Blackleg of Canola

What is Blackleg?

- Blackleg is a serious disease of canola found in the canola growing regions of Western Canada.
- Caused by the fungal pathogen *Leptosphaeria maculans*. A less aggressive pathogen, *Leptosphaeria biglobosa* can cause upper stem lesions but typically does not significantly affect yield.
- Infects canola from the seedling stage onward, with inoculum from previous residue/stubble. The most critical stage of infection occurs during the seedling stage.
- The disease progresses as the crops grows, eventually girdling the stem and cutting the plant off from the vital uptake of nutrients and water, leading to yield loss.
- Genetic resistance, in combination with integrated pest management strategies and proper agronomic practices, can assist in combating this disease.

Blackleg Life Cycle and Symptoms

- The blackleg pathogen overwinters on the previous season's crop residue.

Blackleg Life Cycle and Symptoms *(continued)*

- In spring ascospores from the infected residue are released into the air and infect cotyledons and young leaves, forming leaf lesions.
- These leaf lesions form pycnidia that release spores (pycnidiospores). These spores mobilize (via rain splash) to further infect the plant and spread the disease to neighboring canola plants.
- As the season progresses the original infection moves towards the base of the stem (often referred to as "basal stem canker").
- The cankering at the base of the stem cuts off water and nutrient uptake resulting in premature ripening or plant death.
- Early infections generally lead to greater yield loss. Later infections cause less damage but do contribute to the following years soil inoculum.

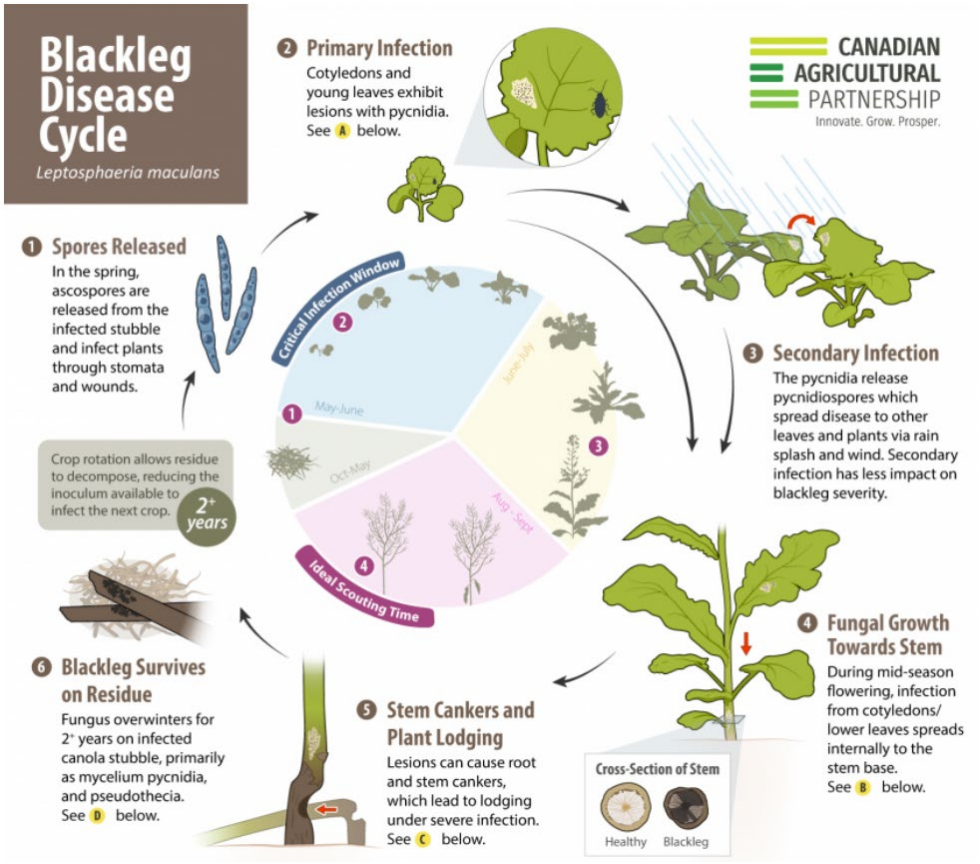


Figure 1. Blackleg disease life cycle (Photo courtesy of the Canola Council of Canada).

Figure 2. Blackleg leaf lesion.

Figure 3. Stem cross section with blackleg damage.

Figure 4. Root and stem cankers.

Breeding for Genetic Resistance

- The Corteva Agriscience Canola Development Team uses a combination of both seedling and adult plant resistance when developing products with blackleg resistance (Table 1).

Table 1. Types of blackleg resistance.

	Seedling: Race Specific Resistance	Stem: Adult Plant Resistance
Also known as:	Major gene or qualitative resistance	Minor gene or quantitative resistance
Resistance Mechanism	Gene for gene or race specific. Resistance gene matches blackleg race. If other races are present the resistance can be over come.	Non race specific. Many genes, each with a relatively small effect, working together to provide resistance caused by any blackleg race.
Location of Resistance	Stem and leaves	Stem only
Mode of Action	Selects for corresponding races virulent for the gene	Does not select for corresponding virulent genes (less selection pressure on pathogen population)
Durability of Resistance	Breaks down with race shifts	Durable over time

Evaluating Blackleg Resistance

- Industry wide testing protocols are utilized in evaluating new canola hybrids for blackleg resistance prior to commercialization.
- Disease severity is rated using the following scale (0-5) based upon the level of diseased tissue in stem cross sections (Table 2).
- Hybrids are then provided a rating based on their susceptibility to blackleg versus the susceptible check, Westar (Table 3).

Table 2. Blackleg disease severity scale.

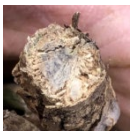
Disease Score	0	1	2
			
Level of disease of cross section	No disease tissue visible	<25% disease	25-50% disease
Disease Score	**3**	**4**	**5**
			
Level of disease of cross section	51-75% disease	>75% disease, some green stem left	Stem/plant is completely dead

Table 3. Blackleg resistance labels.

Field Resistance Rating	% Disease Severity of Westar
R (Resistant)	0-29.9
MR (Moderately Resistant)	30-49.9
MS (Moderately Susceptible)	50-69.9
S (Susceptible)	70-100

On-Farm Evaluations

- The best time to assess the level of a blackleg infestation in a field is near 60% seed colour change (swathing) or near harvest (straight cut).
- Collect 50-100 plants in a W pattern at random from a field.
- Using clippers, cut the base of the plant (stem and root intersection) and observe any black tissue.
- Use the 0-5 scale (Table 2) to determine the severity of the field infection.

Management

- **Crop Rotation:** A minimum two-year break from canola.
- **Scout Fields:** Scout fields regularly to determine incidence (number of plants infected) and severity (proportion of the plant tissue infected).
- A registered fungicide application may be warranted under high disease pressure. These applications will suppress the infection but will not cure the disease. Generally, these can be applied from the 2-6 leaf stage. Consult individual product labels for best practices.
- **Seed Treatment:** The LumiGEN® canola disease package, including Lumiscend™ fungicide seed treatment, provides industry leading protection of airborne blackleg.
- **Hybrid Selection:** Choose canola hybrids with the best overall agronomic package for your farming needs with an R blackleg rating.

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