Foliar Fungicides in Alfalfa Production: A Four Year Summary

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Summary and Implications

Four years of research with foliar fungicides in alfalfa production indicate that the best chance for profitability is with an application in spring to first crop growth at a six to eight inch canopy height. Fungicide applications to later crops during the season are of questionable economic value, and highly dependent on crop yield potential and environments more conducive for disease development.

Introduction

Over the past four years Iowa State University (ISU) has conducted 12 site-years of research trials at the ISU Northeast Research and Demonstration Farm near Nashua. These trials included 85 fungicide treatments by harvest comparisons represented in this research summary.

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 of 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 inch or 6-8 inch canopy heights, and fungicide products of Headline®, Quadris®, Fontelis™, Aproach™, and Champ® copper hydroxide. Data from copper hydroxide treatments was not included in this summary due to its poor performance relative to the other fungicide 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 considerably cooler than normal (Table 2).

Results and Discussion

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

Table 3 shows on average that first crop provided a higher % yield response to a foliar fungicide application than for later crops. Three major factors that contribute this are: 1) the spring environment is usually more favorable for alfalfa diseases; 2) the yield potential for first crop is significantly higher than for later crops; 3) growth period for first crop is considerably longer than for later crops.

The calculations for profitability assumed a fungicide cost of $22/acre, an application cost of $6/acre, and hay converted from 100 percent dry matter to 15 percent moisture to simplify comparisons with current hay market prices selling as-is at hay auctions. Table 3 also includes a column with no application cost since some farmers may apply an insecticide for Potato leafhopper control and assign the application cost to that operation. Treating Potato leafhopper for first and fourth crops is much less likely, so the column with fungicide cost plus application cost would better represent those crops.

Yields of the established stands in these trials were quite good, with seasonal totals of 15 percent moisture hay cut four times a year averaging eight ton/acre. Lower yields would decrease the potential of a foliar fungicide application being profitable. Far right column in Table 3 includes theoretical calculations assuming 20% 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 with lower yields.

The yields for “new seeding” trials were not very good. They were planted later in spring than what is recommend, and trials conducted in 2012 also suffered reduced yields from the droughty summer. Yield response to foliar fungicides was minor for first crop, but significant for second crop. It is logical to assume that disease presence and its potential impact would not be as high for first crop since the new seeding is established on land rotated from a different crop. By second crop, more alfalfa leaf litter is on the ground and likely to act as an inoculum source to potentially contribute to disease infestations.

Disease infestations were greatly reduced during the hot and dry summer of 2012, but were enhanced during the extremely wet spring of 2013. Among the 85 fungicide treatments by harvest comparisons, yield responses to foliar fungicide applications ranged from a negative one percent to a positive twenty percent. This wide range in potential disease infestations 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, types of leaf diseases present and severity.

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Table 1. Monthly rainfall totals at the ISU Northeast Research and Demonstration Farm, Nashua.

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 (GDD) at the ISU Northeast Research and Demonstration Farm, Nashua.

Month	2011	2012	2013	2014	Normal
	- - - - - - - - - - GDD - - - - - - - - - -				
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 treatment by harvest comparisons from 2011 through 2014 at the ISU Northeast Research and Demonstration Farm, Nashua.

	Number of fungicide treatment by harvest comparisons per cutting	Average yield response to foliar fungicide	Average dry matter yields by cutting	Profitability: Assume fungicide cost of $22/acre and application cost of $6/acre. Convert dry matter yield to 15% moisture hay. The breakeven price of 15% moisture hay is:		Theoretical profitability assuming 20% lower yields: Other factors remain the same. The breakeven price of 15% moisture hay is:	
Established stands		%	ton/acre	$/ton with fungicide plus application cost	$/ton with only fungicide cost	$/ton with fungicide plus application cost	$/ton with only fungicide cost
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 crops	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		