

## *How do Fungicides Reduce Disease Pressure in Corn?*

Prior to using a fungicide, a basic understanding of what a fungicide is, how it protects plants from disease, and when to consider an application is important.<sup>1</sup>

### *What are fungicides?*

Fungicides are products that can prevent or reduce the impact of diseases caused by fungi.

### *Do fungicides kill the disease?*

They may or may not, depending on the product. Some fungicides interfere with disease growth and reproduction while others provide a barrier that inhibits spore germination. Still others may induce changes in the plant that make the plant less vulnerable to fungal infections but are not specifically toxic to the pathogen.

### *How do fungicides protect a corn plant from disease?*

Fungicides protect a plant through their specific mode of action and the way each chemistry interacts with the corn plant. There are a number of modes of action among the many fungicides available. Some hamper energy production, while others stop or inhibit particular metabolic functions. The result can be anything from faulty membranes to improper cell division. Each method of control is considered a mode or site of action. Depending on the pathogen and when the plant is susceptible to infection, fungicides may be applied as seed treatments or to the foliage.

### *What are the most important fungicide groups?*

There are three primary groups for foliar treatments on corn:

1) Traizoles inhibit an enzyme that is necessary for sterol production, which is essential for the development of fungal cell membranes. Inhibition results in abnormal fungal growth and eventual death. These are generally

considered to be the curative compounds, but do have some exceptions, like Prothioconazole, an active ingredient in Delaro, which has both preventative and curative activity.

2) Strobilurins inhibit mitochondrial respiration at complex III, which stops energy production, causing fungal death. These are generally considered to be the curative compounds and often times carry with them a “plant health” effect.

3) SDHI's are also respiration inhibitors, blocking electron transport at complex II. They work primarily by stopping spore germination.

To slow the development of fungicide resistance in a fungal population, it is important to blend effective modes of action whenever possible with each application.

### *Is there a benefit to using a fungicide that is a combination of different modes of action?*

Because different modes of action respond to diseases and the environment differently, combining modes of action can improve performance consistency while reducing the likelihood of resistance. A product with two or more modes of action can offer protection even if a fungus is resistant to one of the chemistries. However, to do so, it is critical that multiple modes of action have activity against each of the important diseases.

### *Is it important to know the disease resistance levels of each corn product?*

Yes. Each corn product has its own level of resistance to various diseases. One can be highly susceptible to a disease such as Southern Rust or Tar Spot, and another highly resistant. If environmental and field conditions are favorable for disease development and a susceptible product is planted, a properly applied foliar fungicide can help reduce the potential impact on yield. If the product is highly resistant, a foliar application for the explicit protection against the disease may not be warranted. However, other diseases to which the seed product

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is vulnerable may have the potential to develop, and fungicides can still help with overall plant photosynthesis, green leaf tissue preservation, etc. A well-timed fungicide application can provide protection for the spectrum of diseases and help maintain overall plant health. Fungicide resistance management procedures should be followed.

## ***What fields are considered at high risk for disease development?***

Multiple factors such as continuous corn, fields with greater than 35% residue, fields with a previous history of a disease(s), fields near creeks, lakes, or trees, fields with a practice of no-till or conservation tillage, fields that were delayed in planting, those planted to a susceptible seed product, or products with a history of stalk health issues can influence the likelihood of disease development. A proactive fungicide application may be warranted to help decrease the potential for diseases to limit yield potential.

## ***What environmental conditions are favorable for fungal spore production?***

High moisture situations (rain, heavy prolonged dews, irrigation) can provide a favorable environment for spore generation and infection. Temperatures also play a role, as some pathogens favor cooler temperatures, while others can thrive with warmth (SR likes heat and humidity and Northern Leaf Blight (NLB) likes cool, wet conditions).

## ***Why is field scouting important?***

Timely and regular field scouting for disease development can be an early warning system. If disease lesions are identified, then other factors can be evaluated to determine if a foliar fungicide should be applied immediately, after a waiting period, or not at all. Considerations include the product planted, current weather conditions, forecasted weather conditions, and stage of plant development.

## ***What parts of the corn plant are the most important to be protected with a foliar fungicide?***

The ear leaf and the next higher leaves because they are very important for photosynthetic energy production that is needed for grain fill.

## ***Is there an accepted disease threshold when disease symptoms are found in a field?***

One accepted threshold is if the field is planted to a susceptible or moderately susceptible seed product(s), a foliar fungicide may be warranted if lesions appear on the third leaf below the ear or higher on 50% of the plants at tasseling.<sup>2</sup>

## ***If a foliar fungicide is warranted, what should be the timing for the application?***

Consideration should be given to an application from VT (tasseling) to R1 (silking) to help maximize fungicide activity.<sup>3</sup>

## ***Should a foliar fungicide application be made after a late-vegetative growth stage (V7-V9) hail event?***

Hail wounds can provide an opening for several corn diseases including common smut, Goss's leaf blight and wilt, and some stalk rots. These diseases are generally not controlled with a foliar fungicide.<sup>4</sup> However, an application may help plants recover quicker by protecting the remaining green tissue from controllable diseases that may be present. Additional leaf tissue lost to disease after hail damage can increase the potential for lost yield. A proactive application in geographies that are prone to hail may help the plant produce a stronger stalk and be protected from controllable diseases.

## ***Is it beneficial and warranted to apply a fungicide proactively prior to seeing any disease?***

Applying fungicides proactively can be beneficial for several reasons:

- A proactive application can protect the plant from disease development before usual symptoms appear. Symptoms take several days to appear after initial infection. The time between initial infection and symptom appearance gives a disease such as Gray Leaf Spot (GLS) time to get a foothold and in the process invade plant cells that increase or maintain yield potential. Gray leaf spot has a 2-week latent period from infection to lesions being visible.

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- Fungicides can help reduce the impact of stress events such as disease, hail, drought, and heat. Plants under stress produce the ripening gas hormone ethylene. When ethylene is produced prematurely, plant growth slows, leaf senescence begins, and kernel abortion can occur, which ultimately and negatively impacts yield potential. Fungicides that contain a strobi component inhibit the production of ethylene, which along with other effects, helps keep the plant in times of stress, such as drought.
- During periods of rapid corn growth, the waxy layers on the leaf surface can become thinner, allowing disease an easier entry into leaf tissue.

## Can adjuvants be used?

Use of adjuvants depends on the fungicide and the timing of application. Fungicide labels should be read to determine if, and when adjuvants can be used. Generally, an adjuvant is recommended for applications from V4 to V8 (number indicates the number of leaf collars visible) and after tassel emergence (VT).

## What is the application recommendation for Delaro® fungicide?

Apply Delaro® 325 SC Fungicide at 8oz/acre, with 2 Gallons per Acre (GPA) when applied aerially, or 10 GPA when applied by ground at VT-R1 timing is labeled for control of key Midwestern diseases, such as gray leaf spot, northern corn leaf blight, rust, and tar spot. Delaro® is not registered in all states.

To learn more about Delaro® 325 SC Fungicide, please visit <https://www.cropscience.bayer.us/products/fungicides/delaro> and contact your retailer

## Sources (web sources verified 7/3/19)

<sup>1</sup>Smith, D. Field crops fungicide information. Wisconsin Field Crops Pathology. <https://fyi.extension.wisc.edu/>.

<sup>2</sup>Robertson, A., Abendroth, L., and Elmore, E. 2007. Yield responsiveness of corn to foliar fungicide application in Iowa. <https://crops.extension.iastate.edu/>.

<sup>3</sup>Mueller, D. and Robertson, A. 2008. Preventative vs. curative fungicides. Integrated Crop Management News. Iowa State University. <https://crops.extension.iastate.edu/>.

<sup>4</sup>Malvick, D. Do foliar fungicides provide a benefit to corn damaged by hail? County Agriculture Educator. Wright County Extension Office. University of Minnesota. <https://local.extension.umn.edu/>.

<sup>5</sup>Smith, D. 2015. Corn diseases of 2015 and should I spray fungicide? Wisconsin Field Crops Pathology. <https://fyi.extension.wisc.edu/>.

## Additional Sources

Management of corn diseases. Fungicide efficacy for control of corn diseases – January 2019. The Corn Disease Working Group (CDWG). The Bulletin. University of Illinois. <http://bulletin.ipm.illinois.edu/>.

Voight, Jr., D.G. 2017. When to consider foliar fungicide applications on corn. PennState Extension. The Pennsylvania State University. <https://extension.psu.edu/>.

Dufault, N. 2017. Corn disease management: When to apply a fungicide? IFAS Extension. University of Florida. <http://nwdistrict.ifas.ufl.edu/>.

## Legal Statements

**ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.** Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

**Tank mixtures:** The applicable labeling for each product must be in the possession of the user at the time of application. Follow applicable use instructions, including application rates, precautions and restrictions of each product used in the tank mixture. Not all tank mix product formulations have been tested for compatibility or performance other than specifically listed by brand name. Always predetermine the compatibility of tank mixtures by mixing small proportional quantities in advance. ©2019 Bayer Group. All rights reserved. 5006\_Q1