PURDUE UNIVERSITY | Extension - Entomology

Pest&Crop newsletter

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In This Issue

2023 Western Bean Cutworm Pheromone Trap Report

(John Obermeyer)

		WBC Trapped						
		Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7
County	Cooperator	6/15/23-6/21/23	6/22/23-6/28/23	6/29/23-7/5/23	7/6/23-7/12/23	7/13/23-7/19/23	7/20/23-7/26/23	7/27/23-8/2/23
Adams	Roe/Mercer Landmark, Decatur	0	0	1	0			
Allen	Anderson/Blue River Organics, Churubusco	2	1	0	0			
Allen	Gynn/Southwind Farms, Ft. Wayne	2	0	0	2			
Allen	Kneubuhler/G&K Concepts, Harlan	0	1	0	0			
Bartholomew	Bush/Pioneer Hybrids, Columbus	0	0	0	0			
Benton	Vickrey/Advanced Agrilytics, Trap 1	0	3	0	0			
Benton	Vickrey/Advanced Agrilytics, Trap 2	0	0	0	2			
Benton	Vickrey/Advanced Agrilytics, Trap 3	1	0	0	3			
Benton	Vickrey/Advanced Agrilytics, Trap 4	4	0	0	2			
Benton	Vickrey/Advanced Agrilytics, Trap 5	1	0	1	3			
Benton	Vickrey/Advanced Agrilytics, Trap 6	2	0	1	5			
Benton	Vickrey/Advanced Agrilytics, Trap 7	2	0	1	5			
Benton	Vickrey/Advanced Agrilytics, Trap 8	0	0	2	6			
Blackford	Thurman/Ceres Solutions, Warren	0	0	0	0			
Clay	Mace/Ceres Solutions, Brazil	0	0	0				
Clay	Fritz/Ceres Solutions, Clay City	0	0	0				
Daviess	Brackney/Purdue CES	0	0	0	0			
Dubois	Eck/Dubois Co. CES, Jasper	0	0	0	0			
Elkhart	Kauffman/Crop Tech Inc., Millersburg	0	o	0	4			
Fountain	Mroczkiewicz/Syngenta, Attica	4	5	13	23			
Hamilton	Campbell/Beck's Hybrids	0	0	0	0			
Hendricks	Nicholson/Nicholson Consulting, Danville	0	0	0	0			
Howard	Shanks/Clinton Co. CES, Kokomo	0	0		0			
Jasper	Overstreet/Jasper Co. CCSI, Wheatfield	1	8	16	42			
Jasper	Ritter/Dairyland Seeds, McCoysburg		0	1	40			
Jay	Boyer/Davis PAC, Powers	0	2	2	0			
Jay	Shrack/Ran-Del Co-Alliance, Parker City	0	0					
Jennings	Bauerle/SEPAC, Butlerville	0	0	0	0			
Knox	Clinkenbeard/Ceres Solutions, Edwardsport	0	3	0				
Knox	Edwards/Ceres Solutions, Fritchton	0	0	0				
Kosciusko	Jenkins/Ceres Solutions, Mentone	0	0		35			
Lake	Kleine/Rose Acre Farms, Cedar Lake	0	0	1	1			
Lake	Moyer/Dekalb Hybrids/Shelby	3	1	5	15			
Lake	Moyer/Dekalb Hybrids/Schneider	1	1	10	26			
LaPorte	Rocke/Agri-Mgmt. Solutions, Wanatah	1	0	14	75			
Miami	Early/Pioneer Hybrids, Macy	0	2	4	33			
Montgomery	Delp/Nicholson Consulting, Waynetown	0	0					
Newton	Moyer/Dekalb Hybrids, Lake Village	0	0	2	17			
Perry	Lorenz/Lorenz Farms, Rome 1	0	0	0	0			
Perry	Lorenz/Lorenz Farms, Rome 2	0	0	0	0			
Porter	Boyer/PPAC, Wanatah	0			6			
Posey	Schmitz/Purdue CCSI, Blairsville	0	0	0	0			
Posey	Schmitz/Purdue CCSI, Cynthiana	0	0	0	0			
Pulaski	Capouch Chaffins/M&R Ag Services, Medaryville	0	0					
Pulaski	Leman/Ceres Solutions, Francesville	0	0	0	46			
Pulaski	Nagel/Ceres Solutions, Francesville	0	0	0	134			
Putnam	Nicholson/Nicholson Consulting, Greencastle	1	0	1	0			
Randolph	Boyer/DPAC, Farmland	0	2	1	0			
Rush	Schelle/Falmouth Farm Supply Inc., Carthage	0	0	0	0			
Scott	Tom Springstun/Scott Co. CES, Scottsburg	0	1	0	0			
Shelby	Fisher/Shelby County Coop, Shelbyville	0	0	0				
St. Joseph	Carbiener, Breman	0						
Starke	Capouch Chaffins/M&R Ag Services, Monterey	0	0					
Starke	Capouch Chaffins/M&R Ag Services, San Pierre	0	0					
Sullivan	McCullough/Ceres Solutions, Farmersburg	0	0	0				
Sullivan	McCullough/Ceres Solutions, Dugger	0	0	0				
Tippecanoe	Bower/Ceres Solutions, Lafayette	10	48	42				
Tippecanoe	Obermeyer/Purdue Entomology, ACRE	0	0	0	2			
Tippecanoe	Vickrey/Advanced Agrilytics, Trap 1	1	1	0	6			
Tippecanoe	Vickrey/Advanced Agrilytics, Trap 2	0	0	0	1			
Tippecanoe	Westerfeld/Bayer Research, W. Lafayette	0	0	0	2			

		WBC Trapped						
		Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7
		6/15/23-6/21/23	6/22/23-6/28/23	6/29/23-7/5/23	7/6/23-7/12/23	7/13/23-7/19/23	7/20/23-7/26/23	7/27/23-8/2/23
County	**Cooperator**							
Tipton	Campbell/Beck's Hybrids	0	0	0	0			
Vigo	Lynch/Ceres Solutions, Clinton	0	1	0				
Whitley	Emley/NEPAC/Schrader	0	0	2	1			
Whitley	Emley/NEPAC/Kyler	0	0	1	0			

* = Intensive Capture…this occurs when 9 or more moths are caught over a 2-night period

Field Crop Disease Update In Indiana

(Darcy Telenko)

It is important to continue to scout for diseases in both corn and soybeans. Recent rains have created favorable environmental conditions for the development of foliar diseases in both crops. In our scouting rounds this week we have found our first few tar spot lesions in the lower canopy of corn (see map). The fields where tar spot was found have had plenty of moisture the last few weeks and the corn is at tassel. In addition, I did find some northern corn leaf blight in a continuous, no-till field.

Our soybean fields are approaching flowering and we have yet to find any active foliar diseases. There are a few reports of patches and poorly growing stands of soybean. In these areas it is important to determine if there's an abiotic issue, like water logged soil and anerobic conditions, or if a root pathogens or soybean cyst nematode are the cause of poor root development. The best way to confirm is to send samples into the Purdue Plant and Pest Diagnostic Lab (PPDL). When sampling these areas, please dig plants from the edge of the area of concern and collect both healthy and unhealthy plants and roots.

The most frequent question I have received is, "Should we make a fungicide application?"

My response – What diseases are you finding in your field?
What is your hybrid/variety susceptibility and field history?
What growth stage?
Are you irrigating?

A fungicide application can be effective at reducing disease and protecting yield, but there are a number of factors that need to consider: the field history/previous crop, the amount of disease present in the field, hybrid/variety susceptibility, weather conditions, the value of the crop, and cost of fungicide application.

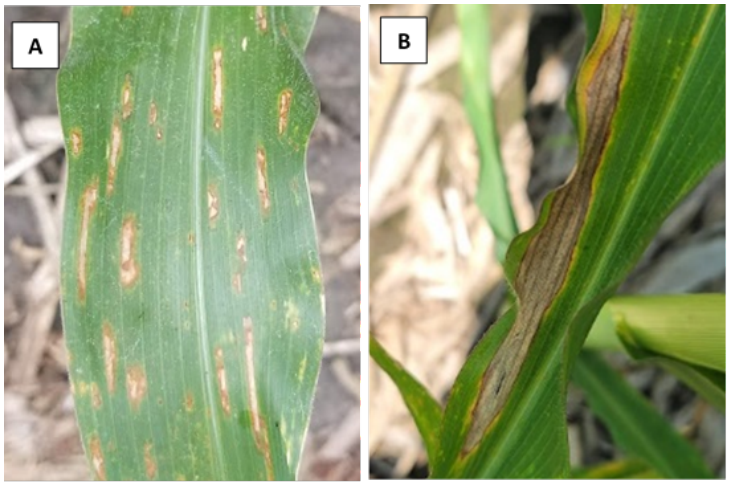

Figure 1. Foliar diseases to watch for in corn A. gray leaf spot, B. northern corn leaf blight. (*Photo Credit: Darcy Telenko*)

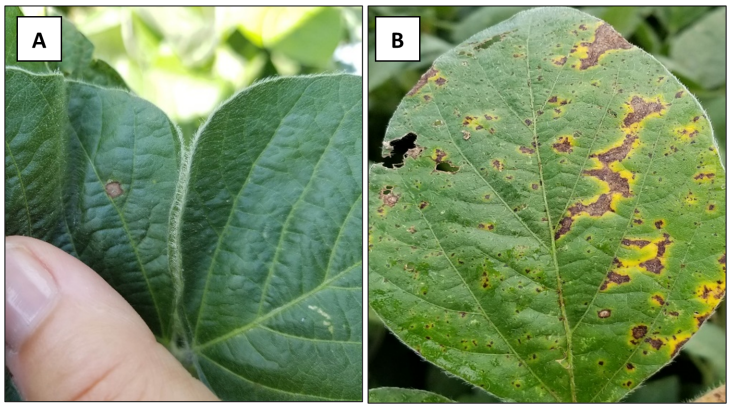

Figure 2. Foliar diseases to watch for in soybean A. frogeye leaf spot, B Septoria brown spot. (*Photo Credit: Darcy Telenko*)

Tar Spot: Tar spot continues to be a concern this season. My team has found a few active tar spot lesions and we have confirmed tar spot on samples sent in to the PPDL (image below). In all these samples the severity is extremely low, just one lesion on each leaf from the lower canopy. These early tar spot detections are like finding a needle in the haystack and required intensive scouting, but as the disease progresses it will be easier to find as the number of spots increase and it moves up the canopy. I would focus scouting efforts the early planted fields that have had a history of the disease. This find means scout and keep an eye out. I would wait to make an informed decision on fungicide application until you find active disease in the corn canopy. Our research has shown that making an application after first detecting the tar spot in the lower canopy is effective. Where we have seen fungicide failure is when the disease has moved up in the upper canopy and greater than 5% of the ear leaf is already showing symptoms at that point it is probably too late to slow it down.

We have confirmed tar spot in LaPorte, Porter and Marshall counties. Tar spot had previously been found in 86 counties (gray color) in Indiana, with the northern part of the state most at risk where we have higher inoculum. We will continue to monitor and update as the season continues.

We are working hard to try to understand this new disease to minimize losses. The good news is that we have a number of fungicides are highly efficacious against tar spot here in Indiana when applied from tassel (VT) to R2 (milk). I would recommend picking a product with multiple modes of action. The national Corn Disease Working Group has developed a very useful fungicide efficacy table for corn diseases (see link below). We will continue keeping a close eye on tar spot. I am interested in adding more locations in surrounding counties in northern Indiana if it is active in your field; please contact me if you suspect a field has tar spot please or send a sample to the Purdue PPDL for confirmation.

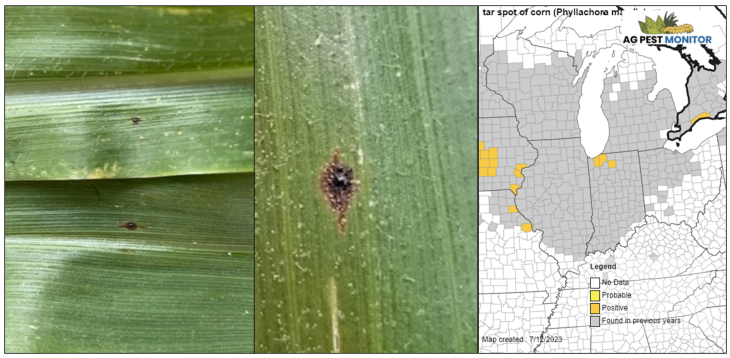

Figure 3. Tar spot lesions on corn in lower canopy, close-up of the stroma formed on the leaf and tar spot map for July 11, 2023. (Photo Credits: Morgan Goodnight and Darcy Telenko)

summary of our timing trial in Indiana from 2019 to 2021 shows that application of fungicide (Trivapro 13.7 fl oz/A) between the tassel (VT/R1) and milk (R3) growth stages were the most effective at reducing tar spot disease severity (gray bars), while VT to dough (R4) protected yield and offered the greatest partial return (green bars) (Fig. 4). These were compared to a location that did not have tar spot where all fungicide application timings did not provide a return on investment (ROI) for the fungicide application.

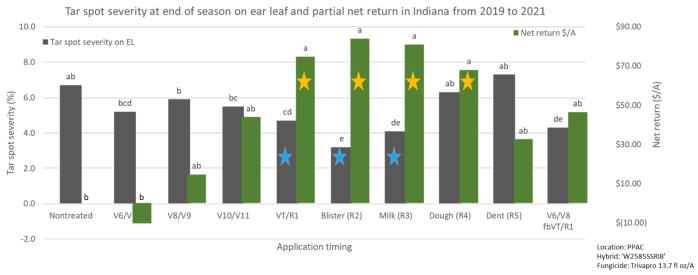

Figure 4. Tar spot severity and partial net-return based on fungicide application timing in a field with history of severe tar spot. Citation: Ross, T. J. et al. In Press. Investigations into economic returns resulting from foliar fungicides and application timing on management of tar spot in Indiana hybrid corn. Accepted to Plant Disease.

Both gray leaf spot and northern corn leaf blight disease may also start to be found in corn across the state. It is going to be **extremely important to be out scouting**, especially if you are trying to make a decision on a fungicide application.

Scout for **Gray leaf spot** in the lower to mid canopy. The lesions are light tan in color and generally narrow and rectangular, and can be as long as 2 inches. As the lesions age they turn grey in color and are delimited by leaf veins (Fig. 1). This annual disease is one of the most important foliar diseases in Indiana. Hybrid susceptibility and weather will have the greatest impact on the severity in a field. Fungicide options that are available for gray leaf spot would be a cost-effective application in fields that have a history of disease and planted to susceptible hybrids in no-till or reduced-till system. As a reminder, fungicide applications add an additional cost to corn production. Therefore, economic factors and other disease issues need to be considered before deciding to apply a fungicide to manage gray leaf spot. Previous research has determined the best time to apply fungicides in preventing yield loss with the most economic return occurs when fungicides are applied in response to disease at tasseling (VT) through early silking (R1).

As a reminder the field history, disease activity, hybrid susceptibility, weather conditions, the value of corn and soybean, and cost of fungicide application are factors that should be considered in making a decision to apply a foliar fungicide. Several fungicides are available to help manage these foliar diseases with a recommended application occurring at late vegetative stages through R1 in corn, and R1 to R4 in soybean for white mold and R3 in soybean for frogeye leaf spot.

Resources:

- Fungicide efficacy table for corn diseases: https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-corn-diseases
- Fungicide efficacy table for soybean foliar diseases: https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-soybean-foliar-diseases

Purdue Field Crop Pathology Website with current maps https://indianafieldcroppathology.com/

As a reminder due to the need to monitor both southern rust and tar spot in Indiana, there will be **no charge for samples submitted to the PPDL for diagnostic confirmation**. This service is made possible through research supported by the Indiana Corn Marketing Council. Please feel free to contact me (dtelenko@purdue.edu) or the PPDL (ppdl-samples@purdue.edu) with any major disease issues you may have this season.

INDIANA CORN Marketing Council

Purdue Field Crop Quick Disease Guide

(Darcy Telenko)

If the farm saw severe tar spot.

1. Watch the tracking map to know when the disease is first active in Indiana. (https://indianafieldcroppathology.com/)
2. Download the Tarspotter app to help with determining if the

weather conditions are favorable for tar spot to develop in your fields. (https://ipcm.wisc.edu/apps/tarspotter/)
3. Scout, scout, and continue to scout your fields.
4. Make informed fungicide decisions. Only in 2021 did our research trials show a benefit of two application at V10/V14 with a follow up application 3 weeks later. We have seen severe disease every season in Porter County, except in 2022
– yield impact will all depend on when the disease starts. In 2019 and 2020, we DID NOT see a benefit of a second fungicide application, that is why it is important to monitor and scout.
5. As for a fungicide timing window VT-R2 has consistently provided good protection with a single application program.
6. We need to make an informed decision on our fungicide use not only for ROI, but also for fungicide stewardship to make sure we aren't increasing risk for fungicide resistance to develop.
7. No, it will not be cost effective to apply fungicide every year. I suggest being flexible and it is important to understand how severe the disease was on your farm. The environmental conditions play a significant role in how fast tar spot develops.

Quick Guide on Tar spot 2023

Take Time to Evaluate Yield, Quality, Resistance, Persistence When Selecting Forage Varieties

(Keith Johnson)

Many times, I get frustrated when I go to the grocery store. The task seems simple enough; purchase a can of beans. The problem for me as I stare up and down the bean shelf is there are too many darn bean choices. Some are no spice, low spice, medium spice, or hot spice. Some are white beans, red beans, black beans or brown beans. Beans are labeled by Company A through Company G. Some are higher price, moderate price or lower price. The beans are canned, in glass, or in a plastic bag. After complete evaluation, I make my decision on what bean type I am going to buy after too much valuable time has passed. Then, I need to move up the aisle and do the same thing with corn and carrots.

Spending more time evaluating the right forage variety for purchase has more value than selecting the right bean on the grocery shelf. (*Photo Credit: Keith Johnson*)

I hope you take more time evaluating what forage species and variety of that species should be purchased than the time taken to buy a vegetable at the grocery store. I perceive that way too often a person walks into a farm store and purchases an inferior forage variety because they don't start the evaluation process soon enough and the top varieties have already been sold, they are novices and don't realize that there are variety choices within a forage species, or the farm store employee is not a forage seed expert and is not fully informed on the differences among species and varieties.

I encourage you to get seed ordered now if you have perennial forages to seed in the next month. Do not wait until the week before seeding to start the process.

What considerations should be made when selecting a forage variety?

- **Seed source** – Select a seed company that has personnel that understands the product they have to sell and can give specific information about forage species and species within a variety.
- **Named variety** – Select a named variety and not one with "Variety Not Stated" or "VNS" on the seed tag. The genetic attributes of unnamed varieties are not known.
- **Yield** – See if yield data is available for performance comparisons among varieties. Put more trust in true yield differences among varieties when statistical analysis has been done and are part of the data tables.
- **Seed Quality** – Be aware of germination and purity of the seed before it is purchased. Low germination, high hard seed count in legumes, and low purity seed are not desired. Note whether there are weed seed and other crop seed with the desired forage seed species. The following link provides useful information about reading seed tags. https://extension.purdue.edu/extmedia/AY/AY-375-W.pdf
- **Forage Quality** – Less likely to be found than yield data, but consider selecting a sorghum-sudangrass or pearl

millet with the brown midrib trait for improved digestibility when used as a summertime crop. Less lignin alfalfa varieties are now available, too.
- **Resistance** – Diseases that are problematic in your area should be considered when selecting varieties. Genetic resistance to diseases is an important step in reducing yield and forage quality losses, and improving persistence of the forage. Potato leafhopper resistant alfalfa varieties are available to lessen damage caused by this sap-sucking insect. Orchardgrass leaf diseases can be reduced by selecting varieties with high resistance.
- **Persistence** – Perennial forage varieties that are economically sustainable through many seasons are preferred to short-lived ones.

Excellent management skills are necessary to exploit the value of improved varieties. Use "Best Management Practices" as it relates to soil fertility, seeding date, seeding rate, harvest date, grazing intensity, and scouting to get the most from purchased varieties.

Take time to select forage species and variety choices. It has more value than selecting a bean type in the grocery store!

Assessing Hail Damage On Corn

(Dan Quinn)

Recent storms which crossed Indiana brought welcome rains to current dry conditions, yet were not without additional challenges, which includes hail damage. When first assessing a field with hail damage, it can often be depressing and discouraging. However, it is important to be patient when assessing the damage and that the observed damage often looks worse than it actually is.

There are three primary ways that a corn plant can be impacted by hail damage **1) plant stand reduction caused by plant death, 2) leaf area reduction caused by hail damage defoliation to the leaves, and 3) direct damage to the plant (e.g., stalk) and ear.** Overall, the impact of hail damage to corn is largely dependent on what stage of development the corn plant is in when the hail damage occurs. Nearly all of the corn across Indiana was in the vegetative growth stages with recent storms, yet growth stages varied across the state with differences in planting dates and the impact of drought conditions on the growing plants. In general, a corn plant that is in a stage of development prior to the V6 growth stage (6 visible leaf collars) will experience minimal impact from hail damage due to the plant's growing point being below the ground. However, as the growing point elevates above the soil surface and the plant progresses through the vegetative growth stages and to pollination, the plant becomes more susceptible to hail damage.

When assessing plant stand reduction caused by hail damage, which is often most common in young corn, it is important to wait 3-5 days to assess plant survivability and determine if plants are showing any noticeable recovery. Plant recovery can be identified as the expansion of new leaves and green leaf area from the whorl of the plant. It is also important to understand that corn yield losses caused by reductions in plant stand are not directly proportional to the number of missing plants. This is due to neighboring plant compensation through kernel number increases and/or the development of an additional ear. For example, when examining corn grain yield response to plant populations (https://www.agry.purdue.edu/ext/corn/news/timeless/PlantPopulations.html), final plant population differences between 28,000 to 35,000 plants per acre only result in a yield change of +/- 1 bushel.

The primary risk of yield loss in corn due to hail damage is due to leaf defoliation. Loss of green leaf area can reduce plant photosynthesis. However, when assessing leaf loss, it is important to consider only leaves which are completely lost, dried, or brown. Leaves which are tattered and torn, yet still attached and green still can contribute to yield production. The leaf loss chart on page 86 of the USDA-FCIC Corn Loss Adjustment Standards Handbook (2023) can help provide an estimation of yield loss due to leaf defoliation and highlights how total yield loss is largely dictated by which growth stage the plant is at when the damage occurs. The same table is reproduced on pp. 59-60 in Purdue's ID-179 Corn & Soybean (2023) Field Guide if you have one of those in your vehicle. Before you use that table, though, be sure you understand how the hail adjusters define leaf stages because their method differs from that most agronomists use (Nielsen, 2019). Typically, their method of leaf staging will be 1-2 stages greater than the leaf collar method (e.g., 11-leaf stage in the table = V9 by the leaf collar method). Based on the table, 100% leaf loss on an 8-leaf plant will result in only an 11% reduction in yield, whereas 100% leaf loss on a tasseled plant will result in a 100% reduction in yield.

On older plants, hail can also cause stalk bruising, whorl damage and/or physical damage to the kernels on the ears. Severely bruised corn stalks from hail can limit the plants' ability to translocate water and nutrients and/or cause the growing point region to die. Therefore, it is often important to split some stalks following a hail damage event to assess any potential damage and damage severity to the stem tissues and/or growing point. In addition, severe whorl damage can also restrict the expansion of whorl leaves and increase plant susceptibility to bacteria invasion caused by soil water splashing from heavy rainfall. Determining the exact amount of yield loss caused by stalk bruising, whorl damage, and/or physical damage to the kernels can be challenging and difficult to determine.

Lastly, one question that always arises following hail damage in corn is "should I apply a fungicide?" and the answer is no (Malvick, 2016). There is a common misconception that foliar fungicides will improve crop recovery and yield following hail damage. This is largely not true due to bacterial diseases being the primary invader of corn following hail, which foliar fungicides are unable to control. In addition, a defoliated crop is less likely to effectively take up fungicide.

Additional Resources:

Coulter, J., and S. Naeve. 2021. Wind and Hail Damage on Corn. Univ. of Minnesota Ext.

https://extension.umn.edu/growing-corn/wind-and-hail-damage#how-leaf-loss-affects-yield-444312 [URL accessed July 2023].

Lindsey, A., and P. Thomison. 2022. Corn Yield Response to Damage from Strong Storms. Bull. AC-1054. Ohio State Univ. Ext. https://ohioline.osu.edu/factsheet/ac-1054 [URL accessed July 2023].

Malvick, D. 2016. Do foliar fungicides provide a benefit to corn damage by hail? Minnesota Crop News. Univ. of Minnesota Ext. https://blog-crop-news.extension.umn.edu/2016/06/do-foliar-fungicides-provide-benefit-to.html [URL accessed July 2023].

Multiple Authors. 2023. Corn & Soybean Field Guide. Purdue University Extension Publication ID-179. https://ag.purdue.edu/department/agry/agry-extension/dtc.html [URL accessed July 2023].

Nielsen, R.L. 2012. Late-Season Hail Damage to Corn. Corny News Network. Purdue Univ. Ext. https://www.agry.purdue.edu/ext/corn/news/timeless/HailDamageLateSeason.html [URL accessed July 2023].

Nielsen, R.L. 2015. Recovery from Hail Damage to Young Corn. Corny News Network. Purdue Univ. Ext. https://www.agry.purdue.edu/ext/corn/news/timeless/HailDamageYoungCorn.html [URL accessed July 2023].

Nielsen, R.L. 2019. Determining Corn Leaf Stages. Corny News Network. Purdue Univ. Ext. https://www.agry.purdue.edu/ext/corn/news/timeless/VStageMethods.html [URL accessed July 2023].

How Does Wildfire Smoke Impact Corn Growth?

(Dan Quinn)

In recent years, Indiana has experienced an increase in air quality concerns during the summer due to elevated incidence and severity of wildfires in Canada and the western U.S. In late-June of 2023, air quality warnings were issued throughout Indiana due to smoke caused by Canadian wildfires, which resulted in a noticeable haze and reduction in direct sunlight. Therefore, not only is this a concern for human health, the question that is also asked by many farmers is “how is the smoke impacting crop development?”. And, as you may have guessed the answer to this question can be tricky and often results in the quintessential extension answer of “it depends”.

Haze and reduced air quality from wildfire smoke can result in both negative and positive impacts on crop growth. The first negative impact is a reduction in light availability, which can reduce crop photosynthesis. For example, during the week of June 26, 2023 (when air quality concerns were the greatest), average weekly solar radiation was decreased by 32% as compared to the week prior (June 12) and the week after (June 31) in West Lafayette, IN (Purdue Univ. Mesonet). Wildfire smoke in the atmosphere can reflect portions of incoming sunlight, thus reducing the total amount available to plants. Reductions in light availability from wildfire smoke are more likely to impact corn than soybean. This is due to corn being a C_4 photosynthesis crop and having a higher light saturation point (the point at which further increases in light do not increase photosynthesis). Soybean is more susceptible to changes in CO_2. The second negative impact caused by wildfire smoke is an increase in ground-level ozone. Ground-level ozone can be both harmful to human health and crop growth. Wildfires can emit various air pollutants which can form ozone when reacted with sunlight. Ozone can cause harm to both corn and soybean by entering the plant through the stomata and causing harm to plant tissue during respiration. Since both reductions in sunlight and increases in ozone can cause photosynthesis reductions, corn may also be inclined to remobilize carbohydrates from the stalks later in the season to satisfy grain fill requirements, thus increasing the potential for weak stalks and lodging prior to harvest.

In contrast to negative impacts caused by reduced sunlight and increased ozone, wildfire smoke in the atmosphere can also have positive effects on crop growth. One positive effect is that not only can wildfire smoke reflect sunlight, it can also scatter sunlight. By scattering the light, this can allow light to penetrate deeper into the crop canopy and increase plant photosynthesis. Furthermore, when light is scattered and direct sunlight is reduced, this can also lower leaf surface temperatures which can benefit crops under drought stress. Lower leaf temperatures can reduce the amount of transpiration (water movement and evaporation from the plant) needed to cool the plant and reduce overall water stress.

Overall, corn is more susceptible to the negative effects of wildfire smoke during the grain fill stages and the good news is that the majority of corn in Indiana was in the vegetative stages during the smoke presence in 2023. Therefore, minor or no yield loss is expected throughout the state. However, much is still needed to be learned about the impacts of wildfire smoke on crop growth, and as these events become more frequent, it will be important to pay attention to them in the future.

Additional Resources:

Archontoulis, S., and M. Licht. 2023. Wildfire smoke impacts on crop production. Integrated Crop Management Blog. Iowa State Univ. Ext. https://crops.extension.iastate.edu/blog/mark-licht-sotirios-archontoulis/wildfire-smoke-impacts-crop-production

Jeschke, M. 2021. Is Smoke from Wildfires Affecting Crop Yields? Pioneer Agronomy. https://www.pioneer.com/us/agronomy/wildfires-crop-yields.html

Lindsey, A., L. Lindsey, and O. Ortez. 2023. How could the haze of wildfires affect crop growth? C.O.R.N. Newsletter. Ohio State Univ. Ext. https://agcrops.osu.edu/newsletter/corn-newsletter/2023-21/how-could-haze-wildfires-affect-crop-growth

Compact Soybean Plants and Reproductive Development

(Shaun Casteel)

Indiana planting pace in 2023 was one of the fastest on record, which lined up with drought years as well as yield-breaking years. For most of our fields, soybean development in the month of June was summarized in one word – stagnant. Well, at least the aboveground growth seemed to stall out with the dry conditions. Fortunately, these soybeans were rooting down deep rather than expending energy into aboveground growth. If we have our choice of dry June or dry August, we will choose a dry June every time (assuming the roots have some access to moisture).

The combination of timely planted soybean with good stand establishment and a dry June sets us up for a nice compact plant. We would rather have a compact plant that has good trifoliate node development and reproductive branches so the water use and photosynthetic efficiencies are optimized during pod development (July-August) and seed fill (August-September). Otherwise, if we get the large plant that has a lot of biomass, we need more water to support that biomass in addition to the developing pods and seeds. Secondly, the large amount of biomass and taller/rank plants can create a situation that is more conducive to foliar disease development (e.g., Septoria Brown Spot, Frogeye Leaf Spot).

The pace of soybean flowering has not followed the timeline of past years of advanced plantings (Figure 1). In fact, flowering has been even delayed compared to the 5-year average. Some might be concerned with this delay, but soybean typically flower over 4 to 6 weeks and often abort nearly 75% of these flowers. Our soybeans have not invested into many flowers and pods as of yet, but again they have established solid root system to access soil moisture once pods develop and seeds begin to fill. In fact, I have found many fields that have developed more vegetatively over the last couple of weeks as the rains have returned. We think of soybean switching from vegetative growth to flowering around V6 (give or take a node), but I have found some fields upwards of V8 to V9 (matching the statewide delay in development).

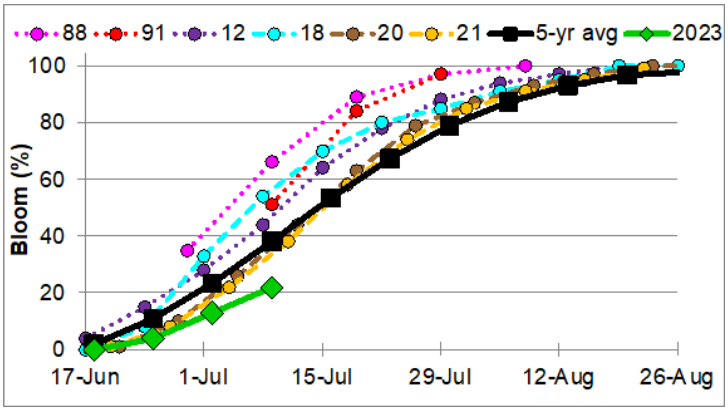

Figure 1. Indiana progress of soybean flowering in the years with advanced plantings. Years with drought were 1988, 1991, and 2012. State record yields were in 2018, 2020, and 2021. The current progress of soybean flowering is delayed compared to 5-year average. (Adapted from USDA-NASS, 2023)

Soybean planted in April and early May are entering late R2 (full bloom) to early R3 (first pod, 3/16" long pod on one of upper 4 nodes, Figure 2). Many farmers and ag retailers target R3, for a foliar fungicide and/or insecticide application. In a given year, I actually lean toward an application at R4 (full pod, ¾" long pod on one of the upper 4 nodes) if it is needed. Today's soybeans have more pod development and seed fill later in the season than the varieties of old.

Figure 2. Soybean in R3 (Beginning Pod)

In a season like this one, I am even more on the side of R4 application than R3. This year's soybeans are compact (i.e., smaller leaves, stacked internodes, shorter stature), so the present amount of vegetative biomass is relatively limited. If foliar fungicide and/or insecticide is on your planned program, I highly suggest holding off until soybean develop more. Soybean typically are in R3 about 10 days (Table 1), so we have time to scout to see if foliar diseases and insect pressures are building and warrant an application. Soybean development of flowers, pods, and seeds are dictated by the growing conditions (photoperiod, heat unit accumulation, and of course water supply). Table 1 provides a good rule of thumb the duration of soybean reproductive stages, but it can fluctuate. For instance, R1 can be as short as a couple days if growing conditions are favorable for active development (e.g., good soil moisture, temperature, and sunlight).

Table 1. Soybean reproductive stage and average duration (days).

Reproductive Stage	Duration (d)
R1: Beginning Bloom	5
R2: Full Bloom	10
R3: Beginning Pod	10
R4: Full Pod	10
R5: Beginning Seed	15
R6: Full Seed	20
R7: Beginning Maturity	10
R8: Maturity	

Drought Conditions Continue To Improve. Will This Continue?

(Austin Pearson)

Timely rains have returned over the past few weeks and have helped crop conditions across the state. Now that we are entering critical corn and soybean growth stages, cooler temperatures and rain are certainly welcome. Although rains have returned, they continue to be inconsistent. Vigo, Sullivan, and Lawrence counties had locations receiving more than 8 inches of rain over the last 30 days (June 11-July 10), which was 3-4 inches above the 1991-2020 climatological average (Figure 1). Northeastern and west-central Indiana ran 1-3 inches below normal in spots, leading to sustained drought over the past several weeks (Figure 2).

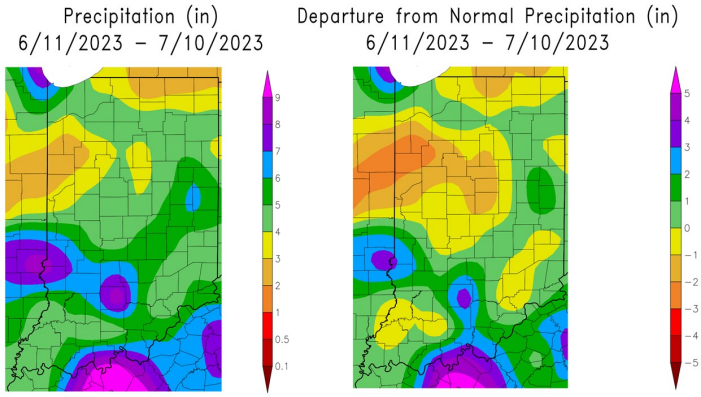

Figure 1: Accumulated precipitation for June 11- July 10, 2023 (left) and accumulated precipitation as a departure from the 1991-2020 climatological normal (right). These maps were obtained from the High Plains Regional Climate Center.

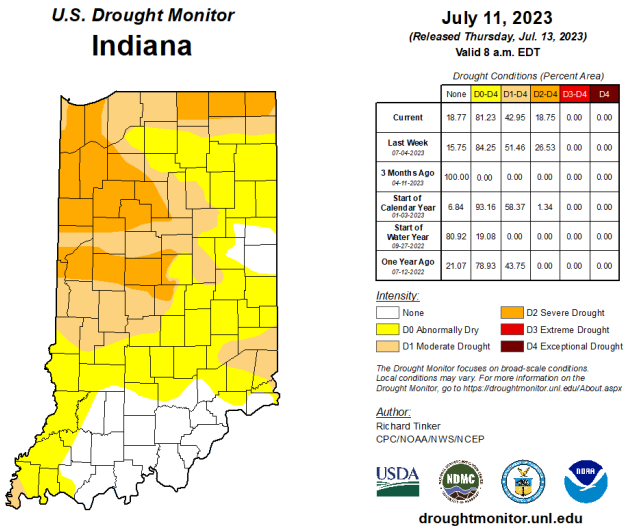

Figure 2: July 11, 2023, US Drought Monitor. The US Drought Monitor is released every Thursday morning by 8:30 AM.

Since June 27th, drought conditions have improved for some, especially in eastern and southern Indiana. The July 11 US Drought Monitor had roughly 43% of Indiana in drought status, which was 8.5% less than last week. Portions of northwest, central, and northeast Indiana continued in severe drought (D2) status. Vegetation conditions have improved, but long-term drought indices still indicate lingering drought stress and impacts in these areas. Continued rains will certainly help conditions improve across the state.

Temperatures have been 1-3°F below normal over the past 30 days (June 11-July 10) (Figure 3). Locations in Lake, Porter, Randolph, and Wayne Counties were between 4-5°F below normal. Since April 1, Modified Growing Degree Days (MGDD) have accumulated between 1300 to 1900 units, which is near normal to 150 units below normal (Figure 4). The MGDD departure is not all that unusual, so there is little concern about delayed progress at this point.

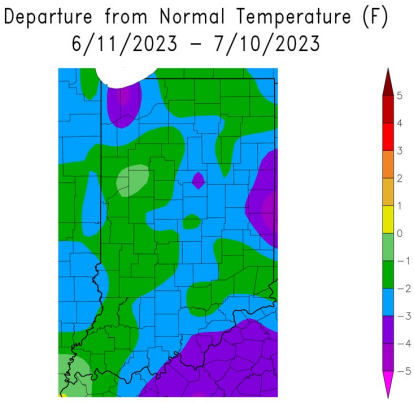

Figure 3: Average temperature for June 11 – July 10, 2023, represented as the departure from the 1991-2020 climatological normal. This map was obtained from the High Plains Regional Climate Center.

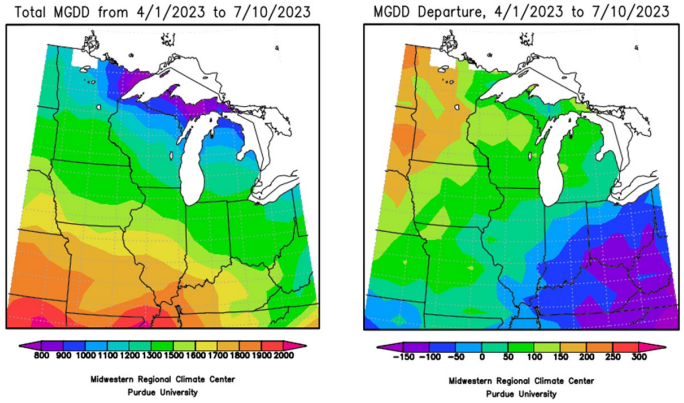

Figure 4: Total Accumulated Indiana Modified Growing Degree Days (MGDDs) April 1-July 10, 2023 (left) and Total Accumulated MGDDs represented as the departure from the 1991-2020 climatological normal (right).

Switching to the outlook, forecasted rain totals through July 19 continue to look variable across the state (Figure 5). South of Indianapolis could see 1.5 to 2 inches. North of Indianapolis could see 1-1.25 inches of rain, which is what we should be getting every week. Northwestern Indiana could also see over 1.5 inches of rain this next week, which should help provide some drought relief. The 6-to-10-day Climate Prediction Center (CPC) outlook (July 17-21) calls for elevated chances of above-normal precipitation statewide. Temperatures are expected to be near normal to slightly below normal at the Indiana-Michigan border (Figure 6). Higher chances for above-normal temperatures creep back in for the 8-to-14-day outlook (July 19-25), accompanied by near-normal precipitation for most of the state (Figure 7).

Northern Indiana has slightly elevated chances for below-normal precipitation. The seasonal outlooks have high confidence in above-normal temperatures and low confidence in the precipitation outlook (Figure 8). Some good news, though, is that the US Seasonal Drought Outlook expects some drought removal and improvement across the state (Figure 9).

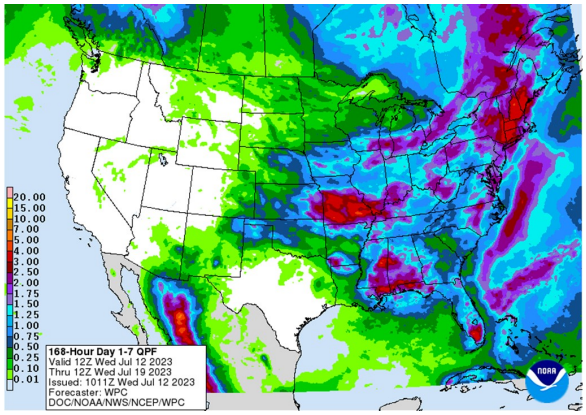

Figure 5: NWS Weather Prediction Center 7-day quantitative precipitation forecast for the continental United States, valid July 12-19, 2023.

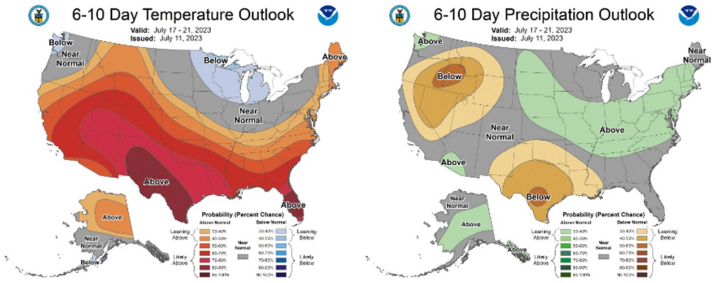

Figure 6: CPC 6-10 day temperature and precipitation outlooks for the United States, valid July 17-21, 2023.

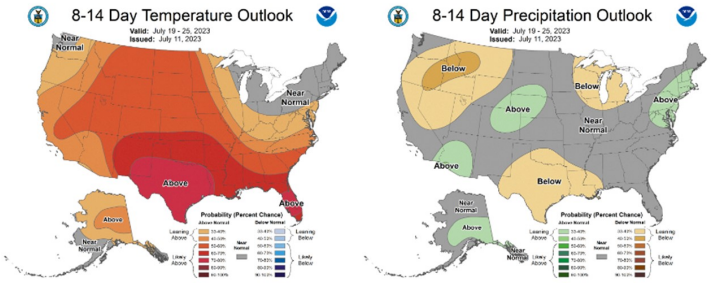

Figure 7: CPC 8-14 day temperature and precipitation outlooks for the United States, valid July 19-25, 2023.

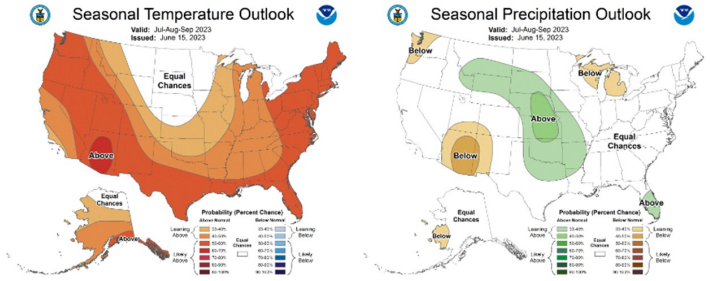

Figure 8: CPC seasonal temperature and precipitation outlooks for the United States, valid July-August-September, 2023.

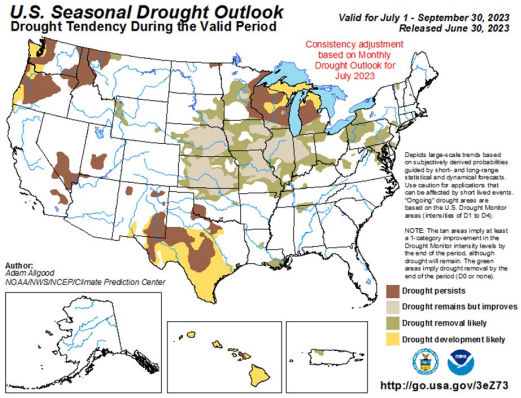

Figure 9: US Seasonal Drought Outlook valid for July 1-September 30, 2023, which is available via the Climate Prediction Center.

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