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Management of Ascochyta blight of lentils

Causal pathogen: *Ascochyta lentis*

Michael Wunsch, Plant Pathologist
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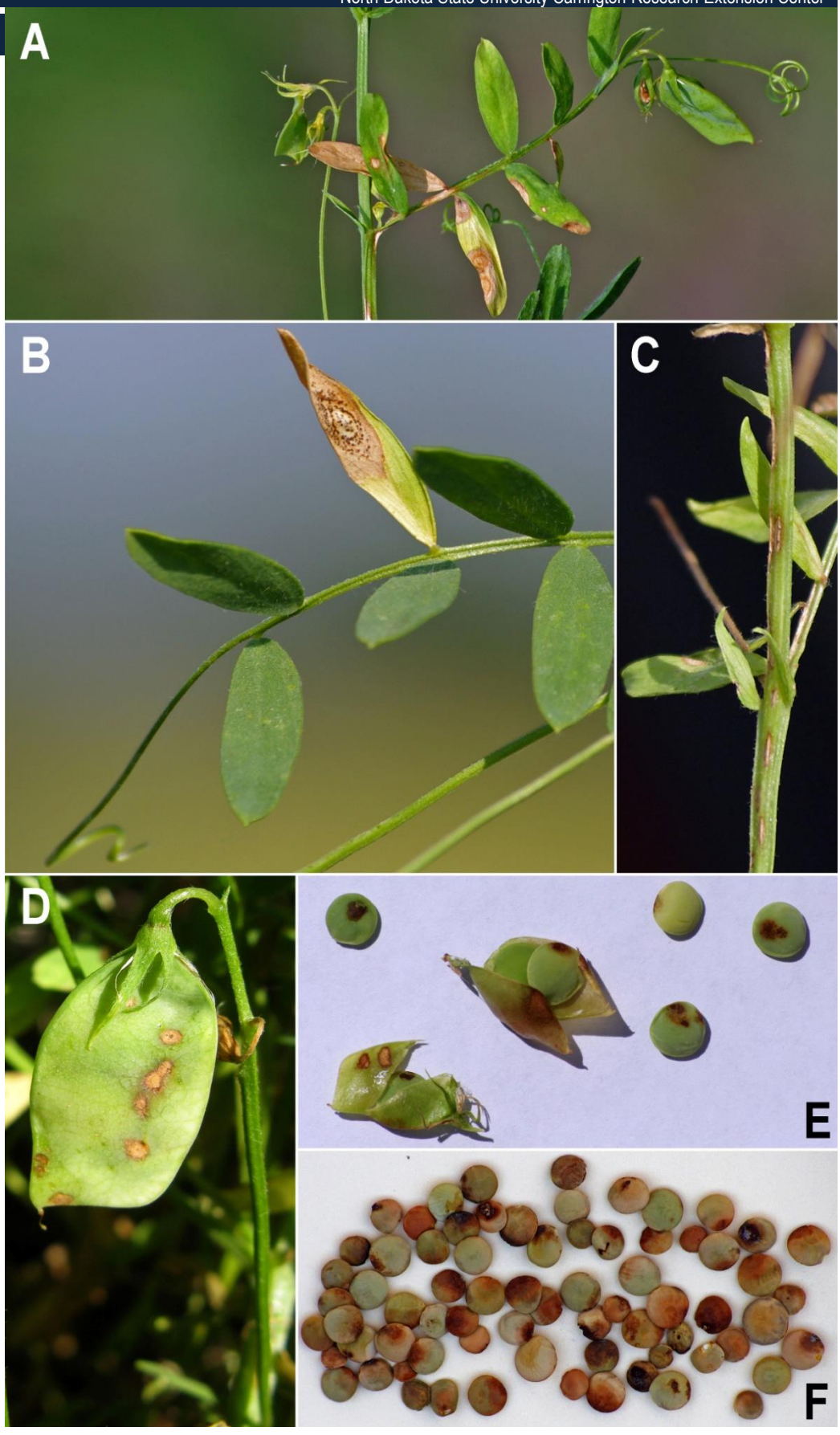
SYMPTOMS:

- Ascochyta blight causes lesions on all foliar parts of the plant, including stems (**C**), leaves (**A,B**), pods (**D**), petioles (**A**; these are the stems holding leaflets), and peduncles (stems holding pods).
- Lesions have a tan to light brown interior and a darker brown border. When the relative humidity has been high, tiny black specks are often visible within lesions (**B**,**C**). These specks are the fruiting structures (pycnidia) produced by the causal pathogen; each contains hundreds to thousands of spores.
- Ascochyta blight causes flower and pod abortion (not pictured), both of which have a significant negative impact on yield.
- Ascochyta blight also causes seed discoloration (**E,F**), which can cause reductions in lentil quality and grade.



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DISEASE IMPACT:

- **Impact on yield:** In Canada, yield losses of 40-50% have been reported from severe disease outbreaks on susceptible cultivars.
- **Impact on quality:** Ascochyta causes seed discoloration and wrinkling, resulting in reductions in seed grade. Severe wrinkling is problematic for red lentil processors, as it can interfere with removing the seed coat and/or splitting the cotyledons.

SOURCES OF DISEASE INOCULUM:

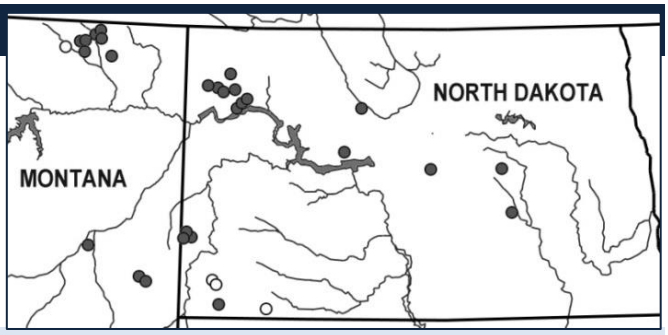
- **Infected seed:** *Ascochyta lentis* is seed-borne and seed-transmitted (the disease is transmitted from infected seeds to seedlings).
- **Lentil debris:** Spores produced on overwintered lentil debris are an important contributor to disease.
  - **In most situations, disease transmission from overwintered infested lentil debris occurs due to splash-dispersal of asexually produced spores**, and the Ascochyta blight that develops from the residues develops only in close proximity to those debris.
  - **In certain circumstances, disease transmission from overwintered lentil debris may be due to the production of specialized spores that are readily carried aloft by air currents**. These spores can be transported long distances, resulting in disease development in fields several miles away from the previous lentil crop. The conditions under which these spores are produced is poorly understood, and it is unknown whether these specialized spores are routinely produced in production fields in North Dakota and Montana. In the Pacific Northwest, they are known to be produced on the residues of at least one lentil variety but not all lentil varieties.

ENVIRONMENTAL CONDITIONS FAVORING DISEASE:

- **Pathogen transmission from infected seed:** Transmission of Ascochyta blight from infected seed to foliar tissues is favored by cool, moist soil. Maximum transmission from seeds to seedlings occurs when the soil temperature is approximately 46˚F.
- **Cool, moist weather:** Ascochyta blight is favored by cool, moist weather. An extended period of leaf wetness is required for disease development, with maximum disease developing occurring after 24 to 48 hours of leaf wetness. Temperatures between 50˚F and 68˚F are highly favorable for disease development, and maximum disease development occurs at approximately 59˚F.

DISTRIBUTION:

- **Saskatchewan:** Ascochyta blight has been known to occur in Canada since 1978.
- **North Dakota and eastern Montana:** In 2011, *Ascochyta lentis* was present on lentils in all of the major lentil production regions in North Dakota and eastern Montana. Ascochyta blight occurred at moderate to high severity in several fields in northeastern Montana (Daniels and Valley counties) but otherwise occurred at only low levels.



Distribution of Ascochyta blight 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 only considered positive for Ascochyta blight if the causal pathogen was isolated from symptomatic lentil tissues collected in that field.

ASCOCHYTA MANAGEMENT - Clean seed

- **In regions where cool, moist weather is likely, only seed testing negative for Ascochyta should be used. In regions with dry climates, up to 4 to 5% seed-borne Ascochyta may be acceptable.** Seed lots that exceed 10% incidence of ascochyta infection should not be used. The use of clean seed is very important; even when the disease is not transmitted from infected seeds to seedlings, seeds infected with Ascochyta suffer from reduced emergence and produce plants with lower vigor and lower seed yield. Infected seeds are not always discolored, and seed lots should be submitted for laboratory testing. The plant diagnostic labs at NDSU and MSU both offer Ascochyta seed testing services.
- **Seed treatment fungicides are useful for reducing seed-to-seedling transmission of Ascochyta blight.** Mertect (thiabendazole) and Stamina (pyraclostrobin) have performed well in university trials in the United States and Canada. Apron Maxx (fludioxonil + mefenoxam) has been less effective in trials. Seed treatment fungicides do not completely eliminate seed-to-seedling transmission of Ascochyta blight, and the use of clean seed is always advised.

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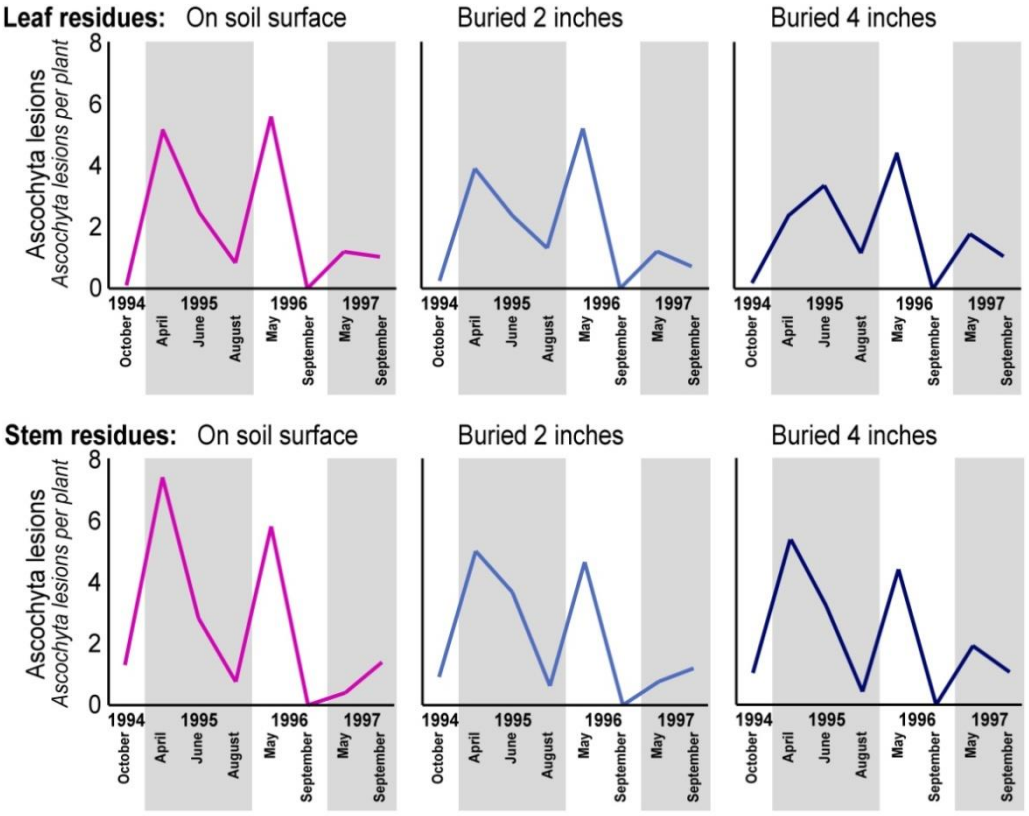
ASCOCHYTA MANAGEMENT – Crop rotation

- A minimum 3-year rotation out of lentils is recommended.
- Low levels of Ascochyta transmission from lentil residues to a new crop may occur even after rotating out of lentils for 3 years. Research conducted in Saskatoon, Saskatchewan on a clay loam soil suggests that transmission from infested lentil residues to new lentils drops sharply after a 2-year rotation out of lentils but can continue for at least 3 years since the previous lentil crop. *The effect of soil type and climate on survival of the Ascochyta pathogen is poorly understood, and it is unknown whether different results might be obtained in different soil types or different climates.*
- In addition to small grains and oilseed crops, chickpeas and field peas are acceptable rotational crops. *Ascochyta lentis,* cause of Ascochyta blight on lentils, is specific to lentils; other Ascochyta species cause Ascochyta blight on chickpeas and field peas.

Infested lentil residues remain capable of transmitting Ascochyta to new lentils for at least 3 years. Numbers represent the average number of Ascochyta lesions that developed greenhouse-grown lentil seedlings inoculated with infested lentil leaf or stem residues recovered from a clay loam soil in Saskatoon, Saskatchewan. Residues were buried 0, 2, or 4 inches deep.



Gossen 2001. **Canadian Journal of Plant Pathology** 23:146-148.

ASCOCHYTA MANAGEMENT – Lentils planted immediately adjacent to last year's crop

Lentils planted immediately adjacent to last year's crop have an elevated risk of Ascochyta blight:

- When lentils are planted immediately adjacent to a field where lentils were grown the previous season, Ascochyta blight is often transmitted from the previous year's crop residues to the new crop, resulting in a a disease gradient. Very high levels of Ascochyta blight are observed in the lentils grown closest to the previous year's crop, with progressively lower levels of Ascochyta blight observed as distance from last year's crop increases.
- Disease gradients in the new lentil crop are expected to be most severe when the new crop is planted on the downwind side (in terms of predominant wind patterns) of the previous year's crop.
- When lentils are planted adjacent to a field where lentils were grown the previous season, applying a foliar fungicide for Ascochtya control to the entire crop of lentils may be advisable, especially if weather conditions are favorable for disease. In an on-farm trial conducted in northeastern Montana in 2012, the use of a fungicide-treated strip (Headline, 6 fl oz/ac, applied at bloom initiation) immediately adjacent to the previous lentil crop did not provide satisfactory disease control even when the fungicide treated strip was wide (270 feet).
- Even when a foliar fungicide is applied to the entire field, Ascochyta blight may reach high levels in the lentils closest to last year's lentil crop. Scouting the lentils closest to the previous year's crop is advised. If the lentils immediately adjacent to last year's crop exhibit high levels of Ascochyta as the crop nears maturity, it may be advisable to harvest those lentils separately so as to prevent seed quality downgrades for the remaining crop.

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ASCOCHYTA MANAGEMENT – application timing of foliar fungicides

- **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.
- **Optimal fungicide timing often coincides with early bloom but can be either earlier or later, depending on conditions.**
- **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 and North Dakota and is provided for reference only.*

ASCOCHYTA MANAGEMENT – fungicide efficacy

- **Registered fungicides differ sharply in their efficacy against Ascochyta blight on lentils.** 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) has shown strong efficacy in multiple trials.**
  - **Bravo WS at 1.5 pt/ac and generics (chlorothalonil) are effective but best applied preventatively** 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.
  - **Quadris at 6.2 fl oz/ac (azoxystrobin) has shown mixed results.**

  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:** Ascochyta blight 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.

ASCOCHYTA MANAGEMENT – variety selection

- **No lentil varieties are completely resistant to Ascochyta blight, but some varieties are significantly less susceptible than others.** The following lentils have good resistance to Ascochyta blight: the small green lentil 'CDC Viceroy'; the medium green lentils 'CDC Greenland' and 'CDC Meteor'; the extra small red lentils 'CDC Impala-CL' and 'CDC Rosetown'; and the small red lentils 'CDC Maxim-CL', 'CDC Redberry', 'CDC Red Rider', and 'CDC Rouleau'. The widely planted 'CDC Richlea' is highly susceptible to Ascochyta blight. Disease ratings of additional varieties can be found in the Saskatchewan Ministry of Agriculture publication 'Varieties of Grain Crops, 2013' available online at http://www.agriculture.gov.sk.ca/Varieties_Grain_Crops.
- ***Ascochyta lentis* has shown an ability to overcome host resistance rapidly,** and the adoption of varieties with elevated resistance to Ascochyta should always be conducted in conjunction with other disease management practices.