Plant Disease Management
NDSU Extension Service

Blackleg of Canola

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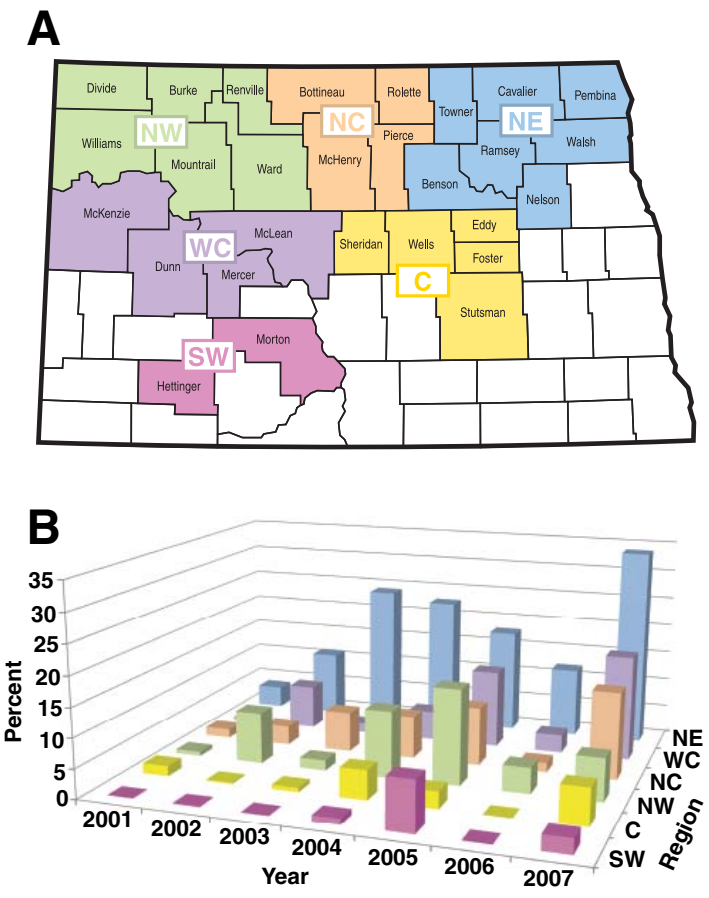

Figure 1. North Dakota regions surveyed between 2001 and 2007 (A) and mean incidence of blackleg infected plants by year (B).

Blackleg, caused by the fungus *Leptosphaeria maculans,* is one of the most destructive diseases of canola *(Brassica napus)* in North Dakota. The disease has been found in every canola-growing region of the state, and yield losses exceeding 50 percent have been reported in severely infected fields.

Blackleg first was reported in Saskatchewan and Manitoba in 1975 and 1984, respectively. In 1991, an annual disease survey was established to assess prevalence of canola diseases in North Dakota. Blackleg was found in all fields surveyed and, on average, 28 percent of the plants in these fields were infected with the disease. Data from more recent surveys demonstrate that blackleg continues to be a common disease in North Dakota (Figure 1).

This publication is based on the original publication, PP1024 Blackleg of Canola, by Art Lamey, Professor Emeritus, Department of Plant Pathology.

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Cause

The fungal pathogens *Leptosphaeria maculans* and *Leptosphaeria biglobosa* can cause blackleg.

Initially, all blackleg disease was thought to be caused by one pathogen, *L. maculans,* which then was divided into pathogenicity groups (PGs). Two PGs were identified in North Dakota in the 1990s: PG1 (previously called the mild strain) and PG2 (previously called the virulent or aggressive strain). However, in 2003 and 2004, additional groups — PG3, PG4 and PGT — (also called aggressive strains) were identified. Since then, PG1 isolates have been identified as a different species, *L. biglobosa*. *Leptosphaeria biglobosa* attacks leaves more frequently than stems and in general is less damaging that *L. maculans* (PG2, PG3, PG4 and PGT).

Intensive surveying in recent years has indicated that relatively few infections are caused by *L. biglobosa*. In a 2002-04 survey of blackleg in North Dakota, only 5 percent of diseased isolates tested were caused by *L. biglobosa*. Of infections caused by *L. maculans*, 92 percent were caused by PG2, 3 percent were caused by PG3, 4.5 percent were caused by PGT and less than 1 percent was caused by PG4. Because of this, this publication will focus primarily on *L. maculans*.

Signs and Symptoms

Infection by the blackleg pathogen often is observed first on leaves. Round to irregular-shaped lesions with a tan or buffed color appear as early as the seedling stage, but can occur anytime until crop maturity. Leaf spots enlarge and small black fruiting bodies called "pycnidia" are formed in the center of the lesions (Figure 2). Pycnidia are small but visible to the unaided eye and resemble ground black-pepper flakes in color and size.

Stems are most susceptible to infection before they reach the four- to six-leaf stage. Lesions can occur anywhere on the stem, but often are found near the base where a leaf was attached. Stem lesions are gray to dark gray and surrounded by a dark or black border. Pycnidia frequently are produced in the center of stem lesions (Figure 3). Lesions become sunken and may rupture (Figure 4) and girdle (Figure 5) the stem, producing the characteristic "blackleg" symptom. Early infection of the stem may result in premature dying and lodging (Figure 6). Late stem infection can cause plants to look less vigorous and unthrifty, but have few above-ground symptoms. Sometimes plants with infected roots will display no above-ground symptoms, but premature death and yield loss can occur. When infected stems or roots are sliced open, they will be black, gray or stained with gray streaks.

Infections to pods and seeds can occur. Seed produced in infected pods may be gray and shriveled and infected pods may split open, resulting in seed loss.

Disease Cycle

The blackleg pathogen survives for several years on infected crop residue. In the spring, the blackleg pathogen forms fruiting structures on this residue. These fruiting structures produce sexual spores (ascospores), which can be dispersed to new canola plants and cause infection. Ascospores can be dispersed for several miles, but most are deposited much closer to the source. Maximum ascospore discharge occurs the second year following crop growth, but can occur until residue is completely degraded.

Following infection from ascospores, masses of pycnidia are produced on the resulting stem and leaf lesions. During wet weather, pycnidia release a gelatinous ooze containing pink asexual spores (conidia) that are dispersed by rain. The conidia are responsible for localized spread of the blackleg fungus, resulting in "hot spots" of infection.

Temperatures in the 70s F and extended periods of canopy wetness favor infection. Disease development is inhibited by temperatures exceeding 85 F or below 50 F. Plant injury (from insects, hail, herbicides, etc.) can increase the incidence and severity of blackleg.

The blackleg pathogen can survive for several years in infected seed. When infected seed is planted, seedlings emerge and develop cotyledon, leaf and stem infections. Infections from seed can result in early and widespread epidemics. Transport of infected seed to other regions has contributed to the spread of blackleg throughout the world.

Figure 2. Blackleg infection on leaf; note small black structures (pycnidia). Photo by Scott Halley, NDSU.

Figure 3. Gray stem lesion with dark border and numerous black pycnidia. Photo by Art Lamey, NDSU.

Figure 4. Advanced stem lesion resulting in ruptured stem; note pycnidia. Photo by Shanna Mazurek, NDSU.

Figure 5. Stems girdled and constricted by blackleg. Photo by Sam Markell, NDSU.

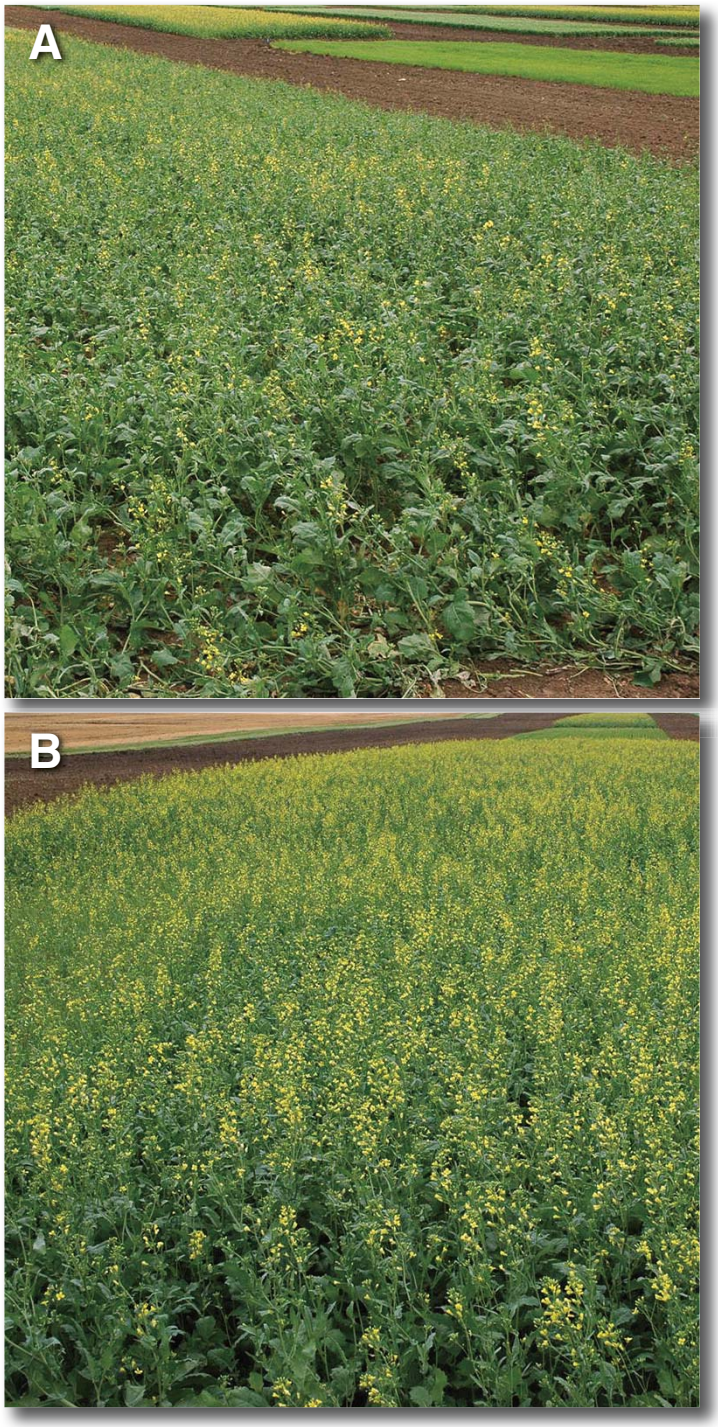

Figure 6. Research plots in a canola rotation study conducted at the North Central Research Extension Center in Minot, N.D. Canola planted eight consecutive years with severe blackleg infection resulting in lodging (A). Canola planted after three years of different rotational crops (B). The same blackleg-resistant hybrid, planting date and agronomic practices were used in both plots. Photos were taken on the same date in 2007 by Sam Markell, NDSU.

Management

Resistance — Plant a blackleg-resistant hybrid (R). Resistance is one of the most effective and least expensive management tools for this disease. However, since the identification of new PG groups in North Dakota (PG3, PG4 and PGT), resistance may not be as durable and other management strategies may be needed. Consult the most recent variety recommendations when selecting a canola cultivar.

Crop Rotation — Because the blackleg pathogen survives in crop residue for multiple years, a four-year crop rotation is recommended. If canola is rotated with crops not affected by sclerotinia (such as wheat, durum, barley, corn), both the sclerotinia and blackleg populations can be reduced.

Disease-free Seed — Plant certified, disease-free seed. This is especially important when planting canola into a new area.

Seed Treatment — Numerous fungicide seed treatments are registered for blackleg in North Dakota. Make sure to use a seed treatment that is effective against blackleg. Metalaxyl alone will not control blackleg. Consult the most recent issue of the "North Dakota Field Crop Fungicide Guide" (Extension publication PP-622) when selecting a fungicide seed treatment.

Fungicides — Economics and disease risk should be taken into consideration before applying a fungicide. High-risk factors include a susceptible or moderately susceptible variety or a tight (or no) crop rotation. Fungicide trials done in 2004 and 2005 demonstrated that a single application was able to reduce disease and provide some yield protection in susceptible varieties, but did not give adequate control as a single management strategy. Additionally, planting a resistant variety (provided the resistance was durable) and not incurring the cost of a fungicide application was more economical

If a foliar fungicide application is warranted, consult the most recent issue of the "North Dakota Field Crop Fungicide Guide" (Extension publication PP-622) for available products and always follow label directions.

Control Weed Hosts — Volunteer canola and wild mustard are hosts to the disease and should be controlled in crops in rotation with canola.

For more information on this and other topics, see: www.ag.ndsu.edu

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