

# Management of *Botrytis* gray mold of lentils

Causal pathogens: *Botrytis cinerea* and *B. fabae*

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## FIELD-LEVEL SYMPTOMS:

- The disease develops on the foliage, flowers, and pods on the lower and middle parts of to the canopy. Upper leaves generally do not become diseased but often turn chlorotic and wilted (**D**) and then necrotic (dead; **F**) when botrytis girdles the stem.
- The disease often results in patches of dead plants surrounded by a thin border of chlorotic plants (**B**, **F**).
- When the disease does not girdle the stem, the lower canopy will become completely necrotic while the upper canopy remains mostly green (**A**, **E**).
- When fully developed, the disease can result in large patches of necrotic plants within fields (**C**).





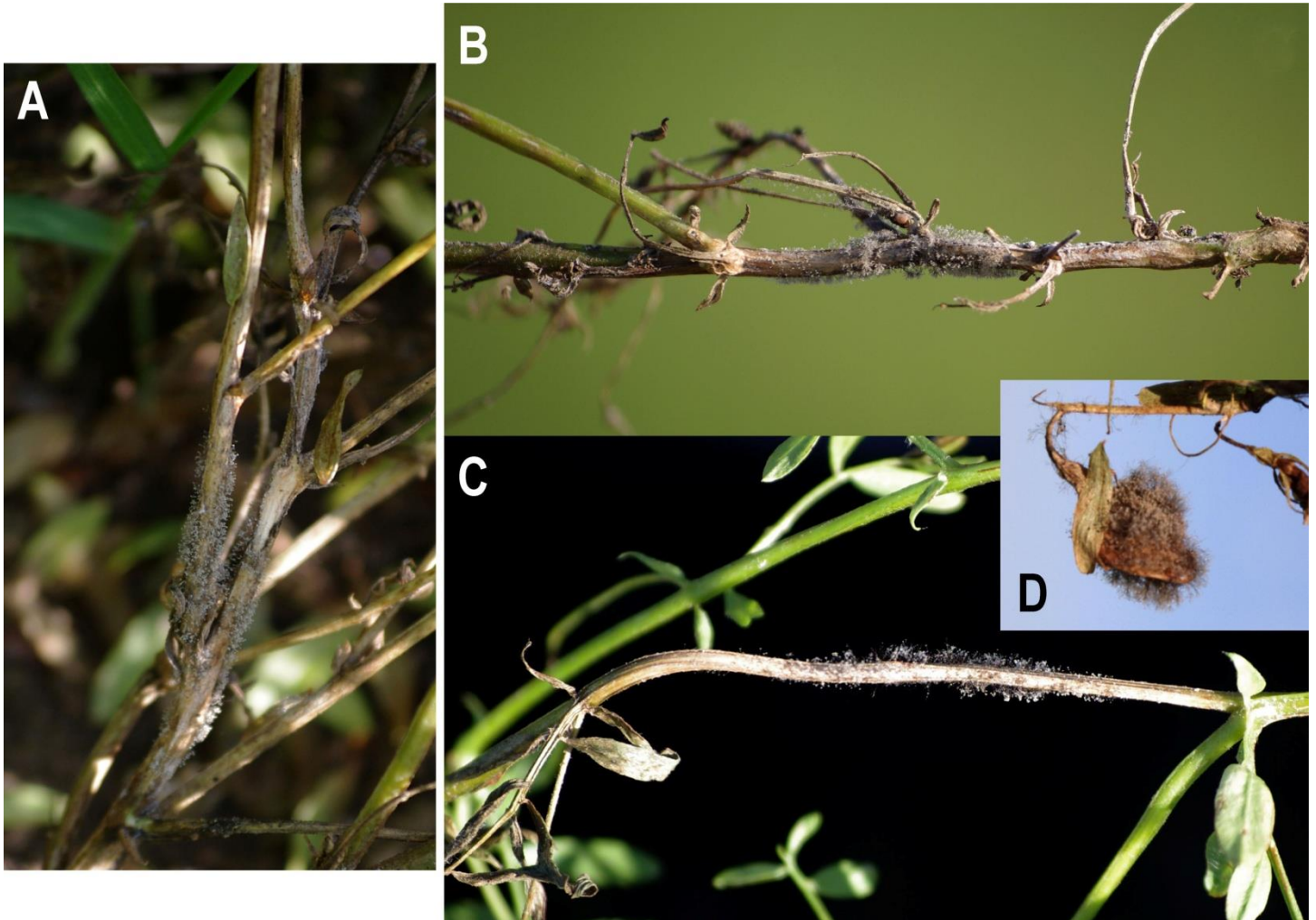
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## SYMPTOMS ON STEMS AND PODS:

- When relative humidity is high (early mornings or after rainfall events), abundant, gray sporulation can be found on diseased tissues, including both stems (**A, B, C**) and pods (**D**). The causal pathogen sometimes also produces small, black sclerotia on diseased tissues. The absence of cottony-white mycelium and the presence of gray sporulation differentiates Botrytis gray mold from Sclerotinia.
- Sporulation is not as common on dead plants; if Botrytis is suspected as the cause of plant mortality in a field, living plants immediately adjacent to the dead plants should be evaluated for the gray sporulation characteristic of Botrytis.
- Even in fields with severe Botrytis, sporulation is often very difficult to find by the late morning or afternoon, especially on dry, windy days. Plants should always be evaluated for Botrytis early in the morning or several hours after rainfall events.



## BOTRYTIS SEEDLING BLIGHT – symptoms and management

- Botrytis seedling blight can be economically important when infected seed is planted or when lentils are planted into a field with crop residues infested with botrytis. It often results in poor stand establishment.
- Seedling blight is characterized by yellowing and wilting followed by plant death; it is distinguished from other seedling diseases by the prolific gray sporulation of the fungus on the lentil hypocotyl at the soil line.
- Botrytis seedling blight often spreads plant-to-plant within a row, resulting in gaps in stand establishment.
- Botrytis seedling blight is managed with the use of Botrytis-free seed or, when disease-free seed is unavailable, with fungicide seed treatments. Most commonly used seed treatment fungicides including Stamina (pyraclostrobin) and Apron Maxx (fludioxonil + mefenoxam) should have efficacy against seed-borne Botrytis, but research in this area has been limited. Seed treatments reduce Botrytis seedling blight but do not eliminate it, and disease-free seed should be used whenever possible.

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## DISEASE IMPACT:

- **Impact on yield:** Botrytis gray mold (the Botrytis disease of mature lentils) can cause yield losses exceed 50%.
- **Impact on quality:** Infected seeds are often discolored and shriveled.

## SOURCES OF DISEASE INOCULUM:

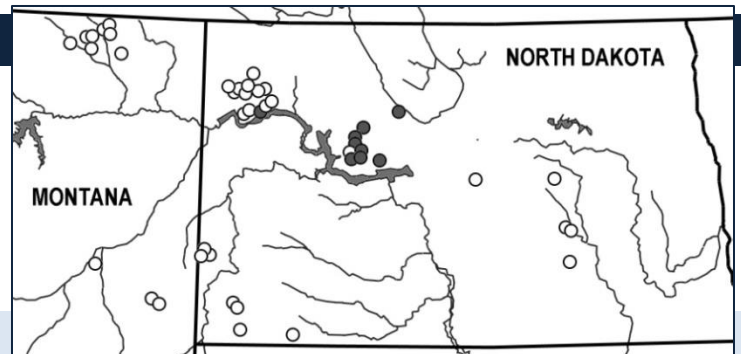
- **Infected seed:** Botrytis is a seed-borne and seed-transmitted disease: The disease is transmitted from infected seeds to seedlings.
- **Infested crop residues**
- **Sclerotia (resting structures of the fungus)**
- **Alternate hosts:** *Botrytis cinerea*, the main pathogen causing Botrytis on lentils in Canada and presumably also the United States, infects a broad range of broadleaf plants, including alfalfa, chickpeas, and field peas.

## ENVIRONMENTAL CONDITIONS FAVORING DISEASE:

- **Cool, wet conditions:** Botrytis is favored by temperatures between 59°F and 77°F accompanied by high relative humidity. When cool, wet conditions occur after canopy closure, Botrytis gray mold epidemics can develop quickly.
- **Dense canopies:** Dense canopies favor Botrytis by maintaining high relative humidity in the lower canopy.

## DISTRIBUTION:

- **Saskatchewan:** Outbreaks of Botrytis have occurred regularly in cool, wet years since the early 1990s.
- **North Dakota and eastern Montana:** Botrytis was widespread on lentils in west-central North Dakota (McLean, Mountrail, and Ward counties) in 2011, where it often occurred at epidemic levels. It was detected at low levels in Williams County but was not detected elsewhere.



### ***Distribution of botrytis gray mold 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 Botrytis if characteristic sporulation was observed in the field and if the causal pathogen was isolated in the lab from symptomatic lentil tissues. Only mature lentils were assessed for Botrytis; seedling blight was not examined.*

## DISEASE MANAGEMENT:

- **Clean seed:** Infected seed is an important cause of Botrytis seedling blight, and sporulation on plants killed by seedling blight may increase disease pressure in mature stands. If clean seed is unavailable, seed treatment with thiabendazole (Mertect) is advised. Infected seed is not always discolored; if Botrytis infection is suspected, seed lots should be submitted for laboratory testing. The plant diagnostic labs at NDSU and MSU both offer seed testing services.
- **Crop rotation:** After an outbreak of Botrytis on lentils or any other crop in a particular field, a break of at least 3 years is recommended before lentils are planted in that field.
- **Avoid planting adjacent to a field that had an outbreak of Botrytis (on lentils or another crop) the previous year:** When lentils are planted immediately adjacent to a field that had a Botrytis outbreak the previous year, severe epidemics can result. Spores produced on residues in the adjacent field can be readily windblown into the new lentil crop.
- **Partial host resistance:** Lentil cultivars have been reported to differ in their susceptibility to Botrytis gray mold, but no data are available on the relative susceptibility of locally adapted cultivars. Cultivars with a spreading growth habit and/or a heightened susceptibility to lodging are expected to be most susceptible.
- **Fungicides:** Fungicides are useful tools for the management of Botrytis gray mold on other crops, but data are limited on their efficacy on lentils. On other crops, Headline (pyraclostrobin) and Endura (boscalid) have been useful for Botrytis management except where resistance to these fungicides has developed. The biology of the pathogen and the dynamics of disease development in the field suggest that the optimal fungicide application timing on lentils may be canopy closure, and results from a fungicide timing trial conducted with Headline in Minot, ND, in 2011 support this conclusion. A second application may be necessary 10 to 14 days later, especially when cool, wet weather persists. As with other diseases, foliar fungicides are best as preventative applications. This pathogen is high risk for the development of fungicide resistance; populations of *B. cinerea* with resistance to Headline and Endura already exist in other cropping systems. When using fungicides to manage Botrytis, always rotate fungicide chemistries: If you use a FRAC 11 fungicide such as Headline at canopy closure, use a fungicide from a different FRAC group the next time fungicides are applied to lentils on your farm, whether that be 10 to 14 days later or the next season.