Foliar Fungicides in Alfalfa Production: A Four-year Summary

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Introduction

Over the past four years, Iowa State University (ISU) has conducted 12 site-years of foliar fungicide research trials at the ISU Northeast Research and Demonstration Farm. This report summarizes 85 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 for seeding year alfalfa were conducted in 2011 and 2012. Trials for established alfalfa stands were conducted in 2012, 2013, and 2014.

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.

Weather during 2011-2014 included some extreme conditions from a droughty summer in 2012 to near record rainfall in the spring of 2013 (Table 1). April through July of 2012 was much warmer than normal, and the 2014 season was cooler than normal (Table 2).

Results and Discussion

From 2012 through 2013, with hay prices at all-time highs, profitability of alfalfa production from use of a foliar fungicide was quite good, especially for first crop. However, hay prices have and are continuing to decrease. This changes the profitability.

Table 3 shows on average that first crop provided a higher percent yield response to a foliar fungicide application than later crops. Three major 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 for later crops.

The calculations for profitability assumed a fungicide cost of $22/acre, an application cost of $6/acre, and hay was converted from 100 percent dry matter to 15 percent moisture to simplify comparisons with posted hay auction prices. Table 3 includes a column without an application cost, since some farmers may apply insecticide for potato leafhopper control and assign the application cost to that operation. Although the need to treat potato leafhopper for first and fourth crops is much less likely, the column with fungicide plus application cost would better represent those crops.

The yields of established stands in these trials were quite good, with seasonal totals of 15 percent moisture hay averaging eight ton/acre. Lower yields would decrease the potential profitability of a foliar fungicide application. The far right column in Table 3 includes theoretical calculations assuming 20 percent lower yields than what this research provided. This used 6.4 ton/acre rather than 8 ton/acre yields to represent possible breakeven hay prices to foliar fungicide applications.

Yields for the “new seeding” trials were below normal. They were planted later in spring than what is recommended, and the dry summer weather in 2012 also reduced growth of the new seedings, more so than for the more deeply-rooted, established stands. Yield response of the new seedings to foliar fungicides was minor for first crop but significant for second crop. It is likely that disease presence would be minimal for first crop since the seeding was established on land rotated from a different crop. By second crop, alfalfa leaf litter on the ground could act as an inoculum source to contribute to disease infestations.

Disease presence was reduced during the hot, dry summer of 2012, but enhanced during the extremely wet spring of 2013. Yield responses to fungicide applications ranged from -1 to 20 percent. This wide range in disease presence relative to weather conditions reduces the odds for making profitable recommendations. Additional research is recommended to augment the data set to better calculate probabilities of economic returns relative to environmental factors, cutting schedules, timing of applications, and types of leaf diseases present and their severity.

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Table 1. Monthly rainfall at the research farm.

Month	2011	2012	2013	2014	Normal
	- - - - - - - - - - inches - - - - - - - - - -				
April	3.86	3.71	6.40	7.21	3.58
May	3.84	4.97	9.92	2.87	4.45
June	4.75	1.71	8.22	10.35	5.07
July	3.48	1.77	2.65	1.41	4.71
Aug	4.60	3.19	3.29	3.82	4.23
Sept	2.32	1.67	1.14	2.78	3.09
Oct	1.52	4.11	1.46	2.53	2.65
Total	24.37	21.13	33.08	30.97	27.78

Table 2. Alfalfa growing degree days at the farm.

Month	2011	2012	2013	2014	Normal
	- - - - - - growing degree days - - - - - - -				
April	244	336	176	211	285
May	567	716	551	568	546
June	830	907	819	852	828
July	1,115	1,053	896	780	910
Aug	905	893	909	912	894
Sept	548	620	721	592	637
Oct	437	306	350	312	313
Total	4,646	4,831	4,422	4,227	4,413

Table 3. Twelve site-years of research trials with 85 fungicide treatments by harvest comparisons from 2011 through 2014 at the ISU Northeast Research and Demonstration Farm, Nashua.

	No. of fungicide treatments per cutting	Avg. yield response to foliar fungicide	Avg. dry matter yields by cutting	Profitability[1]		Theoretical profitability assuming 20% lower yields[2]	
Established stands		%	ton/acre	\$/ton[3]	\$/ton[4]	\$/ton[3]	\$/ton[4]
1st crop	13	12.7	2.23	84	66	126	99
2nd crop	21	7.4	1.79	180	141	264	207
3rd crop	17	8.6	1.46	190	149	279	219
4th crop	10	6.9	1.31	263	207	387	304
New seedings							
1st crop	12	2.2	1.01	1,071	842		
2nd crop	12	10.9	1.38	158	124		

[1]Assumes fungicide cost of $22/acre and application cost of $6/acre. Dry matter yield converted to 15% moisture hay. The breakeven price shown is for 15% moisture hay.
[2]The breakeven price of 15% moisture hay. Other factors remain the same.
[3]$/ton with fungicide plus application cost.
[4]$/ton with only fungicide cost.