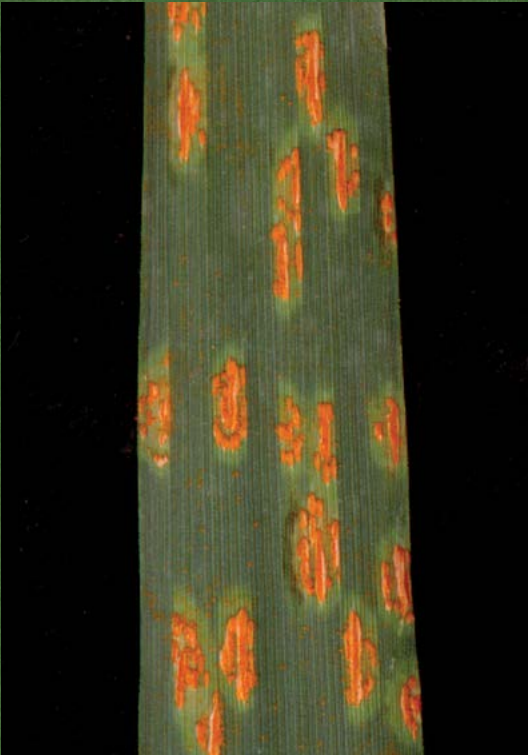
Use resistant varieties and seed treatments.



oats

# crown rust

*Puccinia coronate*



## symptoms

Orange pustules form on both the upper and lower surfaces of leaves.

oats

# crown rust

*Puccinia coronate*

## how crops get infected

Crown rust is caused by wind-borne spores from the United States. It develops when warm sunny days (between 20 and 25°C) combine with mild nights (15 to 20°C) under adequate moisture conditions. Pustules are produced 7 to 10 days after infection and break open releasing masses of brown spores that can infect surrounding plants.

## impact of disease

When infection is severe fewer tillers set fewer seeds per head, resulting in lower yields. Shriveled seeds also impact milling quality.

## what to look for when scouting

Scout for orange pustules forming on both the upper and lower surfaces of leaves. When infection is severe, sheaths and glumes also become infected.

## how to manage the disease

Use resistant cultivars and apply a foliar fungicide.

*wheat · barley*

## ergot

*Claviceps purpurea*

### *symptoms*

Dark black fungal bodies that replace one or more kernels on the head.

*wheat · barley*

## ergot

*Claviceps purpurea*

### *how crops get infected*

Ergot overwinters as black, grain-sized fungal bodies in the soil. Cool, damp weather in late spring and early summer favours fungus germination, which produces tiny mushroom-like structures. Spores are produced from mushrooms that are carried by wind and splashing rain and infect open grain florets.

### *impact of disease*

Yield reductions are usually minimal. However, the ergot bodies contain toxins that are poisonous to humans and livestock, which often results in downgrading. Even small amounts of ergot can lead to big grade reductions and heavy economic losses.

### *what to look for when scouting*

Scout florets for oozing honeydew or hard, dark structures that have replaced normal kernels.

### *how to manage the disease*

Use non-host crops in rotation, tillage to bury fungal bodies, ergot-free seed and mow bordering grass in ditches before grasses head to eliminate additional sources of inoculum.

## *fusarium head blight*

*Fusarium graminearum, Fusarium avenaceum, Fusarium culmorum*



### *symptoms*

Infected heads bleach prematurely and may not fill, grain is often shriveled, light weight and chalky white with traces of pink.

## *fusarium head blight*

*Fusarium graminearum, Fusarium avenaceum, Fusarium culmorum*

### *how crops get infected*

Fusarium overwinters in soil, crop residue and in seed. As warm moist weather develops, spores are produced and spread by wind and rain to infect developing wheat heads. Continuous moisture and warm weather are ideal for infection when a crop is flowering.

### *Impact of disease*

Yield loss results from floret sterility and poor seed filling. Later, seed germination is also impaired. Infected plants produce fusarium-damaged kernels with vomitoxin (DON), which results in grade reduction.

### *what to look for when scouting*

Scout for head infection during post flowering and grain-fill stages. Only partially filled seeds will be found in the infected spikelets. Shriveled grains appear bleached white with traces of pink. Orange spore clusters may also be visible on the head.

### *how to manage the disease*

Use clean seed, fusarium-free seed and remove or manage infested crop residue. Use a seed treatment to protect germination. Rotate to non-host crops, use seed cultivars with higher levels of resistance and apply a foliar fungicide at anthesis time.



*wheat · barley*

## leaf rust

*Puccinia triticina, Puccinia hordei**wheat · barley*

## leaf rust

*Puccinia triticina, Puccinia hordei*

### symptoms

Lesions, or pustules, are largely confined to the leaves, but may occur on leaf sheaths. They do not penetrate stem tissue. Pustules are yellowish red and on heavily infected plants, can give leaves an orange-red appearance. Pustules are small and circular and darken as the plants ripen.

### how crops get infected

Leaf rust overwinters in the southern United States and is carried by winds northward into the Canadian prairies. The disease develops rapidly at temperatures between 11 and 22°C, when adequate moisture is available.

### impact of disease

When heavily infected leaves die, the result is a loss in yield.

### what to look for when scouting

Scout for initial infections in June, with the disease reaching its peak in August. Lesions, or pustules, are predominantly found on upper leaf surfaces. Look for small round orange pustules on leaves and leaf sheaths. As the plant matures, pustules will darken.

### how to manage the disease

Use rust-resistant plant varieties where available. A foliar fungicide application can also reduce disease incidence and severity.

barley

## leaf stripe

*Pyrenophora graminea*, *Drechslera graminea*



### symptoms

Heavily infected plants will be severely stunted and will fail to emerge from the boot. Long yellow or yellow-green longitudinal stripes are bound by the leaf veins. Striped tissues turn brown and will tear between the veins, giving the plant a shredded appearance.

barley

## leaf stripe

*Pyrenophora graminea*, *Drechslera graminea*

### how crops get infected

Leaf stripe overwinters in and on seed. Seedlings are most vulnerable to infection during emergence when soil temperatures are below 10°C. Spores infect the germinating seedling and grow systemically.

### impact of disease

The diseased seed is shriveled and discoloured, resulting in yield loss and downgrading.

### what to look for when scouting

The disease can be seen on seedling leaves, but may not appear until just before heading. Scout for leaves with long, yellow or yellow-green longitudinal stripes bound by the leaf veins. Striped tissues turn brown and will tear between the veins, giving the plant a shredded appearance.

### how to manage the disease

Use resistant cultivars when available and apply foliar fungicides.



wheat · barley · oats

# loose smut

*Ustilago tritici, Ustilago nuda*



## symptoms

Infected seed appears normal and will germinate. Infected heads are replaced with a mass of dark brown spores.

wheat · barley · oats

# loose smut

*Ustilago tritici, Ustilago nuda*

## how crops get infected

Infection occurs during flowering when spores land in a floret and germinate in the embryo of the seed. When infected seeds germinate, the fungus invades the growing point of the seedling. As the head forms, it is extensively invaded by the fungus. Spores from smutted heads are dispersed by wind or rain.

## impact of disease

When the heads form spores in place of normal spikelets, the result is a loss in yield.

## what to look for when scouting

Plants will appear normal until heading. Infected heads will be visibly black and filled with spores.

## how to manage the disease

Use loose smut-resistant varieties, disease-free seed and seed treatments.

barley

*net blotch**Pyrenophora teres**symptoms*

The disease affects leaves, leaf sheaths and glumes. Leaves will appear with light green blotches or brown spots. If blotches are numerous and cover the majority of the leaf surfaces, the leaves will wither and die.

barley

*net blotch**Pyrenophora teres**how crops get infected*

Net blotch overwinters on crop residue and seed. Rain and wind spread the infection from the crop residue. High humidity and warm temperatures favour development of the disease.

*impact of disease*

Shriveled seeds and reduced seed yield result. Infected grain intended for malt purposes may be rejected.

*what to look for when scouting*

The disease can appear in spot or net form. Scout for light green blotches or brown spots on leaves. Spots will enlarge into longitudinal brown streaks creating a net-like appearance. The streaks may be surrounded by a yellowish or chlorotic border.

*how to manage the disease*

Adopt a crop rotation that includes non-cereal crops for at least one year. Use foliar fungicides and seed treatments. Use seed varieties with a high resistance where available.

wheat · barley

## powdery mildew

*Blumeria graminis*

### symptoms

It appears first as small white or grey colonies of fungal bodies on upper leaf surfaces. As colonies increase in number and size they appear as a white, powdery mass. Infections turn grey with maturity.

wheat · barley

## powdery mildew

*Blumeria graminis*

### how crops get infected

Powdery mildew overwinters on crop residue. Spores are dispersed in early spring by wind. Once infection develops, it can reproduce and re-infect several times in the same season. The disease develops rapidly in warm humid weather. Spores can germinate in the absence of free moisture on leaf surfaces.

### impact of disease

Infected leaves will eventually wither and shrivel. Plants that become severely infected early in the growing season may be stunted, resulting in reduced kernel weight and yield loss.

### what to look for when scouting

Scout for white or grey powdery masses that are scattered or completely covering leaves. Later, the fungal growth becomes dotted with black pepper-like spots.

### how to manage the disease

Foliar fungicide applications are effective. Use seed that is mildew-resistant, cultivars where available, rotate to non-host crops, remove or manage crop-infested residue and control volunteer wheat.



barley

scald

*Rhynchosporium secalis*

barley

scald

*Rhynchosporium secalis*

### symptoms

Infections initially appear as water soaked grey-green spots on leaves, which rapidly dry out and become bleached with brown margins.

### how crops get infected

Scald overwinters on barley residue, seed and host grasses. In spring, spores are produced mainly from barley residue left on the soil surface from the previous year. The produced spores are transported to other barley plants by rain drops and wind. The disease favours cool humid weather with temperatures ranging from 12 to 14°C and dense crop canopies where leaves remain wet for prolonged periods. Leaf lesions develop during cool wet weather and affect the leaves and sheaths of the plants.

### impact of disease

When a significant amount of green leaf tissue is affected, grain filling is compromised. The result is smaller kernels and reduced yields.

### what to look for when scouting

Scout for oval spots where the centre has dried out and is bleached, resulting in light grey or tan spots with dark brown margins. The centre can collapse in older lesions.

### how to manage the disease

Use resistant varieties of barley where applicable, adopt tillage and rotation practices and apply a foliar fungicide.

## septoria leaf blotch

*Septoria tritici*, *Stagonospora nodorum*,  
*Stagonospora avenae*



### symptoms

Initial infections appear as yellow flecks on lower leaves which develop into yellow, greyish white or brown blotches on all above-ground plant tissue. Lesions on leaves turn red/brown in colour and centres turn necrotic.

## septoria leaf blotch

*Septoria tritici*, *Stagonospora nodorum*,  
*Stagonospora avenae*

### how crops get infected

Septoria leaf blotch overwinters on seed and crop residue. Spores infect wheat and spread to nearby plants by rain splash and wind. Wet, windy weather with temperatures between 15 and 27°C favour disease outbreaks.

### impact of disease

Shriveled grain and decreased yields.

### what to look for when scouting

Scout for yellow flecks on leaves, which enlarge to oval or lens-shaped blotches. A zone of yellow tissue usually surrounds the light brown blotches and the centres may appear greyish brown. Black, pepper-like spots develop within lesions. Glume infections will begin at the tips and spread downward as purplish brown or grey lesions with dark, pepper-like spots.

### how to manage the disease

Foliar fungicide applications are effective. Use a crop rotation that includes non-cereal host crops.

barley

## speckled leaf blotch

*Septoria passerinii*

### symptoms

Lesions will appear on the leaf as greyish green rectangular blotches, becoming straw coloured. Small black pepper-like fungal bodies appear in lesions. Lesions may coalesce to form irregular dead areas on the leaves. Infection later appears as darkened areas, containing rows of black pepper-like fungal bodies.

barley

## speckled leaf blotch

*Septoria passerinii*

### how crops get infected

Speckled leaf blotch overwinters on barley residue. In spring and early summer, spores produced by black pepper-like fungal bodies are carried to healthy plants by wind and rain. The disease is favoured by warm moist conditions.

### impact of disease

Diseased seed is shriveled, resulting in yield loss. Infected grain intended for malt purposes may be rejected.

### what to look for when scouting

Scout for lesions on the first leaves that appear as greyish green (often rectangular blotches), and soon become straw coloured. Later, look on the leaf for darkened areas containing rows of black pepper-like fungal bodies.

### how to manage the disease

Adopt a crop rotation where there is at least a one-year break between barley crops. The use of a foliar fungicide application can also be effective.



*spindle streak mosaic**spindle streak mosaic**symptoms*

Diseased plants develop a brownish yellow colour and are slow to green-up in early spring when compared to healthy fields.

*how crops get infected*

The virus is harboured in resting spores within the fungus, *polymyxa graminis*. Spores are soil-borne and infect root tissue in fall or early spring. In the fall when the soil temperature is approximately 15°C, the fungus infected with the virus infects roots and releases the virus, which spreads throughout the plant. A period of 6 to 8 weeks with moist conditions and temperatures around 10°C is required for mosaic symptoms to develop. Symptoms of crop yellowing are most severe under consistently cold winters or cool springs with temperatures persisting around 5 to 15°C.

*impact of disease*

When symptoms persist, the affected plants may be stunted and thinned, which results in yield loss.

*what to look for when scouting*

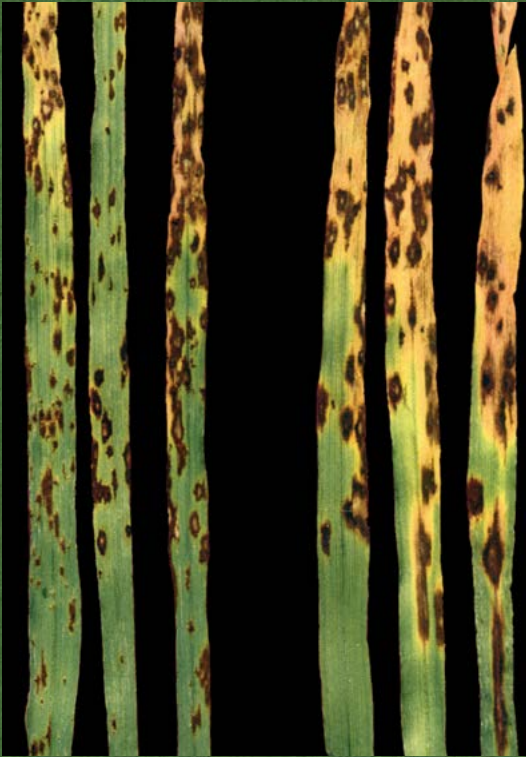
Scout for yellow or light green dashes running parallel to the leaf veins on the foliage. As the crop matures, dashes may become pointed at one or both ends and may have an island of green tissue in their centre. These classic spindle-shaped lesions give the disease its name.

*how to manage the disease*

Adopt rotations with at least four years between winter wheat crops. Improve surface drainage and avoid crop production practices that encourage soil compaction.

*wheat · barley*

## spot blotch

*Cochliobolus sativus*

### *symptoms*

Lesions first appear as small brown spots that enlarge into uniform elliptical dark brown blotches. Dark spots may also appear on the leaf sheaths and heads.

*wheat · barley*

## spot blotch

*Cochliobolus sativus*

### *how crops get infected*

Spot blotch overwinters on crop residue, seed and in the soil. Rain and wind spread the infection. High humidity and warm temperatures favour disease development.

### *impact of disease*

The seeds on a diseased plant are shriveled, resulting in yield loss. Infected grain intended for malt purposes may be rejected.

### *what to look for when scouting*

Scout for light green blotches or brown spots on leaves. Spots will enlarge into uniform elliptical dark brown blotches and may extend longitudinally on the leaf blade, bound by the leaf veins. Spots will not become long narrow streaks like net blotch.

### *how to manage the disease*

Adopt a crop rotation that includes non-cereal crops for at least one year. Use foliar fungicides and seed treatments. Use seed varieties with high resistance where available.

wheat · barley · oats

## stem rust

*Puccinia graminis*

### symptoms

Brick-red pustules form on the stem. As the plant ripens, pustules darken until they are almost black.

wheat · barley · oats

## stem rust

*Puccinia graminis*

### how crops get infected

Stem rust spores overwinter in the southern United States and advance north by wind-blown spores. After 7 to 10 days of infection onset, pustules are formed on the stem and break open, releasing masses of brown spores that can infect surrounding plants. Stem rust thrives in temperatures between 20 and 25°C.

### impact of disease

Heavily and early infected plants produce fewer tillers, set fewer seeds per head and yield small shriveled seeds with poor milling quality.

### what to look for when scouting

Scout for brick-red pustules on stems and leaf sheaths. As the plants ripen, pustules will turn from red to black.

### how to manage the disease

Use seed-resistant varieties where available, apply foliar fungicide application and seed early to avoid infection.



winter wheat

# streak mosaic and spot mosaic



## symptoms

Spot mosaic initially causes small light green to yellow spots that enlarge rapidly, coalesce and turn the leaves a golden yellow.

winter wheat

# streak mosaic and spot mosaic

## how crops get infected

The virus is transmitted by the wheat curl mite and by entry points caused by leaf rubbing. If winter wheat is sown near unharvested spring wheat, infected mites can be blown onto the winter wheat to complete the disease cycle. The virus enters the leaves and spreads to all areas of the plant.

## impact of disease

Infected plants are usually stunted and produce fewer seeds. The seeds are often badly shriveled, which results in yield losses and poor seed milling quality.

## what to look for when scouting

Scout for stunted plants along field margins where mites from adjacent crops are numerous. Look for leaves with dashes, streaks or yellow stripes parallel to the veins.

## how to manage the disease

Seed winter wheat into non-cereal crop stubble and after spring cereal crops mature.

*wheat · barley*

## stripe rust

*Puccinia striiformis*

### symptoms

Yellow, elongated pustules arranged in stripes develop on leaves and heads. Pustules on leaves often extend the entire length of the leaf.

*wheat · barley*

## stripe rust

*Puccinia striiformis*

### how crops get infected

Stripe rust overwinters in the United States, including the Pacific Northwest on winter wheat and native grasses. Spores are carried northward by the wind. In certain geographies in some years, the pathogen can overwinter in Canada. Spores can survive on winter wheat under mild winter conditions. Cool nights, with temperatures between 9 and 12°C, are optimal for the development of the disease.

### impact of disease

Heavy infection results in defoliation and shriveling of seed, causing yield loss and downgrading.

### what to look for when scouting

Scout for yellow elongated pustules arranged in stripes on leaves and heads. Pustules may extend the full length of the leaf. As the season progresses, the yellow spores in the pustules are replaced by dark brown spores.

### how to manage the disease

Use seed-resistant cultivars where available and apply foliar fungicides.

wheat

*tan spot**Pyrenophora tritici-repentis*

wheat

*tan spot**Pyrenophora tritici-repentis**symptoms*

Tan spot develops on both the upper and lower leaves. Lesions first appear as tan or brown flecks that expand into lens-shaped lesions. Lesions develop along veins, similar to lesions produced by septoria leaf blotch.

*how crops get infected*

Tan spot overwinters on standing wheat stubble, straw on a soil surface and on partially buried residue. Spores produced in the spring are carried by wind to seedlings. A minimum of six hours of moisture and temperatures ranging between 15 and 28°C with periods of dew is required for infection to occur.

*impact of disease*

Heavy infection can reduce yield and is often an issue in durum production.

*what to look for when scouting*

Scout for small dark brown to black spots with a yellow halo on the leaves. When moisture and temperatures are favourable, lesions coalesce and form irregular blotches. Tan spot differs from septoria as there are no black pepper-like fungal bodies within the lesions.

*how to manage the disease*

Apply foliar fungicide, use non-host crops in rotation and bury infected crop residue to help control tan spot.



wheat · barley

## yellow dwarf

wheat · barley

## yellow dwarf



### symptoms

Infected plants turn yellow and are stunted. Apical and basal spikelets may be sterile.

### how crops get infected

Aphids acquire the virus by feeding on infected plants and then spread the virus by feeding on healthy plants. After the plants are infected, the arrival of hot dry weather results in premature death or colouration of leaves.

### impact of disease

Stunted plants with fewer tillers than healthy plants result in yield loss and smaller-sized kernels.

### what to look for when scouting

Scout for leaf discolouration appearing as shades of yellow, red or purple from tip to base and from margin to midrib. Look for yellowed or reddened leaves.

### how to manage the disease

Control volunteer wheat, barley and oats, since they may serve as late season hosts to the aphids that carry the virus.



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With the same fungicide actives of Prosaro® (tebuconazole and prothioconazole), Prosaro XTR provides long-lasting preventative and curative activity to quickly eliminate existing infections, while preventing new ones from developing. With the addition of mefenpyr-diethyl, a molecule that helps manage and reduce the effects of environmental stress, your crop spends less energy defending itself and more energy producing yield. Protect your bottom line with Prosaro XTR.



*when timing is everything,  
don't use just anything.*

Folicur® EW has been trusted by Alberta cereal growers like you for over 10 years. It's a reliable combination of application flexibility and control over tough leaf diseases and fusarium head blight. So whatever this season has in store for your crop, keep your focus on yield and quality.

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crop disease guide: canola

*canola*

*contents*

alternaria black spot .....	47
aster yellows .....	49
blackleg .....	51
brown girdling root rot .....	53
clubroot .....	55
foot rot .....	57
fusarium wilt .....	59
sclerotinia .....	61
verticillium stripe .....	63

**IT'S  
GROW  
TIME**

cereals

canola

corn

soybeans

pulses



## alternaria black spot

*Alternaria brassicae*, *Alternaria raphani*,  
*Alternaria alternata*



### symptoms

Leaf spots are grey with purplish or black borders, or entirely black under dry conditions. Lesions often show alternate circular zones of brown, surrounded by a chlorotic halo. Spots on stems and pods begin as brown to black specks that change colour as they enlarge, becoming entirely black or dark bordered with a greyish white centre. Heavily spotted pods contain shrunken seeds.

## alternaria black spot

*Alternaria brassicae*, *Alternaria raphani*,  
*Alternaria alternata*

### how crops get infected

*Alternaria* black spot overwinters on crop residue, seed and several biennial brassica weeds. Infection occurs anytime, although plants are more susceptible at later growth stages. Spores are spread through wind and rain splash. Spores germinate when exposed to moisture and cause lesions within a few days. Lesions produce more wind-borne and rain-splashed spores that may cause additional infection.

### impact of disease

Yield loss varies depending on the conditions. When the disease spreads extensively onto green pods, it may cause premature pod shatter, shriveled seed, lower 1,000-kernel weight and reduced oil content.

### what to look for when scouting

Scout for spots on leaves, stems and pods. Look for early lodging and cool wet weather in the podding stage. Lodged canopies remain wet longer, thus promoting greater spore production.

### how to manage the disease

Bury crop residue with tillage, control volunteers and cruciferous weeds. Seed treatments can also reduce seedling infections. Rotate with non-brassica crops and manage rotation in nearby fields to reduce air-borne inoculum. Use an application of a foliar fungicide. Early swathing and/or the timely harvest of infected crops may reduce losses from pod shatter.

canola

# aster yellows

*Aster yellows phytoplasma*



## symptoms

Infected plants produce distorted sterile inflorescences. Pods are replaced by round to oval blue-green hollow bladder-like structures. Renewed growth occurs late in the season and is very noticeable. Affected parts of flowering shoots are sometimes purple and the disease may be confused with a sulphur deficiency.

canola

# aster yellows

*Aster yellows phytoplasma*

## how crops get infected

Aster yellows is spread primarily by the six-spotted leafhopper. Leafhoppers make their way into Canada in early spring from the United States. Leafhoppers acquire the pathogen by feeding on infected plants and transfer it to healthy plants upon feeding.

## impact of disease

Traces of aster yellows can usually be found at the end of the growing season, but incidence rarely exceeds five percent of plants infected.

## what to look for when scouting

Scout for distorted and sterile inflorescences, pods replaced by round to oval blue-green hollow bladder-like structures, or purple parts of flowering shoots.

## how to manage the disease

Use multiple insecticide applications to control leafhoppers on canola. However, this approach is usually not economical and is too late once plant symptoms appear.

canola

## blackleg

*Leptosphaeria maculans*,  
*Leptosphaeria biglobosa*



### symptoms

Leaf lesions are greyish white, round to irregular, and usually dotted with black or pepper-like spots. Poorly defined white or grey lesions form later on stems. In wet conditions, black spots exude pink or purple spore masses. In severely infected plants, the stem bases develop dry sunken cankers, often with a black border.

canola

## blackleg

*Leptosphaeria maculans*,  
*Leptosphaeria biglobosa*

### how crops get infected

Blackleg overwinters in residue. Cotyledons and leaves are infected in spring from airborne spores that spread down the stems causing stem cankering. It also produces another type of fungal body that appears as pepper-like spots within lesions that ooze spores, which will cause secondary infections. Infected residue can produce spores for 3 to 5 years.

### impact of disease

For each increased unit in severity between 0 and 5, the seed yield declines by approximately 17 percent.

### what to look for when scouting

At the 3 to 6 leaf stage, examine at least 50 plants. If lesions are found on more than 10 percent of the plants, there is a high risk of a significant development of the disease. During swathing scout for disease pressure for future years. Pull up at least 50 plants in a 'w pattern.' Clip at the base of stem/top of root and look for blackened 'pizza-pie' tissue inside the crown of the stem.

### how to manage the disease

Use crop rotation with susceptible crops being planted only 1 out of 4 years. Incorporate a fungicide application between the 2 to 6 leaf stages. Use newest 'R' rated hybrids. Control all volunteers.



# brown girdling root rot

*Rhizoctonia solani*



## symptoms

Light brown lesions with irregular margins form on the tap root or main laterals at any depth below the crown. As they develop, the lesions become darker and sunken, often in vertical streaks. They may coalesce and girdle the tap root.

# brown girdling root rot

*Rhizoctonia solani*

## how crops get infected

Infection occurs below ground, where the pathogens infect the roots and cause lesions. Lesions first appear during flowering and may girdle the tap root by the end of flowering. Wet soil during flowering and dry conditions beyond flowering are most conducive to disease development. New lesions and girdling continue to develop until senescence.

## impact of disease

Yield loss is proportional to the amount of the root system that is lost by girdling. Losses result mainly from pod sterility, reduced seed weight, seed shriveling, and plant death due to desiccation and lodging. Indirect losses may occur from shattering caused by premature ripening.

## what to look for when scouting

Scout for prematurely ripened plants. Pull plants up to examine roots for symptomatic lesions.

## how to manage the disease

Use cultivars that are more tolerant to the pathogens, increase crop rotations to 3 to 4 years between canola or mustard crops, and control volunteer canola and cruciferous weeds (e.g., wild mustard, stinkweed, shepherd's purse) during rotations.

canola

*clubroot**Plasmodiophora brassicae**symptoms*

Root galls develop club-shaped growths that infects most of the root system. Galls begin firm and white and become soft and greyish brown as they mature. Severely diseased plants appear stunted and wilted.

canola

*clubroot**Plasmodiophora brassicae**how crops get infected*

Clubroot can stay in the soil for years as resting spores. Germination is stimulated by secretions from the roots of brassica plants. Resting spores become zoospores, which are capable of swimming short distances in water and seeking root hairs to infect. The result is the creation of galls, which when decayed, releases millions of spores back into the soil.

*impact of disease*

Early infection with high spore loads can lead to a yield loss of 100 percent, while low spore loads may result in no yield loss at all.

*what to look for when scouting*

Above-ground symptoms may be mistaken for moisture stress, or diseases such as blackleg, fusarium wilt or sclerotinia. Proper diagnosis always includes digging up plants to check for galls. The best time to scout is two weeks before swathing. Infection often begins near the access point to a field.

*how to manage the disease*

Practice good sanitation methods to restrict movement of contaminated materials. If a risk is perceived, restrict access to the affected fields. Grow resistant hybrids (preferably only 1 out of 4 years to reduce soil inoculum levels and preserve existing clubroot resistance). Use patch management strategies in small areas.

canola

## foot rot

*Fusarium spp.*, *Rhizoctonia solani*



### symptoms

Disease symptoms can be seen on the stem at the ground level and will continue up the stem of the plant. Lesions are brown or grey, circular and will weaken one side of the plant. Foot rot can often be misdiagnosed as blackleg. Blackleg will cause dry sunken cankers and the base of the stem will appear woody, which differs from foot rot.

canola

## foot rot

*Fusarium spp.*, *Rhizoctonia solani*

### how crops get infected

Foot rot is a soil-borne disease that infects plants before flowering but symptoms appear at or around flowering. It can often be misdiagnosed as other diseases. In recent years, foot rot has increased in significance in Western Canada.

### impact of disease

Similar to brown girdling rot, yield loss is dependent on the level of infection and ultimately the effect on the root system. Lesions caused by this disease can increase the incidence for secondary infection by other pathogens, such as blackleg. Early season symptoms lead to a greater risk to yield. Disease incidence and impact on yield increases in wetter years.

### what to look for when scouting

Look for premature ripening of plants, often seen in single plants across the field or in small patches. Small patches are often seen in low areas where soil is waterlogged.

### how to manage the disease

Rotation is the best way to defend against most soil-borne pathogens. The risk of disease development decreases with 3 to 4 years between canola crops. Improving soil drainage will also help protect against foot rot. Seed treatment fungicides will control seed-borne pathogens but will have limited effect on soil-borne pathogens.



canola

## fusarium wilt

*Fusarium avenaceum*, *Fusarium oxysporum*



### symptoms

Stems, branches and pods turn light green to yellow and eventually brown. Lightly infected plants show only yellow or reddish brown streaks on the stems, often on only one side. Severely diseased plants die prematurely and may have orange discolouration at the stem base.

canola

## fusarium wilt

*Fusarium avenaceum*, *Fusarium oxysporum*

### how crops get infected

Fusarium wilt infects the roots of the plant at the points where the lateral roots emerge.

### impact of disease

When disease levels are higher or severe, yield loss can be up to up to 30 percent.

### what to look for when scouting

Scout for initial symptoms of foliar discoloration, plant stunting and wilting. The development of symptoms on one side of the stems is characteristic of several wilt diseases, including verticillium wilt. Symptoms may also be mistaken for root rot or drought damage, however, there will not be any external root lesions and only individual plants will show symptoms.

### how to manage the disease

Rotating crops with cereals may reduce inoculum levels within the soil. Most, if not all canola hybrids, are resistant to this pathogen.

canola

*sclerotinia**Sclerotinia sclerotiorum**symptoms*

Infection begins as soft watery rot on leaves and stems. When a lesion completely girdles the main stem, the plant will wilt and die. Diseased plants are straw-coloured. The disease is also confirmed by discovering black sclerotinia bodies in the stem of the plant.

canola

*sclerotinia**Sclerotinia sclerotiorum**how crops get infected*

Sclerotinia overwinters in soil. When it germinates, the bodies form spore-producing structures called apothecia that release airborne spores that infect nearby flowers and dead tissue. Infected petals fall and initiate lesions on leaves and leaf axils. When new bodies form, they are released back into the soil after harvest.

*impact of disease*

Yield loss models indicate an approximate crop loss of 50 percent. If 30 of 100 plants have main stem infection, yield loss could be up to 15 percent.

*what to look for when scouting*

Scouting for apothecia is difficult because of its small size and numbers. Instead, scout for conditions that favour its growth. Scout low wet spots that allow for sclerotinia to germinate and nearby fields that had a previous host crop (e.g., canola, soybeans and pulses).

*how to manage the disease*

Monitor the weather and use a fungicide at 20 to 50 percent bloom prior to the appearance of disease symptoms. This is the best approach. Early assessment can be completed by:

- 1) monitoring the conditions up to flowering and consulting a sclerotinia checklist,
- 2) testing petals for spore infestation using a commercially available kit and
- 3) consulting regional sclerotinia risk maps.

## verticillium stripe

*Verticillium longisporum*



Photo credit: Justine Cornelissen, Canola Council of Canada

### symptoms

Faint black vertical striping can be seen on the stems, which when rubbed, may appear darker. Blackening can be seen on the inside of the stem and becomes more obvious as the plants mature. At the end of ripening, the fungal bodies will germinate and produce external spores, giving the stems a powdery look.

## verticillium stripe

*Verticillium longisporum*

### how crops get infected

Verticillium stripe directly enters plant roots through openings in the root. Infections prevent the regular flow of water and nutrients, eventually causing the inner stem tissue to turn black, collapse and shrivel.

### impact of disease

Due to the late onset of the disease, it is less damaging than many other diseases.

### what to look for when scouting

Start to scout for symptoms after flowering, although symptoms are not typically observed until later in the growing season. Verticillium stripe can also be mistaken for sclerotinia stem rot and blackleg. While there may be shredding of the stem similar to sclerotinia stem rot, the hollowing inside the stem will distinguish sclerotinia from the tiny fungal bodies of verticillium stripe.

### how to manage the disease

Currently there are no registered foliar or seed treatment fungicides to control verticillium stripe in canola. As well, there are no varieties of canola with host-resistant traits. Control measures include increasing the length of rotation of non-host crops; managing weeds; increasing soil fertility; using non-host trap crops, green manures, fumigation (Vapam® and chloropicrin), equipment and tool sanitation; and controlling off-farm traffic and monitoring seed/feed/fertilizer sources.





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<sup>†</sup>Source: Bayer DSTs (2016)

<sup>†</sup>2017 BPI (Business Planning Information) Data.



corn

contents

- anthracnose stalk rot ..... 69
- common rust ..... 71
- eyespot ..... 73
- fusarium and gibberella ear rot  
(mycotoxin producing pathogens) ..... 75
- grey leaf spot ..... 77
- northern leaf blight ..... 79

crop disease guide: corn

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corn

## anthracnose stalk rot

*Colletotrichum graminicola*

### symptoms

The most obvious symptom is sudden death and lodging of plants before they mature. Since the leaves wilt and die, the plant appears to be “frosted” or dying from the top. Examination of the stalk in these dead areas show the same black shiny symptoms that are found at the base. Blue-black fungal bodies or pink fungal bodies are produced on the stalk surface.

corn

## anthracnose stalk rot

*Colletotrichum graminicola*

### how crops get infected

Rot pathogens survive and overwinter in soil, crop and weed residues. Disease incidence is higher with minimum tillage, especially when corn follows corn in rotation. Infection occurs through plant roots and stalks. Rain splash carries spores to stalks and leaves and wounds provide points of entry.

### impact of disease

The earlier in the season that stalk rot develops, the greater the impact on yield. Yield losses of about 10 to 20 percent arise from poorly filled ears and losses due to lodging.

### what to look for when scouting

Scout R5 through R6. Pinch the lowest above-ground internode. If it is easily crushed, it indicates stalk rot. Check at least 100 plants throughout the field. If more than 10 percent of stalks are easily crushed, harvest the field early as standability may be an issue.

### how to manage the disease

Use resistant hybrids whenever possible. Plow under residue and control weeds and volunteers to reduce inoculum levels. Crop rotation is essential in areas where reduced tillage is practiced. The control of stalk-boring insects will reduce the entry of *C. graminicola* into the stalk through feeding sites. Use seed treatments and specific foliar fungicides that are registered to protect against stalk rot.



corn

# common rust

*Puccinia sorghi*



## symptoms

Small flecks of discolouration on the leaves turn into small round-to-elongated reddish brown pustules containing spores. Pustules develop on upper and lower leaf surfaces, husks, leaf sheaths and stalks. Leaf tissue around the pustules turns yellow, withers and dies when the disease is more severe.

corn

# common rust

*Puccinia sorghi*

## how crops get infected

Late in the growing season, dark brown spores are produced in pustules on the leaves. These spores only survive the winter in the southern United States. Pustules with reddish fungal spores develop on the infected corn plants, which are carried by wind into Canada. The fungus does not overwinter in Canada.

## impact of disease

Substantial damage may occur in wet seasons where high humidity and temperatures exist. Infected plants may be predisposed to stalk rot.

## what to look for when scouting

Best scouted V12 through R4 or earlier in seed production fields. Raised brick-red pustules are a good diagnostic for common rust.

## how to manage the disease

Field corn hybrids have varying, but often moderate, rust resistance. Early planting ensures that the crop develops to a more resistant stage before spores arrive in the region. Foliar fungicide applications are also useful when managing this disease and should be made at early tassel or the onset of disease. Cultural practices, such as crop rotation and burying residue, have little effect because rust spores do not overwinter in Canada.

corn

# eyespot

*Aureobasidium zeae*

corn

# eyespot

*Aureobasidium zeae*

cereals

canola

corn

soybeans

pulses



### symptoms

On leaves, eyespot lesions are round to oval, 2 to 5 mm in diameter and have a tan to creamy centre with a brown or purple margin surrounded by a yellowish water-soaked halo. Lesions may fuse to form large necrotic areas and upper leaves may wither and die prematurely.

### how crops get infected

Eyespot overwinters in crop residue and spores are spread by rain splash and wind. It is specific to corn and occurs during cool wet weather in late August and September.

### impact of disease

Plants infected with eyespot may be predisposed to stalk rot, which results in lower yields.

### what to look for when scouting

Look for small circular spots starting as early as the V3/V4 stage. "Eyespots" will be outlined by brown to purple rings and a yellow halo. Hold leaves up to light to view translucent patches.

### how to manage the disease

In areas with a history of eyespot, grow resistant hybrids. Crop rotation and burial of residue reduces early season infection. Since eyespot is specific to corn, rotate with crops such as soybean, wheat and barley to lower incidence. Foliar fungicides applied at early tassel or the onset of disease symptoms will help protect against eyespot.

corn

## *fusarium and gibberella ear rot (mycotoxin producing pathogens)*

*Fusarium graminearum, Fusarium spp.*



### *symptoms*

Typical symptoms are a whitish pink to salmon mold on infected kernels. Infected kernels tend to be randomly scattered on the ear and may exhibit a starburst symptom where white streaks radiate from the point of silk attachment to the kernel. Husks may become bleached and adhere tightly to the kernels. Black fungal bodies may be visible on the husks.

corn

## *fusarium and gibberella ear rot (mycotoxin producing pathogens)*

*Fusarium graminearum, Fusarium spp.*

### *how crops get infected*

The pathogen overwinters in soil and on crop residue. Spores are produced in wet weather and are dispersed primarily by wind, but also by rain splash. Infection occurs through the silks or through wounds created by birds or insects. Silks are highly susceptible 2 to 6 days after the start of silking, and kernels are susceptible until they reach physiological maturity.

### *impact of disease*

These pathogens are capable of producing mycotoxins, which are a health hazard to swine, cattle and other livestock.

### *what to look for when scouting*

Check for Western Bean Cutworm pressure. If pressure is high, consider an early silking insecticide application tank-mixed with a fungicide labelled for corn ear rot. Cool wet conditions are conducive to ear rot development. If your field has had corn ear rot in the past, it is likely that the inoculum is still present and ear rot could develop.

### *how to manage the disease*

The best way to protect against ear rot is to use a fungicide registered for fusarium and gibberella suppression in corn. The fungicide should be applied at early to full silking (R1 + 2 days is optimal). Crop rotation and fall tillage may reduce disease levels in the next season. If ear rot is identified, harvest should begin as soon as possible to prevent further mold growth.



corn

# grey leaf spot

*Cercospora zeae-maydis*



## symptoms

Soon after tasseling, narrow rectangular lesions that are about 2 to 7 cm long develop and run parallel to the veins on the lower leaves. The colour of the lesions change from light tan to grey with maturity. The lesions eventually join together to lighten or kill an entire leaf.

corn

# grey leaf spot

*Cercospora zeae-maydis*

## how crops get infected

Grey leaf spot overwinters in crop residue. Spores produced on the residue are dispersed by wind and rain splash. Warm humid weather is conducive to infection and disease development.

## impact of disease

The disease has caused significant yield losses in the United States surrounding the Great Lakes and is therefore a threat to Canada. It is most problematic when corn follows corn in rotation in fields with a considerable amount of crop residue.

## what to look for when scouting

Scout the lower leaves just after tasseling for narrow rectangular lesions that run parallel to the veins. The lesions may be light tan to grey in colour, depending on the stage of maturity.

## how to manage the disease

Some hybrids are tolerant to the disease and crop rotation and tillage will help reduce inoculum levels in crop residues. Rotation and hybrid resistance are necessary with reduced tillage. Foliar fungicide application can be used to help manage this disease. Applications should be made before or at the onset of disease symptoms – usually just before or at early tassel.

corn

# *northern leaf blight*

*Setosphaeria turcica*



## *symptoms*

The disease first appears as long elliptical greyish green or tan lesions on upper and lower leaves. Lesions expand to 4 cm wide by 15 cm long and are marked by a greyish green zone at the margin. When infection is severe, leaves may appear burnt as the lesions join and the leaves die. Severely infected plants turn greyish green and die prematurely.

corn

# *northern leaf blight*

*Setosphaeria turcica*

## *how crops get infected*

Northern leaf blight overwinters on corn residue. Spores are wind-borne up to 2 km and are also dispersed by rain splash. Humid weather with rain showers and persistent leaf wetness at temperatures between 18 and 27°C are conducive to early outbreaks and secondary spreading. Plants with northern leaf blight may be predisposed to stalk rot.

## *impact of disease*

Northern leaf blight is one of the most damaging leaf diseases for corn in Canada and can lead to significant yield losses.

## *what to look for when scouting*

Scout both lower and upper leaves for the first signs of the disease. Leaf lesions are long, elliptical and greyish green or tan in colour. If plants are severely infected, they will turn greyish green and die prematurely.

## *how to manage the disease*

Crop rotation and tillage reduces infected crop residue and lowers pathogen populations. There are four physiological types of the fungus and hybrids are available that are resistant to one or more types. Apply fungicide early in seed corn and sweet corn, ideally pre-tassel. In grain corn, scout for early disease symptoms and apply a fungicide at early tassel or at the onset of the disease.



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soybeans

contents

- asian soybean rust ..... 85
- brown spot (septoria) ..... 87
- charcoal rot ..... 89
- frogeye leaf spot ..... 91
- powdery mildew ..... 93
- phomopsis stem blight ..... 95
- white mould ..... 97



crop disease guide: soybeans



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soybeans

## asian soybean rust

*Phakopsora pachyrhizi*

### symptoms

Rust symptoms are most commonly seen on the leaves starting in the lower canopy. Lesions can also develop on petioles, pods and stems and first appear as small yellow and irregularly shaped spots in early stages. Symptoms develop rapidly once the plant starts flowering and can result in significant defoliation.

soybeans

## asian soybean rust

*Phakopsora pachyrhizi*

### how crops get infected

Asian soybean rust infects plants through airborne inoculum. In areas that experience frost, inoculum is blown in from over-wintering sources.

### impact of disease

Soybean rust development can be explosive, causing rapid loss of leaves and yield.

### what to look for when scouting

Scout for lesions in the lower canopy, petioles, pods and stems of plants. Lesions first appear as small yellow and irregularly shaped spots. Later they enlarge and are tan to dark reddish brown. Also look for spores produced in volcano-shaped uredinia.

### how to manage the disease

There are three basic management tactics that play a role in reducing soybean rust epidemics: fungicides, genetic resistance, and cultural practices. At the present time, the use of fungicides is the only effective tactic.

soybeans

*brown spot (septoria)**Septoria glycines**symptoms*

The disease appears on primary leaves shortly after the trifoliolate leaves develop. Lesions enlarge and join, often concentrated along the veins or margins. Disease development slows under warm dry conditions and progresses rapidly in early fall. Infected leaves turn yellow and die rapidly.

soybeans

*brown spot (septoria)**Septoria glycines**how crops get infected*

Brown spot overwinters in crop residue and infected seed. Spores are spread from residue, infected plants and by rain splash.

*impact of disease*

Yield impact has historically been minimal. Stress caused by a warm, rainy season, shading and infection by soybean cyst nematode increases the severity of the disease.

*what to look for when scouting*

Scout for small dark brown irregular spots with or without a yellow halo on the upper and lower surfaces of the lower leaves. Brown spot is characterized by small black fungal bodies embedded in the necrotic tissue of older lesions.

*how to manage the disease*

No resistant cultivars are commercially available, but some are tolerant to the pathogen. Rotate soybean crops with non-host crops, such as corn and wheat. Bury all soybean residue. A balanced fertility system may reduce disease severity.



soybeans

# charcoal rot

*Macrophomina phaseolina*



## symptoms

Symptoms usually begin during the reproductive stages of development and are first evident in the driest areas of a field. Symptoms include smaller leaves, reduced vigour, premature yellowing of top leaves and wilting. A light grey discolouration develops on the surface tissue of roots and lower stem areas.

soybeans

# charcoal rot

*Macrophomina phaseolina*

## how crops get infected

Charcoal rot overwinters in dry soil and in the residue of host plants and contaminated seed. Infection typically occurs in the spring when soil moisture is high.

## impact of disease

May cause moderate to significant yield loss depending on the severity and the environmental conditions.

## what to look for when scouting

Scout at the beginning of the reproductive stages of development. Scout for smaller leaves, reduced vigour and premature yellowing of top leaves. Surface tissue of the roots and lower stems may have a light grey discolouration. Tiny hard black resting fungal bodies may appear when the outer tissue is scraped.

## how to manage the disease

Rotate crop with non-hosts to reduce inoculum levels. A crop rotation of two years without soybeans should be adopted in severe cases. Use irrigation where available to reduce drought stress. Avoid excessive seeding rates and maintain adequate soil fertility levels, especially potassium. Reducing tillage systems can help conserve soil moisture, but increases disease inoculum in crop residue. Certain foliar fungicides are effective at managing this pathogen.

soybeans

# frogeye leaf spot

*Cercospora sojae*

soybeans

# frogeye leaf spot

*Cercospora sojae*

cereals

canola

corn

soybeans

pulses



## symptoms

Small lesions develop that are 1 to 5 mm in diameter with a tan centre and a dark red or brown border. Grey spores may be visible within the lesions. Older lesions will join and leaves may appear ragged.

## how crops get infected

Frogeye leaf spot overwinters in soybean residue and in seed. Seedlings may become infected with foliar symptoms, normally developing in warm and humid weather. In Ontario, symptoms appear during flowering and pod development and infect the pods and seeds.

## impact of disease

The pathogen can cause yield loss in Eastern Canada, but has not caused significant losses in Western Canada.

## what to look for when scouting

During flowering and pod development, scout for lesions that are 1 to 5 mm in diameter with a tan centre and a dark red or brown border.

## how to manage the disease

Use crop rotation with non-host crops and plant non-infected seed. Genes for resistance are known, but are generally not available in cultivars for northern regions. Certain foliar fungicides are effective at controlling this pathogen.

soybeans

## powdery mildew

*Microspheara diffusa*

### symptoms

Under favourable conditions, white spots spread rapidly over the entire surface of leaves, stems and pods. Underneath the mildew, the host tissue shows a purplish discolouration. As plants begin to mature, pinhead-sized fungal bodies develop on the infected surface, which are golden brown to black in colour.

soybeans

## powdery mildew

*Microspheara diffusa*

### how crops get infected

Powdery mildew is stubble-borne and long-distance airborne. Hot days followed by cool dewy nights and low rainfall favour disease development. In Western Canada, powdery mildew develops earlier in dry years when compared to years of normal rainfall.

### impact of disease

Powdery mildew is widespread across Western Canada, however, resistant varieties have managed to survive the impact. Yield loss of more than 60 percent have occasionally been reported.

### what to look for when scouting

Scout upper surface of leaves for fine powdery white spots. If conditions are favourable, these spots can also be found on stems and pods.

### how to manage the disease

Use resistant cultivars where possible. In areas where the disease occurs frequently and resistant cultivars are not available, early seeding and the use of early maturing cultivars, plus a fungicide application, will provide effective control. Other control measures include crop rotation, burying infested crop residue and locating new crops away from the previous year's fields.



soybeans

*phomopsis stem blight**Diaporthe phaseolorum**symptoms*

The fungus produces black fungal bodies in linear rows on mature soybean stems. These black structures may also cover pods, but may not follow the same linear pattern seen on stems. Symptoms are most prevalent when soybeans near maturity.

soybeans

*phomopsis stem blight**Diaporthe phaseolorum**how crops get infected*

Phomopsis stem blight survives in crop residue and seed. Another source of inoculum is infected seed. The fungus infects soybean plants early in the season from rain-splashed spores from residue or from planting infected seeds.

*impact of disease*

The pathogen is present in all soybean-growing regions. Economic losses are not severe unless warm wet weather occurs before harvest.

*what to look for when scouting*

Scout for black fungal bodies in linear rows on mature soybean stems. These black structures may also cover pods, but may not follow the same linear pattern seen on stems.

*how to manage the disease*

Crop rotation with non-host crops, in conjunction with the removal of soybean residue, will reduce disease incidence levels. Plant healthy seed and use a fungicide seed treatment. Plant full-season cultivars and harvest as soon as possible after they mature.

soybeans

## white mould

*Sclerotinia sclerotiorum*



### symptoms

White bleached lesions develop on stems, leaves and petioles in the lower part of the canopy. Cottony white fungus is sometimes visible on the surface of lesions under humid conditions. The appearance of lesions is followed by rapid wilting of infected plants. Affected plants turn grey then brown.

soybeans

## white mould

*Sclerotinia sclerotiorum*

### how crops get infected

White mould overwinters as hard dark resting fungal bodies in soil and crop residue. These fungal bodies produce mushroom-like structures called apothecia, which release airborne spores.

### impact of disease

Severe infestation can cause significant yield loss.

### what to look for when scouting

Scout for white bleached lesions on stems, leaves and petioles in the lower part of the lower canopy. Under humid conditions, scout for cottony white fungus that is visible on the surface of the lesions. Look for irregular patches of wilting throughout the field. Infected stems and pods will have hard black resting fungal bodies on or in the infected stems and pods.

### how to manage the disease

Use wider row spacing to promote air circulation in the crop canopy. Use long-term crop rotation with corn or small grains. Avoid rotating soybean with susceptible crops, such as pulses, sunflower or canola. Some varieties are more tolerant than others.



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crop disease guide: pulses

pulses

contents

anthracnose ..... 103

ascochyta blight ..... 105

downy mildew ..... 107

grey mould (botrytis stem and pod rot) .. 109

mycosphaerella blight ..... 111

powdery mildew ..... 113

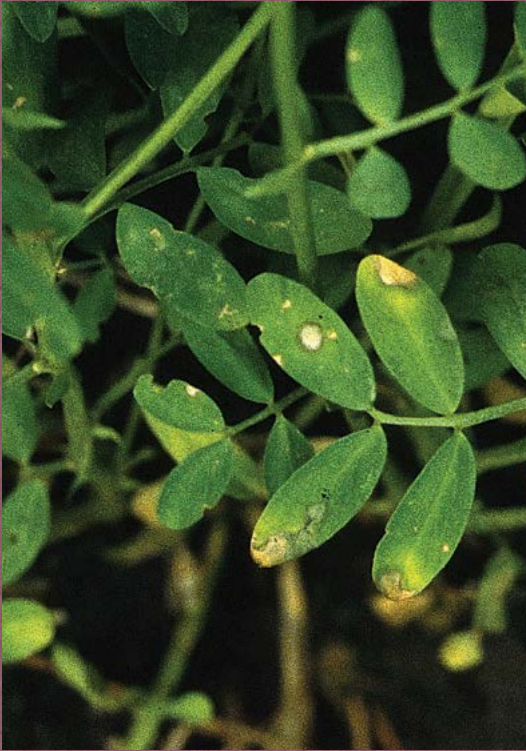
stemphylium blight ..... 115

white mould ..... 117

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*lentils · dry beans*

## *anthracnose*

*Colletotrichum truncatum*

### *symptoms*

Greyish-white oval lesions appear on lower leaflets at the seedling stage, but more commonly appear when the crop canopy begins to close. Stem lesions are tan to brown and sunken. They first develop near the stem base and girdle the stem. It first appears as yellow patches in fields after canopy closure. Dead plants will have stem bases that appear black, which persists on the stubble after harvest.

*lentils · dry beans*

## *anthracnose*

*Colletotrichum truncatum*

### *how crops get infected*

Anthracnose is stubble- and seed-borne.

### *impact of disease*

Yield losses can be up to 60 percent.

### *what to look for when scouting*

Prior to flowering, scout for small brown to dark brown spots on the lower parts of plants.

### *how to manage the disease*

When anthracnose is established, a rotation of at least four years between lentil crops is vital. Eliminating volunteer lentil plants and wild vetch is important. The application of a foliar fungicide before canopy closure will reduce stem infection and yield loss.

## ascochyta blight

*Ascochyta pisi*, *Ascochyta lentis*,  
*Ascochyta rabiei*, *Ascochyta fabae*



### symptoms

Symptoms differ slightly between pulse crops. Generally in dry conditions, small purple spots appear on leaves and, under moist conditions, these purple spots enlarge, turning into well-defined, brown-black lesions.

## ascochyta blight

*Ascochyta pisi*, *Ascochyta lentis*,  
*Ascochyta rabiei*, *Ascochyta fabae*

### how crops get infected

Ascochyta blight may either be seed-borne, soil-borne, or survive in stubble. Cool wet weather promotes spore production, dispersal and infection.

### impact of disease

Peas: Yield loss of 5 to 15 percent.

Lentils: Loss of quality and yield loss up to 70 percent.

Chickpeas: Severe epidemics can result in 100 percent yield loss.

Faba beans: Yield loss of 10 to 30 percent.

### what to look for when scouting

Scout early, start before flowering and then every 5 to 7 days thereafter. Look for small brown spots at the lower parts of the plants. The centres of lesions become speckled with tiny black fungal bodies.

### how to manage the disease

Plant disease-free certified seed. Avoid growing the same crop more than once in four years in the same field. Till or harrow infected residue. Use a seed treatment to reduce seed-borne transfer. Foliar fungicides are effective.



peas

## downy mildew

*Peronospora viciae*

### symptoms

A fluffy greyish white growth that develops in patches and occasionally covers the entire lower surface of leaflets. The leaf becomes chlorotic to light brown on the side opposite the infected area. Systemic infection causes severe stunting, foliar distortion and seedling death. Pod infection causes seed abortion and discolouration.

peas

## downy mildew

*Peronospora viciae*

### how crops get infected

Downy mildew survives in soil and seed and may also be stubble-borne. Inoculum in the soil and seed will result in systemic infection. Plant-to-plant spreading is caused by airborne spores.

### impact of disease

This disease is common and can cause serious yield loss in cool wet years. On the Prairies, it is usually not very common.

### what to look for when scouting

Scout for fluffy greyish white growth in patches, and occasionally the entire lower surface of the leaf. The disease is most common soon after emergence, but may affect plants at any growth stage during periods of cool moist weather.

### how to manage the disease

A 2 to 3 year crop rotation will reduce soil-borne inoculum levels. Seed produced in low rainfall areas is normally free of seed-borne inoculum.

peas · lentils · chickpeas · dry beans

## grey mould (botrytis stem and pod rot)

*Botrytis cinerea*

### symptoms

Plants ripen prematurely due to infection of the lower stem. The infected portion of the stem is light brown or bleached and covered with a grey mouldy growth. Infected seed from diseased pods may be shriveled and discoloured. Pod lesions start to develop in parts of the pod in contact with dead petals, which persist in the flower after pollination.

peas · lentils · chickpeas · dry beans

## grey mould (botrytis stem and pod rot)

*Botrytis cinerea*

### how crops get infected

Grey mould is both seed- and stubble borne. Later in its life cycle spores can become wind-borne. Cool wet weather promotes infection. In dense lodged stands, the disease is spread by plant-to-plant contact.

### impact of disease

Yield loss can exceed 50 percent.

### what to look for when scouting

Scout during late flowering when the symptoms typically first appear. Look for prematurely ripening plants, light brown or bleached stems, brown or rotten pods and grey mouldy growths on stems and pods.

### how to manage the disease

Use disease-free seed and a seed treatment to control seedling blight. Using wide row spacing and reduced seeding rates may improve crop ventilation and reduce stem and pod rot, but can result in heavier weed infestation. Application of a foliar fungicide will aid in controlling the pathogen.

*mycosphaerella blight**Mycosphaerella pinodes***symptoms**

Leaves have small purplish spots with irregular and indefinite margins. On older leaves or when wet, lesions enlarge and may join and cause tissue to dry up. Lesions on petals are small and infected blossoms may drop. Distinctive purplish black lesions on stems often join to cause blighting and foot rot.

*mycosphaerella blight**Mycosphaerella pinodes***how crops get infected**

*Mycosphaerella blight* is seed-, stubble- and soil-borne. Infection occurs when the emerging seedling comes in contact with resting spores or the pathogen grows from the seed into the stem.

**impact of disease**

*Mycosphaerella blight* is the most common disease of field peas in Western Canada. Yield loss can be significant.

**what to look for when scouting**

Scout leaves for small purple spots that have irregular and indefinite margins. On stems, lesions will be purplish black and will cause blighting and foot rot. Pod lesions are small and light in colour. On seedlings, lesions will be on the stem base.

**how to manage the disease**

Losses can be reduced by crop rotation and using disease-free seed. Infested crop residue should be cultivated under the soil surface after harvest. Fungicide seed treatments may prevent the disease from spreading and may reduce other diseases, such as seed rot. The application of a foliar fungicides can help.



*peas · dry beans*

## *powdery mildew*

*Erysiphe pisi*

### *symptoms*

Lesions initially appear as fine powdery white spots on the upper surface of leaves. Under favourable conditions, the spots spread rapidly over the entire surface of the leaves, stems and pods. Underneath the mildew, the host tissues show a purplish discolouration. As plants begin to mature, pinhead-sized fungal bodies develop on the infected surface, which are golden brown to black in colour.

*peas · dry beans*

## *powdery mildew*

*Erysiphe pisi*

### *how crops get infected*

Powdery mildew is stubble-borne and long-distance airborne. Hot days followed by cool dewy nights and low rainfall favour development of the disease. In Western Canada, powdery mildew develops earlier in dry years.

### *impact of disease*

It is widespread across Western Canada, but resistant varieties have managed the impact. Yield loss of more than 60 percent has occasionally been reported.

### *what to look for when scouting*

Scout upper surface of leaves for fine powdery white spots. If conditions are favourable, these spots can also be found on the stems and pods.

### *how to manage the disease*

Use resistant cultivars where possible. In areas where the disease occurs frequently and resistant cultivars are not available, plant your seed early and use early maturing cultivars. Fungicide application may provide effective control, as will crop rotation, burying infested crop residue and locating new crops away from the previous year's fields.

## stemphylium blight

*Stemphylium botryosum*



### symptoms

Leaflet lesions appear at all stages of crop development. Lesions are light cream in colour, usually with angular patterns of lighter and darker areas that spread across or along the entire leaflet. After wet weather in late summer, crops may appear grey due to extensive infection on the upper foliage. Leaflet drop follows, which may be beneficial in drying down the crop.

## stemphylium blight

*Stemphylium botryosum*

### how crops get infected

Stemphylium blight survives in seed, on crop residue and is a naturally occurring fungus. Sporulation and infection are promoted by wet weather in the summer.

### impact of disease

Severe yield loss in lentil crops has been reported in other countries, but significant losses have not been observed in Canada.

### what to look for when scouting

Scout at the 8 to 10 node stage, prior to flowering and then every 5 to 7 days thereafter. Look for lesions that are light cream in colour, usually with angular patterns of lighter and darker areas that spread across or along the entire leaflet.

### how to manage the disease

Since the destructive potential is unknown, the need for control is uncertain. Crop rotation is likely to have little effect, since the pathogen is a naturally occurring fungus. Foliar fungicides to control ascochyta blight and anthracnose may also reduce stemphylium blight.

## white mould

*Sclerotinia sclerotiorum*



### *symptoms*

A soft rot of leaves, stems and pods will develop within the crop canopy. Under humid conditions, a fluffy white fungus is visible on the surface of the rotting tissue. Affected areas become slimy and infected stems wilt or ripen prematurely. When conditions are dry, infected stems and pods appear bleached and break easily.

## white mould

*Sclerotinia sclerotiorum*

### *how crops get infected*

White mould overwinters in dark hard resting fungal bodies. In the spring, these fungal bodies produce mushroom-like structures called apothecia, which release airborne spores. Infection can also be initiated by direct contact of lodged plants with hard dark resting bodies on the soil surface.

### *impact of disease*

Severe infestations can cause a significant loss in yield and quality.

### *what to look for when scouting*

Scout for small mushroom-like structures just before and during the early blossom stage/canopy closure. Scout for soft watery lesions that become covered with dense white cottony growth. Check for hard dark resting fungal bodies inside the infected stems and pods.

### *how to manage the disease*

Prevent build-up of the pathogen in soil by including a high proportion of non-host crops in rotation, such as cereals that are not susceptible. Wide row-spacing and reduced seeding rates will improve canopy ventilation and may reduce infection. Foliar fungicides that are active against sclerotinia are an effective option.





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