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In This Issue

Corn Leafhopper Update: No Detections In Indiana So Far

(Christian Krupke)

The corn leafhopper (*Dalbulus maidis*) is a familiar pest to corn producers and pest managers in Central (its native range) and South America. But like many pests, this insect has been steadily expanding its range northward with warmer weather. It is not tolerant to cold, and definitely cannot overwinter here, but summer detections are becoming more common in the US and there is always plenty of corn available once they get here

The main reason to worry about this insect is not its direct feeding on corn plants, but rather its capacity to vector a suite of viral pathogens that cause corn stunt disease. You can learn more about the disease from Purdue plant pathologist Dr. Darcy Telenko here: https://www.hoosieragtoday.com/2024/04/16/corn-stunt-disease-telenko/

There have been no detections of this insect in Indiana. You probably won't know it when you see it. It is not easily distinguishable from our hundreds of native leafhopper species (see photo below), so we are currently participating in a monitoring network using yellow sticky cards. The network is coordinated by Oklahoma State University and extends throughout the Great Plains and Midwestern states (3 monitoring sites in Indiana). There have been a few detections of the insect this year, including in Missouri and Kansas, see the updated map below: https://cropprotectionnetwork.org/maps/corn-leafhopper

However, before we worry about this new invader, remember that we need **both** the pathogen and the insect to be present in the same place and at the same time in order for disease spread to happen. This is not one to lose sleep over right now. But it is worth knowing that this pest is on the move northward.

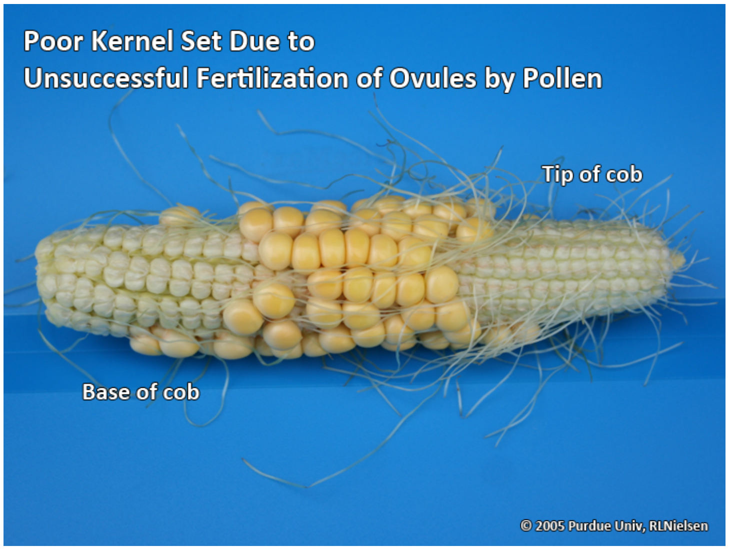
Adult (bottom) and nymphal stages of the corn leafhopper.

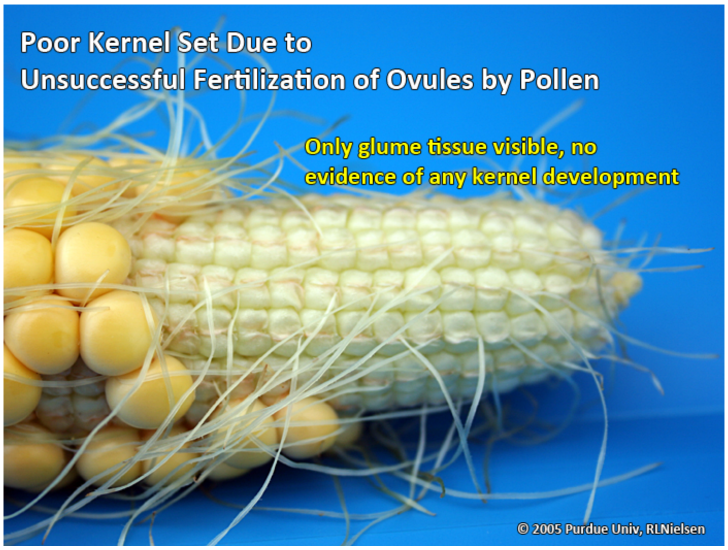
Causes Of Poor Kernel Set In Corn

(Bob Nielsen)

- Kernel set problems typically stem from herbicide injury, ineffective pollination, ineffective fertilization of the ovaries, or kernel abortion.
- Diagnosing the specific cause(s) of poor kernel set can be challenging.

The post-pollination scuttlebutt overheard in coffee shops throughout Indiana during mid- to late summer often revolves around the potential for severe stress that might reduce kernel set or kernel size in neighborhood cornfields. Growers' interest in this topic obviously lies with the fact that the number of kernels per ear is a rather important component of total grain yield per acre for corn.Poor kernel set, meaning an unacceptably low kernel number per ear, is not surprising in fields that are obviously severely stressed by drought, but can also occur in fields that otherwise appear to be in good shape. The time period for determining good or poor kernel set begins at pollination and continues through the early stages of kernel development; typically 2 to 3 weeks after pollination is complete.





Problems with kernel set primary stem from herbicide injury, ineffective pollination, ineffective fertilization of the ovaries, or kernel abortion. Distinguishing the symptoms is easy. Determining the exact cause of the problem is sometimes difficult.

Potential Yield Loss

The potential loss in grain yield caused by lower kernel numbers per ear can be estimated using the formula of the so-called Yield Component Method (Nielsen, 2021a). For example, the loss of only 1 kernel per row for a hybrid with 16-row ears and a stand count of 30,000 ears per acre would equal a potential yield loss of approximately 5 to 6 bushels per acre (1 [kernel] x 16 [rows] x 30 [thousand ears per acre] divided by 85 [thousand kernels per bushel]). Actual yield loss due to poor kernel set is a bit more complicated because of the potential for compensating changes in kernel weight by the remaining kernels on a poorly filled ear (Jeschke et al., 2025).

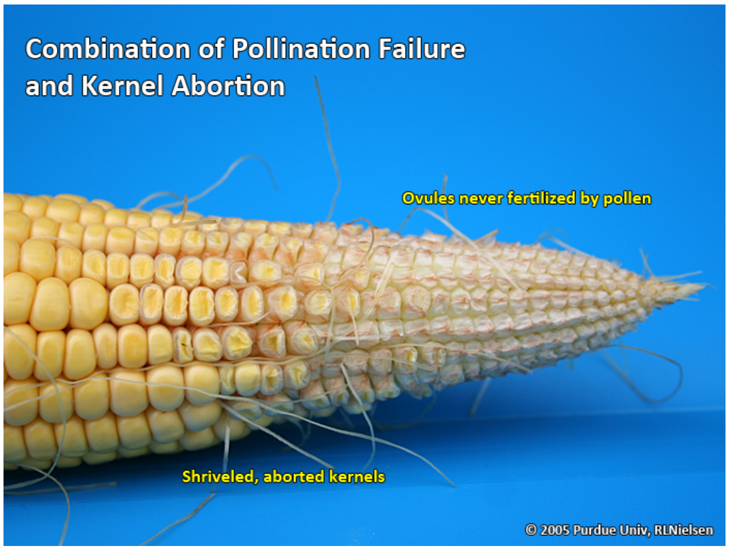
Herbicide Injury

Injury to ovules on developing ear shoots from late applications of certain herbicides, most notably glyphosate, can render some proportion of the ovules inviable to pollen (DuPont Pioneer, 2014). Glyphosate-tolerant hybrids are either homozygous (both inbred seed parents tolerant) or heterozygous (one parent tolerant, one parent susceptible) for the trait. The ovules (and pollen) of heterozygous tolerant hybrids segregate genetically for glyphosate tolerance and susceptibility in a ratio that is typically 3:1. In other words, about 25% of the ovules on developing ear shoots of a heterozygous glyphosate-tolerant hybrid are susceptible to glyphosate and so late, off-label, applications of glyphosate will consequently result in about 25% of the kernels not developing normally. Initially, the affected kernels may have the appearance of translucent bubbles but they will eventually wither away. Normal kernels adjacent to the affected ones will grow larger and the normal rows and columns of kernels will appear more jumbled.

Ineffective Pollination / Fertilization

Poor kernel set may be caused by ineffective pollination (the transfer of pollen from the tassel to the silks) and/or the subsequent failure of the pollen's male gametes to fertilize (i.e., unite with) the female gametes of the ovules on the cob. Ineffective pollination/fertilization is characterized by a total absence of obvious kernel development. In other words, all you see is cob tissue where there should be kernels. Pollination and/or fertilization problems may be due to several stress factors, sometimes working together to influence kernel set.

Severe drought stress, aggravated by excessive heat, can delay silk emergence to the extent that pollen shed is complete or nearly complete by the time the silks finally emerge from the husk. Without a pollen source, ovule fertilization cannot occur. Without the capture of pollen, silks continue to elongate until they deteriorate with age.



Persistent severe silk clipping by insects such as the corn rootworm beetle (*Diabrotica* species) or Japanese beetle (*Popillia japonica*) throughout the active pollen shed period can also limit the success of pollination by restricting viable exposed silks. The simultaneous effects of severe drought stress on silk emergence can easily amplify the consequences of severe silk clipping.

Severe drought stress coupled with excessive heat and low humidity can desiccate emerged silks to the point that they become non-receptive to pollen grain germination. I suspect this is low on the list of possible stressors for Indiana most years (because of our typically high humidity levels), but may play a role in some fields once in a while. Similarly, I suspect that pollen viability is usually NOT an issue for Indiana cornfields because summer air temperatures in the low to mid 90's (F) common to Indiana are usually not great enough to kill pollen.

Consecutive days of persistent rainfall or showers that keep tassels wet for many hours per day over several days can delay or interfere with anther exsertion and pollen shed. Such weather does not typically occur in Indiana, but the remnants of Hurricane Dennis that visited many parts of Indiana in early July of 2005 influenced kernel set in some fields that were trying to pollinate during that week as a result of the many days of showery humid weather (coupled with the excessive cloudiness and its negative effect on photosynthesis).

Exceptionally long potential ears that often result from good weather during the pre-tassel ear size determination period sometimes fail to pollinate the final kernels near the tip of the cob. Remember, butt silks emerge first and tip silks emerge last. With oversized ears, sometimes tip silks emerge after all the pollen has been shed.

An increasingly common hybrid trait in recent years is an aggressive silking habit associated with drought tolerance that lessens the risk of delayed silk emergence in response to severe drought stress and, thus, silk/pollen synchrony is better maintained. However, favorable weather during silk elongation with such hybrids tends to result in silks emerging from the husk leaves several days prior to the availability of pollen from the tassels. Such unusually early silk appearance can result in silk aging / deterioration prior to the availability of pollen. The typical kernel set pattern associated with this situation is blank cob tissue near the basal end of the cobs.

An unusual form of rapid growth syndrome described as "Tassel Wrap" was documented throughout many corn growing areas of the U.S. in 2025 (Jeschke et al., 2025). Rapid growth syndrome itself is not uncommon and usually appears in young corn at about the V6 stage of development (6 leaves with visible leaf collars) and disappears by about V10 (Nielsen, 2019b). The variation of this phenomenon termed as "tassel wrap" is unusual because it manifests itself at later leaf stages and results in the uppermost whorl leaves becoming tightly wrapped around the tassel as it begins to emerge from the whorl. The worst case scenario is when tassels of a large percentage of plants in the field are unable to emerge from the tightly wrapped whorl leaves and shed pollen in sync with the emergence of the silks on the ears. The phenomenon is thought to be correlated with the previously described aggressive silking habit and so silks emerge early before sufficient pollen is available, resulting in varying degrees of ineffective pollination and poor kernel set.

Another factor that affects the availability of pollen in commercial corn fields is the relatively common use of hybrids produced using cytoplasmic male sterility (CMS) technologies (Nielsen, 2025). Seed produced using CMS technologies is itself typically male sterile (i.e., inviable pollen) and must be blended with fertile seed in about a 1:1 ratio before it is marketed. The pollen load in fields planted to such seed is automatically about half that of a normal hybrid but is still adequate for successful pollination. On rare occasions, mistakes occur in the seed blending process that result in fields exhibiting extremely low percentages of plants with fertile tassels that are incapable of providing enough pollen to adequately pollinate all the silks in the field, thus resulting in varying degrees of poor kernel set.

Kernel Abortion

Poor kernel set can also be caused by kernel abortion following successful fertilization of the ovules on the cob. In contrast to ineffective pollination or fertilization, initial kernel development precedes kernel abortion, so the symptoms are usually shriveled remnants of kernels that are whitish- or yellowish-translucent.

The causes of kernel abortion are generally those stresses that greatly reduce the overall photosynthetic output of the plant during the first several weeks after the end of pollination as the kernels develop through the blister (R2) and milk (R3) stages of development. The risk of kernel abortion decreases significantly after the R3 stage of kernel development. Obvious photosynthetic stressors include severe drought and heat stress, consecutive days of excessively cloudy weather and significant loss of photosynthetically active leaf area (e.g., hail damage, leaf diseases, insect damage, nutrient deficiency).

Warm nights during pollination and early grain fill may indirectly affect survival of developing kernels. Research suggests that the increased rate of kernel development due to warmer temperatures lowers the available amount of photosynthate per unit of thermal time; which then becomes a stressor to kernel development particularly at the tip of the ear, leading to kernel abortion (Cantarero et al., 1999).

Final Food for Thought

A plethora (meaning a whole lot) of blank cob tips can quickly ruin the joy of walking a cornfield in the middle of August. Before getting too bent out of shape over the missing kernels, remember to count the number of harvestable kernels on those ears. Sometimes, ears exhibit 1 to 2 inches of blank tips; yet still contain 16 rows by 30 to 35 harvestable kernels per row. Those are perfectly acceptable ear sizes in a year where dry weather has been a concern.

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Corn Is Not Making Your Days More Humid

(Dr. Chad Lee, UK Grain Crops Specialist)

When it gets very hot and very humid, people see the fields of tall, green corn and point the finger at these fields. Corn is not making your days more humid unless you are walking in corn fields all day.

The very short answer is that corn will transpire around 4,000 to a peak of 8,000 gallons of water per acre per day. But, in these current conditions, there are about 160,000 gallons of water in the air already. So, any water coming from a field of corn is negligible to the total amount of water in the air.

Corn, like all plants, transpires water and oxygen to help maintain plant functions. Once the corn plant leaves cover the rows and intercept most of the sunlight, most water loss from the cornfield comes from transpiration. Water loss from transpiration is influenced by water availability in the soil, water amount in the plant, relative humidity (which is water in the air), air temperature, cloud cover and windspeed.

If the relative humidity (RH) is high, then transpiration (water loss) from the plants is low. Some estimates in Nebraska indicate that peak water loss from a cornfield is approximately 0.33 inches per acre per day. That equals 8,960 gallons of water per acre per day for about 20 days. Other estimates east of the Missouri River suggest corn will transpire about 4,000 gallons per acre per day. If RH is 50%, and corn plants are at maximum water demand, corn in the region likely loses closer to 5,000 gallons per day.

While that is a large amount of water for any household to use in a day, it is a very small percentage compared to what is already in the air.

We can determine the water in the air by calculating the weight of dry air above one acre, using a psychrometric calculator, and using 86°F and 50% RH at our elevation. With these parameters in the Bluegrass Region of Kentucky, there is about 0.0136 pounds of water (H_2O) per pound of dry air. That comes to about 160,000 gallons of water above one acre, whether that acre is corn, a football field, or houses in town. See the resources at the end of this publication to double-check this math and work out scenarios where you live.

To add more perspective to the volumes of water being discussed, 1 inch of rainfall is equivalent to 27,184 gallons per acre. The Kentucky Mesonet at Spindletop Farm in Lexington has recorded 3.1 inches of rainfall for July, equivalent to 84,270 gallons of water per acre that has fallen on the soil. If the atmosphere is holding 160,000 gallons of water at 50% RH and 86°F, and all that water decided to fall to earth in a day, that is equivalent to about 5.9 inches of rainfall per acre.

An acre of corn could remove 35,000 pounds of carbon dioxide (CO_2) per acre and release about 25,000 pounds of oxygen (O_2) per acre over the growing season.

If someone walks into a cornfield, that corn will block airflow. As that corn transpires, a person will perspire. Inside that cornfield, it will feel more humid. But, outside the cornfield in this region of the country, it is unlikely that corn or other crops will transpire enough water to dramatically affect the humidity in the neighborhoods, towns, and cities.

Resources

Calculators

Psychrometric

calculator: https://daytonashrae.org/psychrometrics/psychrometrics.shtml

Weight of air: https://www.engineeringtoolbox.com/air-density-specific-weight-d_600.html

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Finally, Some Relief!

(Beth Hall)

Hot, muggy days in Indiana can get old, quickly! With all the rain lately, and higher humidity, it has been a challenge to get any nighttime relief. Fortunately, the next few days and through the weekend should be quite a pleasant change. Temperatures should be in the 70s and by the middle of next week should climb into the mid 80s. Average high temperatures for the first few weeks of August (1991-2020) are in the 80s, so temperatures should feel normal next week (what a change!). Humidity is expected to stay relatively high, so that feeling of mugginess is likely to linger. By the end of next week into the following week, however, temperatures are expected to return to above normal levels. Precipitation outlooks are slightly favoring above normal amounts over the next few weeks, keeping humidity high, morning dew likely, and localized morning fog possible. This may provide highly conducive conditions for plant diseases so keep scouting for signs of development.

July temperatures were above normal across Indiana by 3-6 degrees. Precipitation was far more variable with southern counties receiving up to 5 inches (over 175% of normal) more than normal. Northern counties were highly varied due to very localized precipitation events. Some areas received 4 to 5 inches above normal amounts while other areas received up to 2 inches below normal precipitation (Figure 1)! In general, however, drought and abnormally dry conditions have been improving with only about 3% of the state in drought and about 17% considered abnormally dry (Figure 2).

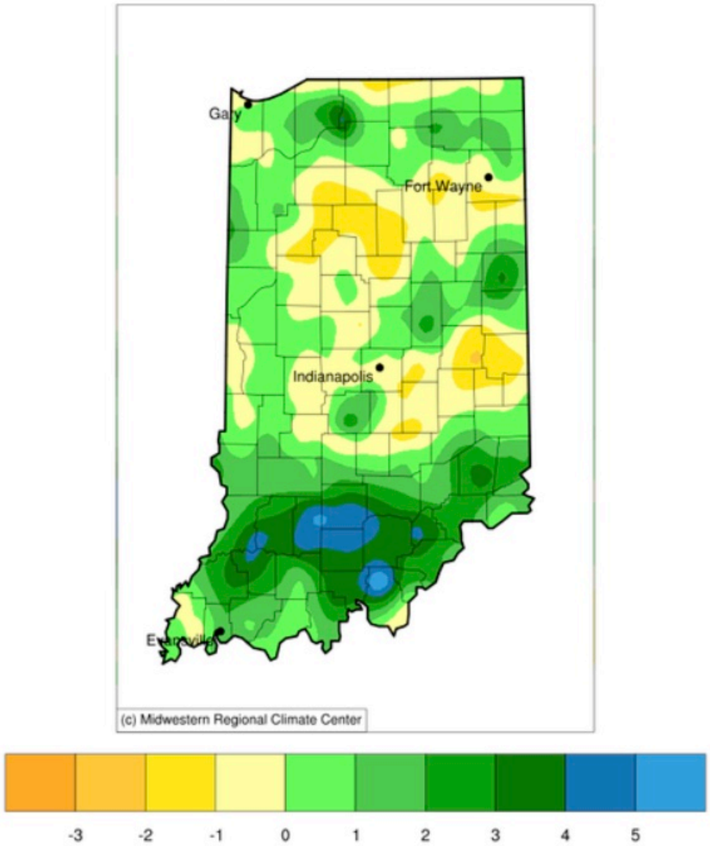
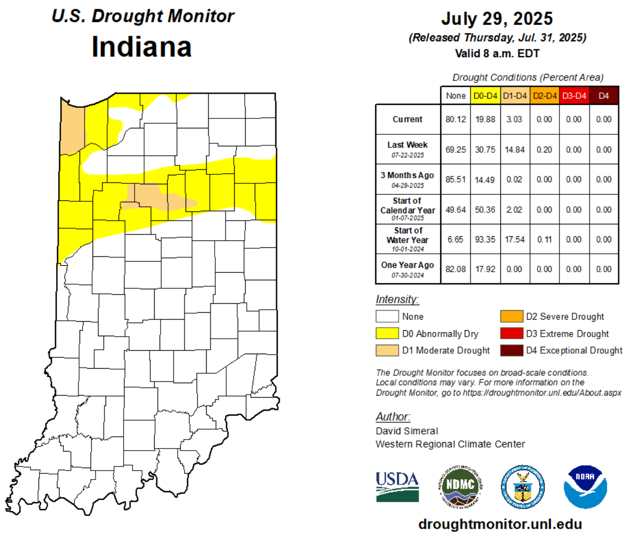


Figure 1. Precipitation departure from normal (1991-2020) in inches for July 2025.



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	80.12	19.88	3.03	0.00	0.00	0.00
Last Week 07-22-2025	69.25	30.75	14.84	0.20	0.00	0.00
3 Months Ago 04-29-2025	85.51	14.49	0.02	0.00	0.00	0.00
Start of Calendar Year 01-07-2025	49.64	50.36	2.02	0.00	0.00	0.00
Start of Water Year 10-01-2024	6.65	93.35	17.54	0.11	0.00	0.00
One Year Ago 07-30-2024	82.08	17.92	0.00	0.00	0.00	0.00

Figure 2. U.S. Drought Monitor status for conditions as of Tuesday, July 29, 2025.

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