

PP1913 (Revised May 2025)

Lentil Disease Diagnostic Series

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EXPERIMENT STATION

Pythium seed and seedling rot	PP1913-1
Fusarium root rot	PP1913-2
Rhizoctonia seed, seedling and root rot.....	PP1913-3
Aphanomyces root rot.....	PP1913-4
Anthracnose	PP1913-5
Ascochyta blight.....	PP1913-6
Botrytis gray mold.....	PP1913-7
Stemphylium blight	PP1913-8
Bacterial blight	PP1913-9
Powdery mildew.....	PP1913-10
White mold (Sclerotinia stem rot).....	PP1913-11
Pea enation mosaic	PP1913-12
Bean leafroll.....	PP1913-13

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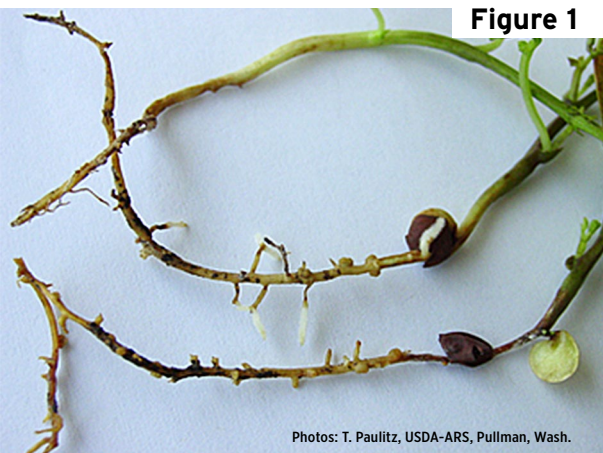
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Pythium seed and seedling rot

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



Fusarium root rot

Fusarium oxysporum, *F. avenaceum*, *F. graminearum*,
F. acuminatum and other *Fusarium* species

Photo: K. Zitnick-Anderson, NDSU



Figure 1

Photo: K. Zitnick-Anderson, NDSU



Figure 2



Figure 3

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



Fusarium root rot

Fusarium oxysporum, *F. avenaceum*, *F. graminearum*,
F. acuminatum and other *Fusarium* species

AUTHORS: Audrey Kalil and Lyndon Porter

SYMPTOMS

- Root necrosis
- Reduced nodulation
- 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
- *Fusarium*-tolerant varieties are available
- Fungicide seed treatments are recommended
- Can be confused with other root rots and water logging



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



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

- Wet conditions during crop emergence
- 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 are not effective
- Resistant varieties are not available
- Can be confused with other root rots and water logging



Anthracnose

Colletotrichum lentis

Figure 1



Photo: Michael Wunsch, NDSU

Figure 2



Photo: Michael Wunsch, NDSU

Photo: Michael Wunsch, NDSU



Figure 3





Anthracnose

Colletotrichum lentis

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
- Variety resistance is only available for *C. lentis* race 1
- No-till increases degradation of pathogen resting structures
- Commonly confused with Ascochyta blight
- Pathogen populations in Saskatchewan, CA have developed resistance to the QoI (FRAC 11) fungicide class

Card 5 of 13



Ascochyta blight

Ascochyta lentis



Photo: Michael Wunsch, NDSU

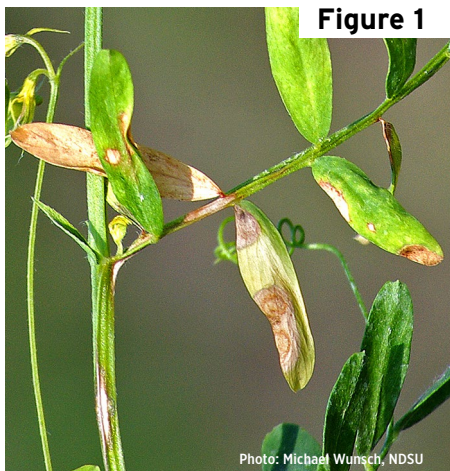


Figure 1

Photo: Michael Wunsch, NDSU



Figure 2

Photo: Michael Wunsch, NDSU



Photos: Michael Wunsch, NDSU

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 pycnidia 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 Ascochyta 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
- Fungicide seed treatment may reduce seed to seedling transmission

Card 6 of 13



Botrytis gray mold

Botrytis cinerea, *B. fabae*

Figure 1



Photos: Michael Wunsch, NDSU

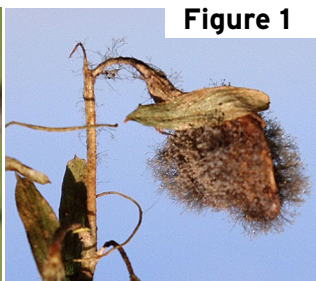
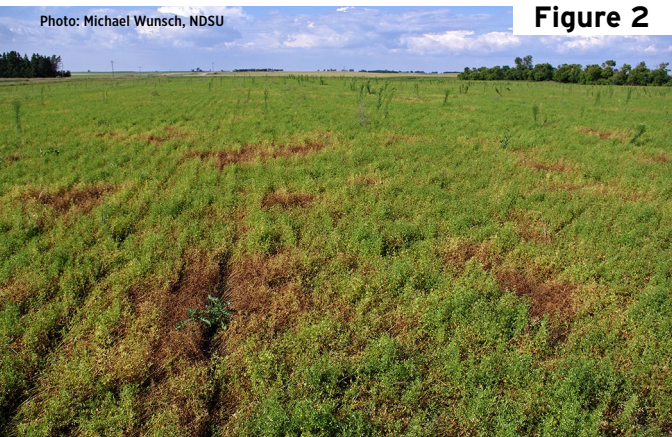


Photo: Michael Wunsch, NDSU

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



Stemphylium blight

Stemphylium botryosum



Figure 1

Photos: Michael Wunsch, NDSU



Figure 2

Photos: Michael Wunsch, NDSU



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



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



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

- **Small white fluffy spots on plant surfaces that quickly enlarge**
- **Spots most commonly observed at flowering or late season**
- **Infected leaves can become chlorotic, necrotic and curled**

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



White mold (*Sclerotinia stem rot*)

Sclerotinia sclerotiorum

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

Figure 1



Figure 2



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

Card 11 of 13



Pea enation mosaic

Enamovirus PEMV



Figure 1

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



Figure 2

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

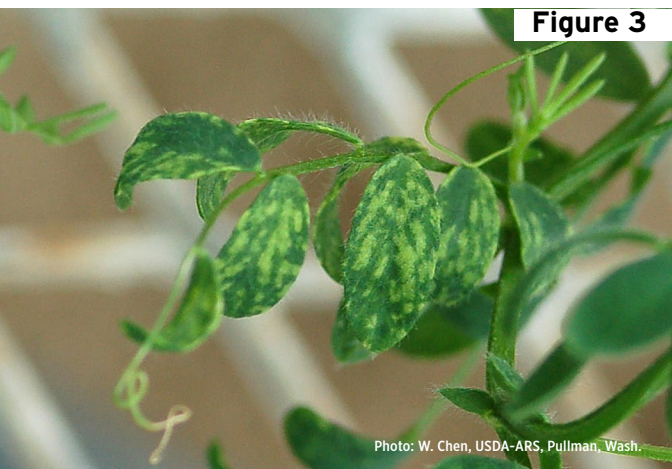


Figure 3

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



Pea enation mosaic

Enamovirus 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



Bean leafroll

Luteovirus phaseoli

Figure 1



Photo: B. Agindotan, Montana State University, Bozeman

Figure 2

Photo: B. Agindotan, Montana State University, Bozeman





Bean leafroll

Luteovirus phaseoli

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