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SPEAKERS

Jamie, Guest, Amy, Serra Sowers, Stump The Chump

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. Hello, everyone, and welcome to another segment of Two Bees in a Podcast. Today, we have a very special guest to talk about a very special topic, a topic that I think that there's a lot of research that's going into this idea. And it's all the idea associated with feeding honey bee colonies, commercial pollen substitutes, and diets. Well, those effects that you see on the colonies as a result; my team and I have looked at these types of things before. And we have a scientist here with us today to talk about some of the research that he and his colleagues have done on this topic. So I think you guys are in for a treat. Joining us today is Dr. Vincent Ricigliano, who's a research scientist for the Honey Bee Breeding, Genetics, and Physiology Research Laboratory, which is a USDA ARS laboratory located in Baton Rouge, Louisiana. Vincent, thank you so much for joining us on Two Bees in a Podcast.

Guest 01:40
Yeah, thanks for having me.

Jamie 01:41
You guys, you and your team, colleagues, y'all published a paper recently entitled, "The effects of different artificial diets on commercial honey bee performance, health biomarkers, and gut microbiota." We're going to talk a lot about that moving forward. But since this is your first time on the podcast with us, Vincent, could you tell us a little bit about yourself, how you ended up where you are, how you ended up studying honey bees? Our listeners really like to learn who these scientists are, who these beekeepers are who we keep interviewing. So Vincent, who are you and how did you get where you are?

Guest 02:16
Yeah, so I'm a scientist at the USDA Honey Bee Breeding, Genetics, and Physiology Lab in Baton Rouge, Louisiana. I've been doing honey bee research for six years, and I've been running my own lab for three years. So I'm relatively new to bees and very humbled by bees. But I'm in love with honey bees as an agricultural system, a superorganism that's essential to crop pollination. I really can't think of anything more interesting to be working on, and I love my job. My background is in plant science and microbiology, so, how bees interface with plants and microbes is a fascinating topic to me. And this is what honed my focus, my research focus on nutrition. My program has two major foci. One is characterizing interactions between honey bee genetics and nutrition. I'm also very interested in developing improved diets and nutrition supplements since pollen substitutes are an important aspect of modern beekeeping.

Amy 03:13
So I'm excited to hear more and actually to have you as a resource. I mean, we had a master's student Emily Noordyke who worked with honey bee nutrition and it's always just fun to speak with other beekeepers and other beekeeping scientists that are working with honey bee diets. So, the research that we're discussing with you today is focused on, like you said, and Dr. Ellis said, honey bee diets. So can you discuss a little bit about artificial diets and what those typically include? I mean, what is an artificial diet? And is it all pollen? Because we consider it a pollen substitute. And so I guess just overall, what would you call a honey bee diet?

Guest 03:54
Yeah, so, artificial diets or pollen substitute diets, as the most of the industry seems to call them, they're designed to act as a substitute for pollen, which is the bees' natural source of macronutrients and micronutrients. And pollen pretty much provides all essential amino acids, fatty acids, sterols, vitamins, minerals, and a wide variety of phytochemicals. So phytochemicals are things that are not necessarily or aren't necessary for basic nutrition, but they may have some kinds of health-modulating effects. So while some commercial diets contain a fraction of natural pollen, most of these diets don't. And that's really, as far as I'm concerned, this is the ultimate goal of diet development for bees, is to replicate the nutritional and functional properties of pollen in a completely artificial diet. So typical bee diets include protein sources from yeast, soy, corn gluten, or other plant-based proteins and fats. Fatty acids are typically included in the form of vegetable oils. That covers, I'd say, a good portion of most commercially available or even beekeeper-formulated diets.

Jamie 05:14
So Vincent, I'm really glad that you are looking at this. I really liked those two foci of your lab, this idea where you're looking at the interaction between genetics and nutrition, as well as trying to improve diets. My team and I fell in the diet research kind of by accident. When I first got hired at UF, we were doing some work with diets per request of a commercial beekeeper, and we were struggling to find any impact of the diets at all with what we were measuring in colonies. And I thought it was a fluke. So we did this two or three times and found the same thing. Did it a few more times, and found the same thing. And then I brought on a master's student, and we were seeing similar things. And so I started

interviewing scientists and thinking about this and wondering how good are we, so far, at making nutritional supplements that are good for bees? You guys are tackling this in one way. So this paper that you guys published, you and your team published, we're going to make sure and link in our show notes so that the listeners can have a look. But, can you give us an overview of the motivation you guys had for this project? And also, I'm curious if you could give us a quick summary of how you guys conducted the project as well. Amy and I are going to ask a lot about the outcomes of this project you did, but I'm curious, why did you want to do it and how did you do it?

Guest 06:27
Yeah, so this project is a collaboration between beekeeper Randy Oliver, who I'm sure probably needs no introduction for most of your listeners out there, he's a very keen beekeeper. And Randy and I just have a long-standing interest in bee nutrition. I mean, Randy's been beekeeping for a really long time. So obviously, his is a lot longer than mine. But we've been in contact since I've met him and we decided to collaborate on this work and, well the impetus for it, from my perspective is that well, as we know, human land use practices climate change. They're altering landscapes that were once key sources of nutritional forage for bees. And artificial diets have a lot of potential for provisioning colonies during periods of reduced natural pollen in the environment. And when beekeepers want to grow their colonies leading up to pollination services, the utility of artificial diets is a complicated subject for a few reasons. One, diet development for bees is lagging compared to other livestock animals like pigs or chickens, or companion animals like dogs and cats. Two, there's a lot of conflicting information in the literature regarding the efficacy of artificial diets. And three, honey bee nutritional responses are complex to evaluate. And anyone who keeps bees or has done research on bee colonies knows that there's a lot of noise in these experiments since bee colony performance and health are so intimately tied to the environment, which is a very dynamic thing. So I've been working with commercial beekeepers for the past five years to test the effects of nutrition within the context of commercial management. And this is where the rubber hits the road in terms of translating research findings into solutions that could be adopted by the beekeeping industry. So this publication that I'm here to talk about, our recent publication, in collaboration with beekeeper Randy Oliver received a lot of attention from the beekeeping community, which indicates to me that we're doing a good job of allocating time and resources toward projects that can positively impact the beekeeping industry. So we carried out a large-scale feeding trial using 144 colonies in Randy's operation, and we tested the effects of different diets on colony performance, as well as a number of health biomarkers and gut microbiome abundance that we measured in the lab. So, Randy and his sons performed the fieldwork, and I performed the lab work and wrote up the paper, a peer-reviewed paper on our findings.

Amy 09:01
So I liked that you were saying that with honey bee research, there's just a lot of noise. Because I feel like that's what we ultimately come up with a lot because there are so many factors that influence so many different pieces of honey bees. Okay, so with your research, you were talking about having 144 colonies, you divided into feeding groups, and then that was replicated at Randy Oliver's, at his apiaries. So what diets were you looking at in your study and why did you choose these? And did you also look at wildflower pollen compared to the different diets that you used?

Guest 09:39
Yeah, so we did. We tested a number of commercially available diets as well as a homebrew beekeeper formulation. And commercial products are mixtures of many ingredients and when conducting nutrition studies in other livestock, usually systematic diet substitutions are performed. Whereas, in this study, we're comparing very different formulas. And this isn't the most scientifically sound approach to nutrition research but we did our best and made do with the materials available to us. So, we leveraged these pre-formulated diets and focused on diet attributes that were correlated with colony performance. And in order to do this, first, we define the diets as best we could. We analyzed them for macronutrient content, so fats, proteins, carbohydrates, as well as amino acid content. And from this point on throughout the study, we focused on quantifiable diet attributes and how they corresponded with colony performance. So we didn't examine wildflower pollen, and we didn't have a control for a 100% pollen-containing diet. And instead, we used a negative control, which was just sugar as a no-protein control. So the use of a 100% pollen diet isn't very realistic, especially since our ultimate goal for diet development is an efficacious and completely artificial diet. So this was a large experiment, 144 total colonies, three apiary sites, eight feeding treatments, so we had to make some calls regarding treatment groups, and we decided on a negative control instead.

Jamie 11:15
So Vincent, as I shared a little bit earlier, my team and I have kind of fallen into some of this nutritional research as well. And a lot of it's just from some of the earlier stuff that we found. I remember a study we did years ago, that we had done a project, we had tried to feed the commercially available products to colonies and get a response from the colonies. And we did it at a time of year that we were hoping, that we thought, that we anticipated, that we believed, was representative of pollen dearth, right? Because we wanted to see the true effect of these diets outside of incoming pollen. But we did see pollen coming in, even in what we call the most dearth period of the year, which led us to think, well, we think we're finding no results, not because these things don't work, but because there's at least a little bit of pollen coming in. And when there's any pollen coming in at all, maybe it renders the effects of the diet moot. And so we've since done a lot of work. And in our projects, we try to have these kinds of sentinel colonies that are always telling us, "Hey, there's incoming pollen," while you're doing this work, or there's not. You guys made a comment in your manuscript, where you had mentioned that the location of the apiaries historically exhibited a lack of forage. And so how did you guys kind of ensure that through the project there was a lack of forage or there was a dearth? Or did you guys in any way try to monitor incoming pollen while these diets were available to the colonies?

Guest 12:37
Yeah, so, this is a really important consideration for field nutrition studies with honey bees, right? Ideally, these studies should be conducted in an environment with reduced natural pollen forage, or even more ideally under dearth conditions. And in a perfect world, we could conduct these experiments in total isolation somehow, in a bubble that kind of excludes all environmental influences, but honey bee field research is far from perfect. So this study took place in Randy Oliver's beekeeping operation in Northern California. It's an arid climate with very little late-season pollen. So the beekeeper, Randy, he knew that these colonies that were not provisioned with supplemental nutrition in these yards would historically do poorly due to the dearth experience during the fall through winter months.

Amy 13:30
So working with Randy and having your artificial diets, working with the bees, can you give us a summary of your major findings? So what did you find with the eight feeding groups?

Guest 13:40
So an important aspect of our experimental design here compared to other bee nutrition field studies out there is that we had, or a majority of the other bee nutrition field studies out there, is that we had apiary site replication. And site location is a major factor that influences nearly everything about a bee colony. Across three apiary sites, we found that diets that contained a fraction of natural pollen, either 15 or 20%, produce the largest colonies and also had the heaviest bees per colony. We also found that two completely artificial diets that did not contain any pollen at all led to larger colonies than a sugar-negative control. We had some interesting correlations shake out of all the things that we measured in the study. In particular, diet amino acid deficiencies relative to leucine content were correlated with average bee weight and colony size sent to almond pollination. And now it's important to note that these are just correlations that require further testing to confirm. We measured a lot of other things in these colonies, but the effect of apiary site influenced those measurements more than the diets themselves. For example, in a previous study, I showed that colony gene expression levels of the nutritional storage protein vitellogenin were associated with healthier colonies. However, in the current study, apiary site influenced vitellogenin expression more than the diets did. And similarly, apiary site influenced gut microbiota abundance more than diet. However, there were some effects of diet on gut microbiota abundance, particularly in a diet containing thymol, which appeared to negatively impact the abundance of two gut bacteria species.

Jamie 15:25
All this is pretty fascinating to me. What I tell beekeepers all the time is one of the areas that we have for greatest improvement in the management lies with pollen substitutes. Obviously, we all want to be able to control Varroa. It would be nice if we had 10 or 15 options to control Varroa and that they were all highly efficacious. That would be great. That's good, I agree. But I feel like in nutritional management, I feel like we're really behind. And I like what you said a little earlier with companion animals and livestock and things like that. We are light years ahead with diet, development, and nutritional needs for all of those types of things. But honey bees are so far behind. And I was intrigued, just to give you a little bit of a background, my team and I and everybody here at UF who works kind of in the honey bee lab, we have a journal club every Tuesday. We read articles and come up with questions in the articles and your article is one of those articles we read. We moved it forward, we wanted to interview you, and we came up with questions. And one of the things that kind of intrigued us through it all is when we think pollen subs and beekeepers think pollen subs, you're thinking, "Okay, I'm replacing protein or I'm supplementing protein." But it seems like in your study, you found that the diets that performed best didn't necessarily have the highest protein content, but maybe had higher sugar content and other things. So, have you guys thought about what this may mean?

Guest 16:44

Yeah, so we didn't find a significant relationship between sugar content and colony performance. In fact, we didn't find a significant relationship between macronutrient content and colony performance. So we couldn't really establish trends, any kind of trend there.

Amy 17:06
So we were talking about how the effects and where the apiary was, there was kind of a dearth season, so there wasn't any pollen coming in. Do you feel like you would have found similar results if there was forage available in the environment? Or maybe other factors? Like you said, it was very arid in North California, which is completely different where we are here in Florida. So do you feel like these factors would have maybe changed some of the results at all?

Guest 17:32
I do. Yeah, I don't believe we would have found similar results since natural forage is a major confounding factor for nutrition studies. Based on previous experience, we would likely have found no significant effect of diet due to incoming natural forage. Bees are definitely less interested in artificial diets when there's sufficient natural forage available. And there are probably also confounding interactions between natural forage and the efficacy of particular diets.

Jamie 18:07
Yeah, I agree completely with you, Vincent. In fact, part of the reason that we started adding Sentinel colony to all of our nutritional studies is, it's funny, it all came from conversations I had 10-15 years ago with Randy Oliver, the same beekeeper that you keep mentioning. In Florida, at least where we live right here, where the University of Florida is in Gainesville, we actually put, we have a couple of colonies that we put pollen traps on every month to just kind of create a pollen calendar throughout the year. We get pollen coming in every month of the year. Now, obviously, there are months where it's much greater than others and things like that. So part of our explanation for some of the lack of the impact of commercial diets that we see, we believe, relates to the availability of natural forage. The interesting thing, though, that I can't explain, I just don't know, is that it seems at the moment unrelated to volume of natural forage. Just like, if any natural forage is available at all, then we see no impact of the diets. And I wonder what the threshold for that is, if you guys did this, in a pollen-dearth time of year, so you got these great results. If we had done maybe the same study here in Florida during a pollen flow we might have gotten something very different. I wonder where the threshold is in between to say, "I don't recommend diets now, or I do recommend diets now," based on what we're kind of seeing available in the environment. I mean, I know this is an impromptu question. Do you have thoughts on that idea?

Guest 19:41
Yeah, this is an interesting question. I think there's a lot of room for optimization in terms of the attractiveness of diets. For instance, you could have the most nutritious substance in the world for bees, but if they are not attracted to it with the same attraction that they show towards pollen, then they're not going to eat it and that substance can't exert its nutritional effects.

Amy 20:09

So this is always the best question. This is what our listeners want to hear. They want to know, what is the biggest or what are the biggest takeaways for beekeepers with this project?

Guest 20:20
Yeah, so it's important to be cautious when interpreting results of scientific studies, of all scientific studies, but especially bee field experiments. And I think a major takeaway here that I could confidently talk about is that beekeepers should be aware of the importance of apiary site and testing different colony manipulations or nutrition supplements. The results of an experiment carried out in a single apiary site can be completely different at another apiary site. So therefore, experimental replication at different sites is important, not only for applied beekeeping research, but for beekeepers who perform their own experiments. And all beekeepers should be performing their own experiments. I'm sure a lot of listeners would love to hear some kind of definitive recommendation on bee diets or commercial products. But I think that feeding regimens tailored to your specific operations and management goals are likely to provide the most benefits, and more laboratory and field studies are needed to really continue improving bee diets.

Amy 21:24
I think that was very well said.

Guest 21:26
Thank you.

Jamie 21:27
Vincent, that's all great information. I'm excited about the research that you're conducting there at the Baton Rouge lab. I really, really, in my heart, believe that this type of research is needed. And I also think it stands to make a really big difference for beekeepers moving forward. So thank you so much for joining us on Two Bees in a Podcast.

Guest 21:45
Yeah, thank you, Jamie. I really enjoyed this and like talking with you and hope to be back again in the future.

Jamie 21:52
Well, thanks. Everyone, that was Dr. Vincent Ricigliano, who's a research scientist at the Honey Bee Breeding, Genetics, and Physiology Research Laboratory for the USDA ARS in Baton Rouge Louisiana.

Amy 22:25
So I'm really excited that we had Vincent on today, Jamie, because you and I have been discussing the top three stressors of honey bees, and that's Varroa, nutrition, and queens. And so we always talk about Varroa. So it's nice to kind of have a change of pace and work with nutrition and hear about some of the nutrition research that's been going on.

Jamie 22:45
Yeah, I completely agree. Everybody's interested in different research topics. And I shied away from nutrition for a very long time. And when I got to Florida, and we did a few projects and couldn't really get positive results out of some of the diets that we were testing, I kind of abandoned it for a while. And then we tried it again and saw the same thing. And I abandoned it for a while, and then we had Emily Noordyke, the master's student you referred to earlier, show up and we systematically tried to address some nutrition questions. And I know she's been on this podcast, and she and I wrote some manuscripts based on her research, but we learned so much about nutrition research, just the way to do nutrition research, that really, ultimately makes me makes me think a lot about the projects that I see coming out. And Vincent really did a good job explaining his project, what they found, and how they did it, etc.

Amy 23:37
Yeah, I feel like every single extension talk that I go to, when I'm speaking to an audience, they always ask me, "Okay, so what should we be feeding our bees? And what's up with the pollen substitutes and the alternative feeding products?" And I'm just like, well, I think, especially after speaking to Vincent, that we realized that nutrition research is not always that straightforward. So I don't really have an exact answer to give to a lot of the beekeepers.

Jamie 24:04
Yeah, Amy, it's tough. I mean, a lot of commercial beekeepers feed pollen subs at different times of the year. No two places are quite created equal. We're here in Florida, we've got different conditions than they have in California where they were doing this research project where they have different conditions than they do in England or Germany or Australia. The science is not as easy as saying, "Well, just feed sugar water," right? Well, that universally solves sugar deficiencies, right? Pollen sub research is not nearly as straightforward and sometimes I'm scratching my head when I talk to beekeepers. Not only do I have no specific recipes to recommend, sometimes don't even have the ability to recommend feeding pollen subs at all.

Amy 24:58
Right.

Jamie 24:59
Like if we can't get them to work, then it's an expensive fix for beekeepers who are put a lot of money into these things and may not be getting in return what they believe they're paying for.

Amy 25:13
I guess let's just summarize some of the factors that go into nutrition and the needs of what the honey bees have.

Jamie 25:21
Well, Vincent said a lot about location. And he is spot on. I was kind of leading him with a question. I had come to the conclusion through our own pollen sub researches, and maybe a lot of the results that

we're not seeing here, the things that we anticipated would happened as a result of feeding patties that we don't see happening, might simply be due that we've just got pollen available in the environment, even at low amounts. And maybe even at low amounts, it's enough to offset what we're feeding them. It's like real estate, location, location, location. So forage availability, is there pollen out there? What's the quality of that pollen? That's why I was asking him about a threshold. It seems like in his case, between Randy's site where there's low or no pollen available at all to here where there's at least some a good chunk of the year, what point is the switch flipped? And the patty that I feed here now works there, because there's no pollen? Where is that switch? And I'll make a final comment related to this. A lot of pollen diet research is just based on consumption, which basically means the patty has disappeared from the hive. We put it in there, it's no longer in there, the bees are using it. Well, these diets are full of sugar. Bees eat sugar. So of course a lot of these things are taken out of the hive. So there's just a lot that goes into understanding how bees use and if bees use pollen subs that are available to them, which is why I'll go back and say all over again, one of the greatest opportunities for improvement that we have in the beekeeping world is through diet improvement for bees. I really believe that is a way that we can make significant impact on the health and productivity.

Stump The Chump 27:05
It's everybody's favorite game show, Stump the Chump.

Amy 27:17
All right, so we are back at that question and answer time. And Jamie, what I've done is I've basically taken some emails, well, we've basically taken some emails and really dissected them to turn them into three different questions. So the first question that we have, someone was asking, and really, they were listening to one of our episodes and had some follow-up episodes about larva nutrition. And so he's wondering, I guess, this first question is really two questions. So maybe everybody gets some extra questions this week. How do we even identify whether we are having a feed problem, especially whether the larva is having some feed issues? And what should we feed them as a supplement?

Jamie 28:00
I really like, Amy, the motivation behind this question. You and I get the advantage that we get to see the whole question. And basically, this listener was saying, "Hey, you guys do a good job on your podcast getting us to think but then you stop short of giving us the answer." And I listen to podcast myself, and sometimes I feel bad about the host. And essentially, the person's like, "Hey, you guys had a really interesting podcast recently about larval nutrition and how important larval nutrition is, etc. but then you didn't tell us how do you recognize larval nutrition issues and address it?" So let me just give you a couple of pointers here. And obviously, bees are really good at rearing larvae when they've got the appropriate resources and stopping rearing larvae when they don't. And so what are the appropriate resources? Well, when there's incoming pollen and incoming nectar, bees will produce, allow the queen to lay eggs, and they'll rear those eggs all the way through the developmental stages to adult bees. And so in order to do that, you've got to have pollen and you've got to have nectar. Now, nectar can be stored and pollen can be stored, but eventually those resources run out. So how can a beekeeper spot that there are nutritional deficiencies in larvae that would make them want to feed? Well, I would argue that beekeepers don't usually have to get to that fine level of detail to know that

because other things would manifest first that beekeepers would recognize more readily. For example, the population is really growing, but there's no honey stored in the nest. So in that case, when you hoist the hive or rocket forward, it's really easy to rock forward because there's no weight. So visually, you just don't see a lot of nectar honey stored for the amount of bees in that nest. Secondly, you might see larvae or the adult bees beginning to abort larvae or brood and that's a clear sign there's not enough pollen coming in. Now, if you really are interested specifically in larval nutrition, you can actually notice that -- let me restart this concept. A lot of people know that when larvae are young, these little C-shaped larvae floating in brood food in the back of the cell, that's the image that they want to see. They want to see these larvae just surrounded by brood food, that white secretion that they're just basically swimming in. Well, one of the first signs of nutritional deficiencies that's starting to take a toll on the larvae is when very young larvae have no brood food in the cells with them, those cells are kind of dry. And that's because the bees don't have enough incoming resources to keep up with the nutritional demands of the larvae. So usually, very shortly thereafter, they'll start cannibalizing the larvae. Again, you would probably notice something else as a beekeeper before you ever get to that point. But if you get to that point, what can you do? Well, if you're experiencing nectar or pollen deficiencies, the only thing you can do in response to a nectar deficiency, you have to feed sugar water or corn syrup or something to replace that. But oftentimes, when you're seeing no brood food, it's not just nectar-related, it's pollen-related. And beekeepers try to mitigate that issue by providing pollen substitutes, pollen patties, and if you've been on this podcast listener list long enough, you'll realize that I've got really mixed feelings about pollen patties, and I'm not sure that they always can remedy the issues that we think that we're seeing in hives. So to make a very long story short, you can spot nutritional deficiencies in larvae when larvae and pupae begin getting consumed or cannibalized or when the young larvae are dry in their cells, it looks like there's no food in the cells with them. But again, that usually manifests much earlier, as whole colony nectar deficiencies, in which case, you see that there's nothing stored and you need to feed your bees. So I really appreciate the question and thought behind the question, but some very basic things, right? If your colonies are light, you don't see pollen or honey or nectar, you're going to have to feed, if the colonies are strong and trying otherwise to grow, and if you see pollen deficiencies, or you see dry cells with young larvae or cannibalized larvae, you might consider putting in protein supplements and seeing if that can solve the problem.

Amy 28:00
So that actually leads us into the second question of the Q&A for today. And this person has top feeder jars. So the bees are apparently not taking the inverted jars of sugar syrup. And I guess, right now, so the person is asking if it's a little too cold, and I guess where this person is at, it's about 55 degrees Fahrenheit. And so what would the reasons be for bees not taking sugar syrup from a jar?

Jamie 33:01
Good question. Usually, the issue is, well, there's usually one of two issues, either, number one, it's too cold, and I believe the questioner asked specifically about 55 degrees Fahrenheit, and for the rest of the world, that's about 12 and a half degrees Celsius or so. Is that too cold? So number one, it could be too cold for the bees to want to take it. I don't think that's the case in this particular case. Or number two, it could be that there's simply nectar coming in. And usually, if there's nectar coming in, bees will ignore the nectar or the sugar water that you provide them all together. There is a third option and that

third option is it's just slightly too far away. But that's usually coupled with it's slightly too far away, and it's slightly too cool for us to want to go that distance. Now, the questioner was specifically mentioning that it was 55 Fahrenheit or 12 and a half Celsius. I don't think that that's too cold. So it might be that it's just slightly too far away from the bees. Usually, when you are feeding bees when it is cool, it is best to put the sugar syrup over the top of the heads of the bees. Now, I know a lot of people who will argue with me here because if the feeder jars or the feeders leak and it is cool, then that sugar water raining down on that cluster of bees during a time of the year when it's cool or cold could cause lots of problems. And I would reply in return just make sure your feeders don't leak so that's not a problem. But in this particular case, it's just cool enough to where the bees might be clustering. The questioner mentioned they use a spacer to kind of allow for some space between the heads of the bees in the sugar water feeder and that space may be just great enough and this just cool enough temperature that the bees aren't wanting to break that cluster to get up to that feeder. So usually, when I recommend feeding bees during winter or cooler months, when you have to get sugar water or something to the bees it has to be right on top of their head. A lot of beekeepers in very cold climates won't feed sugar syrup or any type of sugar-delivering water in any way during cool months or cold months because they're worried about all the side effects associated with it. So they'll feed a solid sugar patty, something a lot of folks around the world called fondant or candy boards, which is basically just almost that same stuff that you find in queen cages that the bees have to chew through to release the queen. And it's kind of a pliable sugar water mixture to where it doesn't harden that hard. It's just a very pliable, clay-like consistency that the bees are able to consume. So to get all the way back down to the answer of the question that the questioner is asking, why aren't my bees taking the sugar water from this jar feeder, it is likely in your case, that's it's slightly cool, and it's slightly too far away from the bees. So either you've got to bring it closer or consider feeding a solid sugar that you would put literally right on the frames where the bees are clustering.

Amy 35:56
That makes sense. All right. So the last question we have is how do you use thymol for wax moth control?

Jamie 36:04
So Amy, this will be the easiest question that I get to answer because the answer is I don't use thymol for wax moth control. I might be wrong about this, but I'm not aware of any formulated product here in the US that includes thymol as an active ingredient to use against wax moths. I know that it is an active ingredient to use against Varroa and some Varroa treatments. And the questioner elaborated a bit on the question which is, I could use the standard thymol products against Varroa and hope for wax moth control, or maybe I can put some thymol in sugar syrup as a food additive or feed additive and hopefully get some wax moth control. But I would argue I wouldn't do either one of those for wax moth control. I would do the standard ways of controlling wax moths, which, in living colonies, would be keeping the colonies as strong as possible so that the bees can police them off themselves, or in stored equipment, I would either use registered products, for example here in the US, you can use something like paradichlorobenzene crystals, PDB crystals. I think they go through a lot of trade names. There are a few registered products for wax moths. Freeze the combs, that's one of my favorites, but again, a lot of people don't have a lot of freezer space. So maybe that's not an option. Or store the combs, in an open

shed that's got a roof, maybe a pole barn, but no sidewalls. And so there's a lot of light and airflow through that area just because wax moths don't like that so they tend to stay out of combs more so in those settings than they would in other settings. So again, to summarize, I wouldn't use thymol to control wax moths, I'd do some of the more traditional approaches for wax moth control. And Amy, we have a couple of documents, I think one, specifically, on wax moth control that we can make sure and link in the show notes if our listeners are interested in reading more about how they would control wax moths either in their living colonies or in stored equipment.

Amy 37:53
Absolutely. I've gotten a couple of emails recently from people asking where the additional show notes are. They're actually, if you go to our website, the main website, UFhoneybee.com, you can click on Two Bees in a Podcast, and all of our episodes with their additional notes are on there. So keep the questions coming. I know we have questions on email or we have them on Facebook, Instagram, or Twitter, so bring them on!

Serra Sowers 38:23
Thank you for listening to Two Bees in a Podcast. For more information and resources on today's episode, check out the Honey Bee Research Lab website at UFhoneybee.com. If you have questions you want answered on air, email them to us at honeybee@ifas.ufl.edu or message us on social media at UF honey bee lab on Instagram, Facebook and Twitter. This episode was hosted by Jamie Ellis and Amy Vu. This podcast is produced and edited by Amy Vu and Serra Sowers. Thanks for listening and see you next week.