

Kentucky Plant Disease Management Guide for Forage Legumes

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SINGLE ALFALFA PLANT AFFECTED BY BACTERIAL WILT.

INTRODUCTION

This guide contains information on the biology and management of the most important diseases of forage legumes in Kentucky. Fundamental information on symptoms, disease cycle, and management is provided. For some diseases, more extensive information on biology and management is also available in other Extension publications. Additional sources of information are listed at the end of this publication.

Disease management in forage legumes relies heavily on using disease-resistant varieties and employing sound agronomic practices. It is important to integrate both of these strategies into a comprehensive disease management program. Failure to consider one or the other will compromise the success of your efforts. The appropriate use of pesticides sometimes plays a significant role in managing certain diseases, but it is secondary to sound cultural practices and proper variety selection.

Resistance to one or more diseases is often incorporated into modern crop varieties. Unfortunately, resistance is not available for some diseases. However, when available, disease resistance is often the foundation for economical disease control.

No one variety is resistant to all diseases present in Kentucky. Also, the importance and prevalence of

crop diseases vary from one farm to the next and from one year to the next. These facts can complicate the variety selection process. Nevertheless, an informed decision can be made by selecting varieties with resistance to the diseases most likely to be a problem. Resistance to other diseases should be considered on a secondary basis.

While it is not possible to know with complete certainty which diseases will develop, the disease history of the farm and area will indicate which diseases are most likely to occur. A disease history for a farm is established by scouting fields and identifying disease outbreaks when they occur. Your county Extension agent, farm supply dealer, and neighbor can also be good sources of information. However, farm-specific information obtained through field scouting is the most reliable basis for developing a farm disease history.

When selecting a variety, recognize that there are different levels of disease resistance. If available, agronomically acceptable varieties with high levels of resistance usually provide the best protection against a serious disease outbreak. Under reduced disease pressure, however, a moderate level of resistance may be enough to achieve acceptable results. For some diseases, low to moderate resistance is all that is available among current commercial varieties, even though higher levels of resistance would be desirable. In these cases, use of a variety with even a low level of resistance is usually superior to planting a susceptible variety. However, recognize that using low to moderate levels of resistance may require you to pay greater attention to other disease management strategies in order to achieve good results. Varieties can also be selected for tolerance — the ability to yield well even though symptoms develop. Information on disease-tolerant varieties is limited, but tolerant varieties can be useful when available.

Always use pesticides safely and according to the label. Misuse of pesticides can be hazardous to the farmer, farm workers, the growing crop, the consumers of the harvested commodity, and/or the environment. The label is the most reliable source of up-to-date information on a pesticide. **ALWAYS READ THE LABEL BEFORE USING A PESTICIDE, AND FOLLOW LABEL INSTRUCTIONS.**

ALFALFA

Anthracnose

CAUSE: *Colletotrichum trifolii*

SYMPTOMS: Oval- to diamond-shaped lesions on stems. Lesions are tan with brown borders. Stems wilt and turn straw-colored, often having a “shepherd’s crook” appearance. Bluish-black crown rot can also develop. Infected plants are susceptible to winter-kill.

KEY FEATURES OF DISEASE: Fungus survives in dead stem and crown tissues. Spores are spread by rainsplash and equipment. Also attacks red clover.

MANAGEMENT:

- Grow only varieties with at least moderate resistance to anthracnose. Use varieties with higher resistance levels in fields where the disease has been diagnosed.
- Cut alfalfa only when foliage is dry.
- Rotate away from forage legumes for at least 2 years.

Bacterial Wilt

CAUSE: *Clavibacter michiganense* subsp. *insidiosum*

SYMPTOMS: Stunted, yellowish-green plants are evident during regrowth following cutting. Internal water-conducting tissue of taproot is yellowish-brown. Usually does not appear until second or third year of stand. Only scattered plants show symptoms at any one time. (See photo on the first page).

KEY FEATURES OF DISEASE: Bacteria survive in dead taproots and stems. Infection through the cut ends of newly mowed stems, feeding wounds of the clover root curculio, and other wounds to crowns and roots. Also spreads on cutter bar.

MANAGEMENT:

- Grow only varieties with at least moderate resistance to bacterial wilt. Use varieties with higher resistance levels in fields where the disease has been diagnosed.
- Cut alfalfa only when foliage is dry.
- Rotate away from alfalfa for at least 2 years.

Crown Rot Complex

CAUSE: *Fusarium*, *Colletotrichum*, *Pythium*, *Phoma*, *Rhizoctonia*, *Mycileptodiscus*

SYMPTOMS: Rotted or corky areas in crown and upper taproot. Color of rotted tissues may be yellow,



reddish-brown, brown, bluish-black, or black. Stems of affected plants sometimes are yellow and/or wilted.

KEY FEATURES OF DISEASE: Crown rot fungi often infect through wounds. Stresses such as poor fertility, insect damage, untimely harvests, and severe winter conditions or spring freezes can predispose plants to infection. Some fungi do not attack alfalfa except as invaders of wounded, stressed crowns. Others also cause other diseases, such as anthracnose and spring black stem. Breeding for resistance is very difficult since so many fungi can cause the disease.

MANAGEMENT:

- Use varieties with a history of good performance in UK alfalfa variety trials.
- Minimize crown injury by avoiding traffic or grazing when soil is wet.
- Maintain good soil fertility, especially potash.
- Allow adequate regrowth between cuttings.
- Allow 4 to 6 weeks between last harvest and freezedown.
- Control leafhoppers and other insects.
- Rotate away from forage legumes for 2 or more years.

Fusarium Wilt

CAUSE: *Fusarium oxysporum* f. sp. *medicaginis*

SYMPTOMS: Infected plants wilt. Leaves and stems may become yellow but eventually become bleached. Internal water-conducting tissue of taproot has reddish-brown to brown streaks. Usually progresses slowly in stands. Only scattered plants show symptoms at any one time.

KEY FEATURES OF DISEASE: The fungus survives for many years (4 to 5 years or more) in infested soils. Infection occurs through small roots or wounds in taproot. An uncommon disease in Kentucky but does occur sporadically.

MANAGEMENT:

- Grow only varieties with at least moderate resistance to Fusarium wilt. Use varieties with higher resistance levels in fields where the disease has been diagnosed.



Leaf Spot Complex

CAUSE: *Stemphylium*, *Cercospora*, *Pseudopeziza*, *Phoma*, *Leptosphaerulina* (see also Lepto Leaf Spot and Spring Black Stem)

SYMPTOMS: Circular or irregularly shaped spots on leaves. Spots may be tan, brown, or black, and may have yellow halos. Leaves fall off when infections are severe.

KEY FEATURES OF DISEASE: These fungi survive in undecomposed leaf tissue on the soil surface. Spores are spread by air currents or rainsplash. Infections occur when leaves are wet with dew or rain. Serious outbreaks can occur during extended periods of humid, wet weather. *Phoma*, *Leptosphaerulina*, and *Pseudopeziza* are most active under cool conditions; *Stemphylium* and *Cercospora* are most active during warm conditions.

MANAGEMENT:

- Timely (or early, if necessary) harvest can help prevent leaf loss.
- Rotate away from forage legumes for at least 2 years.
- Some varieties may suffer less yield loss, but varieties with high levels of resistance are not available.



LEPTO LEAF SPOT

Lepto Leaf Spot

CAUSE: *Leptosphaerulina trifolii*

SYMPTOMS: Tan leaf spots with brown borders, giving an “eyespot” appearance. Spots sometimes have a yellow margin. Leaves and stems eventually blight and turn tan. Spots may be evident in all but the youngest leaves on growing shoots. Most severe in first or second cuttings.

KEY FEATURES OF DISEASE: Favored by cool, wet weather during alfalfa regrowth. Disease pressure is often high following freezing of alfalfa stems or in fields where a cutting is left unharvested, because dead alfalfa leaves and stems are often colonized by the fungus. Survives in alfalfa residue. Spores are spread by air currents. Also can attack clovers.

MANAGEMENT:

- Timely (or early, if necessary) harvest can help prevent leaf loss and accumulation of spores in the field.
- Some varieties may suffer less yield loss, but the reaction of most varieties to the disease is unknown.
- Rotate away from forage legumes for at least 2 years.

Phytophthora Root Rot

CAUSE: *Phytophthora medicaginis*

SYMPTOMS: Seedlings turn yellow to reddish-yellow, wilt, and die. Established plants regrow slowly following cutting but usually do not show any color change. Infected taproots initially are reddish-brown but become black with age. Infected plants are susceptible to winter-kill.

KEY FEATURES OF DISEASE: The disease can be severe in infested fields with poor surface drainage or poor internal drainage (high clay or compacted soils). The



PHYTOPHTHORA ROOT ROT

fungus can survive for 3 to 5 years in infested soil. Spreads in moving water and in soil on equipment or boots. Surveys indicate about 10% of Kentucky alfalfa fields are infested.

MANAGEMENT:

- Grow only varieties with at least moderate resistance to Phytophthora root rot.
- Use varieties with higher resistance levels in fields where the disease has been diagnosed.
- Use metalaxyl-treated seed. Use deep tillage to break up compacted soil horizons.
- Crop rotation helps to reduce inoculum levels, but long-term rotations are necessary to eradicate the fungus.

Sclerotinia Crown and Stem Rot

CAUSE: *Sclerotinia trifoliorum*

SYMPTOMS: Plants are often killed during winter, resulting in stands failing to regrow in spring. Active infections in spring cause patches of plants to turn yellow, wilt, and die. Rotted crowns are yellowish-brown to brown, and they eventually disintegrate. White cottony fungal growth is often present on infected stems and crowns before dew dries. Small, hard, black, pebble-like fungal bodies (sclerotia) are usually present on dead crowns and stems.

KEY FEATURES OF DISEASE: Fall-seeded alfalfa stands are susceptible to severe damage during the first 4 to 6 months, particularly if seeded no-till into sod or



FIELD INFECTED WITH SCLEROTINIA CROWN AND STEM ROT (TOP); SCLEROTIA, WHICH ARE INITIALLY WHITE, BEGINNING TO FORM IN PLANT TISSUE (LEFT); HARDENED, BLACK SCLEROTIA LAYING ON THE SOIL SURFACE (RIGHT); BLACK SCLEROTIA IN PLANT TISSUE.

fields previously sown to forage legumes. Infections begin in late October from airborne spores. The fungus is common in fields and pastures in many areas of Kentucky and survives as sclerotia in soil for 4 to 5 years or longer. The fungus also attacks clovers.

MANAGEMENT:

- Avoid planting in late summer/early autumn where the disease occurs, especially no-till seedings in sod or fields previously sown to forage legumes.
- If fall seeding, seed as early as possible to allow plants to develop larger, more resistant crowns.
- Deep plowing can reduce spore levels by burying sclerotia. However, plowing does not assure a disease-free stand since spores may arrive from neighboring fields.
- Resistant varieties are not available.

Seedling Diseases

CAUSE: *Pythium*, *Phytophthora*, *Aphanomyces*, *Rhizoctonia*

SYMPTOMS: Rot of seeds and damping-off of seedlings before or after emergence.

KEY FEATURES OF DISEASE: Most of these fungi are common in Kentucky soils. Crop rotation does little to reduce their populations. Generally they do not limit stands of alfalfa seedlings, but can do so during periods of high soil moisture.

MANAGEMENT:

- Select well-drained fields.
- Prepare a fine but firm seedbed if seeding using conventional tillage.
- Use high-quality seed of adapted varieties.
- Seed treatment with metalaxyl fungicide sometimes provides a benefit; greatest benefit is expected in no-till spring seedings.
- Plant varieties with resistance to *Aphanomyces* where this disease occurs.
- Broadcast soil treatments with fungicides at planting are not recommended.



Spring Black Stem and Leaf Spot

CAUSE: *Phoma medicaginis*

SYMPTOMS: Small black spots appear on infected leaves, which turn yellow and fall off soon after infection. Spots are usually more severe on older leaves. Stem lesions are dark brown to black and may girdle stem. Can also attack crowns and roots, turning them black.

KEY FEATURES OF DISEASE: Very common fungus in Kentucky alfalfa fields. Survives in stubble of old cuttings, and spreads easily by rainsplash, running water, and equipment. Leaf infections are most common during spring and early summer. Also attacks certain clovers.

MANAGEMENT:

- Timely (or early, if necessary) harvest can help prevent leaf loss.
- Cut alfalfa only when foliage is dry.
- Rotate away from forage legumes for at least 2 years.
- Some varieties may have partial resistance, but the reaction of most varieties to the disease is unknown.

Web Blight

CAUSE: *Rhizoctonia solani* AG-1

SYMPTOMS: Infection of foliage can cause leaves and stems to collapse in a watersoaked mass, which becomes light brown when it dries. During morning dews, cobwebby fungal strands may be evident on infected tissues.

KEY FEATURES OF DISEASE: This fungus is widespread in agricultural soils. Outbreaks occur during warm, humid conditions. Fungal activity is greatest under a dense canopy. This fungus does not infect crowns and does not cause stand loss.

MANAGEMENT:

- Timely (or early, if necessary) harvest can help prevent leaf loss.

RED CLOVER

Black Patch

CAUSE: *Rhizoctonia leguminicola*

SYMPTOMS: Brown to gray-black leaf spots that often have a “target-spot” appearance. Leaves and stems eventually become blighted, turning dark brown.

KEY FEATURES OF DISEASE: The disease occurs only during warm, humid weather in second or later cuttings that go beyond full bloom. Diseased forage produces the chemical “slaframine,” which is toxic to livestock.

MANAGEMENT:

- Harvest hay regularly, by 10% bloom.
- Avoid letting second cutting go to seed.

Leaf Spot Complex

CAUSE: *Phoma*, *Stemphylium*, *Pseudopeziza*, *Leptosphaerulina*, *Cercospora* (see also Black Patch)

SYMPTOMS: Circular tan, brown or black spots on leaves. Leaves fall off when infections are severe.

KEY FEATURES OF DISEASE: These fungi survive in undecomposed leaf tissue on the soil surface. Spores are spread by air currents or rainsplash. Some of these fungi also attack alfalfa.

MANAGEMENT:

- Timely harvest (or early, if necessary) can help prevent leaf loss and accumulation of spores in the field.
- Rotate away from forage legumes for at least 2 years.

Powdery Mildew

CAUSE: *Erysiphe polygoni*

SYMPTOMS: White to gray powdery growth on leaf surfaces. More severe in late summer and early fall.

KEY FEATURES OF DISEASE: Airborne spores of the fungus are very common in Kentucky.

MANAGEMENT:

- Use resistant varieties.

Root and Crown Rot Complex

CAUSE: *Fusarium*, *Rhizoctonia*, *Phytophthora*, *Myrothecium*, *Colletotrichum*, *Gliocladium*, *Cylindrocladium*

SYMPTOMS: Brown to black decay of roots and crowns.

KEY FEATURES OF DISEASE: Crown rot fungi often infect through wounds. Stresses such as insect feeding, other diseases, poor fertility, etc. increase susceptibility to these fungi.

MANAGEMENT:

- Use adapted varieties.
- Maintain adequate fertility, especially potash.
- Allow 5 to 6 weeks between last harvest and freeze-down.

Sclerotinia Crown Rot

CAUSE: *Sclerotinia trifoliorum*

SYMPTOMS: Leaves and stems turn brown, wither, and die. White cottony fungal growth is found on infected tissues before dew dries. Infected crowns and roots turn brown and eventually die.

KEY FEATURES OF DISEASE: Infections begin in late October from airborne spores. The fungus, common in fields and pastures in many areas of Kentucky, is very long-lived. It also attacks alfalfa and other clovers. Red clover is susceptible throughout the life of the stand.

MANAGEMENT:

- Can be difficult to manage where severe.
- Deep plowing can reduce spore levels in some cases.
- Rotations of 4 to 5 years or longer away from forage legumes can also reduce spore levels.
- Fall grazing or clipping removes infected stems and reduces crown infections

Southern Anthracnose

CAUSE: *Colletotrichum trifolii*

SYMPTOMS: Brown to black leaf spots. Infected stems and crowns turn brown to black.

KEY FEATURES OF DISEASE: The fungus survives and overwinters in dead stem and crown tissues. Spores are splashed by rain to new stems. Also occurs on alfalfa.

MANAGEMENT:

- Use resistant varieties.

SOURCES OF ADDITIONAL INFORMATION

Alfalfa Diseases Caused By Rhizoctonia Fungi (PPFS-AG-F-06)

http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-AG-F-6.pdf

Crown Rots of Alfalfa (PPFS-AG-F-05)

http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-AG-F-05.pdf

Risk Factors for Sclerotinia Crown and Stem Rot in Fall-seeded Alfalfa (PPFS-AG-F-12)

http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-AG-F-2.pdf

UK Forage Variety Trials

<http://www.uky.edu/Ag/Forage/ForageVarietyTrials2.htm>

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Photos: Paul Vincelli, University of Kentucky (Lepto leaf spot & Sclerotinia crown and stem rot); Gerald Holmes, Cal Polytechnic State University at San Luis Obispo, Bugwood.org (Stemphyllium leaf spot); and Unknown source (bacterial wilt, Phytophthora root rot & spring black stem)

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