# Profitable corn disease management in Iowa

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Over the past few years, diseases of corn have increased in incidence and severity in Iowa. Several factors have likely contributed to increased disease development and they include favorable weather conditions, disease susceptible hybrids on the market, an increase in continuous corn acres, and reduced tillage practices.

Good disease management programs need to be in place to limit losses when favorable environment conditions occur. Disease is the result of an interaction between the pathogen, host and environment (the disease triangle). It is important to understand how and when this interaction occurs. Furthermore, it is important to understand the disease cycle of each disease. The disease cycle is composed of five stages: survival of the pathogen, production of inoculum and dissemination of that inoculum, infection of the host plant, colonization of the host plant and symptom development. The goal of disease management is to break the disease cycle. For example, residue management reduces survival of the pathogen and consequently inoculum production; fungicide applications limit infection and/or colonization of the host plant.

Several diseases that occur in Iowa can reduce yields. In recent years, wet summer conditions have resulted in a high incidence of foliar diseases such as eyespot, gray leaf spot, northern corn leaf blight and Goss's wilt. Furthermore, we have seed more ear rots (Diplodia, Gibberella and *Fusarium*). In fields where foliar disease severity is high, stalk rots have affected standability.

Diseases may reduce yield but this is dependent of the severity of the disease, and when during grain fill the disease occurs. The earlier during grain fill a disease occurs, the more likely it is to impact yield (Table 1). Managing diseases effectively protects yield potential and ensures profitability.

**Table 1.** Estimated corn yield loss based on percentage of infected tissue (Lipps, 1998)

| Percent ear leaf area affected by early dent (R5) | Approximate yield loss (%) |
|---|---|
| 5 or less | 0-2 |
| 6 – 24 | 2-10 |
| 25 – 74 | 5-20 |
| 75 – 100 (leaf death) | 15-50 |

## Disease management strategies for profitable corn production

### *1. Identify the disease*

To profitably manage a disease, correct identification of the disease is critical. For example, leaf lesions of Goss's wilt and northern corn leaf blight can be difficult to distinguish. Only northern corn leaf blight can be controlled with a fungicide. Consequently a misdiagnosis could result in applying a fungicide which would not be effective, thus a grower loses twice: the cost of the product and application, and the disease is not controlled.

Keeping a record of diseases that have occurred in field along with other field information such as hybrid, planting date, nitrogen applied, etc. Such information is useful in subsequent years to identify hybrids to plant.

### *2. Plant a tolerant hybrid*

Tolerance to many of the diseases that occur in Iowa is available. Disease develops more slowly or less severely on tolerant hybrids, consequently the impact of disease on yield is reduced. Seed companies provide disease rating scores for many of the diseases that occur in Iowa in their hybrid information. Visiting company hybrid demonstration trials planted around the state can be helpful in helping to identify those hybrids that are more tolerant to disease.

### *3. Rotation*

Apart from common and southern rust, the pathogens all of other diseases that occur in Iowa survive in infested crop residue. These pathogens survive longer in surface residue than residue that is buried, but in most cases they survive no more than a year. For many of the pathogens, corn is their only host so rotating to soybean, alfalfa or small grains will allow the residue to decompose, and inoculum levels to decrease. There are some exceptions, for example, *Gibberella zeae*, which causes Gibberella ear rot, also causes head scab on wheat.

### *4. Consider tillage*

Tillage buries crop residues and in so doing physically removes inoculum from the soil surface as well as aids in decomposition of infested residue and therefore reduce inoculum levels. Tillage, however, affects soil quality and therefore if tillage is considered, use proven conservation tillage practices to maintain soil quality.

### *5. Consider foliar fungicides*

Foliar fungicides are effective tools for reducing foliar disease and consequently reducing risk of stalk rots that affect standability. While application of a fungicide may sometimes result in higher yields in the absence of disease, the chances of a profitable fungicide application increase when foliar disease is present (Table 2).

**Table 2.** Mean yield response of corn to foliar fungicide application in low and high disease pressure environments. This data comes from University and extension foliar fungicide research trials on corn conducted in 2008 and 2009 in the United States and Ontario, Canada. Results were compiled by Greg Shaner at Purdue University. Data were provided by University and Extension personnel in Il, IN, IA, KS, KY, ML, MN, MS, MO, NE, ND, OH, OT, SD, VI and WI.

| | Yield response (bu/A) | |
|---|---|---|
| **Disease severity on untreated control at R5** | **2008 (N)** | **2009 (N)** |
| Less than 5 % | 1.6 (88) | 2.6 (90) |
| 5 % or greater | 7.6 (46) | 8.3 (70) |

The upper leaves of the corn plant contribute 75 to 90 percent of the carbohydrate to grain fill (Allison and Watson, 1966). Fifty percent of kernel dry matter accumulation occurs in 35 days preceding black layer (~R4 to R6) (Stack, 2000). Therefore, the upper leaves need to be protected through late dough to early dent growth stage.

Factors that can be considered when applying a fungicide include:

1. the potential for disease development, i.e. weather and field disease history
2. the potential for yield loss if disease occurs, i.e. hybrid tolerance
3. the potential for a profitable return, i.e., cost of product and application, grain price, yield potential.

Remember foliar diseases develop differently. Observed symptoms of disease are the results of infections that occurred 4 to 14 days previously. If weather conditions were favorable for disease development 4 to 14 days prior to an application of fungicide, assume there is more disease than what can be observed. If the weather forecast for next 7 to 10 days is favorable for disease development and the corn growth stage is between tasseling (VT) and dent (R5), the risk of yield loss may be high depending on disease, and an application of fungicide may be justified economically (Stack, 2000).

### *6. Maintain soil fertility*

Weakened corn plants are likely more susceptible to disease. Fertilization can affect disease incidence and severity. Reid et al (2001) reported an effect of nitrogen on maize susceptibility to Gibberella ear rot. They reported that low and high levels of N increased ear rot problems, while optimal levels reduced disease problems. High levels of nitrogen have been associated with increased gray leaf spot disease severity (Ward et al, 1999).

## Summary

Profitable corn disease management depends on knowing what diseases have been or are likely to be a problem in a certain field or area, and implementing a disease management program that included several practices that have been shown to reduce the risk of disease and protect yield.

## References

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