Hello Northeast Ohio Counties!

I hope you are all staying safe and healthy this holiday season. We are working to bring you many educational programs in the next few months including pesticide training, Master Gardener events, and many other topics that we hope you find useful. Stay tuned for updates each week.

If you are already tired of being stuck in the house after harvest, you can still get out to test for soybean cyst nematode. I can help if you are interested just give us a call!

Have a great week!

Lee Beers  Andrew Holden  Angie Arnold
Trumbull County  Ashtabula County  Portage County
Extension Educator  Extension Educator  Extension Educator
Little Mouse, Big Problems!
By: Christine Gelley
Source: https://u.osu.edu/beef/2020/12/09/little-mouse-big-problems/

The damage that a little mouse can do to electrical systems may have great impacts on the functionality of farm equipment. Before putting equipment in storage for winter, do routine maintenance, including preventing mice from taking up residence in your tractor cab.

One quarter of house fires with undetermined causes are assumed to be caused by rodents chewing on electrical wires. This can also be the cause of many tractor malfunctions. With the risk of electrocution, it makes you wonder why would they chew on electrical wires in the first place?

The answer is easy. They chew on everything. Mice, rats, and other rodents have teeth that are constantly growing and therefore they are constantly gnawing on any material they can find to file their teeth. Electrical wires are often hidden from view in places that would be cozy for rodent nests and offer convenient access to wire insulation to chew. People rarely notice damage to the wires until an electrical system fails to work when they need it.

Modern farm equipment operates on a series of electrical systems to connect systems to each other and enable safety functions. A weakness somewhere in the circuit could cause malfunctions to the main electrical system, throwing codes, and triggering safety shut offs.

For example, if a mouse exposes wires to a seat sensor, the motor may refuse to run because it seems that the seat is empty. Imagine this happened to you. Your first idea may be to check if something is wrong with the motor or the battery, but upon inspection you find nothing wrong, and call your mechanic for help. Upon diagnosis, the issue traces back to the electrical system. Your mechanic flips up the tractor seat and finds a mouse nest, damaged wiring, and a faulty sensor. A mouse nest has now cost you hourly fees, parts, and delayed work. In a worse scenario, the damage to the wire coating could be minor and just cause heat to emit from the wires, then short circuit, spark, and catch on fire, melting your wiring harness. The damage can be frustrating, dangerous, and expensive to repair.
Traps and rodenticides are not very effective at controlling rodents on the farm. A barn cat is a helpful teammate, but the most effective control for rodents is preventing entry into storage spaces. It may seem impossible to seal every crack but do the best you can. Mice can squeeze through areas that are a quarter inch squared and rats through a half inch squared. Adding hardware cloth to ventilation spaces can help prevent entry. Keep vegetation around storage buildings trimmed down to reduce hidden entries and passage corridors.

Rodent damage can also be an issue in frequently used machinery during the winter. Mice can scurry away while the equipment is running and return after it is parked again to bask in the radiant warmth after you do chores. Both cabbed and open station equipment can harbor rodents.

Remove any food or loose fabric material from your tractor cab to deter feeding and nest creation. Occasionally inspect your tractor throughout the winter to watch for nesting. Even if the cab or other compartments appear sealed there may be alternative entry points, such as the wheel wells or the firewall, where they can enter and make a cozy nest.

My spouse is an ag mechanic and he frequently shares stories from his day that involve rodent damage, electrical failure, and even damage to cabin air filters. The photos are examples of rodent nests in tractors that caused electrical system failures. One from a tractor with a cab and the other without. A little mouse can cause big problems and go undetected by even the most experienced tractor operators.

Inspect your equipment before and throughout winter storage as well as before use in the spring to scout for rodent damage in hidden spaces. Don’t forget to check your filters, batteries, and tires for replacement or repair at the same time. Consider scheduling maintenance appointments in the off season for swift return before the equipment is needed again in full force.
Male weeds may hold key to their own demise
By: Alayna DeMartini
Source: Materials provided by University of Illinois College of Agricultural, Consumer and Environmental Sciences. Original written by Lauren Quinn. Note: Content may be edited for style and length. https://www.sciencedaily.com/releases/2020/12/20121115452.htm

Scientists are getting closer to finding the genes for maleness in waterhemp and Palmer amaranth, two of the most troublesome agricultural weeds in the U.S. Finding the genes could enable new "genetic control" methods for the weeds, which, in many places, no longer respond to herbicides.
"If we knew which genes control maleness and we could make those genes proliferate within the population, every plant in the field would be a male after a few generations, and theoretically, the population would crash," says Pat Tranel, professor and associate head in the Department of Crop Sciences at the University of Illinois and lead author on a study in New Phytologist.

Tranel and his colleagues had previously identified molecular markers associated with the male genomic region. After sequencing male genomes for both species, the researchers were able to use those markers to zero in on the male-specific region. Now, they are within 120 to 150 genes of finding their target.

"We're confident most of those 120 or so genes are probably doing nothing. It's just stuff that's accumulated in that region of the genome," Tranel says. "If I had to guess, I'd say maybe 10 of them are actually doing something relevant."

Narrowing down the genes related to gender in these weeds could have practical value for control, but the study also sheds light on the phenomenon of dioecy -- male and female sexual organs on separate individuals -- more generally. The vast majority of animals are dioecious, but it's rare in plants. More than 90% of flowering plants have both sexual organs on the same individual, and often within the same flower. Waterhemp and Palmer amaranth, however, are dioecious.

Dioecy means it's impossible for a plant to self-pollinate; instead, female gametes must be fertilized by male pollen from another plant. That's a good thing for ensuring genetic diversity in a population. And it's likely what has made waterhemp and Palmer amaranth so successful at evading the detrimental effects of multiple herbicides.

"To date, waterhemp and Palmer amaranth have evolved resistance to herbicides spanning seven and eight modes of action, respectively. Dioecious reproduction results in all these resistance traits being mixed and matched within individuals. This mixing has allowed populations of both species to combine multiple herbicide resistances, leaving producers with few effective herbicide choices," Tranel says.
Understanding the rare phenomenon of dioecy in plants can help scientists piece together how traits are inherited from each parent, and to understand how the phenomenon evolves.

Unlike in animals, in which dioecy is thought to have evolved just once, scientists believe dioecy in plants has evolved numerous times. And, according to Tranel's study, it appears to have evolved independently in waterhemp and Palmer amaranth, two very closely related species.

"I'm not ready to say we absolutely know they evolved separately, but all the information we found supports that idea. Only two of the 120-150 genes were similar to each other across the two species," Tranel says.

One of those shared genes, Florigen, helps plants respond to day length by initiating flowering. Tranel doesn't know yet whether it determines the gender of flowers, but he's intrigued that it showed up in the male-specific Y region for both species.

"We don't know for sure, but maybe it's involved with males flowering earlier than females. That could be advantageous to males because then they'd be shedding pollen when the first females become receptive. So if, in fact, Palmer and waterhemp really did evolve dioecy separately, but both acquired this Florigen gene for a fitness advantage, that would be a cool example of parallel evolution."

Tranel hopes to narrow down the male-specific Y region in both species even further to isolate the genes that determine maleness. There's no guarantee a genetic control solution will be developed once those genes are identified -- Tranel would likely need to attract industry partners for that -- but having such a tool is not as far off as it once was.

**Microbes and Plants: A Dynamic Duo**

By: Emily Matzke

Drought stress has been a major roadblock in crop success, and this obstacle will not disappear anytime soon. Luckily, a dynamic duo like Batman and Robin, certain root-associated microbes and the plants they inhabit, are here to help.

Plants and animals have a close connection to the microbes like bacteria living on them.
The microbes, the creatures they inhabit, and the environment they create all play a critical role for life on Earth.

“We know that microbiomes, which are the communities of microorganisms in a given environment, are very important for the health of plants,” said Devin Coleman-Derr.

Coleman-Derr, a scientist at University of California, Berkeley, studies how drought impacts the microbiome of sorghum. He recently presented his research at the virtual 2020 ASA-CSSA-SSSA Annual Meeting.

Findings show that certain bacteria living in the roots of sorghum, a crop commonly grown for animal feed, work together with the plant to reduce drought stress. This unique pairing leads to overall plant success.

“Plants have hormones, which help plants decide how to spend their energy,” says Coleman-Derr. “Microbes can manipulate the system and cause the decision-making process of plants to be altered.”

Some bacteria and fungi are destined to inhabit certain plants. And, bacteria want the roots they inhabit to be their dream homes. If a bacterium partners with a plant to help it grow during dry weather, it is essentially building a better home for itself.

Virtually all aspects of the plant’s life are connected to the microbes present. When a plant gets thirsty, it can send the entire microbiome into action.

Drought causes dramatic changes in how bacteria and plant partners interact. Additional bacteria may be recruited to help the plant survive the dry weather. These microbes can influence the plant’s hormones to encourage more root growth, which will help the plant reach more water.

“We want to know if we can control this,” said Coleman-Derr. “Is there the possibility to manipulate the microbiome present to help sorghum cope with drought stress?”

The resiliency of crops to environmental stress is of growing concern to both researchers and farmers, especially with the changes in global climates. New research findings are important to develop crops that can maintain productivity, even in harsher conditions.
“We recognize that the microbiome is dynamic and changes over time,” said Coleman-Derr. “While the jury is still out on if we can control sorghum microbiomes, several labs have shown that some bacteria present during drought stress lead to positive outcomes for plants.”

Understanding plant microbiomes is a large part of determining factors of crop productivity. Fortunately, plants are excellent models for studying microbiomes.

The next step in this quest is to determine if microbiomes can be manipulated and used as a solution for drought in crop production systems.

“By determining if we can alter the microbiome, we can work towards achieving our goal of creating better producing crops with less inputs,” said Coleman-Derr.

Devin Coleman-Derr is a researcher for the Department of Plant and Microbial Biology at University of California, Berkeley. This research was supported by the United States Department of Agriculture Agricultural Research Service and the United States Department of Energy. The ASA-CSSA-SSSA Annual Meeting was hosted by the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.

**Tomatoes offer affordable source of Parkinson's disease drug**

Source: [https://www.sciencedaily.com/releases/2020/12/201209094221.htm](https://www.sciencedaily.com/releases/2020/12/201209094221.htm)

Scientists have produced a tomato enriched in the Parkinson's disease drug L-DOPA in what could become a new, affordable source of one of the world's essential medicines. The development of the genetically modified (GM) tomato has implications for developing nations where access to pharmaceutical drugs is restricted. This novel use of tomato plants as a natural source of L-DOPA also offers benefits for people who suffer adverse effects -- including nausea and behavioral complications -- of chemically synthesised L-DOPA.

Tomato -- was chosen as a widely cultivated crop that can be used for scaled up production and potentially offering a standardised and controlled natural source of L-DOPA.
The John Innes Centre led team modified the tomato fruit by introducing a gene responsible for the synthesis of L-DOPA in beetroot where it functions in the production of the pigments betalains.

L-DOPA is produced from tyrosine, an amino acid found in many foods. The research team inserted a gene encoding a tyrosinase, an enzyme that uses tyrosine to build molecules such as L-DOPA. This elevated the level of L-DOPA specifically in the fruit part of the plant and led to higher yields than those associated with L-DOPA production in the whole plant.

The levels achieved in the tomato fruit -- 150mg of L-DOPA per kg of tomatoes -- were comparable those observed in other L-DOPA accumulating plants -- without some of the known drawbacks that have hampered plant metabolic production of the drug previously.

The aim now is to create a production pipeline where L-DOPA is extracted from the tomatoes and purified into the pharmaceutical product.

Professor Cathie Martin (FRS), corresponding author of the study explains: "The idea is that you can grow tomatoes with relatively little infrastructure. As GMOs (genetically modified organisms) you could grow them in screen houses, controlled environments with very narrow meshes, so you would not have pollen escape through insects.

"Then you could scale up at relatively low cost. A local industry could prepare L-DOPA from tomatoes because it's soluble and you can do extractions. Then you could make a purified product relatively low tech which could be dispensed locally." 

Parkinson's disease is a growing problem in developing countries where many people cannot afford the daily $2 price of synthetic L-DOPA.

L-DOPA is an amino acid precursor of the neuro-chemical dopamine and is used to compensate for the depleted supply of dopamine in Parkinson's disease patients.

Also known as Levodopa, L-DOPA has been the gold standard therapy for Parkinson's disease since its establishment as a drug in 1967. It is one of the essential medicines declared by the World Health Organisation (WHO) and its market value is in the hundreds of billions of dollars.

The most common form of the drug is produced by chemical synthesis, but natural sources are also available. Only a few plants have been reported to contain measurable quantities of the molecule, mainly in seeds.
The most studied is the velvet bean, Mucuna pruriens, which contains up to 10% L-DOPA in its seeds. But this is problematic because the plant is covered in urticating hairs that contain mucunian that can cause irritation and allergic reactions in field workers who harvest the crop. The beans themselves cause elevated levels of tryptamines that can cause hallucinations in Parkinson’s disease patients.

"We have demonstrated that the use of the tyrosinase-expressing tomatoes as a source of L-DOPA is possible. It’s a further demonstration of tomato as a strong option for synthetic biology. Additionally, there were surprising beneficial effects including improvement in shelf-life and raised levels of amino-acids that we can investigate," says first author Dr Dario Breitel.

**Enrollment Continues for Agriculture Risk Coverage and Price Loss Coverage Programs for 2021**

By: USDA Ohio FSA
Source: [https://content.govdelivery.com/accounts/USFSA/bulletins/2b022b3](https://content.govdelivery.com/accounts/USFSA/bulletins/2b022b3)

Agricultural producers can now make elections and enroll in the Agriculture Risk Coverage (ARC) and Price Loss Coverage (PLC) programs for the 2021 crop year. The signup period opened Tuesday, Oct. 13. These key U.S. Department of Agriculture (USDA) safety-net programs help producers weather fluctuations in either revenue or price for certain crops, and more than $5 billion in payments are in the process of going out to producers who signed up for the 2019 crop year.

Enrollment for the 2021 crop year closes March 15, 2021.

ARC provides income support payments on historical base acres when actual crop revenue declines below a specified guaranteed level. PLC provides income support payments on historical base acres when the effective price for a covered commodity falls below its reference price.

Covered commodities include barley, canola, large and small chickpeas, corn, crambe, flaxseed, grain sorghum, lentils, mustard seed, oats, peanuts, dry peas, rapeseed, long grain rice, medium and short grain rice, safflower seed, seed cotton, sesame, soybeans, sunflower seed and wheat.

**2021 Elections and Enrollment**

Producers can elect coverage and enroll in crop-by-crop ARC-County or PLC, or ARC-Individual for the entire farm, for the 2021 crop year. Although election changes for 2021 are optional, enrollment (signed contract) is required for each year of the program. If a
producer has a multi-year contract on the farm and makes an election change for 2021, it will be necessary to sign a new contract.

If an election is not submitted by the deadline of March 15, 2021, the election defaults to the current election for crops on the farm from the prior crop year.

For crop years 2022 and 2023, producers will have an opportunity to make new elections during those signups. Farm owners cannot enroll in either program unless they have a share interest in the farm.

2019 Crop Year ARC and PLC Payments

FSA began processing payments for 2019 ARC-County (ARC-CO) and PLC on covered commodities that met payment triggers on farms enrolled for the 2019 crop year. In addition to the $5 billion now in process, FSA anticipates it will issue additional payments by the end of November for 2019 commodities covered under ARC-Individual (ARC-IC) and additional commodities that trigger PLC and ARC-CO payments for which rates have not yet been published.

Producers who had 2019 covered commodities enrolled in ARC-CO can visit the ARC and PLC webpage for payment rates applicable to their county and each covered commodity. For farms and covered commodities enrolled in 2019 PLC, the following crops met payment triggers: barley, canola, chickpeas (small and large), corn, dry peas, grain sorghum, lentils, peanuts, seed cotton and wheat.

Oats and soybeans did not meet 2019 PLC payment triggers.

2019 PLC payment rates for the following covered commodities have not been determined: crambe, flaxseed, long and medium grain rice, mustard seed, rapeseed, safflower, sesame seed, sunflower seed and temperate Japonica rice. Payment rates for these commodities will be announced at a later date.

Web-Based Decision Tools

In partnership with USDA, the University of Illinois and Texas A&M University offer web-based decision tools to assist producers in making informed, educated decisions using crop data specific to their respective farming operations. Tools include:

- **Gardner-farmdoc Payment Calculator**, the University of Illinois tool that offers farmers the ability to run payment estimate modeling for their farms and counties for ARC-County and PLC.
- **ARC and PLC Decision Tool**, the Texas A&M tool allows producers to analyze payment yield updates and expected payments for 2021. Producers...
who have used the tool in the past should see their username and much of their farm data already available in the system.

More Information

For more information on ARC and PLC, including two online decision tools that assist producers in making enrollment and election decisions specific to their operations, visit the [ARC and PLC webpage](#).

For additional questions and assistance, contact your [FSA County office](#).

*Lee’s Monthly News Column*

Happy Thanksgiving Trumbull County! I hope you all had a safe, healthy, and relaxing Thanksgiving, and you were able to get a few items on your table from local farmers. Despite the roller coaster ride that has been 2020, I hope you are able to reflect on the good things that happened this year. Personally, I am very thankful that my family, friends, and colleagues are all healthy. I am also thankful for coming up on my five year anniversary serving as the Agriculture and Natural Resources Educator for Trumbull County. I can’t believe how fast the time has gone, and I’m looking forward to the next five years!

In my position I get to read and hear a lot of opinions and criticisms about agriculture, both locally and nationally. Among the most frequent criticisms that I hear is “why not plant something other than corn and soybeans?” Or “farmers should plant crop XYZ.” The reasons behind these statements range from general concerns about diversification to the interest in growing local crops for local consumers, or simply they saw a unique crop in the grocery store. Many times a simple explanation will resolve the comments, such as the fact that pineapples won’t grow outdoors in NE Ohio. Other explanations are more complex, and not easily communicated. If I could explain and predict agricultural markets I would be a rich, rich person.

Generally, farmers would prefer to plant more than two crops. In addition to diversifying risk from a business standpoint, this also allows for greater crop rotation, which is better for the soil. In the five years that I have been in this position, I have seen the downfall of miscanthus, the rise and fall of field peas, and most recently the rise of hemp. This interest in new crops is not new, and if you talk to anyone that farmed in the 80’s they will tell you about the rise and fall of buckwheat and sunflowers. These are typically driven by market demands, and in the case of hemp, new legislation. Farmers are used to these cycles, and they would prefer if the markets persisted, but frequently they are a passing fad.
Sometimes the reason a crop doesn’t stick around is simple. The dog food plant that was purchasing the peas changed ownership, and they chose to buy peas from the western states and Canada. Other times it’s more complex. Miscanthus had market pressure from the paper and plastic industries as well as changing biofuel incentives. Hemp is just as complex as it has not been a legal crop in the US since the 1940’s, and was just legalized in the 2018 farm bill. Although there is considerable investment being made for the processing of hemp, the infrastructure to grow, sell, and produce products from hemp is not there yet.

One of the biggest challenges to diversification of crops, especially more unique crops, is selling the crop once it is harvested. We have some of the most talented and intelligent farmers in Trumbull County, and they can grow just about any crop (except pineapple). I was once asked why farmers don’t grow quinoa, and the simple answer is that they couldn’t sell it. If a farmer puts in 10 acres of corn, beans, or wheat they would be able to drive less than 20 miles to sell it. That isn’t the case with quinoa, sunflowers, hemp, buckwheat, or the other numerous potential crops. Without the local infrastructure to handle these crops, it is not feasible or profitable to grow these specialty crops. Most of the processing plants for the specialty crops are located more than two or three states away (if you’re lucky) and the cost of trucking or shipping your crop to these plants is cost prohibitive. So, if you can’t sell these unique crops, what do you grow so that you can be profitable? The answer for many of our farmers is you grow corn and soybeans, and if wheat prices are up you put in a few acres. If the markets are there, I am certain our local farmers will be there to meet the demand.

As always, OSU Extension Trumbull County is still here to serve you during the pandemic. If you have questions about soil testing, plant disease, farm bill, or generally anything about agriculture give us a call. We are working remotely to answer your calls, but our office is open on Monday and Thursday from 8:30-4:30 if you need to drop off samples, buy soil test kits, or say hello. We hope you all stay safe and healthy!
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