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# EPISODE 193 TRANSCRIPT

**Jamie**

Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

**Amy**

Hello, everybody, and welcome to this segment of Two Bees in a Podcast. Today, I'm excited to be bringing on Dr. Gabriela Quinlan, who's a research ecologist with the USDA ARS and is currently based in North Carolina. So, we brought Dr. Quinlan in to discuss winter bees, which is clearly something Jamie and I know nothing about because we've seen bees around snow, I think, Jamie, but just not in Florida. So, we don't get to work winter bees too often, do we?

**Jamie**

Definitely not. And I'll tell you, Gabriela, I just want to give you a fair warning before you start. I know very little about winter bees, but I get a ton of questions. I'm going to be a very excited interviewer and may just bombard you with lots and lots of questions. So, thank you for joining us.

**Dr. Gabriela Quinlan**

Of course I'm excited to be here.

**Amy**

So, Dr. Quinlan, before we get into winter bees, why don't you tell our audience a little bit about yourself and how you got into the honey bee world?

**Dr. Gabriela Quinlan**

Yeah, absolutely. So, I originally got introduced to pollinators while I was an undergrad at North Carolina State University. I was working in Dave Tarpy's lab on wild bees of all things, even though he's such a honey bee guru, and so I really caught the pollinator bug working in his lab. I knew when I graduated that I wanted to continue working with pollinators. So, I went on to do grad school at Michigan State University, and while I was there, I got the chance to work on a project that involved honey bees, and after that I was just totally hooked. I loved all of the amazing behaviors and working with beekeepers. I just haven't looked back since I graduated

from Michigan State and then did a post doc at Penn State with Christina Grossinger. And now, as you said at the top of the episode, I'm at the USDA. So just continued to work with honey bees since then.

**Jamie**

Gabriela, I mentioned a little bit earlier, this fascination I have with winter bees. And I think a lot of it has to do because I've only ever lived and worked in warm climates where, for example, here in Gainesville, where the University of Florida is, we get bees foraging all winter long. We get pollen flows off and on every month of the year. So, this concept's been one that's been difficult for me, but also this concept's one that's kind of exploded onto the scene. It's not like scientists didn't know about it years ago, but now everybody's talking about it. It's so common. When you go to beekeeper meetings, they're like, well, you got to worry about winter bees and understanding that is a little bit of a struggle for me. So, could you introduce us to this world of winter bees? What are winter bees? What makes them different?

**Dr. Gabriela Quinlan**

Yeah, absolutely. So, yeah, kind of unlike Florida where it's pretty warm and there are resources year-round, when you're beekeeping in a place like Michigan or Pennsylvania where I was when I was first introduced to honey bees, being in that temperate climate, the bees have to find a way to survive over the winter. To do so, they produce this cohort of long-lived winter bees. We call them winter bees because they survive the entire winter from when brood production kind of slows down in the fall until food production starts ramping up the following spring.

So, unlike your summer bees that only live about a month, the winter bees are capable of living several months, 8+ months. And so that one cohort of bees will survive the entire winter thermoregulating the nest and keeping it warm. So, they actually survive as a colony, which makes them extremely unique and interesting among the animal kingdom. Most other insects go into sort of a diapause. They sort of sinest during the winter, calling back to my wild bee experience. Like, for example, bumble bees are parts of colonies, but instead of overwintering as an entire colony, only the queen overwinters, so she goes underground and hibernates in a hibernaculum. But honey bees? They spend the entire winter together, overwintering as an entire colony.

**Amy**

I always tell people the more you learn about honey bees, the more you realize, the less that you know. You're just like, oh my gosh, in our minds, we just have these bees and these workers who survive, individual worker bees who survive a month, a month and a half or so. And then all of a sudden, we're talking about winter bees versus summer bees. It's so much fun to hear about. So, when I was living in Virginia, I remember having bees who overwintered and there's just nothing like knowing that your bees are alive. When it starts to get warm outside, you start to check

entrances, right? I mean, that's like a thing like you go to your hive after you've gone through this really intense winter and you're like, okay, are they alive or are they not? And then you can hear them buzzing.

**Dr. Gabriela Quinlan**

Listening in, yeah.

**Amy**

Yeah, that's exactly what you do. So, I guess I have some experience with winter bees. But you kind of mentioned this, and this was one thing, was the difference between winter bees and summer bees as far as them surviving. The winter bees will survive longer than summer bees. Can you elaborate a little bit more on some of the differences between winter bees and summer bees? I mean, what makes them so different from each other?

**Dr. Gabriela Quinlan**

Yeah, totally. I would say, like I said, the biggest difference is how long they live. So, the summer bees are pretty short-lived, about a month. Winter bees, their sort of biggest indicator is how long they live. So those long-lived 8+ months living bees. But they're able to do that and they have several physiological or physical features that enable them to live such a long time. And they kind of give us clues as scientists as to whether we're looking at a winter bee versus a summer bee. So, your winter bees will have larger fat bodies, higher gene expression of genes related to longevity and immunity and nutrition, and they'll tend to have a larger gland.

Compare that to the summer bees. Those physiological features might sound really familiar if you're familiar with the differences between the nurses and foragers. So, in summer, we kind of further breakdown the bees into the types of jobs they do. So, the young nurses that are nursing the brood tend to have these same sorts of biomarkers as the winter bees. So, they're pretty fat, they're young, they have these gene expressions and proteins related to nutrition and immunity. Whereas as they age, that fat body depletes, and they become the older foragers that go out and leave the nest. As you're listening to these physical differences in the individual bees, it might kind of make sense based on the tasks that they have to conduct. So, winter bees have to have a lot of energy to keep that brood nest warm throughout the winter, right? Even when it gets really cold outside, they keep that brood nest at a toasty 95°F. So, that takes a lot of energy, hence why they have those really big fat bodies and that gene expression that's going to allow them to have stronger immune system and higher nutrition and all of that.

Compare that to the summer nurse bees. So, they also are using a lot of energy to produce all of the brood food that they're nursing. So, you can kind of think about that to remember the types of physical differences in winter bees versus summer bees and within summer, nurse bees versus foragers. It's kind of aligning with the types of jobs that they have to do within the hive.

And I should also add that while we kind of breakdown summer bees to nurses and foragers, really during the winter bees, it's all winter bees. Everyone is contributing to that one task of keeping the colony warm, and so, they're all kind of physically very similar.

**Jamie**

So that's been one of the mental struggles that I've kind of had with this idea of winter bees, and that's why I'm so glad we have you on. My mind sometimes tries to separate, is there a true production of bees that are winter bees or are they winter bees because there are fewer standard activities to perform? Let me explain kind of what I mean. Like, if they're never forging because there's no forage, is that why they're long-lived? Or do they emerge from their combs physiologically different, fat body different, preloaded to survive a winter? Whereas, if you had grabbed bees that existed in spring and summer and could keep them alive, they wouldn't themselves be able to lead that colony through winter. You see what I'm saying? It's not activity driven. It's not like there's now no task to perform except heating the hive. Therefore, they can live longer since there's less activity. It's that these are truly different bees.

**Dr. Gabriela Quinlan**

That is a great question. I don't think that the scientific community is in total agreement about what makes a winter bee. So, Jamie, you pretty much outlined in plain language the theory of what's known as the nurse's load. It's this idea that the winter bees are actually just that last cohort of nurse bees that didn't have a ton of brood to rear because, as any of your more northerly beekeepers will know, as you go into the fall, brood production starts to slow. And so instead of those nurse bees having to put all of their energy into nursing the brood, they can hold on to their fat stores for themselves. And in doing so, they can live longer and become that cohort of winter bees.

But there's so much complexity that goes into what's going on in that fall transition. That is sort of where a lot of my research is focused right now on understanding all of the interconnected drivers of what tells bees the time to transition for winter, because it's not just the brood production that's slowing. That happens within this huge context of a lot of changes that are happening in the fall.

So, let's just start with, in the fall, it's getting colder out. So, the plants are slowing down, they're producing less flowers, and so maybe the foragers aren't bringing as much back. Similarly, the cold temperature, temperatures and shorter days mean the foragers don't have as much time to go out and fly and forage. And so they're spending more time in the colony, which means there's less food coming in overall. And we know that we need food in order to make brood, and maybe that's what slows down the brood production. And then because there's less brood to rear, the nurses stay on as nurses for longer. But there are also all sorts of other pheromone things going on within the colony. There could be direct effects of temperature and daylight on the sort of

physical connection of bees. That's certainly how it happens for other insects. We talked about how they get clued to go into diapause over the winter. So, it's just this amalgamation of all of these different clues and limitations that the bees are getting from their surrounding environment and then within the colony environment that makes it pretty difficult to actually piece apart what components are essential for orchestrating this transition from fall summer bees into winter.

A lot of my work has focused on trying to hold one piece of that puzzle study, and then trying to manipulate another piece to understand the relative impact of either.

**Jamie**

So, Gabriela, if I understand correctly, there is one hypothesis, essentially, that says winter bees are the just nurse bees born, they emerge from their cells, there's little for them to do in the nursing perspective, and they're just essentially frozen in time and those bees carry the colony through winter. So that's one hypothesis. Another hypothesis is these are truly purposefully made bees that have the task of carrying them through winter. Of course, that then would lead to a cascade of questions like what triggers production? So, are there just those two competing hypotheses or other things on the table?

**Dr. Gabriela Quinlan**

Yeah, that was perfectly summarized. So, is it that these bees have something during, let's say their larval stage, whether it's the pollen that they get or the environment in which they're reared, be it colder, out of hive temperatures, different pheromones within the hive? There are so many different factors, but something that sort of predisposes this cohort of bees while they're developing larvae so when they emerge, they are the winter bees. There's a lot of different types of research that supports that hypothesis, kind of looking at newly emerged bees, how they are physically different from adult bees.

But then, as you said, the other idea is that they're not predisposed to becoming winter bees, but that as they get older, they're kind of frozen in time, as you said. So, there's a lot of different components to this that kind of support these different theories and help kind of piece together different pieces of the puzzle.

**Jamie**

I'm curious before we get too far in, which hypothesis do you favor?

**Dr. Gabriela Quinlan**

I think that it's a bit of everything. Just like with any answer in nature, there's a lot of different components, but my research is really focused on which of these components are the most important and which are essential. Because, if, like for a lot of insects, it is related to things like temperature and photo period, as we think about changing climates, especially in the Northeast,

for example, we're getting warmer night time temperatures in the fall, how is that going to affect how prepared colonies are to overwinter?

So, if we can understand the relative importance of different components of the transition, then I think it can give us more tools as beekeepers to manage bees and to help them have successful overwintering.

**Amy**

So that actually leads me right into my next question. I'd love to hear more about the research projects that you are doing with winter bees. Do you study what triggers the production of winter bees? I'm excited to hear what projects you're working on.

**Dr. Gabriela Quinlan**

Yeah, absolutely. So, as I've kind of alluded to, it's a really complicated landscape of potential triggers and also potential noise out there when we think about what triggers the transition from summer to winter bees. One of the projects that I did was, as we were saying, is it just the amount of brood that these nurses need to nurse? And if they have less brood, they can kind of hold on to their own energy stores? Or is it something else having to do with the season?

In order to answer that question, I did an experiment where I manipulated colonies in the summer and again in the fall by giving some colonies extra brood to rear and other colonies less brood. So, essentially, we're creating high brood colonies and low brood colonies in the summer and then high brood and low brood colonies in the fall. And then what I found by analyzing the differences in the nurse bee physiology is that it wasn't just the amount of brood that these nurses had to rear. What was more important was the physical season that we were in. So, the better predictor of the bees becoming winter bees was the season itself. So, if we were in fall and the bees had a lot of brood to rear, they were still more winter-like than the bees in the summer that had less brood to rear. So, that suggests that it's not just this nurse's load hypothesis. It suggests that there are other environmental factors like temperature, like photo period, so the day length, like the types of flowering plants and the resources that these bees are bringing back that are influencing how they turn into winter bees.

So, that can give you an idea of the types of experimental approaches that I used to look at winter bee transition. So, holding one thing constant and manipulating another so we can kind of parse apart the effects of the environment versus nurse bee tests, for example.

I'm also looking at other things like the amount of cold that these bees are exposed to, so how long they have to cluster before they turn into a winter state. So that's another hypothesis is that the act of clustering and the pheromones in the cluster may initiate winter-like bees, and the cold itself may initiate that. But the problem with a lot of studies that have looked at that is they weren't able to separate the amount of cold that different colonies were getting from their

opportunity to forage. So, is it just that these bees are bringing in less food because they're in the cold, or is it that the cold itself is driving this?

So, for that experiment, I put colonies in cold storage just overnight to see if that would tip the scales and the number of cold accumulation hours. I'm also looking at things like the type of pollen that they receive and how the source of pollen, be it fall pollen or spring pollen, influences that transition, which could give us an idea about, is it part of the larval rearing that's influencing the transition or is it more on the adult stage?

**Amy**

Oh my gosh, Gabriela, there's so many things to take into consideration. And every time you would mention one thing, I would think about something else, and then you'd mention that something else. And I'm just like, oh my gosh. As Jamie mentioned, we've received so many questions about winter bees, and I'm just really excited that you're here and that you're a resource to be able to pick your brain.

**Dr. Gabriela Quinlan**

It's certainly a tangled web, which makes it very exciting as a researcher to try to pull that web apart.

**Jamie**

Honestly, I think that's been one of the struggles for me with it. I think back to what you just said, if it's the nurse's load hypothesis where there's nothing else for them to do, so when they're born, they just freeze in that state. My mind is like, okay, that makes sense because it seems like there's less of a burden to get them there. On the other hand, the opposite, extreme, last comment you made with that last question was, well, what if they're doing something different in the larval rearing stage, which we don't know yet. But if that's true, the adult bees then would be sensing that, quote, winter is coming. And then they would be making purposeful decisions to rear and treat and move larvae forward differently than they would if they were in spring and summer.

And that would be equally mind boggling given the, it seems, complexity of the development of that behavior and that intent. That's pretty fascinating, right?

**Dr. Gabriela Quinlan**

Yeah, absolutely. I mean, I think there are just so many possibilities and nature is wild.

**Jamie**

Yeah. That's for sure.

**Dr. Gabriela Quinlan**

Yeah.

**Jamie**

That's why I'm glad to have you all because I've been listening to people talk about it so much and it's like, well, it sounds very purposeful, like the bees are doing this on purpose. But then I'm like, well, maybe it's not. Maybe it's just nurse's load kind of thing. So, it's fascinating.

So, obviously, this is a podcast for anybody who loves honey bees, which includes scientists and beekeepers, etc. But at the end of the day, we want to turn all of this back towards management, right? We've got beekeepers around the world who listen to this podcast, many of them living in temperate climates or colder, where winter bees are super important. So, from a beekeeper perspective, how do you manage winter bees versus summer bees or spring bees or whatever? Are there things beekeepers should do to make sure that the winter bee population is maximized or most efficient?

**Dr. Gabriela Quinlan**

Yeah. So, I mean, I think in general, summer bee management looks pretty different from winter bee management for those beekeepers in more temperate climates. Obviously, during the summer, you're a lot more active in your hives. You're inspecting them on a regular basis, you're testing and treating for mites. But during the winter, it's a lot more hands off, and so you really don't want to be going in and opening the lid and disturbing them. I mean, you should be checking to make sure the entrances are clear and there's good ventilation. But beyond that, it's a lot more passive than summer management.

With that said, I think the key thing to remember is that -- I don't remember who said this but -- healthy winter bees are made in the summer. So, just make sure that when that cohort of winter bees is produced, however they may be being produced, even though that's still a bit of a mystery, that they have the best chance at survival. That means treating for Varroa even as early as July and August and making sure your populations are under control and then checking again as you go into September. And once again, some of this will depend on your region. I'm speaking specifically from a Northeast perspective, but making sure your Varroa is under your local management threshold and then making sure that they have plenty of food. So, during the winter, obviously they can't go out and collect anything, or forage for anything. So, they need a lot of carbohydrate resources in order to survive and have enough energy in order to keep that nest thermoregulated so it's nice and toasty warm.

Some of the work that I've been involved in has actually looked at the type of feed that you give them over the winter and the effect that that has on their survival and on your success the following spring. So, from that research, what we found was that honey is king. If you can leave honey on for your bees and enough honey, depending on your region. So, in Pennsylvania, that would probably be close to 80 pounds of honey or so. Tilt the hive, and if it's difficult to tilt,

you're probably in decent shape. So, you want to give them plenty of food to overwinter on. And what we found was that honey in particular led to higher survival -- in our study, it was about 66% survival -- and larger colonies in the spring.

And we talked about the physical attributes of bees. When we looked at the individual bees that were fed honey over the winter, they were fatter, they had high higher gene expression for those genes related to nutrition and immune system functioning compared to some of your artificial feeds. So, we also tested in addition to sort of honey, which is that natural source of carbohydrates. We also tested sugar water, so sucrose water, and high fructose corn syrup and invert syrup. So, invert syrup being sort of that pro-sweet if you're familiar with that. And we found that if you don't want to do honey, probably the next best thing to do as far as healthy bees, big colonies that survive would be to do the two to one sugar water or the invert syrup. So that's a good way to ensure some success, that your colonies have enough food over the winter.

**Amy**

So, Gabriela, you did a really good job giving beekeepers recommendations that they have for Varroa and nutrition. You mentioned carbohydrates and honey and how that is a factor or could be a factor with winter bees. What about pollen nutrition and the production of winter bees?

**Dr. Gabriela Quinlan**

Yeah, totally. So, that's something I'm really interested in is, as we've discussed a little earlier in the podcast, there's a lot of things that could be triggering the transition of winter bees. So, it could be possible that something in fall plants is essential to larval nutrition and triggering their transition. But that is something you'll have to stay tuned for. That's something that I am actively researching to figure out if there's anything special about fall pollen.

In particular, some of the work by Gloria DeGrandi-Hoffman has suggested that fall bees versus spring bees fed on fall versus spring pollen has different effects on their physical attributes. So, I certainly think that there could be something there. And if there is, I think it opens up a lot of exciting possibilities management-wise for thinking about how we're making tailored diets to kind of help our bees prepare and have all the nutrients and micronutrients and everything that they need to make the best winter bees. But that's certainly something on the horizon and not something that is available to us yet, but something that I'm really interested in exploring.

**Jamie**

So, it sounds like there's lots of things that are still on the table to know about this, which is, I guess, good for the research world. So, that leads me kind of to our final question for you, Gabriela, this winter bee stuff we could talk to you about forever. It's fascinating and I'm so grateful to have you on because you've answered so many questions for me personally, but you

got to be doing some other things as well. So, what are some other interests or other projects that you have going on while you work for the USDA ARS?

**Dr. Gabriela Quinlan**

Yeah, yeah. So actually, my current work is pretty different from some of this winter bee work I've had a chance to talk about today. So, in my current role, I am leveraging remote sensing data, so satellite images and data on climate change to help us understand across really, really broad scales across the entire US, what the forage landscape looks like for bees and how that might be changing in the future, and what types of new crops or different types of land management we can do to help us prepare for a changing climate. So, from the very teeny tiny sort of fat bodies of bees all the way to massive sort of macro scale. So, kind of on the opposite end of the spectrum there, but really enjoying that research very.

**Amy**

Very cool. Well, as we end today's episode, was there anything else that you wanted to share with our audience?

**Dr. Gabriela Quinlan**

I don't believe so. Thank you for having me on today. It was so much fun talking winter bees with you all.

**Amy**

Thank you so much. As Jamie mentioned, we get so many questions about it. We have so many questions and we're really grateful that you were able to join us today to talk about winter bees.

**Dr. Gabriela Quinlan**

Sure, thanks for having me.

**Amy**

So, Jamie, there are so many factors that could go into winter bees, and it's so fun to hear Gabriela talking about the research that she's doing and a lot of the unknowns, right? I mean, you and I were talking to Gabriela behind the scenes and even you said there's just so much out there. What are your thoughts?

**Jamie**

Yeah, I'm really glad we had her because it demystifies it a little bit for me. It's almost like I hear it, I don't know, like 50% of the management talks that will occur at beekeeper meetings or out of 10 where someone will say, well, you do this, you do this, this time of year and now in late summer you've got to worry about winter bee production. So, it's almost one of those things that

I hear about and believe. I just don't know if we know enough about it to do. And so having her on really helped me wrap my mind around it because I've also struggled again with that idea. It's like, is there a purposeful production of these bees? Do the bees and the hives say, hey, it's time to transition into producing winter bees? And how would they know that? Maybe shortening days, cooler days, that's fine. But is it just bees that have nothing else to do and so they don't work themselves to death? I was specifically thinking about foragers.

Foragers have about 500 miles worth of flight on their wings, and when they reach that threshold, they die. That's an overgeneralization, but kind of where we know things head. Well, in the winter, they don't have to forage. So, are they just simply surviving simply because they don't have to go out and do this hard work? It's great to hear Gabriela say, hey, we don't know, we're untangling a lot of this stuff. We know it's real. We know they've got different fat bodies and gene expressions, etc. We know it's real. We're just not sure quite yet how they get there.

**Amy**

Like something's got to trigger that, right? I mean, I don't know, I feel that way. What do you think happens?

**Jamie**

Well, I'm scared to guess. My guess is that it's -- well, I said I was scared to guess and now I'm going to guess. But I'm guessing it's complex, like what she said because you've got shortening days, you've got cooling days, you've got a completely different bouquet of flowers blooming in the environment. You've got queens starting to produce fewer eggs. All of these things by themselves could be triggers that push them in the right direction. But one of the things that I'm glad about is while we may not know a lot about those triggers or exactly what winter bees do and who they are, etc., there do seem to be some clear recommendations, which is control Varroa and make sure nutrition is adequate.

**Amy**

Wow, shocking.

**Jamie**

I know, Varroa, nutrition, and queens, right? That's why thinking about these things in July and August and September are so crucial to the success or the likelihood that these colonies will survive over winter. I think that Gabriela really echoed that.

For those of you listeners in our Southern hemisphere around the world, whatever your mid to late summer is, that's your crucial time of year to make sure your colonies are as healthy as possible so that your bees will overwinter successfully. I'm grateful that Gabriela and others are taking a stab at understanding this very, no doubt complex phenomenon.

**Amy**

Absolutely. I'm excited to hear from our listeners. If you all have a theory on what you think is happening, we would love to hear that from you all. So, thank you for listening.

**Stump the Chump** 32:24

It's everybody's favorite game show, Stump the Chump.

**Amy**

All right, welcome back to the question-and-answer segment. Jamie, the first question that we have today is about pheromones on individual colonies. The questioner is asking if there are specific pheromones that are emitted by individual colonies. So, I guess, kind of like people. Does one colony smell different than another?

**Jamie**

This is such a tricky question, and the only reason I'm able to comment at all is because we have been kicking this around recently. For those of you who follow us with regularity, you know that we have a PhD student in our lab named Kaylin Kleckner and she's doing a lot of research in South Africa. One of the projects she had wanted to do was look at nest mate recognition in bees. So, the ability of one colony to recognize a nest mate or a bee that wasn't its nest mate. A lot of these assays will happen at the entrance of colonies. So, you'll take bees from one colony, put them at the entrance of another colony and see how they respond. Okay. And so, in order to think this project through, she had to do a really big literature review on nest mate recognition in honey bees. What she was finding is in the ant literature, there's clear evidence that some colonies just smell different than others. Some ants smell different than others. And a lot of that has to do with cuticular hydrocarbons. So that's just a fancy word to say that the body of insects is covered in a thin layer of kind of this waxy material, and that cuticular hydrocarbon can hold pheromones or hold other smells on the surface of that body. If everybody's living together, they tend to start smelling the same. So, ants in one colony can recognize their own members from those of another colony.

Historically, I have always taught and thought that every colony has a unique smell. That's how they would recognize to keep out bees from other colonies and probably thought that this was related to cuticular hydrocarbons. But when Kaylin started diving in the literature, it was remarkably -- how do I say this? It was remarkably different than what I had anticipated. She found that there's not a ton of evidence for unique smells between colonies. So, colony A does not necessarily have this unique smell compared to colony B. So, then that raises the obvious question, which is, well, how do they recognize their own nest mates but not those of another colony and know how to respond defensively, which is what she said, based on the literature, there's still no clear answer to it. So, let me just go back down to the actual question being asked.

The actual question being asked was, are there specific pheromones that are emitted by individual colonies? So, there's no reason to believe that one colony can produce a pheromone that is unique to it that the other bees themselves aren't capable of producing. They would all have the ability to produce the same pheromones. Now, you could argue that the different colonies may produce those pheromones at different amounts, therefore producing a unique pheromonal bouquet to that colony. But what Kaylin was seeing is, in the literature, it's probably less pheromone related and more so what they're exposed to daily related as well as food that they are carrying. Let me expand on those two thoughts.

So, if colonies are all producing the same pheromones, even if it's slightly different proportions, that's probably not enough to make each colony have a unique quote signature. On the other hand, if this colony is foraging on these plants and visiting those water sources and collecting that pollen, the stuff that they interact with will produce a unique smell that could end up on the cuticular hydrocarbons of bees from nest A and make it smell slightly different than bees from nest B. So, maybe that is a signature that helps them decide who's a nest mate and who's not.

It's also possible, and there's some evidence of this in the literature, that nest mate acceptance in honey bee colonies has a lot to do with whether or not bees coming in have food to offer. So, for example, if a bee from another nest shows up -- so let's just put numbers on them or letters. Bee from nest A shows up at hive B. When she goes in, if she's bearing no resources, she might be recognized as unique, maybe because of smells, but maybe not, and they might attack her. But if she comes bearing resources, so she accidentally flew to the wrong hive, but she has a pollen load or she accidentally flew to the wrong hive but has a nectar load, she would be welcomed more readily. So, it was just very confusing literature to me as I was listening to her kind of go through this and reading what she had written about this topic.

So, the answer, the shortest possible answer, they produce specific pheromones, it would be no because they all produce the same ones, maybe in different amounts. But it's still a little unclear how true nest mate recognition is accomplished in honey bees. It's still kind of a growing science. I thought it was clearer than what I ended up hearing after Kalyin had done her literature review.

**Amy**

Yeah, it's, gosh, it's such an interesting topic. I think that it's like, okay, yeah, it feels like it makes sense if there is a bee with resources that they could contribute to the rest of the nest. Yeah, if someone brought a gift to my door, I'd happily let them in.

**Jamie**

You think about it though, Amy, like we've talked about before the podcast, like in a managed apiary situation, drift is very high. So, if they truly had these unique signatures, they would all fight themselves to death within just a few weeks because of how high the drift rate is. So, it

looks, again, this is over general because we still need to know more, but it looks like, I hate to even say this out loud, but it looks like they're more accepting of one another than, say, like ants are. So, then the question is, well, why do robbing bees get attacked so viciously? Well, you could argue it may not be odor related. It may just be that the colony now is getting its resources taken and they recognize that. So, now they're hypersensitive to anybody who comes to the nest. It's just really tricky. And I was surprised maybe how little we knew about it.

**Amy**

Yeah, gosh, it almost seems like it'd be interesting to look at drifting in different types of the year, based on the resources and whether they're available or not, or what's available.

**Jamie**

Yeah. Drifting. It's so fascinating to me. Actually, Kaylin's in South Africa to study that right now. But it's tricky. It's a tricky thing to study.

**Amy**

Definitely. All right. So, the next question that we have, would the Bee Lab be interested in testing bees' aversions or attraction to different species of wood? They put lumber. I don't know if this means like, I don't know, to put a swarm trap out or just something, as far as what the bees are going to be living in. I'm not sure as far as different species of wood and the reasoning for that. But is there anything out there that says that bees prefer specific types of wood?

**Jamie**

I really like this question because it kind of gets to the heart of some of the ways that I feel about beekeeping. I was given, from a friend at church, a book to read from, I think 1921 or 22/23/24, somewhere in there. But, basically, the book's 100 years old and about beekeeping. And I was reading it the other day, just shocked at how similar what we do now is to what we did 100 years ago, and how the boxes are, and that the pictures in the book look like they could be pictures in books today. I'm like, "Oh my gosh, nothing's changed." And so, it just kind of brings up this idea to me that there are so many things in the beekeeping world that we just kind of do or we just kind of take for granted. But I wouldn't be surprised if there weren't better options. And this question gets right to the heart of that.

What do I mean by that? Well, most of us go to the equipment catalogs, buy the deep boxes, the medium boxes or shallow supers or whatever. We put our bees in it. We don't think twice about it. Some of us may say, well, this equipment manufacturer uses pine for their boxes. This one uses cypress and cypress is more rot resistance, and I might go to that equipment manufacturer and use cypress, but really, we just kind of make those types of decisions.

There's really, to my knowledge, no research on it. Well, maybe bees have a preference. Maybe they do better in pine or cypress or cedar or whatever. So, the question is, is would the Bee Lab be interested in testing bees' aversion/attraction to different species of wood? This is a little bit kind of out of our wheelhouse of things that we study here, but it is still an amazing question to me because my gut would say bees are likely to perform equally well in boxes made of all wood types.

Now, that has nothing to do with whether or not the wood will last. I mean, I think cypress lasts longer than pine, right? That's just the way it is. But that doesn't necessarily mean that the bees would thrive in a cypress box. I go through all this to say that I wouldn't be surprised if there was a wood component to the success of colonies that live in it. I wouldn't be surprised if one wood had natural chemicals that make it harder for the chalkbrood fungus to thrive. So, while we've not tested it, and I'm not aware of tests on it, I wouldn't be surprised if someone someday found that bees living in pine boxes are better off or worse than bees living in Tulip Poplar boxes. I just wouldn't be surprised. So, whether or not we tested, I'm not sure, but it's definitely one of those things that's filed under the, well, we've just kind of taken this for granted, but I wouldn't be surprised if someday someone discovered that it actually makes a difference.

**Amy**

Yeah, definitely. On top of that, looking at the different species of wood, but at the same time, many of our beekeepers paint their boxes, right? There's a paint factor. Or they dip them in wax. So, there's that factor as well. And so there are all these other factors outside of just the bees living in these wooden boxes, right?

**Jamie**

Yeah. It's things we don't -- just like what you said, that's hard for us to consider. Like I think about the wood preservative that beekeepers here in the US, copper naphthenate, things like that, that they dip their boxes in. What if wood A gets heated in our typical summers? Does it release volatiles that wood B does or doesn't release? So, that's what I'm saying, I wouldn't be surprised if this mattered. My guess is it wouldn't make a big difference, but I wouldn't be surprised if someone found something someday. So, it's a really interesting question, something cool to think about.

**Amy**

Okay. So, our third question, this is a big one. How can beekeeping play a role for a family experiencing food insecurity?

**Jamie**

Wow, What a hard question. You and I have said many times that we look at these questions before you ask them to me on the air. I was looking at this. I need to give the caveat I do not

work in this area. I do not work in food security. I wanted to make sure I gave it its due diligence before I tried to answer the question. I'm actually going to do it abysmally, I'm sure.

But I looked up food insecurity because I really wanted to make sure that I had a good definition. It essentially means, just reading here offline, a household level economic and social condition of limited or uncertain access to adequate food. So, someone experiencing food insecurity would be one that had limited or uncertain access to adequate food. And we could debate what adequate means, but it might mean volume, but also healthy and nutritious food. And so, what role can beekeeping play?

So, I was thinking about this from two angles. I was thinking about this from the family experiencing food insecurity. Should they bring bees into their lives, and can they benefit from having bees? I mean, honestly, Amy, I need to think that one through some more because to me, bees are a great hobby, they're a great job. But if I was experiencing food insecurity, there's probably something behind that, right? Maybe I don't have the economics to get the food, or the food is not close to me or whatever. Would bringing colonies that I have to pay for and manage and worry about change that for me? I need to think that angle through more from, if I am experiencing food insecurity, how can bees help me?

You could argue, well, they're a constant source of food and this and that. But yeah, you got to treat them. You might have to feed them. You have to have the equipment necessary to harvest. So, it's just a struggle for me to see how someone experiencing food insecurity might benefit from bees.

On the other hand, I do feel they play a huge role in reducing food insecurity because part of that is food availability as well as the availability of nutritious food. And we know unquestionably that beekeeping plays a role in increasing the amount of food available, which correspondingly decreases the price of that food, but also increasing the type of food availability that would be nutritious for us, right? Fruits, vegetables, nuts, berries, and things like that.

So, if you look at it from those two angles, you kind of get different answers. If someone is experiencing food insecurity, I need to think that one through, I don't want to say that there would be no benefit, but I could definitely see some negatives of having to have bees and worry about bees if you're experiencing food insecurity. But on the other hand, having lots of bees in an area, and generally healthy bees, would reduce overall food insecurity, I believe. I'm curious, Amy, as someone who works more on the public side and social side, what would you think about that question? I mean, how would you think that through?

**Amy**

Yeah, for sure. I definitely agree with you. It's hard to say. I think you're looking at it from a more localized, direct impact and how beekeeping can help, let's say, a family that is experiencing food insecurity, right? It probably wouldn't help to have bees. And I think that the

people that are listening to us understand the ins and outs of what it takes to keep bees. If you're in a food insecure area, the last thing you're thinking about is taking care of some sort of livestock, right? We consider honey bees livestock here.

So having the inputs and the cost of inputs and maybe even the space of having bees may not be beneficial directly and may not help you directly. But from the more general, the larger perspective, absolutely. Beekeeping plays a huge role in the availability of healthy and potentially affordable food. I definitely agree with you. I would say, if I was speaking to a food insecure family, I probably wouldn't recommend that they just go out and get bees and learn this whole art and science. But, if they wanted to do it for fun, I think that that's one thing. But I also think that just being aware of where their food comes from, how this happens, I think that from a larger scale, beekeeping definitely helps food insecurity. It's just not kind of a direct effect that you'll see for those experiencing it directly.

**Jamie**

Yeah, I agree. We're saying similar things. I think, I mean, the only situation, and I hesitate to even say this because I don't want people to run out and spend money on this if it's just not going to work, but maybe food insecurity is a reality for them. Again, we're thinking probably the United States as we answer this question, but probably all around the world there are people where the nearest market may be dozens and dozens of kilometers away. The question is, could having bees on site help them? If a village somewhere is investing in a garden, a community garden, then I could see how having a colony could improve food security in that setting because you need the pollination associated with producing the fruits and vegetables, whatever they come from that garden. Maybe the same is true even in a place like the US, where maybe they're far from a market and trying to grow their own thing.

But like you said, there are so many inputs associated with bee colonies that you would hesitate for someone to believe that bees are going to solve all their problems from a food insecurity perspective and then go out and get 10 colonies and now they're resource stressed, which contributes potentially to that. So, it's really hard. It's really hard thing to think about on a local scale.

**Amy**

Yeah. I mean, I think about this often as well. So, I do work with a lot of insecure areas, specifically here in Florida, right? And I think the thing that really is beneficial is just having, like you mentioned, a community garden or community space or community apiary. I've seen benefits from that perspective, especially when they're working together as a community. I think that's a little bit different than one family who's experiencing it who wants to have bees on their property. I've definitely seen success stories of beekeeping and how it plays a really great role for families who experience food insecurity, and not even, again, not directly related to having food

there, but it helps individuals economically with the potential for maybe someone who is looking to harvest honey and sell that honey or to pull wax and start creating value added products. Now, again, that is an indirect impact of it and not directly providing food.

But then, the other question, and I think you said this at the very beginning, is that a lot of people think of food insecurity, and what that means to them is that there's no food and there's no access to food. Well, from my personal perspective, the way that I see food insecurity is really there is limited access to those healthy foods. And so having bees with the pollination services, working with the community garden, a community apiary, and being able to grow food on a very small scale can be beneficial. So yeah, like you said, it's a very complex question. We're not going to be able to answer it on the podcast, but I do think that it is some food for thought. Just trying to think about wrapping our mind around how beekeeping does play a role in food insecurity.

Alright. Well, with that, that is the end of our Q&A for today. Listeners, if you have questions for us, don't forget to send us an e-mail. You can send us a message on any one of our social media pages. We are about to go strong into 2025. We've been doing this for, gosh, Jamie, we're going into, can we say this is year five? I guess we can.

**Jamie**

That is crazy.

**Amy**

That's kind of crazy to think about. But anyway, for our listeners out there, if you have questions, we are always looking for questions so that we can answer them on air.

Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator, Mitra Hamzavi. Thanks, Mitra.

**Jamie**

Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.