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Six Year Summary of Foliar Fungicide Use in Alfalfa Production

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Summary and Implications

The best probability of achieving an economic response to a foliar fungicide application in alfalfa production is to first crop. Other than that, we need to be more selective of our opportunities for an economic return based on scouting, yield potential, environmental conditions and alfalfa forage value. 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 six years, Iowa State University (ISU) has conducted 16 site-years of foliar fungicide research trials at the ISU Northeast Research and Demonstration Farm, Nashua. This report summarizes 219 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 one to two-year old established alfalfa stands.

Research comparisons varied with the 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™, Priaxor™ 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 to 35 days, weather permitting. Weather during 2012-2017 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, 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 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.

Little 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). However, the fungicide treatments during an extremely wet spring in 2013 resulted in some of the most profitable net returns.

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. 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 inch canopy height for second, third or fourth crop in a 4-cut system could also be problematic in that these products have a 14 day preharvest interval. A compromise is suggested by targeting a 5-6 inch canopy height for these applications. However, the 6-8 inch canopy height timing for treating first crop is preferred.

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, fungicide applications showed little to no improvement in forage quality. 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 less 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 reasonable that alfalfa varieties may have different tolerances to leaf diseases and thus respond differently to fungicide applications. However, there are no standards in place to provide alfalfa variety leaf disease resistance ratings, and recommendations for the use of a foliar fungicide based off of those ratings.

Table 3 provides an overall assessment of the 16 trials conducted over the last six years. On average, the highest probability of an economic response to a foliar fungicide application trends to crops grown earlier in the season and with higher market value.

Just as with fungicide applications for corn and soybeans, we need to select our 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 (inches) and growing degree days (base 41ºF) for 2012 through 2017 from the ISU Northeast Research Farm, Nashua.

	2012		2013		2014		2015	
Month	Rain	GDD	Rain	GDD	Rain	GDD	Rain	GDD
April	3.71	189	6.40	346	7.21	203	4.33	326
May	4.97	557	9.92	718	2.87	568	3.50	597
June	1.71	819	8.22	907	10.35	852	5.78	829
July	1.77	952	2.65	1,133	1.41	823	4.00	906
Aug.	3.19	908	3.29	893	3.82	921	4.63	828
Total	15.35	3,425	30.48	3,997	25.66	3,367	22.24	3,486

	2016		2017		Normal	
Month	Rain	GDD	Rain	GDD	Rain	GDD
April	2.34	312	4.31	320	3.88	285
May	3.04	587	4.79	520	4.44	546
June	11.62	921	5.15	883	5.40	828
July	6.05	949	8.35	916	4.75	971
Aug.	7.32	923	1.67	780	4.37	894
Total	30.37	3,692	24.27	3,419	22.84	3,524

Table 2. Yield, percent yield response to fungicides and net return to three difference hay prices for individual alfalfa crop harvests during 2012 through 2017 at the ISU Northeast Research Farm, Nashua, IA.

				Assumed hay prices provided below ($/ton) result in average net returns to fungicide treatment at $15/ac ($/ac)[1]		
Year	Crop	Average DM yield of untreated control	Average % yield increased with fungicide treatment	$80/ton	$140/ton	$200/ton
2012	1st	1.83	12.13	+5.21	+20.37	+35.52
	2nd	1.84	2.81	-10.74	-7.55	-4.36
	3rd	1.13	7.27	-7.91	-2.60	+2.72
	4th	1.21	5.32	-9.56	-5.48	-1.40
2013	1st	2.23	13.28	+12.32	+32.81	+53.30
	2nd	1.62	10.64	+0.43	+12.00	+23.58
	3rd	1.50	9.47	-2.45	+6.97	+16.38
	4th	1.34	9.50	-3.75	+4.69	+13.13
2014	1st	2.29	6.58	-2.10	+7.58	+17.26
	2nd	2.06	7.14	-2.33	+7.18	+16.68
	3rd	1.57	7.54	-4.76	+2.92	+10.61
	4th	1.48	No treatments			
2015	1st	2.30	10.08	+5.63	+21.10	+36.57
	2nd	2.29	8.80	+2.68	+15.94	+29.19
	3rd	1.96	9.30	+1.08	+13.14	+25.19
	4th	1.41	No treatments			
2016	1st	2.32	6.83	-1.39	+8.81	+19.01
	2nd	1.98	7.15	-2.80	+6.35	+15.49
	3rd	1.68	7.40	-4.26	+3.80	+11.85
	4th	0.84	No treatments			
2017	1st	1.51	Hail storm on May 16 caused crop damage. No treatment data was collected.			
	2nd	1.50	7.98	-4.59	+3.21	+11.02
	3rd	1.67	9.73	-0.60	+10.20	+21.00
	4th	1.44	7.10	-6.20	+0.41	+7.01

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

Table 3. Percent occurrence of a positive economic response to the cost of a fungicide ($15/ac) with and without application cost ($8/ac) for individual crops relative to three hay prices in the 16 trials from 2012-2017 at the ISU Northeast Research Farm, Nashua, IA.

	$80/ton		$140/ton		$200/ton	
Crop	with	without	with	without	with	without
1st	7	20	67	100	94	100
2nd	2	9	24	64	56	89
3rd	0	7	22	62	53	84
4th	0	0	5	25	20	55