

New Strategies for Managing Leaf Diseases of Alfalfa

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Leaf diseases are a serious problem for alfalfa management in all areas where alfalfa is grown. Defoliation from leaf diseases has been measured from 3-71% depending on time of year, environmental conditions, age of the stand, and location. In addition to yield loss, foliar diseases can reduce forage quality and seed yields. This article describes promising new strategies for reducing the damage from foliar diseases.

In the spring, the primary disease observed on alfalfa foliage in the Midwest is spring black stem and leaf spot. During early stages of infection, lower leaves develop small, dark brown to black spots (tarspots). The lesions enlarge and grow together forming irregularly-shaped spots surrounded by a yellow discoloration (Figure 1A). Defoliation usually starts at the base of the stem and progresses upward. Stem symptoms appear as small, dark discolorations that lengthen and combine, blackening most of the surface in severe infections (Figure 1B). Spot development is reduced during periods of prolonged cold, wet weather, leaves become yellow and distorted, and shoots are killed. The fungal pathogen causing this disease (*Phoma medicaginis*) also causes decay of the crown and upper taproot. Spring black stem and leaf spot is considered one of the

most destructive alfalfa diseases since it can significantly reduce first cut yields and lessens plant vigor and persistence.

Although some cultivars have low-moderate resistance to individual leaf diseases, resistance to multiple foliar diseases is not available. In the case of severe leaf disease, the crop should be harvested early to reduce leaf loss and remove inoculum.

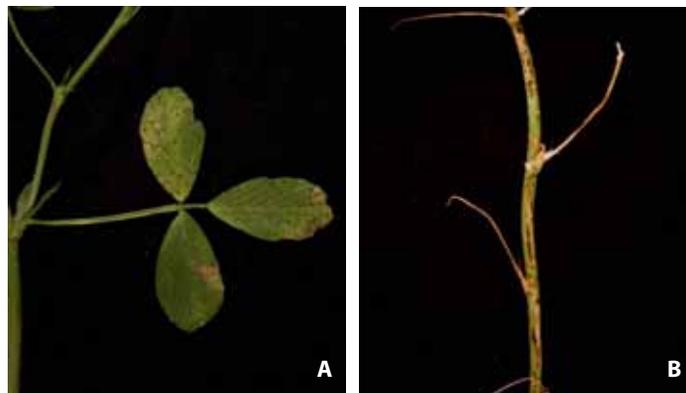
Headline Fungicide

Recently, the fungicide Headline (pyraclostrobin, BASF) was approved for use on alfalfa and is labeled for management of the primary leaf diseases of alfalfa. Currently, this is the only fungicide registered for use on alfalfa. A trial was conducted during the summer of 2011 at Waseca, MN to evaluate the performance

of Headline to control leaf diseases in alfalfa and measure the impact on yield and forage quality. The trial was conducted on an alfalfa stand established in Spring 2010 and consisted of a blend of Pioneer 55V48 and 55V12. Treatments of Headline, the insecticide Warrior or a combination of Headline and Warrior at the recommended field rates were applied when alfalfa was 8-10" tall or ~14 days after cutting. For each of the 3 cuttings, treatment with Headline or Headline plus Warrior significantly reduced leaf spots and increased yield compared to the untreated control or the treatment with Warrior alone (Figure 2, page 8). However, leaf diseases were not completely controlled. Surprisingly, treatments did not have a significant effect on forage quality or percent protein. Further studies are needed to determine

if greater control can be achieved and to investigate the effect of treatments on forage quality. Also, integrated pest management recommendations need to be developed to minimize the risk that the pathogens develop resistance to Headline. Resistance has been observed for pathogens of potato and beet when similar fungicides were applied to crops repeatedly over the course of several years.

Figure 1. Symptoms of spring black stem and leaf spot on alfalfa.



Small brown to black spots grow together to form irregularly shaped lesions surrounded by yellow discoloration.

Lesions on stems and petioles are black or tan with a black border. Defoliation starts with lower leaves and moves upwards.

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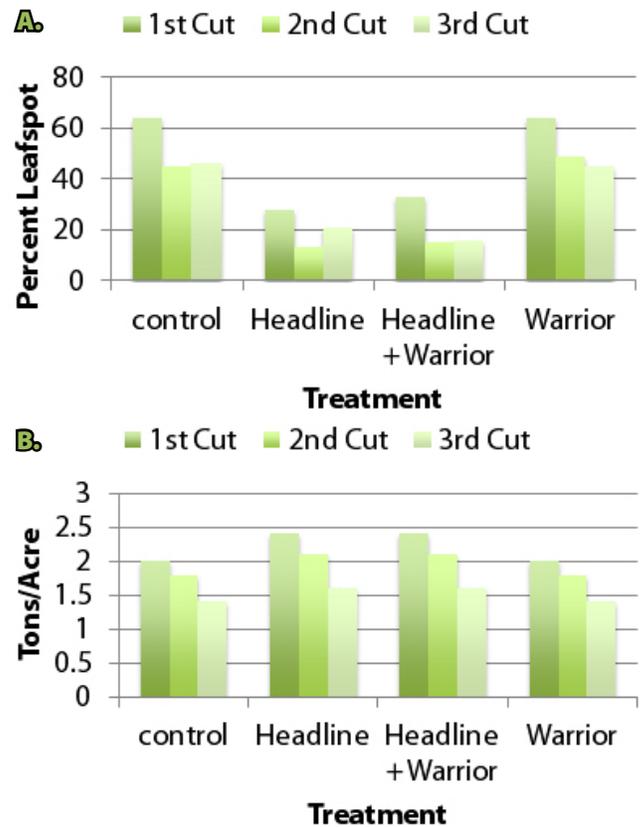
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Glyphosate Herbicide

Researchers have long known glyphosate, the active ingredient in Roundup® herbicide, has antifungal activity. Glyphosate targets an enzyme found in plants and fungi in the pathway leading to production of the amino acids phenylalanine and tyrosine. With the development of Roundup Ready® varieties, in which plants take up and tolerate glyphosate, it is possible to test whether glyphosate can be used to reduce damage from foliar pathogens. In greenhouse experiments, researchers found application of glyphosate at the recommended field application rate completely prevented alfalfa rust infection on 4 week old plants inoculated with the fungus 3 days after glyphosate treatment. Also, complete control of rust was obtained when glyphosate was applied up to 10 days after rust spores, indicating the herbicide also has curative activity. Glyphosate application to stubble and regrowth provided protection for up to 21 days when plants were inoculated with rust spores 3 days after treatment. Treatment afforded some control for anthracnose, but not for spring black stem and leaf spot.

Glyphosate use for managing alfalfa rust is compatible with recommended weed management guidelines for glyphosate-tolerant alfalfa. Rust infections are most damaging in fall planted seedlings. Glyphosate treatments are recommended for weed control in fall plantings soon after establishment and a second application after the fifth trifoliolate leaf has developed, but 5 days prior to a harvest. Based on studies, such treatments would also be effective for fall rust control. Use of glyphosate in established stands for rust control is also compatible with current management guidelines as long as only one application is made for each harvest, with no more than three applications per year. During Fall 2011, alfalfa rust was common in the Midwest. Symptoms of rust include red to brown spots of spore pustules and yellowing of leaves on the stems. Heavy rust infections reduce yield and quality, and cause stress as plants go into dormancy. Although field trials are needed to confirm results, studies indicate that glyphosate could be used to help manage foliar diseases in Roundup Ready alfalfa. ☘

Figure 2. Effect of Headline and Warrior treatments. A. Amount of leaf as measured by percent leafspot symptoms. B. Forage yield in tons/acre. For all harvests, Headline and Headline + Warrior treatments were significantly different from the control and Warrior treatments.




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