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# Using Fungicides on Alfalfa for Dairy Production in Wisconsin

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## Introduction

Recently new fungicides have been labeled for use on alfalfa for dairy production systems. Interest in using these products has increased among farmers in the state of Wisconsin. Data from the 1980s suggested that fungicides applied to alfalfa controlled foliar diseases and increased yield. However, alfalfa varieties, management practices, and disease control products have changed dramatically since this research was conducted. Therefore, new research was conducted to evaluate modern fungicide products such as Headline® on alfalfa grown under 21st century management practices.

## Foliar diseases of alfalfa

There are many foliar diseases of alfalfa. In Wisconsin, it isn't uncommon to observe common leaf spot (*Pseudopeziza medicaginis*), Leptosphaerulina leaf spot (*Leptosphaerulina briosiana*), spring black stem and leaf spot (*Phoma medicaginis*), or Stemphylium leaf spot (*Stemphylium* spp.). These foliar diseases can damage leaves and stems, resulting in defoliation, yield and quality loss. Timely cutting of alfalfa helps reduce these diseases. In dairy-production alfalfa systems, symptoms of foliar disease often are not observed until three or four weeks after the previous cutting. In a 30-day cutting system, this might mean that little to no defoliation will result before the next cutting.


Common leaf spot


Leptosphaerulina leaf spot


Spring black stem


Stemphylium leaf spot

*Typically in a 30-day cutting interval, like that used in dairy production in Wisconsin, foliar diseases cause minimal damage. Coupled with the heightened risk of fungicide resistance development toward these modern fungicides,* ***application of fungicide on alfalfa for dairy production is not recommended unless heavy disease pressure is observed.***

## Fungicides available for use on alfalfa

The fungicide Headline® (BASF Crop Protection; active ingredient is pyraclostrobin) was recently labeled in Wisconsin for use on alfalfa. This fungicide belongs to a group of fungicides called the quinone outside inhibitor (QoI) or strobilurin fungicides, which function on a specific metabolic pathway that limits energy production in fungal organisms.

Other fungicide products have also been labeled, including other strobilurin fungicides such as Quadris® (Syngenta; active ingredient is azoxystrobin) and newer succinate dehydrogenase inhibitor (SDHI) fungicide products, such as Fontelis® (DuPont; active ingredient is penthiopyrad). A complete list of fungicides labeled for use on alfalfa in Wisconsin can be found in the publication, A3646 *Pest Management in Wisconsin Field Crops*. In addition, strobilurin fungicides have been attributed to having an effect on plant metabolism that could result in an increase in yield and quality of a crop in the absence of disease ('plant health' promotion). However, strobilurin fungicides are at high risk for fungicide resistance development by various plant pathogens. Therefore, excessive spraying of these products might eventually result in fungicides failing to control certain fungal diseases of crop plants.

The combination of disease control, the possibility of 'plant health' promotion or enhancement, and increasing alfalfa hay prices has resulted in a lot of interest in spraying fungicide on alfalfa for dairy production systems. However, little was known about the utility or the economics of this practice. Therefore, research trials were conducted from 2011-2014 in Wisconsin to evaluate the practice of spraying fungicide on alfalfa in a 30-day cutting system.

## Research trials using fungicides on alfalfa

Trials were located at various locations in each of the research years and included plots in Monroe County, Waupaca County, and Columbia County. Treatments in all trials were replicated four to six times. Each individual plot comprised a minimum area of 400 square feet. Treatments were applied using a backpack small-plot sprayer calibrated to deliver 20 gallons per acre. All treatments were applied at six to eight inches of growth after each of the three cuttings. Alfalfa was harvested for each cutting using a small plot harvester. Foliar disease data were collected for some trials. For all trials, quality was evaluated by the University of Wisconsin Soil and Forage Testing Laboratory located in Marshfield, Wisconsin. Yield, quality, and, where applicable, disease data were evaluated for each cutting, at each location, for each year. An economic analysis was also conducted using data and variability associated with the application of the fungicide Headline®. The variable costs such as the value of hay and the cost to apply fungicide were included in the analyses to calculate the probability of recovering the investment made when applying fungicide.

## Trial results

In total, 35 separate trials (cutting per site per year) were conducted over the four-year period. In the majority of the trials, disease levels were low and no significant difference in foliar disease and defoliation was identified between treatments. Some detectable differences in quality were identified between treatments in some trials. However, relative forage quality was typically greater than 150 (Prime Grade) for both treated and non-treated alfalfa. Yield was statistically greater in fungicide-treated plots in 12 of the 35 trials. Average yield gain when applying Headline® fungicide specifically was 0.11 tons of dry matter (220 lbs) per acre per cutting, which was a significant increase over not applying fun-

gicide. Average yield gain when applying Quadris® was 0.05 tons of dry matter (100 lbs) per acre per cutting, however fewer comparisons with the non-treated control were made with Quadris® compared to Headline®.

Additional analyses evaluating cutting timing were also conducted. Based on these analyses, there was no advantage of applying a fungicide at a particular cutting. For example, a fungicide application prior to the first cutting had an equal chance of resulting in a yield increase compared to an application prior to the second cutting.

*In Wisconsin where alfalfa production is generally targeted toward dairy production, Headline® fungicide application will often result in a slight increase in yield,* ***but that increase might not be large enough to offset the cost of the applying the product.***

## Economics of applying Headline® fungicide

The economics of applying Headline® fungicide can be highly variable depending on alfalfa price and fungicide application costs. Table 1 provides breakeven yields (tons/acre) needed at different hay prices and fungicide application cost scenarios. For example, if a fungicide application cost is $30 (fungicide plus custom applicator fee) and the hay is sold for $100 per ton of dry matter (TDM), then a 0.30 TDM/acre increase in yield is required when applying fungicide to pay for its application.

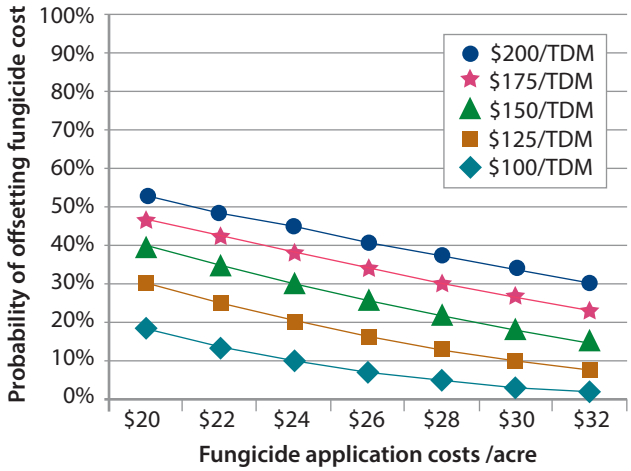
Using our trial results from testing Headline® fungicide against non-treated plots, we can calculate the probability of recovering the fungicide application costs at various hay prices; we can estimate application costs based on the aver-

**Table 1.** Breakeven scenarios (tons/acre) needed to recover fungicide application costs

| Alfalfa Price ($/TDM) | Fungicide Application Costs ($/acre) | | | | |
|---|---|---|---|---|---|
| | $22 | $24 | $26 | $28 | $30 |
| $100 | 0.22 | 0.24 | 0.26 | 0.28 | 0.30 |
| $125 | 0.18 | 0.19 | 0.21 | 0.22 | 0.24 |
| $150 | 0.15 | 0.16 | 0.17 | 0.19 | 0.20 |
| $175 | 0.13 | 0.14 | 0.15 | 0.16 | 0.17 |
| $200 | 0.11 | 0.12 | 0.13 | 0.14 | 0.15 |
| $225 | 0.10 | 0.11 | 0.12 | 0.12 | 0.13 |
| $250 | 0.09 | 0.10 | 0.10 | 0.11 | 0.12 |
| $275 | 0.08 | 0.09 | 0.09 | 0.10 | 0.11 |

*For example, if a fungicide application cost is $30 (fungicide plus custom applicator fee) and the hay can be sold for $100 per ton of dry matter (TDM), then a 0.30 TDM/acre increase in yield is required when applying fungicide to pay for its application.*

**Figure 1.** Probability of recovering fungicide application costs at various hay prices and fungicide costs when applying Headline® fungicide

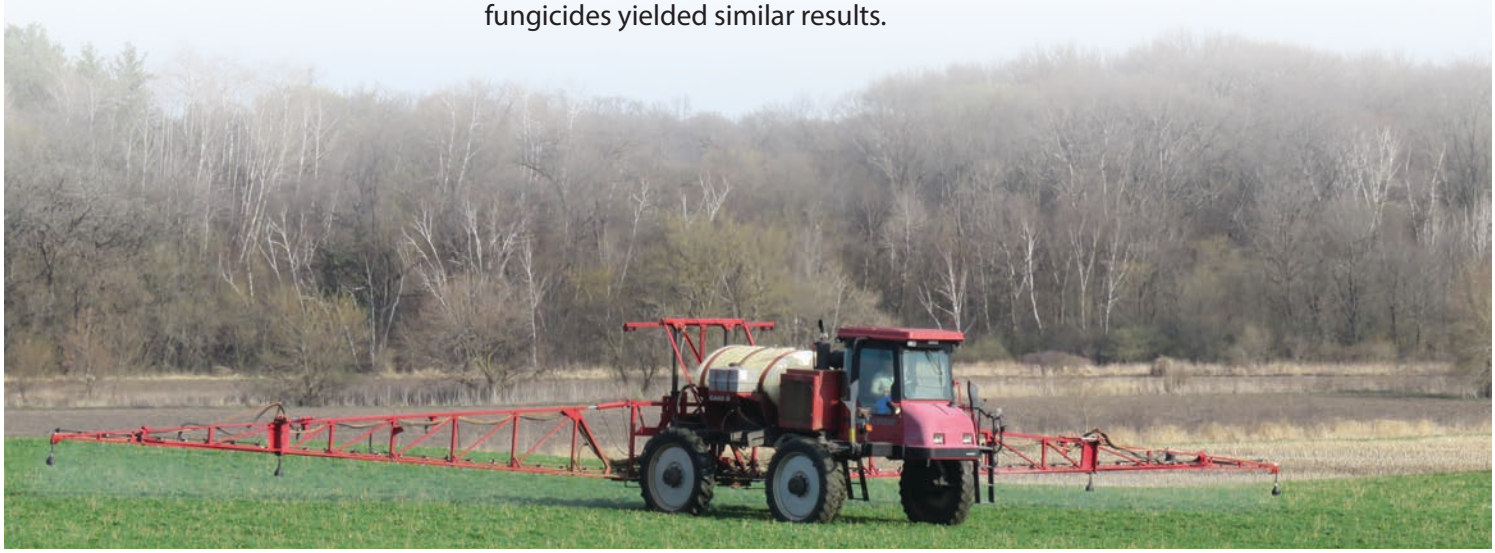



*For example, if hay is priced at $125 TDM and the fungicide application cost is $30, the probability of recovering the fungicide application cost on alfalfa for dairy production in Wisconsin is 10%.*

age yield increase and the inherent field variability that exists in alfalfa fields in Wisconsin. Figure 1 demonstrates these calculations across a number of scenarios. The probability of recovering fungicide costs when applying Headline® fungicide in the absence of heavy disease pressure is generally below 50%. Using our previous example, if hay is priced at $125 TDM and the fungicide application cost is $30, the probability of recovering the fungicide application cost on alfalfa for dairy production in Wisconsin is 10%.

## Conclusions and recommendations

In Wisconsin where alfalfa production is generally targeted toward dairy production, Headline® fungicide application will often result in a slight increase in yield, but that increase might not be large enough to offset the cost of applying the product. Typically in a 30-day cutting interval, like that used in dairy production in Wisconsin, foliar diseases cause minimal damage. Coupled with the heightened risk of fungicide resistance development toward these modern fungicides, application of fungicide on alfalfa for dairy production is not recommended unless heavy disease pressure is observed (this will be a rare event). While most of the analysis presented here targeted Headline® fungicide, testing with other fungicides yielded similar results.



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