Episode 254: Q&A on Honey Bee Weight Spider Venom as Varroa Control, and How Varroa Destructor Got Its Name

Dr. Jamie Ellis

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 episode of Two Bees in a Podcast. We are back to the Q&A episode. I can't even say welcome back anymore because this is its own standalone episode, Jamie. The Q&A. Now I have to figure out like a new intro, a new way to introduce this episode.

Dr. Jamie Ellis

I know. To me, there's a lot of pressure on the Q&A now because now I have to answer enough questions long enough to where they would be timed roughly the length of a standard podcast. So, I don't know.

Amy

That’s not true.

Dr. Jamie Ellis

I know. I just feel pressure, a lot on my shoulders right now.

Amy

Whatever we put on the podcast is the standard amount of time for the podcast.

Dr. Jamie Ellis

OK. I guess that's fair. I guess that's fair. So, you ask the questions I'll try to answer, and we'll see what happens from there.

Amy

An Equal Opportunity Institution.

All right, let's see. So, this first question, this is funny. I feel like someone asked me this question once and it was a question that I had never thought about because I've never thought about this question and I didn't know the answer to it. So, I was the chump that got stumped that day. But the first question is how much does a bee weigh?

And I guess I'll elaborate on that. Is there a difference between a worker and a drone and a queen?

Dr. Jamie Ellis

So yes, there is a difference in weights between a worker, a drone, and a queen. And it's funny you ask that because I've never weighed queens or drones, but I have weighed lots and lots and lots of workers. So, I know right off the bat that workers are usually in the neighborhood of 100 milligrams.

And, of course, it could be a little bit lighter if their bellies aren't full. It could be a little bit heavier if their bellies are full, but they're usually around that 100-milligram weight. And I know because we've weighed lots and lots and lots and lots of honey bee workers because you do that when you're calculating total number of honey bees in the nest.

And a milligram is something that doesn't make sense maybe to a lot of Americans, especially because we don't typically talk about grams and milligrams and kilograms and things like that. But there's like 453,000 milligrams in one pound.

So, that's a lot of milligrams. And so, if the average honey bee weighs 100 milligrams, then you could see where, you know, there's somewhere in the neighborhood of 3500, four thousand, 4500, five thousand, you know, bees in a pound, depending on if they're all full of honey or if they're not all full of honey. But yeah, about 100 milligrams for a worker. And again, it varies, you know, 10 to 20 milligrams in both directions depending on the age and the weight of the bee.

Amy

I was about to say, but also, you know, were these bees alive or dead?

Dr. Jamie Ellis

They're live. And so, for example, we often, especially back in the older days when I used to do this a lot, we would often try to figure out the number of honey bee colonies in a nest. And what we would do is we would weigh the hive full of bees. Then we would shake out all the bees and weigh the hive empty.

And so, what that would tell us would be the total weight of bees in the nest. Then we would take a subsample of those bees, and we would weigh that subsample. So, let's just say for the sake of

argument, it was a thousand bees, right? Well, we would know the weight of 1000 bees, and we would know the weight of those bees on average because we would count the bees.

So, if it's this much weight and this many bees, that told us the average is this much weight per bee. Well, you can divide that into the total weight of all the bees in the colony, and you could get a number of bees in the nest. And that's why I know it hovers around about 100 milligrams.

I've seen it in the 90s. I've seen it around 110, 115, but you know, more or less it's around 100. Queens can be up to double that and drones can be, you know, two hundred, three hundred plus. But you know, I know a lot more about workers because I've weighed a lot more workers in my lifetime.

Amy

I was about to say, I was like, I introduced this question as like, this is one of the hardest questions I've been asked because no one has ever asked me. And you immediately are like, well, this is how much it weighs.

Dr. Jamie Ellis

Well, workers, I seem to know. Again, it's hard to say that 100 is the average because all the experiments are – but it hovers around that amount. Queens and drones, though, that doesn't roll off the tongue. I actually had to look that up. I'm hopeful that what I looked up was accurate.

Amy

What was it?

Dr. Jamie Ellis

Well, like I said, queens were somewhere in the neighborhood of 200 or so milligrams plus or minus a handful. And then drones could be 200 to 350 milligrams. And I'm relying on AI to be correct in those contexts. But it's funny, they often provide sources and the sources are there, but it's pretty reasonable to think, right, drones are roughly twice that of a worker, right? That's a fair assessment. Queens also.

Amy

That's fair. I'm sorry I missed that the first time. I was still just thinking about you knowing the weight of a worker bee.

Dr. Jamie Ellis

Workers, I did know that for sure.

Amy

That's funny. OK, well, thank you all for that question. The second question that we have today, so this question came to me when I was at one of our local beekeepers' associations and I guess there was this article that talked about how in Australia, you know, Australia just recently confirmed that there was Varroa destructor there.

So, there was an article or something that said that there's been research done in Australia looking at spider venom for mite control. So, I guess I'm wondering if you've ever heard of this and you know, what's up with the, the spider venom for mite control? What's the idea behind it?

Dr. Jamie Ellis

I actually have heard of it and that's because I answer questions for the American Bee Journal and someone asked me this very question maybe a couple months ago and I had to look it up. And essentially what it was is the questioners are hanging on to a paper that was published out of Australia, just like what you said, where some scientists, in fact one of them, a colleague of mine, Dr. Vincent Diedemann, who's from France, but he's worked in Switzerland, the last, I don't know, a couple of decades.

He and his team have found a particular ingredient in some spider venom has been shown to have activity against Varroa. So, a couple of general thoughts that I have here about this.

First of all, it's really novel and cool to think about because it's a good story, right? Spider venom can kill Varroa. That's just a genuinely good story. But as the scientist in me, it's always really difficult to think about these things, because lots of things kill Varroa, right?

There's lots of pesticides that kill Varroa, lots of compounds that you can put on Varroa that can kill them. In fact, it's hard to keep Varroa alive in a lab. It's easy to keep them alive in a colony, but hard to keep them alive in the lab. So, I always approach these kinds of findings with cautious optimism.

It's really neat that they found a couple of things within spider venom, happens to be a couple of peptides that's toxic to Varroa. That's cool. But having worked in this space myself for a very long time, I know the obstacles that they still have to overcome before it can ever get to a treatment that beekeepers can purchase and put into their own colony.

So, it's really neat. This is kind of what I would consider phase one, tier one type of research where it's that first step, OK, we've identified an active ingredient, a potential active ingredient, this particular toxin that we've discovered can kill Varroa. OK, so now what?

Well, now you've got to get that stuff, and it's got to be produced at a level that you can test it against bees because you want to make sure it doesn't harm bees. And then you've got to work out the formulation. How can you stabilize this stuff in colonies? And then you've got to get a company that's interested enough in licensing this, right?

Because someone has to take the financial risk of putting this into a treatment and then selling it for beekeepers to use. So, I'm excited in the sense that it's pretty neat that they found novel compounds that have activity against Varroa. But I know that I'm cautiously optimistic because there are just hurdles that they have to overcome before they could potentially ever get it to the market.

Now, I've not gone far down this rabbit hole. I have read the research paper, so maybe they've got a lot of this infrastructure already in place. But it's just one of those things that I know that potentially there's a lot still that has to be done before, you know, beekeepers would be using the stuff to control Varroa.

Amy

Yeah, absolutely. And, you know, this was one of those things where a beekeeper brought it to my attention. And I think as much as we try to, you know, be on top of everything that's coming out, it is very helpful for beekeepers to see things and send these things to us so that we can take a look at it and kind of figure out, OK, well, let's see what happens, you know, moving forward with some of these projects.

Dr. Jamie Ellis

Absolutely.

Amy

All right, OK. So, this third one, I think it was a response to one of your YouTube videos on feeding. Yeah, I think it was one of the feeding videos that you had. But this person commented and said that they've noticed that their bees get really annoying when they feed them.

They're not aggressive, they're just really personal. I like this. They're just really personal and pesky. They're like getting into their personal space and the bees are just, they don't understand personal space, but they are getting really personal. So, you know, this person's basically going to be at the other side of their yard across acreage and then they fly over there just to get into this person's face.

They'll, you know, crawl into their shorts, they'll buzz up around their face. And so, I guess the question is like, what is going on? What is this behavior? It makes sense that they were maybe hungry, but this person is feeding them. And so, if they're feeding them, what do you think the issue is?

Dr. Jamie Ellis

Oh man, Amy, when I was looking at this question before we started this podcast, I was thinking to myself, how should I tackle this? And so, all of you guys, you're going to hear kind of a

behind the scenes Jamie Ellis brain-ism. All right, so I'm sitting here thinking, OK, I can ramble off a lot of potential things and sound like I know what I'm talking about.

Or I could take the other extreme to say I don't know. In which case, Amy, you'd be like, oh, congratulations, you stumped the chump. Jamie's a chump stump. All right, so I'm going to kind of take the middle of the road here, which is, I don't have a good explanation for this because it's not something I see when I'm feeding bees, right?

So, it's kind of like this, I'm not saying what they're seeing is not real, it's just hard for me to comment on it because I don't have good reasons for them seeing it. I feed bees all the time and don't notice a behavior change in them that matches this where they're pinging me up against my face or they're following me around the yard.

I just don't see it. So, then, I would have naturally defaulted to, well, did you change your perfume? Did you change your cologne? Are you using a different shampoo? Was something else riling up the colonies when you're walking around the yards? And the questioner basically preempted, it doesn't seem to matter what I wear, what I smell or how I smell.

It just seems to be happening. And the only common ingredient here is that I seem to be feeding my bees and it doesn't happen when I'm not feeding my bees. And so, it's hard for me to know because I've never experienced this personally, directly. I can't think of a good reason that feeding bees would cause bees unless, of course, now let me let me just say this, unless they are feeding bees outside of the hive.

And what I mean by that is if they're like open feeding bees, I could see where that would create a unique behavior. What do I mean by that? Well, when I'm administering sugar syrup or corn syrup directly to a hive through an entrance feeder, a top feeder or division board feeder, I just have not experienced this.

But if you are open feeding, then you do certainly create a behavioral change in the colonies in your apiary. You get a lot more general flight in the apiary. You would get, in fact, many of these behaviors like what's being described here. But the questioner did not mention that they were open feeding.

So, it's hard for me to say, you know, this is exactly what's happening. So, if they're open feeding then I think it's just you're creating those flight situations where bees are just out looking for things. But if you're not open feeding your feeding colonies directly then, honestly, I've got nothing to offer because I've not experienced this myself.

Amy

Right. Well, you know, and then the other thing, Jamie, I think about, this is my Amy-ism here thinking out loud, and I guess what I'm thinking is maybe if you're feeding, maybe there's some

sugar syrup that has like spilled on your hand or on you. And the bees just kind of, you know, they smell and are attracted to the sugar water or whatever it is that you're feeding, right?

I mean, maybe they're just taking interest in it because they can smell it because the person said that they're not being aggressive. They're just kind of checking it out, right? So, maybe, I don't know, maybe there's some scalp bees and they're like, oh, hey, you know, have you ever seen that meme that basically says you get really excited because a bee lands on you?

And instead of like swatting at them and being scared of them, you feel so honored because they thought you were a flower.

Dr. Jamie Ellis

Well.

Amy

I've had a lot of coffee today. Can you tell?

Dr. Jamie Ellis

You see a lot of memes. I think I have actually seen that one. So, when a bee lands on you, just be happy that it thought you were a flower or something.

When I lived in Florida, I kept bees on the back of my property. And when I would work my colonies, I would often go sit on the back porch afterwards and they would seemingly increase their interest in me. And I don't know if it's because I have been working the hive or been marked by bees or smelled like whatever it is.

And my kids who would sit back there with me after working bees was like, Dad, you brought the bees with you. And maybe there is something to that. I kind of got the impression when I read the question that maybe it happened outside of direct feeding times. In other words, they may have fed them yesterday, but they're experiencing it even still today.

But maybe it is. Maybe there's just sugar water residue. I just don't know. I don't know. I don't know without asking more questions through the questioner, I suppose.

Amy

That's fair. I feel like, you know, Jeffrey, our podcast coordinator, I think he needs like a sound for every time you get stumped.

Dr. Jamie Ellis

Womp womp. What does a stump sound sound like?

Amy

I don't know. I'm going to let Jeffrey put that in right there.

Dr. Jamie Ellis

Jeffrey, we're relying on you, buddy, to have some sort of "You Stumped." People should get T-shirts. I stumped the chump.

Amy

Yeah, we'll just mail it to them if they ask the question.

Dr. Jamie Ellis

We need some swag.

Amy

Oh my gosh, I think that's an elderly person's term. Swag is what I was told by, yeah, by some of the students. But anyway, all right, so this is fun having a longer Q&A because now I can actually, like, say more things. I don't have to skip on to the next question.

OK. So, we are on our fourth question now. Guess this is a yes or no question, Jamie.

Dr. Jamie Ellis

I'm saying.

Amy

OK, do coconuts require pollination?

Dr. Jamie Ellis

They do require pollination, but they are predominantly wind pollinated, though insects can help along. And I actually looked this up. Honey bees are the most common insect found pollinating coconuts according to this one paper. So again, they're primarily wind pollinated. Insects will help. Of the insects, honey bees seem to do best. So, there you go. Quick answer.

Amy

Interesting. But does it require it? Like, will it still do it even if it has wind pollination?

Dr. Jamie Ellis

It will. It requires some sort of pollination, but wind pollination is sufficient to give it at least some, I guess, coconut set instead of fruit set.

Amy

Is coconut still a fruit?

Dr. Jamie Ellis

I don't know. It's got nut in the title. Whose podcast can we go on and ask this question?

Amy

No, yeah, I think we need to ask a question to another podcast out there.

Dr. Jamie Ellis

Two Coconuts in a Podcast.

Amy

Two Coconuts in a Tree. All right, OK, so let's see. We've gone through four questions now. Now we're on to question number five of this Q&A. This question is about wax moth larva and wondering if, I guess do wax moth actually eat the wax or pupil casings in the wax? What do wax moth larvae eat after they emerge when they're adults.

Dr. Jamie Ellis

It's all of the above. So, they get their name because of the perception that they eat beeswax, right? We've seen it. If you're listening to this podcast, you no doubt have seen wax moth larvae and the damage that they cause. But they can't survive exclusively on wax because beeswax is just the lipid, right?

And there's no protein associated with it. They've got to grow based on protein. So, wax moth larvae are very reliant on the other things in the wax, on the wax. So that would be pupil casing. That will be the fecal material that the developing bees leave behind, the larval bees leave behind once they emerge as adults.

It'll be like bits of pollen or other debris, all of these things associated with wax moths. And we know that stuff is there because when bees make virgin comb, it's almost white. It's that creamy white in appearance. And we know it'll stay largely that way if all they ever do is store honey in it.

But we know also that beeswax will darken the more brood cycles that have passed through that wax, right? It'll darken from light brown to brown to almost black in color. And all of that stuff is the stuff associated with the wax that really helps the wax moth develop.

And if you think about it from just a standard practical standpoint, if you put dark comb that that has been used for brood rearing purposes and white comb that's been used for honey production

purposes out in, say, a covered shed, wax malts are preferentially going to lay eggs on that black comb first.

It's not like they won't move to that white comb. They will, but they'll preferentially lay eggs on that dark comb first and decimate it first because of all the other stuff associated with that wax. So, while they can take in wax, they also really like to have all that other stuff associated with it because that supports their growth, development, reproduction, etc.

Amy

Interesting. So, you know, we started with the first two questions that were from going to different associations and hearing from beekeepers. The second question that we got was from social media in one of the videos that you had had. The questions that I'm asking now, the coconut one, the wax moth one, and then this last one that I'm about to ask you actually came from a group.

I think some listeners know on here that I went to Thailand and took 13 beekeepers with me to Thailand to learn about Varroa, Tropilaelaps, and all the different Apis species out there. But all the people, every day we would spend hours on a bus.

And one time, Jamie, I was sitting there at the front of the bus. You probably know where I'm getting at with this story, but I'm sitting at the front of the bus and all of a sudden here comes the Two Bees in a Podcast intro song. They all wanted to listen to Two Bees in a Podcast while I was sitting there.

They turn it on. And it's like having to listen to your own voice, you know, people typically don't love listening to their own voice. I don't, at least. And so, I was like, no, no, no, you have to turn it off. So, all of the participants started asking me questions. Oh, we've got to ask this question for the podcast. You better ask this question on the podcast.

And that's basically all we did for hours, Jamie, is they would just, you know, ask me a bunch of questions like, we want to be heard on the podcast. So, this last question, the reason I was saying that is because my friend Mary Dwayne, who is on the trip from Massachusetts, wanted a specific shout out for the last question that she asked.

And that question is how is Varroa or Varroa destructor, how is that named? Who was that named after? What was that named after? How did they come up with it?

Dr. Jamie Ellis

I can answer that question, and I can answer that question because when I was a PhD student at Rhodes University in South Africa, somewhere from 2001 to 2004, I don't remember the year, but I remember being a student in South Africa.

Apimondia was held in Durban, South Africa. And when I was in South Africa, I drove to Durban to attend Apimondia in Durban, South Africa, and their keynote speaker was Dennis Anderson, who's an Australian bee scientist.

And up until that time, Varroa, the damaging species of Varroa that was believed to be the one that causing all the problems was Varroa jacobsoni. So, if you look in the literature prior to 2000, you'll see Varroa jacobsoni, Varroa jacobsoni, Varroa jacobsoni.

Incidentally, up until that point, there were three species of Varroa. So, the genus is Varroa, and then the species name would be the one that follows that. So Varroa, the genus, jacobsoni, the species. So, there were three species, and the individual who discovers the species is the one that who gets the name the species.

And Dennis Anderson and his colleague Truman, I forget Truman's first name, but the initials are JWH. Dennis Anderson was at this meeting at Apimondia and announcing that jacobsoni is actually more than one species.

So, in fact, it wasn't jacobsoni that was the one spreading around the world causing all of the damage. It was actually a new species. Anderson and Truman, since they discovered the species, get to name the species. And Dennis Anderson's talk at Apimondia as a keynote that year was all about he and his colleagues' discovery, jacobsoni being more than one species.

And because of the damage that this mite causes, they called it destructor, Varroa destructor. That's right. Because of the damage it causes. So, they got to name it.

They named it destructor. And so, when we as scientists first write Varroa destructor in a manuscript, we actually have to name the authors. So, anytime you see in a scientific publication or a destructor, you will see in parentheses Anderson and Truman, 2000, because that's how we recognize the authors of species.

Anderson and Truman were the authors of the species, and in 2000 they named it destructor because they were the ones who discovered that it was not jacobsoni, but was in fact its own separate species. So, there you have it. That's the story.

Amy

That's crazy. If you found something on your own, what would you name it?

Dr. Jamie Ellis

I don't know. I've never really had to think about it. It is not convention to name it after yourself. And incidentally, Amy, Jacobson was the last name, and I don't know the whole story behind it, but whoever would have discovered Varroa jacobsoni, I would have named it after Jacobson.

And a lot of times folks will name it after their supervisor or someone who is instrumental in the field. Some of my colleagues, Nico and Gudrun Koeniger, have Tropilaelaps species named after them. I guess you got to get something named after you that's a pest because people use it a lot.

That's Tropilaelaps koenigeri. And then Tom Rinderer, who was USDA lab leader in Baton Rouge, Louisiana, he actually had a Varroa species named after him, Varroa rindereri. So, if I were to name a species, it's typical to honor someone who's a major player in the field or someone who was instrumental in your own development.

So, I haven't thought much about that, but Anderson and Truman took the approach to name it something charismatic because of all the damage that Varroa does. So, Varroa destructor.

Amy

Very interesting. I don't know if I would be honored, because I think someone would just name something after me, clearly. Sarcasm.

Dr. Jamie Ellis

Varroa Vu is what I'm going for.

Amy

VV. But it's a pest, you know, I'm like, would I be honored or would I be offended? I don't know.

Dr. Jamie Ellis

Well, you get a species named after you. You know Peter Neumann, who we've had on this podcast.

Amy

Yeah, neumanni.

Dr. Jamie Ellis

Yeah, neumanni. Nosema neumanni. And so, he gave him a Nosema species. And again, that's an example of someone who's just very instrumental in the field, and others recognizing that when they discovered this new species. They immortalized him in that way. So, it's kind of neat.

Amy

That is amazing. Very cool. All right, listeners, you know what to do. This is our long Q&A segment. If you like it, let us know. If you don't like it, let us know. We're always willing to change anything. And, if you have different topics that you want us to talk about, just let us know. Jamie and I really enjoy podcasting.

We'll continue to do the podcast as we continue to receive questions, but we appreciate you listening to us. Thank you so much.

Hey everyone, thanks for listening today. We would like to give an extra special thank you to our podcast coordinator, Jeffrey Carmichael. Without his hard work, Two Bees in a Podcast would not be possible.

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 An Equal Opportunity Institution. answered on air to honey bee@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.