Corn & Soybean News

June 2023

Volume 5, Issue 6

COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Grain and Forage Center of Excellence

University of Kentucky

Consideration for Weed Control in Dry Conditions.

The rainfall patterns across Kentucky have been variable with some parts of the state receiving timely rain while other regions have missed the major rain events over the past 4 weeks. The lack of rain has caused droughty conditions in several spots of the state. Those facing these droughty conditions will have to consider the following when planning postemergence weed control. Although many of these considerations also apply to those who have been fortunate enough to receive timely rainfalls.

Scout field fields early for weed escapes.

Late planted corn or soybean fields that received a preemergence herbicide application that has not received significant rainfall need to be scouted for early weed escapes. The lack of an activating rainfall on these fields means there likely already are weed escapes that need to be controlled. Scout all your fields to check for emerging weeds to make plans for postemergence applications. Some fields this year may require multiple postemergence applications due to the lack of residual activating rainfalls and slowed crop and canopy development due to the current weather patterns.

Drought Stressed Weeds are Hard to Kill

The dry conditions also lend to weeds being tougher to kill with postemergence herbicides. All plants that are exposed to droughty conditions develop thicker leaf cuticles. The cuticle is the waxy layer on plant leaves that keeps water in the plant, when a plant experiences dry conditions the cuticle becomes thicker to protect the precious water the plant needs to survive. Unfortunately, the thick cuticle not only helps keep water in, but also keeps spray carrier water and any herbicide contained in that water out. The best way to help overcome this barrier is with the use of appropriate adjuvants for the herbicides being sprayed. Make sure to read your product label to determine the correct adjuvant and adjuvant rate to use in your application. Table 1 and 2 contain postemergence products for corn and soybean and the recommended adjuvants.

Spray When Weeds are Small.

This should not be new information, but in a year when crops and weeds alike are stressed due to dry weather it is especially important. Excessive weed growth, even at low densities, can contribute to additional drought stress to already struggling crops. Thus, eliminating weeds when they are small can reduce the competition for water and stress on the crop. Additionally, smaller weeds in general are easier to control with all postemergence herbicides in all weather conditions. This is why we emphasize the need to scout fields often and early for weeds escaping a residual herbicide that did not get activated. When you are scouting, start making plans to spray whenever weeds first emerge to assure you can get a sprayer across the field prior to the weeds reaching four inches in height.

Be Aware of Crop Growth Stage Restrictions.

Our corn and soybean across the state are at various stages of growth, with some of the early planted corn well beyond growth stages for postemergence herbicide applications. Although many of our acres will be ready to spray in the very near future. When making your postemergence applications be aware of growth stage restrictions. These restrictions are in place to protect the crop from herbicide injury and/or to protect the end product from illegal herbicide residues. Make sure you know the growth stage restrictions of the products you plan to apply. If using multiple products, use the most restrictive (or earliest) growth stage. Table 1 and 2 list the crop stage restrictions for the majority of postemergence herbicide applied in corn and soybean.

Continue to watch weather conditions.

We received several complaints this spring about herbicide drift onto commercial specialty crops and homeowner landscapes from burndown applications. Make sure you are aware of surrounding crops and landscapes and avoid applications to fields when winds are blowing at excessive speeds towards those sensitive crops. In some cases, such as dicamba applications in dicamba-resistant soybean you are not allowed to spray at all if the wind is blowing towards a sensitive crop. Depending on your postemergence products being used you can also use drift reducing nozzle that produce larger spray droplets to mitigate drift potential. Although larger droplets can drift as well in high enough winds and large droplets are not appropriate when using contact herbicides.

Dr. Travis Legleiter
Assistant Extension Professor - Weed Science
(859) 562-1323
travis.legleiter@uky.edu
@TravisLegleiter

Table 1. Postemergence corn herbicides with recommended adjuvants and crop growth stage restrictions.

Herbicide	Adjuvant[1]	Crop Stage
Accent Q	COC, MSO, or NIS + UAN or AMS	Broadcast up to 20" tall corn or that exhibits 6 or fewer collars (V6); Use only drop nozzles for corn between 20“ to 36" tall. Do not apply to corn that exceeds 36" tall or that has 10 or more collars (V10).
Acuron Flexi	NIS. Consult label for use of COC	Apply before corn emergence until plants reach 30 inches or up to 8-leaf stage of corn growth.
Acuron GT	NIS + AMS	Corn emergence up to 30” height or the 8-leaf (V8) growth stage.
Armezon PRO	MSO or COC + UAN or AMS	May be applied preemergence up to 30” tall corn, but 45 days prior to harvest. Use directed applications when corn is 12–30” tall.
Atrazine	COC or Crop Oil	Apply before corn reaches 12” tall
Callisto	COC + UAN or AMS	Broadcast on corn up to 30" tall or up to the 8-leaf stage of corn growth.
Callisto Xtra	COC or NIS + UAN or AMS	Apply after crop emergence but before corn exceeds 12” in height
Capreno	COC + UAN or AMS	Broadcast apply from the 1 leaf collar (V10 to 6-leaf (V6) growth stage. Use directed applications when corn is V6 to V7 growth stage
Dicamba [Clarity, Sterling Blue, Vision, etc]	NIS UAN or AMS may be added. Consult label for use of COC	Apply 8 to 16 oz/A (0.5 to 1 pt/A) from emergence through 5th leaf stage or until corn reaches 8" tall, whichever occurs first; Apply 8 oz/A when corn is from 8" to 36" tall, if 6th true leaf is emerging from whorl, or 15 days before tassel emergence.
DiFlexx or DiFlexx Duo	NIS, COC, MSO + UAN or AMS may be added (consult label)	Broadcast from spike through V6 (6 leaf collars) or 36" tall, whichever occurs first. Directed applications may be made from V7-V10 crop growth stage (7 to 10 collars), up to 36” tall, or 15 days before tassel emergence, whichever occurs first.
Enlist Duo	None	Broadcast on corn no larger than V8 growth stage or 30 inches, whichever occurs first. For corn 30 to 48 inches apply using drop nozzles to avoid whorl of corn plants.
Halex GT	NIS + AMS	Corn emergence up to 30” height or the 8-leaf (V8) growth stage.
Impact / Armezon	MSO or COC + UAN or AMS	May be applied anytime after corn emergence up to 45 days prior to harvest.
Impact Core	MSO (NIS) + AMS or UAN	After corn emergence up to 11” corn height
Katagon	MSO, COC, or NIS	Apply up to the 5 leaf collar (V5) or 20 inches tall
Laudis	MSO or COC + UAN or AMS	Corn emergence up to the V8 growth stage (exhibits 8 collars)
Liberty [glufosinate]	AMS	Apply from corn emergence until V-6 growth stage. Can be applied with drop nozzles until LL-corn is 36" tall.
Permit	NIS or COC (may add 28% Liq N)	Apply from the spike through layby stage of field corn.
Realm Q	COC or NIS + UAN (27-32%) or AMS	Apply to corn up to 20" tall. Do not apply to corn taller than 20" or exhibiting 7 or more leaf collars.
Resolve Q	NIS + UAN (28-32%) or AMS	Apply postemergence to corn that is up to 20” tall. Do not apply to corn taller than 20” or exhibiting 7 or more leaf collars.
Glyphosate	Adjuvant requirements vary with product used	Apply broadcast over-the-top from corn emergence through V8 corn stage or 30 inches, whichever occurs first. For “Roundup Ready 2 Corn” and other hybrids designated as Glyphosate Tolerant drop nozzles can be used to direct applications on corn 30 to 48 inches.
Shieldex	MSO, COC, or NIS	Apply to corn up to the 6 leaf collar (V6) stage or up to 20” tall.
Sinate	MSO or HSMOC + AMS	Apply from corn emergence up to 24 inches (V-7 growth stage). Use drop nozzles for corn 24 to 36" tall.
Spirit	COC or NIS (may include 28% to 34% Liquid Nitrogen)	Apply to corn between 4" to 24" tall; Drop nozzles recommended when corn is >20" tall or exhibits more than 6 collars (V6), whichever comes first. Applications to popcorn are more restrictive.
Status	NIS, COC, or MSO + UAN (28-34%) or AMS	Apply from 4-inch tall (V2) to 36-inch tall (V10) corn. Do not apply if corn is more than 36”, or within 15 days before tassel emergence.
Steadfast Q	COC, MSO, or NIS + UAN or AMS	Apply to corn up to 20" tall. Do not apply to corn >20" tall or exhibiting 6 or more leaf collars (V6), whichever is more restrictive.

[1]COC - Crop Oil Concentrate; NIS - Non-Ionic Surfactant (at least 80% active ingredient); AMS - Ammonium Sulfate; UAN - Urea Ammonium Nitrate (28% to 32% nitrogen fertilizer); MSO - Methylated Seed Oil; HSMOC – High Surfactant Modified Oil Concentrate.

Table 2. Postemergence soybean herbicides with recommended adjuvants and crop growth stage restrictions.

Herbicide	Adjuvant[1]	Crop Stage
Assure II	COC or NIS + (Liquid N or AMS optional)	Before pod set and 80 days prior to harvest.
Cheetah Max	AMS Optional	From emergence up to but not including bloom stage. Do not apply within 70 days of harvest.
Classic	NIS or COC + (Liq N / AMS optional)	After first trifoliate leaf has expanded but 60 days before maturity.
Cobra	COC or NIS (Liq N optional)	Normally when plants are in the one to two trifoliate leaf stage; Do not apply within 45 days before harvest or after stage R6 (full seed).
Extreme	NIS + AMS	Before bloom and prior to 85 days of harvest.
Enlist One or Enlist Duo	---	Emergence to R2 (full flowering)
FirstRate	NIS or COC + Liq N	Before 50% flowering stage & 65 days before harvest for 0.3 oz/A rate
Flexstar	NIS or COC + (Liq N optional)	Do not apply within 45 days of harvest.
Flexstar GT	AMS NIS , COC, or MSO optional	Do not apply within 45 days of harvest.
Fusilade EX	COC or NIS + (Liq N optional)	24 oz/A before bloom stage. 6 oz/A after bloom 60 days before harvest
Fusion	COC or NIS + (Liq N or AMS optional)	Before bloom stage.
Glyphosate	NIS varies with product used. (AMS is optional)	Cracking throughout flowering.
Harmony SG	NIS or COC + Liq N	After first trifoliate leaf has expanded until 60 days before harvest
Intermoc	---	After emergence up to but NOT including bloom stage and 70 days before harvest.
Liberty 280SL	---	After emergence up to but NOT including bloom stage and 70 days before harvest.
Phoenix	NIS	Normally when plants are in the one to two trifoliate leaf stage; Do not apply within 45 days before harvest or after stage R6 (full seed).
Poast	COC (Liq. N optional)	Do not apply within 75 days of harvest.
Pursuit	NIS or COC + Liq N or AMS	Before bloom stage and prior to 85 days of harvest.
Prefix	(Consult label)	Apply at least 90 days before harvest
Raptor	NIS or MSO+ Liq N (COC for certain situations)	Before bloom stage.
Resource	COC + (Liq N optional) (Consult label for using NIS for certain mixes)	Do not apply within 60 days of harvest.
Select MAX & other clethodim products	NIS or COC (Consult label for using AMS)	Do not apply within 60 days of harvest.
Sequence	AMS	From cracking through 3rd trifoliate for Roundup Ready soybean
Synchrony XP	COC + Liq N (Consult label for using NIS for certain mixes)	After first trifoliate has expanded until 60 days before harvest.
Ultra Blazer	NIS (Consult label for using Liq N, AMS, and /or COC for certain mixes)	Do not apply within 50 days of harvest.

[1] COC = Crop Oil Concentrate; NIS = Non-Ionic Surfactant (at least 80% active ingredient); Liq N generally involves Urea Ammonium Nitrate or UAN (28% to 32% nitrogen fertilizer) or 10-34-0. Consult label for specific type of adjuvant and rate.

Dry Weather Effects on Corn at Early Growth Stages

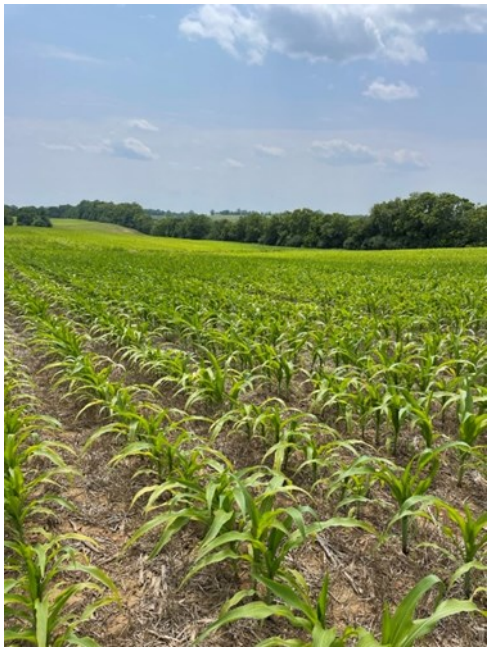


Figure 1. Corn displaying both potassium and zinc deficiency. Photo by Lindsay Arthur, Bourbon County ANR Extension Agent.

Figure 2 Corn displaying potassium deficiency from weed competition, low soil test K values, some sidewall compaction, and dry soils. Photo by Tad Campbell, Mason County ANR Extension Agent.

The original article was released June 6, 2023. Since then, some areas of Kentucky have received 2 inches of rain while others only 0.1 inches. This article remains relevant for the fields that received very little rain.

The dry weather across the state is putting stress on the corn crop. The lack of water to corn before the V12 growth stage usually results in minimal yield losses if adequate water occurs at V12 and beyond. Most of the corn in Kentucky ranges from just planted to about V9 as of June 5, 2023.

While yield losses might be minimal, some other issues can or will occur with a lack of water. Each of these scenarios assumes that the water stress lasts for about two weeks and plants will recover on the other side.

1. **Leaf rolling:** The corn leaves will roll during the heat of the day to try to conserve as much water as possible. When this leaf rolling occurs, the plant conducts less photosynthesis, causing it to produce less biomass during the drought stress.

2. **Potassium Deficiency:** Potassium deficiency is a common indicator for drought stress on young corn plants. Plant tissue samples taken on V3 to V6 corn last week and this week likely will show K deficiency and that K deficiency may be from the drought and nothing else. The corn plant needs water to take up K, so adding more potassium will have no effect on the corn crop if the crop does not have water.

3. **Other Nutrient Deficiencies:** Water is needed for corn to take up several nutrients, not just potassium. Potassium might be the most obvious, but a tissue test will reveal several others as being deficient as well. A soaking rain is the best remedy for these transient deficiencies.

4. **Compaction Becomes Evident:** Both seed furrow sidewall compaction and subsurface tillage compaction become more obvious in dry soils. If corn in a single row or a section of the field shows twisting and curling before other corn, compaction could be a problem. “Vertical tillage” implements and discs of-

ten cause soil compaction at the depth they are set. In dry soils, these compacted areas become impossible for roots to break through. Both sidewall compaction and subsurface compaction stunt roots. Those stunted roots cannot take up as many nutrients resulting in stunted corn plants. Timely rains are about the only in-season remedy for these soils. With the dry weather in the forecast right now, rains might be too late to help.

5. **"Floppy" corn syndrome.** (Someone needs to write a "Floppy Corn" song to the tune of Adam Sandler's Sloppy Joe chorus in "Lunch Lady Land".) The dry weather and hot temperatures can cause all roots from one or more nodes to desiccate or dry out and die. A strong wind at this point will knock the plants over. Corn plants from about V2 to V3 will be most susceptible this week. Corn plants in shallow placement are more susceptible. Soaking rains to allow new root growth before any strong winds occur is the best remedy. For more on Floppy corn, see this article. As for that song: "Floppy corn, flop-floppy corn…" It's in your head now, isn't it?

Figure 3 "Floppy corn" because most of the nodal roots died from a lack of water.

6. **Loss of Row Number or Kernel Number:** Once corn reaches V6 growth stage, the dominant ear and tassel formation start. However, water stress starts affecting row number and kernel number closer to the V12 growth stage. At the V6 growth stage, the corn plants have switched to the nodal root system. This is the final stage before exponential growth. A lack of water from V7 to about V12 could reduce total biomass of the stem and leaves. A lack of water around V12 will reduce kernel rows and then kernel numbers per row on the ears.

Figure 4 Corn with seed coats about ½-inch below the soil surface. This is evidence of shallow rooting and can lead to nutrient deficiencies in dry soils. Photo by Lindsay Arthur, Bourbon County ANR Extension Agent.

7. **Less Disease Risk:** So, we are looking for a positive aspect with this one. A lack of water means foliar disease pressure is extremely low right now. We should not be applying fungicides to V5 or V6 corn anyhow. We certainly do not need fungicide in a drought. Kiersten Wise will have more on this issue.

8. **A Lack of Residual Herbicide Activity:** Most soil residual herbicides need rainfall to activate. Scout fields to identify which weeds are escaping and plan to spray once a rain event occurs. The weeds are not growing well now, either. They need the rain event to be receptive to the herbicides. When applying the herbicides, be sure to use the full adjuvant types and rates recommended on the labels. Travis Legleiter will have more on this issue.

9. **Watch the Roots this Week:** Soils usually dry from the surface downward. This movement

of water can affect root development. The V9 corn should have well developed roots that are deeper into the soil. While the V9 corn demands more water than V2 corn, the V9 roots are more likely to interact with plant available water longer than the V2 corn this week. Emerging corn (VE) and V1 corn demands very little water (less than 0.1 inches per day), and most soils still have enough for those plants at the start of this week. Corn at the V2 to V3 growth stage this week may be at soil depths without water and could lose nodal roots to the lack of water.

10. **Nitrogen On Dry Soils:** Volatilization losses are the greatest risk for N losses in dry weather. Urea fertilizers on the soil surface will be actively volatilizing within 72 hours (about 3 days) after application. Urea treated with the adequate rate of NBPT (the active ingredient in Agrotain and other products) will not begin volatilization for about 7 to 14 days. Urea treated with adequate rates of Duromide plus NBPT (the active ingredients in Anvol) will not volatilize for about 14 to 21 days. If possible, sidedress with liquid urea ammonium nitrate (either 28% or 32% UAN). Only half of the UAN product is urea, making volatilization a smaller risk. The liquid form will soak into the soil further reducing volatilization losses. Injecting the UAN into the soil would be preferred where possible. Whether injected or applied to the surface the UAN will not move far until water re-enters the soil profile. Corn will not take up the N, either, until water is available, so getting the N right next to the corn plant may not be as important. Spray booms with StreamJet (or similar style) nozzles in between each row will apply some of the N close to the plant. Avoid applying any of the nitrogen directly to the corn plants. If applied this week, direct contact of N fertilizer with corn leaves will burn the corn leaves. Usually, this burn is cosmetic and does not affect plant health and yield. But, the corn crop is stressed already, and leaf rolling is limiting photosynthesis. There is no need to add additional stress with leaf burn. If dry urea is the only option available, then apply it. If other options are available, pursue those. Edwin Ritchey and John Grove have more on this topic.

The weather forecast this week provides low chances of rain. More corn in more fields will roll this week. Some of it will look bad. But all of it still has a chance to make good to excellent yields. We will all be monitoring the crop closely and will provide updates in the coming weeks.

References

Lee, Chad and Carrie Knott. co-editors. 2023. A Comprehensive Guide to Corn Management in Kentucky. University of Kentucky Cooperative Extension Service. Lexington. http://www2.ca.uky.edu/agcomm/pubs/id/id139/id139.pdf

Nielsen, R.L. 2022. “Rootless” or “Floppy” Corn Syndrome. Corny News Network. Purdue Univ. http://www.kingcorn/news/timeless/FloppyCorn.html

Chad Lee, Ph.D.
Grain Crops Extension Specialist, Lexington
Director, Grain & Forage Center of Excellence
(859) 257-3203
Chad.Lee@uky.edu

University of Kentucky

2023 Pest Management Field Day
at the UKREC Farm
June 29, 2023

Location: 1205 Hopkinsville St., Princeton, KY 42445
Time: 8:30 a.m. to 12:30 p.m. CDT — Sign-in begins at 8 a.m. CDT

Pre-registration is highly recommended by June 22, 2023
by either scanning QR Code, clicking web link, or by telephone.

https://uky.az1.qualtrics.com/jfe/form/SV_4PjveAuq6mK9rXU
Or contact the UKREC at (270) 365-7541, ext. 22569.

Topics and Speakers

• Palmer amaranth and Waterhemp control • Weed Control in early planted soybean • Weed Control in corn • Italian ryegrass Research Update	*Travis Legleiter*
• Herbicide Resistant Johnsongrass	*JD Green*
• Weed Management utilizing cover crops	*Erin Haramoto*
• Corn Disease Research Update	*Kiersten Wise*
• Entomology Research Update	*Raul Villanueva*

Continuing Education Units for
Certified Crop Advisors and Kentucky pesticide applicators available

Follow us on Twitter: *@TravisLegleiter* and *@KYGrainCropsIPM*
Like us on Facebook: *KY Grain Crops IPM*

Cooperative Extension Service
Agriculture and Natural Resources
Family and Consumer Sciences
4-H Youth Development
Community and Economic Development

LEXINGTON, KY 40546

Disabilities accommodated with prior notification.

Monitoring for important corn diseases in 2023

Farmers are annually concerned about corn disease, and this year will be no exception. Corn is moving through growth stages quickly, with much of the early April-planted corn approaching the ten -leaf stage, or V10. This growth stage has become a popular stage for a fungicide application timing with high-clearance ground sprayers, and there have been questions about what diseases are prevalent and how to monitor for disease presence to determine if a fungicide application is needed in 2023.

To date, weather across most of Kentucky has not been conducive for foliar disease development. Most of the state has experienced low rainfall and low humidity for several weeks, and this combination slows or prevents disease development. Even with spotty rainfall over the weekend, most areas will still be at reduced risk for foliar disease at this time.

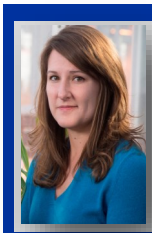
This said, it is never too early to scout for disease and monitor our resources to determine where and when disease has been reported so we are ready for action if needed.

One of the most important corn diseases to monitor in Kentucky is southern rust. The fungus that causes southern rust does not overwinter in Kentucky, but spores of the fungus move north on wind currents and weather each summer. We can track the movement of southern rust by watching the map on the cornipmpipe website here: https://corn.ipmpipe.org/southerncornrust/. On the map, red counties/parishes indicate that southern rust has been confirmed by university/Extension personnel. To date, no counties have confirmed southern rust that has been reported on the corn.ipmpipe, but I have heard from my extension colleagues that the disease is likely in the Florida panhandle. Southern rust typically arrives in Kentucky in mid-July, and whether a fungicide will be needed to manage southern rust at that time will depend on the crop growth stage at the time it is detected in your area. Fungicide applications may be needed to manage southern rust through the milk (R3) growth stage. More information on southern rust can be found here: https://cropprotectionnetwork.org/publications/an-overview-of-southern-rust

Another disease that can be monitored on the cornipmpipe website is tar spot. Tar spot is a new disease in Kentucky, with only two counties having confirmed disease in 2021 and one county with confirmed disease in 2023. In all cases, tar spot was not observed until mid-September and did not impact yield. This is a disease of concern in states to the north, and we can monitor real-time confirmations at https://corn.ipmpipe.org/tarspot/. No tar spot has been confirmed in the United States in 2023 to date. More information on tar spot can be found here: https://cropprotectionnetwork.org/publications/an-overview-of-tar-spot

If considering a fungicide application in 2023, remember to scout fields first and check hybrid resistance ratings prior to fungicide application. Hybrids that are moderately resistant or resistant to foliar diseases like gray leaf spot are less likely to demonstrate an economic response to fungicide application.

Scouting over the next few weeks and just prior to tasseling can help determine if fungicide applications are needed. Although disease levels will continue to build over the course of the season, University research indicates that foliar fungicides applied at tasseling or early silking (VT-R1) provide optimal foliar disease control for diseases like gray leaf spot compared to applications that occur earlier or later in the season. For southern rust, a fungicide application may be needed through milk (R3). Management of tar spot will be on a case-by-case basis at this time. Always check with your County Agent for updates on the diseases present in your specific county and help determining if management is warranted.



Dr. Kiersten Wise
Extension Plant Pathologist
(859) 562-1338
kiersten.wise@uky.edu

Why does Corn Yield more than Soybean?

Did you ever wonder why corn yields so much more than soybean? The two crops grow in the same environment in our production systems, often in adjacent fields. Photosynthesis is the main driver of yield production in both crops and yield is the weight of seeds harvested at maturity, but the yield of corn is, on the average, about three times higher than soybean. What are the characteristics of corn that allow it to produce so much more yield?

There are three primary reasons for the yield differential. First, photosynthesis of a corn community is higher than soybean. Soybean has C3-type photosynthesis (first stable product is a three-carbon compound) which includes a process called photorespiration. Photorespiration results in the loss of CO_2 from the leaf in the light thereby reducing photosynthesis and plant growth. Photorespiration is inhibited by the CO_2 in the air, so the rate of photorespiration decreases (photosynthesis increases) as the CO_2 concentration in the air increases. The CO_2 we are adding to the atmosphere that is causing climate change is also doing a little good by increasing soybean photosynthesis.

Corn has C4-type photosynthesis (the first stable product is a four-carbon compound) that does not exhibit photorespiration, so photosynthesis in corn is higher than it is in soybean. Higher photosynthesis contributes to higher yield. Since corn does not have photorespiration, it does not respond to increases in the CO_2 concentration in the air. The more upright corn leaves also contribute to higher community photosynthesis by providing a more uniform distribution of sunlight over all the leaves. The upright leaves give corn an additional advantage, photosynthesis wise, over soybean which has more horizontal leaves that intercept most of the sunlight near the top of the canopy.

Seed composition is the second reason that corn has higher yield than soybean. The synthesis of the oil, protein, and carbohydrates (starch) in the seed requires energy and this energy comes from respiration of the simple sugars produced by photosynthesis. Biochemists have calculated the energy cost (expressed as the amount of glucose that must be respired) of each of the seed components. They found that oil requires the most energy per unit weight, protein is next, and carbohydrates are the lowest. The soybean seed with its high protein and oil concentrations requires 2.64 grams glucose per gram of seed while corn (low in oil and protein and high in starch) only requires 1.42 grams glucose per gram of seed. Consequently, corn will produce more seed weight from a given quantity of simple sugars from photosynthesis than soybean. Corn would have a higher yield because of its lower oil and protein concentrations in the seed even if the photosynthesis of the two crops was equal. These energy relationships explain why it is so difficult to develop soybean varieties with higher oil and protein seeds without losing yield.

A slightly longer seed-filling period in corn over soybean could be the third and final reason for the higher corn yields. Yield is produced during the seed-filling period – the time from when the seeds

first start accumulating dry weight until they reach their maximum weight at physiological maturity. The length of the seed-filling period is under genetic control, and it is related to yield. There is some evidence that corn may have a longer seed filling period than soybean, but this evidence comes from separate experiments. No one has compared modern high-yielding corn hybrids and soybean varieties in the same environment to conclusively determine if corn does have a longer seed-filling period.

The roughly three-fold higher yield of corn is a direct result of higher photosynthesis, lower oil and protein concentrations in the seed (more seed weight per unit photosynthesis) and possibly a longer seed filing period. Soybean is penalized by its lower rate of photosynthesis and its high oil and protein seeds. These traits are fundamental characteristics of the two species that cannot be changed by management.

Dr. Dennis Egli
Professor Emeritus
(859) 218-0753

2023 UK Corn, Soybean & Tobacco Field Day

July 25, 2023

UKREC Farm
1205 Hopkinsville St.

Registration: 7:30 (CT)

Tours begin: 8 am (CT)

EDUCATIONAL CREDITS:

CCA: *Pending*

Pesticide: *Pending*

University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Topics include:

- Corn Disease Concerns for 2023
- Red Crown Rot of Soybean: A New Disease to Kentucky
- The New "Non-Certified Pesticide Applicator's" Category
- UKREC Tobacco Barn Construction Update
- Evaluating Biological N Fixation for Corn
- Tobacco Types Grown in Kentucky: Old Vs. New Varieties
- Do We Need to Spray For Caterpillars in Soybeans?
- Comparing Wheat, Barley, and Rye Cover Crops Before Corn
- Flea Beetle Management
- The Continuing Battle Against Problematic Weeds!
- Corn & Soybean Outlook Talk
- Potassium Chloride Use in Tobacco
- Effect Of Fungicides on Cigar Wrapper Leaf Production

Thank you to our lunch sponsors!

Kentucky Soybean Board

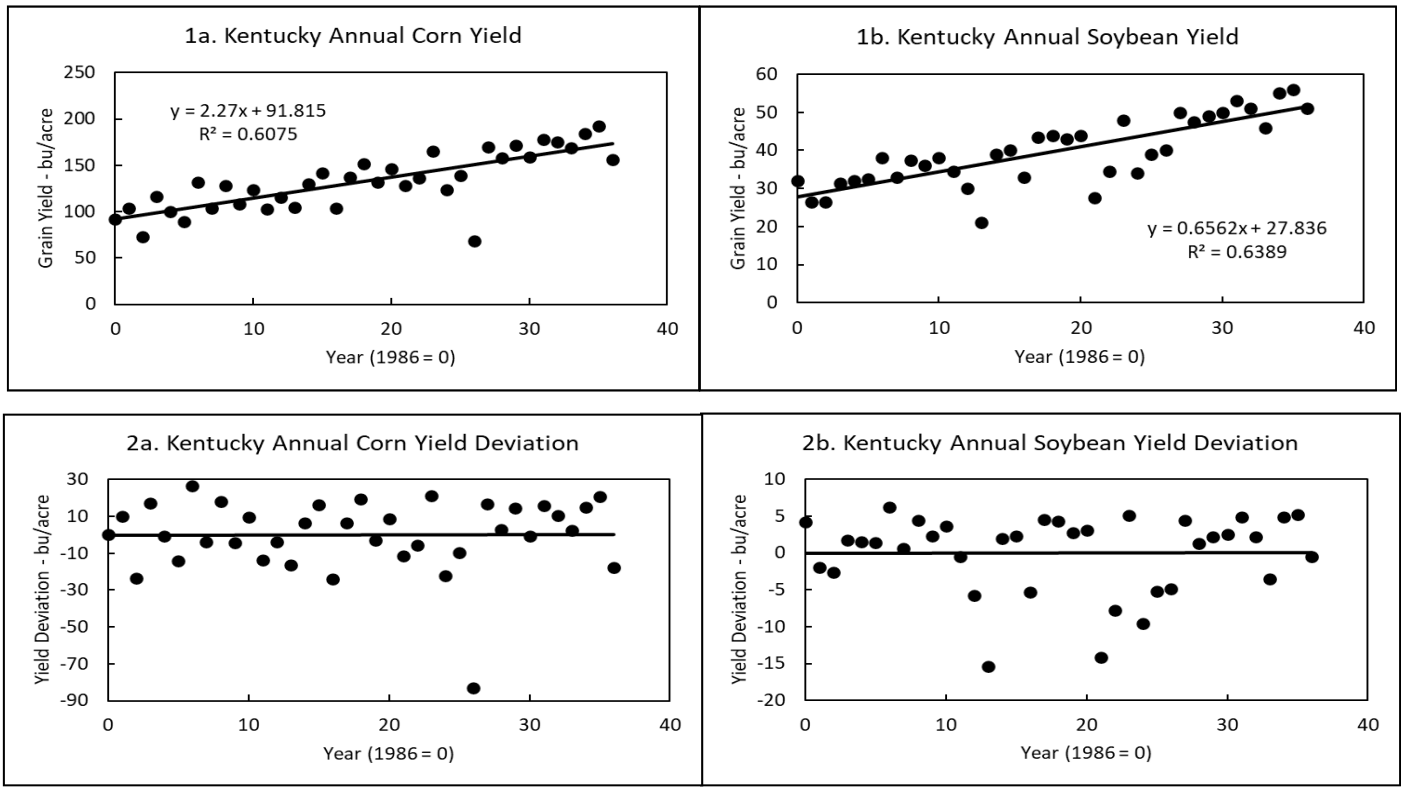
Kycorn Promotion Council

Altria
Altria Client Services

Using Kentucky's Crop Condition Ratings in 2023

We are at the point where weekly crop condition ratings for corn and soybean are being published by the USDA National Agricultural Statistics Service. The crop condition rating data consists of an aggregate observer group assessment of the percentage of the corn or soybean crop area that is in "Excellent (E)", "Good (G)", "Fair (F)", "Poor (P)" or "Very Poor (VP)" condition. The first weekly ratings for corn, for week 21 of 2023, were released on 30 May for the week ending 28 May CW053023.pdf (usda.gov). The first ratings for soybean were for week 22 of 2023, released on 5 June for the week ending 4 June CW060523.pdf (usda.gov). As I wrote last month https://graincrops.ca.uky.edu/files/cornsoynewsletter2023vol05issue05may.pdf, middle to late season crop condition ratings, combined weekly into a single Crop Condition Index (CCI), are reasonably predictive of the season's deviation from the state-wide crop yield trend – whether the year's corn or soybean yield will be above, at, or below the long-term yield trend.

First, a brief review. I found the long-term linear yield trends in corn (Fig. 1a) and soybean (Fig. 1b) yield. Then, to focus on the seasonal yield changes, I removed the linear yield trends to leave the annual seasonal deviation in corn (Fig. 2a) and soybean (Fig. 2b) yield – yield deviations due mostly to seasonal weather differences.

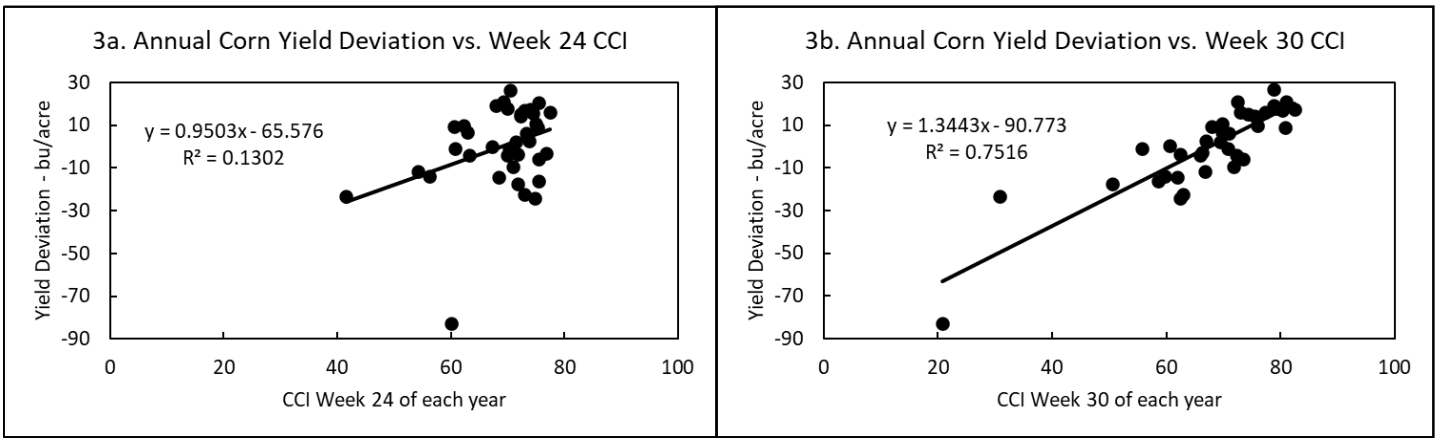


The weekly CCI value, between 0 and 100, is calculated as:

$$\%E(1.0) + \%G(0.75) + \%F(0.50) + \%P(0.25) + \%VP(0.0) = CCI$$

Then I graphed the seasonal yield deviation versus the weekly CCI value. As the year progresses – as the weeks increase in number, the relationship between the seasonal yield deviation and the weekly

CCI value improves (the R^2 value increases). For corn, this is shown in Figures 3a and 3b, where the R^2 value rises from about 0.13 to about 0.75 in week 24 (week ending June 18 this year) and week 30 (week ending July 30 this year), respectively. Between 1986 and 2022 the week 24 CCI values predicted only 13% of the variability in seasonal yield deviation but week 30 CCI values predicted 75% of that same seasonal yield deviation. Later in the season, CCI values are more likely to predict that season's yield deviation, if any.



Using the succession of weekly equations for 1986 to 2022 corn yield deviation versus corn CCI value, I calculated the CCI values for corn (Table 1) at which the 2023 statewide Kentucky corn yield deviation from the long-term yield trendline would likely be +20, +10, 0, -10, or -20 bushels per acre. For example, using the equation shown in Figure 3b and setting the yield deviation to +20 bushels per acre: 20 = 1.3443 * (week 30 CCI value) – 90.773; (20 + 90.773)/1.3443 = week 30 CCI value;

110.773/1.3443 = week 30 CCI value for a +20 bushel/acre statewide corn yield deviation = 82.4

Note that the low R^2 values for early season equations results in a broader range in calculated CCI values that are weaker in value as predictors of the season's yield deviation. However, by week 30 (week ending 30 July 2023) the calculated corn CCI values have generally 'converged'.

Table 1. Calculated CCI values predicting the 2023 statewide Kentucky corn yield deviation from the long-term yield trendline as the 2023 season continues.

2023 week ending:	week number	equation R^2 value	Seasonal deviation from corn yield trendline: (bushels/acre) +20	+10	0	-10	-20
			Calculated CCI Value				
18 June	24	0.1302	90.1	79.5	69.0	58.5	48.0
02 July	26	0.4175	86.1	77.7	69.3	60.8	52.4
16 July	28	0.5515	86.4	77.3	68.2	59.0	49.9
30 July	30	0.7516	82.4	75.0	67.5	60.1	52.6
13 August	32	0.8014	81.3	73.6	65.8	58.1	50.3
27 August	34	0.8456	80.8	73.3	65.7	58.2	50.6
10 September	36	0.8599	81.1	73.8	66.5	59.2	51.9
24 September	38	0.8825	81.6	74.5	67.3	60.2	53.0

As for corn in Table 1, I performed the same calculations of CCI values for soybean (Table 2), using the succession of weekly equations for 1986 to 2022 soybean yield deviation versus soybean CCI value at which the 2023 statewide Kentucky soybean yield deviation from the long-term trendline would likely be +5, +2.5, 0, -2.5, or -5 bushels per acre. Note that the low R^2 values persist further into the year than those for corn, making more of those early soybean CCI estimates weaker in value for a longer period of time each year. I am not exactly sure why this happens, but I suspect that the fact that double crop soybean is an important component of Kentucky soybean production, and that double crop soybean observers might be looking at this crop somewhat differently as they make crop condition ratings, plays a role. In any case, there is reasonable 'convergence' in the calculated soybean CCI values sometime in late August/early September (Table 2).

Table 2. Calculated CCI values predicting the 2023 statewide Kentucky soybean yield deviation from the long-term yield trendline as the 2023 season continues.

2023 week ending:	week number	equation R^2 value	Seasonal deviation from soybean yield trendline: ----------(bushels/acre)---------- +5	+2.5	0	-2.5	-5
			---------Calculated CCI Value----------				
25 June	25	0.0164	126.4	97.9	69.4	40.8	12.3
09 July	27	0.0359	119.8	93.6	67.3	41.1	14.8
23 July	29	0.0399	108.9	88.1	67.4	46.6	25.9
06 August	31	0.2822	81.8	74.0	66.2	58.4	50.6
20 August	33	0.4781	79.9	72.5	65.1	57.7	50.3
03 September	35	0.6531	77.6	70.9	64.2	57.5	50.8
17 September	37	0.6725	76.9	70.2	63.5	56.8	50.1
01 October	39	0.7582	77.1	70.6	64.1	57.6	51.1

In summary, our collective perception of corn and soybean crop condition may be subjective but does have some statewide scale value when numerically aggregated. I admit to wondering how we compare with satellite yield estimates. At least we are not as hindered by cloud cover (LOL).

Dr. John Grove
Professor of Agronomy/
Soils Research and Extension
(859) 562-1301

College of Agriculture, Food and Environment

KATS
Kentucky Agriculture Training School

2023 Spray Clinic

July 13, 2023

8:30 am to 12:00 pm
(sign in @ 7:30)

University of Kentucky
Research and Education
Center
Princeton, KY 42445

Pre-registration is required at:
https://2023KATSsprayclinic.eventbrite.com

$65 Registration fee
Lunch will be provided

Pesticide and Certified Crop Advisor Credits have been applied for

Topics and Demonstrations:

- The importance of spray droplet size for herbicide application
- Weather conditions during spray application
- Tank mixing and adjuvants
- Fungicide spray application efficacy
- Fungicide application with drones
- Kentucky regulations for spray drones

For more information contact
Travis Legleiter (Travis.Legleiter@uky.edu)
or Lori Rogers (lori.rogers@uky.edu)

KENTUCKY Small Grain GROWERS' ASSOCIATION

UPCOMING EVENTS

PEST MANAGEMENT FIELD DAY

Princeton (IPM-Grain Crops)

June 29, 2023

KATS SPRAY CLINIC

July 13, 2023

UK CORN, SOYBEAN & TOBACCO FIELD DAY

July 25, 2023

Cooperative Extension Service
Agriculture and Natural Resources
Family and Consumer Sciences
4-H Youth Development
Community and Economic Development

LEXINGTON, KY 40546