



LEAF AND STEM DISEASES OF ALFALFA

Alfalfa is commonly attacked by a number of leaf and stem diseases that cause a loss of vigor and reduce both the hay quality and yield. Diseases are worst when the spring season is cold, wet, and late and when there are frequent showers and heavy dews. Seedling stands often become heavily infected, especially under a thick nurse crop (such as oats). A high stubble and weeds matting around the alfalfa plants also contribute to disease severity.

COMMON, OR PSEUDOPEZIZA LEAF SPOT.

This is caused by the fungus *Pseudopeziza medicaginis* and occurs wherever alfalfa is grown. The disease appears to be most serious on soils that are acid or low in fertility. Plants may be severely weakened, lack vigor, and become stunted the first year, but little permanent damage occurs. Common leaf spot starts on the lowermost foliage and progresses up the plant. Later cuttings are usually the ones attacked most severely.

Small, circular, dark brown to black spots, about 1/16 inch (1 to 3 mm) in diameter, develop first on the lower and inner leaves (Figure 1). In the thickened center of fully developed spots, a tiny, raised, light brown, disk-shaped fungus fruiting body (apothecium) forms on the upper leaf surface. This fruiting body is easily visible with a hand lens or reading glass. Large numbers of microscopic spores (ascospores) are shot into the air during cool to warm, wet weather and are carried by wind currents and rainsplash to other plants. Thus, the disease may spread quickly throughout a field. When the spots are numerous, the leaflets soon turn yellow and fall off. Premature defoliation reduces the quality and quantity of forage. The causal fungus overwinters as mycelium in fallen, undecayed leaves and leaf fragments on the soil surface. It is not known to be seedborne. As indicated, disease attacks are most damaging on susceptible varieties during prolonged periods of cool, wet weather in spring, early summer, and autumn. The incidence of disease decreases during dry warm summers.



Figure 1. Common or *Pseudopeziza* leaf spot.

SPRING BLACK STEM AND LEAF SPOT. All aboveground parts of the plant are attacked by the fungus *Phoma medicaginis* var. *medicaginis* (formerly called *Ascochyta imperfecta* and *Phoma herbarum* var. *medicaginis*). Numerous spots develop on the lower leaves, petioles, and stems in early spring. These spots are small, dark brown to black, and irregular. Young shoots are often girdled and killed. Leaf lesions may enlarge and merge, killing large areas of the leaflets. The leaves turn yellow and often wither

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Figure 2. Spring black stem.

before dropping off. Stem and petiole lesions may enlarge, girdle, and blacken large areas near the base of the plant (Figure 2). The fungus may extend into the crown and upper root causing a crown and root rot. Affected stems are brittle and easily broken. When severe, entire stems are blackened and killed.

The Spring Black Stem and Leaf Spot fungus (*Phoma*) mostly overwinters as mycelium in old stems and fallen leaves where minute, brown to black, pimple-like fruiting structures (pycnidia) are produced. Large numbers of microscopic spores (conidia) formed within the pycnidia,

ooze out in cool, wet weather and are spread primarily by splashing water, but also by wind and insects. In cool humid areas, seed pods may become infected and the fungus becomes seedborne as mycelium in the seed coat. Infection of new alfalfa shoots by the Spring Black Stem and Leaf Spot fungus occurs as the shoots grow through the residue or stubble of a previous alfalfa crop. The first harvest is usually damaged the most.

SUMMER BLACK STEM AND LEAF SPOT, caused by the fungus *Cercospora medicaginis*, is most prevalent and damaging during warm to hot, moist weather when harvesting is delayed. Small brown spots form on both leaf surfaces. The spots soon enlarge to form roughly circular, reddish to smoky brown lesions with an indefinite margin and 1/8 to 1/4 inch (2-6 mm) in diameter. Warm to hot, high humidity weather results in lesions that become ashy gray with silvery, glistening areas covered with clusters of conidiophores and conidia. Severely infected leaflets are killed and a high amount of defoliation occurs. As the infection progresses, elongated, dark brown to black lesions enlarge, merge, and may cover most of the stems and petioles. Small stems, petioles, and peduncles on nearly mature plants may die, resulting in further defoliation. Spring and summer black stem infections are much more severe following feeding injury by pea aphids and their secretion of “honeydew.” The honeydew stimulates the black stem fungus and results in many new infections. Infected stems are not as brittle as those attacked by spring black stem, so damage is not as serious. The *Cercospora* fungus overwinters as mycelium in old infected stems and other crop debris. In warm to hot, moist weather, large numbers of microscopic conidia are produced and are spread to new foliage and to other plants by air currents and rain. The fungus can be seedborne in warm, humid areas.

YELLOW LEAF BLOTCH is caused by the fungus *Leptotrochila medicaginis* (formerly named *Pseudopeziza* or *Pyrenopeziza medicaginis*); imperfect stage *Sporonema phacidiodes*. It occurs primarily in the northern half of the United States and in Canada. Yellow leaf blotch is less prevalent than common leaf spot or spring and summer black stem, being most conspicuous in rank and unusually tall stands. Disease attacks occur during prolonged cool, wet weather in the spring and autumn. Enlarging yellow spots, streaks, and blotches develop, most commonly along the leaf margins or along the veins. The blotches become elongated to fan-shaped as they expand and orange-yellow with small dark dots, which are fungus fruiting bodies (pycnidia), embedded in the center. The center of



Figure 3. Yellow leaf blotch. Note the dark areas (pseudostromata and apothecia) on the infected leaflet (courtesy Clemson University and USDA).

the blotched area finally becomes dark brown to black with the formation of pseudostromata and apothecia (Figure 3). Similar, elongated yellow blotches may occur on the stems. These blotches later turn dark brown. Dead leaves curl downward and frequently remain attached to the stems for some time.

The yellow leaf blotch fungus overwinters as mycelium and apothecia in infected leaflets and stems. It is spread mostly by planting infected seed and by airborne ascospores. The discharge of ascospores is favored by a relative humidity above 70 percent and a temperature below 77°F (25°C). The ascospores germinate from 36° to 88°F (2° to 31°C) with an optimum of 40° to 70°F (7.5° to 21°C). Their germ tubes penetrate alfalfa tissue directly within 4 hours at 68°F (20°C), 8 hours at 54°F (12°C), and 24 hours at 43°F (6°C).

Yellow leaf blotch attacks are favored by prolonged cool, wet spring weather, a thick nurse crop, and succulent, lush growth. Losses are in proportion to the number of leaves that drop during wind and rain storms, which may be as high as 40 percent at harvest time or 80 percent at the time of seed pod formation.

LEPTO, OR PEPPER LEAF SPOT is caused by the fungus *Leptosphaerulina* (*Pseudoplea* or *Pleosphaerulina*) *briosiana*. Lepto leaf spot is common throughout the Midwest, especially during prolonged periods of cool, moist weather. Small, irregular black spots develop—mostly on the younger leaves, although some may form on the petioles and young stems. Leaf symptoms vary with the plant's age, stage of growth, and environment. The lesions often start as small, black “pepper” spots. The lesions generally enlarge to form round to oval, light brown to tan spots with a darker brown margin—often surrounded by a yellowish area (Figure 4). Under prolonged cool, wet conditions with rapid regrowth, the lesions appear as rather large, light tan to almost white areas that merge to kill the entire leaf. In older growth, the young upper leaves become infected and have typical symptoms but seldom die before harvesting. The dead leaflets and petioles often cling on the stems for a time. Tiny black dots (fungus fruiting bodies called ascocarps) may be sprinkled within the light brown centers in the late fall and early spring. Ascospores are produced within the fruiting bodies on dead but undecayed leaves and stems during cool, moist weather. The ascospores are forcibly discharged and disseminated by air currents. The greatest damage by Lepto leaf spot occurs to the leaves of young regrowth following harvest. Epidemics, however, may occur at any time during the growing season following periods of cool, moist weather.



Figure 4. *Lepto*, or pepper leaf spot.

STEMPHYLIUM, OR ZONATE LEAF SPOT is caused by the fungus *Stemphylium botryosum*; sexual stage *Pleospora herbarum*. Stemphylium leaf spot is a common disease that develops during prolonged periods of warm, wet weather in the summer and fall, especially in dense stands. Small, oval, dark brown spots appear on the leaves, petioles, stems, peduncles, and seed pods. The slightly sunken spots later enlarge and often become zoned. They are light and dark brown, often surrounded by a pale yellow “halo” (Figure 5). Infected leaves



Figure 5. *Stemphylium* leaf spot (courtesy of University of Wisconsin).

commonly turn yellow and fall prematurely. Usually a single large lesion causes a leaflet to turn yellow and drop prematurely. Black areas appear on the stems and petioles. Stems and petioles may be girdled in wet weather, causing the foliage above the lesion to wilt and die. Foliar infection by *Stemphylium* reduces root growth and may hasten death of alfalfa plants. The *Stemphylium* fungus overwinters on seed and as mycelium on dead stems and leaves. The fungus is spread by airborne and waterborne spores (conidia and ascospores) and by sowing infected seed.

STAGONOSPORA LEAF AND STEM SPOT OF ALFALFA AND SWEETCLOVER. This disease is caused by the fungus *Stagonospora meliloti* (sexual stage *Leptosphaeria pratensis*). The leaf and stem lesions are similar, having a diffuse margin and a bleached center in which dark brown specks (pycnidia) are sprinkled.

Infected leaves drop soon after the lesions appear. The fungus also produces a slowly developing crown and taproot decay which appears to develop from crown and stem infections. Small pockets of an orange-red material give the solid and dry crown and taproot tissue an irregularly speckled appearance. The exterior of an infected root has a rough texture. Eventually, the root decays and the plant dies. The *Stagonospora* fungus overseasons as mycelium in crop debris and is believed to be spread by airborne and waterborne spores (conidia and ascospores). Stagonospora leaf and stem spot is most severe during prolonged periods of warm, moist weather and where alfalfa or sweetclover are not rotated with corn, soybeans, small grains, sorghum, or forage grasses.

BACTERIAL LEAF SPOT is caused by the bacterium *Xanthomonas campestris* subsp. *alfalfae* (*X. alfalfae*). Bacterial leaf spot begins as small, irregular, yellowish, watersoaked spots on the leaves. These spots enlarge, turn brown to black, and may develop a light yellow to tan, papery center (Figure 6). The lesions usually shine due to dried, bacterial exudate. Severe defoliation is common. The stem lesions are watersoaked and “greasy” at first, later turning light to dark brown or black. Lesions may coalesce and extend for several inches. Seedlings are often killed, especially in late summer or early fall seedlings. The disease is favored by extended periods of hot, rainy, windy weather. Optimum growth of the bacterium occurs at 82° to 90°F (27° to 32°C). The casual bacterium overwinters in crop debris and seed. It is spread by wind and rain, insects, all types of equipment, and by infected forage. An invasion of alfalfa tissue occurs through a variety of wounds, especially those made by blowing sand or soil particles.



Figure 6. Bacterial leaf spot with stem lesions (courtesy of University of Minnesota).



Figure 7. Downy mildew on two alfalfa leaves. Note the downy mold growth on the underside of the leaf (right) (courtesy D.L. Stuteville).

DOWNY MILDEW is caused by the fungus *Peronospora trifoliorum*. Downy mildew may be prevalent during uncommonly cool, wet or very humid late springs. The disease seldom damages stands. Downy mildew is most severe during the first year following seeding. Mildew disappears during warm, dry weather but may reappear during cool, wet periods in the autumn. Pale green to yellowish green blotches appear on the young leaves. If the disease is severe, leaflets will roll and twist downward. A delicate, violet-gray, downy mold of conidiophores and conidia may be abundant on the underside of

these leaflets in cool, wet weather (Figure 7). Terminal portions of the shoots are often dwarfed. Highly susceptible, systemically infected plants may be stunted and yellowed, with swollen stems.

The downy mildew fungus overwinters in systemically infected crown buds and shoots of certain susceptible plants, enabling it to survive from season to season. The delicate conidia are produced in cool, overcast, moist weather and are disseminated by wind and rainsplash. Germination occurs only in free water at temperatures from 40° to 85°F (4° to 29°C); optimum 65°F (18°C). The youngest leaves are most susceptible to infection. Secondary cycles can occur every 5 days if the weather remains cool and moist. Weather-resistant spores (oospores) also form in old dead leaves, where they remain dormant over the winter and germinate the following spring. The fungus is also seedborne.

RUST is caused by the fungus *Uromyces striatus*. Rust may be common, but generally is not very damaging because infections usually occur late in the season. The disease is favored by warm to hot, damp weather and rank, lush growth. Small, round, powdery, reddish brown to dark brown pustules form, mostly on the undersides of the leaves (Figure 8). Pustules may also appear on the petioles and stem. Seriously infected leaves may turn yellow, wither, and drop prematurely. The rust fungus survives the winter in the southern states and the infective spores (urediospores) spread into Illinois from middle to late summer on southerly winds.



figure 8. Rust pustules on the underside of an alfalfa leaflet (courtesy of Univ. of Wisconsin).

Several other diseases affect alfalfa stems, usually at or near the crown. These diseases include Anthracnose, Sclerotinia crown and stem rot, and Rhizoctonia stem blight. Those diseases and others are discussed in Report on Plant Diseases No. 302, "Root and Crown Troubles of Alfalfa."

CONTROL

1. **Grow well-adapted, high-yielding alfalfa varieties.** Varieties differ in their resistance to Common leaf spot, Lepto leaf spot, Spring Black Stem, Anthracnose, Downy mildew, other diseases, and winter hardiness. See the current "Illinois Agricultural Pest Management Handbook." Alfalfa cultivars with *Medicago falcata* germ plasm tend to have some resistance to Yellow leaf blotch.
2. **Sow certified, disease-free seed produced in arid areas.** The following leaf and stem diseases are spread by planting infected seed: Spring Black Stem, Yellow leaf blotch, Stemphylium leaf spot, Bacterial leaf spot, and Downy mildew. In addition, several different crown and root rots, as well as seed decay and seedling blight (damping-off) organisms, are transmitted via infected seed.
3. **Plant in warm, well-drained soil in a well-prepared seedbed that is only slightly acid to neutral** (a pH of 6.5 to 7.0).
4. **Practice balanced soil fertility. Maintain adequate amounts of phosphate and potash in the soil, based on soil tests.**
5. **Cut heavily infected stands in the mid to late bud stage before bloom appears for high yields, minimal leaf loss, and high quality.** Cutting before leaf drop maintains the quality of the hay and removes the infected leaves that are the source of infection for later growth. Thus, later cuttings

have a greater chance to remain healthy. Cut early to avoid rank foliar growth that favors fungus growth (disease buildup).

6. **Cut only when the foliage is dry.** This avoids spreading fungi and bacteria that cause leaf and stem diseases, wilts, and crown and root rots.
7. **Cut short, leaving a stubble of 1 1/2 to 2 inches.** This removes sources of infection for the recovering shoot growth.
8. **Control weeds.** Prevent thick growth of weeds to mat around the alfalfa plants.
9. **Control insects.** Follow the suggestions given by University of Illinois Extension Entomologists.
10. **Where feasible, rotate alfalfa at least two years with corn, soybeans, small grains, sorghum, or forage grasses that are free from volunteer forage legumes.**

No control measures are practical or usually necessary for Bacterial leaf spot, Downy mildew, and Rust.

The practices briefly outlined here should reduce losses of hay yield and quality by 50 percent or more.