FUNGICIDE APPLICATIONS ON V5 CORN

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Foliar fungicide applications on corn remain a controversial topic. There continues to be debate regarding the economic use of foliar fungicides, and more recently, discussions have ensued about the use of foliar fungicides during vegetative growth stages, specifically at the V5 to V6 growth period coinciding with post-emergence herbicides applications. In soybean, the use of tank mixes has been discussed extensively in terms of avoiding the mixing of herbicides-insecticides-fungicides based on several factors like application equipment (nozzle type), coverage, and timing as well as the use of thresholds for insects like aphids (see: http://www.planthealth.info/pdf_docs/trimix_05.pdf). We feel that these same considerations need to be made about the use of tank mixes for corn. However, in corn less is known about the effect of early-season fungicide applications on disease development and late season stalk health.

Regional Summary 2009

In 2009, several states conducted trials to examine the effect of foliar fungicides applied early, late, or in a combination of timings. A general summary of that research can be found here: http://bulletin.ipm.illinois.edu/article.php?id=1284. In particular, results indicated that only one of eight trials (Nebraska) was there a response of > 10 bushels per acre. Interestingly, the greatest responses were observed with applications made at VT-R1 in trials in Nebraska and Iowa. In Nebraska, the primary disease that was being controlled was southern rust. Averaged across trials, the mean response was 1.5 bushels per acre with V5-V6 applications compared to 8 bushels per acre with the VT-R1 applications, although variability was high in the trial.

2009 Lancaster ARS Trial

To examine the effect of fungicide, application timing, and rate, an experiment was conducted at the Lancaster ARS in a field previously cropped to corn with a history of anthracnose. The experimental design was a randomized complete block with four replications, with a single hybrid (P37Y14) used. The trial was planted on 11 May 2009 at 33,000 plants per acre and was harvested on 27 October 2009. The general growing conditions were cool and wet the entire season. The treatments are listed in Table 1. Fungicide application dates were 17 June and 29 July and were made using a CO_2-backpack sprayer calibrated to 20 gallons per acre and 40 PSI. Prior to the 29 July fungicide application, hail occurred in these plots and ranged in size from pea to marble sized. Due to the hail damage, disease ratings focused on measures associated with ear mold development, common smut, anthracnose top dieback and stalk health. Yield measures included grain moisture, test weight, and grain yield. Data were analyzed using SAS PROC MIXED and mean comparisons were based on the least significant difference (LSD) at the 10% level.

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Table 1. Treatments in the 2009 foliar fungicide trial at the Lancaster ARS that examined fungicide active ingredient, timing, and application rate.

Product	Active ingredient	Timing	Rate
UTC	-	-	-
Quilt	Azoxystrobin + Propioconazole	R1	14 fl oz/A
Quilt Xcel	Azoxystrobin + Propioconazole	R1	10 oz/A
Quilt Xcel	Azoxystrobin + Propioconazole	R1	14 oz/A
Quilt Xcel	Azoxystrobin + Propioconazole	V6	10.5 oz/A
Headline	Pyraclostrobin	R1	6 oz/A
Headline (+NIS)	Pyraclostrobin	R1	6 oz/A (+0.25% v/v)
Headline fb Headline (+NIS)	Pyraclostrobin	V6&R1	3 oz/A fb 6 oz/A (+0.25% v/v)
Headline	Pyraclostrobin	V6	3 oz/A
Headline (+NIS)	Pyraclostrobin	R1	6 oz/A (+0.25% v/v)
Headline fb Headline (+NIS)	Pyraclostrobin	V6&R1	6 oz/A fb 6 oz/A (+0.25% v/v)
Headline	Pyraclostrobin	V6	6 oz/A
Stratego	Propiconazole + Trifloxystrobin	R1	10 oz/A

Results for the 2009 trial are provided in Tables 2 and 3. Overall, there was no evidence of an effect of foliar fungicide application on any of the late season disease measures or yield measures.

Table 2. Summary of late season disease assessments and stalk health, for the foliar fungicide trial conducted at the Lancaster ARS in 2009.

Treatment	Ear mold	Top dieback	Push test	Stalk rating
	(%)	(%)	(%)	(0-5)
UTC	5	10	25	1.7
Quilt, R1, 14 oz/A	15	20	40	2.7
Quilt Xcel, R1, 10.5 oz/A	10	20	20	1.7
Quilt Xcel, R1, 14 oz/A	13	18	58	2.4
Quilt Xcel, V6, 10.5 oz/A	15	15	25	1.3
Headline, R1, 6 oz/A	8	10	25	1.2
Headline, R1, 6 oz/A (plus NIS)	3	8	43	1.0
Headline, V6, 3 oz/A	5	18	33	2.8
Headline, V6, 3 oz/A fb Headline, R1, 6 oz/A (plus NIS)	8	13	28	1.5
Headline, V6, 6 oz/A fb Headline, R1, 6 oz/A (plus NIS)	13	13	40	1.9
Headline, V6, 6 oz/A	15	10	35	1.1
Stratego, R1, 10 oz/A	15	8	25	1.4
LSD (10%)	NSD	NSD	NSD	NSD

Table 3. Summary of yield measures for the foliar fungicide trial conducted at the Lancaster ARS in 2009.

Treatment	Grain moisture	Test weight	Grain yield
	(%)	(lb/bu)	(bu/A)
UTC	25.4	50.7	107
Quilt, R1, 14 oz/A	23.8	51.4	109
Quilt Xcel, R1, 10.5 oz/A	23.8	51.4	119
Quilt Xcel, R1, 14 oz/A	22.8	52.7	93
Quilt Xcel, V6, 10.5 oz/A	25.7	51.1	117
Headline, R1, 6 oz/A	25.1	51.6	93
Headline, R1, 6 oz/A (plus NIS)	25.6	52.0	128
Headline, V6, 3 oz/A	23.4	51.4	107
Headline, V6, 3 oz/A fb Headline, R1, 6 oz/A (plus NIS)	26.7	51.4	117
Headline, V6, 6 oz/A fb Headline, R1, 6 oz/A (plus NIS)	25.0	52.0	110
Headline, V6, 6 oz/A	25.0	51.7	115
Stratego, R1, 10 oz/A	24.9	51.2	141
LSD (10%)	NSD	NSD	NSD

2010 Lancaster ARS Trial

In 2010, a similar trial was conducted again at the Lancaster ARS in the same field. The experimental design was a randomized complete block with four replications, and a single hybrid (NK N51T-3000GT) was used. The trial was planted on 10 May at 33,000 plants per acre and was harvested on 22 October. The general weather conditions were warm, humid, and rainy throughout the growing season. Treatments are listed in Table 4. Fungicide application dates were 16 June and 19 July, and were made using a CO_2-backpack sprayer calibrated to 20 gallons per acre and 40 PSI. Disease assessments were made between the two fungicide applications (8 July), shortly after the second application (21 July), and at kernel dent (10 September). Ratings on 8 July and 21 July were at the whole plant level and on 10 plants per plot, while the 10 September rating was on the ear leaf for 10 plants per plot. Stalk ratings were made on 22 September using both a push testing on 20 plants per plot as well as a stalk rating (0-5) on 10 plants per plot. Yield measures included grain moisture, test weight, and grain yield. Data were analyzed using SAS PROC MIXED and mean comparisons were based on the least significant difference (LSD) at the 10% level.

Table 4. Treatments in the 2010 foliar fungicide trial at the Lancaster ARS that examined fungicide active ingredient, timing, and application rate.

Product	Active ingredient	Timing	Rate
UTC	-	-	-
Stratego YLD (+Induce)	Prothioconazole + Trifloxystrobin	R1	5 oz/A (+ 0.125% v/v)
Stratego YLD (+Induce)	Prothioconazole + Trifloxystrobin	V5-V6	2.5 oz/A (+ 0.125% v/v)
Stratego YLD (+Induce) fb Stratego YLD (+Induce)	Prothioconazole + Trifloxystrobin	V5-V6 fb R1	2.5 oz/A (+ 0.125% v/v) fb 5 oz/A (+ 0.125% v/v)
Quadris	Azoxystrobin	V5-V6	6 oz/A
Quadris fb Quilt Xcel	Azoxystrobin fb Azoxystrobin + Propioconazole	V5-V6 fb R1	6 oz/A fb 10.5 oz/A
Quilt Xcel	Azoxystrobin + Propioconazole	R1	10.5 oz/A

Results for the 2010 trial are provided in Fig. 1 and 2. In this trial, there was a low level of disease at V5-V6 and there was no evidence of differences among treatments when plants were assessed on 8 July (data not shown). As shown in Fig. 1A, there was evidence of differences among treatments for both eyespot and anthracnose, although the effect of a fungicide application on anthracnose was difficult to quantify due to low disease pressure in the untreated control. Eyespot was reduced, however, with all treatments applied early. Late in the growing season (Fig. 1B), differences were also noted among fungicide treatments on disease severity assessments made on the ear leaf. The severity of anthracnose was high, consistent with field history of this disease. There were also differences noted for common rust, gray leaf spot, and northern corn leaf blight, although the severity was very low making inference difficult (data not shown). However, as shown in Fig. 2A, there was no evidence of an effect of foliar fungicide application on either stalk lodging (push test) or stalk rating, respectively. There were differences in grain moisture (Fig. 2B) with all fungicide treatments greater than the UTC ($P = 0.81$). While there was no evidence of an effect of fungicide treatment on grain yield, there was a trend towards higher yield in fungicide treated plots. Further research is needed to determine if this is a consistent response and/or a response due to control of eyespot or anthracnose leaf blight.

The current results on the early application of a foliar fungicide in corn are inconclusive. Conditions were more favorable in 2010 for disease development than in previous years, and we saw efficacy against several diseases. While there were some trend results for grain yield in 2010, further research is needed to quantify what the primary factor(s) may be driving such a response.

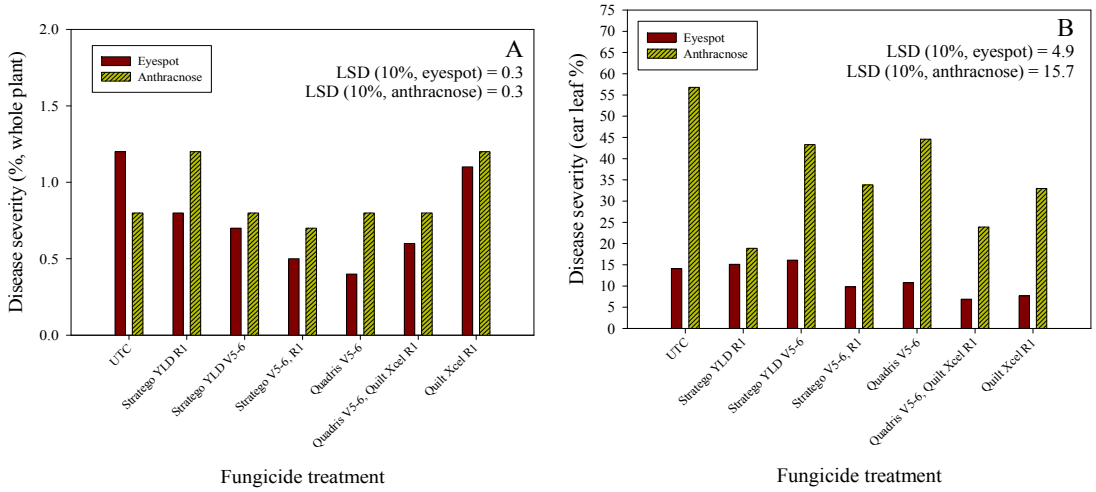

Figure 1. Disease severity at the whole plant level for eyespot and anthracnose on (A) 21 July and on the ear leaf on (B) 10 September 2010. The P-values for the statistical analysis were 0.0016 (eyespot) and 0.0228 (anthracnose), respectively.

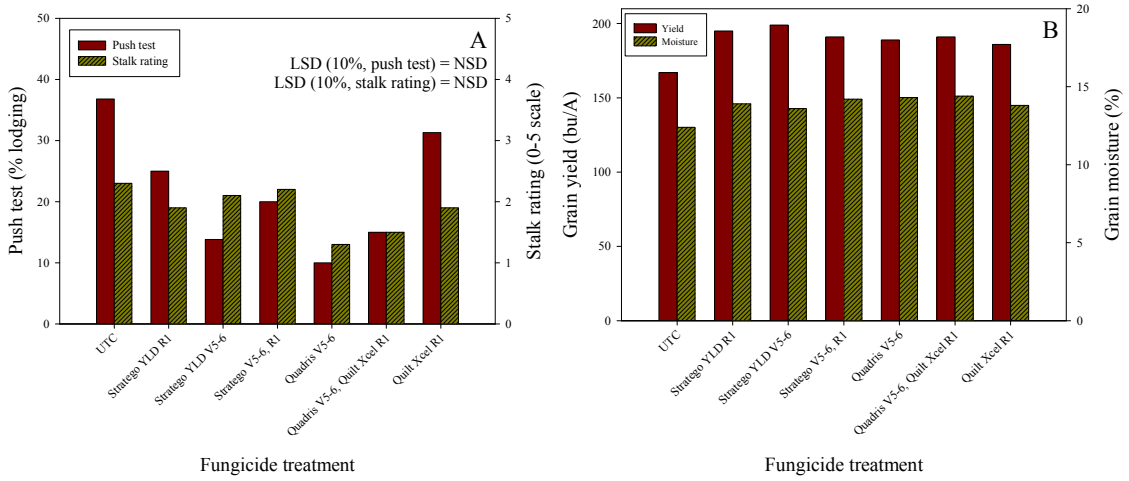

Figure 2. (A) Stalk lodging based on push test and stalk rating and (B) grain yield and grain moisture in the 2010 trial. Differences were noted for grain moisture (B) (P = 0.0097, LSD (10%) = 0.81) and while there was no evidence of a difference in grain yield (P = 0.1012), there was trend toward higher grain yields in fungicide treated plots.