



# TAR SPOT:

## Symptoms and Management

### // WHAT IS TAR SPOT?

Tar spot is a fungal disease in corn caused by *Phyllachora maydis*. The disease causes black specks to form on the leaves.

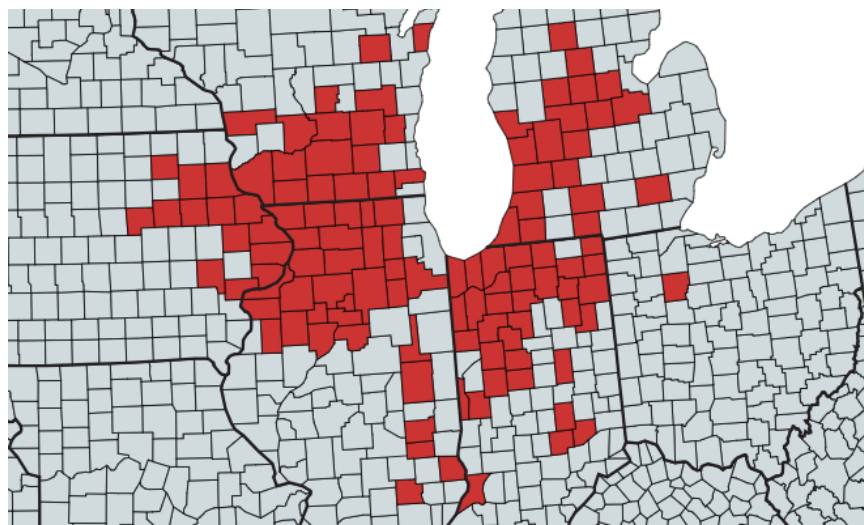
In Mexico and Central America, where the disease was discovered, it is referred to as the Tar Spot Complex because of the involvement of a second pathogen found on plants that causes the disease in that region.

The additional pathogen, *Monographella maydis*, has been thought to be responsible for the “fish eye” symptoms that coalesce and cause greater leaf tissue loss. However, the second pathogen has not been confirmed in the United States.

### // WHAT YOU'LL LEARN

- How and when tar spot arrived
- The impacts it has on corn
- How to manage tar spot
- What to expect in the future

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A map of confirmed tar spot infected areas as of October 2018. Map created via mapchart.com.

#### ***Q. When and how did tar spot get to the United States?***

A. One theory is that a tropical storm from the Gulf of Mexico in 2015 deposited wind-blown spores to northern Illinois and northern Indiana.

#### ***Q. Where can it be found?***

A. Currently, tar spot has been confirmed across a widespread area of eastern Iowa, central and northern Illinois, southern Wisconsin, northern Indiana, southern Michigan and northwest Ohio. The earliest reported and most heavily infected areas in 2018 have been in northern Illinois and southern Wisconsin, though the disease did appear to reach significant levels by harvest in Michigan and eastern Iowa.

#### ***Q. What conditions favor tar spot development?***

A. Based on research from Mexico, *Phyllachora maydis* prefers cooler temperatures (specifically in the 50-70 degree range). Additional research is needed regarding the conditions favorable for disease development in the United States. Extended leaf wetness, high humidity and frequent rainfall can help initiate and promote disease development.

Several areas with fields experiencing severe tar spot symptoms saw high amounts of rainfall in June, whereas rainfall in July and August varied among these areas. Extended hours of leaf wetness and high humidity following June rains may have contributed to epidemic levels of tar spot in these areas, although that is not confirmed at this time. We continue to review internal data and weather patterns, and work with university researchers to understand how and why tar spot became a widespread issue in 2018.

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Tar spot is a fungal disease that appears as a series of black spots containing spores on corn leaves (top row of pictures). Depending on the date of infection, the spores may proliferate on the plant's leaves and cause reduced photosynthesis, which can lead to stalk cannibalization and poor standability (bottom right). (Photos by Jim Donnelly)

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## ***Q. What are the impacts of tar spot?***

A. Like other foliar diseases, the impact of tar spot depends on how early infection occurs and how severe the infection is. In many cases this year, initial infections appear to have occurred in June, with secondary infections occurring in July. In some cases, symptoms were extremely severe by August, which may have resulted in premature plant death.

When leaves are severely infected with disease during grain fill, sugars may not be available, and plants may not be able to completely fill ears prior to black layer, resulting in an overall loss in kernel weight and yield. Also, when photosynthesis is reduced because of a loss of leaf area, stalks may be cannibalized for sugars, which results in poor standability and lodging.

Throughout the area where tar spot is occurring, there also are a large number of fields that will likely see little to no yield loss because the disease came in late or symptoms did not develop to levels that affect yield. Just because tar spot is present in a field, that does not mean yield will be reduced.

Likewise, yields in fields with tar spot may be reduced because of many other stress factors, such as other diseases like gray leaf spot, reduced fertility from loss of nutrients, or loss of stalk integrity.

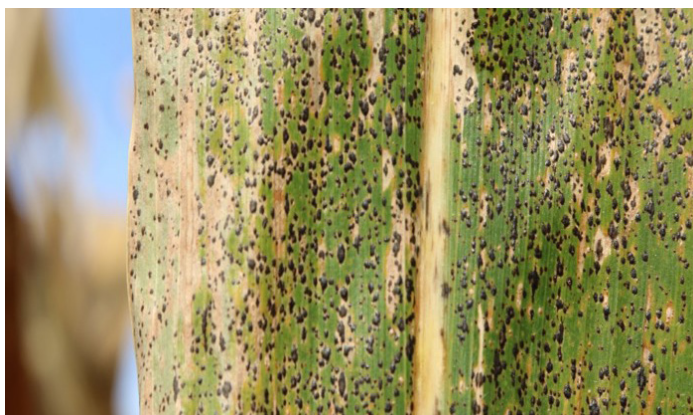
In some areas, tar spot can be seen progressing in the corn canopy on dead plant tissue following other disease infection or nutrient stress. Maintaining plant health throughout the season by reducing stress from lack of nutrients or from other pathogen infection could help reduce risk of yield loss.

## ***Q. How does tar spot start and spread?***

A. The tar spot fungus appears to overwinter in infested crop debris, although the exact means of how the fungus overwinters, and the exact way it infects, are not known. At some point, wind-blown or splashing rain likely moves fungal spores from crop debris onto the leaves of the new corn crop, which then becomes infected.



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Fungicide applied at VT. Plot was evaluated for disease. Predominant disease was tar spot. (Photos by Jim Donnelly)

Research from Mexico suggests that the incubation period (the time it takes from infection to visible lesions) may be as long as 40 days. Observations in the United States suggest that this period may be only 12 to 15 days under certain circumstances. Like other corn diseases, such as rust, gray leaf spot and northern leaf blight, tar spot is polycyclic, meaning that it can produce many generations of spores and infect the crop multiple times within the same season.

## ***Q. Do infected fields have the second pathogen?***

A. Based on multiple samples submitted in 2018 from several states, infected fields do not have the second pathogen. This year, we have seen the fish-eye symptoms in the United States, which in Central America are usually associated with the second pathogen, *Monographella maydis*. However, to date in the United States, *M. maydis* has not been found in submitted samples.

## ***Q. Does tar spot overwinter here?***

A. Because symptoms have been observed in the same areas since 2015, it appears that the fungus is overwintering rather than being reintroduced from Mexico or Central America each year. However, more research is needed to learn how it overwinters, where it does so, if it survives on other alternative hosts, etc.

## **MANAGEMENT**

## ***Q. Are there differences in corn product resistance to tar spot?***

A. While there are no corn products grown in the U.S. Corn Belt that are known to have high levels of resistance to tar spot, there appear to

be slight differences among products in levels of susceptibility. Most U.S. corn products from all companies appear to be relatively susceptible to tar spot, but only a few products appear to have slightly less severe symptoms.

Comparing corn product reactions to tar spot, or any disease in isolation, can be tricky. Multiple side-by-side comparisons in fields with uniform levels of disease pressure are best suited for comparing product reactions. Comparing levels of infection between products in different fields may not be accurate. The severity of symptoms depends, to some degree, on when infection occurred, which in turn, depends on the amount of the tar spot fungus that overwintered in infested corn debris in a field. Fungicide applications, neighboring fields with high amounts of inoculum, or uneven levels of tar spot infection throughout a field might also complicate comparisons.

## ***Q. Does rotation help manage tar spot?***

A. Rotation should not make tar spot any worse, but it may not provide much control. Because the fungus appears to overwinter in infested debris, avoiding that inoculum early in the season should be of some benefit depending on how much inoculum is available to move in from other sources (e.g., neighboring fields) and how far the spores spread. Based on the widespread occurrence of tar spot in 2018, the fungus appears to be able to spread very rapidly over long distances when weather is favorable. In years with less favorable weather, rotation or management of infested debris may be of more value in limiting the development of tar spot.

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## ***Q. Do fungicides help control the disease?***

The overall assessment is that fields treated with a fungicide are better than those without. However, some fields sprayed with a fungicide still suffered some yield loss and standability concerns. It is unclear whether these applications were too late, too early or simply not frequent enough to control the disease. It is also possible that because we are dealing with a new pathogen in combination with some susceptible germplasm, when experiencing a perfect environment, one application could simply not be enough. Farmers, retailers and seed companies are used to working with products with respectable tolerance to many foliar diseases. With low tolerance to a disease, very susceptible crops historically have required multiple applications of fungicide to prevent yield loss. At this point, we can't say what the right answer is, but we're working on it. The combination of fungicides with more tolerant products will likely be the best means of help in the near term.

Delaro® applied at 8oz/A, with 2 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. Tar spot is currently labeled under a 2(ee) for Illinois, Indiana, Iowa, Michigan, Ohio and Wisconsin.

Delaro® is not registered in all states.

## ***Q. Will we have tar spot again next year?***

A. Tar spot has occurred in northern Illinois and Indiana each year since it was first discovered in 2015. Levels of severity have varied depending on weather and other factors. Considering the amount of corn debris infected with tar spot that will remain in fields after harvest in 2018, inoculum is likely to be abundant over a wider geographic area than in any of the three previous years. However, infection of the 2019 corn crop by tar spot will largely depend on weather conditions that are favorable to the development of the disease.

For instance, in La Salle County, Illinois, in 2015, harvest time levels of tar spot were quite noticeable. By 2017, levels were extremely low. Environmental conditions in 2016 and 2017 likely played a role in this reduction, and the same thing could happen in the future.

We are monitoring current and historical weather conditions to better understand risk and frequency of possible occurrence, particularly in the affected states of Illinois, Indiana, Iowa, Michigan, Ohio and Wisconsin.

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