

PESTICIDE REPORTS

Division of Agricultural Sciences and Natural Resources • Oklahoma State University
<http://pested.okstate.edu>



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JUNE TEST HELP DATES

The OSU Pesticide Safety Education Program will conduct the next test help workshops for 2019 in June. The workshops will be held June 19th in Tulsa and June 25th in Oklahoma City.

The Oklahoma City Test help session will at the Oklahoma County Extension Office 2500 NE 63rd. The Tulsa session will be at the Tulsa County Extension Office at 4116 E. 15th.

Space is limited and preregistration is encouraged to insure a seat for the program and to test! Walk ins will only be taken if space is available and is not guaranteed.

The help sessions will focus on information covered in the core and service tech tests. OSU PSEP will answer any questions over other category tests during this session.

Applicators should acquire and study the manuals before coming to the help session for optimum success. Study manuals can be purchased by using the manual order form available at our website <http://pested.okstate.edu/pdf/order.pdf> or by calling University Mailing at 405-744-9037.

ODAFF Testing fees are not included in the registration fee and must be paid separately.

Register online at the Pesticide Safety Education Program (PSEP) website at <http://pested.okstate.edu/html/practical.htm>. Registration forms can also be downloaded from the website.

Registration will start at 8:30 and the program will run from 8:45 am to 12:30 pm at both locations. Testing will begin at 1:30 pm at both locations.

NO CEU's will be given for this program!

Please check our website below for future test help dates.

<http://pested.okstate.edu/html/practical.htm>

RECENT COURT CASES COULD AFFECT ON-FARM DECISIONS

With the warming temperatures of spring comes decision making affecting plowing, planting, fertilizing, spraying... and court cases? The past few months have brought with them several court decisions with the potential to affect the availability and use of specific pesticides in coming years.

Chlorpyrifos

In April, the U.S. Court of Appeals for the 9th Circuit issued a ruling in *League of United Latin American Citizens et al. v. Andrew Wheeler* 17-71636. It is a case addressing the Environmental Protection Agency's (EPA) approval of chlorpyrifos, a pesticide widely used in corn, soybeans and numerous specialty crops.

This decision is part of a years-long legal and policy battle over its status, the most recent of which began last August, when EPA was ordered to revoke all tolerances and cancel all registrations for the pesticide. The result of this ruling would have been a complete ban on its usage within the United States.

One month later, the Department of Justice appealed the decision, asking for a rehearing of the case with additional judges. The rehearing was granted and heard on March 26, 2019. In its subsequent ruling, the court gave EPA 90 days — until mid-July 2019 — to decide whether or not to ban its use.

In addition to that agency decision, bills are pending in both the United States House of Representatives (H.R.230) and Senate (S.921) that would, if passed, impose a nationwide ban.

However, even if it is permitted to be used on a nationwide scale, individual states have authority to make decisions on whether specific pesticides may be used within their boundaries. In 2018, Hawaii passed a law banning the use of the chlorpyrifos, and more recently, in early May, California did the same. In doing so, both states' laws also included a transition period in which the pesticide may be used with restrictions before its eventual removal. A similar ban has passed through the legislature in New York and is awaiting the governor's decision.

Glyphosate

The second recent court decision that may impact producers in coming years involves glyphosate, the most-used herbicide in the United States. It is the third trial in a series of personal injury cases brought by plaintiffs who claim that the use of glyphosate has caused them to develop cancer.

In each of the cases, juries have returned multi-million dollar verdicts against Monsanto (which was acquired by Bayer in 2018).

In the most recent case, concluded on May 13 of this year, a jury awarded the plaintiffs \$55 million in compensatory damages and \$2 billion in punitive damages.

Bayer has appealed each verdict, arguing that scientific evidence does not support the argument that glyphosate is carcinogenic. Those appeals are pending.

Further, there are currently more than 13,000 similar cases pending in state and federal courts. A federal judge in California has ordered the company to engage in mediation to try to resolve the federal cases.

The next case anticipated to go to trial, however, is in state court in Missouri. It is scheduled to begin in August just outside St. Louis, which served as Monsanto's headquarters before the acquisition.

The court cases coincide with a periodic glyphosate registration review conducted by EPA. As part of that review, EPA has released a proposed interim decision for public comment. In that decision, the agency lays out its findings that there are no risks to public health when glyphosate is used in accordance with its current label. Further, the document concludes that glyphosate is not a carcinogen.

The proposed decision, however, does identify some ecological risks of its usage, such as injury to pollinators, as well as management proposals to address those risks. Anyone who is interested may comment on the proposal at [here](#). Comments must be received by July 5.

So while you're making your plans for this year, keep these court cases in mind. These decisions, and subsequent ones expected later this year, have the potential to affect your decision-making process in many years to come. (Southwest FarmPress, May 31, 2019)

<https://www.farmprogress.com/crops/recent-court-cases-could-affect-farm-decisions>

HONEYSUCKLE'S SWEET SCENT NOT SO KIND TO MOSQUITOES

The delicate scent of honeysuckle in the air is a pleasing sign of summer's approach. However, this perennial flowering vine also packs a powerful punch when it comes to knocking out the larvae of mosquitoes, including *Aedes aegypti*, the species that spreads yellow fever.

In laboratory studies by Agricultural Research Service (ARS) scientists, essential oils in Italian honeysuckle killed 100 percent of the larvae, which hatch from eggs deposited in sources of water by adult female mosquitoes after they've taken a blood meal—such as from you!

Entomologist Ephantus Muturi and his colleagues at ARS's National Center for Agricultural Utilization Research in Peoria, Illinois, investigated honeysuckle as part of a larger project to identify and develop biobased alternatives to synthetic insecticide ingredients, which some consumers may be wary of using.

The team's efforts aim to provide consumers and public health officials with a greater arsenal of weapons to choose from in preventing the diseases that mosquitoes can spread, including yellow fever, Zika, dengue fever, and malaria—the last of which is linked to 219 million reported cases and 435,000 deaths worldwide in 2017.

Adding to that threat is the potential for some mosquito populations to develop resistance to the insecticides used against them, notes Muturi, who is in the Peoria center's Crop Bioprotection Research Unit.

In all, Muturi and colleagues identified 16 different compounds in the essential oils of Italian honeysuckle. The oils are found in the plant's stem, leaves, and distinctly shaped flowers and give rise to its alluring scent, which fills the air starting in late spring, depending on the region.

Of the compounds tested, the one that delivered the knock-out punch was patchouli alcohol, a discovery that could open the door to formulating it as a biopesticide that can be safely applied to such mosquito larvae "haunts" as ponds, drainage ditches, stormwater catch basins, and even kiddie pools.

The researchers don't envision growing and harvesting honeysuckle for its essential oils, though. After all, some species—like Amur honeysuckle, which can be found throughout much of the eastern United States—are considered invasive. Instead, the oil and some of its bioactive chemical constituents,

such as patchouli alcohol, can be purchased commercially and are commonly used as active ingredients in perfumes and other cosmetics products. However, until the team's studies (which were published in *Pest Management Science*), the added benefit of killing mosquito larvae hadn't been shown.

Muturi's group plans on scaling up its studies of the insecticidal potential of honeysuckle essential oil and its chemical constituents, along with compounds from other plants. They're also examining microorganisms such as fungi that infect and kill different mosquito life stages, diminishing the biting pest as a public nuisance and health threat.—By Jan Suszkiw, ARS Office of Communications. (PCT Online, May 24, 2019) <https://www.pctonline.com/article/honeysuckle-eliminate-mosquito-larvae/>

US EPA HEARING THE BUZZ ABOUT DRONES AND PESTICIDES

Interest is rising in the use of drones in the US to apply pesticides. The appeal is driven by the promise of precision applications that could benefit the environment, improve worker safety and reduce the amount of chemicals used to combat weeds and insect pests.

While China, Japan and other countries have crafted specific rules to oversee the use of drones to deliver pesticides, the US EPA has yet to develop a formal regulatory framework. Fitting the technology into the Agency's pesticide rules might not be easy, state and federal officials said last week at an EPA pesticide stakeholder meeting.

The existing legal landscape for drones and pesticides is murky – applicators can get several waivers from the Federal Aviation Administration (FAA) to potentially use drones to apply low-risk pesticides, but the lack of guidance from the EPA is posing headaches for state officials and other stakeholders and hindering the adoption of the technology. "We are in a position right now where

we have these applications going on and we have inspectors asking us 'what do I do, what am I supposed to be following?'," said Rose Kachadoorian, president of the Association of American Pesticide Control Officials (AAPCO) and the pesticide programs manager for the US state of Oregon Department of Agriculture.

The AAPCO has formed a working group to examine the issue and is keen to help the EPA tackle the issue, Ms Kachadoorian told the Agency at the May 8th meeting of the Pesticide Program Dialogue Committee (PPDC).

State officials are hopeful that the EPA will begin to craft guidance, potentially putting out a notice providing labelling standards as well as information about what data states might need to approve their own uses, she added.

"We are hoping that we can speed things along to help the people who are actually in the field," Ms Kachadoorian said.

Questions to be addressed

A key issue for the EPA is whether pesticide labels allowing "aerial applications" extend to drones and other unmanned aerial vehicles (UAVs). Risk assessments for existing products with aerial applications were formed without drones in mind so it is not yet clear what the "right approach" for the Agency is, said Ed Messina, acting deputy director of the Office of Pesticide Programs (OPP).

Pesticides approved for aerial applications have requirements that include boom length, and the Agency must figure out if those standards should be changed given that drones are capable of applying pesticides from much closer distances than helicopters or fixed-wing aircraft. The EPA must also identify any data gaps and uncertainties posed by UAVs with regard to its risk assessments, and the Agency also needs to better understand the scope of products and use patterns for drones, Mr Messina added.

The EPA will need to consider the variety of drones that could be used to deliver pesticides as each one has different airflows and different rotors –

potentially requiring the need for new drift assessments. "This technology is constantly changing," Mr Messina said. "How do we keep up with that?"

Buffers and bosses

Questions also remain about whether drones should be subject to buffer requirements for aerial applications or ground applications. "Or is this some kind of hybrid method where we don't have the data to support either direction?" Ms Kachadoorian said. "There are more questions than answers."

Another tricky issue centers on who is technically the "pesticide applicator" when a UAV is used as it appears operations will typically involve more than one individual, Ms Kachadoorian added. "Who is ultimately responsible?" she asked, noting that the EPA and state officials should think about long-term implications and not just about drones. "We are hearing talk about robots, a lot about micro-rate dispensers and also artificial intelligence, where you might not even have a human being making that decision," Ms Kachadoorian told the PPDC. "You could have a piece of machinery going down a field not only just deciding what weeds to clip but which weeds to spray. So, who is really the applicator there?"

Go slow

A representative of the National Agricultural Aviation Association (NAAA) pushed back against the suggestion that the use of drones should be allowed under existing labels without new assessments. "I don't think an unmanned vehicle meets in any way the spirit of the aerial application language, and work needs to be done before there is further use of these tools," said Damon Reabe, a PPDC member, NAAA board member and aerial applicator based in Wisconsin.

"The process for registering a pesticide and doing spray drift risk assessments doesn't change because we have a new piece of technology available," Mr Reabe added. "If we are doing an assessment to protect the environment, workers and society, it needs to be done no matter which vehicle is doing

the application." (Pesticide & Chemical Policy/AGROW, May 21, 2019)

EPA CANCELS REGISTRATIONS OF 12 NEONIC PESTICIDES

On May 20, 2019, the [Environmental Protection Agency](#) (EPA) published notice in the Federal Register canceling the registrations of 12 neonicotinoid-containing pesticides (neonics). This cancellation was the result of a lawsuit settlement reached by the agency with several environmental groups. The lawsuit settlement also requires that EPA conduct a review of all neonics, so there could be more registration cancellations coming.

The Dozen Cancelled Neonics

The product registrations cancelled by the notice are:

Registrati on No.	Compa ny No.	Product name	Active ingredients
100-1341	100	Meridian 0.20G	Thiamethoxam.
100-1346	100	Meridian 0.14G	Thiamethoxam.
100-1399	100	Avicta Complete Corn 500	Azoxystrobin; Metalaxyl-M; Fludioxonil; Thiabendazole; Abamectin & Thiamethoxam.
100-1426	100	THX_MXM_FD L_TBZ FS	Thiamethoxam ; Metalaxyl-M; Fludioxonil & Thiabendazole.
100-1449	100	Adage Deluxe	Thiamethoxam ; Metalaxyl-M; Fludioxonil & Azoxystrobin.
100-1450	100	Adage Premier	Thiamethoxam ; Metalaxyl-M; Fludioxonil; Azoxystrobin & Thiabendazole.

PESTICIDES ON HEMP CAUSING HEADACHES FOR EPA AND STATE REGULATORS

US state officials and hemp industry advocates are pressing the EPA to develop a plan to regulate pesticide use on hemp. They warn that a lack of federal oversight could undermine growth of the nascent industry and lead to a patchwork of state regulations.

The EPA, however, is cautioning that hemp does not fit easily into its pesticide regulatory scheme and says that the array of uses for the crop -- ranging from fiber to grain to cannabidiol (CBD) -- poses some unique challenges for conducting exposure and human health assessments.

Agency officials say that they are keen to hear from stakeholders on a path forward and outlined a list of possible concerns during a session at last week's meeting of its Pesticide Program Dialogue Committee (PPDC).

One dilemma is a pesticide safe for use on hemp grown for fiber, for example, may not be safe for use on hemp grown to produce CBD or for food products.

"This is going to be a heavy lift," Ed Messina, acting deputy office director of the EPA's Office of Pesticide Programs said at the May 8th PPDC meeting.

In addition to assessing the impacts on public health and the environment, the EPA must eventually set tolerance levels for products used on hemp that is ultimately consumed in food products, including through CBD added to foods and dietary supplements.

Mr Messina added that the EPA is "new in this space" and has only been considering the issue since the passage of the 2018 Farm Bill late last year. The law took hemp -- defined as cannabis that has less than 0.3% THC -- off the federal list of illegal drugs and made it a commodity crop.

Registration No.	Company No.	Product name	Active ingredients
264-1125	264	Emesto Quantum	Clothianidin & Penflufen.
59639-164	59639	V-10170 0.25 G GL Insecticide	Clothianidin.
59639-176	59639	Inovate Seed Protectant	Clothianidin; Metalaxyl & Ipconazole.
59639-187	59639	Inovate Neutral Seed Protectant	Clothianidin; Metalaxyl & Ipconazole.
59639-214	59639	Aloft GC G Insecticide	Bifenthrin & Clothianidin.
72155-95	72155	Flower, Rose & Shrub Care III	Clothianidin & Imidacloprid.

Seven of the canceled neonics are used primarily as seed coatings. The others are general-use insecticides.

May use existing stocks

The manufacturers of these products — Bayer, Syngenta and Valent — are permitted to continue selling their existing stocks for one year until May 20, 2020. Persons other than the manufacturers can continue to sell and use the products until their existing stocks are exhausted.

Bee colony collapse

The lawsuit that generated this settlement and the registration cancellations was filed in 2013 by the not-for-profit Center for Food Safety. The Center filed the suit on behalf of themselves, beekeepers and other conservation groups concerned with bee colony collapse. (See this [September 2014 Landscape Management blog](#) for background on neonics and bees.)

To read the full Federal Register notice on the regulation cancellations, [click here](#).

(Landscape Management, May 29, 2019)
<https://www.landscapemanagement.net/epa-cancels-registrations-of-12-neonic-pesticides/>

A handful of pesticide labels list "industrial hemp" but those registrations are rare and only apply to hemp grown to make rope, Mr Messina said.

"There are currently no pesticides registered by EPA specifically for use on cannabis and ... there are no tolerances established for marijuana or hemp," he said.

Currently, growers can only use minimum risk pesticides approved by their state and those products often prove inconsistent and inadequate for larger-scale production, Bob Pearce, an agriculture extension professor at the University of Kentucky, told the PPDC.

"Some of the proponents of hemp have early on claimed this is a crop that can practically grow itself," he said. "This might be true if you are growing a few plants in isolation or if you see feral plants growing by the roadside, but scaling up to commercial field production is going to require growers to protect their crops in order to achieve the best economic returns."

EPA officials said they have not yet received an application for a new pesticide registration for hemp or a request by a pesticide manufacturer to add hemp to the label of an existing product. The Agency must still determine the exposure pathways for hemp, what residue testing it would need and what kind of field trials it might require for pesticides intended for use on hemp, OPP Director Rick Keigwin said.

"Those types of considerations we are going to need to explore as this crop becomes further introduced in the agricultural commodity," he said, adding that another potential concern is whether pesticide residues concentrate in CBD.

Interim solutions

Given the rigidity of the EPA's pesticide regulations, hemp growers will likely have to wait several years before new pesticides are available, several experts said during the PPDC meeting in Arlington, Virginia.

Andrew Thostenson, a pesticide program specialist with North Dakota State University's extension service, cautioned that when canola was introduced into the US in 1988, it took about 5-7 years to get products approved for use.

"Perhaps we can do that a little faster with the hemp situation than we did with canola ... but before we get widespread adoption of pesticides for use on hemp, it is probably going to take 5-10 years to really get the information generated to be able to issue the pesticide labels," he said. "That is the reality."

Kentucky Department of Agriculture (KDA) senior official Michael Williams called on the EPA to explore "ways to expedite labelling" for pesticide use on hemp grown solely for fiber and to consider adding hemp to current pesticide labels approved for similar to hemp, including mint, hops and tobacco.

"Doing so will provide a great lift to our producers as we get ready to expand growing operations," said Mr Williams, who is director KDA's division of environmental services.

Mr Messina said that the EPA would take the advice under consideration and noted that the Agency is reaching out to regulators in Canada, where hemp has been legally grown since 1998.

"Maybe for some early quick wins, we look to those products that are tolerance exempt," he added. "The more intense conversation is going to be around the chemicals where we need to establish tolerances and what testing do we require."

Educating growers

Testing of hemp across several states has found residues of pesticides not licensed for use on the crop, suggesting that there is confusion among growers over what is and what is not legal for use.

This has state pesticide officials scrambling to educate producers and to make sure only legal pesticides are being used, said Lisa Fleeson-Trossbach, program manager of the Virginia Dept. of Agriculture's Office of Pesticide Services.

But state programs "are going to vary greatly," she said, as some will simply follow the EPA while others will craft lists of approved pesticides or provide guidance to define which chemicals can be used.

Regardless of the approach, hemp growers need "a consistent message" on what pesticides are allowed and which ones are not, Ms Fleeson-Trossbach said.

A key question is whether hemp will be considered a raw agricultural commodity or a food crop, she added.

"Right now we don't know, but that will impact pesticide regulatory programs," she said.

Education for growers is paramount, agreed Mr Pearce, who cautioned that competing state regulations can confuse growers and potentially promote misuse of pesticides.

"The lack of properly labelled options may tempt some growers to use products off-label," he said.

There is also "very limited information" about the specific pest and disease pressures on hemp, the impacts on yields or best management practices, Mr Pearce said.

"What is needed is a comprehensive national plan that identifies pests with the most potential to cause losses and pesticides that can be used to manage those pests," he told the PPDC. "EPA in consultation with industry and grower representatives, should prioritize the most pressing needs and establish a clear list of the data that is needed to support that labelling, so that researchers can really focus their efforts on those areas and those pesticides with the greatest potential to improve production practices for hemp growers." (Pesticide & Chemical Policy/AGROW, May 20, 2019)

HERBICIDE APPLICATION: EFFECTIVE MANAGEMENT OF HARD WATER IN SPRAY SOLUTIONS

Water quality is a frequently overlooked factor that can adversely affect the performance of pesticides, especially herbicides. Besides pH, water "hardness" is a key concern, with much of the agricultural water sources across the U.S. exhibiting high concentrations of calcium, magnesium, iron, sodium, and aluminum. These hard-water cations — especially calcium and magnesium — can wreak havoc in a spray tank when not managed.

Weak acid herbicides, such as glyphosate and 2,4-D, are most susceptible, but no herbicide chemistries are completely immune to the negative effects of hard water, including dicamba and sulfonylurea (SU) herbicides. Use of ammonium sulfate (AMS) in spray solutions only counters the effects of calcium hard-water cations, providing no protection whatsoever from magnesium and the others.

"When you do a good job of addressing hard water, the herbicides mix, blend, and apply much better," says Jason Winegar, an applicator at Nutrien Ag Solutions in Dunlap, IA. "You get more uniform spray coverage, better adhesion to and penetration of herbicides to target weed species, and more control over drift by better managing spray droplet size and patterns."

For eight years Winegar has driven floaters and high-clearance sprayers over at least 50,000 acres of corn and soybeans annually. He makes burndown, pre-emergence, and post-emergence over-the-top herbicide applications and often covers the same ground at least twice during any given growing season.

With a staff of five or six applicators, this Nutrien Ag Solutions location provides custom-application services on at least a quarter-million acres every year. Herbicides routinely applied include glyphosate, Accuron, Diflex, Caprino, Harness Extra, 2,4-D, and dicamba. In addition to his

application work, Winegar also works in the company's mixing and blending facilities.

Multiple Modes of Action

Water with high concentrations of magnesium and calcium is a challenge to manage when applying herbicides. Instead of AMS, Winegar uses a water conditioner, Choice Trio from Loveland Products, which offers three modes of action: sequestering, synthetic chelating, and complexing. The adjuvant, he says, reduces the effects of hard-water cations on herbicide performance, eliminating the need to use AMS.

“We can't run AMS through the liquid system at the plant because it plugs things up,” Winegar says. “Instead, I have to add it directly to the sprayer while nursing in the field. This means I have to manually open 50-pound bags of granular AMS and pour them into the sprayer. It's a handling issue that really slows us down when we need to focus on covering as many acres as quickly as possible. We can load the Choice Trio at the plant and do away with the AMS field-loading delays.”

Choice Trio is a liquid formulation available in 2.5-gallon pack sizes. Besides interfering with herbicide efficacy, hard water that isn't properly buffered also takes its toll on equipment, including pumps, seals, screens, filters, and hoses. “This is another economic downside of hard water,” Winegar says. “It drives up maintenance costs because these items have to be replaced more often.”

Enhanced Grove Care

Commercial applicator Richard Byrd in South Florida makes herbicide applications in an area where water is exceptionally hard. Operating under Richard Byrd Caretaking, he conducts herbicide applications on 1,800 to 2,000 acres of orange groves, making three application trips per year for a combined 5,500 to 6,000 treated acres.

This work includes chemical mowing of grove middles and weed control in the tree line with residual and contact herbicides, including Karmex, Solicam, glyphosate, Tree Vix, and MSO. He uses

high-end application equipment, GPS positioning, and other state-of-the-art technology.

“When I'm running flat out, I mix and apply 1,400 to 1,500 gallons of herbicide daily,” Byrd says. “Due to the concentrations of magnesium in the surface water I use as a carrier, I would have to stop two or three times a day — about every 400 to 500 gallons — to clean clogged filters. Then, a few weeks after application, there would be strips in the middles where weeds had not been controlled due to clogged nozzles or herbicide that didn't mix very well.”

Another hard-water casualty was the toll it took on spray tanks. A nasty black substance would build up on tank bottoms and walls following herbicide applications. This was residue from the magnesium in the water, and cleaning it required a substantial amount of elbow grease. In 2015 Byrd began using Choice Trio adjuvant to better address the mixing, application, and staining issues associated with hard water.

“I haven't had to clean the magnesium and chemical residues out of any spray tanks in the four years since I started using the adjuvant,” he says. “I also have greatly reduced — almost eliminated — the downtime associated with clogged filters, screens, and nozzles, as well as the misapplications of herbicides due to mixing issues.”

Byrd says 99.9% of mixtures in the tank are applied and that mixtures stay in suspension longer. “Any herbicide remaining in the tank after application is wasted money,” he notes. “And any herbicides that don't mix properly are costing you money as well.”

Byrd adds that taming his hard water has had a profound effect on equipment maintenance costs. “I'm getting at least an extra year out of my pump seals, as well as from my pumps,” he says.

Other adjuvants that Byrd routinely relies upon include E-Z Mix when applying powdered or granular herbicides and LI 700 as a sticker/spreader to reduce drift, improve spray droplet retention by adhesion and spreading, and increase herbicide penetration without cuticle disruption. He no longer uses liquid AMS, he says, because he doesn't have

to. (CropLife, May 14, 2019)
<https://www.croplife.com/crop-inputs/herbicides/herbicide-application-effective-management-of-hard-water-in-spray-solutions/>

BED BUGS ARE AS OLD AS DINOSAURS, RESEARCHERS FIND

Bed bugs have been parasitic companions with other species aside from humans for more than 100 million years, walking the earth at the same time as dinosaurs.

Work by an international team of scientists, including the University of Sheffield, compared the DNA of dozens of bed bug species in order to understand the evolutionary relationships within the group as well as their relationship with humans.

The team discovered that bed bugs are older than bats - a mammal that people had previously believed to be their first host 50-60 million years ago. Bed bugs in fact evolved around 50 million years earlier.

Bed bugs rank high among the list of most unwanted human bedfellows but until now, little was known about when they first originated.

Experts have now discovered that the evolutionary history of bed bugs is far more complex than previously thought and the critters were actually in existence during the time of dinosaurs. More research is needed to find out what their host was at that time, although current understanding suggests it's unlikely they fed on the blood of dinosaurs. This is because bed bugs and all their relatives feed on animals that have a "home" - such as a bird's nest, an owl's burrow, a bat's roost or a human's bed - a mode of life that dinosaurs don't seem to have adopted.

The team spent 15 years collecting samples from wild sites and museums around the world, dodging bats and buffaloes in African caves infected with

Ebola and climbing cliffs to collect from bird nests in South East Asia.

Professor Mike Siva-Jothy from the University of Sheffield's Department of Animal and Plant Sciences, who was part of the team, said: "To think that the pests that live in our beds today evolved more than 100 million years ago and were walking the earth side by side with dinosaurs, was a revelation. It shows that the evolutionary history of bed bugs is far more complex than we previously thought."

Dr Steffen Roth from the University Museum Bergen in Norway, who led the study, added: "The first big surprise we found was that bed bugs are much older than bats, which everyone assumed to be their first host. It was also unexpected to see that evolutionary older bed bugs were already specialized on a single host type, even though we don't know what the host was at the time when T. rex walked the earth."

The study also reveals that a new species of bed bug conquers humans about every half a million years: moreover that when bed bugs changed hosts, they didn't always become specialized on that new host and maintained the ability to jump back to their original host. This demonstrates that while some bed bugs become specialized, some remain generalists, jumping from host to host.

Professor Klaus Reinhardt, a bed bug researcher from Dresden University in Germany, who co-led the study, said: "These species are the ones we can reasonably expect to be the next ones drinking our blood, and it may not even take half a million years, given that many more humans, livestock and pets that live on earth now provide lots more opportunities."

The team also found that the two major bed bug pests of humans - the common and the tropical bed bug - are much older than humans. This contrasts with other evidence that the evolution of ancient humans caused the split of other human parasites into new species.

Professor Mike Siva-Jothy from the University of Sheffield, added: "These findings will help us better understand how bed bugs evolved the traits that make them effective pests - that will also help us find new ways of controlling them."

The researchers hope the findings will help create an evolutionary history of an important group of insects, allowing us to understand how other insects become carriers of disease, how they evolve to use different hosts and how they develop novel traits. The aim is to help control insects effectively and prevent the transmission of insect-vectored disease.

The research has been published in Current Biology. (PCT Online, June 3, 2019)
<https://www.pctonline.com/article/bed-bugs-old-dinosaurs/>

GLYPHOSATE MAY CONTRIBUTE TO DICAMBA VOLATILITY

Adding glyphosate to an Engenia or XtendiMax application may increase the likelihood of dicamba drift, according to a recent University of Tennessee Institute of Agriculture study.

Dr. Larry Steckel, UTIA weed specialist, Jackson, Tenn., reported in a recent podcast that farmers several years ago had observed dicamba drifting against the wind when they had glyphosate mixed in the tank with Engenia or XtendiMax.

"They didn't see it so much if they were just spraying those straight dicamba products alone," he said.

Steckel asked Tom Mueller, UTIA weed scientist at Knoxville, to set up a study with a humidome.

"He took XtendiMax and sprayed it on a tray of soil and compared that to XtendiMax with Roundup sprayed on a tray of soil.

He did that outside of the greenhouse, away from where he was doing all these tests and then brought them into the greenhouse, put plastic covers over the humidomes (he essentially has a little vacuum that pulls air over the soil) and he monitored dicamba coming off that soil for 60 hours after application."

The result was telling. Steckel says with Roundup in the tank with XtendiMax, from three to nine times more dicamba left that treated surface over 60 hours compared to a straight XtendiMax treatment.

Promoting volatility

"It did look from that data that he could detect that Roundup was promoting some volatility from the soil."

Steckel said the EPA reworked the label this year to account for pH. "Anything below 5 is considered acidic enough to make these dicamba products more volatile."

Steckel said Mueller's research indicates that Roundup is lowering the pH. He wondered what else could contribute to lower pH. "We asked growers in the state to send us samples of water they mix from."

With more than 12 samples, Steckel said the result shows "we have water pH all over the board across the state. I had no idea how variable they were. They run from 8.5 down to below 4.6, right out of the tap."

He said producers need to consider water pH when they are mixing herbicide applications. "They could see some volatility with low pH and need to consider bumping the pH up."

Steckel said producers may want to consider adding pH modifiers.

He said three products “BASF showed us did as advertised. They raise the pH of the Engenia and Roundup tank mix from 4.6 to about 5.5. They also did it for XtendiMax. So, very positive on that aspect that it does raise the pH. It should improve dicamba staying put as a result.”

Roundup effectiveness

Steckel said the research brings up more questions. One is how well will Roundup work if modifiers raise pH. “There is a reason why Roundup drives the pH down. It works better at low pH, so if you artificially raise the pH, do you lose weed control? We don’t know. That’s something we need to look into.”

Steckel said Roundup lowers pH more than AMS, which has been a key point in dicamba training — not to put AMS or any acidifying agent in the tank. They drive pH down and make the dicamba products more volatile.

Steckel said Roundup was driving pH down by 1 to 2 pH units. “That’s a lot.”

He said AMS drives pH down a half point.

“Some other aspects of ammonium sulfate besides pH may be enhancing volatility, but it just kind of goes to show, at least from this research, that Roundup PowerMax in the tank mix could be a culprit in why we’re seeing some of the drift in the fields these last three years.”

He does not recommend adding AMS.

“Anything that promotes volatility or (dicamba) leaving the field, we are definitely against. I think AMS doesn’t need to be in the tank and our recommendation from this research is we don’t encourage Roundup being in the tank, either.

This data show that it’s lowering the pH, and from that we are seeing more volatility, according to the research Dr. Mueller has done. So, we are discouraging both AMS and Roundup.”

Roundup alternative?

If Roundup is not recommended, what can producers use?

Steckel said one of the graminicides, like Clethodim, could be an option. “It doesn’t affect the pH as much as Roundup.”

He said Roundup goes in the tank mostly for grass control. “But Roundup is not controlling a lot of the grass species in west Tennessee, whether it’s goosegrass or jungle rice or johnsongrass, and we’re having to put Clethodim in anyway.”

He said leaving Roundup out is especially important when spraying around sensitive vegetation, sensitive crops, sensitive areas. “Use one of the graminicides instead, like Clethodim, or come back with Roundup later.” (Southwest FarmPress, May 15, 2019)

<https://www.farmprogress.com/weeds/glyphosate-may-contribute-dicamba-volatility>

Find us on Twitter at
[@OkstatePestEd](https://twitter.com/OkstatePestEd)

CEU Meetings

Date: June 11-12, 2019

Title: Collins 2019 IPM for Food Plant Seminar

Location: Hershey, PA

Contact: Marie Gallagher (812) 425-7000

<http://collinspestmgt.com/register-for-seminar/>

CEU's:	Category(s):
8	7A
1	11A

Date: September 11, 2019

Title: General Pest Services (Defined by label/What does this mean to you?)

Location: Hampton Inn Edmond, OK

Contact: Donald Stetler (281) 217-2965

www.ensystemex.com www.for-thor.com

CEU's:	Category(s):
4	3A
2	7A
3	7B

Date: September 10, 2019

Title: General Pest Services (Defined by label/What does this mean to you?)

Location: Hampton Inn Tulsa, OK

Contact: Donald Stetler (281) 217-2965

www.ensystemex.com www.for-thor.com

CEU's:	Category(s):
4	3A
2	7A
3	7B

Date: September 12, 2019

Title: General Pest Services (Defined by label/What does this mean to you?)

Location: Hampton Inn Durant OK

Contact: Donald Stetler (281) 217-2965

www.ensystemex.com www.for-thor.com

CEU's:	Category(s):
4	3A
2	7A
3	7B

ODAFF Approved Online CEU Course Links

Online Pest Control Courses

<https://www.onlinepestcontrolcourses.com/>

PestED.com

<https://www.pested.com/>

Certified Training Institute

<https://www.certifiedtraininginstitute.com/>

WSU URBAN IPM AND PESTICIDE SAFETY EDUCATION PROGRAM

<https://pep.wsu.edu/rct/recertonline/>

CEU University

<http://www.ceuschool.org/>

Technical Learning College

<http://www.abctlc.com/>

All Star Pro Training

www.allstarce.com

Wood Destroying Organism Inspection Course

www.nachi.org/wdocourse.htm

CTN Educational Services Inc

http://ctnedu.com/oklahoma_applicator_enroll.html

Pest Network

<http://www.pestnetwork.com/>

Univar USA

<http://www.pestweb.com/>

AG CEU Online

<https://agceuonline.com/courses/state/37>

For more information and an updated list of CEU meetings, click on this link:

<http://www.kellysolutions.com/OK/applicators/courses/searchCourseTitle.asp>

ODAFF Test Information

Pesticide applicator test sessions dates and locations for June/July are as follows:

June		July	
13	Tulsa	9	McAlester
27	Tulsa	11	Tulsa
		25	Tulsa

Enid: Garfield County Extension Office,
316 E. Oxford.

Goodwell: Okla. Panhandle Research &
Extension Center, Rt. 1 Box 86M

Lawton: Great Plains Coliseum,
920 S. Sheridan Road., Prairie Bldg

McAlester: Kiamichi Tech Center on
Highway 270 W of HWY 69

OKC: ODAFF Building 2800 N Lincoln
BLVD Oklahoma City OK

Tulsa: Tulsa County Extension Office
4116 E 15th St. (**New Location**)

Pesticide Safety Education Program