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Management of Sclerotinia stem rot (white mold) of lentils

Causal pathogen: *Sclerotinia sclerotiorum*

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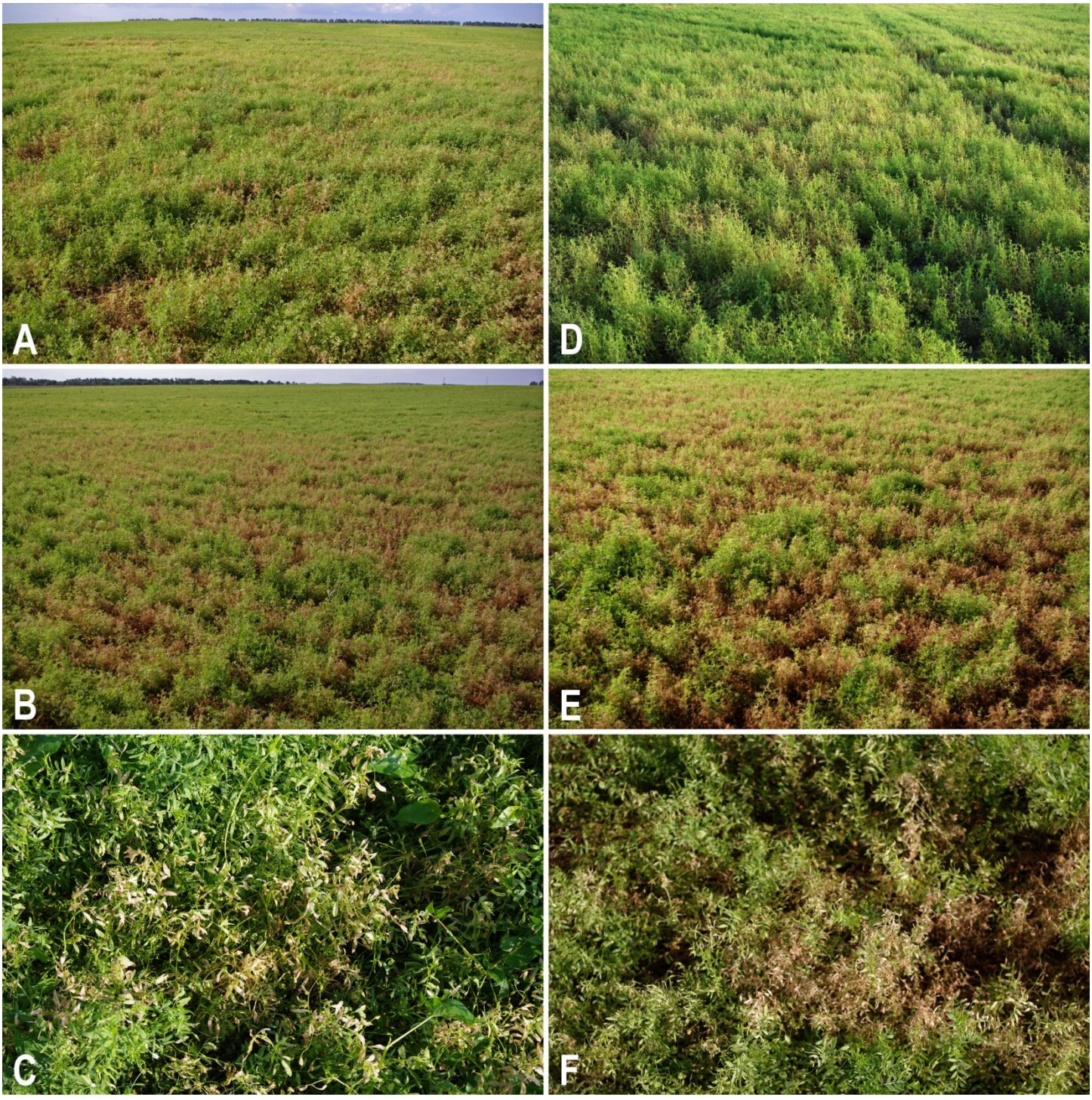
FIELD-LEVEL SYMPTOMS:

- Sclerotinia girdles the stem, initially causing the upper leaves to become chlorotic and wilted (**C**). Once the plants die, they become necrotic **(F).**
- Sclerotinia stem rot often forms an irregular patchwork within a field (**A**,**B**,**D**,**E**). Initially, the patchwork of sclerotinia-infected plants will only exhibit chlorosis (**D**). However, as Sclerotinia progresses and plants die, the patchwork becomes increasingly necrotic (**A**,**B**,**E**).



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DETAILED SYMPTOMS:

- Sclerotinia stem rot is characterized by bleached (white) tissues (**A**,**B**,**C**,**D**,**E**,**F**,**G**) and the deposition of black sclerotia in and on stem tissues (**C**,**F**).
- When moisture levels are high, cottony white growth can be found on diseased leaves and stems (**A**,**B**,**C**,**D**,**E**).
- The causal pathogen, *Sclerotinia sclerotiorum*, does not sporulate on disease tissue; if gray spores are observed, Botrytis gray mold may be present. Sclerotinia often occurs in conjunction with other diseases, including Botrytis gray mold, anthracnose, Ascochyta blight, and Stemphylium blight.

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DISEASE IMPACT:

Impact on yield: Not well characterized but an important production constraint in Canada in years that are cool and wet.
Impact on quality: Not well characterized; Canadian researchers indicate that it can lead to seed discoloration and wrinkling.

SOURCES OF DISEASE INOCULUM

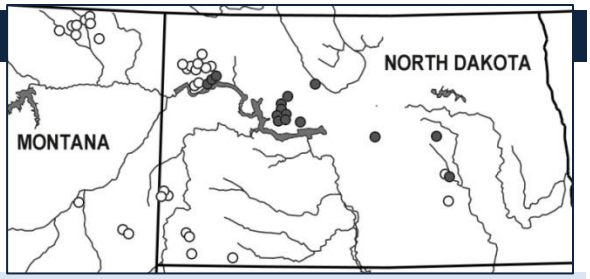
***Sclerotinia sclerotiorum* produces sclerotia – small black resting structures – that can persist in the soil up to 5 to 7 years.** Sclerotia in the top 1 to 1.5 inches of the soil can germinate to form apothecia – tiny mushrooms, often 2 to 4 mm in diameter – that produce spores. In addition, sclerotia that are in contact with plant tissues can directly infect plants without first producing spores. Sclerotinia generally must first get established on dead plant tissue before it can cause disease on living tissues. In many crops, Sclerotinia first becomes established on dead flower petals, and infection moves from dead flower petals into living plant tissues. In lentils, Canadian researchers hypothesize that Sclerotinia may primarily infect lentils through colonization of senescing leaflets in the understory and move into living plant tissues subsequently.

ENVIRONMENTAL CONDITIONS FAVORING DISEASE:

- **Cool, wet conditions:** Sclerotinia is favored by temperatures between 50 and 78˚F accompanied by high relative humidity. When cool, wet conditions occur after canopy closure, Sclerotinia stem rot can be important.
- **Dense canopies:** Dense canopies favor Sclerotinia stem rot by maintaining high relative humidity in the lower canopy.

DISTRIBUTION:

- **Saskatchewan:** Sclerotinia is an important constraint on lentil production in Saskatchewan in cool, wet years.
- **North Dakota and eastern Montana:** Sclerotinia was common in central and west-central North Dakota in 2011, where it often occurred at economically damaging levels. In northwestern ND (Williams County), it was important in fields that had irrigation capability, even when the lentils received no irrigation. Sclerotinia was not detected in other regions.



Distribution of Sclerotinia stem rot in North Dakota and eastern Montana lentil production fields in 2011:
Solid circle = field assessed, disease present; open circle = field assessed, disease absent. A field was considered positive for Sclerotinia stem rot if the white cottony mold, black sclerotia, and bleached stems characteristic of Sclerotinia were observed on plants in the field.

DISEASE MANAGEMENT:

- **Crop rotation:** Crop rotation is generally of limited utility for managing Sclerotinia stem rot. Sclerotinia has a broad host range, infecting virtually all broadleaf crops and weeds, and the resting structures (sclerotia) of the fungus can persist in the soil for up to 5 to 7 years. However, long rotations into small grains will reduce the buildup of pathogen inoculum. Tight rotations of crops such as lentils, which are highly susceptible to Sclerotinia, can be expected to result in a buildup of pathogen inoculum.
- **Tillage:** If you have an outbreak of Sclerotinia and plan to rotate to a non-susceptible crop such as small grains or corn or a less-susceptible crop such as flax the next season, no-till may be beneficial. When the resting structures (sclerotia) of the fungus remain on the surface or in the top 1 to 1.5 inches of the soil, they are able to germinate to produce spores. If conditions are cool and wet, they will germinate and produce spores under any crop canopy irrespective of whether that crop is susceptible to Sclerotinia. Once sclerotia have produced spores, they are finished and unable to cause disease in future seasons. While this approach will not eliminate Sclerotinia, it can reduce the disease pressure in subsequent crops.
- **Partial host resistance:** In a field trial conducted in Carrington in 2012, 'CDC Viceroy' (a small green lentil), 'CDC Impala CL' (a extra-small red lentil), and 'CDC Maxim CL' (a small red lentil) showed excellent performance under high Sclerotinia disease pressure. 'CDC Impress CL' (a medium green lentil), and the large green lentils 'Pennell' and 'Riveland' did not perform as well. 'CDC Richlea' exhibited intermediate performance. For full results, see the report posted on the NDSU Carrington Research Extension Center website. *These results should be treated cautiously; they were obtained from a single trial in a single year, and additional testing is needed for confirmation.*
- **Fungicides:** Controlling Sclerotinia stem rot with fungicides can be difficult; the disease is favored by dense canopies, and obtaining satisfactory fungicide coverage when the canopy is dense can be a challenge. In a field trial conducted in Carrington in 2012, none of the registered fungicides provided satisfactory control of Sclerotinia stem rot; see the report posted on the NDSU Carrington Research Extension Center website for details. In Canada, field trials conducted with Endura (boscalid), a fungicide that is very effective against Sclerotinia on several other crops, produced mixed results. The Canadian research indicates that early infections, such as those occurring shortly after canopy closure, can be controlled with fungicides but that late-season infections, which typically occur at the base of a very dense canopy, are not well controlled with fungicides. Consequently, the use of fungicides to control Sclerotinia may not consistently result in increased seed yields. Research on the use of fungicides to control Sclerotinia on lentils has been very limited, and these conclusions should be interpreted cautiously. However, producers should note that Headline (pyraclostrobin) and Quadris (azoxystrobin) have little, if any, efficacy against Sclerotinia on any crops.