

ALFALFA DISEASE MANAGEMENT

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Alfalfa can be a vigorous and productive forage crop for Kentucky farmers. Like all farm crops, however, alfalfa is subject to infectious diseases that can limit forage production. Managing these diseases is an important part of economical alfalfa production.

Alfalfa diseases can cause reduced forage yield, reduced forage quality, and decreased stand persistence. Sometimes, the effects of infectious diseases can be dramatic, such as sudden stand loss in a fall-seeded crop caused by *Sclerotinia* crown and stem rot. Often, the effects of diseases on alfalfa are more subtle but no less important. For example, alfalfa plants with *Phytophthora* root rot sometimes regrow slowly following cutting, resulting in a stunted stand showing no other obvious symptoms of disease.

Other diseases like bacterial wilt can kill a few scattered plants between each cutting. Over a period of a few seasons, this can result in a gradual yet substantial loss in plant stand. Also, several diseases predispose alfalfa to winter injury, such as crown rot diseases and *Phytophthora* root rot. In many cases, stand loss during the winter may be blamed on winterkill when an infectious disease ultimately may be involved.

TYPES OF ALFALFA DISEASES

Seedling Diseases

Fungal infection of roots and stems of very young seedlings can cause sudden wilting and death seedlings. Loss of some seedlings to disease will not cause significant economic loss. However, a severe epidemic of a seedling disease like *Aphanomyces* root rot or *Phytophthora* root rot can cause nearly complete loss of a new stand.

Leaf Spots And Shoot Blights

Invasion of leaves by disease-causing microorganisms (*pathogens*) can produce discrete dead spots on leaves. Leaves with a great number of spots are less effective at photosynthesis, which can result in reduced plant growth. Also, leaves with spot symptoms often drop to the ground, resulting in reduced forage yield and quality. Many of the leaf-infecting fungi and bacteria also infect stems of alfalfa. Often, stem infections prevent water flow to the rest of the shoot, causing sudden wilting and desiccation (*blight*). Lepto leaf spot, spring black stem, *Stemphylium* leaf spot, and

summer black stem are common alfalfa diseases that cause spotting of leaves. Anthracnose, Rhizoctonia stem canker, Sclerotinia crown and stem rot, and spring black stem cause blighting of shoots.

Root Rots

Root rot diseases may be caused by a variety of fungi. Following infection, roots become rotted and no longer function in removing water and nutrients from the soil. Above ground, affected plants may exhibit stunting, yellowing or reddening, and wilting. Also, some root rot diseases can make alfalfa more susceptible to winter injury. Phytophthora root rot is a common root rot disease of alfalfa grown in Kentucky.

Wilts

Certain fungi and bacteria infect the water-conducting tissues of alfalfa plants without causing any noticeable root rot. While roots may appear fine superficially, infection of the water-conducting tissues of roots and stems prevents water flow to leaves. This results in wilting of shoots and eventual death of infected plants. Bacterial wilt and Fusarium wilt are two such diseases of alfalfa.

Crown Rots

A great variety of fungi can infect the crown of the alfalfa plant, which is the portion of the taproot just below the soil line. An aggressive crown rot disease like Sclerotinia crown and stem rot can kill young plants by destroying crown tissues. Crown rot diseases of established plants can reduce yields by destroying crowns, preventing new shoots from developing after cutting. The alfalfa plant stores food reserves for winter in the crown. Crown rot diseases interfere with this process, making plants more susceptible to winter injury.

IMPORTANT DISEASE MANAGEMENT PRACTICES

Most disease-control decisions for alfalfa are made before diseases are visibly apparent. For several alfalfa diseases, once the symptoms appear, little can be done to control the disease. Therefore, careful planning is necessary to keep alfalfa diseases from building up to damaging levels. Like most crop diseases, alfalfa diseases are most effectively managed by integrating as many control methods as practical. With the exception of seed treatment, alfalfa diseases cannot be controlled economically using commercial fungicides. Control practices include the following.

Crop Rotation

Most alfalfa pathogens do not survive well in the absence of alfalfa. As infested alfalfa residues decompose, pathogen cells become exposed to the soil, where they die out. Therefore, rotating to another crop for several years can help reduce pathogen populations in the field, particularly if rotating to a crop other than red clover. Corn, small grains, soybeans, or forage grasses are good rotation crops for reducing populations of alfalfa pathogens.

How long should one rotate away from alfalfa? The longer, the better. In practice, two or more years away from alfalfa is advisable from a disease management standpoint, although a one-year rotation often will not suffer serious disease problems when alfalfa is sown again. Recognize that there are limits to the effectiveness of rotation for disease control. As an example, the fungus that causes *Sclerotinia* crown and stem rot can survive for 5-10 years in the absence of alfalfa in untilled land.

Site Selection And Preparation

Alfalfa is most vigorous when growing on deep, well-drained soils. Increased plant vigor can result in increased resistance to some diseases. Also, several root rot fungi are more active in poorly drained soils, so choosing a well-drained site helps to reduce root rot diseases. Preparing a fine but firm seedbed can provide an environment favorable for plant growth and unfavorable for pathogens.

Fungicides

Seed treatment

Pythium fungi that can cause death of seedlings are very common in Kentucky soils. Also, the fungus that causes *Phytophthora* root rot is found in up to 20% of alfalfa fields. These fungi can be very active in fields with wet soils after planting. Seed treatment with the fungicide metalaxyl (found in Apron^R) is active against these fungi, and may improve stand establishment in some instances. Given the low cost, low environmental impact, and the possibility of great benefit when wet conditions occur after planting, seed treatment with metalaxyl is recommended for all alfalfa seeded in Kentucky.

Broadcast application

Ridomil 2E and Ridomil Gold are labeled for use at seeding. However, in UK studies, alfalfa yields were usually unaffected by Ridomil applications at planting, and there were some instances where we actually saw a yield decrease! Studies at other universities have also shown that Ridomil does not alleviate the risks associated with seeding alfalfa into an established stand of alfalfa. Therefore, use of these products is not recommended for Kentucky.

Variety Selection

For Kentucky producers, there is a rule of thumb that will generally simplify variety selection from the standpoint of disease resistance: **Select high-yielding varieties with an R or HR rating to *Aphanomyces* root rot.**

First, start by identifying the high-yielding, adapted varieties. Examine the alfalfa variety test report produced annually by the UK Dept. of Agronomy, available through UK Extension Agents for Agriculture. That publication nicely summarizes variety tests over the entire state for several years. These reports are important in two ways:

1. They identify the top-yielding alfalfa varieties for Kentucky conditions.
Unfortunately, there is no single variety that always is among the top group in every location, every time. Life never seems to be that simple. However, there are varieties that *generally* provide top yields across many locations and years.
2. They identify the best adapted varieties, those which perform well under a range of conditions over a period of years. This can be important from a disease management standpoint, as well, since poorly adapted varieties are sometimes more susceptible to crown rot diseases.

Once you have identified the top-yielding, adapted varieties, select those with at least an R or HR rating to *Aphanomyces* root rot. Recall that alfalfa varieties are scored for disease resistance as follows.

Susceptible (S): 5% or less of the plants are resistant in standardized tests
Low resistance (LR): 6-14% resistant plants
Moderate resistance (MR): 15-30% resistant plants
Resistance (R): 31-50% resistant plants
High resistance (HR): 51% or more resistant plants

Recent research by UK forage scientists has shown that alfalfa varieties with an R or HR rating are needed should an outbreak of *Aphanomyces* root rot occur. *Aphanomyces* root rot can be a common problem in Kentucky in spring seedings where wet conditions prevail during the period of 4-6 weeks after seeding.

But what about the other important alfalfa diseases, like *Phytophthora* root rot, anthracnose, bacterial wilt, *Fusarium* wilt? Yes, we still recommend resistance to all of these. In particular, *Phytophthora* root rot is a very important disease on many farms where alfalfa is being produced. Anthracnose is still a potential threat, in my opinion, even though almost no destructive outbreaks have been seen in Kentucky since the drought of 1988.

Fortunately, one does not have to pay attention to all these diseases when selecting a variety. If you select a variety with an R or HR rating to *Aphanomyces* root rot, it will already have adequate levels of resistance to these other diseases. The *Aphanomyces* resistant varieties are the "new kids on the block", and they've all been developed to already have resistance to these other diseases.

Unfortunately, the *Aphanomyces* story gets more complex. Like the tobacco black shank fungus, there are races of *Aphanomyces euteiches*. In plant pathology, pathogen races are distinguished from one another based on the fact that they attack different host varieties. For example, Race 0 of the black shank fungus cannot cause disease on tobacco varieties with the L8 resistance gene; however, Race 1 can. Thus, a producer whose field is infested with Race 0 only can use L8 hybrids to control black shank. If the field has Race 1, however, use of the L8 hybrid won't help; it is fully susceptible to Race 1.

Recent work is showing that the practical significance of this new race of *A. euteiches* called Race 2 is substantial. Several important conclusions can be made, as follows.

1. *A. euteiches* Race 2 is widespread. This race commonly can be found in soils from North Carolina and Kentucky on northward to Wisconsin and Minnesota. UK research indicates that Race 2 is present from Harrison County to as far west as Caldwell County. My suspicion is that it is present anywhere in the state that *A. euteiches* occurs, which is probably every county except the Eastern Kentucky coal region.
2. *A. euteiches* Race 2 is often present at potentially damaging levels of inoculum. In their most recent paper, University of Wisconsin researchers found that in 6 of 16 fields sampled, every isolate of *A. euteiches* obtained from the soil was Race 2. It is also interesting that over 50% of the isolates of *A. euteiches* collected from a field with no recent history of alfalfa production were Race 2, indicating that it survives well in soils in the absence of alfalfa. Our limited work in Kentucky indicates that damaging levels of Race 2 are present in at least some fields here.

Unfortunately for producers, almost all of the current generation of *Aphanomyces*-resistant alfalfa varieties are resistant only to Race 1, not Race 2. This means that almost all of the varieties available to alfalfa producers can experience outbreaks of *Aphanomyces* root rot under disease-conducive conditions, in sites where Race 2 is present at damaging levels.

My suggestion is for producers, Extension agents, and agricultural professionals to be aware of the possibility of typical symptoms of *Aphanomyces* root rot in new seedings of alfalfa varieties reported to be *Aphanomyces*-resistant. In these cases, samples should promptly be provided to one of the UK Plant Diagnostic Labs for testing.

Information on the disease resistance ratings of commercially available alfalfa varieties is available on the Web at <http://www.alfalfa.org>, which is published by the Certified Alfalfa Seed Council. However, information on the race reaction of *Aphanomyces*-resistant alfalfa varieties is not readily available; it must come directly from the seed company or their representative. I am only aware of four alfalfa varieties with substantial levels of resistance to Race 2 and even fewer have been tested in Kentucky. Clearly, options for selecting a Race 2-resistant variety are very limited at this time.

Balanced Soil Fertility

Maintaining an appropriate soil pH and adequate levels of nutrients is important for promoting vigorous growth, which helps the plant resist diseases and winter injury. Have a soil sample tested to determine lime and fertilizer requirements. In particular, maintain adequate potash fertility. Don't expect miracles from potash, but research shows that inadequate potash levels can sometimes lead to higher severity of crown

rot. See the Cooperative Extension publication "Alfalfa: The Queen of Forage Crops" (AGR-76) for more information on soil fertility for alfalfa.

Harvest Management

Timely harvest

Scout fields for premature defoliation for leaf spotting, and be prepared to harvest before much defoliation occurs. The most important management technique for alfalfa foliar diseases is timely harvest, sometime between early bud and first flower. Cutting the hay accomplishes several things: it captures the yield from infected leaves before they defoliate; it reduces the buildup of infectious residue on the ground, protecting future cuttings; and it exposes the crowns to the sun and wind, reducing the risk of crown infections from spring black stem.

Cut alfalfa when it is ready. Don't wait for a forecast of 3-4 days of sunny, dry conditions. Advancing maturity causes substantial loss in forage quality. Thus, waiting for dry weather can cost as much quality loss as can rain damage.

Allow adequate growth before freezedown. Alfalfa needs four to six weeks of regrowth between the final harvest and freezedown. This is necessary in order to have sufficient root reserves to withstand winter weather and to resist crown rot infections during the dormant season. Following freezedown, the forage can be harvested or grazed as desired.

Minimize Crown Injury

Injuries to the crown provide infection sites for crown rot fungi. When the soil is wet, minimize practices that injure crowns such as grazing or using heavy equipment.