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Management of anthracnose of lentils

Causal pathogen: *Colletotrichum trunacatum*

Michael Wunsch, Plant Pathologist
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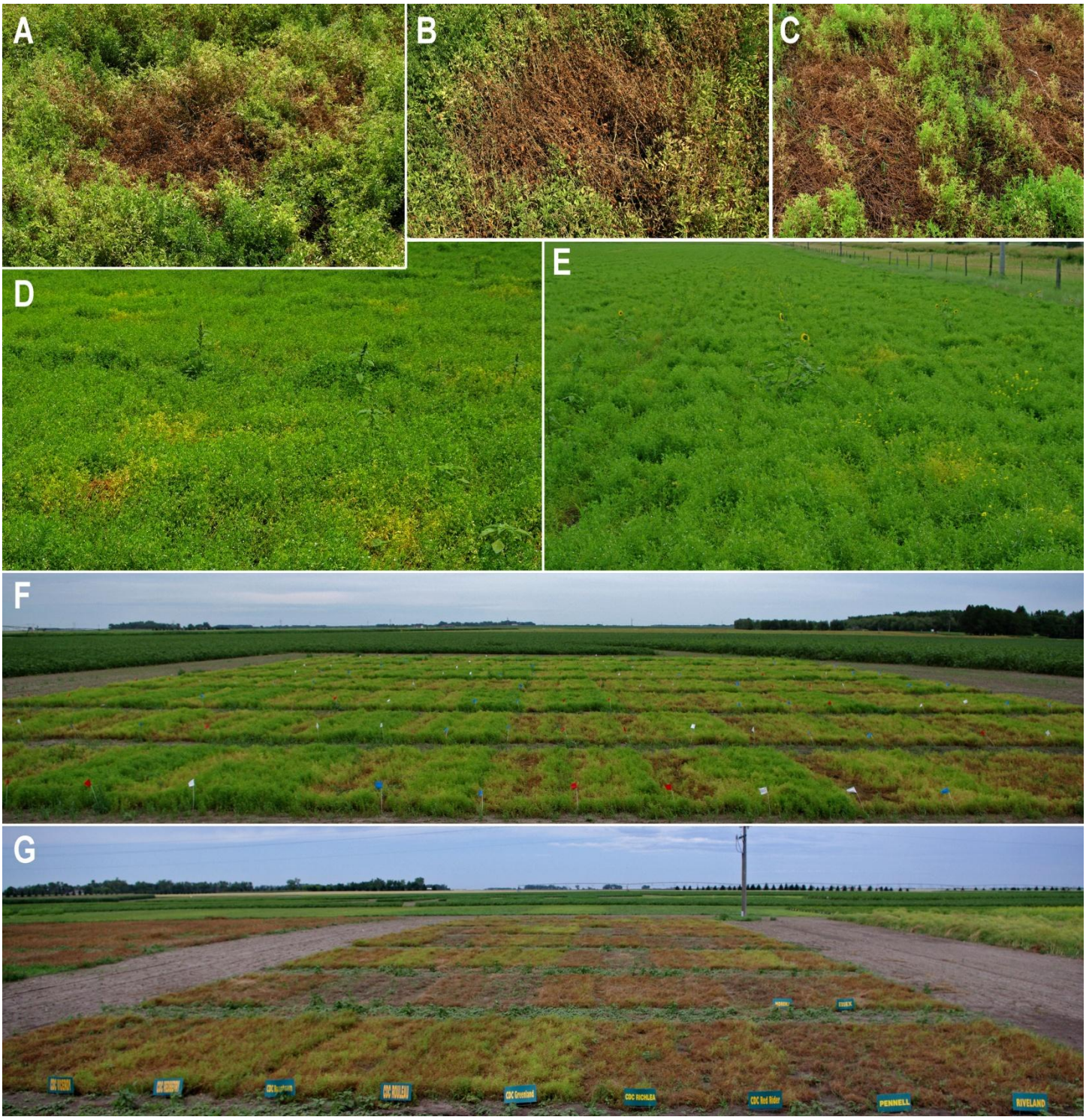
FIELD-LEVEL SYMPTOMS:

- 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.



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SYMPTOMS ON STEMS, LEAFLETS, PODS, AND SEEDS:

- Symptoms of anthracnose are very similar to symptoms of Ascochyta blight, particularly at disease initiation. Laboratory analysis is often necessary to distinguish the diseases with confidence.

- Leaflet lesions are tan, generally with a darker brown border **(B)**. 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 on the lower parts of stems and subsequently develop higher in the plant. Lesions are generally tan to light brown with a darker border and may be sunken. The lesions often contain numerous black dots **(D,E,F,G,H)**; 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**,**C)**. 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 **(E,H)**.

- Pod lesions are tan to light brown with a darker brown border **(I,J)**. Seeds within disease pods are often infected and discolored **(J)**.

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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 I, previous page). However, anthracnose does not have as severe an impact on seed quality as Ascochyta blight.

SOURCES OF DISEASE INOCULUM:

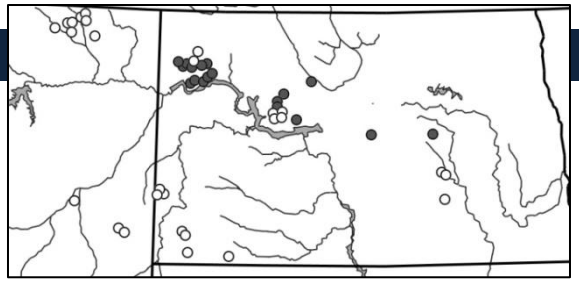
- **Infested crop residues:** Anthracnose is readily transmitted from infested crop residues.
- **Microsclerotia-infested dust from harvesting:** Microsclerotia – small black survival structures of the fungus – are released as dust during mechanical harvest and carried downwind. This micosclerotia-infected dust has been shown to transmit anthracnose to lentils.
- **Soil-borne microsclerotia and infested residues:** The fungus causing this disease persists in the soil as microsclerotia and in infested crop residues.
- **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. It was not detected in southwestern North Dakota in 2011.
  - Anthracnose was reported in Montana in 2011 and 2012 but does not appear to have reached economically damaging levels in Montana yet.



Distribution of anthracnose in lentil production fields in North Dakota and eastern Montana, 2011:
Solid circle = field assessed, disease present; open circle = field assessed, disease absent.
A field was considered positive for anthracnose if (1) characteristic disease symptoms were observed and (2) the causal pathogen was isolated in the lab from symptomatic lentil tissues.

ANTHRACNOSE MANAGEMENT – Selecting appropriate fungicides.

- **Registered fungicides differ sharply in their efficacy against anthracnose.** Fungicide efficacy testing results have been posted to the NDSU Carrington Research Extension Center website (click on "Plant Pathology"); as you select fungicides, we recommend that you assess the performance of fungicides across multiple trials and multiple locations. *Cautionary note: Fungicide performance can differ in response to the diseases present, levels of disease and crop growth stage when products are applied, environmental conditions, plant architecture, and susceptibility to disease of the lentil variety planted, and other factors. Selecting products that consistently perform well is critical.*
- **Summary of key fungicide efficacy testing results:**
  - **Headline at 6 fl oz/ac (pyraclostrobin) and Priaxor at 4 or 6 fl oz/ac (pyraclostrobin + fluxapyroxad) are highly effective**. The activity of Priaxor appears to be derived entirely from the pyraclostrobin active ingredient; fluxapyroxad applied alone shows little efficacy.
  - **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) are less effective than Headline under conditions of high disease pressure.**
  - **Endura at 6 oz/ac (boscalid) and Vertisan at 20 fl oz/ac (penthiopyrad) show little efficacy against anthracnose on lentils.**
    This summary is based on a modest number of field trials and should be treated cautiously. The summary is provided for educational purposes and is not an endorsement of any specific products.
- **Fungicide resistance management:** Anthracnose is high-risk for the development of fungicide resistance; when using fungicides to manage anthracnose, fungicides should be rotated between FRAC groups. We are currently making a concerted effort to identify and register additional fungicides from other FRAC groups that can be rotated with Headline without sacrificing disease control.

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ANTHRACNOSE MANAGEMENT – Fungicide application timing

- **When properly timed, a single fungicide application is often sufficient for managing foliar diseases on lentils.** A second application is generally only beneficial when wet weather persists and disease pressure is high.
- **In field trials conducted in Minot and Carrington, ND in 2011, optimal fungicide timing coincided with canopy closure.** However, optimal fungicide application timing can be either earlier or later, depending on conditions. Fungicides are often 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.
- **Canadian researchers recommend utilizing the following guide when timing fungicide applications:** Scout lentils every 3 to 5 days beginning at the 10- to 12-node stage and continuing through the bloom period. Assign points to plant stand (0 = thin, 5 = moderate, 10 = normal, 15 = dense), days of rain in the past 2 weeks (0 = 0 days, 5 = 1-2 days, 10 = 3-4 days, 15 = 5-6 days, 20 = > 7 days), 5-day weather forecast (0 = dry, 10 = unpredictable, 15= light showers, 20 = rain), and disease severity (0 = no disease, 5 = leaf spots on 1-5% of lower leaflets, 15 = leaf spots on 6-10% of lower leaflets, 25 = leaf spots on > 10% of lower leaflets or small stem lesions present). The threshold for making a fungicide application is a total score of 50. *This decision-making guide has not been rigorously tested in Montana or North Dakota and is provided for reference only.*

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 often does not predict field performance.
2. **No lentil varieties have complete resistance to both races of anthracnose, but some lentil varieties are less susceptible than others.** See the Carrington Research Extension Center website (click on "Plant Pathology") for results from field trials in which lentil varieties were screened against anthracnose.

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.

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

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

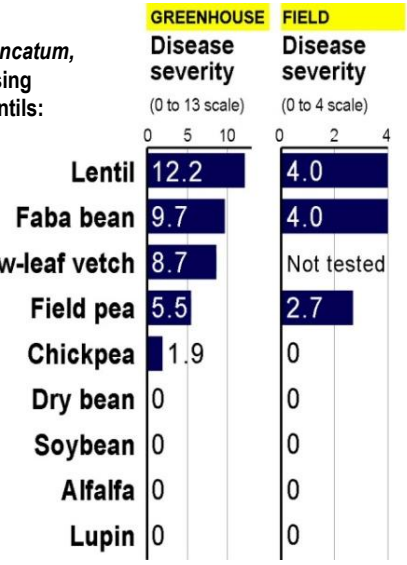

Figure adapted from Gossen et al. 2009. Canadian Journal of Plant Pathology 31:65-73.

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.

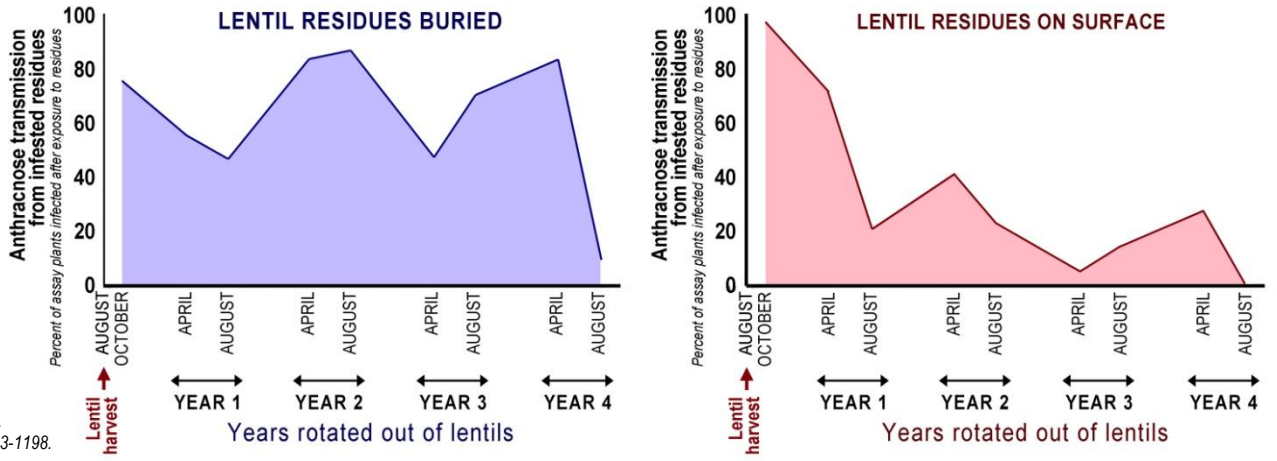

Figure adapted from Buchwaldt et al. 1996. Phytopathology 86:193-1198.