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Foliar Fungicides in Alfalfa Production: A Five-Year Summary

Brian J. Lang
Iowa State University, bjlang@iastate.edu

Ken Pecinovsky
Iowa State University, kennethp@iastate.edu

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Brian Lang, extension agronomist
Ken Pecinovsky, farm superintendent

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, Nashua, Iowa. 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 all were from established alfalfa stands during 2012 through 2016.

Research comparisons varied with the trials. Comparisons included two alfalfa varieties, foliar application timing on 3–4 in. or 6–8 in. 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). April through July of 2012 was much warmer than normal, and the 2014 season was cooler than normal (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, and 3) the growth period for first crop is considerably longer than 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/ton hay as it would to $200/ton hay. Therefore, yield per cutting plus yield response to fungicide plus hay price all are 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/ton (Table 2). This is a logical cause and effect and strongly supports 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 in. canopy versus a 6–8 in. canopy. Because foliar fungicides only protect what these are applied to, an application to the 6–8 in. canopy should offer more protection. Although 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 4-cut system also could be problematic since these products have a 4-day preharvest interval. A compromise is suggested by targeting a 5–6 in. canopy height for these applications. However, a 6–8 in. canopy height timing for treating first crop is preferred.

It is reasonable to assume 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 there was 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’ averaged 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 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 on those ratings.

Conclusions

Just as with fungicide applications for corn and soybean, it is important to select the opportunities where the probability of economic return is the greatest. To apply fungicides to alfalfa without much thought to harvest schedule or environmental conditions does not follow proper stewardship of pesticide use, nor would it result in maximizing profits.

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

	2012		2013		2014	
Month	**Rain**	**GDD**	**Rain**	**GDD**	**Rain**	**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**	**GDD**	**Rain**	**GDD**	**Rain**	**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 fungicides, and net return to three difference hay prices for individual alfalfa crop harvests during 2012 through 2016 at the ISU Northeast Research Farm, Nashua, IA.

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.