

Alfalfa Diseases 101: Diagnosing Common & Emerging Disease Problems

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Over 50 pathogens have been identified that cause significant damage to alfalfa and prevent it from reaching its full potential for producing high yields of quality forage. There has been excellent progress by plant breeders and plant pathologists in developing cultivars with multiple disease and pest resistance adapted to each region of the country. Yet, despite these advances, alfalfa yields have not increased appreciably. From a plant pathologist's perspective, new disease-causing organisms or new races of previously described pathogens may be playing a role in limiting yields. Also, pathogens previously considered to cause minor damage may be becoming more problematic, particularly with shifting agricultural practices and changing environmental patterns. Alfalfa growers, industry representatives, agricultural consultants, and extension personnel are on the "front lines" for identifying emerging alfalfa disease problems.

The Disease Triangle Concept in Disease Management

Disease is a product of the interaction of a susceptible alfalfa plant, a pathogen capable of causing disease, and a favorable environment. These three elements are known as the disease triangle. If any one of the elements is missing, disease will not occur. Crop management has a large effect on each element of the disease triangle. Planting high quality certified seed of a locally adapted, disease resistant cultivar is the most economical, efficient, and easiest way to reduce disease problems. The National Alfalfa & Forage Alliance (NAFA) annually publishes a list of cultivars and their resistance to major pathogens and insects. Growers should select a cultivar with resistance to the most serious diseases in their area. However, since resistance is not available for all diseases, an integrated use of other management measures is necessary.

Seed should be planted into a weed-free, well-drained seedbed of fertile soil with a pH between 6.5-8. Alfalfa seeds are small and seedlings are rather fragile and vulnerable to several diseases, so they often suffer high mortality. This is compensated for by seedling rate and use of seed treatments to reduce some of the disease problems. Well-drained soil helps to minimize seedling diseases as some of these pathogens have motile spores that require water for movement. Adequate and balanced levels of phosphorus (P, phosphate), potassium (K, potash), and micronutrients can help reduce disease losses. Vigorous plants can tolerate diseases better than stressed plants, and are often able to produce well even in the presence of diseases. A number of root and crown diseases increase when P and K levels are inadequate and leaf and stem diseases can be more severe when there is excess nitrogen (N) or too little K. Controlling weeds helps to minimize foliar diseases by promoting good airflow that speeds drying of foliage. Weeds can also harbor viruses that can be transmitted to alfalfa.

Alfalfa forage should be harvested to maintain plant vigor. Plants are subjected to wounding from mowing and equipment tires that provide entry points for pathogens. To minimize damage to crowns, machine traffic should be limited to periods when the soil is dry. Mowing when the foliage is dry will help limit the spread of pathogens. Because younger stands tend to have less disease, it is important to mow younger stands before older stands and clean debris from equipment to reduce spread of disease between fields. Timely harvests reduce the potential for foliar diseases to build up. However, early harvests can reduce leaf loss when foliar diseases are severe. Fall harvests need to be timed to allow 6-8" of growth before a killing frost. This enables the plant to build up food reserves for spring re-growth and decreases vulnerability to crown and root rot pathogens that are active in cold soils.

Disease Identification in Disease Management

Even with the best crop management, some disease will occur. Many of the pathogens that attack alfalfa can persist in the soil

Photo 1. Symptoms of common leaf spot.



Photo 2. Symptoms of Lepto leaf spot.

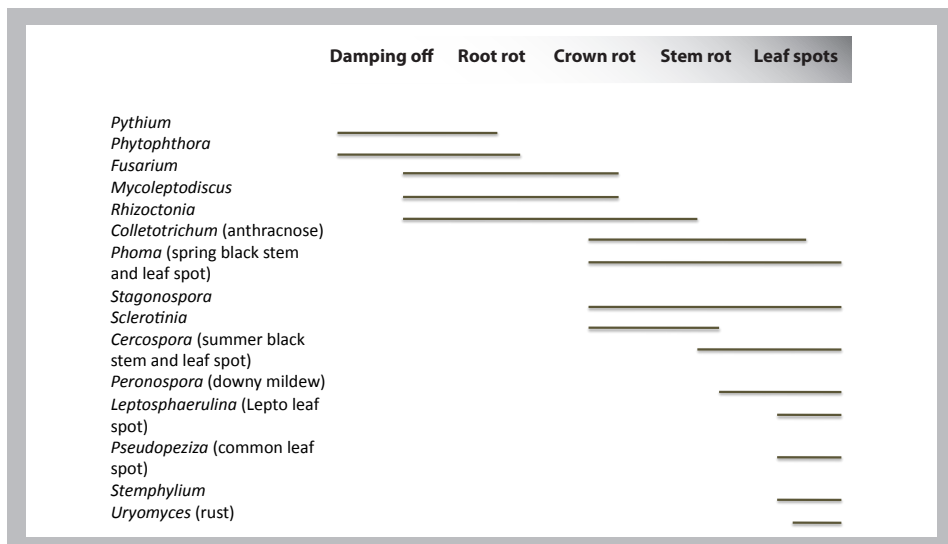


Photo 3. Symptoms of rust.



for long periods of time. Also, pathogens are carried to new plantings by wind and insects. It is important to be able to diagnose or identify the diseases affecting the alfalfa in order to determine the appropriate management strategy. Fields should be scouted regularly to identify areas in which disease symptoms are beginning to occur. Such symptoms include yellowed foliage, small and stunted stems and leaves, and stands that are thinning and losing productivity. The next step is to determine if the symptom is primarily on the foliage, the crown, or the roots. Symptoms of multiple diseases may be present on the same plant, especially older plants. Foliar symptoms of some diseases start in the crown, so it is important to dig up plants and cut open the crown to examine internal tissues. The figure illustrates the different parts of the alfalfa plant infected by pathogens. Good pictorial guides to the most common diseases and insect pests include the *Alfalfa Analyst* and the *Alfalfa Management Guide*. *The Compendium of Alfalfa Diseases* (identifies all known alfalfa pathogens) is currently out of print, but a new edition will be available soon from the American Phytopathological Society (APS) Press. Several websites have good photos and descriptions of the common alfalfa diseases. Some diseases have similar symptoms, such as the crown and root rot diseases, and a specific diagnosis from symptoms alone is not possible. Most state universities have disease diagnostic clinics that are usually associated with the plant pathology department. Clinicians are skilled in identifying pathogens from the spores they produce, by isolating the pathogen in culture, and using DNA-based identification tests. These services should be used when unable to make a conclusive diagnosis or when an unusual pathogen may be present and causing widespread damage.

Figure. Common pathogens of alfalfa and the parts of the plant attacked.



Here are some late-summer and early-fall diseases to watch for:

Common leaf spot: This disease is prevalent in spring and autumn during moist, cooler temperatures. Symptoms are small, circular brown-black separate spots on leaflets (Photo 1). Older leaves are attacked first. Infected leaves turn yellow and drop. Defoliation reduces plant vigor, forage quality, and yield. In severe infections, harvest should not be delayed, and if possible, harvest should occur before leaves drop. Some varieties have moderate resistance. Fungus - *Pseudopeziza medicaginis*.

Lepto leaf spot: This disease attacks young leaves first during wet, cool weather and where plants do not dry between periods of overhead irrigation. Lesions usually have a light brown to tan center with a darker border and a yellow halo (Photo 2). Leaflets are killed and remain attached to stems for a short time. With severe leaf spot, harvest should be done early to prevent leaf loss. Fungus - *Leptosphaerulina briosian*.

Rust: In northern areas, rust is seen in the fall as spores move from southern regions during the late-summer season. Infections are usually light, but may be severe in some years. Rust is recognized by small, red-brown pustules of spores breaking through the surface of leaflets (Photo 3). The spores rub off easily. When abundant, rust causes leaves to fall prematurely. In southern regions rust can cause loss of fall-seeded stands. Fungus - *Uromyces striatus*.

Emerging Disease Problems

Farming practices continue to evolve and with such changes come new disease problems. It is important to recognize shifts in diseases so that appropriate research can be done and disease resistance can be incorporated into new cultivars. In late-summer and early-fall, areas in which plants are yellow, stunted and/or slow to regrow with few stems should be investigated as these may be symptoms of diseases that are becoming more prevalent including *Aphanomyces* root rot on adult plants, *Stagonospora* crown and root rot, and *Mycoleptodiscus* crown and root rot. See contact information for instructions on sampling and packaging plants for disease diagnosis (below photos).

This past spring, alfalfa plants in Pennsylvania were found with yellow, stunted foliage and distorted leaves, which are symptoms of a disease called witches'-broom of alfalfa. The pathogen causing the disease is a phytoplasma, a cell wall-less bacterium that cannot be grown in lab culture. Phytoplasmas exist only in the phloem (carbohydrate conducting tissues) of plants and are transferred from plant to plant by leafhoppers. Severely infected plants show a proliferation of stems (the witches'-broom symptom) and small leaves. To identify the pathogen, DNA is extracted from plants and used in a polymerase chain reaction (PCR) test that is specific for phytoplasmas. It was found that the plants from Pennsylvania were positive in the PCR assay for phytoplasma and also were infected by *Phoma medicaginis*, the cause of spring blackstem and leaf spot. Because the phytoplasma cannot be grown in culture, proving that

it was the cause of the symptoms is difficult. Other diseases may have been responsible for the symptoms observed in combination with unusually cold, wet weather. The PCR positive plants are being grown to attempt to transfer the pathogen using leafhoppers.

Surveys done in commercial alfalfa fields in Wisconsin in 1998 found phytoplasmas in the aster yellows group were widespread, although many plants did not show symptoms. Further studies are needed to determine the extent of phytoplasmas in alfalfa. Even though plants may not show symptoms of a disease, infection may be reducing productivity. Because phytoplasma are located in the phloem, they affect movement and availability of carbohydrate reserves, which could reduce productivity and stand persistence. Alfalfa may act as a reservoir for phytoplasmas that can be transferred to other crops (i.e., soybean).

References

Winter Survival, Fall Dormancy & Pest Resistance Ratings for Alfalfa Varieties (www.alfalfa.org/varietyLeaflet.html)

Alfalfa Analyst (www.alfalfa.org/publications.html)

Alfalfa Management Guide (www.agronomy.org/publications/alfalfa)

- <http://cropdisease.cropsci.illinois.edu/alfalfa/>
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