

USE OF FUNGICIDES IN HAIL-DAMAGED CROPS

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Hail damage is common across many soybean and corn producing areas in the United States (National Crop Insurance Service, 2008). Since 2003, the National Crop Insurance Service has paid claims on an average of 2.3 million acres of soybean per year at an average cost of \$53.5 million. Over the same period of time, the NCIS estimates approximately \$36 to \$59 million in annual claims due to hail damage in corn (Bradley and Ames, 2010). With increasing global temperatures, more extreme and unpredictable weather patterns have been suggested; therefore; grower risk for severe hail damage may increase (Kajfez Bogataj, 2005).

In 2009, severe hail damage was reported in Southwest WI and across large sections of Iowa. Following this hail event, growers, retailers, and agronomists alike were asking if these acres needed to be treated with a fungicide. Much of this was prompted by BASF's supplemental label for Headline® that states, "the plant health benefits may include improved host plant tolerance to yield-robbing environmental stresses, such as drought, heat, cold temperatures, and ozone damage" and for corn, "improved stalk strength and better harvestability, inducted tolerance to stalk diseases, better tolerance to hail, more uniform seed size."

Prior to EPA's approval of the BASF plant health label, Bradley and Ames (2010) initiated an experiment to quantify the effect of Quinone outside inhibitor (QoI) foliar fungicides on hail damaged corn. Using a hand-held gas powered string mower Bradley and Ames simulated hail damage at V12 corn. At the VT growth stage, plots were either treated with azoxystrobin (Quadris; Syngenta Crop Protection, Greensboro,NC) at 109 g a.i./ha or pyraclostrobin (Headline; BASF Corp.) at 110 g a.i./ha, or not treated (nontreated control). Disease ratings were taken ~3 weeks after fungicide application and grain yield was collected at maturity. Both Headline and Quadris decreased disease incidence in 2007, however no differences in disease control were noted in 2008. No yield benefit was shown in either year.

Wisconsin Corn Trial

In 2009, many trials at the Lancaster ARS were impacted by hail damage on 24 July (pea to marble size). In particular, we had a corn study established to assess the effect of fungicide active ingredient and fungicide timing on the risk of anthracnose stalk rot. This

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trial was inoculated at planting with *Colletotrichum graminicola* and was conducted in a field area known to have anthracnose. The trial was sprayed at R1 on 29 July and monitored for disease throughout the rest of the growing season. Results of late season assessments for stalk quality and yield indicated that there was no effect of foliar fungicide on late season occurrence of anthracnose or on grain yield (Table 1). Overall, yield in this trial was reduced by hail and anthracnose by approximately 20 bu/A from what might have been expected in most normal growing seasons at the Lancaster site.

Table 1. Effect of fungicide applied prior to hail damage on corn, Lancaster WI, 2009.

Treatment	Late Penetrometer (kg-Force)	Stalk Rating (0-5)	Yield (bu/A)	
UTC	13.5	1.7	107.3	
Quilt (R1 app'n): 14 oz/A	12.4	2.7	108.8	
Quilt Xcel (R1 app'n): 10.5 oz/A	13.5	1.7	118.7	
Quilt Xcel (R1 app'n): 14 oz/A	10.6	2.4	93.2	
Headline (R1 app'n): 6 oz/A	12.9	1.2	93.2	
Stratego (R1 app'n): 10 oz/A	12.8	1.4	141.3	
Quilt Xcel (V6 app'n): 10.5 oz/A	14.3	1.3	117.4	
Headline @ 3 oz./A at V6 followed by Headline @ 6 oz./A + NIS @ 0.25% v/v at R1	13.6	1.5	117.0	
Headline @ 3 oz./A at V6	12.2	2.8	106.7	
Headline @ 6 oz./A + NIS @ 0.25% v/v at R1	15.2	1.0	128.3	
Headline @ 6 oz./A at V6 followed by Headline @ 6 oz./A + NIS @ 0.25% v/v at R1	12.0	1.9	109.6	
Headline @ 6 oz./A at V6	14.2	1.1	115.1	
	P-value	0.0755	0.2975	>0.5
	LSD	2.112	NSD	NSD
	CV (%)	13.5	65.1	25.1

Wisconsin Soybean Trial

Following the significant hail event that occurred on July 24 at the Lancaster research station, we examined several fields to find uniformly damaged areas where we could initiate a hail experiment in soybean. The field sites were assessed on August 1 and sprayed on August 5. The gap between the hail date and the application date was to allow for sufficient new leaf growth so we wouldn't just be treating bare branches. The area that we chose experienced an average loss of three total nodes (from 15 down to 12) and 80% defoliation. The soybeans were at the R3 growth stage at the time of the hail event. The products chosen are shown in Table 2 and applied in a RCB design with four reps in plots sized 10 feet by 25 feet. There was no yield response to foliar fungicides following hail in this trial.

Table 2. Soybean hail fungicide trial
Lancaster, WI.

Treatment	Product	Rate	Grain Yield bu/A
1	UTC		55.6
2	Quilt	14 fl oz/A	51.0
3	Headline	6 fl oz/A	53.1
4	Stratego	10 fl oz/A	50.7
Means			52.6
Probability %			33.6
LSD 10%			NS
CV%			8

The results from the two Wisconsin studies and Bradley and Ames (2010) suggest variable disease response and no yield response to fungicide following severe hail damage in corn or soybean. Given the significant yield loss that can occur from hail events, we have not seen any benefit from foliar fungicide applications to severely hail damaged corn or soybean.

Literature Cited

- Bradley, C.A., and K.A. Ames. 2010. Effect of foliar fungicides on corn with simulated hail damage. *Plant Dis.* 94:83-86.
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