FIELD-LEVEL SYMPTOMS:

- Diseased plants can initially be seen in fields as patches of chlorotic plants (D, E). As the disease progresses, plants are killed, resulting in patches of heavily lodged, brown plants (A, B, C, F, G).

- Anthracnose severity is influenced by fungicide usage (F) and by lentil variety (G).
  - In photo F, green plots correspond to effective fungicide treatments.
  - In photo G, greener plots correspond to lentil varieties that are less susceptible to anthracnose.
Symptoms of anthracnose are very similar to symptoms of Ascochyta blight. Laboratory analysis is often necessary to distinguish the diseases with confidence.

Leaflet lesions are tan, generally with a darker brown border (B, C). They often appear either prior to flowering (8- to 12-node stage) or shortly after bloom initiation. Diseased leaves may show premature leaf drop.

Stem lesions first appear at the base of stems and subsequently develop higher in the plant. Lesions are generally tan to light brown with a darker border. The lesions often contain numerous black dots (F, G, H, I, J); these dots are microsclerotia (long-term survival structures of the pathogen). When microsclerotia are not present, the lesions show a consistent internal tan to light brown color (A, D). As lentils mature, the lesions expand to cover large sections of the stems. These expanded lesions are often covered with abundant microsclerotia, giving them a blackened appearance (G, I, J).

Pod lesions are tan to light brown with a darker brown border (K, L). Seeds within disease pods are often infected and discolored (L).
Management of lentil anthracnose

Causal pathogen: *Colletotrichum truncatum*

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**DISEASE IMPACT:**

- **Impact on yield:** When weather is favorable for disease, yield losses from anthracnose can be severe.
- **Impact on quality:** Severely infected seeds are often discolored (see picture L, previous page).

**SOURCES OF DISEASE INOCULUM:**

- **Infested crop residues:** Anthracnose is readily transmitted from infested crop residues.
- **Microsclerotia-infested dust from harvesting:** Microsclerotia – small black survival structures of the fungus – are released as dust during mechanical harvest and carried downwind. This microsclerotia-infected dust has been shown to transmit anthracnose to lentils.
- **Alternate hosts:** *Colletotrichum truncatum*, the pathogen causing lentil anthracnose, is also an aggressive pathogen of faba beans and a moderate pathogen of field peas under field conditions. It is also an aggressive pathogen of at least one species of wild vetch (*Vicia americana*). It does not appear to cause disease on chickpeas under field conditions.
- **Infected seed is not an important source of disease.** Anthracnose is a seed-borne disease but it does not appear to be seed-transmitted: Anthracnose infects seed but there is no evidence that it is transmitted from infected seeds to germinating seedlings.

**ENVIRONMENTAL CONDITIONS FAVORING DISEASE:**

- Anthracnose develops at a wide range of temperatures when the weather is wet, but disease development is most severe at 68˚F to 75˚F.
- When the weather is favorable for disease and disease inoculum is present, the first symptoms often appear at either the 8- to 12-node stage (prior to flowering) or shortly after bloom initiation.

**DISTRIBUTION:**

- **Saskatchewan:** Anthracnose has been known to occur in Saskatchewan since 1990, and it occurs in most lentil production regions of the province.
- **North Dakota and eastern Montana:**
  - Anthracnose was first reported on lentils in North Dakota in 1992.
  - Anthracnose was widespread on lentils in central and northwestern North Dakota in 2011, including the major lentil production regions in Williams County. In fields where fungicides were not applied, it was often severe at harvest.
  - Anthracnose was not detected in eastern Montana or southwestern North Dakota in 2011.

**ANTHRACNOSE MANAGEMENT – Fungicides**

- **Fungicide efficacy:** Fungicide testing on lentils for anthracnose management has been limited, but results to-date suggest the following:
  - **Headline** at 6 fl oz/ac (pyraclostrobin) is highly effective.
  - **Bravo WS** at 1.5 pt/ac and generics (chlorothalonil) are effective when applied as a preventative application when (1) the canopy is open and (2) disease is at trace levels. This application timing generally corresponds to either the 8- to 12-node stage or early bloom. Bravo WS and generics are contact fungicides with no systemic activity, and obtaining good coverage is critical for maximizing their efficacy. They are not expected to perform as well in applications made after canopy closure.
  - **Proline** at 5 fl oz/ac (prothioconazole) and **Quadris** at 6.2 fl oz/ac (azoxystrobin) also have efficacy but appear to be slightly less effective than Headline under conditions of high disease pressure.
  - **Endura** at 6 oz/ac (boscalid) is not effective. However, these recommendations are based on a small number of field trials and should be treated cautiously.
- **Fungicide timing:** Fungicides are best applied (1) when the first foliar lesions are present, (2) before the first stem lesions develop, and (3) when the weather is favorable for disease. Typically, this timing corresponds with early bloom, but it can be either earlier or later, depending on conditions. When wet weather persists, a second application may be necessary 7 to 10 days later if a contact fungicide such as Bravo WS (chlorothalonil) was applied first or 10 to 14 days later if a systemic fungicide such as Headline or Proline was applied first.
- **Fungicide resistance management:** Anthracnose is high-risk for the development of fungicide resistance. When using fungicides to manage anthracnose, rotate fungicide chemistries between FRAC groups. Headline and Quadris are both in FRAC group 11, Proline is in FRAC group 3, and Bravo WS and generics are in FRAC group M5.
ANTHRACNOSE MANAGEMENT – Crop rotation and tillage

1. No-till is best for anthracnose management on lentils. In a study in Manitoba (see figure, below), anthracnose survived at high levels for up to 4 years in buried residues. When lentil residues remained on the surface, a significant reduction in anthracnose survival was observed after 1 year.

2. A minimum 3-year rotation out of lentils is recommended. In the same study conducted in Manitoba (see figure, below), anthracnose transmission from infested residues kept on the soil surface dropped sharply after the first year but still remained at relatively high levels for the next 2 to 3 years.

3. Field peas and faba beans are alternate hosts. Research from Saskatchewan (see figure at right) indicates that Colletotrichum truncatum, the pathogen causing anthracnose on lentils, does not cause economic damage to field peas but is able to cause disease and reproduce on field peas. The results suggest that including peas in a tight rotation with lentils may increase anthracnose pressure on lentils.

4. At least one species of wild vetch is an alternate host. Vicia americana (narrow-leaf or American vetch) is highly susceptible to lentil anthracnose (see figure at right). In regions where lentil anthracnose is a problem, managing this weedy legume species may reduce disease pressure on future lentil crops.

ANTHRACNOSE MANAGEMENT – Partial host resistance

1. Some lentil varieties have resistance to one of the two races of anthracnose that occur in North Dakota. Lentils with resistance to one race include ‘CDC Viceroy’, ‘CDC Impala CL’, ‘CDC Imperial CL’, ‘CDC Rosetown’, ‘CDC Maxim CL’, ‘CDC Redberry’, and ‘CDC Rouleau’. However, because both races are widespread, this resistance does not necessarily predict field performance.

2. No lentil varieties have complete resistance to both races of anthracnose, but some lentil varieties are less susceptible than others. In a field trial in Carrington, ND in 2011 (right and below), anthracnose developed most slowly in the large green lentil ‘CDC Greenland’, the extra-small red lentil ‘CDC Rosetown’, and the small red lentils ‘CDC Redberry’ and ‘CDC Rouleau’. However, these results are from observations made in a single field season and should be treated cautiously. Additional testing is needed for confirmation.

Host range of Colletotrichum truncatum, the pathogen causing anthracnose on lentils:

Field trials were conducted in Saskatoon, Saskatchewan in 1999 and 2000. Disease ratings correspond to disease symptoms caused by C. truncatum.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Field Trial 1</th>
<th>Field Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lentil</td>
<td>12.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Faba bean</td>
<td>9.7</td>
<td>4.0</td>
</tr>
<tr>
<td>Narrow-leaf vetch</td>
<td>8.7</td>
<td>Not tested</td>
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<tr>
<td>Field pea</td>
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<td>2.7</td>
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<tr>
<td>Chickpea</td>
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<td>Dry bean</td>
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<tr>
<td>Lupin</td>
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<td>0</td>
</tr>
</tbody>
</table>

Figure adapted from Gossen et al. 2009, Canadian Journal of Plant Pathology 31:65-73.

Survival of anthracnose in lentil residues:

Field trials were conducted in Winnipeg, Manitoba from 1991-1995 at two locations, one with clay soil and another with silt-loam soil.

Figure adapted from Buchwaldt et al. 1996, Phytopathology 86:193-1198.