FUSARIUM HEAD BLIGHT

WHAT IS FUSARIUM HEAD BLIGHT?

Fusarium graminearum (Fg) is a serious fungal disease of cereal grains that affects yield and grade, resulting in poor quality grain intended for feed, malting, milling, and the biofuel industry. Recent surveys indicate Fg is established in southern Alberta and traces are present in central and northern regions of the province. Although all cereal crops are susceptible, durum and corn are major hosts.

Fg can be effectively controlled under normal conditions using a combination of disease prevention strategies throughout the growing season. The use of a single strategy usually fails when weather conditions are favourable for infection. During the growing season, strategies include careful herbicide applications, irrigation management and an in-crop fungicide application if risk levels are moderate to high.

WHAT DOES FUSARIUM LOOK LIKE?

Fg in Wheat

FG in Barley

FHB MANAGEMENT DURING THE GROWING SEASON (JUNE 2013)

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Cereal crops are most vulnerable to new Fg infection at flowering time if weather conditions are moist and warm. Disease spores are spread by rain splashes and wind to infect open flowers. If possible, irrigation during flowering should be avoided.

Grain heads that rapidly and uniformly pass through the flowering period are least susceptible, so prevention of crop injury during post-emergent herbicide applications is important to prevent uneven crop maturity. Variable maturity extends the flowering period, thus leaving the crop open to a longer infection period, prolonging the irrigation break and reducing fungicide performance.

Observable Fg symptoms don't appear until the late heading stage when it is too late to apply protective fungicide. A decision to apply a fungicide must be made prior to this, at the early flowering stage. Disease risk level increases when more of the following factors exist:

- field is located in a region where Fg is established,
- cereal variety being grown is susceptible to Fg,
- durum or corn is in the crop rotation,
- cereal crops are frequently grown in the same field or in nearby fields,
- weather conditions are damp and warm at crop flowering stage,
- irrigation is used in the farm operation,
- yield potential is good,
- cereal grain prices are high.

If the risk level is assessed as moderate to high and yield return justifies fungicide application cost, a foliar fungicide application should be applied at early flowering to protect open florets. Application of fungicide too early is better than too late.

With wheat, flowering begins 3 to 4 days after head emergence and lasts approximately 7 days. The optimum stage for fungicide application is during early flowering when some visible anthers are present on the head, so begin watching closely when the wheat head begins to emerge from the boot.

With barley, flowering begins just prior to head emergence and continues during heading, lasting approximately 14 days. The optimum stage for fungicide application is when the spike is fully emerged from the boot, so begin watching when the first spikelet emerges from the boot.

Studies indicate that FHB control is improved by directing spray nozzles at 30 degrees from the horizontal either forward or backward or simultaneously forward and backward, and use a high water volume to optimally cover grain heads. While 10 gallons (45 litres) per acre of water is adequate for spring wheat, 18 gallons (80 litres) per acre are recommended for durum as durum grain heads are more difficult to wet.

The most apparent Fg disease symptom is premature bleaching or blighting of one or more spikelets in the head, which stands out on green heads (see picture). Under prolonged humid conditions, orange-coloured fungal spores appear on blighted parts of the head. If humid conditions persist, the pathogen can cause higher mycotoxin levels by spreading to other kernels and heads after seed set.

Foliar Fungicide options: Folicur, Proline, Bravo, Caramba, Prosaro.
Barley – Caramba, Proline, Prosaro.
Wheat – Bravo, Caramba, Folicur, Proline, Prosaro.

-Neil W. May 2013

Fusarium Fact Sheet

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex92

Alberta Fusarium graminearum Management Plan

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex5210

Fusarium Head Blight – Frequently Asked Questions

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/faq12513

Fusarium Head Blight (FHB), Scab, Pink Mold or White Heads

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/prm4518

Article: Fusarium – the Enemy Within (January 2013)

http://www1.agric.gov.ab.ca/$department/newslett.nsf/all/agnw20430

BLACKLEG OF CANOLA

WHAT IS BLACKLEG OF CANOLA?

Blackleg is a disease of the cabbage family and occurs on crops such as mustard and canola. It is caused by two species of fungi. One species, *Leptosphaeria maculans*, is a highly virulent, or aggressive, pathogen of canola that can cause serious yield losses in susceptible canola crops. It infects canola seedlings early in the season and colonizes plants through the summer, eventually causing a dry rot at the base of the stem that cuts off water and nutrient flows. The diseased plants ripen prematurely, have reduced seed yield and may even be killed. The other fungus, *Leptosphaeria biglobosa*, causes mild infections that do not lead to significant economic losses and is therefore less of a concern to canola producers.

The virulent or aggressive blackleg fungus was first detected in Canada in 1975 in east central Saskatchewan, but today both blackleg fungi occur everywhere canola is grown in western Canada.

WHAT DOES BLACKLEG LOOK LIKE?

ARTICLE: "MAKING A COMEBACK" – BLACKLEG ON CANOLA

Blackleg was once a devastating disease that commanded the respect of all canola producers in Western Canada 20 to 30 years ago. The disease received less attention after the introduction of resistant canola cultivars that essentially eliminated the disease risks, especially when sound crop rotation practices were employed with the resistant cultivars. However, blackleg disease is now making a comeback across the Canadian prairies and once again getting lots of attention from those involved or interested in canola production.

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The virulent or aggressive blackleg fungus was first detected in Canada in 1975 in east central Saskatchewan, but today both blackleg fungi occur everywhere canola is grown in western Canada. In the 1980's and 1990's it was estimated that the aggressive blackleg fungus caused over $500 million in losses in Saskatchewan alone (www.canolacouncil.org). Today blackleg is still one of the most commonly found diseases in canola fields on the Canadian prairies, but it can be successfully managed by scouting/evaluating risks, and employing the necessary management tools.

Growers can scout for evidence of blackleg risk at three key times:

- Spring and summer – look for dirty-white lesions with small "pepper-like" spots on cotyledons, foliage and stems (Figure 1)
- August and September – look for dry basal stem cankers and blackening of the internal stem tissues just prior to swathing (Figure 2)
- Next year (or the year after canola was harvested) – look on the remaining canola stubble/residue for fungal spore producing structures, called pseudothecia (Figure 3).

Taking time to carefully develop a blackleg management plan is important for canola producers because of the explosive nature of the disease and the serious economic losses that could result from a severe outbreak. Additionally, multiple management tools need to be incorporated into a blackleg management plan because blackleg cannot be controlled with just one management tool. The blackleg fungus is highly adaptable to most management tools and therefore control of the disease will rapidly decline when only one tool is used. For example, the blackleg fungus can rapidly become insensitive to many fungicides, and it has the potential to overcome the genetic resistance of the host canola plant very quickly. A sound blackleg management plan would include some of the following components:

1. Rotate away from crops that are susceptible to blackleg for 3 or 4 years. This is the foundational management tool for blackleg management upon which the consistent success of all other tools is rooted. The blackleg fungus does not survive very long in soil, so once the canola residues have decayed and broken down, the fungus has nowhere to live, and the pathogen populations quickly decline. This process of canola residue breakdown takes 3 to 4 years. Once the populations of the blackleg fungus have declined, then other management tools will be able to successfully, and consistently, control blackleg disease. If crop rotation options are limited, then rotation of canola varieties, foliar fungicides, tillage and weed management will become increasingly important. However, without adequate crop rotation, the consistency of the performance of these other tools may be compromised. The blackleg risk on a farm or field can be estimated using the information given in Table 2. Where growers have a high risk in categories 1-3, a fungicide application should be seriously considered.

2. Use resistant, or moderately resistant, canola cultivars. Avoid susceptible or moderately susceptible cultivars. Using resistant cultivars, in conjunction with rotation, will successfully control blackleg in most canola producing areas of western Canada. Keep in mind that the population structure of the blackleg fungus will adapt to host resistances over time, therefore rotating canola resistance genes will also be an important part of disease management. Canola seed company representatives and canola agronomists may be able to assist canola growers in making educated choices about what canola cultivars could be used to “mix up” the resistance genes that the blackleg fungus is trying to adapt to. It’s like shuffling a deck of cards so that you don’t play the same card each year. When the same card is played repeatedly, the fungus quickly adapts to the resistance gene the resistance breaks down. As mentioned in #1, mixing up (or rotating) the resistance genes employed on a farm is even more important when crop rotation options are limited.
3. Foliar fungicides can be an important tool to help reduce the blackleg populations in a field, or region, and can reduce disease severity and avoid yield penalties due to early blackleg infections. There are a number of fungicides registered to control blackleg on canola. The fungicide application targets the early infections of the aggressive/virulent fungus which become very damaging and yield-reducing. These damaging infections are initiated at the cotyledon to bolting stage in canola; therefore the fungicides must be applied early in the season, at the 3-5 leaf stage, to prevent these infections. Table 1 lists the available fungicides, their application timings and other properties associated with their use. A fungicide application may not be a sufficient compensation for a lack of crop rotation or employment of effective genetic resistance.

4. Blackleg can be transmitted on seed. Even though the transmission of blackleg on seed is likely very low, seed infection could initiate disease early, or introduce a new race of the blackleg pathogen onto your farm. Therefore high quality, disease-free, with a registered seed treatments applied, should be used to establish a healthy canola crop. Do not use bin-run grain as seed, especially if it was harvested from a region that had any fields with high levels of blackleg disease.

5. Tillage practices can, in theory, affect the rate of decomposition of canola stubble, and also prevent the release of spores from the pseudothecia the year after the canola was harvested. However, mixed results have been obtained when burying or burning canola stubble have been performed in attempts to control blackleg. Ploughing to bury canola stubble in the top 12 cm (5 in) could be considered as a potential management strategy on farms where blackleg is a serious and recurring problem, however it should not be considered as a foundational management principle and it should not be expected to provide consistent, effective management of blackleg.

6. Weed control in important for managing canola diseases, because the susceptible weeds can provide a reservoir of disease that carries inoculum through the non-host rotation period. If there are ample weeds from the Brassica family (volunteer canola or mustard, wild mustard, shepherds purse, stinkweed) then the rotation period will be ineffective.

Blackleg quick facts:

- Blackleg was the most commonly occurring disease in Alberta canola fields in 2012
- The blackleg fungus causes disease lesions on leaves and stems, but it is the unseen growth of the fungus inside the stem that causes almost all of the yield loss
- Blackleg caused crop failures in some Alberta fields in 2012
- Both the virulent and weakly virulent species of blackleg occur in western Canada, while only the weakly virulent species occurs in China. This situation has caused some trade barriers for Canadian canola supplies destined for Asia.
- Blackleg incidence and severity has been slowly increasing over the past few years as crop rotations have become shorter, and less diverse, due to the increasing canola production
- Spraying fungicides to control blackleg must be done prior to scouting for in-crop disease symptoms.
- Evaluating blackleg risk can be done using canola stubble from the previous year, and even in an adjacent field.

Table 1. Fungicides registered for use against blackleg on canola

Product	Active Ingredient	Fungicide Group	Stage	Rate (mL/acre)	Water (L/acre)
Headline	Pyraclostrobin	11	2-6 leaf stage	120 – 160	40
Quadris	Azoxystrobin	11	2-6 left stage	200	40

Table 2. Assessment of blackleg risk		
Category	**High Risk**	**Low Risk**
1. Scouting	No scouting	Quantify blacklet at end of season and in-crop scouting
2. Crop rotation	2 year or less rotation	3 or 4 year rotation
3. Variety rotation	Same variety in tight rotation	Use a different variety each time
4. Fungicide	No fungicide use	Use Headline or Quadris
5. Seed source	Bin run seed	Certified treated seed
6. Weed control	Poor control or brassica weeds	Good weed control

Blackleg Facts

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex147

CLUBROOT

WHAT IS CLUBROOT?

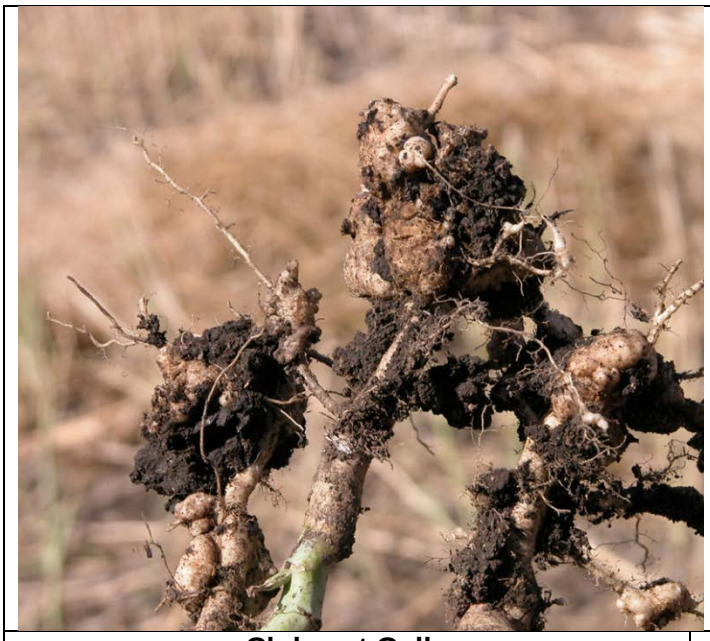
Clubroot is an infectious disease that can significantly reduce yield and quality, or even destroy a susceptible crop entirely, if infestation levels are high. Although clubroot itself is not new to Alberta, the first case reported in farm-grown canola in western Canada was in the Edmonton area in 2003, and it has continued to spread since.

Clubroot is a serious soil-borne disease of canola, mustard and other crops in the cabbage family. As the name suggests, roots of infected plants have a club-like (galled) appearance. Infection at the seedling stage can result in wilting, stunting and yellowing symptoms by the late rosette to early podding stage, while premature ripening or death can be observed in plants nearing maturity. Plants infected at later growth stages may not show wilting, stunting or yellowing, but may still ripen prematurely, and seeds may shrivel, thus reducing yield and quality.

WHAT DOES CLUBROOT LOOK LIKE?

Resistant vs Susceptible

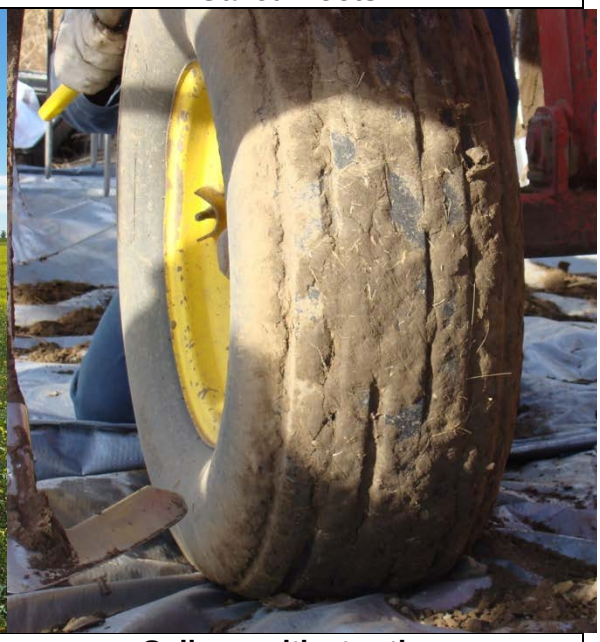
Resistant vs Susceptible



Clubroot Galls

Galled Roots

Above Ground Symptoms



Soil on cultivator tire

ARTICLE: HOW TO COMBAT CLUBROOT IN YOUR CROPS (JUNE 2013)

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Clubroot can be a tricky disease to identify. The above-ground symptoms can mimic drought, nutrient deficiencies or other diseases, so suspect plants need to be carefully dug from the soil to check for typical clubroot galls on the roots. Other causes of root galling in canola can include hybridization nodules and injury from phenoxy herbicides, so suspect plants should be sent to a lab for confirmation. Most of the varieties of canola, mustard and cole crop vegetables currently being grown in Alberta are highly susceptible to clubroot.

Root galls are usually visible on plants that are 6-8 weeks of age, when canola and mustard are usually at the bolting to early flowering stage, so this is a good time for producers and agronomists to start scouting for the disease. Crops can be examined throughout the remainder of the season, but tall stands can be very difficult to walk through. After crops are swathed and combined, clubroot galls can be looked for in stubble fields, which are much easier to walk through; however, plants should be dug up rather than pulled because mature galls may break off and remain behind in the soil.

So what should producers do if they suspect clubroot in their fields this season?

- First confirm the disease diagnosis. To avoid misdiagnosing a suspect plant by relying on visual symptoms alone, symptomatic plants should be submitted to a provincial plant health lab or to a private lab that offers a clubroot testing service. Consult the Canola Council of Canada's website (www.clubroot.ca) for a list of plant diagnostic labs in western Canada.

- Confirmed cases of clubroot should be reported to a local municipal authority, such as an agricultural fieldman, or to the provincial agriculture department using the Alberta Pest Surveillance System toll-free number (310-2777). In Alberta, clubroot is a declared pest under the Agricultural Pests Act and the owner or occupant of land where this disease has been found has the responsibility to take measures to prevent its establishment and spread. Recommendations for the prevention and control of clubroot can be found in the Alberta Clubroot Management Plan (http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex11519).

- Practice good sanitation to restrict the movement of potentially contaminated soil and plant material between fields. This approach will help reduce the spread of other diseases, weeds and insects too. Clubroot resting spores are most likely to spread via contaminated soil and infected canola plant parts adhering to farm equipment, machinery and vehicles that have worked in infested fields. Consult the "Managing Clubroot: Equipment Sanitation Guide" on the Canola Council's website (www.clubroot.ca) for practical tips on sanitizing various kinds of equipment. The website also sets out recommended protocols for entering clubroot-infested fields or those of unknown status.

To recap, careful scouting of canola crops and the use of best management practices (BMPs) are the key to preventing or controlling clubroot. Growers should consider the following key management strategies:

1. Assess your risk and prevent clubroot from arriving on farm (equipment sanitization).
2. Identify clubroot early (crop scouting).
3. Develop a comprehensive clubroot management plan, including the use of clubroot-resistant varieties, longer and logical crop rotations, and the sanitization of vehicles, machinery and equipment used in infested fields. These BMPs serve both to prevent the introduction of clubroot and to deal with the disease if and when it arrives on a farm.
4. Work with your local municipality. Ag Service Board Fieldmen in Alberta are designated inspectors under the Agricultural Pests Act and can provide growers with advice on recognizing and managing clubroot in susceptible crops. They may also know where clubroot has been found in their respective jurisdictions and will have the responsibility to enforce municipal clubroot regulations.

For more information on clubroot, including more details on what you can do to prevent this disease, go to www.agric.gov.ab.ca or www.clubroot.ca.

Alberta Clubroot Management Plan

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex11519

Clubroot Frequently Asked Questions

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/faq7389

Facts about clubroot disease

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8593

Disinfesting farm machinery and equipment to prevent spread

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/prm12120