

TAR SPOT: AN EMERGING DISEASE OF CORN

In part 1 of this series, learn the history of tar spot spread in North America.



Tar spot is a foliar disease of corn that has recently emerged as an economic concern for corn production in the Midwestern U.S. Historically, tar spot's range was limited to high elevations in cool, humid areas in Latin America, but it has now spread to South American tropics and parts of the U.S. and Canada. During the first

few years of its presence in the U.S., tar spot appeared to be a minor cosmetic disease that was not likely to affect corn yield. However, widespread outbreaks of severe tar spot in multiple states in 2018 and again in 2021 proved that it has the potential to cause a significant economic impact. With its very limited history in the U.S. and Canada, much remains to be learned about the long-term economic importance of this disease and best management practices.

TAR SPOT ORIGINS

Tar spot in corn is caused by the fungus *Phyllachora maydis*, which was first observed over a century ago in high valleys in Mexico. *P. maydis* was subsequently detected in several countries in the Caribbean and Central and South America. Despite its decades-long presence in many of these countries, it was not detected in the Continental U.S. until 2015.

Historically, *P. maydis* was not typically associated with yield loss unless a second pathogen, *Monographella maydis*, was also present, the combination of which is referred to as tar spot complex. In Mexico, the complex of *P. maydis* and *M. maydis* has been associated with yield losses of up to 30%.¹ In some cases, a third pathogen, *Coniothyrium phyllachorae*, has been associated with the complex. Only *P. maydis* is known to be present in the United States but it has proven capable of causing significant yield losses, even without the presence of an additional pathogen.

TAR SPOT SPREAD TO THE U.S. AND CANADA

The first confirmations of tar spot in North America outside of Mexico were in Illinois and Indiana in 2015.² It has subsequently spread to Michigan (2016), Wisconsin (2016), Iowa (2016), Ohio

(2018), Minnesota (2019), Missouri (2019), Pennsylvania (2020), Ontario (2020), Kentucky (2021), New York (2021), Nebraska (2021), Kansas (2022), and Maryland (2022). Its presence was also confirmed in Florida in 2016³ and in Georgia in 2021.

2018 outbreak

During the first few years of its presence in the U.S., it appeared that tar spot might remain a relatively minor cosmetic disease of little economic impact. In 2018, however, tar spot established itself as an economic concern for corn production in the Midwest, with severe outbreaks reported in Illinois, Indiana, Wisconsin, Iowa, Ohio, and Michigan. Significant corn yield losses associated with tar spot were reported in some areas. University corn hybrid trials conducted in 2018 suggested potential yield losses of up to 39 bu/acre under the most severe infestations.⁴ Growers in areas severely impacted by tar spot anecdotally reported yield reductions of 30–50% compared to 2016 and 2017 yield levels. Yield losses specifically attributable to tar spot were often difficult to determine however, because of the presence of other corn diseases due to conditions generally favorable for disease development. Instances of greatest tar spot severity in 2018 were largely concentrated in northern Illinois and southern Wisconsin, where other foliar diseases and stalk rots were also prevalent.

2019 and 2020 observations

In 2019, tar spot severity was generally lower across much of the Corn Belt and appeared later and more slowly compared to 2018, although severe infestations were still observed in some areas. There is no clear explanation for why tar spot severity was lower in 2019 in areas where it was severe 2018. Less favorable conditions for disease development during the latter part of the growing season in 2019 may have played a role. Reduced winter survival may have been a factor as well. Winter temperatures in some tar spot-affected areas oscillated between warm periods and extreme cold, which may have affected fungal dormancy and survival.⁵

Despite the generally lower disease severity, tar spot continued to expand its geographic range in 2019. In Iowa, tar spot presence was limited to around a dozen eastern counties in 2018 but expanded to cover most of the state in 2019 (Figure 1). Tar spot was confirmed in Minnesota for the first time in September of 2019.⁶ Tar spot spread to the south and east as well, with new confirmations in parts of Missouri, Indiana, Ohio, and Michigan.

2020 brought another year of generally lower tar spot severity in the Corn Belt, with severe infestations mostly limited to

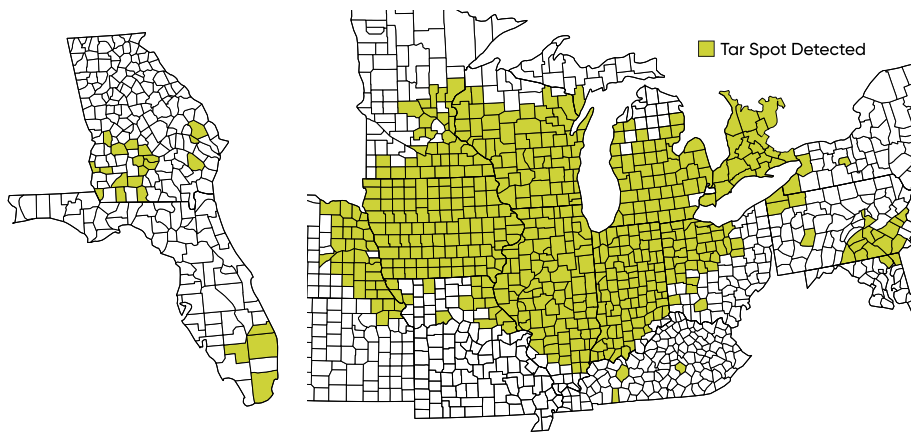


Figure 1. Counties with confirmed incidence of tar spot, as of October 2022. (Corn ipmPIPE, 2022).

irrigated corn and areas that received greater-than-average rainfall or developing late enough in the season that they had minimal impact on yield. Tar spot continued to spread, however, with the first confirmation of tar spot in Pennsylvania. Tar spot was also confirmed to be present in corn in Ontario, marking the first time the disease had been detected in Canada.

2021 outbreak

The 2021 growing season proved that the 2018 outbreak was not a fluke, with a severe outbreak of tar spot once again impacting corn over a large portion of the Corn Belt. Wet conditions early in the summer appeared to be a key factor in allowing tar spot to get a foothold in the crop. Whereas in 2018, when tar spot appeared to be mainly driven by wet conditions in August and September, in 2021, many impacted areas were relatively dry during the latter portion of the summer. Wet conditions early in the summer were apparently enough to allow the disease to get established in the crop and enabled it to take off quickly when a window of favorable conditions opened up later in the summer. The 2021 season also provided numerous demonstrations of the speed with which tar spot can proliferate, enabled by its rapid reinfection cycle.

The availability of several fungicides labeled for tar spot allowed growers to get a better look at fungicide efficacy.

Fungicide application timing proved to be critical for controlling tar spot in 2021. In some cases, two applications were necessary to provide adequate control.

2022: tar spot story gets more complex

2022 was another season with generally low to moderate tar spot severity in most affected areas, similar to the 2019 and 2020 growing seasons. Dry summer conditions experienced in many areas of the Corn Belt may have helped keep tar spot in check. Greater familiarity with the disease following several years of infestation and two major outbreaks may also be driving a more proactive approach to management with foliar fungicides when symptoms begin to develop.

Tar spot made another substantial expansion westward in 2022, with its presence confirmed for the first time in numerous eastern Nebraska counties as well as a few counties in northeastern Kansas. Eastward spread was more limited, with only a handful of new confirmations in counties in Pennsylvania, New York, and Maryland. Infestation continued to spread in the southern U.S. with several new confirmations in Georgia.

Look for part 2 of our tar spot series in the March issue of *Groundwork*. We'll show you how to differentiate tar spot from similar-looking diseases, explore how it impacts crops, plus review potential treatments.

¹ Hock J., J. Kranz, and B.L. Renfro. "Studies on the epidemiology of the tar spot disease complex of maize in Mexico." *Plant Pathology*, 44 (1995):490-502.

² Bissonnette, Suzanne. "CORN DISEASE ALERT: New fungal leaf disease 'Tar spot' *Phyllachora maydis* identified in 3 northern Illinois counties." *The Bulletin*, September 21, 2015. University of Illinois Extension. <http://bulletin.ipm.illinois.edu/?p=3423>.

³ Miller, Christian. "Tar spot of corn detected for the first time in Florida." University of Florida Extension. 2016. <https://discover.pbcgov.org/coextension/agriculture/pdf/Tar%20Spot%20of%20Corn.pdf>.

⁴ Telenko, Darcy., Martin Chilvers, Nathan Kleczewski, Damon Smith, Adam Byrne, Phil Devillez, Thierno Diallo, et al. "How tar spot of corn impacted hybrid yields during the 2018 Midwest epidemic." Crop Protection Network. July 29, 2019. <https://cropprotectionnetwork.org/publications/how-tar-spot-of-corn-impacted-hybrid-yields-during-the-2018-midwest-epidemic>.

⁵ Kleczewski, Nathan. "What do low tar spot disease levels and prevent plant acres mean for 2020 corn crop?" Illinois Field Crop Disease Hub, 2019. University of Illinois Extension. <http://cropdisease.cropsciences.illinois.edu/?p=992>.

⁶ Malvick, Dean. 2019. "Tar spot of corn found for the first time in Minnesota." *Minnesota Crop News*, October 1, 2019. University of Minnesota Extension. <https://blog-crop-news.extension.umn.edu/2019/10/tar-spot-of-corn-found-for-first-time.html>.