Five-Year Summary of Foliar Fungicides for Alfalfa Production

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Summary and Implications

We need to select our opportunities based on scouting, yield potential, environmental conditions and alfalfa forage value as to where the probability of an economic return to a foliar fungicide application is likely. To apply fungicides to alfalfa without consideration for yield potential of individual cuttings or environments favorable to disease development would not follow proper stewardship of pesticide use nor result in maximizing profits.

Introduction

Over the past five years, Iowa State University (ISU) has conducted 15 site-years of foliar fungicide research trials at the ISU Northeast Research and Demonstration Farm. This report summarizes 191 fungicide treatments by harvest comparisons from this research.

Materials and Methods

The trials were conducted on Readlyn loam, or Tripoli silty clay loam soils. All trials had four to six replications. Trials summarized in this report were all from established alfalfa stands during 2012 through 2016.

Researched factors varied somewhat with the different trials. Comparisons included two alfalfa varieties, foliar application timing on 3-4 inch or 6-8 inch canopy heights, and fungicide products of Headline®, Quadris®, Fontelis™, Aproach™, and Champ® copper hydroxide. Data from copper hydroxide treatments were not included in this summary due to its poor performance relative to the other products.

In all trials, harvest schedules followed a 4-cut system with the fourth harvest in late August to early September. Harvest intervals were approximately every 30 days to as much as 35 days at times, weather permitting. Weather during 2012-2016 included some extreme conditions from a droughty summer in 2012 to record rainfall in the spring of 2013 and the late summer of 2016 (Table 1).

Results and Discussion

On average, first crop provided a higher percent yield response to a foliar fungicide application than for later crops. Three main factors that contribute to this are: 1) a spring environment is usually more favorable for alfalfa diseases, 2) the yield potential for first crop is higher than for later crops, 3) the growth period for first crop is considerably longer for that of later crops.

Also important is hay price. For example, a 10 percent yield increase from a fungicide application does not add as much value to $80 per ton hay as it would to $200 per ton hay. Therefore, yield per cutting plus yield response to fungicide plus hay price are all critical in contributing to profitability.

Limited rainfall occurred in the summer of 2012. For trials conducted within this timeframe, disease incidence was low and the average yield response to fungicide treatments only averaged about five percent. This resulted in a net loss to fungicide treatments even with hay priced at $200 per ton (Table 2). This is a logical cause and effect and strongly supports that foliar fungicide applications under dry climatic conditions are not profitable. However, fungicide treatments during the extremely wet spring of 2013 resulted in some of the most profitable net returns for both first and second crop.

Some trials compared timing of fungicide applications at a 3-4 inch canopy versus a 6-8 inch canopy. Since foliar fungicides only protect what they are applied to, an application to the 6-8 inch canopy should offer more protection. While there were small numerical differences in disease reduction and yield response with these treatments favoring the later application, they were not statistically significant. Waiting for an 8 in. canopy height for second, third or fourth crop in a four-cut system could also be problematic in that these products have a14 day preharvest interval. I suggest a compromise by targeting a 5-6 inch canopy height for these applications. However, I still prefer the 6-8 inch canopy height timing for treating first crop.

It is reasonable to assume that if foliar fungicide applications reduce disease infestations, leaf retention may be improved and result in higher forage quality at harvest. In order to measure forage quality differences, subsamples of harvested forage from some of these trials were sent to forage testing labs. Even though we had some visual evidence of better leaf retention, there was little to no effect of fungicide detected on the forage quality analyses and calculated RFV and milk per ton. Thus the main reason to use foliar fungicides is to achieve increased yield and not necessarily count on increased forage quality.

Some trials included two alfalfa varieties. Variety ‘A’ average 14 percent lower leaf disease incidence than variety ‘B’, and yielded better than variety ‘B’ in absence of a fungicide treatment, yet both yielded similar when treated with a fungicide. It is understandable that alfalfa varieties may have different tolerances to leaf diseases. However, there are no standards in place to provide alfalfa variety leaf disease resistance rating charts, and recommendations for the use of a foliar fungicide based off of those ratings.

In summary, if we calculate the overall occurrence of a positive economic response to fungicide for individual cuttings of 1st, 2nd, 3rd and 4th crops in these five years of

trials, we find the highest probability for 1st crop, followed by 2nd crop, with little chance of economic responses for 3rd and 4th crops (Table 3.); and only in years with strong hay prices.

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Table 1. Average monthly rainfall (inches) and growing degree days (GDD) base 41ºF for 2012 through 2016 from the ISU Northeast Research Farm, Nashua.

	2012		2013		2014	
Month	Rain (inch)	GDD	Rain (inch)	GDD	Rain (inch)	GDD
April	3.71	189	6.40	346	7.21	203
May	4.97	557	9.92	718	2.87	568
June	1.71	819	8.22	907	10.35	852
July	1.77	952	2.65	1,133	1.41	823
Aug.	3.19	908	3.29	893	3.82	921
Sept.	1.67	713	1.14	603	2.78	577
Total	17.02	4,138	31.62	4,600	28.44	3,944

	2015		2016		Long-term normal	
Month	Rain (inch)	GDD	Rain (inch)	GDD	Rain (inch)	GDD
April	4.33	326	2.34	312	3.62	285
May	3.50	597	3.04	587	4.45	546
June	5.78	829	11.62	921	5.03	828
July	4.00	906	6.05	949	4.72	971
Aug.	4.63	828	7.32	923	4.25	894
Sept.	2.61	804	14.91	732	3.04	637
Total	24.85	4,290	45.28	4,424	25.11	4,161

Table 2. Yield, percent yield response to foliar fungicide application and net return to three difference hay prices for individual alfalfa crop harvests during 2012 through 2016.

Year	Crop	Average DM yield of untreated control	Average % yield increase with fungicide treatment	Assumed hay prices below($/ton) result in average net returns to fungicide treatment ($/a)[1]		
				$80/ton	$140/ton	$200/ton
2012	1st	1.83	12.13	-4.68	+10.56	+25.80
	2nd	1.84	2.81	-19.46	-15.30	-11.14
	3rd	1.13	7.27	-18.09	-12.90	-7.71
	4th	1.21	5.32	-19.67	-15.67	-11.67
	Total	6.0 ton/a DM (7.1 ton/a 15% moisture hay; 15.0 ton/a 60% moisture haylage)				
2013	1st	2.23	13.28	+2.52	+23.16	+43.80
	2nd	1.62	10.64	-7.86	+5.00	+17.86
	3rd	1.50	9.47	-12.54	-3.20	+6.14
	4th	1.34	9.50	-13.80	-5.40	+3.00
	Total	6.7 ton/a DM (7.9 ton/a 15% moisture hay; 16.8 ton/a 60% moisture haylage)				
2014	1st	2.29	6.58	-12.10	-2.43	+7.25
	2nd	2.06	7.14	-12.30	-2.78	+6.75
	3rd	1.57	7.54	-14.70	-6.98	+0.75
	4th	1.48	No treatments			
	Total	7.4 ton/a DM (8.7 ton/a 15% moisture hay; 18.5 ton/a 60% moisture haylage)				
2015	1st	2.30	10.08	-3.53	+12.57	+28.67
	2nd	2.29	8.80	-7.40	+5.80	+19.00
	3rd	1.96	9.30	-8.87	+3.23	+15.33
	4th	1.41	No treatments			
	Total	8.0 ton/a DM (9.4 ton/a 15% moisture hay; 20.0 ton/a 60% moisture haylage)				
2016	1st	2.32	6.83	-10.80	-0.15	+10.50
	2nd	1.98	7.15	-12.80	-3.65	+5.50
	3rd	1.68	7.40	-14.20	-6.10	+2.00
	4th	0.84	No treatments			
	Total	6.8 ton/a DM (8.0 ton/a 15% moisture hay; 17.0 ton/a 60% moisture haylage)				

[1] The net return calculations include the average cost of fungicide. No application cost included.

Table 3. Percent occurrence of a positive economic response to fungicide[1] application with and without application cost for individual crops relative to three hay prices in the 15 trials from 2012-2016 at the ISU Northeast Research Farm, Nashua.

	$80/ton		$140/ton		$200/ton	
Crop	With $8/acre application cost	Without application cost	With $8/acre application cost	Without application cost	With $8/acre application cost	Without application cost
1st	0	0	40	60	73	100
2nd	0	0	7	13	40	66
3rd	0	0	0	0	20	47
4th	0	0	0	0	0	29

[1]Average fungicide cost = $18/acre.