Alfalfa is a vigorous and productive crop. Like all farm crops, however, alfalfa is subject to stand yield loss from disease, insect injury and nutrient deficiencies. Prompt and accurate diagnosis of a problem can allow early treatment to modify or correct the situation before yields are seriously affected or stands are lost.

The purpose of the Alfalfa Analyst is to provide an identification guide to some of the more important alfalfa diseases, nutrient deficiency symptoms and problem insects. Please use it to help identify any alfalfa problems that you may have. Then secure specific up-to-date management recommendations from your local, county or state agricultural authority.
1. **Bacterial Wilt**  
*Clavibacter michiganense* subsp. *insidiosum* (syns. *Corynebacterium insidiosum*)

First symptoms are a yellowish-brown discoloration in the woody cylinder of the tap root. This occurs in cross section as a ring under the bark and will eventually extend throughout the woody cylinder. Scattered plants become stunted, yellow-green in color, with cupped leaves. The bacteria are in the soil and enter through wounds. Bacterial wilt usually appears in the second or third crop year.

2. **Phytophthora Root Rot and Seedling Blight**  
*Phytophthora megasperma* f. *medicaginis*

Seedlings may be attacked and killed prior to or after emergence when conditions are cool and wet. Diseased seedlings that survive have rotted roots and yellow to reddish leaves and continue to die (blight) for several months. Taproots of older, diseased plants are rotted off. Shoots of older plants are stunted, but otherwise appear normal until the plant eventually collapses and dies or winterkills. Rotted roots are first yellow to reddish brown and later turn black. These unproductive plants may remain alive for several years. Favored by wet soil conditions.

3. **Fusarium Wilt**  
*Fusarium oxysporum* f. *sp. medicaginis*

Stems on one side of the plant wilt and die or the entire plant dies. Stems and leaves become bleached in appearance. Diseased plants are scattered throughout the field. Brown to brick-red streaks, that appear as partial or complete rings in cross section, occur in the woody cylinder of the tap root. As the disease progresses, the entire outer portion of the woody cylinder becomes discolored and the plant dies. The fungus lives in the soil and enters through wounds or fine roots. Some other species of *Fusarium* are associated with crown rot. Fusarium Wilt is more severe in association with root-knot nematodes.
4. Crown Rot

May be caused by *Rhizoctonia solani*, *Phoma medicaginis* var. *medicaginis*, *Stagonospora meliloti*, *Colletotrichum trifolii* or *Fusarium* spp.

Crown rot may be caused by one or more of the above fungal pathogens. Crown rot often begins as a small cone-shaped discoloration below the base of a cut stem. The rotted area enlarges and may merge with rot from other infection sites until the central portion of the crown is destroyed, often leaving a rim of live crown tissue and stems. Some plants may partially recover and be productive for several years, while other progressively worsen until the entire crown is destroyed and the plant dies. Crown and bud rot usually occur during the second or third production year and becomes progressively worse over time. Crown rot is usually more severe where machine traffic is heavy or in fields that are heavily grazed. Parasitism by the stem nematode results in the eventual development of crown rot as a result of entry of a complex of fungi and bacteria.

5. Sclerotinia Crown and Stem Rot

*Sclerotinia trifoliorum*

The first symptoms occur in the fall as small brown spots on leaves and stems. Diseased parts wilt and die, then the fungus spreads to the crown. In early spring the crown or basal part of the stem becomes soft and discolored. As the infected parts die, a white fluffy fungal mycelium grows over the area, forming hard, black bodies (sclerotia) which may adhere to the surface of or be imbedded in the stem or crown. Plants less than one year old are most susceptible. Favored by cool, moist conditions.

6. Verticillium Wilt

*Verticillium albo-atrum*

Symptoms begin as temporary wilting of upper leaves of scattered plants on warm days at prebud to floral stage and progresses to a yellow blotchiness and/or yellow to pinkish-orange-brown V-shaped segments of leaflets. Leaflets may curl along the midrib. Stems remain erect and green or chlorotic for awhile after the leaves on the stem die. Yellowish to brown discoloration is usually present in the woody cylinder of the tap root. Regrowth appears normal in most infected plants, but symptoms reappear as top growth approaches the prebud stage. Plants become progressively weaker and usually die later in the season when plants are stressed for moisture. Favored by cool, wet conditions. Most prevalent on spring and fall growth.
7. **Anthracnose**  
*Colletotrichum trifolii*

Diamond-shaped tan lesions with dark borders appear near the base of the stems. The centers of the lesions contain small black bodies that produce spores. The fungus may girdle and kill stems, crown buds and eventually the crown. Crown rot due to anthracnose is characteristically bluish-black (gunmetal). The "shepherd's crook" is often observed in young, dead shoots. Dead, straw-colored erect stems scattered throughout the field may indicate anthracnose infection. The disease is favored by hot, moist weather. Diseased plants are susceptible to winter kill.

8. **Rhizoctonia Stem Blight,  
Web Blight and Root Canker**  
*Rhizoctonia solani*

Stem blight results when *Rhizoctonia* girdles stems at their base. These stems eventually die, resulting in a stem blight. These blighted stems may resemble anthracnose. However, crooking of the upper stems, known as "shepherd's crook", is absent. Web blight, characterized by dead leaves sticking to each other and to stems by hyphal strands of the fungus, occurs in the warm humid areas of the United States, particularly after extended rainy periods. Root canker is common in the summer in the irrigated valleys of Arizona and California. These large cankers are often darker at the margins and turn black with age. It is most severe under high temperatures and moist conditions.

9. **Seedling Damping-off**  
May be caused by either *Aphanomyces euteiches*, *Phoma medicaginis var. medicaginis*, *Pythium* spp., *Phytophthora megasperma* f. sp. *medicaginis* or *Rhizoctonia solani*

Germinating seeds may be attacked and killed prior to or shortly after emergence. Leaves of diseased seedlings which survive may be yellow, red or brown. Seedling stands may be reduced, especially when soil remains saturated for several days after planting. Infected seedlings which survive often result in stunted, unproductive plants. Feeder roots of older plants also can be attacked by *Aphanomyces* or *Pythium*.
10. **Stem Nematode**  
*Ditylenchus dipsaci*

Germinating seedlings may be attacked and killed. Seedlings are swollen and deformed. Stem buds of older plants are stunted, swollen and brittle and are easily broken off, providing open wounds for crown-rotting organisms. Stems that do develop are usually swollen at the base, with reduced distances between internodes, resulting in compacted crowns and stunted plants. Bases of swollen stems become brown to black. White leaves and stems ("white flagging") develop on some plants. Advanced symptoms include a general crown rot associated with secondary infections. Effected plants are predisposed to winterkill. Worse in irrigated fields with heavy soils. The chrysanthemum foliar nematode, *Aphelenchoides ritzemabosi* produces similar symptoms as the stem nematode and is frequently found in diseased plants along with *Ditylenchus dipsaci* in the western states.

11. **Common Leaf Spot**  
*Pseudopeziza medicaginis*

Small, circular chocolate brown spots appear on leaves. As the spots become older, small, raised discs, usually lighter in color, erupt through the leaf surface in the center of the spots. Infected leaves turn yellow and drop off. Severe defoliation may occur. This disease occurs in most alfalfa growing areas in the United States and is favored by warm, moist conditions. Severe defoliation may occur.

12. **Lepto Leaf Spot**  
*Leptosphaerulina brioslana*

Small brown spots on the leaflets, surrounded by a halo, enlarge and acquire a tan center with an irregular brown border. The infected leaves die and cling to the stem for a time. Only young leaves become infected and the greatest damage occurs on young growth soon after clipping if moist weather conditions occur at that time. In older growth, only the young upper leaves become infected and have typical symptoms. Worse in cool, wet summers.
13. Stemphylium Leaf Spot
*Stemphylium botryosum*

Has both cool temperature (C-T, California—see cross-hatched area) and warm temperature (W-T Eastern—remainder of U.S.) biotypes which produce somewhat different symptoms.

The Eastern biotype causes oval, light brown spots which are slightly sunken, with a dark brown border often surrounded by a light yellow halo. With age, lesions become concentrically ringed and may affect a large portion of the leaflet. When severe, lesions may cause general leaf yellowing and early defoliation. Stems may also be diseased and turn black.

The California biotype produces somewhat irregular lesions that are light tan (almost white), with a sharply-defined light brown border. Spots vary in size, but are seldom longer than 3/16 inch. Spots do not change with age. Forage quality may be reduced, but early defoliation is rare. The disease shows up early in the spring in the interior valleys and throughout the growing season in the cooler coastal areas. Stems are not effected.

14. Spring Black Stem and Leaf Spot
*Phoma medicaginis var. medicaginis*

Dark spots with irregular borders appear on the older, lower leaves. They enlarge and merge until much of the leaf is covered. The leaves turn yellow and drop. Stem lesions are dark green at first, later turning black. Stem lesions may enlarge and merge until most or all of the lower portion of the stem becomes black. Young shoots are often girdled and killed. The disease is most severe on spring growth and is favored by cool, moist weather.
**15. Summer Black Stem**
*Cercospora medicaginis*

Large, usually circular, light gray to black spots usually appear on lower leaves during the summer and early fall. Young spots on the leaves are often surrounded by a halo. Considerable leaf drop, starting with the lower leaves and progressing up the stem, may occur. Brown to black lesions appear on the stem. These lesions become elongate and often cover large portions of the stems. Lesions are reddish brown to chocolate brown in color. The disease is favored by warm, moist weather. Worse on second and third cuttings.

**16. Downy Mildew**
*Peronospora trifoliorum*

Light green to yellow blotches appear on upper leaves. Terminal portions of the shoots are often dwarfed and the leaves twisted or rolled. A grayish cottony growth, which is the mycelium and fruiting structures of the fungus, is often visible on the underside of the leaflets. New spring seedings may be severely injured or destroyed when disease is severe. Cool, moist weather favors the disease. Leaf defoliation does not occur.

**17. Alfalfa Mosaic Virus**

Symptoms of alfalfa mosaic virus are yellow streaks between the leaf veins or light green to yellow mottling of the leaflets, often accompanied by malformation of the leaflets. Plants are sometimes stunted and may be killed by the virus. Many infected plants show no symptoms. Symptoms are most evident in the spring and fall.
1. Nitrogen
Nitrogen deficiency develops due to poor nodulation caused by acid soils or improper seed inoculation. Plants are usually stunted and spindly with light green or somewhat yellow leaves. Early stages of nitrogen deficiency may be observed as pinkish petioles continuing up the midrib of the oldest leaves. Liming these soils is often the long-term solution, although addition of nitrogen fertilizer can provide an immediate response. Also see molybdenum.

2. Lime
Alfalfa plants grown on low pH, acid soils, are light green, stunted and stands thin quickly. Low soil pH is often responsible for stand loss and poor crop performance. Aluminum and manganese may be toxic to alfalfa plants on highly acid soils. Adding agricultural limestone increases soil pH and reduces the availability of these toxic elements. Increasing the soil pH on many soils increases the availability of soil molybdenum, stimulating nitrogen fixing bacteria in root nodules. It also may increase soil phosphorus and some other nutrient availabilities. Lime provides varying amounts of calcium and magnesium depending on the type of limestone.

3. Potassium
Potassium deficiencies are much more common in areas that receive 25 or more inches of precipitation/year. The distinctive symptom of small white spots or flecks around the outer edges of the leaflets is very characteristic. Although the spots are usually most obvious on the upper leaflets, marginal yellowing is greatest on the lower leaves. Under severe conditions the size and number of spots increase, coalesce and the leaves become yellow and dry, and may drop off the plant. Alfalfa stand failure, winterkill and encroachment by grasses are sometimes indications of low potassium. Soil tests and plant analysis may be used for predicting potassium needs. Potash removal rates are 55-60 lb K₂O/ft² dry matter harvested when soil tests are near optimum. At higher soil test levels, removal may increase by 50% or more.

4. Sulfur
Sulfur deficiency is most common on excessively drained, sandy, low organic matter soils located away from urban or industrial areas, which have not received manure in recent years. Deficient plants tend to be stunted and unthrifty with the whole plant, including the veins, pale green to yellow. Although plant analysis may be helpful in diagnosing sulfur deficiencies, soil tests typically do not account for all sulfur inputs. Soil tests, therefore, only correctly identify sulfur availability status when adequate amounts of sulfate are present in the plow layer.

5. Boron
Boron deficient alfalfa is sometimes called "yellow top." The symptoms are often confused with leafhopper yellowing. The top leaves become yellow or reddish yellow. Plant tops may become bunched with shortened internodes and the growing tip may actually die, while the lower leaves and branches remain green. Boron deficient alfalfa does not bloom normally and produces poor seed yields. The deficiency symptoms are most prominent during dry periods, particularly on coarse textured soils with low organic matter. When moisture conditions improve, side branches may resume growth and extend beyond the main stem. The deficiency is readily corrected by small rates of borate or borated fertilizers.
6. Phosphorus
Phosphorus deficient alfalfa often does not exhibit distinct symptoms other than stunted growth. Roots may be light brown and tops stunted, stiff and erect. Leaves, especially on acid soils, may be small and abnormally dark or bluish-green. Well-calibrated soil tests may be particularly useful for predicting phosphorus needs. Alfalfa removes about 12-15 lb P2O5/T of dry matter produced.

7. Molybdenum
Molybdenum deficient alfalfa tends to be pale or light green because molybdenum is essential for nitrogen fixation. Deficiency occurs on very acid soils, as liming increases the solubility and availability of soil molybdenum. Liming or use of a molybdate seed treatment using 0.5 - 1.0 oz. of molybdenum per acre usually corrects the problem.

8. Air Pollutant Damage
Alfalfa is sensitive to high concentrations of smog, sulfur dioxide or ozone in the air. The leaf symptoms are similar for all three. Symptoms range from veinal chlorosis to chlorosis of the entire leaf. Varying degrees of leaf necrosis result from very high concentrations or long periods of exposure. Older leaves are more sensitive than young leaves. Damage usually occurs near urban or industrial areas and may be more pronounced in low areas in fields.

9. Heaving
Heaving usually occurs on heavy soils high in moisture. Alternate freezing and thawing temperatures cause the wet soil to expand and exert upward pressure on the crown. When the pressure is great enough the root and crown are lifted and the tap root will often break when the base of the root is frozen solid. Heaving may be severe in late summer or fall seedlings because of less-developed root systems.

10. Traffic Damage/Compaction
When alfalfa is subjected to excessive traffic, or traffic when the soil is wet, the soils become compacted and less aerated. This results in increased root disease problems, crown damage and poor nutrient utilization. Stand loss in these high-traffic areas is common.
1. Alfalfa Weevil
*Hypera postica* (Gyllenhal)

The alfalfa weevil is the most important insect pest of alfalfa in the United States. Damage from this insect usually starts in early spring when the larvae emerge. The young larvae have black heads and a white stripe down the back. They feed first in the growing tips and then shred the foliage, giving infested fields a greyish cast. The adults are about 1/4 inch long and usually are not seen during the day. The pupae may be found in net-like cocoons either on the plants or in debris on the soil. Both larvae and adults are present after the first cutting, feeding on new growth. Remaining larvae soon mature and the new adults leave the fields during the summer, but return in the fall and start depositing eggs. The map includes both alfalfa and Egyptian weevils. Biological control agents (parasitic wasps and a fungus) have greatly reduced the impact of the alfalfa weevil in the eastern regions of the country.

2. Clover Leaf Weevil
*Hypera punctata* (Fabricius)

The larvae of this insect look very much like alfalfa weevil larvae except they are larger (1/2 inch long) and have brown heads, not black. They are found feeding on alfalfa at night, very early in the spring. They are very susceptible to a fungus disease and diseased, dying or dead larvae curled around the stems are commonly seen. Usually their numbers are reduced by the disease before extensive damage occurs.
3. Clover Root Curculio
*Sitona hispidula* (Fabr.)

The adult clover root curculio is a small, slender, dark gray snout beetle about 3/16 inch long. It feeds on the foliage, but is rarely serious in this stage. However, extensive larval damage to the roots is frequently found, particularly in older stands. Damage is characterized by extensive scarring of the epidermal layers of the roots, as pictured. These lesions may become avenues of entrance for various disease pathogens, causing wilt and root rot.

4. Alfalfa Snout Beetle
*Brachyrhinus ligustici* (L.)

This large snout beetle, nearly 1/2 inch long, has been found thus far only in New York, southern Vermont and Ontario. The beetles' spread has been limited because they do not fly. The larvae are large, white and grub-like in appearance. Damage from adults feeding on the foliage and larvae feeding on or in roots may be severe enough to kill plants.
5. **Blue Alfalfa Aphid**  
*Acyrthosiphon kondoi* (Shinji)

The blue alfalfa aphid was first found in California in 1974 and now occurs in several western and midwestern states. It is similar to the pea aphid in appearance, but can be distinguished by its bluish green coloration in contrast to the yellowish or light green color of the pea aphid. Coloration of the third antennal segment of adults and nymphs and thoracic area of the winged forms can also be used in the field. The third antennal segment of the blue alfalfa aphid is uniform brown in contrast to a narrow dark band at the tip of the third antennal segment in the pea aphid. The thoracic area of the winged pea aphid is light brown, in contrast to a dark blackish brown for the blue alfalfa aphid.

6. **Pea Aphid**  
*Acyrthosiphon pisum* (Harris)

This large green aphid is common on alfalfa. It builds up huge populations which cover the stems and terminal buds in cool, wet seasons. It causes damage by sucking plant juices, causing the plants to wilt. Usually, as drier and warmer weather develops, natural controls reduce the infestations. This insect has many natural enemies.
7. Potato Leafhopper
Empoasca fabae (Harris)

This tiny light green insect which jumps when disturbed is a common cause of alfalfa yellowing. The nymph or immature stage is light yellow and characteristically walks sideways. Feeding by these insects causes severe stunting of the plants and yellowing or reddening of the foliage. Leafhopper damage starts in wedge-shaped areas at the tips of the leaves. The first cutting is not usually affected, but subsequent cuttings may be severely damaged.

8. Spotted Alfalfa Aphid
Therioaphis maculata (Buckton)

This tiny aphid is light yellowish green or straw colored, with rows of dark spots on its back. Unlike the pea aphid, it develops under hot, dry conditions. It causes severe stunting and yellowing of plants and will kill seedling stands. It secretes a great abundance of sticky honeydew in which a sooty black fungus may develop. This aphid is most severe in the arid areas of western and southwestern United States.

9. Meadow Spittlebug
Philaenus spumarius (L.)

The meadow spittlebug is an early spring pest. The most characteristic symptom of infestation is the frothy spittle secreted by the yellowish green nymphs as they feed. Feeding causes stunting with a shortening of internodes so that the leaves are bunched together, giving a rosette appearance. The jumping adults emerge in early June and cause little economic damage to alfalfa, but may be abundant and annoying to the grower at harvest time.
10. Alfalfa Blotch Leafminer
*Agromyza frontella* (Rondani)

The adult leafminer is a tiny dull-black humpbacked fly which emerges in the northeast in late May from overwintering pupae on the ground. The fly's presence is best recognized by its pinhole oviposition and feeding punctures which may range from a few to over 100 per leaflet. The female deposits 1 to 3 eggs per leaflet, so most of the punctures are due to feeding. Mines are produced in the leaves from feeding by the larvae on leaf tissue between the upper and lower leaf surfaces. A mine tunnel is formed as feeding progresses, usually beginning at the base of the leaf, widening as it approaches the leaf apex and terminating with an enlarged blotch which is often “comma” shaped. The mature larvae leave their mines and drop to the ground to pupate. In the northeast, a second generation emerges about a week after pupation in mid-July, followed by a third generation in late August.

11. Variegated Cutworm
*Peridroma saucia* (Hubner)

This cutworm prefers non-grass crops and can cause extensive damage to alfalfa during warm, wet seasons. When fully grown, it is about two inches long and may range in color from almost black to light greenish yellow or tan. It has a distinctive row of light yellow diamond-shaped spots aligned down the middle of the back. The worms feed mainly at night and hide under clods or in soil debris during the day. There are other species of cutworms which occasionally damage alfalfa.
12. **Differential Grasshopper**
*Melanopus differentialis* (Thomas)

The differential grasshopper is only one of several species of grasshoppers which may attack alfalfa and cause serious damage. Grasshoppers become most numerous in uncultivated areas. Consequently, heaviest infestations are usually found in field margins, fence rows, pastures, grass waterways, etc. Their populations increase in seasons which are hot and dry. New seedlings of alfalfa are favorite foods of grasshoppers. Grasshoppers will move from field margins into these new seedlings, depleting them as they feed.

13. **Plant Bugs**
*Lygus* species

There are several species of plant bugs which are common in alfalfa fields. The tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), which is the one pictured, is one of the most common in the Midwest and eastern states. Plant bugs cause serious damage to seed and are not usually thought of as forage pests. However, they suck the juices from the foliage and are frequently very abundant, resulting in wilting of the plant tips and thus forage yield loss.

14. **Blister Beetles**
*Epicauta* species

There are several species of blister beetles which are common in alfalfa fields. Striped blister beetles (complex of species) are the most common group found in the Midwest, but several other species also occur. These insects cause limited plant damage to alfalfa, but when ingested by horses, may cause sickness and possible mortality. Blister beetles contain cantharidin, a toxin that is generally lethal to horses when approximately 25 to 100 blister beetles are consumed in a 24 hour period.
COMMON FORAGE LEGUME INSECTS

For safe and effective use of insecticides, always identify the problem correctly.

1. Alfalfa weevil adult, and larvae and damage
2. Clover leaf weevil larva
3. Sweetclover weevil and typical damage
4. Varigated cutworm
5. Grasshopper
6. Green cloverworm
7. Potato leafhopper (greatly enlarged) and leafhopper damage to alfalfa
8. Meadow spittlebug and nymphs
9. Spotted alfalfa aphid
10. Pea aphid

Prepared by Extension Entomologists of the North Central States in cooperation with the Federal Extension Service, U.S. Department of Agriculture
1. Adult alfalfa weevil—Overwinters in alfalfa. Females lay eggs in alfalfa stems from September through June. New adults leave alfalfa fields in June to estivate in field margins, woods, and other sheltered areas until fall when they return to alfalfa. Adults feed primarily on alfalfa, but will infest clovers and several other plants if alfalfa is not available. Adults are ½ inch long, brown colored with a darker stripe down the back.

**Alfalfa weevil larvae**—The larvae shown are fully developed and ready to pupate for the change to adults. The larvae normally hatch in April, May, and June. Newly hatched larvae are yellowish white. They imbibe themselves in the growing tips of alfalfa stems. After several days feeding, the larvae turn green and have a white stripe down the back. When fully developed, the larvae are about ½-inch long. Chemical control of the larval stage is the best method of control available at this time.

**Alfalfa weevil damage**—Close inspection of infested fields in the spring is necessary to detect the beginning of leaf skeletonization caused by larval feeding. As more and more leaf tissue is removed, the field assumes a silvery appearance. Feeding may continue until stems are eaten which may kill young alfalfa plants. Hay quality will be very poor if feeding damage reaches the degree shown.

2. Clover leaf weevil—A close relative of the alfalfa weevil occasionally injures alfalfa and red clover. These insects usually pass the winter as partially grown larvae and may be found at the base of plants during the day. The larvae are green with a pale white stripe edged with pink down the back. Full grown larvae are about ½ inch long. Adult weevils are twice as large as the alfalfa weevil and lay their eggs in September and October. Disease and a parasitic wasp keep this species in check most of the time.

3. Sweet clover weevil—Adult weevils commonly feed on all clovers, alfalfa and soybeans. The brownish beetles, about ¼ inch in length, have a short snout, eat out rounded areas in plant leaves, and may cause severe damage. The larvae are small grubs that feed on clover roots and crowns. Their damage usually goes unnoticed. When severe populations occur, rotation to grasses or cultivated crops will eliminate the infestation.

4. Variegated cutworm—Larvae of this pest are frequently found in alfalfa and other crops. The cutworm overwinters as a pupa. When fully developed the larvae measure 1-1½ inches long. They have pale yellow dots along the middle of the back, and often have a W on the eighth abdominal segment. The skin is smooth, generally ashen in color, or a light dirty-brown, lightly mottled with dark brown. Three to four generations occur.

5. Grasshopper—Several species of grasshoppers are commonly found in forages. Outbreaks severe enough to cause economic damage are usually associated with prolonged periods of drought. Undisturbed areas, such as fence rows, road-sides and pastures are the preferred habitats for early development.

6. Green cloverworm—Nearly always present in alfalfa and clover, the green cloverworm occasionally attains economically important numbers. It overwinters both in the pupal and adult stage. The adults are dark brown, black spotted or mottled moths with a wing spread of about 1½ inches. The larvae are about the color of alfalfa leaves with two narrow white stripes down each side of the body. When fully grown, they are 1-1½ inches long. Two to three generations probably occur in Missouri.

7. Potato leafhopper—This pest is known to feed on 100 cultivated and wild plants. The ¼-inch-long, yellowish-green wedge-shaped adults migrate into the state each spring. The females live a month or more and deposit 2-3 eggs a day in plant stems and leaf petioles. The eggs hatch in 10 days, and the yellowish green nymphs become full grown in about two weeks. The nymphs are similar in shape to the adults, but lack wings: They feed on the underside of the leaves, usually where they hatched. The leafhoppers pierce the leaf vein and suck the sap from the plant, causing the leaves to turn yellow. In dry seasons, the added stress of drought to “hopperburn” can cause serious damage to alfalfa plants, as well as loss of the current cutting. Two to four generations may occur in Missouri each year.

8. Meadow spittlebug—Nymphs are found inside the spittle masses in April, May, and June. They are pink when very young, but turn yellowish-green as they develop. Soon after hatching, the nymphs secrete a liquid (mostly plant sap) and force air through it to produce the spittle masses. The grey or mottled-brown winged adults, about ¼ inch long, emerge in June. Almost all damage is caused by the nymphs sucking sap from the plant.

9. Spotted alfalfa aphids—These plant lice are usually pale yellowish-green with six or more rows of black spots on their backs. The spotted alfalfa aphids seen on alfalfa are nymphs or winged and wingless females. Males are rare. Both adults and nymphs suck sap from the plants. Resistant alfalfa varieties, including Cody, offer adequate protection against this pest.

10. Pea aphid—These plant lice are usually dark green, darker than the spotted alfalfa aphid, and do not have spots on their bodies. Infestations may build up in April, May, and June. Predators usually hold the populations in check.

Issued in furtherance of cooperative extension work, acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture, Carl N. Scheneman, Vice-President for Extension, Cooperative Extension Service, University of Missouri, Columbia, Mo. 65201. The University of Missouri-Columbia is an equal employment and educational opportunity institution.
ALFALFA DISEASES I

1. Common leaf spot
2. Yellow leaf blotch
3. Leptosphaerulina leaf spot
4. Stemphylium leaf spot; R, close up of lesion
5. Summer (Cercospora) black stem and leaf spot
6. Rust
7. Downy mildew. L, upper and lower leaf surfaces; R, infected shoot tip
8. Alfalfa mosaic
9. Bacterial leaf spot
10. Spring (Phoma and Ascochyta) black stem (L) and leaf spot (R)
11. Cercospora leaf spot
ALFALFA DISEASES

1. Common Leaf Spot, caused by the fungus *Pseudopeziza medicaginis*, occurs world-wide reducing both yield and hay quality by early and heavy defoliation. Seedlings or young plants may be killed outright by Common Leaf Spot following extended periods of cool, moist or very humid weather. Numerous small (1 to 3 mm), circular, dark brown to black spots form on the leaflets. These lesions remain distinct and develop a slight yellow halo. A tiny, light brown, cup-shaped structure (apothecium) appears in the center of older spots on the upper leaf surface. Plants are rarely killed outright by Common Leaf Spot, but defoliation can seriously reduce plant vigor and predispose a plant to winter injury. The fungus survives in undecomposed leaves and leaf fragments on the soil surface.

2. Yellow Leaf Blotch, caused by the fungus *Leptotricha medicaginis* (synonym *Pseudopeziza jonesii*; imperfect stage, *Sporonema phacioides*), occurs world-wide where stands are rank and tall. Leaf spots start as chlorotic flecks that often enlarge to form yellow-to-orange streaks between the leaf veins. Older lesions turn an orange-yellow or brown. Numerous dark specks (conidia) form in the centers of older lesions on the upper leaf surface. The withered leaves may remain attached for some time. The fungus survives in undecomposed leaves on the soil surface.

3. Leptosphaerulina Leaf Spot, also called lepto leaf spot, halo spot, pepper spot and brown leaf spot, is most severe on young leaves, petiole and other above ground parts of recently cut stands. The disease is most prevalent in cool, moist weather. The causal fungus, *Leptosphaerulina briosiana* (synonyms *Pseudopeziza briosiana* or *Pleospora briosiana*), produces small, reddish-brown to black spots ("pepper spots") that may enlarge to form oval-to-round tan spots with a darker brown border often surrounded by a yellowish area. Infected leaves and petioles die and often cling to the stem for some time. The fungus overwinters in leaves on the soil surface.

4. Stemphylium Leaf Spot, also called target spot, is caused by the fungus *Stemphylium botryosum* (perfect stage, *Pleospora herbarum*). The disease is often most severe in lush dense stands following warm wet weather when harvesting is delayed. Lesions on the leaflets are oval-to-elongate, dark brown spots with lighter centers that enlarge and form concentric light and dark brown zones. A single large lesion can cause a leaflet to turn yellow and drop prematurely. Older leaf and stem lesions are covered by a sootlike mold due to growth of the Stemphylium fungus. Black, girdling lesions may develop on the peduncles, petiole and stems causing the foliage beyond to wilt, wither and die. The fungus overwinters on old infected stems or on seed.

5. Summer (Cercospora) Black Stem and Leaf Spot, also called Cercospora leaf spot and Cercospora black stem, is caused by the fungus *Cercospora medicaginis*. The disease is common after the first cutting during warm, moist weather. Leaf lesions begin as small brown spots that enlarge to form roughly round, reddish-to-smoky-brown lesions, 2 to 6 mm in diameter, with a yellow halo. If severe, leaflets are killed causing early defoliation. Stem and petiole lesions are elliptical to elongate and reddish-to-chocolate-brown. These lesions may expand to girdle and kill the stems, petioles and peduncles resulting in further defoliation and loss of seed. The fungus overwinters in crop residue and may be seed-borne.

6. Rust, caused by the fungus *Uromyces striatus*, is a late-season disease that occurs world-wide. Theuredal pustules are reddish-brown and dusty, forming on the lower leaf surface, petioles and stems. When severe, rusted leaves may turn yellow and fall prematurely. The near absence of the alternate hosts (*Euphorbia* spp.) in the USA makes the black telial stage, which forms at the season's end, nonfunctional in the disease cycle. The fungus survives in southern states in theuredal stage in living plants. Theuredospores are wind-borne northward as the season progresses.

7. Downy Mildew, caused by the fungus *Peronospora trifoliorum*, appears mainly in the spring and fall during cool, moist or humid weather. Symptoms appear during warm-to-hot, dry weather. Young leaflets, especially at the shoot tips of rapidly growing plants, are often dwarfed, twisted or curled downward with light green-to-yellow blotches. A pale violet, downy growth may be visible on the underleaf surface, especially during cool, moist or very humid weather. Systemically infected plants may be stunted and yellow. Fall-infected seedlings commonly winter-kill. The fungus overwinters as thick-walled spores (oospores) in crop residue and as mycelium in systemically infected crown buds and shoots.

8. Alfalfa Mosaic is caused by a virus of many strains transmitted to seed through pollen and ovules from infected plants and by aphids after feeding on infected plants. Typically, a yellow or light green interveinal mottling and yellow streaks parallel to the leaf veins appear in young developing leaves during cool weather. Infected leaves or entire plants often become distorted and stunted. Mosaic-infected plants may die within several weeks to several years. Symptoms expression is often masked in hot weather; many infected plants may never show symptoms. The virus is seed-borne and also overseasons in living alfalfa and other plants (some 220 species in 73 genera).

9. Bacterial Leaf Spot, caused by the bacterium *Xanthomonas alfae*, occurs world-wide following warm-to-hot, moist weather. Small round-to-irregular, water-soaked leaf spots expand up to 3 mm in diameter, become irregular and brown or black, often with a lighter center that may glister due to dried bacterial exudate on the surface. Infected leaves usually wither and drop prematurely. Stem lesions are "greasy" before enlarging and turning light-to-dark brown. Infected seedlings are often stunted or killed. The bacterium overseasons in crop residue and in soil.

10. Spring Black Stem, or Ascochyta leaf spot, is similar to Summer (Cercospora) Black Stem (5), but disease development is favored by cool, moist weather in spring and fall. Usually the first cutting is most damaged. The causal fungus, *Phoma medicaginis var. medicaginis* (synonym *Ascochyta imperfecta*), primarily infects the stems, but attacks all above ground plant parts. Dark green, water-soaked, girdling lesions develop in the stems and petioles, turning dark brown to black with age. The lesions may enlarge and merge until most of the lower parts of stems are blackened. Young shoots may be girdled, turn yellow-to-brown, and die. Numerous small, irregular, dark brown or black spots form on the lower leaves. The lesions enlarge and may merge to cover most of the leaflet. If severe, the leaves turn yellow, wither, and drop prematurely. A crown and root rot may also develop. The fungus overseasons is diseased plant tissue and may be seed-borne.

11. Cercospora Leaf Spot is a minor foliar disease in warm, moist weather caused by the fungus *Cercospora zebrina*. The fungus is closely related to the one that incites Summer Black Stem (5); however, *C. zebrina* also attacks various clovers. The brown leaf lesions are oval to irregular in shape, expanding into dark, target-shaped spots surrounded by a yellow halo. Older lesions may appear ash-grey due to sporulation of the fungus on the diseased tissue. The fungus overwinters in plant residue and may also be seed-borne.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university or your county extension office.
ALFALFA DISEASES II

1. Bacterial wilt

2. Phytophthora root rot. L, dead and dying plants; R, typical root symptoms

3. Anthracnose. L, external and R, internal symptoms

4. Fusarium crown rot

5. Mycoleptodiscus crown rot

6. Sclerotinia crown and stem rot

7. Fusarium wilt

8. Rhizoctonia stem canker

9. Violet root rot

10. Crown wart

11. Dodder
ALFALFA DISEASES II

1. **Bacterial Wilt**, caused by the bacterium *Corynebacterium insidiosum*, is a major disease that occurs worldwide, especially in poorly drained wet areas. The bacterium is easily spread in the field by mowing and tillage equipment, surface water, and animal life in the soil. Symptoms first appear as the dying of scattered plants throughout a field, usually starting in the second or third year after seeding. Severely infected plants are stunted, turned brown, and yellow-green to bleached. Such plants are more susceptible to winter-kill. Under moisture stress, young succulent growth wilts and dies. A cut through a diseased tap root or crown reveals a yellow-to-brown discoloration in the vascular cylinder. The bacterium overwinters in crop debris in the soil and infects plants through a variety of wounds.

2. **Phytophthora Root Rot** is a serious, worldwide, soil-borne disease caused by the fungus *Phytophthora megasperma*. Like Bacterial Wilt (1), it occurs primarily in low-lying, poorly drained soils following periods of excessive rainfall or flood irrigation. Losses are most severe to seedlings. Infected plants are stunted; the leaves turn yellow or reddish, wilt, and die. Regrowth is often slow and greatly reduced after a cutting. The tap roots and rootlets are rotted with yellow-to-brown lesions that later turn black. There is usually a sharp line between rotted and healthy tissue and the decay may occur at various depths in the soil. The fungus probably overwinters as thick-walled, dormant spores (oospores) or as mycelium in crop debris.

3. **Anthracnose**, caused by the fungus *Colletotrichum trifolii*, occurs in the southern half of the USA during warm, moist or humid weather. Infected shoots wilt and die, turn straw-colored to white, and are scattered through a field. Newly killed shoot tips often have a "shepherd's crook" appearance. Lesions on the lower parts of these shoots are oval to diamond-shaped with a straw-colored center and a brown border. Black fruiting structures (acervuli) form in the centers of older lesions and on crop debris. The fungus may grow downward from infected shoots into the crown tissue which appears bluish-black. Diseased crowns produce weak, less vigorous shoots or entire plants are killed thinning out the stand. The fungus overwinters in living and dead plants, on machinery, and in the soil.

4. **Fusarium Crown Rot** and root rot, like Fusarium Wilt (7), is a widespread, soil-borne disease caused by several species of *Fusarium*. These fungi enter through a variety of wounds caused by machinery, cold temperatures, nematodes, insects and other animals. Infected plants are usually stunted with bleached, yellow leaves that wilt under a moisture stress. Light brown-to-black streaks develop in the vascular tissue of diseased plants. Leaves on these plants often curl slightly and wither. The disease progresses slowly, rarely killing a plant in a single growing season. The stand is gradually thinned from year to year. Seedlings may wilt, wither and die (postemergence damping-off), especially during warm, wet weather. These fungi survive as chlamydospores in soil or plant debris.

5. **Myxoleptodiscus Crown Rot**, caused by the fungus *Myxoleptodiscus terrestris*, is only found in the USA and is most severe in warm, humid weather. The fungus causes damping-off of seedlings, but is more prevalent as a black rot of the lateral roots that later spread into the tap root and crown. Infected crowns have numerous wilted and dead stems. Small brown leaf spots and reddish-brown stem lesions are occasionally seen. As with Sclerotinia Crown and Stem Rot (6), fungal mycelium and numerous, small, round to spindle-shaped black sclerotia may be found in decayed crown tissue. The fungus probably overwinters as sclerotia in crop residue and soil.

6. **Sclerotinia Crown and Stem Rot**, caused by the fungus *Sclerotinia trifoliorum* (synonym *S. sclerotiorum*), is a cool, wet weather disease that infects plants of all ages. Small, more or less circular patches of dying and dead seedling plants are common. On older plants, infected leaves and stems become yellow and finally collapse. A white, cottony mass of fungus mycelium grows over dead plants or the soil surface in wet weather. Dark brown to black sclerotia later form in the fluffy growth. Affected plants may die with the fungus invading the crown area. The crown turns soft and grayish-green, causing the shoots to wilt and turn yellow. The fungus overwinters as dormant, hard, round-to-irregular sclerotia, up to 8 to 20 mm in diameter, in soil and crop debris.

7. **Fusarium Rot**, normally caused by the soil-borne fungus *Fusarium oxysporum f. sp. medicaginis* occurs in irregular areas in a field. Scattered plants within these area wilt, sometimes starting on one side, with the leaves turning light green-to-yellow. Affected plants are commonly stunted or dwarfed and die slowly over a period of several weeks or months during warm-to-hot weather. Dark or reddish-brown streaks within the vascular cylinder are visible in a tap root that has been split or cut across. The fungus, like those cause Fusarium Crown Rot (4), survives in soil for years as chlamydospores or as mycelium in living or dead plants.

8. **Rhizoctonia Stem Canker** or blight is caused by the cosmopolitan soil fungus *Rhizoctonia solani*. Scattered, round to irregular areas of affected plants are evident in a field. Elliptical to circular, somewhat sunken, tan to reddish- or brown-black lesions (cankers) form on the lower stems, crown and tap root. If severe, stems and roots are girdled causing the leaves and shoots to turn yellow, wilt and die. Seedlings are killed before or after emergence. In hot, humid weather the leaves and shoots, especially on lush plants in thick stands may appear wate soaked. Affected plants soon wilt, wither and die. The fungus survives, for years in the soil as minute, irregular, dark brown-to-black sclerotia or as a saprophyte in plant debris.

9. **Violet Root Rot**, caused by the fungus *Rhizoctonia crocorum* (sexual stage, *Helicobasidium purpureum*), is usually of minor importance. The disease is most prevalent in older stands after midsummer, killing plants in enlarging, circular to irregular patches. The shoots turn yellow, then brown, wither, and die. Infected roots decay, turn brown to dark violet, and are covered with a thick, bright violet-to-orange feltlike mat of hyphae and spores. The fungus survives as deep violet-brown, velvety sclerotia in soil and as a saprophyte in plant debris.

10. **Crown Wart**, a common disease in excessively wet fields, mostly in the western USA, is caused by the fungus *Phytophthora megasperma*. Like bacterial wilt (1), it occurs in low-lying, poorly drained soils following periods of excessive rainfall or flood irrigation. Losses are most severe to seedlings. Infected plants are stunted; the leaves turn yellow or reddish, wilt, and die. Regrowth is often slow and greatly reduced after a cutting. The tap roots and rootlets are rotted with yellow-to-brown lesions that later turn black. There is usually a sharp line between rotted and healthy tissue and the decay may occur at various depths in the soil. The fungus probably overwinters as thick-walled, dormant spores (oospores) or as mycelium in crop debris.

11. **Crown Wart**, a common disease in excessively wet fields, mostly in the western USA, is caused by the fungus *Phytophthora megasperma*. Like bacterial wilt (1), it occurs in low-lying, poorly drained soils following periods of excessive rainfall or flood irrigation. Losses are most severe to seedlings. Infected plants are stunted; the leaves turn yellow or reddish, wilt, and die. Regrowth is often slow and greatly reduced after a cutting. The tap roots and rootlets are rotted with yellow-to-brown lesions that later turn black. There is usually a sharp line between rotted and healthy tissue and the decay may occur at various depths in the soil. The fungus probably overwinters as thick-walled, dormant spores (oospores) or as mycelium in crop debris.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

Photo credits: F. I. Froehnke (1L, 3L, 7, 8), W. G. Wills (1R, 5, 11), University of Illinois (2L, 6R), University of Wisconsin (2R, 9R, 10), A. S. Williams (3R, 9L), F. L. Lukezic (4, 6L), and G. W. Simone (6C).
1. Stemphylium leaf spot or Target spot
2. Common or Pseudopeziza leaf spot
3. Sooty blotch
4. Cercospora leaf spot
5. Bacterial blight or bacterial leaf spot
6. Powdery mildew
7. Red clover vein mosaic
8. Alfalfa mosaic
9. Northern anthracnose
10. Root rot
11. Root and crown rots
12. Fusarium root rot or Common root rot
13. Internal breakdown
14. Dodder
1. Stemphylium leaf spot or Target spot, caused by the fungi *Stemphylium sarcinaeforme* and *S. botryosum*, is a common, warm, wet weather disease of red clover. Losses are greatest in dense stands in late summer and autumn. Small dark brown spots on the leaflets later enlarge and develop into oval-to-round, target-like spots with alternate light and dark brown rings. Early on, the lesions are dark brown with a sooty appearance. Such leaves usually remain attached to the plant. Elongated, sunken brown lesions with light centers may occasionally form on the stems, petioles and pods. The causal fungus overwinters in infected plant residue.

2. Common or Pseudopeziza leaf spot of red clover, caused by the fungus *Pseudopeziza trifolii*, is closely related to those causing common leaf spot and yellow leaf blotch of alfalfa. Infections are widespread during cool, wet weather. Very small, angular to round, dark spots—often reddish-brown, purple or black—develop on both leaf surfaces. Occasionally, small elongated dark streaks may occur on the petioles. Severely infected leaves may become yellow. The fungus overwinters in crop debris.

3. Sooty blotch, sometimes called black blotch, is a widely distributed disease of red clover caused by the fungus *Cymatodera trifolii*. Olive-green dots appear on the lower leaf surface, enlarge, become thicker and darker, and eventually resemble velvety, black, elevated cushions. In the fall, the black areas have a shiny surface. If infection is severe, the entire leaf turns yellow-to-brown, dies, and drops early. The fungus overwinters in plant residue.

4. Cercospora leaf spot, sometimes called summer black stem, is a widespread disease of red clover. The lesions on affected leaves become wrinkled and darker, often reddish-brown, purple or black—develop on both leaf surfaces. During wet weather, a milky-white bacterial exudate may form on the affected leaves, petioles, stipules, stems, and flower pedicels. During wet weather, a milky-white bacterial exudate may form on diseased areas. The exudate dries to form a thin, crusty film that shines in the light. Infected leaves may become wrinkled and torn as the wind tears away the dead areas. The bacterium overwinters in infected residue and is spread by splashing rain and equipment.

5. Bacterial blight or bacterial leaf spot, caused by *Pseudomonas syringae*, is a minor disease of red clover. During cool, wet weather at any time during the growing season, angular, dark brown-to-black blotches may form on the leaflets, petioles, stipules, stems, and flower pedicels. During wet weather, a milky-white bacterial exudate may form on diseased areas. The exudate dries to form a thin, crusty film that shines in the light. Infected leaves may become wrinkled and torn as the wind tears away the dead areas. The bacterium overwinters in infected residue and is spread by splashing rain and equipment.

6. Powdery mildew occurs whenever red clover is grown. It is most severe during long periods of dry weather when nights are cool and days are warm. The disease, caused by the fungus *Erysiphe polygoni*, can reduce both yield and hay quality, especially late in the growing season. A dusty, white to pale gray mildew grows in patches on the leaves. Infected leaves may turn yellow and wither prematurely. The mildew fungus overwinters as black specks (cleistothecia) scattered on diseased plant residue. It is spread by air currents.

7. Red clover vein mosaic is caused by a virus and is transmitted from plant-to-plant by the pea aphid (*Macrosiphum pisi*) and other aphids as they feed. The first symptom is a faint yellowing of the leaf veins. The chlorosis gradually intensifies until the veins and adjacent tissue may become a whitish-yellow. Symptoms are most conspicuous in young leaves during cool weather. Symptoms become “masked” or disappear during hot weather. Yields are reduced and affected plants are weakened and more susceptible to root rot fungus, winter injury, and drought. In time, clover stands thus become thin and unproductive.

8. Alfalfa mosaic is a virus-caused disease, transmitted from diseased alfalfa, red clover, or other legume plants to healthy plants by various species of aphids. A systemic light and dark green or yellow mottling is the most common symptom. Other symptoms may include vein yellowing, leaf curling and distortion, and yellow streaks or blotches on and between the veins. Lesions expand, and often turn brown and then die back. Growing near clover or alfalfa fields, commonly serve as reservoirs for mosaic viruses—alfalfa, red clover vein, bean yellow, and pea common. The viruses overwinter in a wide range of perennial host plants.

9. Northern anthracnose, caused by the fungus *Kabatiella caulimora*, is a serious disease of red clover in cool, wet weather. Elongated, dark brown to black, sunken, girdling lesions on the leaf petioles and stems cause the shoots to die. Infections are widespread and severe, the entire leaf turns yellow-to-brown, dies, and drops early. The anthracnose fungus is carried on or within the seed; it also overwinters in plant residue.

10. Root rot may be caused by one of several soil-borne fungi. Fungus growth is found in the crown-root area and within ruptured or otherwise injured tissues. Irregular, brown-to-black decayed areas may develop or the whole crown and upper taproot may disintegrate. Root rot is most conspicuous in early spring. This disease complex causes a greater loss than all other diseases of red clover combined.

11. Root and crown rots affect all types of clover. This disease, caused by a complex of soil-borne fungi, acting singly or together, may cause a 50 percent loss of red clover plants during the first year. Diseased plants are generally yellow to bleached, stunted, and often wilt during hot, dry weather. Such plants gradually decline in vigor; finally wither and die.

12. Fusarium root rot or Common root rot, is caused by several species of the fungus *Fusarium*. Like other crown and root rots, infection usually occurs to plants weakened by winter injury, prolonged drouth, low or unbalanced fertility, insect or nematode injury, improper management, mechanical injuries, or other diseases. Affected plants appear unthriftly, stunted, yellowish and wilt during hot, dry weather. Plants may be killed at any stage of growth but stand loss is greatest during the second year. A spongy or soft, light brown, reddish brown, or dark brown internal and external decay develops in the larger roots. The smaller feeder roots are also decayed, and appear "pruned off." The causal fungi are common soil inhabitants and are generally distributed wherever red clover is grown.

13. Internal breakdown is common in winter-injured crown and root tissue of red clover and other clovers. Crown buds are damaged or killed. This tissue is later invaded by fungi and bacteria resulting in serious crown and root rot losses. The control is to grow well-adapted species and varieties in a well-drained, fertile soil. Avoid: overgrazing and overcutting in the fall, rank growth, and excessive rates of fertilizer (especially nitrogen).

14. Dodder (*Cuscuta spp.*) is a slender, twining, parasitic vine that occurs in tangled, yellowish-orange patches that "pull down" clover plants. Dodder infects a wide range of crop plants, being especially common and damaging to clovers and alfalfa. Dodder seed is very difficult to separate from clover seed.

For chemical control suggestions, a listing of resistant varieties, and other control measures, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

---

Photo credits: A. Williams (1L), N. A. Smith (1R), University of Wisconsin (2, 3, 4L, 5, 7, 8, 9L, 10, 11, 14), W. W. Willis (4R), K. T. Leah (6, 12, 13), and D. Wysong (9R).

The Illinois Vocational Agriculture Service provides equal opportunities in programs and employment.
1. Cercospora leaf spot
2. Common or Pseudopeziza leaf spot
3. Ascochyta leaf spot
4. Slime molds
5. Stagonospora leaf spot
6. Rust
7. Pseudoplea leaf spot
8. Sooty blotch or black blotch
9. Northern anthracnose or clover scorch
10. Peanut mottle
11. Clover phyllody
12. Root rot of sweetclover
13. Fusarium wilt of sweetclover
14. Crown rot of sweetclover
CLOVER DISEASES II

1. Cercospora leaf spot, more commonly called summer black stem, is a widespread, warm, moist weather disease caused by the fungus *Cercospora trullfolii*. Damage to white (Ladino) clover pastures may be severe during late summer in the southern half of the United States. On Ladino the lesions are angular to rectangular, dark brown, and more or less delimited by the veins. The centers of older fruiting lesions are gray-to-black. Lesions on the stems, petioles, and flower heads are reddish brown to dark brown and somewhat sunken. Severely infected seed are shriveled and discolored. The fungus also persists overwinter in old stems.

2. Common or Pseudopeziza leaf spot of Ladino clover is caused by *Pseudopeziza trifolii*, a fungus that attacks other perennial clovers as well. Infections occur during cool wet weather. Small, round to angular, to-black lesions on the stems, petioles, and flower heads are reddish is a widespread, warm, moist weather disease caused by the fungus *Kabatiella caulina*. It is most common on red, crimson, alsike, and white sweet clovers during cool, wet weather in the northern half of the United States. Elongated, sunken, medium brown-to-black, girdling lesions, with light centers, form on the stems and petioles and result in a dark brown scorching of the foliage. Leaves and flower heads commonly drop to form a “shepherd’s-crook.” The anthracnose fungus is seed-borne and also overwinters in plant residue.

3. Ascochyta leaf spot, also called spring black stem, is caused by the fungus *Phoma trifolii*. Dark brown-to-black spots, irregular in size and shape, develop on or along the leaf veins and on the petioles following cold wet weather. Some lesions may develop gray-tan centers. Black, enlarging lesions form on the stems. Young shoots may be girdled and killed. Leaf and stem infections together may result in defoliation. The causal fungus is seed-borne and also overwinters in crop debris.

4. Slime molds cause an unimportant disease. During wet weather, one of a number of these primitive, soil-borne fungi creep (flow) up and over low-lying vegetation or other objects and soon form their powdery, bluish, white-to creamy yellow, or black fruiting bodies. Some of the more common species include *Physarum cinereum*, *Mucilago spongiosa*, and *Fuligo septica*. Although unsightly, these fungi do no harm except to keep light off the foliage in areas up to about three feet in diameter. The growth can easily be rubbed off to expose the healthy or yellowed clover tissue underneath. Slime molds usually disappear following a good rain.

5. Stagonospora leaf spot is widely distributed on white clover, including Ladino, in warm, wet areas. The causal fungus, *Stagonospora meliloti* (perfect stage *Leptosphaeria pratensis*), also infects red and alsike clovers, alfalfa, sweetclover, and other legumes. Small, round to irregular spots with a pale, almost white center and light to dark brown borders are most numerous on the lower leaf surface, may cause infected leaves to wither, become brown, and drop prematurely. The sooty blotch fungus, *Cymodothea trifolii*, overseasons in crop residue.

6. Rust occurs wherever clovers are grown but usually causes little damage. The rust fungus, *Uromyces trifolii*, has several stages. The acelial stage appears in spring as swollen, yellow to orange-yellow pustules on the stems, petioles, and leaves that may cause distortion. Later in the season, small, oval, reddish brown, dusty pustules (uredinial stage) develop on the leaves, petioles, and stems. When severe, especially in late summer and autumn, rusted leaves may turn yellow and drop early. Late in the season the pustules become dark brown to black (telial stage). The rust fungus overwinters on clovers in the southern United States and is blown northward each summer on southerly winds. The rust fungus may survive in soil or plant refuse for five years or more in the absence of sweetclover and other host plants.

7. Pseudopeziza leaf spot, also called pepper spot, is widely distributed on white clover, including Ladino, in warm, wet areas. The causal fungus, *Pseudopeziza trifolii*, has several stages. The acelial stage appears in spring as swollen, yellow to orange-yellow pustules on the stems, petioles, and leaves that may cause distortion. Later in the season, small, oval, reddish brown, dusty pustules (uredinial stage) develop on the leaves, petioles, and stems. When severe, especially in late summer and autumn, rusted leaves may turn yellow and drop early. Late in the season the pustules become dark brown to black (telial stage). The rust fungus overwinters on clovers in the southern United States and is blown northward each summer on southerly winds.

8. Sooty blotch or black blotch occurs generally on white, alsike, and other clovers. Small, angular to irregular, velvety or shiny black spots, most numerous on the lower leaf surface, may cause infected leaves to wither, become brown, and drop prematurely. The sooty blotch fungus, *Cymodothea trifolii*, overseasons in crop residue.

9. Northern anthracnose or clover scorch is caused by the fungus *Kabatiella caulina*. It is most common on red, crimson, alsike, and white sweet clovers during cool, wet weather in the northern half of the United States. Elongated, sunken, medium brown-to-black, girdling lesions, with light centers, form on the stems and petioles and result in a dark brown scorching of the foliage. Leaves and flower heads commonly drop to form a “shepherd’s-crook.” The anthracnose fungus is seed-borne and also overwinters in plant residue.

10. Peanut mottle is a viral disease that occurs in about the southern half of the United States. Numerous legumes, including clovers, peanuts, and soybeans are infected. Diseased plants are often stunted, lack vigor, and are more susceptible to winter injury, drought, and other diseases. Leaves on affected plants are irregularly mottled with a yellow and light and dark green mosaic. Yellowish patches and line patterns commonly develop. The virus is spread by several aphids as they feed and is seed-borne at a low frequency. Peanut mottle cannot be distinguished from other viral diseases in the field. Laboratory tests are required for positive identification.

11. Clover phylloxy, caused by one or more mycoplasma-like organisms, and transmitted by several genera and species of leafhoppers is a striking but unimportant disease. The most characteristic symptoms is a transformation of certain flower parts (calyx lobes) into miniature, simple or trifoliate leaf-like structures borne on the ends of pedicel-like organs. Individual flower pedicels, calyx lobes, and ovaries may be three times their normal size. The other flower parts (keel and wings) remain white but dwarfed or even absent. New shoot growth is prolific, spindly, and stunted with smaller than normal yellowish leaves. In later stages the leaves may be slightly deformed and darker green.

12. Root rot of sweetclover may be caused by numerous soil-borne fungi including species of *Phytophthora*. The tops of affected plants are sometimes stunted, later wilt, become bleached-to-brown, and die from a spongy, soft, yellowish brown-to-black rot of the crown and taproot following excessive rain or overirrigation. The disease is most common and severe in poorly drained soils subject to periodic flooding or saturation. *Phytophthora* and other root-rotting fungi enter all types of wounds.

13. Fusarium wilt of sweetclover results in a wilting, yellowing and browning, and slow dying of scattered plants in irregularly shaped areas of fields that are infested with the *Fusarium oxysporum* fungus. The water-conducting tissue (xylem) inside the stems, crown, and roots shows a dark discoloration due to fungus invasion and root-tissue response. The fungus may survive in soil or plant refuse for five years or more in the absence of sweetclover and other host plants.

14. Crown rot of sweetclover may be caused by several soil-borne fungi that persist in soil and crop debris. Infections occur through a wide variety of wounds. Plants weakened by adverse temperatures, insect or nematode feeding, virus diseases, drought, improper management, other mechanical injuries, low soil fertility, or other unfavorable soil conditions are most susceptible. Crown rot can be found in most plants over a year old. Decayed tissue varies in color from yellowish brown to dark brown or black, often interspersed with healthy tissue. Crown rot often progresses slowly over several years, gradually killing plants and thinning out the stand. The relative prevalence and severity of these crown- and root-rotting fungi vary greatly with the type and variety of clover, age of the plant, season of the year, locality, soil type, and management conditions.

For cultural control suggestions, and a listing of resistant varieties, consult the Extension Plant Pathologist at your land-grant university, or your county extension office.

Photo credits: University of Illinois (1, 4C, 8 far R, 9, 10L and O), USDA and Clemson University (2L, 4R, 5), BASF (2R, 3, 6, 8L, 11), Pennsylvania State University (4L), British Ministry of Agriculture (7), T. M. Sjulin (8 far L, 8R, 10 far L), University of Wisconsin (8C, 10R), University of Georgia (10 far R).

The Illinois Vocational Agriculture Service provides equal opportunities in programs and employment.