Foliar Fungicides for Corn Production: Always or Sometimes?

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Introduction

Since the 2007 growing season, use of foliar fungicides on corn in the Midwesthas increased dramatically. In 2007, approximately 10 million to 14 million acres of corn in the Midwest were sprayed with a foliar fungicide, and estimations for the 2008 season are similar. Fungicide products that were applied to corn in 2007 and 2008 were generally either solo strobilurin fungicides (i.e., Headline® or Quadris®) or strobilurin + triazole fungicide mixtures (i.e., Quilt® or Stratego®). Strobilurin fungicides belong to a relatively new class of fungicides that have efficacy on a broad spectrum of pathogenic fungi. In general, strobilurin fungicides are considered to be preventative fungicides (should be applied prior to or at the beginning stages of disease). Triazole fungicides have been around longer than strobilurin fungicides; in fact, Tilt® fungicide (a triazole fungicide) was the first systemic fungicide registered for use on corn in the United States. Although both strobilurin and triazole fungicides have some systemic properties, triazoles tend to be more systemic and may have better "curative" or post-infection activity on some pathogenic fungi.

Results of University Corn Fungicide Trials

2007. A summary of corn fungicide trials conducted in 2007 by universities in twelve states (Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Minnesota, Missouri, Nebraska, North Dakota, Ohio, and Wisconsin) and one Canadian province (Ontario) was developed. This summary included trials that evaluated Headline®, Quilt®, or Stratego® fungicide, which resulted into 168 data points. In this summary, the yield differences between fungicide-treated and non-treated plots ranged from -29 to 27 bu/A, and the average yield difference was 3 bu/A in favor of fungicide-treated plots (Figure 1). When hybrid susceptibility to gray leaf spot was considered in this summary, corn hybrids with good to excellent resistance to gray leaf spot and treated with a fungicide had 3 bu/A greater yield than untreated areas; however, corn hybrids with fair to poor resistance to gray leaf spot and treated with a fungicide had 6 bu/A greater yield than untreated areas.

Results of Illinois corn fungicide trials conducted in 2007 were similar to the national summary, in which the average difference between fungicide-treated and untreated plots was 3 bu/A in favor of fungicide-treated plots. In these trials, differences in rainfall during July and August in different regions of the state influenced the results of fungicide trials conducted in those regions. Fungicide trials in southern Illinois, central Illinois, and northern Illinois resulted in a 1 bu/A, 3 bu/A, and 5 bu/A yield advantage with fungicides, respectively (Figure 2).

Figure 1. Summary of corn fungicide research trial results conducted by 13 universities from the United States and Canada.

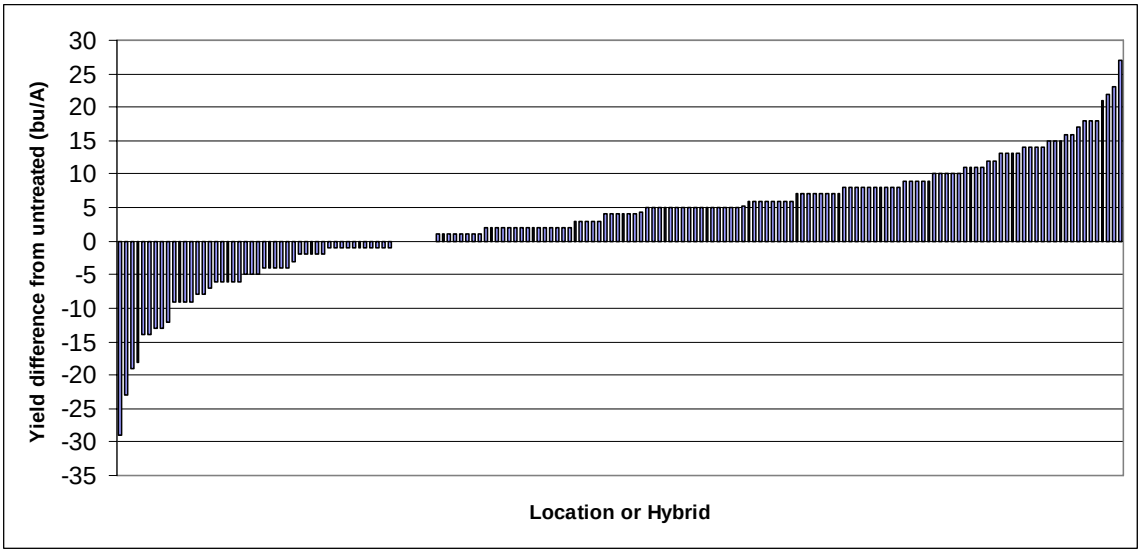
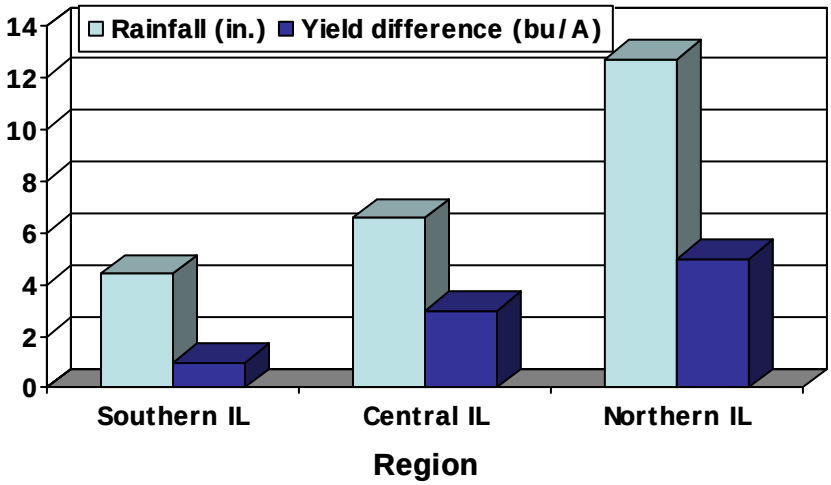
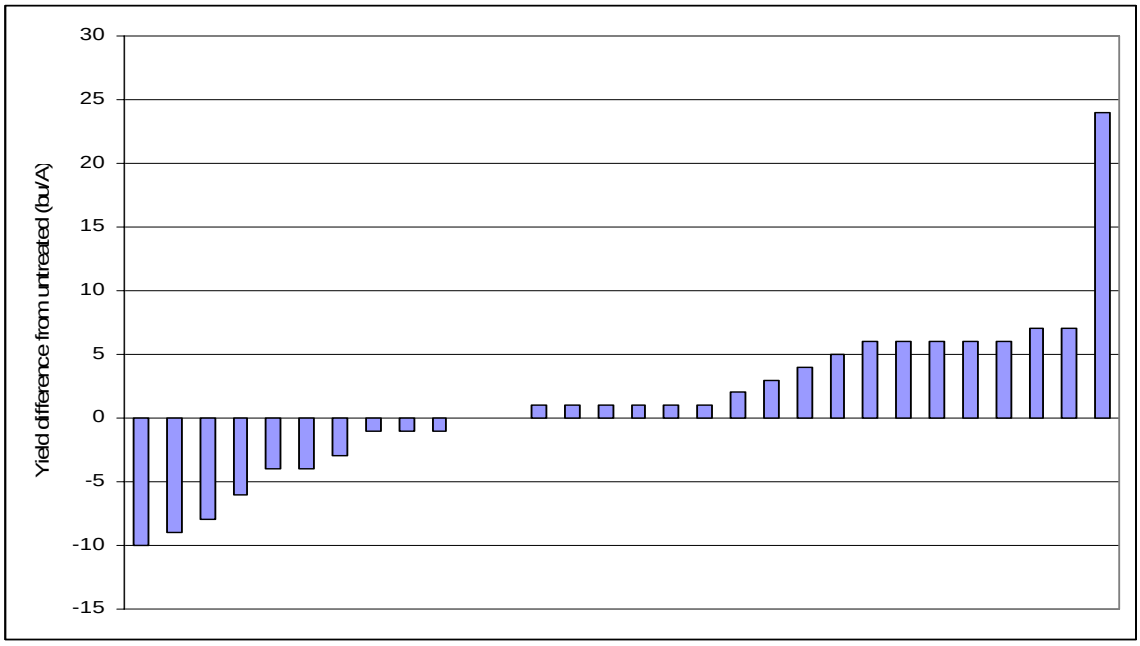


Figure 2. Summary of 2007 University of Illinois corn fungicide trials by state region.



2008. At the time this article was written, only a few University of Illinois fungicide trials located in Monmouth, Urbana, and Dixon Springs, IL had been harvested. Results from these trials showed a yield response range from -10 bu/A to 24 bu/A, with the average yield response to a fungicide at 1.4 bu/A (Fig. 3).

Figure 3. Preliminary summary of University of Illinois corn fungicide research trials conducted in 2008.



How Much Yield Increase is Needed to Make the Application Profitable?

The amount of yield increase needed to make a fungicide application profitable depends on the cost of the fungicide, the application cost, and the contracted price of the corn. In Illinois, the cost of the fungicide plus the application can range between approximately $22 and $28/A. For corn contracted at $3, $4, or $5/bu, a grower would need a return of approximately 8, 6, or 5 bu/A, respectively from a fungicide application to "break-even."

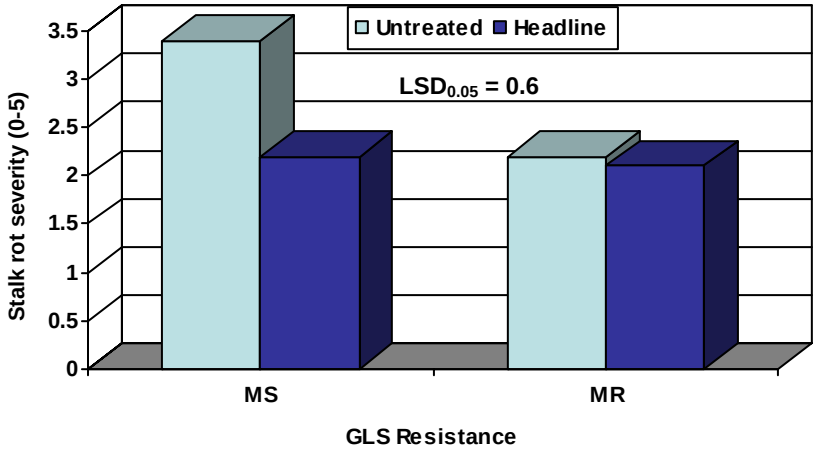
From the 2007 multi-university corn fungicide summary, a corn fungicide application would have been profitable 38% (63 out of 168 times) of the time (assuming that a 6 bu/A return is needed) (Fig. 1). From the 2008 Illinois corn fungicide summary, a corn fungicide application would have been profitable 27% (8 out of 30 times) of the time (Figure 3).

What about Effects on Stalk Rot Diseases?

In general, foliar fungicides are used on corn to protect against foliar diseases only (i.e., gray leaf spot, common rust, etc.); however, some fungicides have been touted as being able to improve stalk quality. In some fungicide trials conducted in Illinois in 2008, stalks were split open after kernels on the plants had reached "black layer," and stalk rot severity was rated. Results from these trials indicate that fungicides did not always have an effect on stalk rot, but when foliar diseases were severe, foliar fungicides were more likely to decrease stalk rot severity. In a study in Urbana, IL in 2008, Headline® fungicide reduced stalk rot severity on a hybrid that was moderately susceptible to gray leaf spot, but not on a hybrid that was moderately resistant to gray leaf spot (Figure 4). It

is unlikely that foliar fungicides have a direct effect on corn stalk rot pathogens; rather, it is more likely that when foliar diseases are at high levels, then stalk rot is likely to be more severe due to the reduction in photosynthates produced by the leaves. Thus, when foliar diseases are controlled, leaves are more likely to produce higher amounts of photosynthates, leaving a higher quality of stalk strength.

Figure 4. Effect of foliar fungicides on stalk rot of a hybrid moderately susceptible (MS) to gray leaf spot (GLS) and a hybrid moderately resistant (MR) to gray leaf spot.



Conclusions

Foliar fungicides are very good tools available for control of corn foliar diseases. When considerations such as amount of disease pressure present, weather, hybrid susceptibility to diseases, and amount of corn residue left in the field are used to help make fungicide application decisions, it is more likely that an application will be profitable. If a "blanket approach" of spraying cornfields is used, it is likely that some applications will not be profitable and that some applications are more likely to be unwarranted. Spraying foliar fungicides with the intent of controlling foliar diseases in high foliar disease pressure environments may provide some indirect control of stalk rot diseases, but it is unlikely that foliar fungicides directly control stalk rot diseases.