NDSU EXTENSION
EXTENDING KNOWLEDGE ❯❯ CHANGING LIVES

PP1988 (Reviewed Oct. 2022)

Canola Diseases: Blackleg

Fereshteh Shahoveisi, Canola Research Assistant, Department of Plant Pathology
Sam Markell, Extension Plant Pathologist, Department of Plant Pathology
Luis E. del Río Mendoza, Canola Pathologist, Department of Plant Pathology

Figure 1. Lesion on cotyledon. (Luis del Rio Mendoza, NDSU)

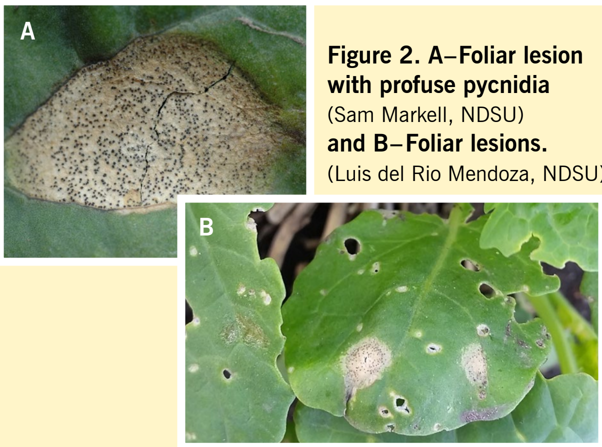

Figure 2. A–Foliar lesion with profuse pycnidia (Sam Markell, NDSU) **and B–Foliar lesions.** (Luis del Rio Mendoza, NDSU)

Figure 3. Ruptured stems with pycnidia. (Sam Markell, NDSU)

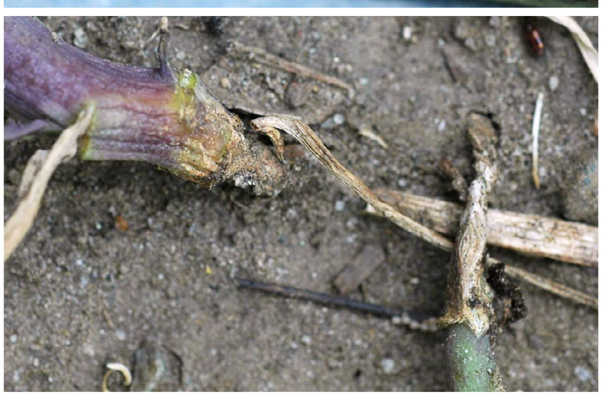

Figure 4. Stems with girdling lesions. (Sam Markell, NDSU)

Blackleg is one of the most serious diseases affecting canola production in North Dakota. Field surveys conducted in recent years indicate blackleg presence in the state is widespread and virulent races have been detected in more than 50% of scouted fields. Yield losses due to this disease commonly range between 5% and 20%; however, under severe conditions they can be greater than 50%.

Cause

The fungus *Leptosphaeria maculans* is the primary cause of blackleg of canola. Another species, *L. biglobosa*, can cause minor damage to the crop but is not considered an important threat to canola in North Dakota.

L. maculans is genetically variable, and different races (formerly called pathogenicity groups in canola) develop as the pathogen overcomes resistance genes. The prevalence of races changes in response to the resistance genes in the hybrids being planted. When a resistant hybrid is planted continuously, especially in short rotations, races capable of attacking it will increase in prevalence.

If this selection pressure is not managed properly, yield losses due to blackleg will increase to the point where the resistance genes present in the hybrid no longer will be useful. Therefore, planting cultivars with appropriate sources of resistance is essential in the management of blackleg.

Previously, races that infect cultivars carrying resistance genes *Rlm1* or *Rlm2* were grouped within pathogenicity group 2 (PG-2), and races that attack cultivars carrying resistance genes *Rlm1*, *Rlm2* or *Rlm3* were grouped within PG-4. While multiple races can be contained in each PG, they all have the ability to infect cultivars that carry the resistance genes listed.

Sign and Symptoms

Signs and symptoms of the disease may be observed on cotyledons, leaves, stem and pods (Figures 1-4). Lesions on cotyledons (Figure 1) and leaves (Figure 2 A and B) are round to irregular in shape and light brown to tan. Small dark-colored fungal pycnidia (these structures release asexual spores called pycnidiospores) are visible on the surface of the lesions.

Upon infection, the fungus moves through the vascular system into the main stem and toward the crown and root regions. Stem lesions may result in rotting and canker development in the crown area or where the stem is attached to the leaves; however, lesions may form on any part of the stem. The stem might rupture (Figure 3) and be severed from the root system under extreme disease pressure (Figure 4).

NDSU | EXTENSION
North Dakota State University, Fargo, North Dakota

The pathogen can infect canola plants at any stage of development. However, infections that occur between the seedling stage and the fourth- to sixth-leaf growth stage have the highest chance of reaching the crown and typically result in significant economic damages.

Plants that are affected late in the season show symptoms similar to nutrition deficiency and water stress. These plants may not show obvious lesions or cankers on the stem but may have dark discoloration inside the basal stem.

Root discoloration and rotting can cause premature death and yield reduction. Infected pods may result in seed infection, and they might shed and result in yield loss.

Survival and Dissemination

The pathogen overwinters on canola residue as pseudothecia, which are small dark-colored sexual fruiting bodies. In the spring, ascospores are produced and disseminated by the wind over long distances; however, most remain close to the source.

While ascospores can be released after one year of overwintering, ascospore release reaches its maximum rate on 2-year-old stubble. Once lesions form, pycnidia will develop and produce asexual spores that act as secondary inoculum. These spores can travel short distances via wind and rain splash and cause "hot spots" in the field.

The pathogen also can survive on canola seeds. When seed-borne infections occur, emerged seedlings show the lesions on cotyledons. Infected plants might become stunted and die premature.

The severity of the disease is higher in regions with frequent rainfall, and warm and humid conditions. However, the disease can be problematic under dry conditions if early season showers disperse the inoculum.

Maximum spore dispersal happens when the air temperature is between 55 and 70 F and the relative humidity is higher than 80%. Wind also has an important role in the dispersal of sexual and asexual spores that cause primary and secondary infections, respectively.

Published with support from

Northern CANOLA GROWERS Association

Management

Integrated pest management (IPM) strategies such as cultural practices, certified seed, seed treatment and fungicide application are highly recommended in the management of blackleg disease.

Scouting: Scouting is important to determine if management tools (such as genetic resistance) are effective. Cotyledons and lower leaves can be inspected for tan lesions with small dark-colored pepperlike structures (pycnidia) in the center. Stem cankers and vascular discoloration may be visible as the season progresses.

Resistance: Planting resistant cultivars is an essential part of blackleg management. More than a dozen resistance genes have been identified, although not all of them have been incorporated into commercial hybrids. Some seed companies are labeling their hybrids according to the resistance genes they carry. Rotation of resistance genes is important for long-term effective management. As a rule of thumb, avoid planting the same hybrid in more than two consecutive growing seasons.

Crop rotation: Two-year old canola residues produce the highest amounts of ascospores; therefore, avoid planting canola every other year if blackleg is a problem. Additionally, tight rotations can increase the speed at which the pathogen produces new races and overcomes resistance genes. A three-year rotation will help manage the disease.

Avoid canola residue: When possible, avoid planting canola close to a previous year's crop residue. Canola stubble from previous seasons can act as important sources of inoculum for the new plantings. While 1,500 feet of separation is ideal, even shorter distances between planting will reduce the amount of spores traveling to the new crop.

Weed management: Common weeds such as shepherd's purse and wild mustard, as well as volunteer canola, can be infected by blackleg and will serve as sources of inoculum. Weeds and volunteers infected with blackleg reduce the efficacy of crop rotations in reducing inoculum.

Certified seed: Planting disease-free seed prevents seed-borne infections and introduction of the disease to new areas.

Seed treatment: Seed treatments can protect the seedlings from early infection, especially when the disease pressure is high. However, treated seeds provide protection for no longer than three weeks after planting. Multiple compounds have been registered for seed treatment in North Dakota. For the most recent information, see the "North Dakota Field Crop Disease Management Guide" (Extension publication PP622).

Fungicide application: In some cases, foliar fungicide application may help manage blackleg. Several factors, including resistance level of the hybrid, crop rotation plan, weather conditions and inoculum presence, should be taken into consideration before making any fungicide applications. The most efficacious timing of foliar applications is typically when plants are at the two- to four-leaf growth stage. Forecasting models that predict the effect of ascospore shower time on disease development and that help determine optimal timing of fungicide application are being developed. Incorporation of these models into a forecasting system is in progress and may help growers making management decisions in the future.

Consult the most recent publication of the "North Dakota Field Crop Fungicide Guide" (Extension publication PP622) for more information regarding foliar applications.