



*Alfalfa Diseases:  
Symptoms and Management*

# *Alfalfa Diseases: Symptoms and Management*

- Alfalfa diseases can reduce alfalfa tonnage, quality, and feeding value.
- Alfalfa disease management begins with the selection of locally adapted alfalfa products that have high levels of tolerance or resistance to the prominent alfalfa diseases in the area.
- Alfalfa diseases can occur when causal agents (fungi, bacteria, insects, nematodes) are present in the field, the alfalfa product is susceptible to the disease, and the environment is favorable for the disease.

Alfalfa growers have the common goal of producing high tonnage, excellent quality, and high feeding value alfalfa for their livestock or for commercial sale. Some 50 or more alfalfa diseases can compromise that goal.<sup>1</sup> Many alfalfa products have identified levels of tolerance or resistance to some, but not all, of these diseases. Therefore, it is important to know the most prevalent alfalfa diseases within the local area and then select the best adapted products to help manage potential disease outbreaks. Crop rotation may not be a viable management option because many alfalfa disease pathogens can survive within the soil or on residue for several years.

Depending on the disease, plant infection can occur through soil water, splashing rain, wind, and possibly insect

feeding. During the growing season, crop scouting should be conducted weekly to become aware of any disease development. Plant examination should be thorough as disease symptoms can mimic damage from insect feeding, herbicide burn on leaves, fertility deficiencies, environmental stress, and other issues.

Disease management is also a product of plant establishment. At planting, fields should be weed-free, well-drained, fertile, and have a pH between 6.5 and 8.0.<sup>1</sup> To help maximize germination and stands, seeds should be treated with fungicides and be planted at a depth of 1/2 inch, regardless of soil type.<sup>2</sup>

Foliar fungicides may or may not be economical to help manage foliar diseases. The use of foliar fungicides may be the most beneficial for the first cutting each year because spring weather is more favorable for foliar alfalfa disease development, the yield potential for the first cutting is usually higher, and the growing period is usually longer for the first cutting.<sup>3</sup> Hay price, the stage of alfalfa growth, the amount of disease development, and the cost of the fungicide must be considered to help determine if a foliar fungicide application may be warranted.

Most alfalfa diseases can be characterized by how the disease affects the plant - damping off, root rot, crown rot, and foliar diseases. However, many alfalfa diseases have a combination of symptoms.

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# Alfalfa Diseases That Can Cause Seedling Death

## Aphanomyces Root Rot (*Aphanomyces euteiches*)<sup>4</sup>

**Type of Infection:** Damping off and later-season root rot.

**Primary time of Infection:** Mid-March through May. Root rot can occur throughout the growing season.

**Races:** Race 1 and Race 2

### Symptoms

- Seedlings develop yellowish cotyledons and may be reddish on underside; seedlings may die within two to four weeks after planting.
- Leaves may have bluish-green cast.
- Roots are grayish or light brown, water soaked, and have reduced mass.
- Plants appear stunted, yellowish, may resemble nitrogen deficiency (Figure 1).

### Favorable Environment

- Saturated soils.
- Warm (75 to 82°F) soils.

### Management

- Select race-specific resistant products.
- Avoid poorly drained fields and excessive irrigation.
- Use fungicide treated seed.



*Figure 1. Stunting and yellowing caused by Aphanomyces Root Rot.*

Picture courtesy of Dr. Craig Grau, University of Wisconsin-Madison. Permission to use granted by Dr. Damon Smith, University of Wisconsin-Madison.

## Mycoleptodiscus Crown and Root Rot (*Mycoleptodiscus terrestris*)<sup>5</sup>

**Type of Infection:** Damping off and root and crown rot.

**Primary time of Infection:** Mid to late-summer. Can cause early-season damping off.

### Symptoms

- Plants appear stunted and yellow.
- Lateral and fibrous roots are reduced.
- Existing roots may be black and rotted.
- Crown branches are rotted.
- Crown interior is brown with a black margin and decayed from crown into taproot (Figure 2).
- Black sclerotia present in the root and on surface of rotted crown.

### Favorable Environment

- Overwinters as sclerotia in residue and soil.
- Seedling damping off can occur when temperatures are very warm (mid-80s).

### Management

- No resistance available.
- Sclerotia can persist in soil for many years making crop rotation unreliable for management.
- Can infect other legume species including: birdsfoot trefoil, white clover, alsike clover, red clover, crimson clover, and soybean.
- Fungicide treated seed may or may not be effective.



*Figure 2. Decayed root tissue caused by Mycoleptodiscus Crown and Root Rot.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.

## Phytophthora Damping Off and Root Rot (*Phytophthora megasperma*)<sup>6,7,8</sup>

**Type of Infection:** Seedling damping off and root rot.

**Primary time of Infection:** Mid-March through May. Can infect anytime during the growing season.

### Symptoms

- Seedlings fail to emerge or die soon after emergence.
- Plants appear stunted, yellow or reddish-purple lower leaves, may be wilted.
- Taproots have tan to brown or red-brown to black lesions and can be rotted just below crown (Figure 3).
- Infected plants can be easily pulled from soil.

### Favorable Environment

- Wet soils and cool temperatures.
- Survives in soil for many years.
- Greatest problem in poorly drained soils with high organic matter.

### Management

- Select resistant products and consider planting at a higher seeding rate.
- Avoid poorly drained fields and excessive irrigation.
- Improve drainage and manage compaction.
- Use fungicide treated seed.



*Figure 3. Interior taproot rot caused by Phytophthora Root Rot.*

Picture courtesy of John Watkins, Emeritus, University of Nebraska-Lincoln. Permission granted for use by Dr. Stephen Wegulo, University of Nebraska-Lincoln.

## Pythium (*Pythium* spp.)<sup>6</sup>

**Type of Infection:** Damping off.

**Primary time of Infection:** Mid-March through May.

### Symptoms

- Seedlings fail to emerge or die soon after emergence.
- If emergence occurs, plants appear stunted, yellowish, may be wilted.
- Roots appear water soaked, mushy, rotted (Figure 4).
- Can infect mature plants with rotting of fine roots (Figure 5).

### Favorable Environment

- Wet soils and cool temperatures.
- Survives in soil for many years.
- Greatest problem in poorly drained soils with high organic matter.

### Management

- Select resistant products and consider planting at a higher seeding rate.
- Avoid poorly drained fields and excessive irrigation.
- Use fungicide treated seed.



*Figure 4. Seedling alfalfa plants showing decay resulting from Pythium.*

Photo courtesy of and alteration approved by Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.



*Figure 5. Comparison of healthy (left) and Pythium infected alfalfa roots center and right.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.



## Rhizoctonia (*Rhizoctonia* spp.)<sup>9</sup>

**Type of Infection:** Seedling damping off, root rot, crown and stem rot, and foliar.

**Primary time of Infection:** Can infect anytime during the growing season.

### Symptoms

- Seedlings fail to emerge or die soon after emergence.
- Tan, sunken, and elliptical lesions develop on taproot where lateral roots emerge (Figure 6).
- During the winter, existing root lesions turn black.
- Roots are girdled during the summer.
- Infected crowns appear dark brown to black.
- Lower portion of stems develop light brown cankers.
- Leaves wilt, turn yellow, may turn reddish, and dead leaves stick together.
- Plants may collapse into a water-soaked, light-brown mass.
- Cobwebby strands may develop on leaves.

### Favorable Environment

- Wet soils and high temperatures.
- Survives in soil for many years.
- Greatest problem in poorly drained soils with high nitrogen-organic matter (plowed under sod or manure spread during warm, humid weather).

### Management

- Select adapted alfalfa products.
- Avoid poorly drained fields and excessive irrigation.
- Harvest no later than first flower.
- Avoid crown injury that can be caused by grazing or equipment crossing wet soils.



*Figure 6. Alfalfa roots showing cankers caused by Rhizoctonia Root Rot.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.

# Alfalfa Diseases That Can Cause Root Rots

## Bacterial Wilt (*Clavibacter michiganense* subsp. *insidiosum*)<sup>10</sup>

**Type of Infection:** Root rot.

**Primary time of Infection:** Established alfalfa stands of three years or older.

### Symptoms

- Stunted plants have many spindly, shortened stems and small, light green to yellow leaflets (Figure 7).
- Outer vascular taproot tissue becomes yellow to dark golden brown (Figure 8).
- Leaves may be cupped.
- Plants may wilt during the day and recover at night.

### Favorable Environment

- Wet soils and cool temperatures.
- Survives in crop residue.
- Enters plants through wounds.

### Management

- Select resistant products.
- Rotate crops.
- Avoid poorly drained fields and excessive irrigation.
- Avoid mowing when wet.
- Harvest first-cutting at late-bud and every 30 to 40 days thereafter.
- Clean equipment before leaving field.
- Improve drainage and manage compaction.



*Figure 7. Bacterial Wilt infected plant (right).*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.



*Figure 8. Root symptoms of Bacterial Wilt.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.

## Fusarium Wilt (*Fusarium oxysporum* f. sp. *medicaginis*)<sup>11</sup>

**Type of Infection:** Root rot.

**Primary time of Infection:** Established alfalfa stands of two years or older.

### Symptoms

- Scattered, wilted plants are first evidence.
- One side of the stem may wilt and die or whole plant may be affected.
- Stems and leaves appear bleached (Figure 9).
- Leaves wilt during the day and regain turgidity at night.
- Outer layer of taproot initially develops brown to brick red streaks, finally surrounds taproot, then dies.

### Favorable Environment

- Survives in soil and residue for many years.
- Enters plants through wounds.
- More severe if root-knot nematodes are present.

### Management

- Select resistant products resistant to root-knot nematode and Fusarium Wilt.



*Figure 9. Alfalfa plant showing symptoms of Fusarium Wilt.*

Picture courtesy of and used with the permission of Forage Genetics International.

Phytophthora Root Rot (Please see seedling diseases on page 7)

Rhizoctonia Root Rot (Please see seedling diseases on page 8)

# Alfalfa Diseases That Can Cause Crown and Stem Rots

## Anthracnose (*Colletotrichum trifolii*)<sup>12</sup>

**Type of Infection:** Crown rot, stem rot, and foliar leaf spot.

**Primary time of Infection:** Can occur throughout the growing season but most noticeable after second cutting and on stands two or more years old.

### Symptoms

- Stem tips wilt and bend forming a “shepherd’s crook” (Figure 10).
- Diamond shaped, ash-gray lesions with dark-brown to purple borders develop on lower stems.
- Lesions may girdle the stem causing plants to wilt, drop leaves, and have straw-colored shoots.
- Infected crowns are bluish-black near stem origins and reddish-brown near inner crown tissues (Figure 11).

### Favorable Environment

- Warm, humid conditions late in the growing season.

### Management

- Select resistant products.
- Harvest when plants are “young”.
- Rotate out of alfalfa for one or more years.
- Clean equipment before moving into other fields.



*Figure 10. Characteristic straw-colored to pearly white dead shoots with drooping stem (shepherd’s crook) and leaf death caused by Anthracnose. Leaves die after stem is girdled.*

Picture courtesy of and used with the permission of Dr. Stephen Wegulo, University of Nebraska-Lincoln.



*Figure 11. Rotted crown caused by Anthracnose.*

Picture courtesy of and used with the permission of Dr. Stephen Wegulo, University of Nebraska-Lincoln.

**Sclerotinia Crown and Stem Rot (Primary - *Sclerotinia trifoliorum*, Secondary - *Sclerotinia sclerotiorum*)<sup>11,13</sup>**

**Type of Infection:** Crown and stem rot.

**Primary time of Infection:** Early spring and late fall.

**Symptoms**

- White fluffy mass grows on plants or soil surface and infects plants as the mass grows.
- Seedlings most vulnerable.
- Fungus forms small, hard black sclerotia in or on the plant (Figure 12).

**Favorable Environment**

- Cool and wet.

**Management**

- Select tolerant products.
- Rotate out of alfalfa; however, sclerotia can remain viable in soil for many years.
- If possible, avoid planting into infected fields.
- Avoid seeding in the fall.
- Clean equipment before moving into other fields.



*Figure 12. Sclerotia removed from alfalfa stem infected with Sclerotinia Crown and Stem Rot.*

Picture courtesy of and used with the permission of Forage Genetics International.

# Alfalfa Diseases That Can Cause Foliar Lesions and Stem Rot

## Bacterial Leaf Spot (*Xanthomonas campestris* subsp. *alfalfae*)<sup>14</sup>

**Type of Infection:** Foliar and stem rot.

**Primary time of Infection:** Mid-summer, but common in early fall and late-summer.

### Symptoms

- Tiny circular water-soaked lesions on lower leaf surface which become translucent or tan and shiny (Figure 13).
- Stem lesions are initially water-soaked and “greasy” then turn light to dark brown or black (Figure 14).
- Considerable stand loss can occur.

### Favorable Environment

- Wet, hot (82 to 90°F), and windy.
- Spread by wind and rain.
- Survives winter in residue.

### Management

- Select resistant pathogen-free products.



Figure 13. Early lesion development caused by Bacterial Leaf Spot.

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.



Figure 14. Water soaked stem lesions caused by Bacterial Leaf Spot.

Photo courtesy of and alteration approved by Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.

## Spring Black Stem and Leaf Spot (*Phoma medicaginis* var. *medicaginis*)<sup>14,15</sup>

**Type of Infection:** Foliar and stem rot.

**Primary time of Infection:** Early spring.

### Symptoms

- Irregular small, dark brown to black spots on lower leaves, petioles, and stems appear in early spring (Figure 15).
- Leaves turn yellow and wither before falling.
- Stem and petiole lesions can girdle and blacken large areas near base of plant.
- Fungus can infect crown and upper root.
- Stems are brittle and easily snapped.

### Favorable Environment

- Cool, moist conditions.
- Survives winter in residue.
- Spreads by splashing rain, wind, and insects.

### Management

- Cut early if leaf drop becomes excessive.
- First harvest is usually the most affected.



*Figure 15. Stem discoloration caused by Spring Black Stem and Leaf Spot.*

Picture courtesy of and used with the permission of Dr. Stephen Wegulo, University of Nebraska-Lincoln.



## Summer Black Stem (*Cercospora medicaginis*)<sup>14,15</sup>

**Type of Infection:** Foliar and stem rot.

**Primary time of Infection:** Mid-summer.

### Symptoms

- Small, circular brown spots develop on both leaf surfaces.
- Spots enlarge and become reddish to smoky brown, then turn ash gray to silvery (Figure 16).
- Defoliation starts on the lower leaves and progresses up the stem.

### Favorable Environment

- Warm to hot, humid weather.
- More severe following the feeding of pea aphids and secretion of honeydew.
- Overwinters in residue.
- Can be seedborne.

### Management

- Cut early if leaf drop becomes excessive.
- Scout for pea aphid activity.



*Figure 16. Ash-gray lesions caused by Summer Black Stem and Leaf Spot.*

Picture courtesy of and used with the permission of Dr. Stephen Wegulo, University of Nebraska-Lincoln.

## Verticillium Wilt (*Verticillium albo-atrum*)<sup>11</sup>

**Type of Infection:** Foliar, stem rot, and root rot.

**Primary time of Infection:** Mid-April to Early October.

### Symptoms

- Initial infection includes V-shaped yellow or tan leaf tips (Figure 17).
- Leaves become purple, tan, bleached, twisted, or dead.
- Stems remain green.
- Light brown ring develops inside taproot.
- Dead plants.

### Favorable Environment

- Overwinters in residue.
- Can infect some weeds.
- Can be seedborne.

### Management

- Select resistant products.
- Rotate to other crops for two to three years.
- Control broadleaf weeds.
- Clean equipment before leaving infected fields.



*Figure 17. Verticillium Wilt.*

Picture courtesy of William M. Brown Jr., Bugwood.org.

# Foliar Alfalfa Diseases

## Common Leaf Spot or Alfalfa Leaf Spot (*Pseudopeziza medicaginis*)<sup>14</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Anytime during the growing season under high moisture.

### Symptoms

- Lower leaves develop small, dark brown to black circular spots. On the upper leaf surface, mature spots develop a light brown, raised fruiting body in the center of the spot that shoots microscopic spores into the air during cool to wet weather (Figure 18).
- Leaves turn yellow on the upper leaf surface and drop.

### Favorable Environment

- Prolonged periods of cool and wet weather.
- Favors soils that are acid or low in fertility.
- Overwinters in residue.

### Management

- Cut early if leaf drop becomes excessive.

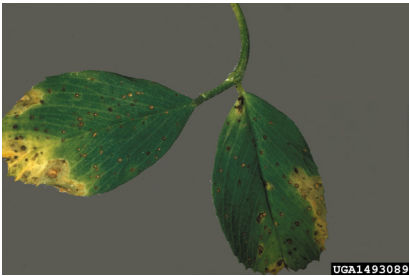


Figure 18. Common Leaf Spot or Alfalfa Leaf Spot.

Picture courtesy of University of Georgia Plant Pathology, University of Georgia, Bugwood.org.

## Downy Mildew (*Peronospora trifoliorum*)<sup>14</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Mid-May through late June.

### Symptoms

- Yellowish, green blotches on upper leaf surface.
- White-gray mold growth on lower leaf surface (Figure 19).
- Leaflets roll and twist downward.

### Favorable Environment

- Cool (optimum 65°F), moist weather.
- More severe first year following seeding.
- Disappears during warm, dry weather.
- Survives in infected crown buds and shoots.

### Management

- Cut early if leaf drop becomes excessive.
- Use fungicide treated seed if planting in late summer to early fall.



*Figure 19. Downy mildew on lower leaf surface.*

Picture courtesy of and used with the permission of Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org.

## Leptosphaerulina Leaf Spot (Pepper Leaf Spot) (*Leptosphaerulina briosiana*)<sup>14</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Mid-May through mid-June and late fall.

### Symptoms

- Lesions start as small, black peppery spots which enlarge to form round to oval light brown spots with dark brown border and yellow halo (Figure 20).
- Lesions may appear as large light tan to white lesions that encompass and kill the leaf under prolonged wet, cool conditions.

### Favorable Environment

- Cool, wet weather.
- Spores dispersed by wind.

### Management

- Cut early if leaf drop becomes excessive.
- Youngest leaves after harvest may show greatest damage.



*Figure 20. Leptosphaerulina Leaf Spot.*

Picture courtesy of and used with the permission of Bruce Watt, University of Maine, Bugwood.org.

## Rust (*Uromyces striatus medicaginis*)<sup>14</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Usually occurs late-season.

### Symptoms

- Small reddish-brown pustules on both leaf surfaces (mostly undersides) with brownish-orange spores (Figures 21 and 22).
- Pustules may develop on petioles and stems.
- Leaves may turn yellow, wither, and drop.

### Favorable Environment

- Warm to hot, damp weather.
- Builds up when third or fourth cutting is delayed.
- Rank and lush growth.
- Spores travel via wind from southern into northern states.

### Management

- Timely cutting.



*Figure 21. Reddish-brown rust pustules.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.



*Figure 22. Rust pustules on upper and lower alfalfa leaf surfaces.*

Photo courtesy of and used with the permission of Dr. Deborah A. Samac, United States Department of Agriculture, Agricultural Research Service, Plant Science Research.

## Stemphylium Leaf or Zonate Leaf Spot (*Stemphylium botryosum*)<sup>14,16</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Summer and fall.

### Symptoms

- Small, oval, sunken, dark spots on upper plant parts.
- Spots enlarge and become zoned and bordered by a yellow halo (Figure 23).
- Leaves turn yellow and drop.
- Stems and petioles may have black areas and be girdled.

### Favorable Environment

- Warm (60 to 70°F) and moist weather in summer and fall.
- Overwinters on seed and residue.
- Spread by water, wind, and infected seed.

### Management

- Early harvest.



*Figure 23. Stemphylium Leaf or Zonate Leaf Spot.*

Picture courtesy of and used with the permission of Gerald Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org.

## Yellow Leaf Blotch (*Leptotrochila medicaginis*)<sup>14</sup>

**Type of Infection:** Foliar.

**Primary time of Infection:** Summer and fall.

### Symptoms

- Small yellow spots on upper leaf surface become elongated blotches parallel to the leaf veins (Figure 24).
- Blotches contain numerous dark brown specks.

### Favorable Environment

- Prolonged cool (optimum of 40 to 70°F), moist conditions.
- Overwinters in residue.
- Favors rank and tall plants.

### Management

- Cut early if leaf loss is excessive.



*Figure 24. Yellow Leaf Blotch lesions on upper leaf surface.*

Picture courtesy of Clemson University – USDA Cooperative Extension Slide Series, Bugwood.org.



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Web sites verified 2/19/21.

# *Legal Statements*

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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