# EPISODE 187 TRANSCRIPT

**Jamie**

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

**Amy**

Hello, everybody, and welcome to this segment of Two Bees in a Podcast. Today, we are joined by Jennifer Standley, who used to be a master's student and finished her master's degree here at the UF Honey Bee Research and Extension Laboratory and is now doing her PhD with Doctor Geoff Williams at his laboratory in the Department of Entomology and Plant Pathology at Auburn University. So, we're bringing Jennifer on today, I'm really excited about it, to discuss a research project that she did here at UF with Jamie. So, Jennifer, thank you so much for joining us today.

**Jennifer Standley**

Oh well, thank you so much for having me on the podcast. It's an honor to be on this. I've been listening to the podcast, actually, since the beginning, I would say before graduate school. So this is going to be fun.

**Amy**

Very awesome.

So today we're going to talk about your paper called “Does consuming irradiated royal jelly affect Apis mellifera larvae development and survival to adulthood in vitro?” I'm excited to talk to you about that research. It was fun to kind of see you join our lab and then do your research projects and come out with a published paper. But before we get there, why don't you introduce yourself to our audience and tell everyone how you got into beekeeping and beekeeping research?

**Jennifer Standley**

Okay, great, Amy. Okay, well, I guess I'm going to see if I can keep it pretty short. And I really enjoy listening to the podcast still, and I like to hear how people get into the beekeeping. Honey bees reach us in so many random intriguing ways. But, basically, I am a beekeeper turned researcher, and I'm what you call, at this point, a traditional graduate student, but it started about

11 years ago and I've been beekeeping for almost that amount of time. But about 11 years ago, there was a local UF extension beekeeping course being offered that was about two days that I attended. At that time, I currently worked in the veterinary medicine field. I thought the course sounded interesting and I like to learn about new things, but I never thought I could legally keep honey bees in my backyard in an urban environment setting in the state of Florida back 11 years ago.

So, in that extension course, they told us that the state law had just recently passed, that's in the state of Florida, giving the state authority to regulate beekeeping, and that I could legally keep bees in an urban environment. So, at that point, once I found out I could keep bees, I wanted to get started. So, I started reading as much as I could about the biology of bees and beekeeping, because I'm actually a little bit of a nerd like that. I like to understand things and understand organisms. So then, from there, I got my first colony in the spring and was hooked. I became active in my local beekeeping club, served on its board as a vice president for two years, and that's where I heard about the UF Honey Bee Lab and heard about the master beekeeping program. And at that point, there was the whole campaign of helping to build the bee lab that I was a part of. So, then I went through the process of becoming a UF/IFAS master beekeeper. During that time, I started thinking I wanted to go back to school and get my master's degree. I approached Dr. Ellis with taking me on as a graduate student, and after a few conversations, I also went and I gained some research skills, because at that time I did not have any with a professor that was locally to me, Doctor Scott Dobrin. After that, Doctor Ellis let me join the team as a master's student.

**Jamie**

Well, I've heard my name a couple times. So, Jennifer, you're right, for full disclosure, you were a master's student in the laboratory, and we're bringing you on to ask you specifically about some of the research that you did while you were here. Amy's already read the title, right? "Does consuming irradiated royal jelly affect Apis mellifera development and survival to adulthood in vitro?" And so there may be a lot of terms in that question with which our listeners are not so familiar. So, your research focused specifically on rearing honey bees in vitro on a diet containing royal jelly. So, before we get into the meat of your research, can you tell us a little bit about what it means to rear honey bees in vitro? And why would anyone do that?

**Jennifer Standley**

Yes, Jamie, that's a great question to ask me. And so first I like to make sure people have an understanding of definitions. So, let's get a clear understanding what in vitro means. But in vitro basically means outside the organism's natural environment. So, in this case, in vitro rearing honey bees, we're rearing honey bees outside their natural environment. We're not rearing them in the natural nest of a colony, they're actually reared in an incubator.

So, for in vitro rearing, that requires newly emerged larvae and this takes several days of preparation, which in terms of getting those newly emerged larvae, it requires caging the queen about 3 days prior so that when those eggs hatch, we know we have the right aged larvae at about ±12 hours old. Those larvae are taken into a lab where they're grafted onto something we call well plates. Those well plates are easy to move around and move in and out of the incubator. Then those larvae are fed a diet which consists of royal jelly, and so they're reared in an incubator.

And I like to point out that why are we interested in in vitro rearing with honey bees, it is a very powerful form of research in which we could study how stressors, like pesticides are a very good example, that might affect the developmental life stage using this method. Prior to in vitro rearing honey bees, research could only focus on the adult life stage and how those stressors might affect the adult life stage. But now with in vitro rearing, you can see how those stressors affect the developmental life stage as well.

**Amy**

So Jennifer, you mentioned royal jelly and that being the diet. So basically, you're taking honey bees and you're raising them in the laboratory, specifically in this case, worker bees. Is that right?

**Jennifer Standley**

Yes, they're going to be worker bees, correct.

**Amy**

Awesome. So, as beekeepers, we know that the larva get fed royal jelly among other things as well, and I wanted to talk about royal jelly. So, can you talk about royal jelly and where this comes from?

**Jennifer Standley**

Yes, Amy. Yeah, royal jelly, to me, is super fascinating. I would say it's equivalent to what we might call bee milk. For example, say, mammals need milk in their juvenile stage to grow development, which is typically supplied by the mammary glands. So, bees, in a way, are kind of like mammals. They also need milk in that developmental stage, that larval stage. So royal jelly has everything that that baby bee, that larval bee needs to grow and develop into an adult bee. It contains proteins, lipids and sugars. If someone isn't familiar with what royal jelly looks like, it's that milky white substance you might see a larvae sitting in a pool inside a cell inside a colony. So, what's even more fascinating though, as I mentioned, like mammary glands and mammals, it does come from glands. But those glands are called the hypopharyngeal glands and mandibular glands. And believe it or not, those glands are located in the worker bee's head. So, it's the nurse bees or those newly eclosed or emerged bees who are roughly under 15 days old that are the producers of royal jelly.

Additionally, let me point out that pollen and proper nutrition at colony level is super important for the nurse bees to produce royal jelly. It is the nurse bees who primarily need both bee bread and pollen that they eat, that they consume to produce royal jelly. And additionally, as we kind of mentioned, it's the main component that's used in the artificial larval diet for in vitro rearing.

**Jamie**

So, there's a lot to put together here, right? So, we've talked about royal jelly, we've talked about this in vitro rearing process. So ultimately, you can rear honey bees completely indoors for a number of purposes, but one of the things that's needed to pull that off is to have royal jelly that you can use as the basis of their diet. Well, the title of what we're discussing with you is, does consuming irradiated royal jelly affect the success, essentially, of developing honey bees in these lab rearing situations? So, why, Jennifer, would you want to irradiate royal jelly before use in the in vitro rearing diet in the first place?

**Jennifer Standley**

Yes, Jamie, that's a great question. Why would we want to irradiate royal jelly? As I mentioned, royal jelly is the main component for the in vitro rearing honey bees, but typically, it is sourced internationally in the United States of America. It's just cost effective to use imported royal jelly in research. But there are concerns that it could harbor potential pathogens that might spread to honey bees, for example, Paenibacillus larvae or as we know it, American foulbrood or AFB, additional honey bee viruses could be contained in that royal jelly. Therefore, currently in the United States, imported royal jelly is required to be treated like a biological contaminant if used in honey bee research. That means one must have, one, proper permitting and, two, a USDA United States Department of Agriculture containment facility.

It's just cost effective, as I mentioned, to use imported royal jelly with in vitro rearing as one might go through a lot of it. In fact, per the permitting, any waste generated with imported royal jelly needs to be sterilized, typically with an autoclave. I'd like to point out that, two, the irradiation in this study, I used gamma irradiation using cesium. And in this case, a lot of people sometimes hear radiation and think maybe it persists in an environment, but it does not persist in the royal jelly. It just works at one time point to sterilize it. And this is a known method of sterilization in many regards, and in some cases, in the food industry for humans.

**Amy**

Yeah. So, Jennifer, let's talk about your research in this paper in particular. Can you describe what you were looking for and what you were doing research on and how you went about this?

**Jennifer Standley**

I guess, first to start, there is insufficient literature on the dose of radiation necessary to kill microorganisms that threaten honey bees. Like for example, like I mentioned Paenibacillus

larvae. It's a spore forming bacteria that can persist in the environment for many decades. Therefore, it's very hard to kill. There is some literature that shows a dose of 25 kilograys. A kilogray is 1000 greys and this is the dose that I use for irradiating royal jelly. So, there's some literature that points that maybe 25 kilograms would kill the AFB scores. But it was not known if honey bees could develop on irradiated royal jelly. So, I wanted to test that and see if it could be. The ultimate goal, in my case, would be for the possible permit regulation change. That way, honey bees could be reared in vitro with larval stressors. And at this point, right now, we can't look at the adult life stages. So, there's the hopes with a permit regulation change that we could additionally study honey bees that are reared in vitro on their larval stage could additionally be studied into adulthood and see how those stressors affect them into adulthood.

I'd like to add that this was a part of three projects for my masters. So this was part one of three where I look at honey bees. Yes, they can be reared on irradiated royal jelly at 25 kilograys. The next question that I had was, is a radiation dose sufficient at sterilizing royal jelly? And then the third question that I had was what pathogens might be contained in imported royal jelly?

**Jamie**

So, Jennifer, all good questions. And so I'm thinking for our listeners out there, to summarize it, you could tell me if I'm correct or not. Essentially, scientists use this kind of in vitro rearing process to look at the effect of stressors on developing bees. But it requires us to go through copious amounts of royal jelly, which while we buy it in the US from U.S. companies, they source it internationally. So, there's a fear by regulatory authorities that maybe there's stuff that comes in the royal jelly that could be a problem for bees. So as a result, we do this all under permitting. Our colleagues around the US do this. If they do in vitro rearing, they do it under permitting. So, you're curious then if using radiation will sterilize it such that it is not only safe to feed bees, but may someday open up the permitting process and allow us to test a lot more?

So given all of that, you just told us then, as well, you have 3 projects. Number one, can you rear honey bees in vitro on irradiated royal Jelly? #2, does irradiation sterilize it? #3, what's in royal jelly? So I know you're still working on papers associated with projects two and three, but with project one, what did you find? When you irradiated royal jelly, did bees develop on it?

**Jennifer Standley**

Oh yes, Jamie. Okay, so, what did I find? Yes, I found that bees could be reared on irradiated jelly at a dose of 25 kilograys, which was exciting. I will point out though, there was a bit of a reduction in survival compared to the control. The control would be there was also a treatment in which the bees were fed royal jelly that was not irradiated, but at the same time it still met the United States toxicology standards. Some potential causes in that regard, though, could be there maybe have been some compositional nutritional quality changes to royal jelly or diminished. Royal jelly did look a little different in color and texture after irradiation, which maybe

suggested slight impact. There are maybe some possibilities of future refinements as well. We're looking at a lower dose of irradiation, lower than 25 kilograys to improve survival. But in the end, yes, I did find that I was able to rear honey bees in vitro on irradiated royal jelly at 25 kilograys.

**Amy**

So, Jennifer, I've got 2 questions for you. It's the same question, but may have two different answers. With your findings and your research, the first question would be, what does this mean for beekeepers out there? And then the second question is what does this mean for honey bee researchers out there?

**Jennifer Standley**

Okay, Amy, I'm going to reverse the order a little bit. I think it's important for both beekeepers and researchers. It is valuable. So, in terms of the researcher side, it will open the possibility for new studies focusing on the stressor impacts, like, say, pesticides and how those exposures mature. But with the permit regulation change, there could be additionally incorporating how adult honey bees function the colonies. Because at this point now, we can only know how the developmental stages are affected. We don't know how they maybe function in a colony. So, therefore, it could help beekeepers as well to know, additionally, if that research can continue into adulthood, how their own colonies might be affected by those stressors at the larval juvenile stage.

There is one other thing that I have contemplated in this, and I didn't discuss in my paper, the manuscript, but I do think it's a possible ability to rear gnotobiotic bees or bees that don't have any microorganisms potentially. That is, like if you're familiar with lab rats that are sterile, if you're feeding them a sterile diet, there's the possibility that they could contain no microbiome. So, this could be future work in honey bee gut microbiome work possibility as well.

**Jamie**

Yes, there is a lot to know about all of this, and I think it's important that we just reiterate right now, at least within the US, regardless of the results that you've generated, it's still required to have an APHIS permit if you purchase royal jelly and it was sourced internationally. So that's good. But your information, hopefully, will be informative in shaping some future decisions on how to handle bees that they're produced in this rearing process. So, Jennifer, we can really talk for days about this project. I think it's important to say to our listeners that this paper is published and we'll make sure and include a link to it in the show notes. So, for any of you who are interested in following up with it, you certainly can. But Jennifer, you're not here at the University of Florida anymore. You're at Auburn University. You're in Geoff Williams' Laboratory there, and you've got a completely different set of projects that you're investigating.

So, before we let you go, we'd love to hear a little bit about what your work is like there, what you're looking at and things like that.

**Jennifer Standley**

Oh, okay, Jamie. Well, yeah, I'm happy to tell a quick report on what my PhD now is focusing on. I definitely have taken a big turn from doing molecular microbiology work and in vitro rearing work for my masters. But now my focus is still on nutrition though, which kind of falls into the in vitro line, and also pollination oncology. Part of my research is helping to bridge the gap for beekeeping, so, this is important for beekeepers, and the government on an encroaching non-native tree called the Tallow tree, Triadica sebifera. It's a tree that is found here in the southeastern United States. But there are talks for the governmental release of biological control organisms for its control. But some beekeepers feel that the tree is a good spring forage for resources for honey bees. So, my research is helping to bridge the gap between beekeepers and the government and the importance of this tree to beekeepers.

Additionally, I collected 2 years of corbicular pollen samples from southern Mississippi and central southeastern Alabama. I'm interested in seeing what preference and resources colonies have in the southeastern United States. So, this has taken a big turn for me, just dipping my feet into learning the art of pollen ID or palynology, which I do have to say, it's kind of funny how life takes a turn. But when I was a beekeeper in the early stages and working in the veterinary field, I was very interested in pollen. I would look at pollen, back then, collected directly from the flowers. So, it's funny how life has taken me back into pollen and learning about it and nutrition. But this research will hopefully be beneficial to beekeepers to know good resources for their bees in the spring in the southeastern United States.

**Amy**

Very cool. Jennifer, I'm excited to see you speak at some future conferences. Excited to see what other papers you start to publish, especially with pollen and Tallow in the Southeast United States. But I'm also excited to see what comes out of Project 2 and 3 in your masters as well. So once all those papers are published, because it's so easy to just write papers and get them all peer reviewed and out there, we'll have to bring you back for that, for sure.

**Jennifer Standley**

Thank you, Amy. Thank you so much. It's just great talking to you both. I miss you both very much. And thank you so much for having me on the podcast and letting me share some of my research and my bio.

**Amy**

Yeah. Absolutely. And for our listeners out there, as Jamie mentioned, we will take that publication and add it to our additional resources, which is located on our website www.ufhoneybee.com.

**Amy**

Jamie, it was nice catching up with Jen again. It's been a couple of years since we've seen her because she graduated two years ago from here. Time flies by very quickly though.

**Jamie**

I know. It's hard to believe she's been gone that long.

**Amy**

I know, seriously. Well, I just wanted to bring up the whole in vitro thing. This is something that we do here at the lab, that other laboratories do, and every time we kind of bring it up, if we're speaking to beekeepers at associations, they're like, why in the world would you want to do that? Like, what is the purpose of in vitro? So, let's talk about that a little bit.

**Jamie**

Yeah, I mean, there's really a lot to consider in this regard. I will say, essentially, that the in vitro rearing method exists for the purpose of rearing honey bees in the lab. That's what in vitro means in this context. And just like Jennifer said, there's a lot of uses for it. Our lab has used it principally to study the impacts of pesticides on developing honey bees. When you have this food that's based on royal jelly, you can put pesticides into it, rear the honey bees on it, and see how that affects their survival, their development, their weight, their developmental time, how long it takes them to get to the pupa stage, all these different things.

But you can also use it to rear bees in vitro to study honey bee nutrition or honey bee behavior. It's just that, at least, here in the US, where it's difficult to find locally sourced royal jelly, in the US, a lot of researchers buy it from companies that source it internationally. It's interesting, Amy, because you, today, could purchase royal jelly for consumption at your house. You get the same royal jelly that we get. And it's not regulated kind of in that context because you could get it, you could eat it on your cereal, you could do whatever people do with royal jelly, whoever want to purchase it. But when we purchase it and bring it into a honey bee lab, the USDA APHIS wants us to make sure that we are being as safe as possible and conducting in these very specific situations, which is why Jennifer alluded to the permit. And so, in the US, if we're using internationally sourced royal jelly, we have to do it under this very specific protocol.

And I'm sure, internationally, it's very similar. A lot of people get around that simply by trying to find a local source for royal jelly, which has been a little difficult to do here in the US. I may be

opening a can of worms, but why do you think it's so difficult for us to try to harvest royal jelly here in the US?

**Jamie**

Well, labor first of all, right, because you have to produce a lot of royal jelly. I'm talking kilograms and kilograms and kilograms that we go through when we're rearing honey bees in vitro. 1 little queen cell doesn't produce a lot. So, you've got to rear thousands and thousands of queen cells, and someone has to go in and harvest that stuff. And that's why you typically see it done in countries like China. I believe they're the biggest source, in fact, of royal jelly. So, in that particular context, it's just difficult to replicate in the US. So, it's expensive for people to produce it, therefore, very expensive for people to purchase it. And I think all of that's kind of part of the issue.

**Amy**

I assume you've seen some of those videos of people harvesting royal jelly and how insane and quick they are at it. It's unbelievable. I really like watching it. It's very mesmerizing to me.

**Jamie**

Yeah, it is mesmerizing. It is.

**Amy**

So, Jamie, what Jennifer was talking about was the irradiated jelly. That's what made it kind of different, right, than just using your standard royal jelly. So, I guess let's just real quickly talk about that.

**Jamie**

Yeah. So, Jennifer, then, was doing a series of projects like she talked about where she wanted to understand kind of how big of a risk is this royal jelly to honey bees, this international source, and could that risk be mitigated? And this was just the first of those three projects. Can you mitigate the risk? The way she tried to mitigate the risk was irradiate the royal jelly with 25 kilograys before she added it to the worker diet. And if you do that, you've got to make sure that the bees can be reared on it, that they'll actually consume it and grow and develop. And that's it. That's her research. And so basically, she said, yeah, I irradiated and I was successful. We were able to rear honey bees to adulthood on irradiated royal jelly. And that's important because it's a first step in making the argument that, hey, if we irradiate this royal jelly, we make it safe for use in laboratories of bees. Then, maybe we can carry the next step where we can produce adult bees from this and look at the impacts of immature bee exposure to royal jelly on adult bee survival, behavior, all of these things. So, it's very important research. And Jennifer did that and a lot of other work, and she was very good at introducing those other two projects. Hopefully, we'll have

her back on the podcast when those two projects are published as well, because it kind of finishes out the story of how best to handle this royal jelly.

**Amy**

Yeah, definitely. The last question I had, we did mention that this is typically done on worker larvae. Is this common with drones? Is it common with queens? Or, do researchers primarily look at worker development?

**Jamie**

So, Jennifer's interest was workers because the worker assay has been worked out, so to speak. We and labs around the world can use this method. That's actually a method that we refined in our laboratory and it's very successful. Labs around the world have been using this method to rear honey bees in vitro. So workers are really easy and straightforward to rear in vitro. Conversely, queens and drones have not been. There have been some labs that have been successful producing queens, but it's not at high survival rates like what we're seeing with workers. Drones are even another level of difficulty. So yes, it's probably possible to do both, but those are definitely research needs that folks can look into more in the future.

**Stump the Chump**

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

**Amy**

All right, welcome back to the question and answer segment. This is the third of our Bee College Q&A questions that we were asked in the survey. Something that I think a lot of people don't realize, Jamie, is that a lot of the people who come to Bee College are newbies. I mean, it's kind of crazy when we asked, like how many of you have been to Bee College or if this is your first Bee College and we've just got so many new beekeepers all the time. So that kind of leads me into the first question that we have for today. This individual was asking what drew you to beekeeping? And, if there was one thing that you could tell a newbie, what is that one thing you would recommend?

**Jamie**

Jeez.

**Amy**

I know.

**Jamie**

So, the first question is easy for me to answer because I know very clearly what drew me into beekeeping. But secondly, it's a little bit tricky. It's hard to say. There are four things that equally influenced my journey into beekeeping. So just very quickly, beekeeping is not in my family. So, it's not like I had a grandfather who kept bees or mother who kept bees. Those things didn't happen. But there are 4 episodes that kind of worked together, no doubt, to make it happen. Episode #1, somewhere around kindergarten, first grade, a beekeeper came and spoke to our class and brought with them some little fact sheet about honey bees and beekeeping that I had that I kept in my toy box that would kind of resurface every once in a while, when I would do stuff. All right, that's number one. Number two, my bus route to elementary school passed a house that had a beehive in the backyard. I vividly remember that because it's only maybe 1/4 of a mile from my school. #3, I don't know if those things put those thoughts in my head, but I actually had a dream around 8 years old about beekeeping. And I'm like, gosh, I just want to do that. So that's three things. And so, from 8 years old, I started reading books about bees, tried to talk my parents into getting me bees, and it took kind of about four years or so to kind of make that happen.

What really made it happen is when I was around 11 or 12, I guess, 12, I had a school teacher who I said out loud to that I wanted to keep bees and was never able to, and she had an uncle or a relative who was a beekeeper. And then she went and got me an empty beehive and showed up at my house with an empty beehive. So, all four of those things kind of came together and made it where, okay, I'm going to do this. I want to keep bees and sort of the rest is history.

Now, one thing would I tell a newbie? I don't have one thing. I really have, I guess, two things. The first.

**Amy**

That's it?

**Jamie**

Yeah, well, I know it's not like -- but I'm really putting a lot under these two things and calling it two things, even though it's probably a lot of things. #1 learn as much as you can before you get into bees. So, I read a lot. I had a mentor who trained me a lot, and I watched a lot before I ever got my bees. Six months, a year or so before I ever got my bees. So, my second piece of advice would be get three colonies. Not one, not two. All of you've heard me say this. If you have one colony, you can't know if it's sick if you don't have a second colony to compare it to. But if you only have two colonies, there's a big enough chance that both of them are bad. So, you might be comparing a bad one to a bad one and thinking everything's normal. So, I think that risk is reduced when you have three. What really helped me is I just got bees, 10-15 colonies, and I just kept them. There was no experience like true experience, just physically being in bees. I learned very quickly what kept them alive. I learned very quickly what killed them. So, I knew how to

address those things in my own operation. So that's kind of the two big pieces of advice I would give.

**Amy**

All right. I think those are fair. Definitely. Okay, so the second question that we have. I was going to say this is probably an opinion question, but it's not, but I'll ask anyway. Screen or solid bottom board. Are you a screen or solid bottom board person?

**Jamie**

So, I do have data to back up this answer, so I don't have to be 100%. I will say, I haven't looked at the research in years and there hasn't been a project on screen bottom boards, to my knowledge, in years. But at the time when screen bottom research was happening, kind of the collective data set suggested, of course across all the studies that I saw at the time, that if you use screen bottom boards, you have a 10 to 15% lower Varroa population than if you use solid bottom boards.

So, you have to have a bottom board on the hive. So, why not start with a screen rather than start with a solid? Obviously, if you've got 10,000 colonies that are on solid boards, you're not really going to want to change those out. But if you're starting from scratch, why not screen bottom boards, right? Because you've got to have one. And since they help a little, you might as well use them. So, it's that "since they help a little" that I've struggled with, because I'm also a believer that that they should not be open in winter. And I've only ever lived in warm climates. So, I happen to keep, you know, I'm in Florida now, right? I happen to keep screen bottom boards on my hives year-round. I still think it's better to close those screen bottoms during winter to reduce cold air flow into the hive. I know we've had individuals on this podcast before who we've talked with about thermoregulation of hives. I think that the growing science of thermal regulation is going to suggest that colonies perform best when they're adequately insulated. And the question then is, is well, are they adequately insulated if they have a screen bottom board?

The truth is I don't know. So, from a Varroa perspective, using a screen bottom board does give you some benefit and some benefit is certainly better than no benefit. But does that offset any potential negative impacts you get from using screen bottom boards from a winter perspective or any other perspective that I just don't know, because most people, myself included, who've done screen bottom research have only looked at it almost exclusively from a "what does it do for Varroa populations" perspective. So, since those data sets came out, I've only ever used screen bottom boards and think that it's good. But now that I'm getting older, I sometimes wonder, are they best? And certainly with all this new thermoregulation research coming out, I'm really beginning to question that recommendation. But until I see an overwhelming data set to suggest otherwise, I'm going to personally continue using them.

**Amy**

Yeah, definitely. And not even that, but the types of hives, the materials, are different. People are starting to come out with different types of hives instead of just the wooden ones too. So, it'll be interesting to see what happens. All right, for the third question that we have, if bees cannot see the color red, why are bee suits white? Not all bee suits are white. I've seen different colors.

**Jamie**

I do like this question because sometimes I feel like when we talk about the fact that bees can't see red, there's this maybe idea that red is invisible, and they don't see red, that's true but –

**Amy**

They can just see right through it.

**Jamie**

Exactly, that's why I always giggle. If you wear a red bee suit, do the bees see you naked? No, they don't. When they look at red, they see the color black. That's their perception. They don't see red, they see black. Bee suits are white mainly for heat purposes and defensive purposes. We know bees, when they get agitated, sting dark colors. So, having a black bee suit, as an example, could increase their defensiveness. On the other hand, having a black bee suit will also make us very hot while we work bees. So truly, bee suits are white just to make it a little bit more palatable to wear bee suits because I hesitate to say white bee suits still make it completely cool, and they don't. You are still hot in a white bee suit.

**Amy**

They definitely don't.

**Jamie**

But you're not as hot as you would be in a dark bee suit. So that's why bee suits are white, to minimize stings, as well as to minimize the heat to the beekeeper.

**Amy**

There you go. All right, listeners, if you have other questions, feel free to send us an e-mail or message us on one of our social media pages.

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

**Jamie**

Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram,

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