FLIPPING THE SCRIPT ON FOLIAR DISEASE MANAGEMENT

XYWAY™ FUNGICIDES

FMC An Agricultural Sciences Company

THE IMPACT OF FOLIAR DISEASE: IT'S A NUMBERS GAME

Adoption of fungicides continues to grow. From 2010 to 2018, according to the USDA NASS, U.S. corn acres applied with a fungicide rose from 8% to 17%, a 112.5% increase in eight years.

With approximately 90 million acres of corn planted annually in the United States, corn growers are looking for proactive measures to help combat the impact fungal diseases may have on their crops. The Crop Protection Network estimates that foliar corn diseases rob growers of hundreds of millions of bushels each season. In 2020 alone, the organization estimated that foliar diseases caused a loss of 286.5 million bushels in the 28 key corn-growing states. If using the 2021 average closing price of corn, these losses come out to $1.69 billion.

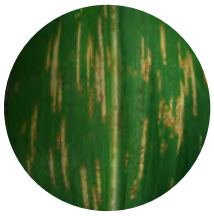
But as acceptance of foliar fungicides gains further steam and diseases continue to limit corn growers from reaching their hybrids' full yield potential, the approach to achieving control is evolving just as fast.

THE FIVE MOST DESTRUCTIVE CORN DISEASES

ESTIMATED TOTAL U.S. CORN YIELD LOSSES (MILLIONS OF BUSHELS) DUE TO FOLIAR DISEASES

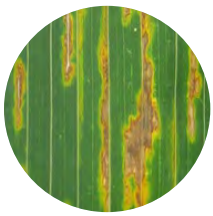
LEAF AND ABOVE-GROUND DISEASES	
SOUTHERN RUST	91.4
GRAY LEAF SPOT	80.5
NORTHERN CORN LEAF BLIGHT	56.7
BACTERIAL LEAF STREAK	36.5
TAR SPOT	12.3

SOUTHERN RUST



GRAY LEAF SPOT

NORTHERN CORN LEAF BLIGHT



BACTERIAL LEAF STREAK

TAR SPOT

> “IF I WANT A FIELD SPRAYED BUT THE AIRPLANE CAN’T GET THERE FOR ANOTHER 10 DAYS, WHAT AM I LOSING?”
>
> – Jay Harper, Grower
> Newton County, IN

FOLIAR DISEASE CONTROL – AN EVOLVING SPACE

A number of factors are shaping the foliar fungicide segment. From ever-changing and less predictable weather conditions and patterns to the sheer amount of acreage applied to a gradual change in who owns the responsibility of applying fungicides, methods like self-application are gaining interest among growers.
A common denominator among these two factors is time. This can range from timing a fungicide application in relation to the disease’s infection to the residual of foliar fungicides, which can range from 10 to upward of 28 days. The key to an effective fungicide is application timing in relation to the disease infection. Applied too soon and a grower will risk running out of residual when the disease is most active in the canopy. Applied too late and they’ve missed the window to help manage the disease, thus incurring economic damage.

As fungicide technology advances, options are emerging to help growers address the residual vs. application timing quandary.

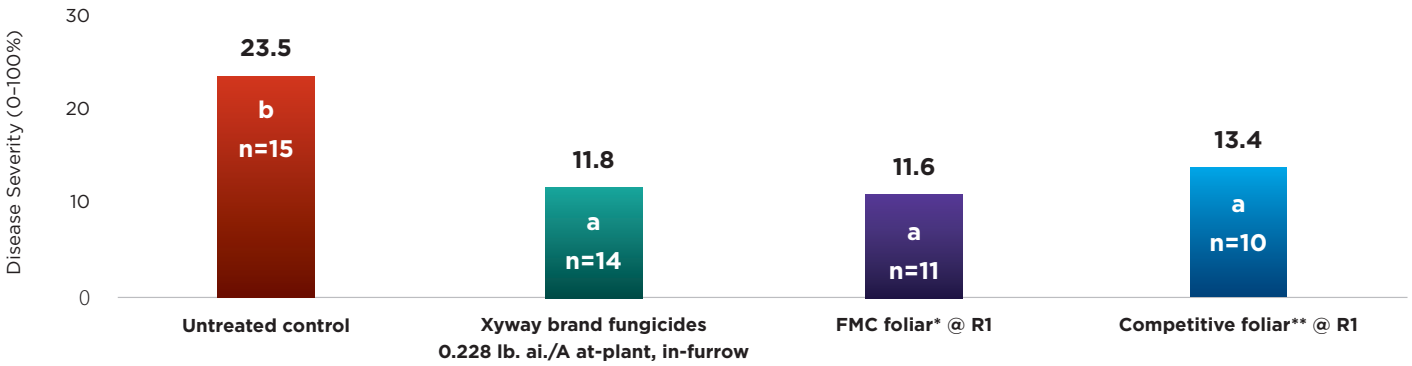
THE NEWEST ADVANCEMENT IN FOLIAR DISEASE CONTROL

Until recently, corn growers have only been able to manage foliar diseases with an application during one of the key growth stages: V5-V10 or VT-R1. That's changing. In 2021, FMC introduced a new way to help manage foliar disease protection: **XYWAY™ BRAND FUNGICIDES (XYWAY 3D FUNGICIDE AND XYWAY LFR® FUNGICIDE).** These products are applied at-plant and provide season-long foliar disease protection.

In particular, this solution starts providing protection from key foliar diseases like gray leaf spot and Northern corn leaf blight before they are present as well as in the early disease emergence stages and beyond. The highly systemic and long residual activity of Xyway brand fungicides helps protect the corn plant and reduces disease infection levels from the lower canopy of the plant to the top of the plant. These fungicides have also shown to provide benefits beyond foliar disease protection, like stronger roots and healthier stalks. Additional protection from stalk diseases such as *Anthracnose* and *Fusarium* have also been found, leading to greater standability through harvest.

LATE-SEASON DISEASE SEVERITY

AVERAGED ACROSS DISEASE SPECIES[1]



Across Trial Comparison
Tukey Means Comparison; *a* = 0.05
*FMC foliar consisted of Topguard® EQ fungicide or Lucento® fungicide.

**Competitive foliar consisted of Trivapro® or Headline AMP® fungicides.

[1]Consisted of Northern corn leaf blight, gray leaf spot and common rust

CRUNCHING THE NUMBERS

Over the last four years, more than 400 research trials have been conducted, including trials by 24 universities in 2020. These trials have documented that Xyway brand fungicides applied at-planting, consistently performed as good or better when compared to a foliar fungicide applied at R1. This exceptional finding, confirmed by university plant pathologists, gives growers a new way to manage gray leaf spot, Northern corn leaf blight and other diseases in corn with the advantage of limiting application timing hassles and expense.

SCAN TO DOWNLOAD THE XYWAY BRAND FUNGICIDES DATA BOOK, FEATURING 4 SEASONS OF COMPILED DATA FROM 400+ UNIVERSITY, GROWER AND FMC RESEARCH TRIALS.

IT'S JUST NICE TO SEE SOMETHING NEW ON THE MARKET THAT IS LOOKING AS GOOD AS OUR TOP PERFORMERS IN THE FIELD, AND THOSE TOP PERFORMERS ARE BEING APPLIED AT TASSEL. THE ECONOMICAL SAVINGS AND THE INTERESTING ASPECTS OF GOING ABOUT DISEASE MANAGEMENT IS WHAT I LIKE, AND I'M GLAD TO BE INVESTIGATING IT."

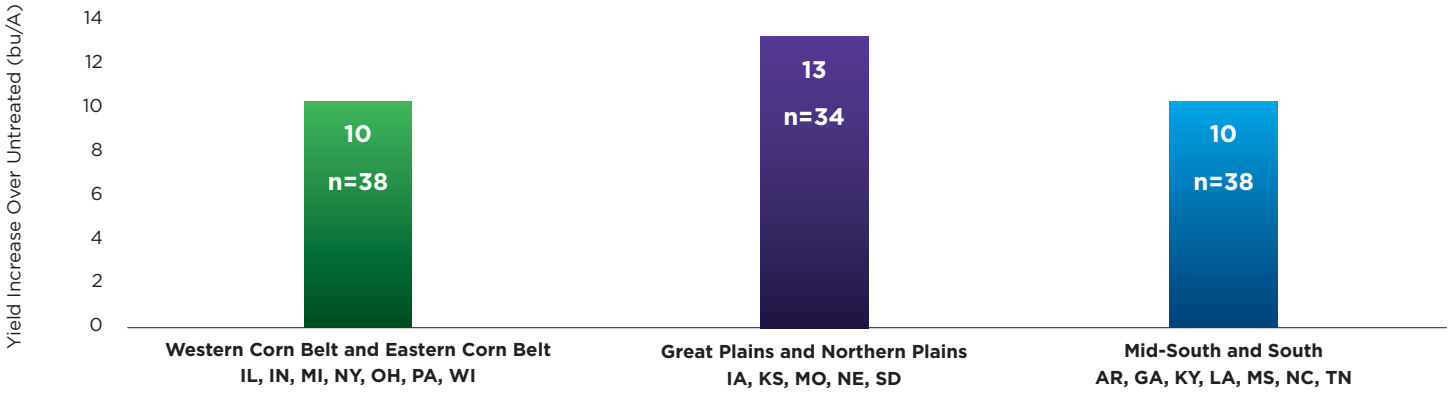
- Dr. Heather Kelly, Associate professor of field crops pathology at the University of Tennessee

In a sampling of 125 research trials conducted across the U.S. from 2018-2020, Xyway™ brand fungicides delivered a 9.2 bu/A average yield advantage over the untreated check. FMC also had more than 30 in-field grower demonstration trials in 2020.

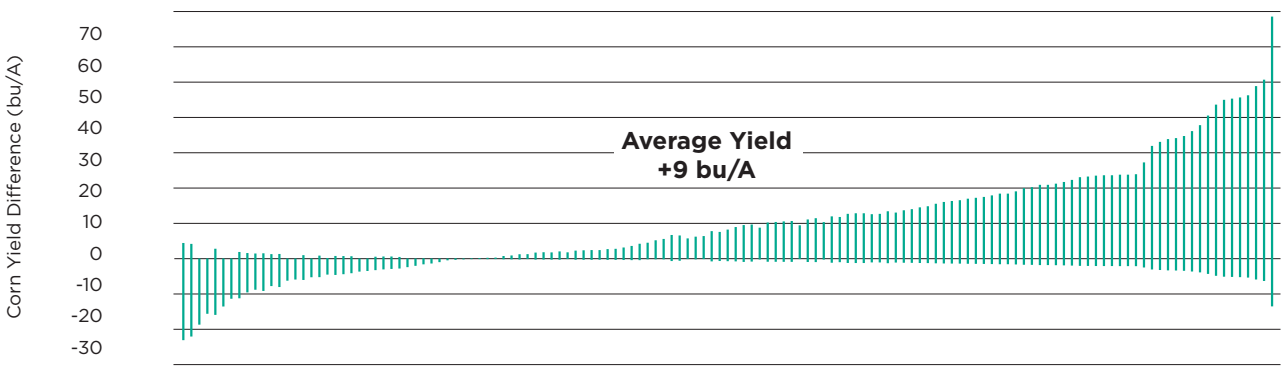
Disease severity is another area in which Xyway brand fungicides can aid growers. Consistently in trials that compared Xyway brand fungicides against foliar-applied fungicides and an untreated check, Xyway brand fungicides offer the lowest percentage in the severity of fungal diseases detected late into the growing season. In trials conducted in the Mid-South that examined gray leaf spot disease severity, Xyway brand fungicides showcased comparable results in terms of disease severity against foliar-applied fungicides.

SEASON-LONG PERFORMANCE PAYS OFF AT HARVEST.

XYWAY BRAND FUNGICIDES 0.228 LB. AI/A AT-PLANT, IN-FURROW CORN YIELDS AVERAGE OVER UNTREATED 2018-2020



XYWAY BRAND FUNGICIDES VS. UNTREATED | BALANCED DATA SET, 19 PROTOCOLS; 125 TRIALS; 2018-2020



THE BUILDING BLOCK THAT'S CHANGING IT ALL – FLUTRIAFOL

The element that allows Xyway™ brand fungicides to thrive the way they do from planting and onward is its active ingredient: flutriafol. Introduced originally as an inhibitor of sterol biosynthesis with broad-spectrum use to control certain fungal diseases found on various crops, FMC has been able to expand upon this compound and its original usage to deliver a novel approach to disease management.

Flutriafol works as a systemic demethylation inhibitor (DMI) fungicide that can be used as a curative or preventative treatment. Flutriafol inhibits the specific enzyme, C14-demethylase, a fungal cytochrome P450, which plays a role in sterol production. Flutriafol's unique characteristics lie in its ability to target the xylem for absorption by plant tissues and translocation upward to tissues, its systematicity and its persistence matrix.

Flutriafol's systemicity allows a fungicide applied at-plant to:

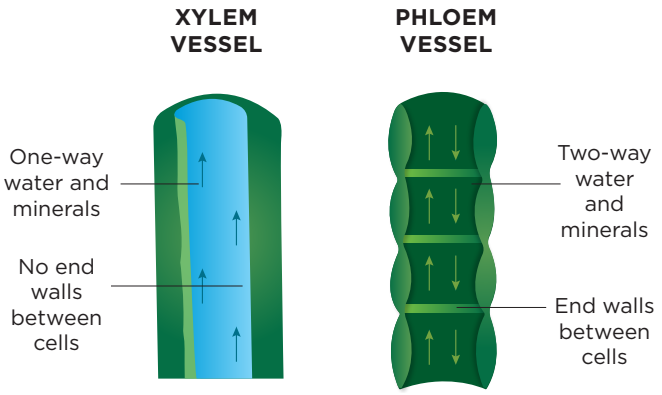
- Be taken up by roots and translocated into the entire corn plant throughout its productive life cycle.
- Deliver preventative activity with certain diseases.
- Distribute active ingredient throughout the stalk and leaves to protect from diseases before they become a yield-limiting factor.

Studies by researchers at Michigan State University in 2019 and 2020 confirmed flutriafol moves from the plant's roots via the xylem to the leaves. Lab analysis of individual leaf, stalk and root samples collected 90 days after the at-plant fungicide application found levels of flutriafol in these areas, indicating movement throughout the plant during the season.

PLANT UPTAKE AND REDISTRIBUTION OF FLUTRIAFOL IS FASTER THAN ANY OTHER TRIAZOLE

TRIAZOLE	LOG P
FLUTRIAFOL	2.3
CYPROCONAZOLE	2.9
TETRACONAZOLE	3.1
EPOXICONAZOLE	3.4
TEBUCONAZOLE	3.7
PROPICONAZOLE	3.7
DIFENOCONAZOLE	4.3
MEFENTRIFLUCONAZOLE	4.6

MORE MOBILE



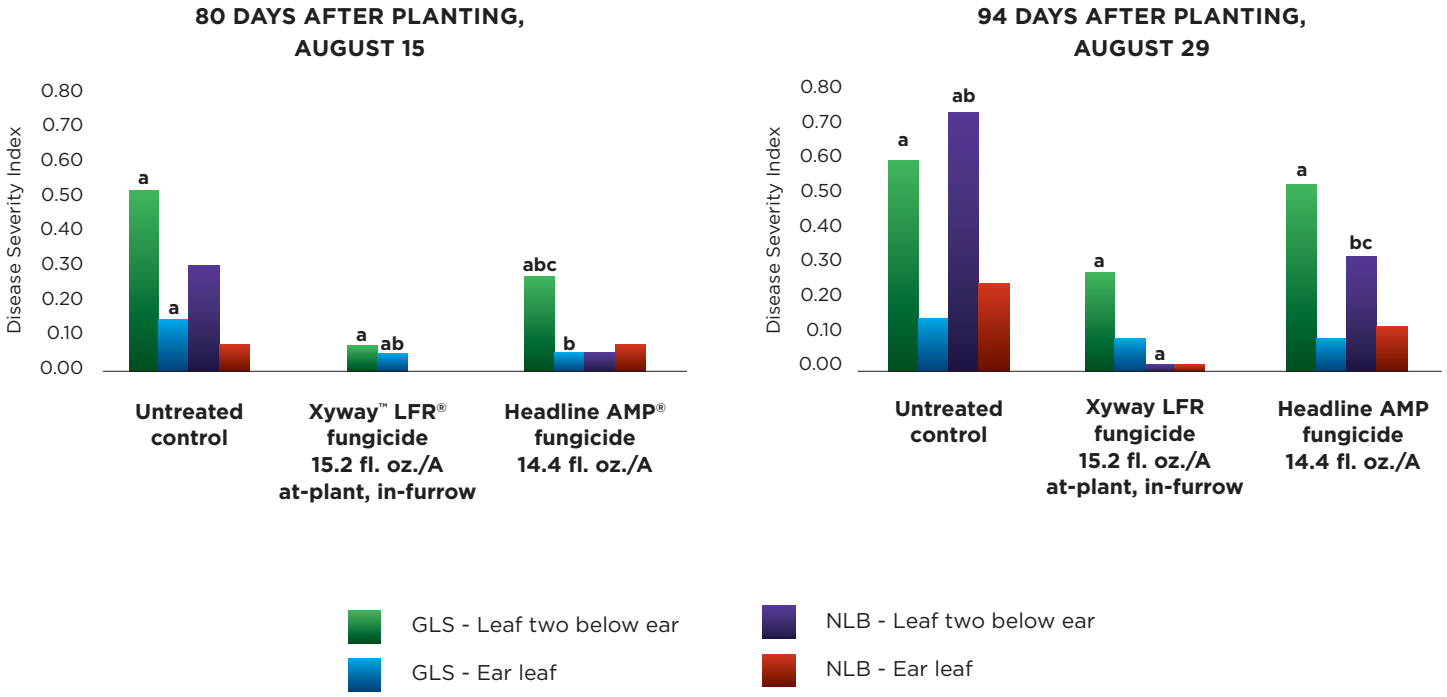
The activity level and residual of flutriafol-based at-plant fungicides pay dividends both agronomically and economically by easing management and timing concerns. Because the residual of the active ingredient is still in the plant and working defensively, growers can apply a foliar fungicide, if needed, at a timing that is more suitable to their disease spectrum, like late-season diseases Southern rust and tar spot. This flexibility allows growers to achieve the greatest control instead of hoping their VT/R1 timing will last through the key grain-fill period.

> THE ONE THING ABOUT XYWAY 3D FUNGICIDE THAT MADE US WANT TO TRY IT WAS THE SEASON-LONG SYSTEMIC ACTIVITY IN THE PLANT. THE IDEA THAT IT WOULD TRAVEL FROM THE ROOTS WITH THE PLANT AS IT GROWS, ALL THE WAY THROUGH TASSEL PERIOD. WE HAVEN'T SEEN THAT BEFORE IN ANY OTHER PRODUCT. THAT'S AMAZING.
>
> - Roy Houdersheldt, Grower in Shelby, NE

IN-FURROW TRIAL, EAST LANSING, MI

PLANTED MAY 27, 2019; AT-PLANT, INOCULATED JULY 1

In a 2019 at-plant, in-furrow trial, Xyway™ LFR® fungicide was shown to reduce the prevalence of gray leaf spot (GLS) and Northern corn leaf blight (NLB) diseases 80 days and 94 days after planting, respectively, compared to untreated corn and other leading fungicide brands.



LOOKING TO THE FUTURE OF CORN DISEASE MANAGEMENT

Xyway brand fungicides are at the forefront of cutting-edge technology to address foliar corn diseases proactively and the timing challenges related to foliar applications that aggravate growers as they strive to help maximize yield potential. This new innovative method puts growers in the driver's seat and gives them more control over their applications while allowing them to achieve comparable disease protection to a foliar-applied fungicide.

As the industry's use of fungicides that target foliar diseases continues to grow, new solutions and tools are required to address the diverse needs of the different and unique growing operations, the emerging disease threats and the barriers that have traditionally hindered the majority of corn growers from using a fungicide. Tackling all of these while contributing to on-farm efficiency are the keys to sustained growth of the fungicide segment.

FMC continues to be a leader in the development of novel fungicide technologies, formulations and innovations to address the evolving needs and challenges of the grower today and in the future. With the promise of advancing chemistry to advance agriculture, FMC is dedicated to working hand-in-hand with the growers, retailers, agronomists, crop consultants and university researchers to push the segment into a new era of foliar disease management.

XYWAY™
FUNGICIDES

TO LEARN MORE ABOUT XYWAY™ BRAND FUNGICIDES AND THE GROWING FMC FUNGICIDE PORTFOLIO, VISIT XYWAY.AG.FMC.COM OR CONTACT YOUR LOCAL FMC RETAIL MARKETING MANAGER.

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