Using Foliar Fungicides on Corn: 2007 Plot Results from the University of Wisconsin

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Introduction

Increasing corn acreage and rising commodity prices has generated considerable interest in the use of foliar fungicides as a means of enhancing corn yield. Because insufficient data exists in Wisconsin to support this use, staff at the University of Wisconsin Cooperative Extension Service and UW College of Agricultural and Life Sciences initiated a coordinated effort to generate data from replicated on-farm and small plot trials.

Advantages of small plot research include the ability to control variables such as soil type/texture, drainage, soil compaction and pest interactions. It also allows the researcher to evaluate several different treatments in a small area. However, the value of large scale on-farm research is that the previously mentioned variables are not singled out and those results better represent "real world" scenarios. Both approaches are important steps in the research process.

To address the questions of economical foliar fungicide use in corn, small scale replicated plots were implemented at the Arlington Agricultural Research Station during the 2004-2007 growing seasons and large scale on-farm research plots were conducted at various Wisconsin locations in 2007. Discussion of each type of plot will be kept separate because of the variation in experimental design.

Large scale on-farm plots

Plot design. On-farm large and small plot replicated trials were initiated during the 2007 growing season in Chippewa, Columbia, Dane (2), Green Lake, La Crosse, Monroe (2), Ozaukee, Sheboygan and Washington counties. Plots were maintained using the individual grower's production practices. Quilt®, Headline® and/or Stratego® were applied at labeled rates at each location using ground application equipment at the VT (tassel) stage of corn development. Leaf health was determined by recording specific diseases present and the percent area of leaves symptomatic of disease. Foliar disease ratings were taken prior to application and then again during early September to determine disease change during the growing season. A stalk nudge test was conducted in early October to determine the incidence stalk rot and lodged stalks in each plot.

Disease Summary. Across all locations, September disease severity ratings ranged from less than 1% to a high of 33% in the untreated checks. Three of eleven fields had a severity rating greater than 10% (17 %, 22% and 33%). Severity ratings in the other eight fields were below 10% and six of those fields were less than 5%. Foliar diseases presence varied across locations and those present included common rust, gray leaf spot, northern corn leaf blight, northern corn leaf spot, anthracnose and eyespot.

Results. Five of the eleven fields included more than one fungicide. As a result, there were 17 fungicide comparisons with an untreated check. Only one of the eleven locations (Dane #2) had a statistically significant yield increase (Table 1, next page) of 6.4 bu/a when a fungicide was used. Grain moisture was also higher (0.9% increase) at this location in the treated plots (Table 2, next page). However, this increase in yield would not have been enough to pay for the fungicide, application costs and additional drying costs at current market values of $4.00/bu corn, $6.00/a application costs, $20/acre fungicide costs and drying cost of 5 cents/bushel for a yield of 161 bu/a. This field also had an average of 17% diseased foliage in the untreated check compared to 7% in the fungicide treated plots.

Grain Moisture was also inconsistently affected. Four fields (including the Dane County field mentioned above) had significantly higher grain moisture levels at harvest than did the untreated check. Those differences in moisture were 1.0%, 0.9%, 0.7% and 0.5%. Stalk lodging (Table 3, next page) was also inconsistently affected by a foliar fungicide. Of the seventeen possible product comparisons, 5 significantly reduced % lodging while 13 did not have a significant statistical effect.

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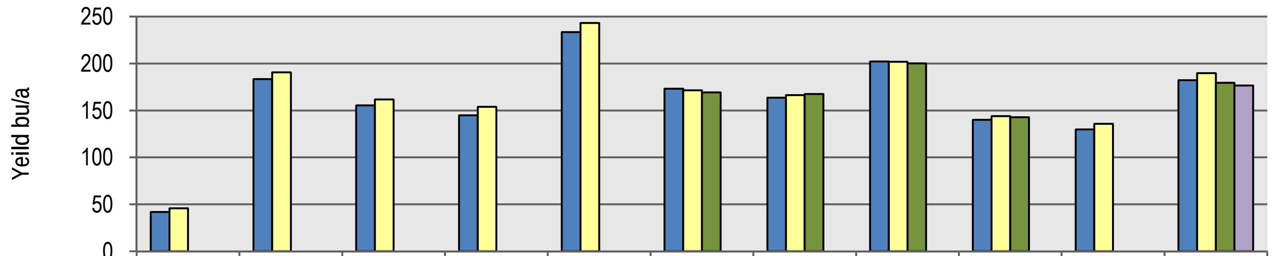
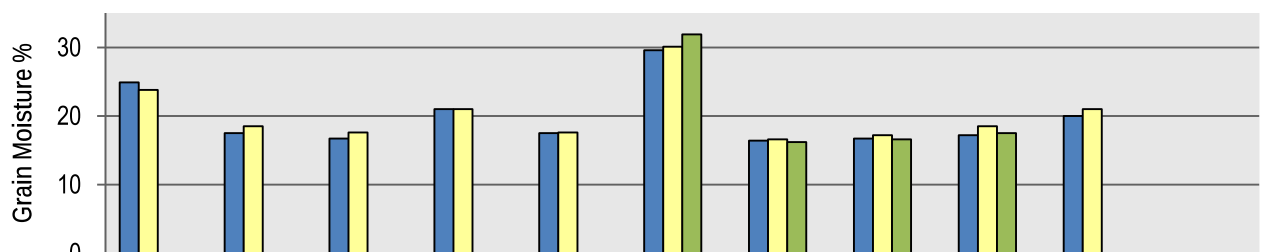
Table 1: Yield results (bu/a)



	Chippewa	Dane #1	Dane #2	Green Lake	La Crosse	Ozaukee	Sheboy-gan	Washing-ton	Monroe #1	Monroe #2	Columbia
Untreated	41.85 a	183.4 a	155.4 b	144.9 a	233.5 a	173.2 a	163.6 a	202.2 a	140 a	129.7 a	182.3 a
Quilt	45.7 a	190.6 a	161.8 a	153.9 a	243.2 a	171.5 a	166.4 a	201.9 a	144 a	135.7 a	189.8 a
Headline						169.2 a	167.5 a	200.2 a	142.7 a		179.5 a
Stratego											176.6 a

Yield values within a column followed by the same letter are not significantly different (P=0.05, Duncan's Multiple Range Test)

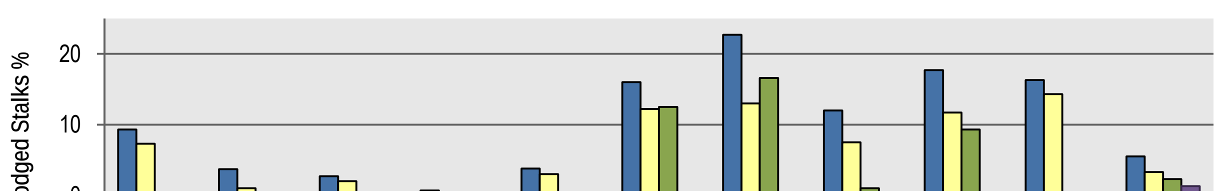
Table 2: Grain Moisture (%)



	Chippewa	Dane #1	Dane #2	Green Lake	La Crosse	Ozaukee	Sheboy-gan	Washing-ton	Monroe #1	Monroe #2	Columbia
Untreated	24.9 a	17.5 b	16.7 b	21 a	17.5 a	29.6 a	16.4 ab	16.7 b	17.2 b	20 a	
Quilt	23.8 a	18.5 a	17.6 a	21 a	17.6 a	30.1 a	16.6 a	17.2 a	18.5 a	21 a	
Headline						31.9 a	16.2 a	16.6 b	17.5 ab		
Stratego											

Moisture values within a column followed by the same letter are not significantly different (P=0.05, Duncan's Multiple Range Test)

Table 3: Lodged Stalks (%)



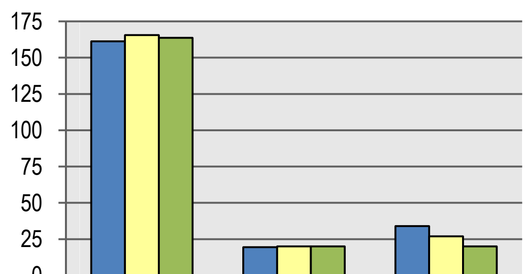
	Chippewa	Dane #1	Dane #2	Green Lake	La Crosse	Ozaukee	Sheboy-gan	Washing-ton	Monroe #1	Monroe #2	Columbia
Untreated	9.3 a	3.7 a	2.7 a	0.7 a	3.8 a	16 a	22.7 a	12 a	17.7 a	16.3 a	5.5 a
Quilt	7.3 a	1 a	2 a	0 a	3 a	12.2 b	13 b	7.5 a	11.7 a	14.3 a	3.3 ab
Headline						12.5 b	16.6 b	1 a	9.3 a		2.3 ab
Stratego											1.3 b

Lodged stalk values within a column followed by the same letter are not significantly different (P=0.05, Duncan's Multiple Range Test)

Data were also combined across all locations (Table 4), except for Chippewa County. Chippewa County experienced extremely dry conditions and yields ranged between 40-50 bu/a. Therefore, these yields were not considered representative of typical growing conditions.

Results from the combined data indicated that yield and % grain moisture were not significantly affected by foliar fungicides. However, there were significantly fewer lodged stalks in the Headline® and Quilt® treatments but this difference was not reflected in yields. It is not known why lodging was decreased with a fungicide application, but was likely related to extended duration of physiological activity of leaves which in turn slowed stalk maturation. Information on corn hybrids and disease reactions were not available, but likely contributed to the outcome observed in these trials.

Table 4: Combined results across all locations



	Yield (bu/a)	Grain Moisture (%)	Lodged Stalks (%)
Untreated	161.3	19.5	34 b
Quilt	165.5	20	27 a
Headline	163.7	20	20 a

Means within a column followed by the same letter are not significantly different (P=0.00021, Fischer's Protected LSD)

Small plots

Plot Design. Small scale fungicide plots were evaluated at the Arlington Agricultural Research Station. Headline® was applied at the labeled rate using high clearance ground application equipment during the VT stage of corn development. Corn was planted in rotation with either soybean (2004-2007), corn (2005-2007) or wheat (2007) in both no-till (2007) and chisel plow (2004-2006).

Results. In 2 of 11 trials a significant yield response occurred that covered the fungicide cost (Table 5). Assuming a break even yield response of 6 bu/a with a $22/acre fungicide cost (including application fee) and $3.75/bushel corn. Each of these positive yield responses were in corn following soybean.

Table 5: Corn and Headline® fungicide response in Wisconsin.

Year	Previous Crop	Tillage	No Fungi-cide	With Fungi-cide	Fungi-cide increase	Did it Pay?
			------bushels per acre------			
2007	Corn	No-till	216	222	6	?
	Soybean	No-till	203	230	27*	Yes
	Wheat	No-till	205	210	5	No
	Soybean	No-till	206	208	2	No
2006	Soybean	Chisel	226	229	3	No
	Corn	Chisel	214	217	3	No
	Corn	Chisel	227	227	0	No
2005	Corn	Chisel	181	186	5	No
	Soybean	Chisel	199	211	12	?
	Soybean	Chisel	212	213	1	No
2004	Soybean	Chisel	200	211	11*	Yes

An asterisk indicates significance at $P \leq 0.10$.

Summary

Results of these trials indicated that there were no consistent statistical yield benefit and an occasional negative impact on moisture when a foliar fungicide was applied. Significantly higher stalk lodging was observed in the untreated plots at several locations; however, this did not translate into a yield reduction. For those growers considering foliar fungicides as part of a disease management strategy, IPM practices such as crop rotation, hybrid selection and residue management should be considered important preventative practices. Furthermore, timely field scouting is necessary to determine the need for a fungicide and if warranted, proper application timing is necessary to achieve maximum economic benefit of this investment.

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