Increasing the odds of a profitable yield response to foliar fungicide application on corn

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Introduction

During the 2007 growing season, approximately 3 million acres of corn were sprayed with a foliar fungicide. Yield responses due to a fungicide application varied widely. Data compiled from university trials in 12 Corn Belt states and Ontario, Canada in 2007 showed an average yield response of 3 bu/acre to applications of corn fungicides (Bradley, 2008). Among the industries from on-farm trials, BASF reported an average yield increase of 12 to 16 bu/acre, Bayer CropScience an average yield increase of about 10 bu/acre and Syngenta an average yield increase of 15 to 20 bu/acre (Farm Industry News, Feb 15, 2008).

During the 2008 growing season, applications of foliar fungicide to corn were again fairly common in Iowa. Early reports of yield responses to a fungicide application once again vary widely. Are we ever going to be able to reasonably predict when a foliar fungicide application could be an economically viable management practice?

We know that the fungicides registered on corn are highly effective at reducing foliar disease development. Foliar diseases decrease yield and consequently application of a foliar fungicide protects yield by reducing disease severity. Certain production practices and factors impact the risk of foliar disease. It stands to reason that these practices and factors likely influence response of corn to a foliar fungicide application.

Factors that affect the probability of a positive yield response to a foliar fungicide application include: hybrid susceptibility, weather conditions just prior to and during grain fill, disease pressure, cropping history, percent surface residue, yield potential, planting date and geographical location and fungicide application details (timing, technique, carrier volume).

Over 30 replicated trials to evaluate the yield response of corn to a foliar fungicide application were completed throughout Iowa from 2006 to 2008. Many of these trials incorporated one or more of the factors listed above that are likely to affect the probability of a positive yield response. Yield data were collected in addition to foliar disease severity at all locations. Stalk rot incidence or severity was collected at approximately 10 of the locations. The influence of these factors on the overall yield response due to each fungicide was determined.

Hybrid susceptibility

Yield response to a foliar fungicide varies between hybrids. Since most hybrids vary in their susceptibility to foliar diseases, this is likely no surprise. Bradley's study (2008) showed the yield response due to a foliar fungicide application was +6 bu/A for hybrids with a "Fair to Poor" rating for gray leaf spot resistance compared with +4 bu/A for hybrids with a "Good to Excellent" gray leaf spot resistance rating. Similarly, Pioneer also reported greater yield responses with hybrids that were susceptible to foliar diseases compared to those that were resistant (Jeschke and Doerge, 2007). No differences were reported in the Iowa state study, likely because disease

pressure was low at the experimental sites (Robertson et al., 2007). Similarly in 2008, yield responses to a fungicide application varied widely across hybrids.

Disease pressure

Foliar disease pressure was extremely low throughout the state in 2008. In southeast Iowa, the gray leaf spot haven of Iowa, gray leaf spot severity on the ear leaf averaged <5% at growth stage R5. Fungicides reduced severity of disease at all locations tested and all fungicides registered for use on corn were equally effective. Similar to 2007, at some locations a corresponding positive yield response occurred.

Similarly, at several locations stalk rot severity was lower in fungicide treated plots compared to non-treated plots. Lower stalk rot severity may contribute to improved standability and harvestability. In some studies, a positive yield response was associated with decreased stalk rot disease.

Fungicide application techniques

Trials were conducted around the state from 2006 to 2008 to determine the optimum time to apply a foliar fungicide and thus attain the most positive yield response. For many trials, the most positive yield response occurred with an application at VT, however there some trials where this was not the case.

Previous crop

Many corn foliar pathogens survive in corn debris and thus when corn was the previous crop and greater than 30 percent residue is left on the soil surface, the risk of foliar disease increases. Trials to compare the average yield response in corn following corn and corn following soybean have not shown a difference in average yield response in Iowa studies (Robertson, 2007; Robertson, unpublished). Jeschke and Doerge (2007) found the average yield response in corn following corn fields was far greater than that in corn following soybean. However, Bradley (2008) found the yield response on corn following soybean was greater than that when corn was the previous crop.

Geographical location

Weather conditions across Iowa vary. In southeastern Iowa, mean temperatures in the 80s and humidity above 90 percent during grain fill is the norm. In northwest Iowa, conditions are usually cooler and drier. As a result, foliar disease pressure, particularly gray leaf spot, is often greater in the southeastern part of the state compared with the northwestern part. With this in mind, yield response to a foliar fungicide on corn would be expected to be more positive in the southeastern cropping district versus the northwestern cropping district. Data from corn foliar fungicide trials conducted at ISU research and demonstration farms around the state have not necessarily reflected this difference.

Summary

Foliar fungicides remain an effective disease management tool. Positive yield responses can occur when disease pressure is low. Factors that impact the profitability of positive yield response to a foliar fungicide application are many, and complex interactions between two or more factors likely occur and may further confound the issue. Determining the hierarchy of factors that

are important will require an exhaustive compilation of all data (disease pressure, production practices, and fungicide application details) from many sites over several years. Until we have a better understanding of what these risk factors are, yield benefits from a fungicide application on corn should be determined on an individual basis, grower by grower, field by field and year by year.

References

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