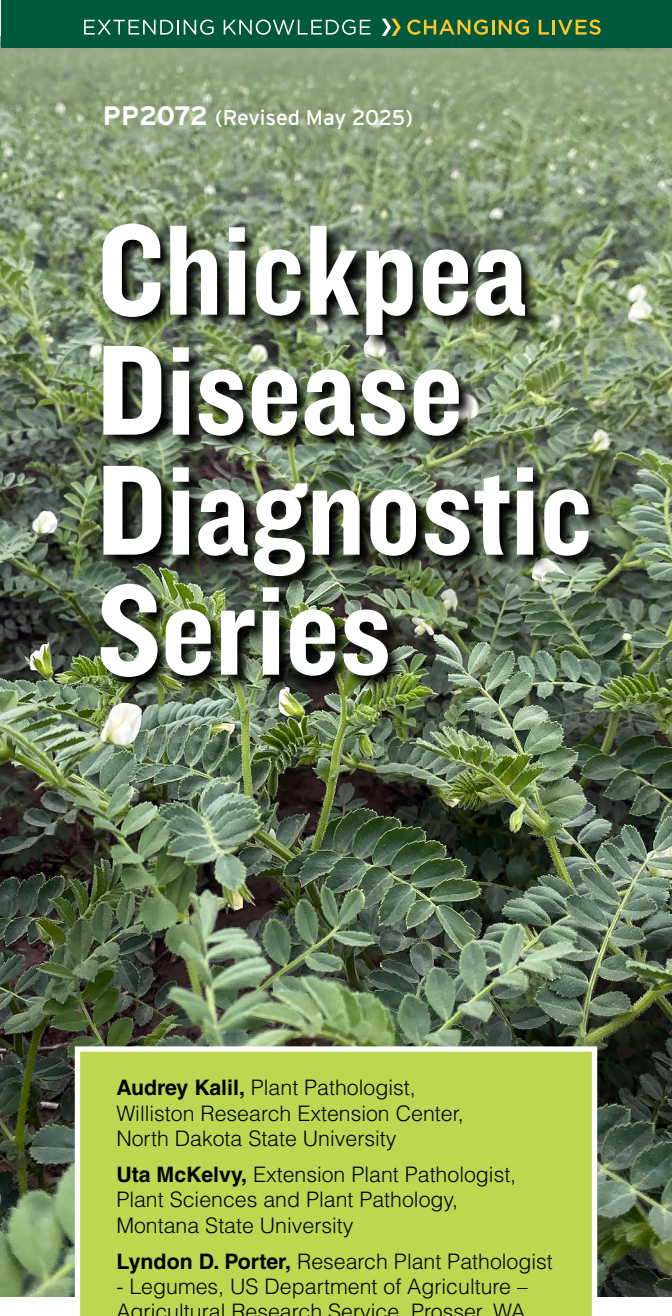
**PP2072** (Revised May 2025)

# Chickpea Disease Diagnostic Series



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Cover photo: Audrey Kalil, NDSU

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 64-12-22; 394-5-25

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# Damping-off

*Pythium* and *Globisporangium* species

**Figure 1**

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

**Figure 2**

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

**Figure 3**

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



# Damping-off

*Pythium* and *Globisporangium* species

**AUTHORS:** Weidong Chen and Lyndon D. Porter

## SYMPTOMS

- **Rotten seeds coated with hard-to-remove soil**
- **Infected seeds and root tissue are light brown in color**
- **Bare patches where plants fail to emerge**
- **Emerged plants are chlorotic, stunted, with poor vigor**

**FIGURE 1** – Infected root radical and infected seed tissue coated in soil

**FIGURE 2** – Washed infected seed

**FIGURE 3** – Infected roots with pinching-off of secondary roots and discoloration

## FACTORS FAVORING DEVELOPMENT

- Planting into cool (below 50 degrees Fahrenheit) and compacted soils
- Deep seeding (more than 2 inches)
- Poor quality/old seed
- Soil is water-saturated at or soon after planting

## IMPORTANT FACTS

- Manage with seed treatment, shallow seeding in warm soils and planting high vigor seed
- Seed treatment options: metalaxyl (resistant *Pythium* strains exist), ethaboxam, picarbutrazox
- Kabuli varieties are more susceptible than desi
- Resistant kabuli varieties are not available
- Commonly confused with Fusarium and Rhizoctonia root rot and water logging



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# Rhizoctonia seed, seedling, and wet root rot

*Rhizoctonia solani*

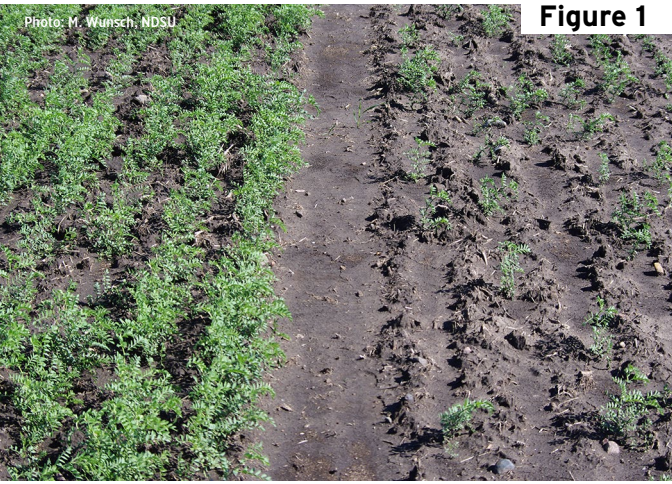


**Figure 1**


**Figure 2**


**Figure 3**

# Rhizoctonia seed, seedling, and wet root rot

*Rhizoctonia solani*

**AUTHORS:** Michael Wunsch and Erin E. Gunnink Troth

## SYMPTOMS

- **Seed decay and damping-off, resulting in poor emergence**
- **Sunken reddish to brown lesions on the epicotyl and tap root**
- **Distribution may be patchy to widespread in a field**

**FIGURE 1** – Reduced stand establishment and plant vigor resulting from high *Rhizoctonia* pathogen pressure

**FIGURE 2** – Cotyledon rot and a sunken lesion at the seed attachment site

**FIGURE 3** – Older lesions turn black as secondary microbes invade diseased tissues

## FACTORS FAVORING DEVELOPMENT

- Cool, wet soils
- Damage from herbicide carryover

## IMPORTANT FACTS

- Plant residues and soil can harbor the pathogen
- Wide host range includes faba bean, dry bean, field pea, lentil, soybean, canola and sunflower
- Fungicide seed treatments are highly effective, particularly SDHI (FRAC 7) fungicides
- Commonly confused with other root rots and often occurs in a complex with them



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# Dry Root Rot

*Macrophomina phaseolina*

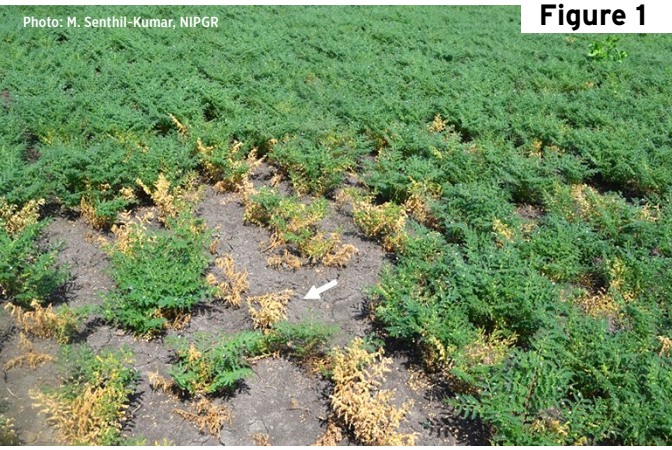

Photo: M. Senthil-Kumar, NIPGR

**Figure 1**

Photo: M. Senthil-Kumar, NIPGR

**Figure 2**

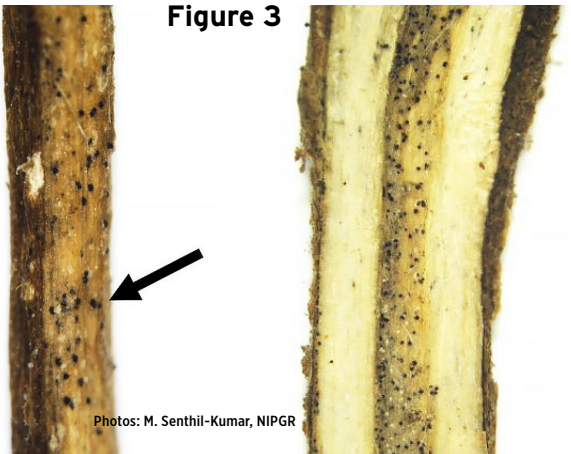

**Figure 3**

Photos: M. Senthil-Kumar, NIPGR



# Dry Root Rot

*Macrophomina phaseolina*

**AUTHORS:** Malaika Ebert and Muthappa Senthil-Kumar

## SYMPTOMS

- **Rapidly dying plants scattered throughout the field during reproductive growth stages**
- **Taproot dry and dark without lateral roots**
- **Lower taproot often missing, easy to uproot plants**

**FIGURE 1** – Field symptoms with straw-colored plants (arrow)

**FIGURE 2** – Diseased plants are straw-colored with brittle and rotten primary taproot

**FIGURE 3** – Black microsclerotia on the exterior and interior of the stem (arrow)

## FACTORS FAVORING DEVELOPMENT

- Hot and dry conditions, with daily minimum above 68 degrees Fahrenheit and maximum above 86 degrees Fahrenheit
- Drought stress
- Poor or sandy soil

## IMPORTANT FACTS

- Pathogen is seedborne, soilborne and survives on infected residue as microsclerotia
- Resistant cultivars are available
- Survives in soil for more than 12 months
- Fungicide seed treatment or preventative foliar fungicides help manage disease
- Pathogen has a broad host range of over 500 plant species, including many legumes
- May be confused with Fusarium wilt and other root rots



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# Fusarium root rot

*Fusarium* species

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

**Figure 1**

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

**Figure 2**

# Fusarium root rot

*Fusarium* species

**AUTHOR:** Lyndon D. Porter

## SYMPTOMS

- **Yellowing and necrosis of foliage at plant base and moving upwards**
- **Dark black, reddish or brown root rot beginning at seed attachment point and spreading to roots**
- **Stunting**
- **Symptoms can develop early but are most pronounced at flowering**

**FIGURE 1** – Black discoloration of infected roots and progressive yellowing of foliage from base upwards

**FIGURE 2** – Loss of secondary roots (middle plant)

## FACTORS FAVORING DEVELOPMENT

- Compacted soil and plant stress
- Short chickpea crop rotations (two-year rotations)
- Warm, moist soil (68 to 82 degrees Fahrenheit)

## IMPORTANT FACTS

- Pathogen survives in soil and on seed
- Often associated with other root rots
- No known cultivars with complete resistance
- Alternate hosts include peas and lentils
- Commonly confused with Rhizoctonia and Black streak root rots



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# Fusarium wilt

*Fusarium oxysporum* f. sp. *ciceri*

**Figure 1**

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

**Figure 2**

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

**Figure 3**

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

# Fusarium wilt

*Fusarium oxysporum* f. sp. *ciceri*

**AUTHOR:** Lyndon D. Porter

## SYMPTOMS

- **Symptoms typically appear at flowering**
- **Drooping, wilted, dull-green leaves**
- **Leaf symptoms may be more severe on one side of the plant than the other**

**FIGURE 1** – Scattered distribution of infected plants dying in the field

**FIGURE 2** – Leaf yellowing, wilting and death progresses from lower canopy upward

**FIGURE 3** – Dark brown to black vascular stem tissue near plant base

## FACTORS FAVORING DEVELOPMENT

- Warm soil temperatures (77 to 86 degrees Fahrenheit), especially during early growth stages
- Short chickpea crop rotations (two-year or less)
- Planting infected seed and susceptible cultivars

## IMPORTANT FACTS

- Races 0, 1A, 1B/C, 5 and 6 are found in the U.S.
- Cultivars vary in resistance to different races
- Pathogen has two pathotypes, one causes slow yellowing, the other wilt
- Commonly confused with Fusarium root rot and abiotic stresses such as waterlogging



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# Verticillium wilt

*Verticillium dahliae* and *Verticillium albo-atrum*

Photo: M. Ebert, NDSU

**Figure 1**

Photo: M. Ebert, NDSU

**Figure 2**

Photo: M. Ebert, NDSU

**Figure 3**



# Verticillium wilt

*Verticillium dahliae* and *Verticillium albo-atrum*

**AUTHORS:** Dimitri Fonseka, Julie Pasche and Malaika Ebert

## SYMPTOMS

- **Leaves turn yellow, wilt and eventually die**
- **Light brown discoloration of vascular tissue in the stem**

**FIGURE 1** – Yellowing of leaves, twisting/curling, and dead leaf tissue

**FIGURE 2** – Uneven necrosis of leaflets moving up stem

**FIGURE 3** – Light-brown discoloration of the vascular tissue (arrow)

## FACTORS FAVORING DEVELOPMENT

- Warm, moist soils (61 to 68 degrees Fahrenheit)
- Warm air temperatures (72 to 82 degrees Fahrenheit)
- Planting susceptible cultivars

## IMPORTANT FACTS

- The pathogen is spread in irrigation water, on farm machinery and via infested seed
- *Verticillium* can survive in the soil for up to 10 years
- *Verticillium* has a broad host range which includes woody and herbaceous plants. Rotation to non-host crops (small grains) is recommended
- Sanitation of farm equipment between fields reduces spread
- Commonly confused with Fusarium wilt and drought stress



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# Ascochyta blight

*Didymella rabiei*

**Figure 1**

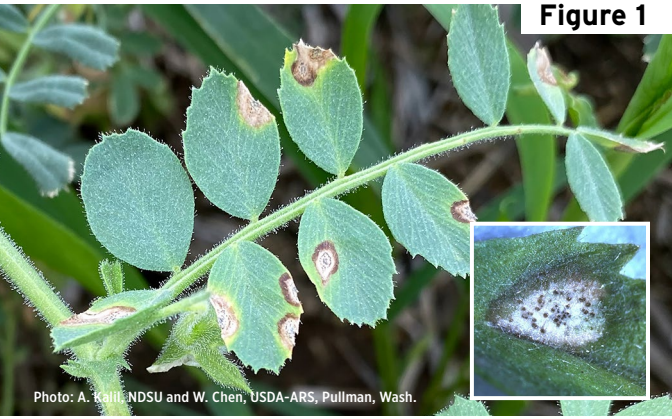

Photo: A. Kalil, NDSU and W. Chen, USDA-ARS, Pullman, Wash.

**Figure 2**

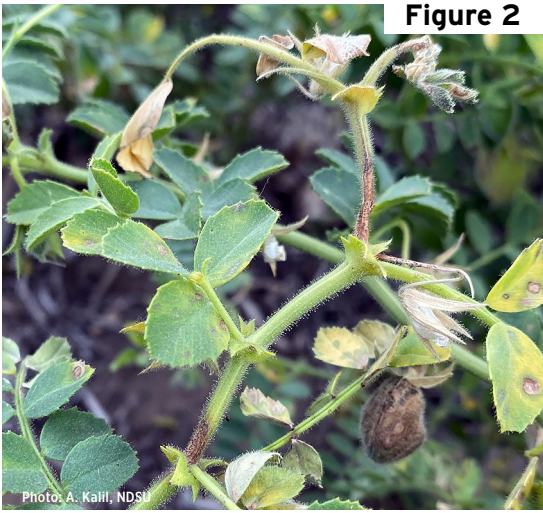

Photo: A. Kalil, NDSU

**Figure 3**

Photo: A. Kalil, NDSU

# Ascochyta blight

*Didymella rabiei*

**AUTHOR:** Weidong Chen

## SYMPTOMS

- **Leaf lesions are initially water-soaked, irregular flecks and/or circular to oval lesions, with concentric ring pattern of small brown pycnidia**
- **Stem lesions develop at nodes, elongate and cause stem breakage**
- **Shriveled seed with brown discoloration**

**FIGURE 1** – Leaf lesion with pycnidia and water-soaked border

**FIGURE 2** – Ascochyta blight lesion girdling the stem

**FIGURE 3** – Pod lesion with concentric rings of pycnidia

## FACTORS FAVORING DEVELOPMENT

- Moderate temperatures (60 to 77 degrees Fahrenheit) and frequent rainfall
- Short rotation interval between chickpea crops
- Planting chickpea adjacent to where chickpea was planted the previous year

## IMPORTANT FACTS

- Pathogen survives in crop residue and is seed-borne
- Pathogen host range is limited to chickpeas
- Strobilurin (QoI) fungicide resistance has been documented
- Plant disease-free seed with fungicide seed treatment
- Managed with minimum three-year crop rotation, less susceptible cultivars and timely application of foliar fungicides



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# Alternaria Blight

*Alternaria alternata*

**Figure 1**

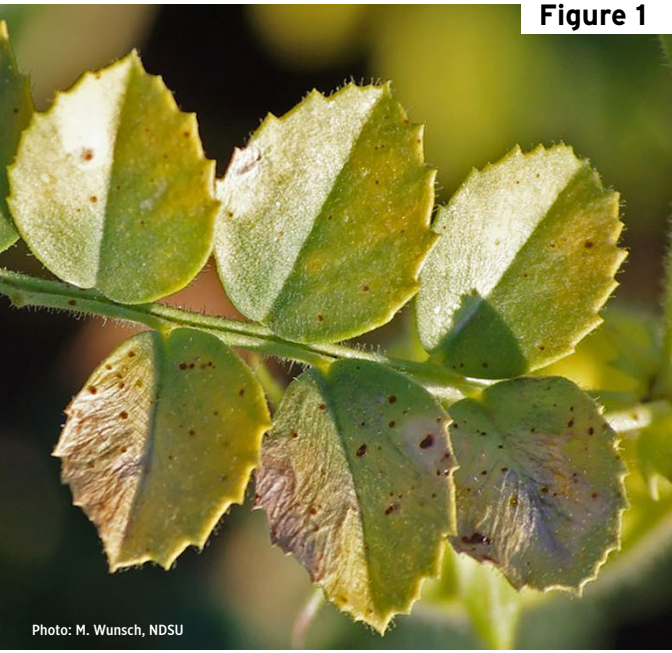

Photo: M. Wunsch, NDSU

**Figure 2**

Photo: M. Wunsch, NDSU

# Alternaria Blight

*Alternaria alternata*

**AUTHOR:** Malaika Ebert

## SYMPTOMS

- **Symptoms occur on all above-ground plant parts**
- **Small, water-soaked, circular lesions turn reddish brown to purple**
- **Infected flowers and leaves may turn straw-colored before falling off**
- **Infected seed is shriveled and blackened**
- **In moist conditions, infected plants appear black from fungal sporulation**

**FIGURE 1** – Reddish-brown lesions on stems and leaves with yellowing and dead tissue

**FIGURE 2** – Foliar symptoms of Alternaria blight

## FACTORS FAVORING DEVELOPMENT

- Planting infected seed and susceptible cultivars
- Warm temperatures (75 to 82 degrees Fahrenheit) and high humidity (above 85%)
- Older plants are more susceptible

## IMPORTANT FACTS

- Pathogen has broad host range including lentil, pea, mungbean and cowpea
- Pathogen survives in seed for up to 20 months
- Infected seed may be unfit for human or livestock consumption
- Manage with disease-free seed, resistant cultivars and seed and foliar applied fungicides
- May be confused with Ascochyta or Stemphylium blight



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# Stemphylium blight

*Stemphylium* species

Photo: M. Burrows, MSU

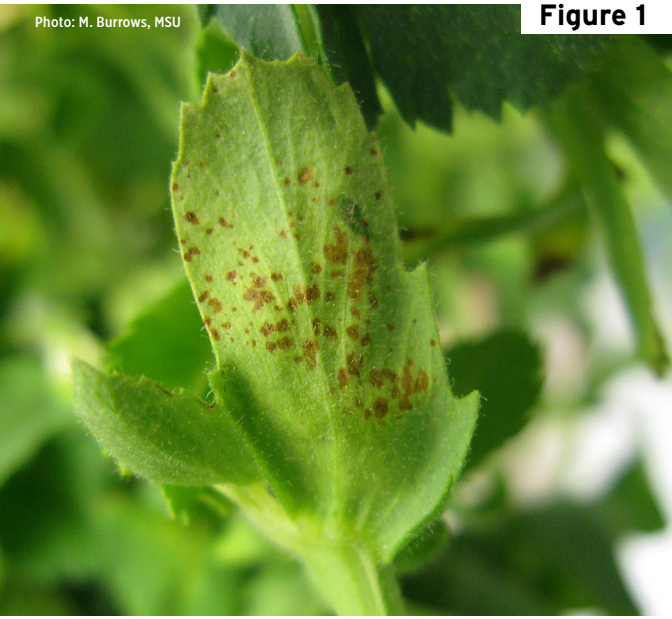

Figure 1

Photo: M. Burrows, MSU

Figure 2

# Stemphylium blight

*Stemphylium* species

**AUTHOR:** Uta McKelvy

## SYMPTOMS

- **Develops as large irregular patches in the field**
- **Older leaf lesions may develop yellow or gray borders**
- **Leaf loss may occur**
- **Small, elongated, brown spots on the stems**

**FIGURE 1** – Initial lesions are small, roughly circular and brown

**FIGURE 2** – Leaf lesions merge, develop irregular shapes and cover large areas

## FACTORS FAVORING DEVELOPMENT

- Cool temperatures (59 to 68 degrees Fahrenheit) and high humidity
- Excessive vegetative growth
- Disease usually develops at and after flowering

## IMPORTANT FACTS

- Disease is present in the U.S. but is of minor importance
- Pathogen is transmitted on/in residue, soil and seed
- No fungicides are registered for disease control
- May be confused with Alternaria blight and Ascochyta blight



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# Sclerotinia stem and crown rot

*Sclerotinia sclerotiorum, S. minor* and *S. trifoliorum*


**Figure 1**


**Figure 2**


**Figure 3**

# Sclerotinia stem and crown rot

*Sclerotinia sclerotiorum, S. minor* and *S. trifoliorum*

**AUTHOR:** Michael Wunsch

## SYMPTOMS

- **Lesions girdle stems, causing plants to senesce and wilt**
- **Lesions on stems and/or crowns are initially light brown; turn bleached and become brittle with age**
- **Fluffy white fungal growth occurs at edges of growing lesions**
- **Black hardened fungal structures develop in and on mature lesions**

**FIGURE 1** – Wilted plant caused by a *Sclerotinia* lesion girdling the stem

**FIGURE 2** – *Sclerotinia* lesions are light brown to bleached with white fungal mycelium at the lesions edge

**FIGURE 3** – Sclerotia, black hardened fungal structures, are produced on diseased tissue

## FACTORS FAVORING DEVELOPMENT

- Wet weather with daytime highs in 70 to low 80 degrees Fahrenheit
- Dense canopy
- Tight rotations with other broadleaf crops, especially lentils, sunflowers and canola

## IMPORTANT FACTS

- The pathogen persists in the soil as sclerotia for many years
- Sclerotinia stem rot often develops concurrently with Ascochyta blight and Botrytis gray mold
- Fungicides must be applied preventatively for successful Sclerotinia stem rot management
- Fungicides have no efficacy against Sclerotinia crown rot



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# Botrytis gray mold

*Botrytis cinerea*

**Figure 1**

Photo: M. Wunsch, NDSU

**Figure 2**

Photo: M. Wunsch, NDSU

**Figure 3**

Photo: M. Wunsch, NDSU

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# Botrytis gray mold

*Botrytis cinerea*

**AUTHORS:** Michael Wunsch and Audrey Kalil

## SYMPTOMS

- **Water-soaked lesions on leaves, stems, flowers and pods that turn gray to dark brown**
- **Fluffy, gray sporulation produced under humid conditions**
- **Flower drop and seed abortion**

**FIGURE 1** – High humidity promotes abundant gray sporulation on lesions

**FIGURE 2** – Stem symptoms include brown speckling and lesions that girdle the stem

**FIGURE 3** – Diseased pods are initially brown and become gray from sporulation when humid

## FACTORS FAVORING DEVELOPMENT

- Planting infested seed
- Dense crop canopy
- High humidity (above 95%) and moderate temperatures (68 to 77 degrees Fahrenheit)

## IMPORTANT FACTS

- Pathogen has a wide host range of more than 100 plant species
- Pathogen is seedborne, survives in the soil and on infected plant residue
- Disease progresses rapidly
- Foliar fungicides have poor efficacy due to difficulty achieving good coverage inside the canopy
- Seed treatment with effective fungicides reduces seed to seedling transmission



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# Pea enation mosaic

*Enamovirus PEMV*

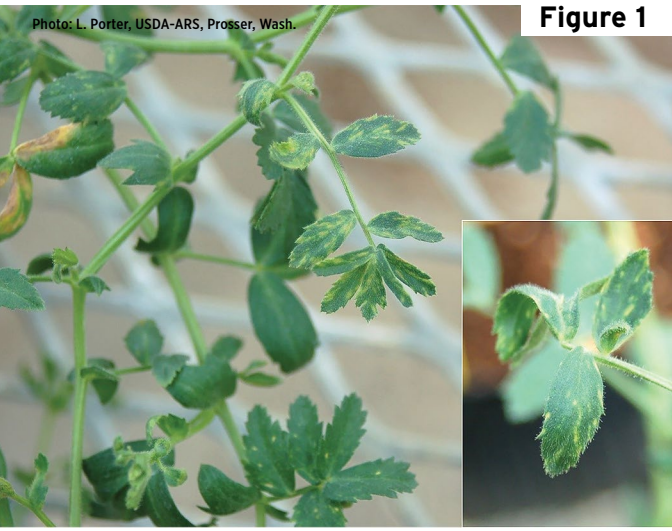

Photo: L. Porter, USDA-ARS, Prosser, Wash.

**Figure 1**

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

**Figure 2**

# Pea enation mosaic

*Enamovirus PEMV*

**AUTHOR:** Lyndon D. Porter

## SYMPTOMS

- **Small yellow spots or flecks on leaves**
- **Severe stunting**
- **Leaves and pods are malformed**

**FIGURE 1** – "Windows" of yellow spots and streaks on distorted and curled leaves and close-up of "windows" on leaflets

**FIGURE 2** – Close-up of distorted leaflets (see arrows)

## FACTORS FAVORING DEVELOPMENT

- Virus-carrying aphids, such as the pea aphid, present and feeding on plants
- Warm spring temperatures favoring early aphid development and migration
- Infections at early growth stages are more severe

## IMPORTANT FACTS

- All currently available commercial cultivars are susceptible to PEMV
- PEMV is not seed-transmitted
- Insecticides to manage aphids may reduce secondary spread of PEMV
- Pea, lentil, faba bean and vetch are also susceptible
- Commonly confused with thrips, herbicide or other virus damage



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# Chickpea health issue

*Causal agent unknown*

**Figure 1**

Photo: T. Parkin, AAFC, Swift Current, Sask., CA.

**Figure 2**

Photo: Saskatchewan Pulse Growers, CA

**Figure 3**

Photo: Saskatchewan Pulse Growers, CAU

# Chickpea health issue

*Causal agent unknown*

**AUTHOR:** Michelle Hubbard

## SYMPTOMS

- **Symptoms appear at flowering to early podding**
- **White, yellow or brown discoloration of leaflet edges**
- **Plant death can occur**

**FIGURE 1** – Discoloration of leaflet edges

**FIGURE 2** – Wilting of apical growth or new growth on side branches

**FIGURE 3** – Symptoms often occur in patchy patterns in the field

## FACTORS FAVORING DEVELOPMENT

Not fully understood, but the following may contribute:

- Potentially caused by both biotic and/or abiotic causes
- Drought, followed by moisture
- Ectoparasitic nematodes
- In-season application of metribuzin herbicide

## IMPORTANT FACTS

- Causes are unknown but under investigation
- The use of the active ingredient sedaxane in seed-applied fungicide may help support crop health
- Has been observed in Saskatchewan (CA), Washington, Idaho, Oregon, Nebraska, North Dakota, and Argentina
- Contact your local agronomist(s) or plant health clinic if you suspect the issue in your field
- Commonly confused with potassium deficiency, botrytis gray mold, Fusarium wilt



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