Episode 43 PROOFED

Mon, Apr 11, 2022 12:56PM • 49:41

SUMMARY KEYWORDS

queens, temperature, colonies, drone, foundation, hive, bees, honey bees, beekeepers, sperm, comb, mating, honey bee, pollen, research, red light, work, frames, question, people

SPEAKERS

Stump The Chump, Honey Bee, Amy, Jamie, Guest

Jamie 00:10
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. Welcome to another great episode of Two Bees in a Podcast. Today we are joined by Dr. Alison McAfee from NC State University. She'll be talking with us about the impact of temperature stress on queen honey bee quality. Today we'll also have a Five Minute Management segment and our topic will be the different types of foundation. And of course, we will finish today's episode with the question and answer segment, Stump the Chump. Welcome to another segment of Two Bees in a Podcast. Amy, we're sitting here at the beginning of 2021. And I look back on 2020, our first year in podcasts, and probably one of the things we talked about most was queen quality. Wouldn't you say queens and queen-related issues came up a lot in our first year of podcasting?

Amy 01:35
We get a lot of questions about queen quality.

Jamie 01:37
It makes sense when we look at the BIP data. They talk about queen issues being issues that beekeepers report routinely and I feel like we've had a few guests who talk about queen quality. I know when you put out that survey asking listeners who they'd like to hear, Dr. Alison McAfee was one of those individuals they wanted us to interview. We're fortunate to be joined today by Dr. Alison McAfee, who is a postdoctoral research scholar at Dr. David Tarpy's lab at NC State University in a joint appointment with the University of British Columbia. She's based in Vancouver. She's also a columnist

for The American Bee Journal. She's going to be with us talking about temperature stress and its impact on queen quality. Alison, thank you so much for joining us on Two Bees in a Podcast.

Guest 02:23
Yeah, thank you very much for having me.

Jamie 02:25
I'm pretty excited to have you on board. We had a postdoctorate at one point in my lab who was an insect physiologist, and she was absolutely enamored with temperature stress on insects. That was her background. And she was always vocal about the lack of information that we have with temperature, stress, and honey bees. So, I'm interested in hearing what you're going to say about how temperature stress can actually impact queen quality. But before we get there, Alison, if you don't mind, could you tell us and our listeners a little bit about yourself? How did you find yourself studying honey bees?

Guest 02:57
Sure. I have a background in biochemistry. I did my bachelor's degree at the University of British Columbia. I've always really liked learning about and studying the molecules of ourselves like proteins and DNA and how they can somehow give rise to this really amazing thing called life. I also enjoyed studying ecology. My first research experience actually had absolutely nothing to do with honey bees, it was on intertidal ecology. That was very enjoyable, but I was really missing the work on molecular problems. My goal for my graduate studies was to find a lab that was both in the realm of biochemistry and had components of fieldwork. There happened to be a lab studying honey bees at UBC and that just seemed like the perfect marriage of these two things I really craved, which was working outside working with actual animals. And at the same time, being able to do the really hardcore biochemistry -- stuff that that I was passionate about. So it honestly could have been almost any organism. It didn't have to be honey bees, but, like a lot of people who kind of accidentally fall into the world of honey bees, you very quickly become enamored with them. They have so much to offer. I'm very happy that it happened to be honey bees.

Jamie 04:35
Have you started keeping bees as a result?

Amy 04:37
That's what my question was gonna be.

Guest 04:38
No, I get enough beekeeping out of my research, I must say. When you're working 30 colonies in a field trial, you don't really want to go home to more.

Amy 04:55
Had you had beekeeping experience before that?

Guest 04:58
No, absolutely. none. I can very clearly remember the first time I opened a colony because it was not that long ago.

Amy 05:07
That's crazy. That's pretty cool. I know that you've done a lot of research on factors that affect queen quality. After looking at your bio, I realized that you had focused a lot on sperm viability, so we might have to bring you back to talk about that. But today we wanted to talk about temperature stress. Can you just talk to us a little bit about what that research looked like? And what you found?

Guest 05:29
Yeah, sure. The reason why I was interested in looking at temperature stress was because what I actually really wanted to study was sperm biology and sperm storage mechanisms within queens. And Jeff Pettis, who is one of my co-advisors, in 2016 published a really interesting paper showing that temperature stress, both hot and cold, could reduce sperm viability. I became interested in this topic because I want to figure out how queens can keep sperm alive in their spermatheca for so long. And one way to study something like that is to try to perturb the system. If you can kind of poke at them from different angles, one of them being temperature stress, which we know will harm the sperm, then you can sort of start to figure out what biological processes are important for maintaining the sperm. Just to back up a little bit, because I don't know how much everybody knows about queen biology. My background, my PhD, was on honey bees. But I studied worker behaviors. And there was a lot that I did not know about queen biology going into this. So for those who may not know, queen store their whole lifetime supply of sperm in their spermatheca, which is a specialized organ in their abdomen. It looks a lot like a very small pearl. If you have a queen that you're having to remove for one reason or another, maybe you're just replacing her with a younger queen, you can do a quick little field dissection. If you open up the last couple segments of her abdomen, you should be able to find this little pearl in there. That contains her whole lifetime supply of sperm. But when queens are exposed to extreme temperatures, especially heat, though, to a lesser extent cold, those sperm start to die. And that's a really big problem because that is a permanent change to her reproductive ability. She only mates during one period. She can't just go acquire more sperm if she runs out of sperm, or if they start to die. So it has the potential to be a really big problem.

Amy 08:08
Do you know what the temperature is of the perfect spermatheca?

Guest 08:11
Yeah. Some of the work that we did in our nature sustainability paper (and by "we" I actually mean Jeff as he had done this work quite a long time ago and it fit really nicely with the rest of our project) was taking a whole bunch of queens and exposing them to different temperatures ranging from five degrees Celsius to 42 degrees. And you would think that I would have the Fahrenheit equivalent memorized by now because I talk to so many American beekeepers, but I still for the life of me can't remember what the conversion is.

Jamie 08:50
It's simple. You take away 30 and divide what's left by two. All of our listeners are able to do that now.

Guest 08:56
Yeah, it's simple if you're good at doing math.

Jamie 09:00
I had to do it this morning for my kid. He's homeschooled. Before I came to work, he was having a problem converting Celsius to Fahrenheit. I was able to do it quickly for him. There you go.

Guest 09:09
Yeah. In that work, we exposed them to a range of temperatures in between those as well, because what we wanted to do was find what the Goldilocks zone is for the queens and we found that between 15 degrees Celsius and 38 degrees Celsius is like a pretty conservative safe zone. Anything outside of that for two hours or more has the potential to be really damaging to her stored sperm.

Jamie 09:43
That gives me a lot of questions. That's a wider range than I was expecting you to say. You're saying it's 15 degrees Celsius, which you multiply by two and add 30. What is that? About 60 Fahrenheit. So from 60 Fahrenheit to just over 100 Fahrenheit. That's the zone at which sperm have what we would call optimum survival?

Guest 10:08
Well, optimum would be a much more narrow range, actually. If you could imagine a bell curve, like an upside down hill, then the center of that curve, the maximum, would be the optimum of whatever trait you're measuring. So here we have a curve shape. That range between 15 and 38 is not, the sperm viability within that range is not the same. It is lower at 15 than, say, around 25. But the decrease from the optimum to the tail of that curve is small enough that we don't think that it would really cause a big effect on the queen's quality. The range itself is not the optimum, but I'd say it's the safe range in which we wouldn't expect significant harm to come. The optimum is actually probably, as you would expect, much closer to the hive temperature.zy

Jamie 11:26
That leads me to this series of questions that I've typed up while you were talking. I'm thinking about that range 15 to 38. Again, my quick cheat sheet when you're converting temperatures, that's about 60 to 100 to 105 Fahrenheit. If that's a bell shape and the closer you are to 25 to 30 the better it is, it seems like the queen would only experience these optimum or better temperatures in the nest. When is it dipping below 60? And when is it going above 110 Fahrenheit? What would actually lead to this temperature stress in a nest that otherwise keeps a pretty reasonable temperature?

Guest 12:17

That's a really good question. I have a couple of answers for that. The first is that queens in nature, yes, spend most of their time inside the hive, except for when they're mating or when they're swarming. But with our current beekeeping industry, we ship queens, sometimes all over the world. Definitely domestically, but here in Canada, for example, we obtain many, many of our queens something like 250,000, queens every year from international sources. Queens are shipped quite frequently. And when they're shipped, they're shipped in these tiny little cages. You've probably seen these small, either plastic or wooden cages with just a few attendants in them. And it's very hard to thermoregulate in that kind of situation. And in the cargo hold of planes they have some degree of thermoregulation, but it's still nowhere near as controlled as it would be in a hive, for example. We've made some observations with shipping temperatures. And I remember clearly one test we did was we put temperature loggers in a queen shipment. We were transporting 20 queens from Edmonton, Alberta to Vancouver so they had to go on a plane. And the temperature was actually fine while they were airborne, which is where I expected things to get quite cold. It was when they had landed. Based on the timestamp associated with the temperatures in the logger I could tell that they got really cold, like four degrees Celsius, when they were in the Air Canada warehouse at the airport. They had landed and they're in storage waiting to be cleared to be handed off to me. I was waiting outside and this was an evening in June. I think it was quite late. It was, like, 10pm. I had to go pick up the queens at 10pm one night, but still it was not four degrees outside. It was light jacket weather. But somehow they got very cold while they were in storage waiting for me. So all that is to say that during shipping, both the queens and us, the beekeepers, have very little control over the temperature that they're exposed to.

Jamie 14:57
The next question that I have that comes off of that, though, surely there's some sort of time-related exposure. So maybe four degrees Celsius isn't bad for 30 minutes, but maybe you start getting really detrimental effects at one hour or something? Have you also added a time component?

Guest 15:13
Yeah, yeah, that's right. In the experiment where the queens were exposed to a whole range of temperatures, we did the exposures -- I should say, again, Jeff did the exposures. This is like a royal weed, right? In research it's a team effort.

Jamie 15:29
Of course. I understand you don't need --

Guest 15:33
The exposures were done for one hour, two hours or four hours. Across the board for the one hour exposures there wasn't any significant difference, no matter what the temperature. But after two hours, then we started to see some substantial changes.

Jamie 15:51
Do you think those changes are additive? I mean, I'm thinking again, about your warehouse story. You land and Air Canada's got these queens stored in a warehouse, and they only get 30 minutes of

exposure at four degrees. But then you carry them and you put them in the back of your truck. And there's 30 minutes -- I mean, I almost think about it like chill hours that plants have. They require so many chill hours before they bloom, as an example. It's a temperature times time interaction. Is there you believe it's similar for queens? It's not just one exposure to four degrees or 15 degrees, it's maybe multiple exposures over her lifetime that could increase these impacts on sperm viability?

Guest 16:34
I honestly don't know, nobody has tested that yet that I'm aware of. I'm just not sure. I could see it going either way. For example, with the cold temperatures, the queens, like any other bee, can generate some heat themselves. You might not see an additive effect there because, let's say, for 30 minutes, they can produce enough of their own heat to mitigate whatever the external temperature is. But then after 30 minutes, I don't know, their wing muscles get tired or something and they can't keep themselves warm anymore. In that case, you wouldn't necessarily expect an additive effect of short periods of cold temperatures to accumulate. But, like I said, I don't know. I don't think anybody has tested it yet. certainly plausible. Maybe that's something that we should do in the future.

Amy 17:29
Yeah. There's always research to be done. I feel like whenever we are recording podcast, Jamie and I are talking about how there's so many opportunities for research to be done. There's still a lot that we don't know, which is the best thing about honey bees, I think.

Guest 17:42
Just to go back, because I actually had two answers to that last question. The temperature range is pretty much what queens should experience most of the time, so when would this actually be a problem? The second half of that answer is that during heatwaves inside colonies, it can actually get surprisingly hot. We usually think about a honey bee colony as being this tightly thermoregulated environment that doesn't really change. And that needs to be adjusted a little bit because the colony still has limits for what it can thermoregulate against. Some other data in this nature sustainability paper shows that when there's a heatwave outside -- and in this case it was around 45 or 46 degrees Celsius, so quite hot -- the temperature inside the colony could reach as much as 38 or 39 degrees, I think, up to three frames in from the outside of the standard 10 frame deep. And so that means that only the central few frames are are in that stable environment. We all know the brood nest can obviously be bigger than just those three central frames. So there is potential for queens to experience these extreme temperatures even when they're inside a colony. She can, of course, move around and we don't know exactly where she was when this measurement was going on. But I would challenge people to think about other kinds of colonies that queens are sometimes kept in, like five frame nucs or mating nucs. If there's a heatwave and you have queens in a smaller colony, like a meeting nuc, you only have, even a five frame nuc, you only can go three frames in from the outside. In that situation I would expect a smaller colony to have their thermoregulation abilities break down. That may seem like a really, really extreme weather event. And it is, but we should probably expect those kinds of extreme heat waves to happen more often in the future, as the climate changes even more. Even as it currently

is here in BC, there's one region in the interior, where fairly routinely we can experience heat waves of around 42 degrees Celsius. That's up here in Canada.

Amy 20:53
Yeah, and you're telling us this and we're down here in Florida. It gets pretty hot throughout the year.

Guest 21:01
That's right. And it's also quite humid down there. Humidity affects the bees' ability to deal with temperature, too. Just like us they do evaporative cooling, just like we sweat and then that evaporates, and that cools us down. The bees will gather water and then fan it and that'll evaporate and cool everything down. The higher the humidity, the less effective that is. It means that the same temperature could effectively be hotter, if there's a higher humidity.

Amy 21:35
We talked a little bit earlier about sperm viability. What are some additional impacts of temperature that you found on queens? Did it affect their longevity? Did it affect the amount of eggs they were putting out? Did you measure some of that? What are some additional impacts that you found?

Guest 21:56
I haven't actually looked at longer term impacts. I've mainly done lab experiments. But one of my former colleagues, Marta Guarna, did a longer-term field trial. And I don't want to talk about her results too much, because as far as I know, it's not actually published yet. But she has looked into those more long term effects. I might just summarize that it didn't look good.

Amy 22:32
That's fair. We'll have to bring her on some time as a guest after her work has been published.

Guest 22:37
That would be good.

Jamie 22:37
Alison, this is a very interesting discussion given that beekeepers routinely talk about quality of queens. When they talk about it, they're talking about longevity, sperm viability, their ability to lay eggs and be good stocks in general. I'm curious, what type of recommendations do you see coming out of your research, even if you're not quite there yet? Where do you see this heading? What are some best management practices beekeepers might follow based on some of the things that you're beginning to find?

Guest 23:11
This research might make us want to think twice about where we get our queens. Shipping is where, I think, they're at the highest risk for temperature stress. It looks like these sort of extreme temperature events happen in somewhere between 10 and 20% of shipments, probably on the lower end of that.

But even still, when you're talking about shipping sometimes hundreds of queens then that means that so many of those queens that we're receiving could potentially be already damaged, in a sense. If it's possible for you, as a beekeeper, one way that you could avoid that as a risk altogether is to either produce your own queens or to purchase locally produced queens that don't need to be shipped, that you can just go and pick up yourself and be sure of what temperatures she's exposed to during transport. I get that is not an option for a lot of people. It depends on the timing. Locally, queens are available at different times compared to queens that are either brought from across the country or imported from another country. That's the whole reason why Canada imports so many queens, is because beekeepers need queens before local queens are available. For a lot of people there isn't really a way around that. But if you can, I would recommend buying a locally produced queen. I also think that we should put some more effort into coming up with better shipping procedures. Not necessarily a different kind of cage, but a different method of transporting queens, like housing them in a different way. Maybe having more worker attendance on the outside of the cages and having them in a larger box or something like that. That could help mitigate temperature stress if it occurs. Or, if you want to get really fancy, some kind of temperature-controlled incubator that's portable that can go on these planes and in the warehouse and whatnot.

Amy 25:32
Alison, can you tell us what they currently do right now to ship queens? They put them in cages and just in boxes. Are there peanuts in there with them? Not the kind that you eat.

Guest 25:43
What I can say is that it's not regulated, as far as I know. If you are exporting queens there is not a defined way that you must package them to mitigate these temperature fluctuations. Certainly, domestically, queens are shipped however the distributor prefers.

Jamie 26:15
Alison, I really appreciate you joining us today. Everything you're talking about is really interesting. I've been keeping bees for over 30 years now. I've purchased queens from the very first year I've been keeping bees and even now in my research lab we purchase lots of queens. We are in Florida where it's hot, seemingly, all the time and humidity is high a good chunk of the year. It's interesting to hear how some of these things that we overlook and don't really consider closely can still impact the health and quality of our queens. I can imagine a situation where sperm viability is being impacted and, therefore, the number of fertilized eggs. There's all kinds of downstream effects that I could see happening. I appreciate you and your collaborators and colleagues for working on this very important topic. I think the beekeepers really enjoy hearing what you have to say in this segment.

Guest 26:58
I hope that it's useful.

Jamie 27:01

Absolutely. That was Dr. Alison McAfee, postdoctoral research scholar at David Tarpy's lab at NC State as well as University of British Columbia. She's also a columnist for the American Bee Journal and an expert on temperature stress on queen quality. Thanks for listening to this segment of Two Bees in a Podcast.

Honey Bee 27:21
For additional resources, visit the podcast page on our website, UFhoneybee.com

Amy 27:30
Welcome to Five Minute Management. This is our new segment. I'm so excited.

Jamie 27:37
Clock's ticking, Amy.

Amy 27:39
Jamie, should I start the timer when I start speaking? Or, should I start the timer as soon as I ask a question? Or, should I start the timer when you start speaking?

Jamie 27:47
Why don't we make it incredibly scary for me and we start the timer when you ask the question? Because I know then that the clock is ticking and I gotta get that answer out quick. Boom! Like that.

Amy 27:59
I started. What kind of foundation is there --

Jamie 28:02
I'm nervous. You're cutting into my time. Alright, go ahead. Say it again.

Amy 28:05
What kind of foundation is there to use? What types of foundations are there?

Jamie 28:11
Let me first tell you what foundation is, especially for those of you who maybe are brand new beekeepers and not quite sure what we're talking about. Foundation is that infrastructure that goes into wooden frames, on which bees will construct their combs. If you just throw honey bees into an empty box or a box that has frames that has no foundation, the bees are going to build comb anyway they want to, in any direction they want to, and not necessarily in your frames. Foundation, as the name implies, provides that platform to guide the bees and on which they can construct their comb. Prior to us starting the Five Minute Management, I put down a few notes because I wanted to make sure and tag all the foundation bases, but I quickly came up with at least six different types of foundation. I'm not going to be giving you trade names, because for each of these types there's usually a handful of different trade names because there's foundations made by different companies. The oldest that I can

think of is the pure beeswax foundation. As the name implies, it's just beeswax. People have taken beeswax, they've melted it and formed it into thin sheets and it normally goes to a press. That press is necessary because it will imprint the hexagon bases on that sheet of beeswax. Those hexagon bases forming the starting point, the building block, on which the bees can construct their comb. So, there's pure beeswax, number one. Number two, the second type of foundation is pure beeswax that contains wire. Usually that wire is crimped and it will go vertically up and down in the foundation. One end of that wire will have a hook that extrudes from the front foundation it kind of makes an L shape. So we call that crimped wire foundation. That wire is added for support. The pure beeswax foundation you typically use for cut comb or comb honey right you want to cut that out and and be able to chew it without having wire in your mouth. The crypt wire is usually made for extracting honey. That wire provides that support in that pure beeswax foundation. The next thing that was made was a thin sheet of plastic, usually clear plastic, that has wax on either side of it. It's a usually very bendy foundation and this particular foundation, you'll often see little circles around areas cut in the bottom corners of that foundation. This type of foundation was an attempt to move away from the wire in foundation and provide a more solid structure that the bees can build on. My only concern about this type of foundation is that when bees clean the wax all the way down to that thin plastic layer, they will often not construct comb on any of the exposed plastic. As over time the plastic becomes increasingly exposed, the bees will build less and less comb on it. It's that thin plastic with wax hexagons imprinted on either side.

Amy 31:21
What is it called?

Jamie 31:22
Well, there's a few different varieties. The one that sticks out in my mind the most is the brand called Duragilt. Now there's a more modern version where the plastic is much thicker. In fact, the plastic is the bulk of the foundation. In this case, it's usually black or yellow type of plastic, sometimes cream colored. There'll be a thin layer of wax on either side of this. This is no doubt the most popular foundation that exists today because it is so easy to put in frames. And it's also so easy to use for extraction. You don't have to go back after the fact and put in wires. You don't have to worry about the cone bursting out while you're extracting. And again, it's just very thick plastic imprinted with the basis of these hexagon cells with thin wax on either side. The wax is principally put there to get bees to build comb on it in the first place. Alright, so that's the fourth version. The fifth version is whole plastic combs where the entire cell is made of plastic. Imagine a beeswax comb just made of plastic. The sixth version is the whole frame itself is plastic. And it contains either the whole plastic comb, or the thick plastic foundation with that thin layer of wax on either side. Six different types.

Amy 32:47
Wow, good job. Six seconds left.

Jamie 32:54
Let me add, Amy, since this is outside the question. The question was, "What are the types of foundations?" An interesting discussion in the future to have -- which should you use? What are some

of the benefits and drawbacks of each? That no doubt will show up in another Five Minute Management.

Stump The Chump 33:15
It's everybody's favorite game show, Stump the Chump.

Amy 33:17
Hi, everyone, welcome back to the question and answer time. Jamie, I've got three questions for you.

Jamie 33:34
Good deal. Let's go.

Amy 33:35
Awesome. The first question is that someone heard that red lights inside of a hive will help control small hive beetle. We have a red room at our lab and bees can't see red, right? Is there any basis or any biological research that has shown the control of the small hive beetle?

Jamie 33:56
So honestly, Amy, you just helped me answer my question.

Amy 34:00
I did?

Jamie 34:00
Yeah, I'm going to show you how in just a moment. My first comment was going to be, I've been working with small hive beetle since about 1996. So that's, I don't know, a long time ago.

Amy 34:00
100 years. Oh, wait, okay.

Jamie 34:02
Well, '96 is when I graduated high school, so be careful. I was working with small hive beetles, or aware of them since that time, maybe more like '98 or so when I finally got heavy into bee research. Shortly thereafter, I started seeing contraptions built with this red light idea in mind. I have seen absolutely no data to support that this is the case. I'm even aware of what's before -- multiple different types for multiple different people, types of lids that were produced that were exclusively red. Kind of like red plexiglass with the idea that the sun will shine through that red plexiglass straight into the hive. But since bees can't see red, they think that they just have a lid on top of their hive, even though the sun's beaming right through to the combs through that red, and pushing the beetles out. I've just never seen any evidence ever that there's any impact at all a red light on small hive beetles. Now I know that there's a handful of contraptions associated with this. And as a scientist, I want to just say, so people don't get mad at me, that doesn't mean red light doesn't work on beetles. I've just never seen data to

suggest that it does. All I've seen are inventions and contraptions whose inventors say that these things work. And how you help me answer this question is, as you mentioned, in the lead up to this question, we have a huge room here at our new bee lab at University of Florida that is an observation hive room. We can accommodate 12 observation hives in that particular room. It is lit with red lights so that we can observe the bees in those 12 observation hives with minimal disturbance. And every one of those observation hives has had small hive beetles, lots of them, in fact. And those are small hive beetles we didn't put in there. So, I know in a completely red-lit room beetles still came into those hives, and interacted with the bees in a way that looked as normal as possible to me. I just don't know that there's much there. I do reserve the right to be wrong, though. If there's some data in the future that suggests that using red lights in a hive can reduce beetle populations I'm totally fine with that. I still think at the moment, the best way to address beetles is keep your colony strong and consider using some in-hive traps with mineral oil or vegetable oil or apple cider vinegar in them to control beetles.

Amy 36:49
How would you even put a red light in a hive? Would you keep it plugged in all the time?

Jamie 36:53
I've seen some contraptions, I think at least two or three, where people have made small things that mounted inside the hive that would stay on all the time. Another thing that I've seen before is, imagine a removing a telescoping lid from a hive and having only an inner cover. And if you're familiar with the inner cover, it's got that wooden rim that goes around, it's flushed with the sides of the uppermost box, and then it's got the flat surface in the middle of that hole in the middle. Well, imagine replacing that flat surface with red plexiglass so that the colony is essentially open. The Hive is essentially open to the sun, but the sun has to beam through red plexiglass. And in that case, they weren't using generated red light, something created from a light bulb, they were using essentially a filter, so that when the sun passes through it, it would be red in color on the inside of the hive.

Amy 37:45
And they leave that on all the time?

Jamie 37:47
All the time, with the idea that it would push beetles out of the hive. But again, it's not that I've seen data that these things don't work. I'm just not seeing data that they do work. And I feel like even a contraption was pitched to me fairly recently. I just feel like a lot of these things in the beekeeping world need more research. There's great contraptions, and great inventions being created by beekeepers, but it's always hard to test them. It's always hard to find scientists to invest heavily in these ideas. And unfortunately, there's more misses than hits with these things, so it's a difficult decision when a researcher is presented with one and trying to decide whether or not to test it and see if it would be a valuable use of their time. So it's tricky, but this is another example of one of those times where we're just not sure, but I'm personally a little skeptical.

Amy 38:43

The second question. Have there been any scientific studies done concerning the claim that pollen present in raw honey can relieve allergy symptoms? I hear that all the time, Jamie, when people are like, if you eat raw honey allergies will go away.

Jamie 39:00
I absolutely hear this all the time. The answer to the question is, I'm not aware of any studies that have convinced me that honey benefits allergies. It is important for me to say in this public disclaimer that I am not an apitherapy specialist The reason I mentioned that is within honey bees, within apiculture, there's lots of different branches of research -- disease and pests, genetics, genomics, microbiology, behavior, etc. One of those components of apiculture, or honey bee research, is apitherapy, the therapeutic benefits of using honey bee derived products. Most of what I've picked up, I've picked up by reading journal articles or attending conferences where I hear people speak about these things. I think most of the evidence related to honey and allergies is anecdotal. But the logic is almost always presented the same way to me. Hey, Jamie, honey has pollen. And if you eat pollen in small doses, it's almost like a vaccine where you're getting exposed to small amounts of pollen that your body learns to adjust to over time. So when that pollen flush happens that would otherwise make you allergic, your immune system is primed and ready to respond. And I just don't, personally buy it. I know that this idea sells a lot of honey, and maybe someday there will be conclusive evidence that suggests that local honey does, in fact, fend off allergies. I just don't think that body of evidence exists. So far, the best explanation that I've heard regarding this is just thinking about it from a practical standpoint. Most of the pollens -- this is a generalization, so it's not universally true -- but generally speaking, most of the pollens to which humans have allergies are wind-pollinated plants and not insect-pollinated plants. So it's unlikely or less likely for the pollen that you need to be "vaccinated" against showing up in your honey in the first place, because bees are not visiting those things that are likely to make you sneeze. There's just lots of things like that. I will say, there is an international beekeeper organization called Apimondia. In fact, we need to have its president on our podcast at some point in the future. There are standing commissions within Apimondia. There's a honey bee pests and diseases, there's a toxicology, and behavior, beekeeping for rural development, etc. Within Apimondia is a standing commission on apitherapy. Anytime someone asks me an apitherapy question, I look up Apimondia's standing commission on apitherapy. I forward that individual to whoever the head of the standing commission is at that point because he or she will be an expert on this topic and will know probably the complete body of literature related to whatever's being reported. You've got things such as honey being good for allergies or bee venom being good for whatever you can think of. I've seen it being good for everything. Royal jelly being good for whatever. That standing commission of apitherapy within Apimondia is a good resource.

Amy 42:37
The third question I'm gonna ask, I don't fully understand the question, so I'm just gonna read it, and then you can let me know what you think. Have there been any studies related to drone numbers near commercial queen mating yards, versus drone numbers in a similar ecosystem minus the thousands of mating nucs? Did I ask the question right?

Jamie 43:00
You asked the question in a way that I think I can answer it. Essentially, what the question is, is, have there been any comparative studies looking at drone numbers away from commercial beekeeping queen production yards, and near to commercial beekeeping queen production yards? And at the end of the day, there have been quite a few studies on drone congregation areas. In fact, we've even done some with a former master student of mine, also PhD student of mine, but she did a master's project on drone congregation areas, or DCAs. And as long as you have a reasonable density of feral honey bee colonies, then you can have similar numbers of drones near to and far from queen production areas. However, there aren't usually a high number of feral colonies out there in the environment. So queen producers, then, will put lots of drone producing colonies nearby their mating nucs so that they can up the number of drones available to mate with their virgin queens, as well as control who those drones are. Florida is a great way to think this through. My master student, Ashley Mortensen, she was in central Florida, right on the edge of where African derived honey bees are Africanized bees are. She was looking at the make-up of drones at drone congregation areas, close to managed colonies and away from managed colonies. And what she found is the closer she got to managed colonies, the more the drones at the drone congregation areas were European derived. Conversely, the further she got from managed colonies, the more those drones at the drone congregations were African derived. So it's not just a volume of drones that you're trying to achieve when you stock a mating area with drone source colonies. But it's a makeup of those drones. You don't want just a lot of drones near your virgin queens, you want good drones near your virgin queens. There's been a lot of work related to that. Certainly putting drone source colonies nearby mating yards is very advantageous for the queen producers.

Amy 45:27
Based on what you're saying, Jamie, are there recommendations for number of drone source colonies per number of mating nucs in an area?

Jamie 45:35
There is a series of recommendations that I like to give people. I'm not an expert on rearing queens. A very similar question came to me last year in 2020. And so I posed the question to Dr. Bob Danka, who at the time, was the research leader at the Baton Rouge USDA Bee Lab where they're experts on producing queens. I asked him specifically, how should drone source colonies be arranged in a mating yard? And, is there a number of drone source colonies that you should use per mating nuc? What he said, in fact, I've got the email up in front of me now, what he said is a good target would be to have one drone source colony per 10 mating nucs. And he mentioned, that's what he sees yields good mating success. And he says that it's best if these drone source colonies are distributed over two, three, or four yards around the mating yard. So imagine this, imagine you have 2000 mating nucs right here. You're going to need correspondingly one drone source colony for every 10 of those, so you're going to need 200 drone colonies. So he had mentioned, he put 120 or so of those drone source colonies with the nucs. They're located amongst the nucs, which leaves you 80 colonies. 40 of those he put half a mile on one side of the nucs and the other 40, he put a half a mile on the other side of the nucs. So in that case, it's a one-to-10 ratio, one drone source colony to every 10 mating nucs with three

different locations, some of the drone colonies amongst the meeting nucs, and the other drone colonies split into yards, about half a mile away each. And what is a drone source colony? That's with at least one comb of drone comb. So if you have a standard hive that's got 10 frames, one of those frames should be given drone foundation. So the bees will pull out drone comb and the queen will lay drone eggs in that frame. So about one drone comb in one colony would constitute a drone source colony.

Amy 47:39
And basically, putting them all around would just give the greatest chance of having the best drones out there. Right?

Jamie 47:44
That's right. If you think about it, queens are flying a mile to two miles away, many kilometers away, 5, 6, 7 kilometers away, and they're going to mate with drones that are available those distances away. So having them with the queens in the same yard as the queens is not quite as good, in fact, as having them a little bit away from the queens. The reason for this is drones tend to fly closer to their parent colony than queens do. So they might fly somewhere in the half-a-mile to a mile radius. This is biology. So it's a little messy, it might be more or less, whereas queens go a mile and a half to two miles away. So really, it's more beneficial to put drone source colonies, a few amongst the mating nucs, but a lot more scattered at about a half-mile radius around that mating yard.

Amy 48:33
That makes sense. All right. Well, thank you so much, Jamie. We will continue on for next time.

Jamie 48:40
Looking forward to it.

Amy 48:49
Hey, everyone, thanks for listening. Today we'd like to give an extra special thank you to our podcast coordinator Lauren Goldstein and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible.

Jamie 49:03
For more information and additional resources for today's episode, don't forget to visit the UF/IFAS Honey Bee Research Extension Laboratory's website ufhoneybee.com Do you have questions you want answered on air? If so, email them to honeybee@ifas.ufl.edu or message us on Twitter, Instagram or Facebook @UFhoneybeelab. While there don't forget to follow us. Thank you for listening to Two Bees in a Podcast!