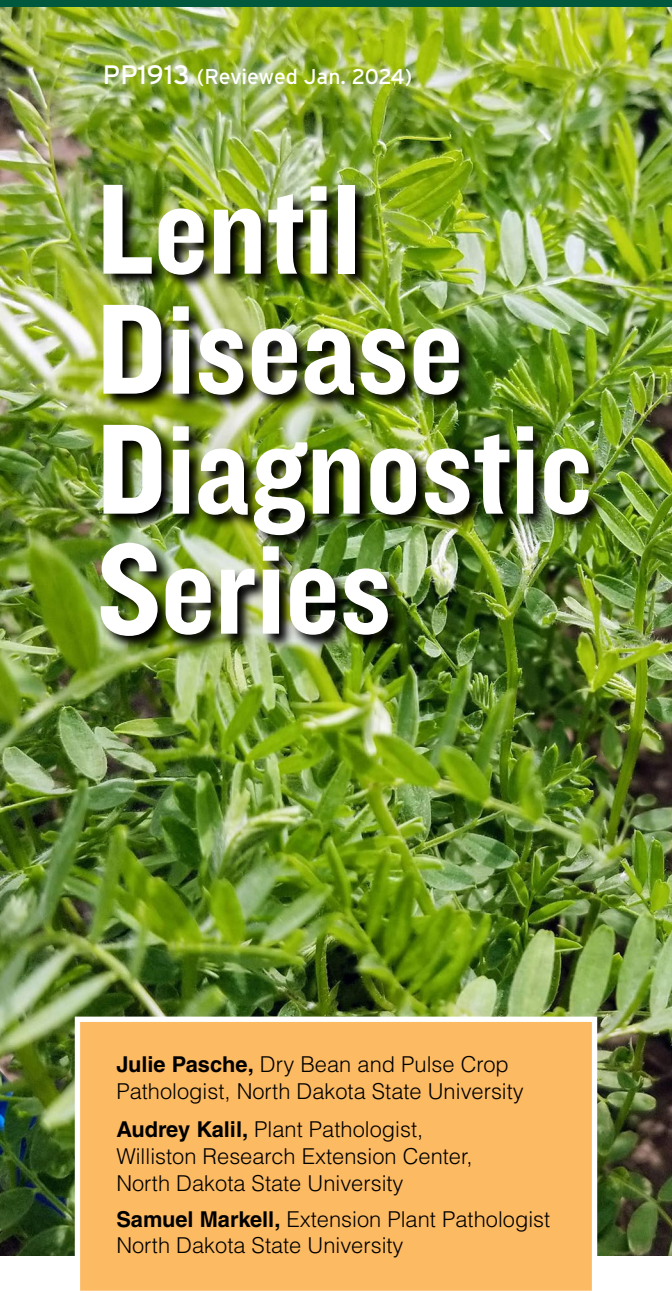
PP1913 (Reviewed Jan. 2024)

Lentil Disease Diagnostic Series



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NDSU North Central Research Extension Center

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 760-1-19; web-1-24

PP1913-1
Lentil Disease Diagnostic Series

Pythium seed and seedling rot

Pythium ultimum, P. irregulare, P. aphanidermatum and other *Pythium* species

Figure 1

Photos: T. Paulitz, USDA-ARS, Pullman, Wash.

Figure 2

Photo: T. Paulitz, USDA-ARS, Pullman, Wash.

Pythium seed and seedling rot

Pythium ultimum, P. irregulare, P. aphanidermatum and other *Pythium* species

AUTHORS: Lyndon Porter, Timothy Paulitz and Kurt Schroeder

SYMPTOMS

- **Poor emergence, rotted seed with light brown root discoloration**
- **Stunted plants with yellow or purple leaves developing from the bottom**

FIGURE 1 – Brown/black discoloration and pruning of lateral and tap roots by *Pythium irregulare*

FIGURE 2 – Range of yellowing on plant foliage

FACTORS FAVORING DEVELOPMENT

- Cool, water-saturated or compacted soil and poor seed vigor

IMPORTANT FACTS

- Metalaxyl (mefenoxam)-resistant *Pythium* is present in some growing regions
- Effective seed treatments are available for metalaxyl-resistant and sensitive *Pythium*
- Avoid planting into wet or compacted soils
- Pathogen survives on plant debris and in soil
- Resistant varieties are not available
- Often occurs in complex with other root rots
- Can be confused with other root rots and water logging

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Fusarium root rot

Fusarium avenaceum and other *Fusarium* species

Photo: K. Zitnick-Anderson, NDSU

Figure 1

Photo: K. Zitnick-Anderson, NDSU

Figure 2

Photo: L. Porter, USDA-ARS, Prosser, Wash.

Figure 3

Fusarium root rot

Fusarium avenaceum and other *Fusarium* species

AUTHORS: Audrey Kalil and Lyndon Porter

SYMPTOMS

- **Poor emergence**
- **Wilting, stunting and premature death**

FIGURE 1 – Brown to reddish-brown lesions on lower stems and roots caused by *Fusarium* infection

FIGURE 2 – Infected seedlings

FIGURE 3 – Yellowing progressing upward and premature death caused by *F. avenaceum* (diseased [middle/bottom] and healthy [top] roots)

FACTORS FAVORING DEVELOPMENT

- Soil compaction and plant stress
- Warm, moist soil (68 to 82 F)
- Short pea and lentil rotations

IMPORTANT FACTS

- Pathogen survives on plant debris and in soil
- Often occurs in complex with other root diseases
- Resistant varieties are not available
- Fungicide seed treatments may be recommended
- Can be confused with other root rots and water logging

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Rhizoctonia seed, seedling and root rot

Rhizoctonia solani

Figure 1

Photo: K. Zitnick-Anderson, NDSU

Figure 2

Photo: K. Zitnick-Anderson, NDSU

Rhizoctonia seed, seedling and root rot

Rhizoctonia solani

AUTHORS: Jessica Rupp, Myron Bruce and Timothy Paulitz

SYMPTOMS

- **Poor emergence**
- **Reddish-brown to dark brown lesions on roots and base of stem**
- **Secondary roots absent**
- **Plants are stunted and leaves turn yellow**

FIGURE 1 – Sunken brown lesions on stem and root just below soil

FIGURE 2 – Moderate (top) to severe (bottom) Rhizoctonia root rot

FACTORS FAVORING DEVELOPMENT

- Wet, compacted or waterlogged soils

IMPORTANT FACTS

- Pathogen survives on plant debris and in soil
- Resistant varieties are not available
- Fungicide seed treatments may be recommended
- Often occurs in a complex with other root rots
- Can be confused with other root rots and water logging

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Aphanomyces root rot

Aphanomyces euteiches

Figure 1

Photo: L. Porter, USDA-ARS, Prosser, Wash.

Figure 2

Photo: L. Porter, USDA-ARS, Prosser, Wash.

Aphanomyces root rot

Aphanomyces euteiches

AUTHORS: Lyndon Porter

SYMPTOMS

- **Root rot may extend slightly above the soil line**
- **Leaf yellowing progresses from lower canopy upward**
- **Early season stunting and premature plant death**

FIGURE 1 – Infected roots with caramel-brown root rot (R), compared with healthy roots (L)

FIGURE 2 – Infection moving up primary stem

FACTORS FAVORING DEVELOPMENT

- Cool, wet spring conditions
- High soil moisture
- Short rotations with peas and lentils

IMPORTANT FACTS

- Chickpea, cereals and faba bean are not important hosts
- Often occurs in a complex with other root rot diseases
- Can survive for many (20) years in soil without a susceptible host
- Seed treatments and genetic resistance are not effective
- Can be confused with other root rots and water logging

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Anthracnose

Colletotrichum species

Figure 1

Figure 2

Figure 3

Anthracnose

Colletotrichum species

AUTHORS: Michael Wunsch and Julie Pasche

SYMPTOMS

- **Light-brown stem lesions with a dark border**
- **Symptoms initiate at the base of plant and spread upward**
- **Patches of dead plants develop when stem lesions girdle plant**

FIGURE 1 – Small black fungal resting structures (microsclerotia) within anthracnose lesions

FIGURE 2 – Severe anthracnose lesions coalescing

FIGURE 3 – Anthracnose-infected pods and discolored seeds

FACTORS FAVORING DEVELOPMENT

- Abundant rainfall during bloom and pod development
- Wide range of temperatures; 68 to 74 F optimal
- Dense canopy

IMPORTANT FACTS

- Seed quality declines with increasing anthracnose severity
- Varieties differ in susceptibility to anthracnose; none are resistant
- No-till increases degradation of pathogen resting structures
- Commonly confused with Ascochyta blight

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Ascochyta blight

Ascochyta lentis

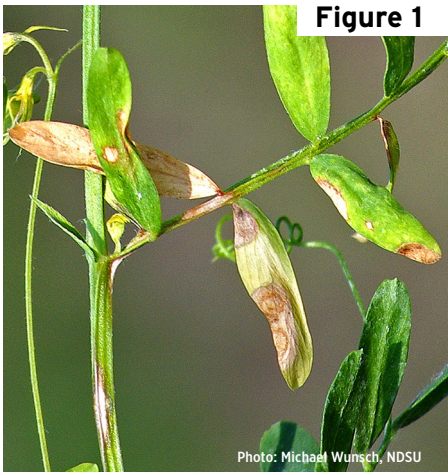

Figure 1

Figure 2

Figure 3

Ascochyta blight

Ascochyta lentis

AUTHORS: Michael Wunsch and Julie Pasche

SYMPTOMS

- **Light brown leaf, stem and pod lesions with dark brown borders**
- **Small brown fungal fruiting structures (pycnidia) within lesions**
- **Disease lesions and/or picnidia within lesions often exhibit a concentric ring pattern (unlike anthracnose)**
- **Flower and pod abortion**

FIGURE 1 – Concentric ring pattern from pycnidia inside the light brown lesion

FIGURE 2 – Mid-canopy Ascochyta blight lesions

FIGURE 3 – Discolored seeds produced in pods with Ascochtya lesions

FACTORS FAVORING DEVELOPMENT

- Cool, wet weather; 50 to 68 F optimal
- Planting lentils immediately adjacent to a field where Ascochyta blight occurred on lentils the previous year

IMPORTANT FACTS

- Ascochyta blight is seed-borne and seed-transmitted; seed should be tested
- Managed with crop rotation (minimum two years out of lentils) and foliar fungicides
- Commonly confused with anthracnose

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Botrytis gray mold

Botrytis cinerea, B. fabae

Photos: Michael Wunsch, NDSU

Figure 1

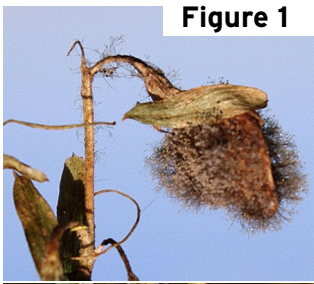

Photo: Michael Wunsch, NDSU

Figure 2

Botrytis gray mold

Botrytis cinerea, B. fabae

AUTHORS: Michael Wunsch and Julie Pasche

SYMPTOMS

- **Gray fungal growth on diseased stems, leaves and pods in the lower canopy**
- **Plant tissue is light brown to bleached**
- **Plants become chlorotic, wilt and die when lesions girdle the lower stem**
- **Plant-to-plant spread of Botrytis is common, resulting in dead patches**

FIGURE 1 – Gray sporulation on diseased tissues when relative humidity is high

FIGURE 2 – Dead patches in lentil field

FACTORS FAVORING DEVELOPMENT

- Dense crop canopies that restrict airflow
- High relative humidity and frequent rainfall
- Cool temperatures; 59 to 77 F optimal

IMPORTANT FACTS

- Resistant varieties are not available
- Fungicides can be effective if applied preventatively
- Commonly confused with white mold and anthracnose

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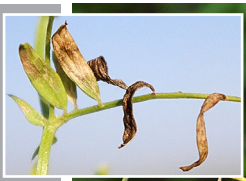
Stemphylium blight

Stemphylium botryosum

Photos: Michael Wunsch, NDSU

Figure 1



Photos: Michael Wunsch, NDSU

Figure 2

Photos: Michael Wunsch, NDSU

Figure 3

Stemphylium blight

Stemphylium botryosum

AUTHORS: Weidong Chen and Michael Wunsch

SYMPTOMS

- **Leaflets may exhibit angular lesions at disease onset**
- **Disease is most severe on leaves but also infects pods, stems and petioles**

FIGURE 1 – Tan to light brown lesions at disease onset

FIGURE 2 – Diseased leaflets that have become dark brown to gray due to pathogen sporulation under high relative humidity

FIGURE 3 – Defoliated plants that have shed diseased leaves

FACTORS FAVORING DEVELOPMENT

- Extended periods of high relative humidity in the last third of the growing season
- Warm temperatures; 77 to 86 F optimal

IMPORTANT FACTS

- Red lentils are generally more susceptible than green lentils
- Managed with fungicides and partially resistant varieties
- Can be confused with nutrient deficiencies (such as low nitrogen) or plant senescence

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Bacterial blight

Pseudomonas syringae pv. *syringae*

Photo: F. Mathew, South Dakota State University

Figure 1

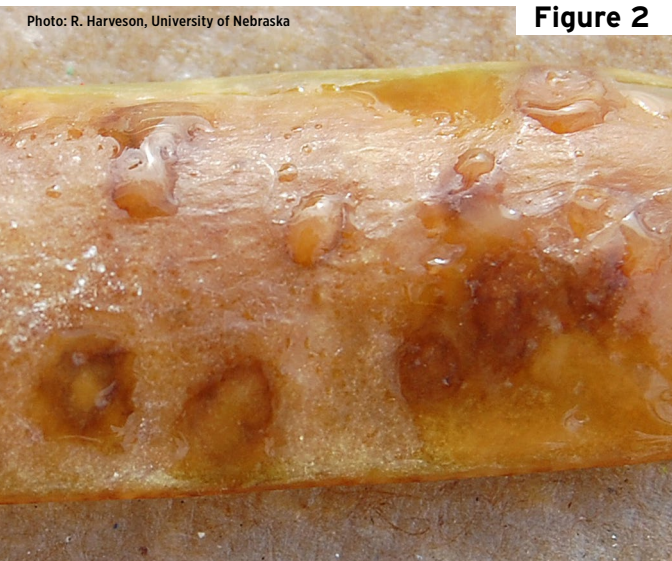

Photo: R. Harveson, University of Nebraska

Figure 2

Bacterial blight

Pseudomonas syringae pv. *syringae*

AUTHORS: Febina Mathew, Bob Harveson and Bright Agindotan

SYMPTOMS

- **Lesions observed on all above-ground plant parts**
- **Initial lesions are water-soaked and become necrotic through time**
- **Bacteria may ooze from lesions under high-humidity conditions**

FIGURE 1 – Brown, circular and translucent foliar lesions

FIGURE 2 – Bacterial ooze from pod lesions

FACTORS FAVORING DEVELOPMENT

- Warm temperatures
- High humidity or moisture on leaves
- Hail

IMPORTANT FACTS

- Bacteria can be spread by rain, wind and mechanical means
- *P. syringae* pv. *syringae* can cause disease on soybean, dry edible beans and other legumes
- Physical damage (such as hail) can facilitate infection and spread
- Fungicides are not effective
- Planting infected seed can increase disease risk
- Can be confused with Ascochyta blight or anthracnose

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Powdery mildew

Erysiphe pisi and *Leveillula taurica*

Figure 1

Photo: L. Porter, USDA-ARS, Prosser, Wash.

Figure 2

Photo: L. Porter, USDA-ARS, Prosser, Wash.

Figure 3

W. Chen, USDA-ARS, Pullman, Wash.

Powdery mildew

Erysiphe pisi and *Leveillula taurica*

AUTHORS: Lyndon Porter and Weidong Chen

SYMPTOMS

- **Most visible starting at flowering and later in the season**
- **Infected leaves can become chlorotic/ necrotic and curled**
- **Infection begins as small spots that enlarge quickly and cover plant surfaces**

FIGURE 1 – Early infection - white “powdery” spots (yellow arrows)

FIGURE 2 – Leaf and stem surfaces covered with powdery mildew

FIGURE 3 – Feltlike white fungal growth

FACTORS FAVORING DEVELOPMENT

- Late planting
- Conditions limiting sunlight
- Temperatures of 59 to 77 F are optimal

IMPORTANT FACTS

- Pathogen can be soil-borne, seed-borne and wind-dispersed
- Fungicides may be effective if applied early in disease development
- Crop rotation is important
- Lentil varieties have differing levels of resistance
- Can be confused with white mold and the fungal growth of saprophytes or other pathogens

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White mold (Sclerotinia stem rot)

Sclerotinia sclerotiorum

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Figure 1

Photo: L. Dighans, Pro Co-op Ag Center, Scobey, Mont.

Figure 2

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Figure 3

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Figure 4

White mold (Sclerotinia stem rot)

Sclerotinia sclerotiorum

AUTHORS: Mary Burrows, Weidong Chen and Michael Wunsch

SYMPTOMS

- **First observed as water-soaked lesions**
- **Lesions enlarge and become bleached**
- **White fluffy fungal growth may appear under high humidity**
- **Hard, black sclerotia may appear late in the season**
- **Wilting**

FIGURE 1 – Dead patches of plants
FIGURE 2 – White, fluffy fungal growth on leaves and stems
FIGURE 3 – Bleached lesions with white fungal growth
FIGURE 4 – Dark, hard fungal structures (sclerotia) on the soil surface (yellow arrows)

FACTORS FAVORING DEVELOPMENT

- Cool, wet conditions after canopy closure
- Short rotations with susceptible crops
- Lush canopy

IMPORTANT FACTS

- Sclerotia survive in the soil for several years
- Pathogen infects most broadleaf plants
- Fungicides can be effective if applied preventatively
- Can be confused with powdery mildew, nutrient deficiencies (low nitrogen) or plant senescence

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Pea enation mosaic

Pea enation mosaic virus (PEMV)

Figure 1

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Figure 2

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Figure 3

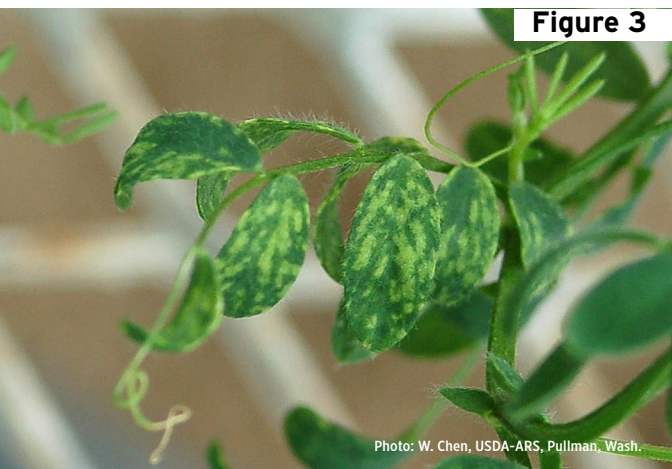

Photo: W. Chen, USDA-ARS, Pullman, Wash.

Pea enation mosaic

Pea enation mosaic virus (PEMV)

AUTHORS: Lyndon Porter, Bright Agindotan and Kevin McPhee

SYMPTOMS

- **Small, circular to elongated translucent spots or streaks on leaves**
- **Vein clearing**
- **Stunted growth and malformed pods**

FIGURE 1 – Twisted and malformed leaves

FIGURE 2 – Leaf mottling

FIGURE 3 – Leaf mottling

FACTORS FAVORING DEVELOPMENT

- Presence of aphid vectors, including pea, cowpea, green peach, potato or foxglove
- Movement of aphids from virus-infected overwintering hosts in the spring or alfalfa fields during cuttings

IMPORTANT FACTS

- Can infect chickpea, pea, faba bean, vetch, crimson clover and lambsquarters
- PEMV is not seed-transmitted
- No known resistant varieties
- Insecticides applied to manage aphid vector may help reduce secondary spread
- Can be confused with other viruses or damage from herbicides or thrips

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Bean leaf roll

Bean leaf roll virus (BLRV)

Figure 1

Photo: B. Agindotan, Montana State University, Bozeman

Figure 2

Photo: B. Agindotan, Montana State University, Bozeman

Bean leaf roll

Bean leaf roll virus (BLRV)

AUTHORS: Bright Agindotan and Lyndon Porter

SYMPTOMS

- **Yellowing and stunting**
- **Small leaves**

FIGURE 1 – Early leaf yellowing symptoms

FIGURE 2 – Advanced stage of yellowing (Infected [L, R] and healthy [C])

FACTORS FAVORING DEVELOPMENT

- Presence of other BLRV-infected legume crops and weeds
- Presence of aphid vectors, including pea, cowpea, potato and vetch
- Movement of aphids from alfalfa fields during cuttings

IMPORTANT FACTS

- Leaf rolling absent
- BLRV is not seed-transmitted
- BLRV infects pea, chickpea, lentil, alfalfa and other legumes
- Insecticides applied to manage aphid vectors may help reduce secondary spread
- Resistant varieties may be available
- Can be confused with nutrient deficiencies (low nitrogen) or plant senescence

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