

Auglaize County OSU Extension Weekly Agriculture Newsletter – June 24, 2020

Scouting and Latest Information



Wheat



Corn

Hello!! Good morning! I pray you are well.

Every Tuesday from 8:30 to 9:30 AM we will be hosting a virtual meeting via Zoom that can also act as a simple conference call for those of you not able to get online to view live. The meeting will be set up to discuss key, timely information for your operation and to open the floor for questions and sharing of information. You may propose topics for the next meeting at anytime during the week by e-mailing or calling me. **Next week's topics will be weather and other.** Please join use every Tuesday for Auglaize County Farm Talk.

If you are a buyer or seller of hay or straw, let me know and I can keep a list to share with others.

List of individuals searching for hay or straw: None

List of individuals selling hay or straw:

1. About 200 3' X 3' wheat straw bales for sale. This same individual is willing to sell his winter cover crops as forage to anyone interested.
2. At least 500 small square wheat straw bales for sale.

Call the OSU Extension office at 701-541-0043 or e-mail me at stachler.1@osu.edu to get the contact information.

Joke: What do you call a horse that lives next door??

Agricultural Fun Fact: A typical ear of corn has about 800 kernels. The range is from 500 to 1,200 kernels per ear!

Rain fell only 2 days this past week. Parts of the county are very dry with moisture-stressed crops. I saw corn shriveled very tightly on Sunday. Rainfall on Sunday, June 21th ranged from 0.1" near Santa Fe-New Knoxville and Shelby-Fryburg roads, Brown and Pusheta roads, near Uniopolis, and near St. Rt. 117 and St. Rt. 67. Rainfall early Tuesday morning ranged from 0.11" near Fiekert and St. Rt. 385 roads to 1.71" (yes that is correct!) near Mercer Line and St Rt. 197 roads. Rainfall for the week ranged from 0.27" near Santa Fe-New Knoxville and Shelby-Fryburg roads to 1.95" near Mercer Line and St Rt. 197 roads. Rainfall for the week averaged 0.7", 0.12" more than last week. Rainfall is forecasted at least at 40% for Wednesday, Thursday, Friday, Saturday, and Sunday.

The average high temperature now is 83 degrees F, two degrees more than last week. Temperatures were above normal for **2** days of the week and below normal for **3** days of the week. The range in high temperature for the week was 76 to 90 degrees F. The average high temperature for the week was 82.9 degrees F, which is 5.5 degrees F warmer than last week and 0.1 degrees F **cooler than** the current normal high temperature. Temperatures for the next 7 days will be near normal.

Wheat



Wheat development



Field of wheat

Wheat is quickly turning color. All wheat is in the soft dough stage. Now we just wait for harvest. I did not change the wheat condition again for the week, so it is: 10% excellent, 42% good, 43% fair, 5% poor and 0% very poor. I found Fusarium head blight at least at 15% in a field. Most fields had none or less than 5%. Hopefully the vomitoxin levels will be low since we have been dry. Get your bins and equipment ready as we should be harvesting next week some time. My guess is that wheat yields will be between 50 and 100 bushels per acre with about an 80 bushels per acre average.

Alfalfa



Severe leafhopper burn

It is time to start cutting alfalfa for the second time. One field was already at the early flower stage. Alfalfa is looking pretty good with little to no leafhopper burn in later harvested alfalfa. Check alfalfa for potato leafhopper as they are building quickly as shown in one field in the picture above.

Corn



Current stage of corn (V7)



Moisture-stressed corn in a compacted area

Corn has taken off. Corn is gaining color, but is still chlorotic in areas in many fields. Crop quality stayed about even although changed some this week! I'm still not impressed with the crop! I rated the corn crop at 8% excellent, 29% good, 59% fair, 4% poor, and 0% very poor. Last week I rated the corn crop at 3% excellent, 32% good, 52% fair, 10% poor, and 3% very poor. The largest corn at this time is at the V8 stage (eighth collar visible). The range in corn is from emergence to V8 stage. Most corn is at the V7 (seventh collar) to V8 (eighth collar) stage. The corn is still short for its age! No leaf diseases are present yet. All of the early planted corn has been side-dressed and most postemergence herbicide have been applied as well.

Soybean



Most developed soybean (R1)



Field of soybean



Preemergence herbicide damage



Postemergence herbicide damage

All soybeans are planted now, except for double-crop soybean. I downgraded the soybean crop again this week because of the dry weather and herbicide damage! The current condition of soybean in the county is 10% excellent, 45% good, 41% fair, 4% poor, and 0% very poor. Last week's crop condition was 16% excellent, 40% good, 33% fair, 10% poor, and 1% very poor. The most advanced soybean is at the R1 (beginning flower) stage, but most are at V3 (3rd trifoliolate leaf unrolled) to V4 (4th trifoliolate leaf unrolled). I saw preemergence and postemergence soybean injury this week. Some fields have now been sprayed postemergence. I found a field where at the edge the soybeans are deficient in potassium.

Weeds



Giant ragweed still emerging!



Giant ragweed still in corn!

The latest in the dicamba lawsuit is that farmers and retailers are allowed to use dicamba products in stock until June 30th in Ohio. There are many soybean fields with high densities of volunteer corn! Please take them out in the first herbicide application. I found giant ragweed still in corn, so scout fields as we are nearing the end of postemergence herbicide applications in corn. If spraying early corn, drop nozzles should really be used now based upon the stage of corn development. Get herbicides applied to soybean now if using Flexstar and glufosinate as you are supposed to stop using them at beginning flower stage! Thankfully most waterhemp is growing slowly, but that will change now with the rainfall. Check fields after application to see if a second postemergence herbicide application is warranted.

Insects/Other



Leaf hopper damage in alfalfa

The biggest insect news is potato leafhopper. Scout fields ASAP based upon the photo above. This was only one field, but it will get bad quickly. No other insect issues at this time.

With the cancellation of dicamba products applied to dicamba soybean, I did not update the label information below. Not sure of label changes for Engenia (<https://agro.basf.us/campaigns/engenia/tankmixselector/>), XtendiMAX (<http://www.xtendimaxapplicationrequirements.com/Pages/default.aspx>), FeXapan (<https://www.corteva.us/products-and-solutions/crop-protection/fexapan/tank-mix-partners.html>), and Tavium (<http://www.syngenta-us.com/herbicides/tavium-tank-mixes>) this week. The Engenia label still has the most approved products compared to XtendiMAX and FeXapan. No new herbicide was added to the XtendiMAX label this past week, which totals 252 herbicides. No new adjuvant was added the XtendiMAX label, now totaling 442. No new nozzles were added to the XtendiMAX label, which totals 44. No new Drift Reducing Adjuvant (DRA's) were added to the XtendiMAX label this week, making a total of 107 DRA's. No nutritional products were removed from the XtendiMAX label which totals 259. No new products were added to the Insecticides, Fungicides, Insecticides plus Fungicides, Plant Growth Regulator and Other group on the XtendiMAX label which totals 115. No new adjuvants were added to the Engenia label, which now totals 600. No new herbicides were added to the Engenia label, which brings the total herbicide count to 204. No new products were added to the Other category (growth regulators and fungicides) on the Engenia label, which totals 37. No new insecticides were added to the Engenia label which currently has 49 products. No new Drift Reducing Adjuvants (DRA's) were added to the Engenia label, which totals 131. No new nozzles were added to the Engenia label, which totals 31. No new nutritional products were added to the Engenia

label which totals 231 products. No new products was added to the pH Modifier group of the Engenia label which totals 17 products. The FeXapan label has many of same the products and nozzles as the XtendiMAX label, but NOT all are the same, so check the FeXapan label carefully. The FeXapan website has changed drastically! They now have DRA's listed for each product type that must be mixed with FeXapan. There are some products that need no DRA added! There are 13 glyphosate formulations, 229 herbicides, 41 insecticides, 17 fungicides, 96 DRA's, 317 adjuvants, 204 nutritionals, 30 plant growth regulators, 18 other products, and 46 nozzles that have been approved for the FeXapan label. There are 47 herbicides, 101 DRA's, 316 adjuvants, 96 nutritionals, 16, insecticides, 7 fungicides, 8 other products, and 41 nozzles approved for use with Tavium.

Enlist One and **Enlist Duo** for Enlist soybeans and corn also have approved tank-mix partners and nozzles like the dicamba products. **There were no changes to the labels this week.** The list of approved tank-mixtures for both of these products has been updated. Please follow these labels online at <https://www.enlist.com/en/herbicides.html>. There are 48 nozzles, 143 herbicides, 19 glyphosate formulations, 9 glufosinate formulations, 11 Dry AMS products, 85 insecticides, 30 fungicides, 21 plant growth regulators, 645 other products, and 315 fertilizers / nutrients labeled with Enlist One. There are 23 nozzles, 74 herbicides, 48 insecticides, 17 fungicides, 22 plant growth regulators, 8 Dry AMS products, 512 Other products, and 168 fertilizers / nutrients labeled with Enlist Duo.

Other information about the Enlist products include the following:

1. Enlist Duo rate is 4.75 pts/A which only has 1.0 lbs ae/A of glyphosate which is really not enough. You would think you could just add more glyphosate, but you CAN NOT add more glyphosate with Enlist Duo.
2. Enlist One can be mixed with ANY rate of glyphosate, glufosinate and 192 other herbicides.
3. Never use Enlist One alone on Enlist crops and always apply Enlist One at 2 pts/A
4. You CAN NOT add glufosinate with Enlist Duo!
5. When adding a postemergence grass soybean herbicide like quizalofop, clethodim, sethoxydim, or fluazifop to Enlist One add 33% higher rate of these products to reduce the antagonism with grasses OR apply the postemergence grass herbicides 7 days after the Enlist One.

Upcoming Meetings

1. **Auglaize County Farm Talk.** Every Tuesday from 8:30 to 9:30 AM we will have a virtual agricultural meeting. Next week's topic is the weather and more. The link to get onto the meeting is as follows: <https://osu.zoom.us/j/2119847503> If you just want to call in the phone number and meeting code are as follows: 646-876-9923 2119847503#
2. **The OSU Farm Office is Open.** The OSU Extension Farm Office Team will open our offices online and offer biweekly live office hours on Thursdays from **9:00-10:30 am** EST. This week there will be a meeting!! Each office session is limited to 500 people and if you miss our office hours, we'll post recordings on farmoffice.osu.edu the following day. **Register at <https://go.osu.edu/farmofficelive>.**
3. **All OSU Extension face to face meetings have been cancelled or postponed through July 6th. Meetings after this date will go on as planned at least until further notice.**

Answer to joke: A neigh-bor!!

The Nature Conservancy Seeks Cover Crop Farmers in the Maumee River Watershed

DEFIANCE, Ohio (June 9th, 2020) – The Nature Conservancy is looking for farmers who are currently utilizing cover crops on their farms in the Maumee River Watershed of the Western Lake Erie Basin. We are looking for a diverse group of farmers; large acreage, small acreage, corn and soy, small grains, livestock, new and experienced, willing to reach out and share their knowledge and experiences with other farmers in their area. Selected farmers will be compensated for their time. If you are interested in being part of this exciting farmer led outreach project and would like to apply as a Farmer Advocate for Conservation please complete the online application form by using this [Link](#). Or by contacting Stephanie Singer, Stephanie.Singer@tnc.org, Phone: 419-782-0652.

The Nature Conservancy will work with multiple partners including the Ohio Farm Bureau Federation, American Farmland Trust, National Wildlife Federation, and the Ohio State University to train farmers in the Maumee River Watershed to become technical experts and community leaders for sustainable agriculture. The project will train 60 farmers, 20 per group in three groups over a 3-year period in the Maumee River Watershed to engage another 3,000 farmers in education and outreach activities, which may lead to wider adoption of the new best management practices aimed at improving soil health and water quality management at the farm level.

“This is an opportunity for farmers to take the knowledge they’ve gained on their own farm and make an impact in a larger area. We want people (farmers) who realize the importance of soil health goes beyond their own farm and who want to see farming be successful. The future of farming depends on soil health.” said Stephanie Singer, outreach education specialist at the Western Lake Erie Project Office.

The application window for the first round of advocate selection is open from the beginning of May till the end of July 2020. The top 20 candidates will be notified of their acceptance as Farmer Advocates for Conservation in the fall when they will be given a complete schedule of training sessions to begin in January of 2021. This project is funded by the Great Lakes Restoration Initiative which will allow Farmer Advocates to be compensated for their time.

Farmers interested in participating as a Farmer Advocate for Conservation can complete the [online application form](#). To nominate a farmer you believe would be an excellent candidate as Farmer Advocates for Conservation please complete the [online nomination form](#), or please contact Stephanie Singer, Stephanie.Singer@tnc.org. Phone: 419-782-0652.

Preparing for wheat harvest



We are getting closer to wheat harvest. I estimate wheat harvest should begin sometime next week. This is going to be a challenging wheat harvest for some due to the presence of Fusarium head blight. Luckily not everyone will need to deal with this as the fungicide application seemed to do pretty well.

Preparing the grain bin is critical to controlling insect problems since wheat is the most likely grain to have pest problems. Hopefully your bins have already been prepared for filling. It is best to prepare them at least two weeks in advance and preferably longer. If still needing to prepare the bin be sure ALL grain is removed from the inside and outside of the bin, including below the floor. Remove all vegetation from around the outside of the bin. Inspect all augers and be sure they are working properly and lubricate them as necessary. If wheat will be stored for a long period of time consider spraying an insecticide on the walls and floor of the bin.

Prepare the combine by greasing and oiling all parts of the combine and making sure all parts are in working order. Check all sickle sections and replace all dull or broken sections.

Setting up the combine is extremely critical to harvesting quality grain with minimal loss. It is recommended to set the cylinder/rotor and concave spacing to $\frac{1}{4}$ inch with a range of $\frac{1}{8}$ to $\frac{1}{2}$ inch. Set the cylinder/rotor speed to 1000 revolutions per minute (rpm) with a range of 750 to 1350 rpm. Set the fan speed or choke near the high end with a range of medium to high. The fan will likely need to be set near the maximum to remove as many scabby kernels as possible. The recommended sieve opening is $\frac{1}{4}$ inch with a range of $\frac{1}{8}$ to $\frac{3}{8}$ inch. The recommended chaffer opening is $\frac{5}{8}$ inch with a range of $\frac{1}{4}$ to $\frac{3}{4}$ inch. The sieve and chaffer settings may need adjusted further than normal to remove the scabby kernels.

Estimating yield loss when harvesting is very important to properly adjusting the combine. To check for harvest loss, stop the header and combine speed simultaneously. Once the header has stopped operating back

the combine up about 20 feet then turn off the threshing unit followed by the engine. Take a one foot square frame and place it three times in the standing wheat ahead of the header and count the number of wheat kernels in each square and take an average. This is the preharvest count. Repeat the three square count in the area between the standing wheat and the header. This is the header count. Now take the header count and subtract the preharvest count and divide by 20. This is the header loss per acre. Twenty is used in the calculation because this is considered to be the number of kernels in a square foot equal to one bushel per acre spread across the entire field. Go behind the back of the combine and lay the counting frame down three times in the area between the tires counting the seeds in each square and obtaining an average. This is the separator count. Take the separator count and subtract the header count and divide by 80 (number of kernels per square foot behind separator discharge to equal 1 bushel per acre with no spreading device). Eighty is replaced by 65 if a bat type spreader is used, by 50 if a straw chopper is used, and by 25 if a chopper and chaff spreader are used. The goal is to have harvest losses below 2% of total yield. To summarize combine settings, operation and estimating yield loss check out the publication "Harvesting Wheat" from Kansas State University (<https://www.bookstore.ksre.ksu.edu/pubs/MF2026.pdf>).

Once the moisture of the wheat reaches 20% begin harvesting. This is more important than normal since Fusarium head blight can be found in some fields. Harvesting at 20% moisture and air drying will result in higher test weight and quality. Harvesting 20% moisture wheat when field conditions are fit will reduce the chance that rain will reduce grain quality from sprouting and vomitoxin (which will be a problem this year where Fusarium head blight is present). Definitely harvest wheat before it reaches 14% moisture because kernel damage will occur below this moisture. Wheat can lose 2.5% moisture each day. Check with your local elevators to determine what their discount rate is for delivering wheat above 14%. Do not fill the bin beyond 9 feet when air drying wheat because wheat reduces air flow more than corn.

C.O.R.N. Newsletter

<https://agcrops.osu.edu/newsletter/corn-newsletter>

What a Difference a Year Makes in the Weather

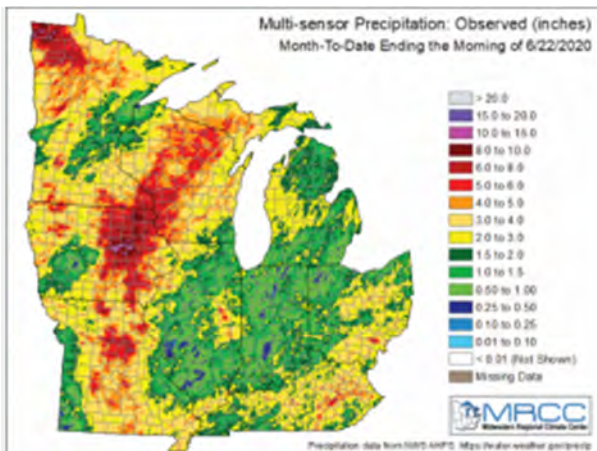


Figure 1: Multi-sensor observed month-to-date precipitation ending on June 22, 2020. Figure from the Midwestern Regional Climate Center (<https://mrcc.illinois.edu>).

Things change quickly when it comes to weather and climate. Recall 2019, a record wet start to the year for many across Ohio, only to see 26% of the state enveloped in moderate drought conditions by October. Though not nearly as wet as last year, it has been wetter than average through the first five months of 2020.

Since our calendar flipped to the meteorological summer on June 1, however, precipitation has all but turned off across western and northwest Ohio (Figure 1). Most areas here have seen an inch or less of rainfall. Community Collaborative Rain, Hail and Snow Network ([CoCoRaHS](#)) observers in Ada, Napoleon, and Lima have only recorded 0.18”, 0.29”, and 0.40” of rainfall so far for the month! With warm summer conditions, this has led to intense evaporation rates and rapidly drying soils. To submit a report of drought impacts for your area, consider the [Drought Impact Reporter](#). For more information on recent climate conditions and impacts, check out the latest [Hydro-Climate Assessment](#) from the [State Climate Office of Ohio](#).

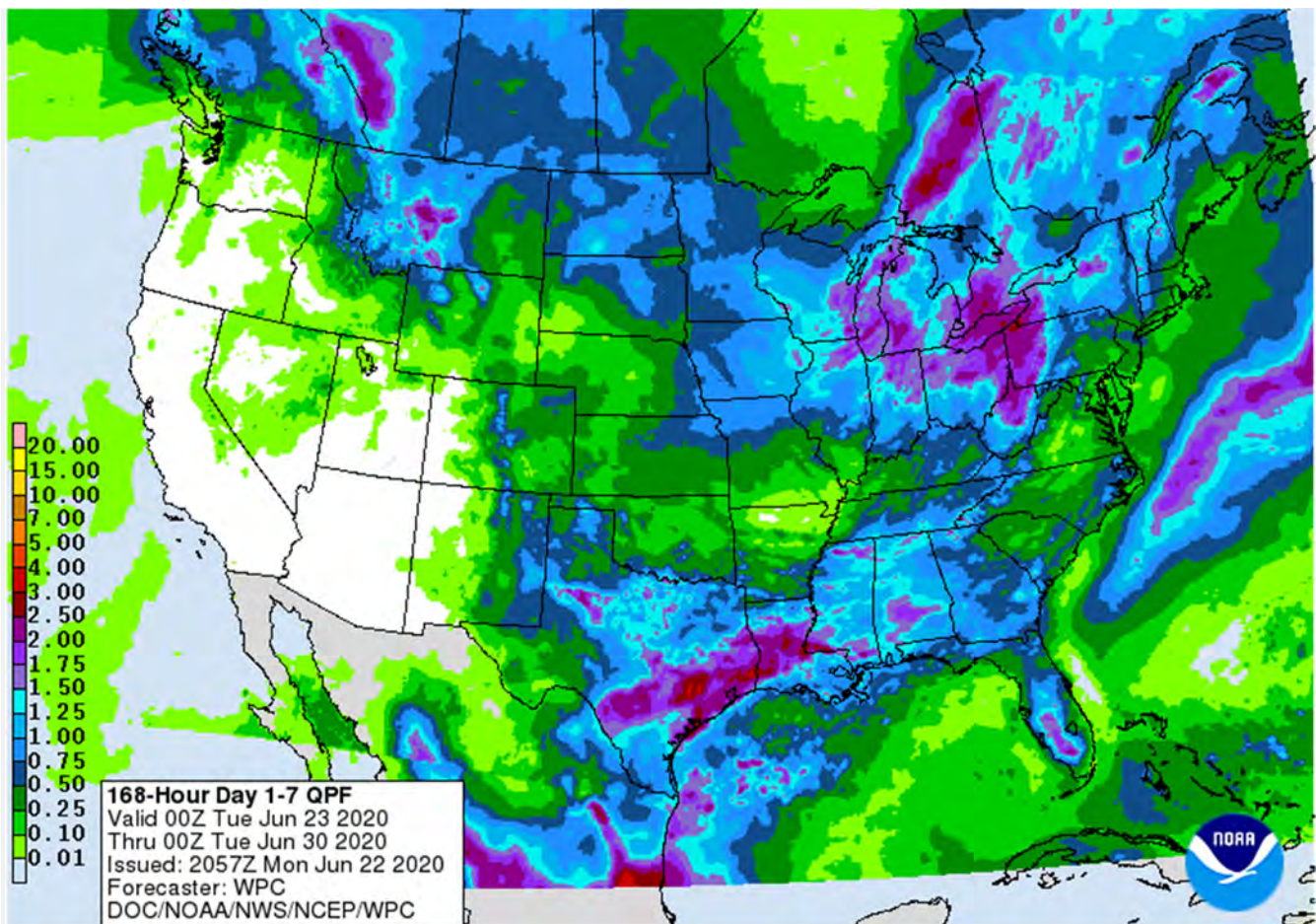


Figure 2: Forecast precipitation for the next 7 days. Valid from 8 pm Monday June 23, 2020 through 8 pm Monday June 30, 2020. Figure from the Weather Prediction Center <https://www.wpc.ncep.noaa.gov/>.

A cold front slowly moving through the region on Tuesday this week will provide a focus for showers and storms across the state. Behind this front, cooler and slightly less humid air will move in for Wednesday through Friday, with highs in the low to mid-70s across northern Ohio and mid to upper 70s across southern Ohio. Temperatures will moderate back into the 80s for the weekend. Though a few scattered storms cannot be ruled out for Wednesday through Friday, typical summertime storms will return for the weekend. Overall, we are expecting 1-2" of rain over the next seven days across northern Ohio, with 0.50-1.25" across our southern counties (Figure 2). There could be locally heavier rainfall where stronger storms occur. The latest [NOAA/NWS/Climate Prediction Center](#) outlook for the 6-10 day period (June 28 – July 2) shows elevated probabilities of *above-average temperatures and above-average precipitation* (Figure 3). This scenario strongly points to warmer than average overnight lows throughout the region. Normal highs during the period should be in the low- to mid-80s (north to south), normal lows in the low- to mid-60s, with 1.05-1.20 inches of rainfall per week. The [16-Day Rainfall Outlook from NOAA/NWS/Ohio River Forecast](#)

Center supports above-average precipitation over the next couple of weeks.

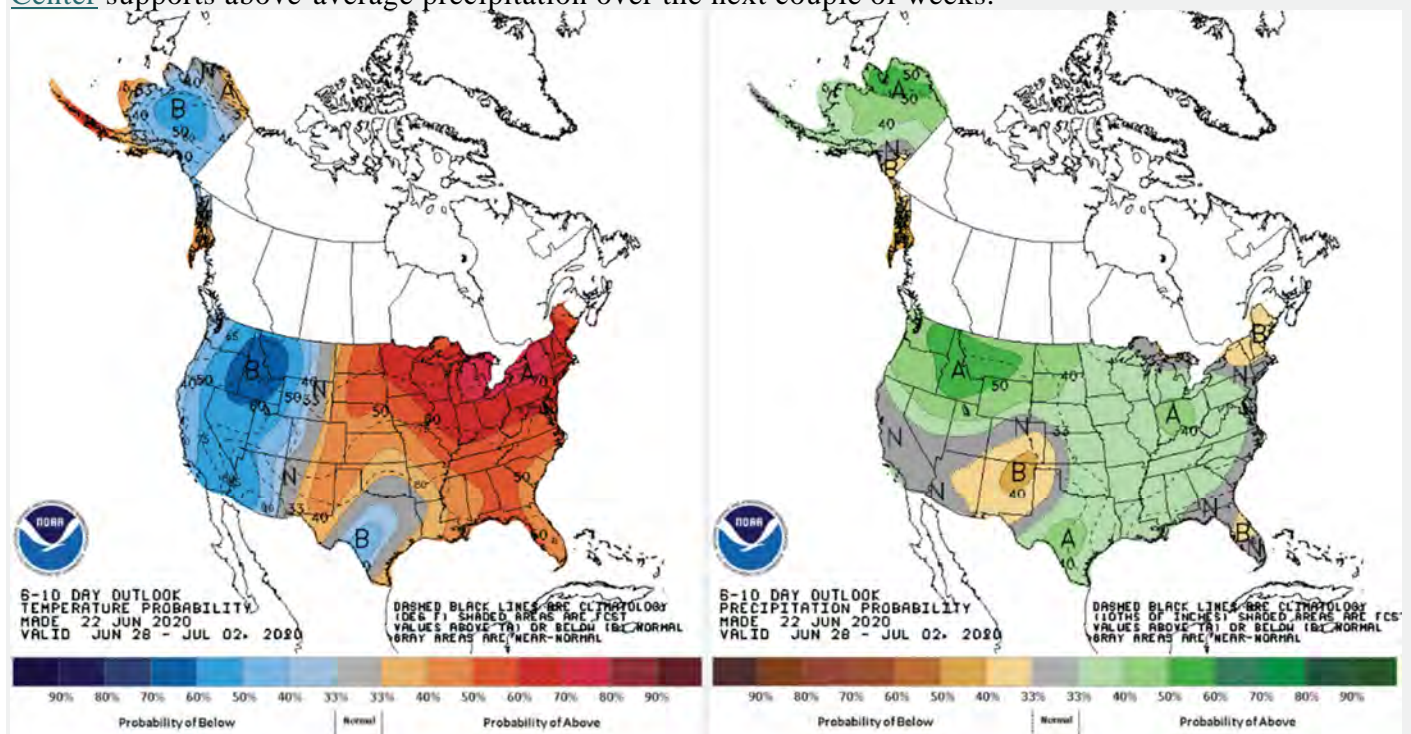


Figure 3: Climate Prediction Center 6-10 Day Outlook valid for June 28 – July 2, 2020 for left) temperatures and right) precipitation. Colors represent the probability of below, normal, or above normal conditions.

Author(s):

Aaron Wilson

The 6th Annual National Forage Week!



The 6th Annual National Forage Week is being celebrated on June 21-27, 2020, to raise awareness of the importance and impact of forages in our lives. The American Forage and Grassland Council have prepared a cool video of the impact and influence of forages, which you can access at <https://nationalforageweek.org>.

Author(s):
Mark Sulc

Dicamba battles continue: court allows dicamba use



There was a great deal of action last Friday in the case that vacated the registrations of XtendiMax, Engenia, and FeXapan dicamba-based products. Despite a barrage of court filings on Friday, however, nothing has changed the current legal status of the dicamba products in Ohio, and **Ohio growers may use existing stocks of the products now. Still, they must end-use by June 30th, 2020.**

Here's a rundown of the orders that the Ninth Circuit Court of Appeals issued in the case last Friday:

The court denied the emergency motion that the petitioners (National Family Farm Coalition, Center for Food Safety, Center for Biological Diversity, and Pesticide Action Network North America) filed on June 13th. That motion asked the court to enforce its previous mandate to vacate the registrations, to prevent any further use of the products, and to hold the EPA in contempt for issuing the Cancellation Order the agency had made that allowed continued use of existing stocks of the products. The court did not provide its reasoning for denying the motion.

The court granted amicus curiae (friend of the court) status to CropLife America and American Farm Bureau (representing itself as well as national soybean, cotton, wheat, corn and sorghum association interest.) Those parties filed their amicus curiae briefs in support of the EPA's Cancellation Order and opposition to the petitioners' emergency motion.

The court also granted emergency motions to intervene in the case filed by BASF Corporation, maker of Engenia, and DuPont (Corteva), maker of FeXapan. The companies argued that they did not know that the scope of the court's order on Bayer's XtendiMax product registration would also affect their dicamba product registrations, and they should now be permitted an opportunity to defend their products.

BASF filed a motion asking the court to recall the court's mandate that had canceled the registrations of the products, claiming that the court had not followed appropriate procedural rules. In its brief, BASF also suggested that the company would be filing petitions for rehearing since BASF had not had an opportunity to be heard when the court vacated the registration of its Engenia product.

The court ordered the original petitioners to file a brief in response to BASF's motion to recall the mandate by June 23rd, and for BASF to reply to that brief by June 24th.

The companies that make the dicamba products clearly intend to challenge the vacatur of their product registrations, even though the EPA's Cancellation Order allows the continued use of existing stocks of the products until July 30th, 2020. This dicamba battle is not yet over, and we'll keep you posted on new developments.

Read our previous posts on the court's vacatur in National Family Farm Coalition [here](#), on the EPA's Cancellation Order [here](#), and on the Ohio Department of Agriculture's ruling on the use of the products in Ohio [here](#).



Author(s):
Peggy Hall

Soybean Vegetative Growth Stages- VC vs V1



Across the state, soybean growth and development is variable, ranging from early vegetative stages to flowering. However, there has been some confusion regarding the identification of the VC and V1 growth stages. This confusion is mostly due to two definitions of V1...that actually mean the same thing. The Fehr and Caviness Method (1977) is based on the number of nodes that have a fully developed leaf, whereas Pederson (2009) focuses more on leaf unrolling so that the leaf edges are no longer touching. The VC definition for both methods is the same, but the differences start to appear between the methods at V1. Fehr and Caviness define V1 as “fully developed leaves at unifoliolate nodes,” which also means that there is “one set of unfolded trifoliolate leaves unrolled sufficiently, so the leaf edges are not touching.” This second definition is common in extension publications (Pedersen, 2009).

Stage	Definition	
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<p>VC</p>	<p>Fehr and Caviness (1977)- Unifoliolate leaves sufficiently unrolled, so the leaf edges are not touching</p> <p>Pederson (2009)- Unifoliolate leaves unrolled sufficiently, so the leaf edges are not touching</p>	
<p>V1</p>	<p>Fehr and Caviness (1977)- Fully developed leaves at unifoliolate nodes</p> <p>Pedersen (2009)- One set of unfolded trifoliolate leaves unrolled sufficiently, so the leaf edges are not touching</p>	
		<p><i>Photo credits: Greg McGlinch and Fabiano Colet</i></p>

Soybean growth stages are described in the OSU Corn, Soybean, Wheat, and Forages Field Guide (available for purchase here: <https://extensionpubs.osu.edu/corn-soybean-wheat-and-forages-field-guide-pdf/>). A visual guide to soybean staging is available as a pdf from Dr. Shawn Conley at the University of Wisconsin-Madison (https://coolbean.info/library/documents/2017_Soybean_GrowthDev_Guide_FINAL.pdf).

Author(s):

Laura Lindsey

Other Articles

Weed's wily ways explained

Date: June 17, 2020

Source: University of Illinois College of Agricultural, Consumer and Environmental Sciences

Source: <https://www.sciencedaily.com/releases/2020/06/200617121440.htm>

Like antibiotic-resistant bacteria, some herbicide-resistant weeds can't be killed by available chemicals. The problem affects more than just the errant weed in our driveways; herbicide-resistant weeds threaten our food supply, stealing resources and

outcompeting the crops that make up our breakfast cereal and feed the nation's livestock.

The weed that represents the biggest threat to Midwestern corn and soybean production, waterhemp, has outsmarted almost every kind of herbicide on the market today.

University of Illinois scientists are working to reveal waterhemp's tricks. Through years of research, they discovered the weed can ramp up production of detoxifying enzymes that neutralize certain herbicides before they can disrupt essential cellular processes. Metabolic resistance, as this strategy is known, is just one process by which waterhemp evades herbicides. Unfortunately, because there may be hundreds of detoxifying enzymes involved, metabolic resistance is hard to identify and even harder to combat.

In two recent studies, Illinois researchers explain metabolic resistance to three commonly used herbicides in waterhemp, getting closer to finding important genetic cues. Results also confirm the importance of using a multi-pronged approach to waterhemp control.

"These waterhemp populations are adapting and evolving incredible abilities to metabolize everything. It's bad news, but at least we understand the mechanisms better. And ultimately, that understanding could potentially be exploited to use waterhemp's metabolic arsenal against itself," says Dean Riechers, professor in the Department of Crop Sciences at Illinois and co-author on both studies. "That's one interesting way our research could be directly applied to controlling this weed."

Last year, Illinois researchers documented resistance to Group 15 herbicides in waterhemp. This group of herbicides, including S-metolachlor, targets very-long-chain fatty acid production in sensitive plants. The researchers suspected it was also a case of metabolic resistance, and the Illinois team, led by graduate student Seth Strom, has now confirmed it in a study published in *Pest Management Science*.

"We were the first group in the world to show resistance to Group 15 herbicides in waterhemp, and now we have identified the mechanism behind it," Riechers says. "Again, it's not good news because it means we're running out of herbicides, and in this case it involves pre-emergence herbicides."

The study suggests two classes of detoxifying enzymes, known as GSTs and P450s, appear to neutralize S-metolachlor in resistant waterhemp.

Group 15 herbicides can be safely used in corn because the crop uses GSTs to naturally detoxify the chemicals; in other words, corn has a natural tolerance to these chemicals. Strom's research suggests waterhemp is not only able to mimic corn's natural detoxification mechanism, but it evolved an additional way to avoid being harmed by S-metolachlor.

Honing in on the two classes of detoxifying enzymes is not the end of the story, however. Because plants have hundreds of enzymes in each class, the researchers have more work ahead of them to identify the specific genes that are activated.

In a separate study, Riechers and another group of Illinois scientists revealed more of waterhemp's metabolic secrets.

"We have known for the last 10 years that whenever we see waterhemp with resistance to an HPPD inhibitor in the field, such as mesotrione, it has always shown metabolic atrazine resistance, too. However, it is possible for waterhemp to be resistant to atrazine and not mesotrione," Riechers says.

The apparent association between mesotrione and metabolic atrazine resistance could be coincidental, but given how often the resistances co-occur, Riechers thought the genes controlling resistance for the two chemicals might be shared or linked.

In a study published in *Weed Science*, graduate student Kip Jacobs demonstrated an overlap in the genes responsible for metabolic atrazine and mesotrione resistance. Because researchers already knew the single gene for metabolic atrazine resistance, the results get them closer to understanding the genes conferring mesotrione resistance.

"Whenever we find out whether it's two or three or four genes involved in mesotrione resistance, our results tell us one of them should be the metabolic atrazine resistance gene," Riechers says. "We know which one that is."

Unfortunately, even if researchers are able to trace each resistance trait back to the genetic level, that won't ensure an easy solution to the problem. Experts say there are no new herbicide sites-of-action coming into the marketplace, so farmers will need to consider alternative methods of weed control.

"With metabolic resistance, our predictability is virtually zero. We have no idea what these populations are resistant to until we get them under controlled conditions. It's just another example of how we need a more integrated system, rather than relying on chemistry only. We can still use the chemistry, but have to do something in addition," says Aaron Hager, associate professor in the Department of Crop Sciences at Illinois and co-author on the Pest Management Science study. "We have to rethink how we manage waterhemp long term."

University of Illinois College of Agricultural, Consumer and Environmental Sciences. "Weed's wily ways explained." ScienceDaily. ScienceDaily, 17 June 2020.
<www.sciencedaily.com/releases/2020/06/200617121440.htm>.

Crop residue decisions affect soil life

Date: June 17, 2020

Source: American Society of Agronomy

Source: <https://www.sciencedaily.com/releases/2020/06/200617091007.htm>

In some ways, farming is like cooking. Cooking would be much easier if we could leave the kitchen after eating and not come back until we make the next meal. But someone needs to put away the leftovers, do the dishes, and clean up the table.

Similarly, there's work to do in farm fields after harvest and before planting the next spring.

After harvest in the fall, farmers take the harvested crops to market or store them on their farm. They don't take the whole plant from the field, though.

The leftover parts of the plant, like the stalk and leaves from corn, remain in the field. This debris is called crop residue.

Using no-till and prescribed fire management are two potential ways to manage crop residue. Both practices help keep organic matter and nitrogen in the soil. However, research was needed to understand how these two practices can affect long-term soil health.

Lisa Fultz and her team want to help farmers determine the best way to manage their residue between growing seasons. To do this, her team decided to learn more about how no-till and prescribed fire management affect nutrients and microbes in the soil. Fultz is a researcher at Louisiana State University AgCenter.

No-till is a practice where farmers plant directly into the crop debris from the previous year. Prescribed fires are used to purposely burn off the previous crop debris with controlled fire. "Both of these practices have minimal physical disturbance to the soil," says Fultz.

Both of these practices also come with drawbacks. No-till can cause poor conditions for crop growth like low spring temperatures and increased moisture, which promotes disease. Prescribed fire can leave bare soil vulnerable to erosion.

The team focused the research on wheat and soybean rotations and continuous corn production systems. "These are common practices not only in the mid-south, but across many areas of the world," explains Fultz.

"Wheat and corn production leave behind residue," she says. "Common practices, like conventional tillage, are highly disruptive. The need to identify viable conservation practices is growing in importance."

Crop residue and its degradation by soil microbes is an important part of the carbon cycle. Plants store carbon during the growing season, then microbes use the plant residue for food. The carbon then gets stored in the soil in a chemically stable form.

"Fresh, green material in no-till fields is easy to breakdown and provides rich nutrients for soil microbes," says Fultz. "Ash from burned residue is more chemically stable, but it doesn't provide a nutrient source for microbes."

The team found that impacts from crop management practices, like crop rotation or fertilization, outweighed the influence of prescribed fire for residue management. Researchers found some decreases in microbial activity after yearly prescribed burns.

Findings show prescribed fire had some possible short-term benefits for soil nutrient availability, but timing is crucial. Prescribed burning of wheat residue provided an increase of nitrogen for about 7 days. These benefits should be weighed against other possible impacts, like carbon dioxide production and crop yield.

We still need to learn the long-term influence of prescribed fire on the soil biological community," says Fultz. "While short-term impacts were measured, the long-term influence on soil nutrients, biological cycles and soil health are not known."

No two farm management systems are the same, and their success is defined by the user. Scientists continue to examine possible scenarios to provide accurate and sustainable recommendations to farmers.

"I have always been interested in soil conservation and the potential it has to impact many facets of life," says Fultz. "By improving soil health, we can improve air and water quality, store carbon, and provide stable resources for food production."

American Society of Agronomy. "Crop residue decisions affect soil life." ScienceDaily. ScienceDaily, 17 June 2020. <www.sciencedaily.com/releases/2020/06/200617091007.htm>.

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