



# Pest e-alerts



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## **New Disease in Oklahoma: Blackleg of Canola**

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A sample of canola plants was collected by Heath Sanders from Alfalfa County, Oklahoma and submitted to the Plant Disease and Insect Diagnostic Laboratory (PDIDL). Plants in the sample had beige lesions on the leaves and black pepper-like dots were observed within the leaf spots. The observed symptoms were the result of blackleg caused by *Leptosphaeria maculans*. The disease is also called Phoma blackleg or Phoma stem canker. Previously, blackleg has not been confirmed in Oklahoma; therefore it is not known what affect the disease will have on canola yields in our state.

There are two species of the blackleg fungus, one which is weakly aggressive and the other which is highly aggressive. *Leptosphaeria biglobosa* is the weakly aggressive species that generally affects plants later in the season by causing stem cankers that only minimally impact yield. *L. maculans* is the more aggressive species, which can attack plants at all ages and can significantly affect yield. Aggressive blackleg begins with lesions on the leaves that is followed by infection of the stems near the soil-line. Stem infections can cause deep cankers, lodging, reduced plant vigor, and in severe cases, kill the plant. The two species of *Leptosphaeria* cannot be distinguished in the field, but laboratory tests have shown that the blackleg fungus recovered Oklahoma is the more aggressive *L. maculans*.

At this time, Extension Specialists and Agronomists are working to determine the extent of the disease in the canola growing areas of Oklahoma. Symptoms have been observed on fields north of Burlington, near Cherokee, and as far south as Hennessey, OK. Given the wide distribution of infected fields, it is likely that the blackleg fungus has been present at low levels for several years. The outbreak this fall is most likely due to the cool, wet weather which was conducive for disease development and spread. If additional locations are found, they will be reported.

Given the age of the crop, growers should take no action at this time besides scouting their fields for symptoms of blackleg. Growers should review the information below about blackleg to familiarize themselves with the symptoms and management. As additional information is gathered, it will be compiled and distributed.

If growers observe symptoms of blackleg and want to have the disease confirmed, they should contact their local county extension office. The extension educators will examine samples and submit them to the PDIDL if blackleg testing is requested. Symptoms should not be confused with normal winter dormancy and dieback of leaves in cold weather.

Care should be taken to avoid introducing the blackleg fungus to uninfested fields. The spores can be carried on equipment, shoes, clothing, etc., so these items should be cleaned when leaving symptomatic fields.

### **SYMPTOMS OF BLACKLEG:**

In the early stages, the symptoms of blackleg are not obvious because only a few random leaves may be affected (Fig 1). In some cases, the symptoms are more obvious on leaves under the canopy (Fig 2). The lesions are beige colored and measure about ½ inch in diameter. As the disease progresses, additional spots develop on the leaves and the lesions may coalesce so that large portions of the leaf are affected (Fig 3). Lower leaves or severely affected leaves may yellow and die. Within the dead tissue, black pepper-like fruiting bodies develop (Fig 4). In general, the mildly aggressive strain attacks older, senescing leaves while the highly aggressive strain attacks cotyledons (seedling leaves) and young leaves. If the disease appears early in the growing season, it is more likely that the aggressive strain is involved.



**Fig 1.** Early symptoms of blackleg of canola.



**Fig 2.** Lower leaves with yellowing and leaf spots caused by blackleg.



**Fig 3.** Lower and upper leaf surfaces of canola leaves with lesions due to blackleg.



**Fig 4.** Closeup of blackleg leaf spots with black pepper-like fruiting bodies.

As the disease progresses, the aggressive species will attack the stem causing a lesion or canker near the soil-line (Fig 5). These stem lesions are beige to gray and may have a dark border. Black pepper dots may appear within the lesions which are the fruiting bodies of the fungus. Plants with stem cankers are weak and may lodge or snap off in the wind. Often, there is a latent (symptomless) period between when lesions appear on the foliage and then on the stems. The weakly aggressive strain may cause lesions on the stem, but they are generally superficial, occur late in the season, and do not impact yield.

It is also possible to have lesions appear on pods. These lesions are less obvious than those on the leaves and stems. They may exhibit the black pepper like dots and the pods often shatter prior to harvest. If the pods are infected, the seeds are usually infected with the fungus.



**Fig 5.** (top) Canola stem lesion with dark border and numerous black pycnidia. (center) advanced stem lesion resulting in ruptured stem, (bottom) canola stems girdled and constricted by blackleg. Photos by NDSU Extension Service.

**HOSTS:**

The blackleg fungus can affect a variety of *Brassica* crops including canola, rutabaga, oilseed turnip rape, turnip and cabbage. Volunteer canola is often infected with the disease (Fig 6). It can also attack plants in other genera including *Sinapis* (white mustard), *Raphanus* (radish), *Descurainia* (tansymustard, flixweed), *Sisymbrium* (rocket), *Thlaspi* (pennycress), and *Capsella* (Shepherd's purse).



**Fig 6.** Volunteer canola with leaf spots due to blackleg fungus.

**SPREAD AND SURVIVAL:**

The blackleg fungus has several methods of spread including infected seed. Although seed infection is low (usually less than 1%), it can allow the disease to travel long distances and be introduced to new fields. When infected seed is planted, the seedlings may emerge with lesions on the cotyledons (seedling leaves) (Fig 7). These lesions contain spores (pycnidiospores) that can be splashed to healthy seedlings and initiate new infections. One infected seedling could infect many surrounding plants. The pycnidiospores remain viable in plant debris at the end of the season and may continue to cause infections 3-5 years later. It may take large canola roots 2-5 years to breakdown and until stubble is completely decomposed, spores can be produced that can infect new plants.

The blackleg fungus also produces another type of spore on infected debris. This spore (ascospore) is formed when two strains of the aggressive fungus mate. The ascospores are discharged and can be wind-blown to canola or weedy mustards in nearby fields to start new infections. The spores may travel long distances on wind currents, but most land within 1 mile of the site where they were formed. Ascospores can be released from canola debris for up to 5 years although most spores are released in the first 2 years following infection.



**Fig 7.** Young canola plant with lesions on cotyledons.

#### **MANAGEMENT OF BLACKLEG:**

Research in other states on spring canola has shown that fungicides rarely provide control of blackleg on plants that are larger than the 6-leaf stage. Fungicides may have some value if applied to young plants and are most valuable as seed treatments. Fungicide studies on winter canola have recently been established in northern and central Oklahoma to evaluate the

efficacy of labeled products on control of blackleg. Blackleg is best controlled by integrating a variety of methods. The following recommendations should be followed as management practices allow.

1. **CERTIFIED SEED:** If available, use certified, blackleg-free seed. The seed should include a certificate that indicates the seed lot tested negative for the blackleg fungus. This is most important when new fields are being planted in areas not known to have blackleg.
2. **FUNGICIDE SEED TREATMENT:** Canola seed should always be treated with a fungicide that is effective for blackleg control. It is important to remember that even if seed tests negative, a few infected seeds may slip through the testing process. Fungicide seed treatments further reduce the chance of introducing blackleg to a field. Use the recommended rates for seed treatment. Seed treatments will also protect against other diseases and insects.
3. **CROP ROTATION:** Rotate out of canola for 3-5 years. Longer rotations ensure that infected stubble has sufficiently degraded and that spores are no longer viable.
4. **WEED CONTROL:** Volunteer canola and weedy mustards should be eliminated (Figs 8 and 9). If these alternative hosts are not removed, crop rotation will not be effective. The broad host range has not been well studied, but an effort should be made to eliminate weeds in the mustard family (Brassicaceae) from infected fields, the border of infected fields, and fields in rotation out of canola.
5. **SANITATION:** Clean equipment and machinery before moving field to field. This is especially important if canola is being planted in fields or areas not previously planted to canola. Care should also be taken to clean boots, hands, clothing, etc. after visiting an infected field as spores can easily be carried and introduced to uninfected crops.
6. **TILLAGE:** If canola plants are infected with blackleg, bury canola stubble under 5 inches of soil. This will bury debris and fruiting bodies so that they are not on the surface releasing spores that will blow to nearby hosts. If debris is not buried, it may serve as a source of inoculum (spores). Infected canola residue may release spores for 3-5 years after infection.
7. **SEEDING:** Use shallow tillage or direct seeding to prevent bringing residue back to the soil surface at planting. Non-hosts such as wheat should be planted during crop rotations.
8. **RESISTANCE:** Growers should plant varieties that are less susceptible to blackleg. In locations where blackleg is established, the use of resistant or tolerant varieties is the main method of controlling blackleg. Table 1 lists the reaction of the most common winter canola varieties used in Oklahoma to blackleg. These ratings are from the National Winter Canola Variety Trial, and indicate that their level of resistance to blackleg varies considerably for different canola varieties.





**Fig 8.** Volunteer canola plant infected with blackleg directly across the road from a canola field.



**Fig 9.** Shepherd's purse, an alternate host for blackleg, adjacent to a canola field.

**Table 1.** Field ratings for winter canola varieties commonly grown in Oklahoma.<sup>1</sup>

Variety	Blackleg % diseased <sup>2</sup>
Westar <sup>3</sup>	90
DKW46-15	53
DKW47-15	40
DKW45-10	37
Wichita	30
DKW41-10	27
HyClass 110W	27
Sumner	23
HyClass 115W	20
HyClass 154W	13

<sup>1</sup> Field ratings for resistance to Phoma blackleg from the 2008 National Winter Canola Variety Trial in Plains, GA, Table 38. Higher numbers indicate greater susceptibility to blackleg.

<sup>2</sup> Blackleg rated as the total percentage of plants killed by blackleg or with severe basal stem canker.

<sup>3</sup> Variety included in test as blackleg susceptible standard.

If growers have questions, they should contact their local county extension educator or Dr. Tom Peeper in the Department of Plant and Soil Sciences (405-744-6420). Since blackleg is new to Oklahoma, the information presented here has been gathered from sources in other states and countries that grow canola. The effects of the fall blackleg infections on Oklahoma grown canola has yet to be determined. We will continue to evaluate the situation as the crop matures and will present new information as it becomes available.

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