

# Episode 106\_mixdown PROOFED

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## SUMMARY KEYWORDS

bees, colonies, varroa, july, silk, honey bee, nectar flow, hive, mites, brood, beetles, winter, honey, larvae, management, beekeepers, put, cells, work, bee

## SPEAKERS

Serra Sowers, Jamie, Amy, 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.

### Amy 00:51

Jamie, I thought it was really hot in June, and now we're going into July and I feel like it's just going to get hotter.

### Jamie 00:56

That's the way it is. That's just the way it is.

### Amy 00:59

All right, so how do we prepare for July, and what are the things that we need to take into consideration? Let's start with pests and diseases.

### Jamie 01:07

Great place to start, always, especially in July.

### Amy 01:10

Number one favorite ever is Varroa. So what should we be doing with Varroa during this time of year going into July?

### Jamie 01:17

It's a little depressing to start the show off with Varroa but I feel like if beekeepers around the world can manage Varroa appropriately, it would solve so many problems for honey bees. And so we're going to kick off our July management discussion talking about Varroa. Varroa is bad. We know it spreads pathogens to our bees, those pathogens are bad, so Varroa bad plus pathogens bad equals really bad, right? So our colonies really suffer.

**Amy** 01:47

Great math.

**Jamie** 01:48

Bad, bad is bad squared, double bad, something like that. Anyway. So like we said back in June, bee populations are starting to dwindle within a colony in June, July, kind of August, and Varroa populations are just cruising along. So in July, you want to continue, maybe, every three to four weeks, sample your colonies, do a powdered sugar shake or an ether roll or an alcohol wash or something to estimate the number of Varroa that you have per 100 adult bees. And if you exceed three Varroa per 100 adult bees, you need to treat your colonies. It matters not so much to me what you elect to treat your colonies with as long as it's a labeled product, but you need to do something. And I will put in a quick plug here for the Honey Bee Health Coalition. The Honey Bee Health Coalition has a wonderful guide on Varroa management. And they also have a wonderful decision support tool to help you know if and how you need to treat Varroa. So for example, if in July, you do an ether roll or you do an alcohol wash or powdered sugar shake, and I'd like to recommend powdered sugar shake over the other two of those because powdered sugar shakes, you don't end up killing the bees and you can put those back in the hive. But on the Honey Bee Health Coalition website, if you just Google 'Honey Bee Health Coalition Varroa', you'll get there, you can find out how to sample colonies, you can get to this decision support tool, and the decision support tool says, what's your number Varroa, what time of year is it, in other words, is your colony growing, is it dormant, is brood present or not? Then it kind of works you down this tree and then it says: Are you open to using synthetic acaricides or would you rather not use a synthetic acaricide? And then it kind of takes you down that tree, and then it gives you options that work best for you that time of year. So what I would say about Varroa in July is you must monitor your colony, number one. Number two, if you exceed three mites per 100 bees, you need to make a treatment decision. You need to treat that colony. The Honey Bee Health Coalition's guide, its decision support tool and the supporting videos and document will go a long way to helping you know what you need to use, what will work best to control Varroa this time of year.

**Amy** 04:05

I had a talk this past weekend and the beekeepers had listened to our podcast. And when I started talking about Varroa, I was like, "There's this really great resource." And I stopped and I looked at the people that said that they had listened to our podcast and I'm like, "The people who listened to our podcast already know what I'm going to say." And they all said, "The Honey Bee Health Coalition," and I said, "That's right, you all are my success story. So thank you for listening."

**Jamie** 04:28

Well, I'm glad it worked. Listen, I will put out there, I'm not affiliated with the Honey Bee Health Coalition. I didn't help develop those tools or instruments. I just believe that they're really good.

**Amy 04:39**

Alright, so we're continuing in July. And actually, now that I think about it, there are things that we were talking about in June that I think we could just kind of follow up on for July. So we just did Varroa, and so in June, we were talking about small hive beetles. So what are your recommendations for small hive beetles?

**Jamie 04:39**

And I think that they are, frankly, the best out there. I've just never read a Varroa treatment guide as good as the one the Honey Bee Health Coalition put together. And in fact, I've said it before, we're not even trying to produce something out of our lab here at UF because I just don't know that we can improve upon what already exists. But I will say, Amy, just to make sure everybody can find it, we'll make sure and link to it in our show notes. And I know that I've alluded to this before on a previous podcast episode, but Dr. Cameron Jack here from the University of Florida and I also reviewed all of the control methods ever tested against Varroa around the world, we put all of that together in a big research article on Varroa integrated pest management. We'll make sure to link that document in the show notes as well so that you can see the research behind all the Varroa control strategies that people use around the world. But the Honey Bee Health Coalition has a good practical guide, and then that research document that we'll make sure and link is the science behind it all. And I think you guys will find that interesting and useful as well.

**Amy 04:39**

Right.

**Jamie 05:59**

Yeah, so like June, beetle populations are continuing to go up in July, and July tends to be when I start seeing legitimate issues. And what I mean by legitimate issue, I'm not just seeing beetles, but we will lose the occasional colony or two to beetles. I'm from the camp that, generally speaking, a colony should be able to handle a small hive beetle population. I mean, all of our colonies here at the University of Florida have small hive beetles, every year, all year long, but only a small fraction succumb to them. And usually, they succumb to them when they are weak, they're having queen issues, or there's some other disease or pest or nutritional issue that's in the hive. So generally speaking, to combat small hive beetles, you solve all the rest of those problems. But July is when I'm starting to see the occasional colony get taken out by beetles. And what does that mean, "get taken out?" I'll go into it, we'll see adult beetles everywhere, and when we start pulling frames, there's beetle larvae just in a lot of the combs, the colony's clearly suffering.

**Amy 07:01**

Oh, and it smells so bad.

**Jamie 07:03**

It's bad, yeah, it smells bad. The honey's fermented, it's just a gross, nasty mess. And so I start seeing that in July. I see it more so in August and September but July is when, usually, we will lose our first colony or two to small hive beetle. So monitor them. Unfortunately, there's not a good economic

threshold for beetles as there is for Varroa. So I can't say, "Well, if you see this many beetles you need to do something." But what I always tell folks is to keep colonies strong and healthy, and if you see what you consider an alarming number of beetles, you might consider putting some small hive beetle traps into your hive. So what would I consider an alarming number of beetles? If I pop the lid of a hive and see 10 beetles scurry, or I pull an outermost frame of one of the boxes and see 10 or 15 or so beetles on those outermost frames, if I'm seeing beetles regularly as I go through a hive, then I might throw in a couple of traps just to try to keep those beetle populations low. But I will also make sure that my colony is otherwise strong and healthy so that they can keep those beetles at bay.

**Amy 08:03**

All right, so water was a huge topic from last month. And so what are your recommendations, the same for water, just making sure that you have a clean water source?

**Jamie 08:13**

That's it! Clean, available, and I will tell you, everybody's going to be in a different environment right now. For us, in July in Florida, at least where we live, it's incredibly hot, but it's also very humid and we get lots and lots of rain. So usually July is not a problem water source for us because bees can just get it anywhere even if you're not close to a pond or a lake or something. They can find it anywhere. There's water puddles or just dew somewhere because there's just so much water around. But you can still have problems with your bees going to places that you don't want them to go, a neighbor's swimming pool etc. We've talked about that before, so you can put water out for bees. There are a few ways you can do this. You can have a trough of some sort where you fill it with water, you could put flotation devices in there so the bees have something to float on. I know a lot of beekeepers will create nice little fountains. Or they'll have these goldfish ponds in their yards that bees can land on the lily pads and take advantage of water. I even knew a guy who would put a piece of wood under a faucet and the wood was slanted from the faucet to the ground. And what he would do is lightly turn on the faucet and let water just sort of slowly go down that piece of wood all day long every day. And bees would line up on either side of that little bitty water stream as it were and collect water. And in my own case, I had actually bees leaving my hives and going to my neighbor's horses' water troughs and what I did is rather than putting water out for them, I gave them water directly at the hive. I took an entrance feeder, slid it in the entrance of my hives, filled up Mason jars or glass jars with water, and put those on the hives and it really reduced, I think, almost eliminated, the number of my bees that were going over to my neighbor's water troughs. So there are lots of ways to get water to bees. But just keep in mind if you live in a dry area and it's hot, you've got to provide that for them for sure. For sure.

**Amy 10:11**

So with beekeeping, I feel like it's a science, but it's also an art, right? And so splitting and then combining colonies and splitting and just equalizing in general, are we trying to split in July? Should beekeepers consider splitting in July? What should we do?

**Jamie 10:28**

Yeah, so I'm going to continue on the theme that we talked about in last month's June management. June is a time of year I like to split colonies because there are just so many bees, and life is good. So usually, by the time July has rolled around, I've taken care of all that myself. However, there are some

folks who might split in July. It's a hot month. And the reason I point that out is because, first of all, it's just hot to be out there working bees in July and doing all this extra work. But also, if you are relying heavily on the production of queens by queen breeders to provide those queens to you for your splitting purposes, it gets a little trickier in July because a lot of queen producers will not ship queens in June, July, and August because it's really hot, and they run the risk of overheating while they're in the post on their way to you. But if that's not a problem for you, and if you didn't split in June, and if you do not have a July nectar flow, then you might consider splitting in July. It's less of an emphasis for me. But it's certainly a time of year that you can do it if your colonies remain strong and everything else is addressed so that the colonies are able to be split.

**Amy 11:32**

So those were kind of just follow-ups that we had from June. What else do we need to consider going into July?

**Jamie 11:38**

Yeah, there are some unique things that happen in July, especially for folks who are fortunate enough to have significant nectar flows. Just to give you an example, I'm from Georgia and one of the premium honey crops in the state of Georgia is a tree called Sourwood that blooms in late June, and the first three or so weeks of July. So if I lived in that area, then I would have the amazing advantage of a major nectar flow that's not only major but it's incredibly profitable, because sourwood happened to be a very premium honey. So for a lot of folks who are fortunate enough to live in an area where you might get a significant summer nectar flow, it's usually occurring at this time. And so then my management recommendations for the month of July are almost similar to those that you would hear back in March or April in advance of the major nectar flow. You want to make sure your colonies' queens are managed appropriately. They all need a queen, she needs to be laying well, life needs to be good in that hive, the diseases and pests need to be controlled, and you also might have to even control swarming. I've moved bees in the past to summer nectar flows in July and lost a few to swarms just because they get this kind of second trigger. "Hey, there's incoming nectar, seems to be a lot, let's swarm." And so what you would do in July, if you're fortunate enough to live in an area that has that second major nectar flow, you would just prepare the bees as if you were preparing them back in March. Queen management, swarm control, and otherwise super when necessary to make sure that the bees are ready for that nectar flow.

**Amy 13:15**

Okay, so we're looking at queen management, swarm control, and there are some nectar flows around the nation. And last month we were talking about honey harvesting. So should we be harvesting honey right now? And also, do we need to start feeding bees?

**Jamie 13:31**

Well, for those folks who are getting that significant nectar flow in July, you might end up having to harvest that honey in late July or early August. I know where we live here in Florida, we've got an even more unique honey flow. We've got a pretty significant honey flow that's going to start in August and go through a little bit of September. But if you get the typical summer nectar flow, usually by the end of July, you might be harvesting again. Amy, you asked specifically, too, about feeding bees. That's an

important thing to talk about now. So the best case scenario is that you live in an area with a major nectar flow in April, May, life is good, the bees are strong in June, they've stored lots of honey and in July, you can kind of sit back on cruise control from a food perspective. The bees have enough, you don't have to feed, that's all okay but I try to cover everything, a lot of scenarios in these management months discussions. And you can be in a situation in July where the bees have no honey, no food, no fuel. What do you do then? Well, first of all, this is a real problem. Where I live, in Florida, my major nectar flow in spring usually starts at the very end of February and goes through March. It's just enough for the bees to fill up one medium super's worth of honey, just one. And I don't like this particular honey. I didn't want to harvest it and sell it to folks. So, it's just honey I leave for bees. So to make a long story short, they make enough in early spring to get them to August or September when I can anticipate one more flow that my bees will make one more super using. However, because my spring flow is so early, it's subject to damage by freezing temperatures that knock off the bloom. So it's very possible in March, for me, to only make a half or three-quarters of one super, in which case, the bees have nothing else except that little bit of honey for April, May, and June. So for me, July is when colonies start running out of food if they had a poor nectar flow back in spring. So if everything's going well, a lot of you guys out there have nothing to do from the food perspective at all in July. But for those of you who had a tough spring, July might be that time of year when you're going to have to feed them a little bit if you don't have a significant nectar flow or if your next nectar flow is August or September or October, which can be common in a lot of areas for these kinds of late summer, early fall nectar flows. So for me, I have to think about feeding oftentimes, in July, depending on what happened to my colonies in spring. So I'll just tell you folks out there, if you've got a good medium super's worth of honey on your hive, that's good. If you don't, you might want to hoist your colonies as you manage them every so often, and just double-check and make sure that they have the food reserves necessary. If I didn't feed sometimes in July, they'd never make it to August or September when I can count on that next nectar flow and I'd be in a pickle. So July can be an important feeding month. And if you're wanting to split colonies in July or August, you might have to feed just to get colonies strong so that you'll be able to split them. So don't write it off completely just because you came out of a nectar flow about a month and a half earlier, you still need to be watching for this through the process.

**Amy 17:01**

Right. And I feel like we're in the time of year where we need to start considering the fall and the winter. Right? And so how do we start thinking ahead? I know at the beginning of this year in 2022, in January, February, March, we had to think ahead. And so we're at that time of year where we do need to start thinking ahead. I know that you and I were talking about winter bees, do you want to kind of talk about what that is?

**Jamie 17:25**

Yeah, it's really hard in Florida, in July, to be thinking about winter. But we live in an area where we have such extended warm seasons. Our winter is incredibly truncated. But if you're listening to us from upstate Maine, or you're listening to us from Alaska, or you're listening to us from the UK or Germany, or places that are going to have significant winters where cold temperatures start mid to late August, September, etc, then July is when you would start making preparations for winter. So it's hard for us, me and you, Amy, to think about that where we are. But so much of the temperate world has to begin preparing their colonies for winter, even as early as July. So a lot of what we've talked about so far

helps you get there. Varroa control, disease and pests in general management, queen management, making sure bees have adequate food reserves so that as they go into that kind of last August, September, October push to store pollen and nectar, they'll be ready to do that. Well, in some parts of the world, especially when it gets kind of cold early, kind of August, September-ish, the bees might even start producing what we now call winter bees. And so what's a winter bee? Well, we know that the average worker honey bee somewhere between April and August or September lives somewhere in the neighborhood of about six weeks, up to six weeks. They'll do a lot of the tasks, then they'll graduate ultimately to these foraging tasks that take place outside of the hive, and they'll end up dying, working themselves to death. So these are what we call summer bees or spring bees. They are the worker bees that get you through those production times of the year. Well, in mid to late summer and early fall, colonies switch to start producing what we call winter bees. And these are the workers whose task it is to get the colony, as the name implies, through winter. Now, you think about bees from a winter perspective. They don't have a lot of tasks to do. They're not usually producing or rearing lots of brood, they're not producing and storing honey, they're not building comb, they're not foraging, they're not swarming, so there's not a lot of energy for those types of activities. Instead, you need bees that are built for thermal regulation, these ones that are going to carry that colony through winter by heating it using food reserves, etc. These bees, depending on where you live, may have to live for months. In Florida, they don't have to live too long because we can produce brood nearly year-round. But if you're in a much colder climate, your colonies may essentially go dormant for six months or longer. So the bees that start getting produced, especially in late July, and through August and September, those are the bees that are going to be taking your colonies through winter, and they need to have a lifespan of 4, 5, 6 maybe even depending on where you live, seven months. So colony nutrition and health are paramount this time of year. You need healthy colonies that are disease and pest free, with adequate and copious amounts of high-quality resources to start investing in the production of winter bees that research increasingly shows, behaviorally and physiologically, are different than those worker bees that will do all the work for us in spring and summer. So if you do everything else that we've talked about so far in this July management, you will tick the boxes necessary for your colonies to start investing in the production of winter bees. But a lot of people don't think about it. They'll have a winter loss, and they'll ascribe it to something that happened at that moment when in reality, it starts now. July, August, September, maybe October, you want premium, high-quality bees produced. In order to do that, you've got to have those diseases, pests, and nutrition all under control.

#### **Amy 18:38**

Absolutely. Bees are so cool. They just know. It's just amazing what they're able to do. We try to do our best to help that. We try to do our best to support them in any way we can, but sometimes they just take care of themselves. So don't forget, in July, we're just following up from June looking at Varroa, small hive beetle, making sure that your colonies still have water, splitting your colonies if you need to, and we're definitely looking to prepare for fall and winter at this point. If you're in Florida, we do have our Florida Beekeeping Management Calendar available on our website, and we will be sure to add it to our additional notes on Ufhoneybee.com.

#### **Stump The Chump 22:26**

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

**Amy** 22:38

We are back at the question and answer time. And Jamie, the first question is about mites. Of course. Of course it's about mites.

**Jamie** 22:45

What else?

**Amy** 22:46

We should have like at least one question related to Varroa in every single Q&A?

**Jamie** 22:52

Even then, we still probably-

**Amy** 22:53

We probably do actually.

**Jamie** 22:56

Even then, we'd still have Varroa killing colonies. They're a little pesky critter. They're awful.

**Amy** 23:01

Alright, so this person's asking, so they have high mite populations in their colonies, and they're seeing deformed wing virus on the bees. So they're wondering, basically, if they can combine different mite treatments, and if that's safe for bees or whether it's actually going to work. What's its efficacy?

**Jamie** 23:20

Oh, this is a tough, tough question. And the reason I say that is because in other commodity groups, it is very common to treat with multiple treatments simultaneously. So to make it easy to understand firsthand for example, if you're wanting to control a fungus and a pest insect on watermelons, you might tank mix a fungicide and an insecticide so that when you treat once, you're killing multiple things. Now, there are some crops and other things and pesticide products to protect those crops that allow for multiple mixes of things that are targeting the same organism. So let's just say you have insect A, there are products one and two that work against it, and when you mix those one and two together, you get a better control over organism A than you would if you just treated with one or just treated with two. All right. So someone mentioned to me a few years ago, maybe five or six years ago, "Hey Jamie, we don't have a product that's amazing against Varroa. We use Apivar, ApiLife Var, thymol-based products, things like that. So rather than relying on one, why can't we co-treat?" Let's just say that you have three products. So you've got lots of different options to treat. You've got product A, you could use product B or C, or you could use AB, or AC or BC, or you could use ABC. So they're like, "We don't really just have three treatment options, we've got multiple treatment options because we could just mix as is common in the other commodities." Okay, so that got my wheels turning at the time. "Well, gosh, this is maybe something that could be done." The problem is, number one, it's not the problem, this is actually a good thing, you should always follow the label. So you can't mix if the label doesn't say mixing is allowable. The problem that I was going to say is I don't know that the labels specifically mention this for the available Varroa products. So what I would always do then is default to my second answer.



While the idea is good and needs research, the idea needs research. So what I mean by that is yes, this is a good idea, yes, we need to study it but because there's nothing in the literature on using multiple treatments simultaneously, then I would recommend not doing it until we know more, and until we know clearly what the labels say about this. And I can deal with the part about knowing more. To my knowledge, there's no research, at least that I've seen, where folks are looking at product A and B, product B and C, product A and C, things like that tested simultaneously in a colony. Why does this matter? Yeah, it might make it a more effective Varroacide. But it also may make either one of them or together both of them, more toxic to bees. So I will say all of this is a good idea and needs to be investigated from a research perspective. So until it is done from a research perspective, it simply needs to remain a good idea that people don't try. I would discourage people from trying it. Certainly, you can't do what's contrary to the label. But if the label doesn't exclude it, I would still not try it simply because we don't know what these mixes might do to bees, how it might show up in honey, things like that. Again, a good idea, needs to be explored experimentally. But we're really in the early stages of understanding this. So I would caution folks from moving forward with it.

**Amy 27:08**

Well, and I think, in my mind, I was thinking what about the mites? They're starting to show resistance to some of the chemicals, right? And so would that make that resistance happen faster? I don't know.

**Jamie 27:19**

That's an interesting comment. Actually, a lot of people do this for resistance management, because what it does is, let's just say that you've got mites in a colony that are resistant to mostly resistant to Amitraz. Right? And so if you treat with Amitraz, let's just say 20% of the mites survive. Well, because 20% of mites survive, they very quickly are selected for Amitraz resistance. But using two chemicals at the same time, there's a hope that that second chemical will take out, say, for example, in this example, the Amitraz-resistant mites so that you're left essentially with no mites. So actually double treating sometimes can be used for resistance management because you're attempting not to leave a resistant population behind. Whatever chemical A missed, you're hoping B picks up.

**Amy 28:10**

Right, right,

**Jamie 28:11**

Rather than the other way around. So that's part of a strategy for resistance management, but it could also cause the development of resistance to multiple compounds simultaneously. So that's what I'm saying is we know so little about it that even though the idea is good, we've got to know more before I would encourage it. And again, it still has to be consistent with the label because if it's not, then it doesn't matter how good it works, we'd still be breaking the law if we did it.

**Amy 28:39**

Right. Okay, so the second question we have -- so if anyone's seen bees build wax, they have wax come out of them, and it's perfectly white. So new wax is always just white. And so this person's asking, they watched some of the bees coating it in yellow, or brood wax, which comes out like yellow / brown,

you know, they're different colors, and it's not all white. And so the questioner is asking, why would this be? Is it propolis? Is it different types of oil? What's happening here?

**Jamie 29:14**

Yeah, it's funny. When I got this question, and we were looking at it here before we started this recording, I thought it must be from the same individual who had also emailed me from the American Bee Journal, but it's not. It's a completely different individual, but asking the same question. And I think this gets at the fact that this idea is a little bit of a mystery out there. And it's kind of an exciting mystery to unravel, as it were. So essentially, we all know that when bees secrete wax from their wax glands underneath their abdomens, it comes out, well, for the sake of argument, I'll say mostly white. It's not necessarily pure white, it looks white when it's on the scales, but when you put a lot of it together, you can see that it's almost got a cream or yellowish hue to it. But for the sake of this discussion, let's just call it white. Alright, so when they build virgin comb, which is what we call it, it's mostly white. Okay, so how does it darken over time? Number one, and number two, do bees add stuff to it that darkens over time or that is darker than white? Well, we know that if comb is used exclusively for honey production, it tends to stay whiter. And if it's used as an area where brood is reared, it gets darker, all the way to black. And the reason for this is that while pure beeswax is mostly white, the brood comb turns dark over time because small amounts of propolis are added to the cell walls, which is probably what this individual who asked the question: what is this kind of yellowish looking stuff that I see them adding to the comb? It's very likely plant rosins, propolis that they're adding to the cell walls. But to broaden my answer to talk about why cells darken in general, number one, propolis can be added to the cells. Number two, when a bee is developing in the cell, she actually spins silk in almost like a cocoon. And I know we've got another question coming up about that. So I won't say much more about that. But these deposit on the cell wall, which can darken the cell wall. We also know that bees, as they're developing in the cells, shed their exoskeleton multiple times. They also defecate in their cells. All of these things can work their way into the cell wall. We also know that there are just standard stains associated with bees moving about a hive. Bees have dirty feet, so walking on white wax, it can darken it over time. And then fifth, you can get a lot of debris that ends up falling down on the cells or becoming parts of the cell. And then, of course, pests and pathogens can cause a buildup of stains or debris in the cell wall. So in the brood area, all of these things contribute to the darkening of that white wax, ultimately, to make it mostly black in color. In fact, brood cells become so adulterated, I'll say, that if you put a brood comb in a solar wax melter and all the wax is melted away, you still have the shape of the brood cells because of all of this stuff that has built up over the years in the lining of the cell. So to answer this person's very specific question, what were they depositing that was kind of yellowish in color on the cell walls, it's probably propolis. And they further asked, well does it possibly help out with hygienic responses? And in the case of propolis, it probably does, but to broaden my answer in general, why does brood comb darken all overtime, it's for all these reasons that I mentioned: propolis, silk, shed exoskeleton, feces, debris building up in the wall, dirty footprints, etc. And for that matter, even honeycombs that are used from year to year to year to year will darken it. They just won't darken because of brood rearing, they will darken because of silk or things like that. They'll simply darken from staining and aging over time.

**Amy 33:15**

Okay, so you mentioned silk twice now. And that leads us to our third question. And we know that honey bees go through a complete metamorphosis, they go from an egg to a larva to a pupa to emerge as an adult. So you were talking about that layer of silk that surrounds the larva. So can you elaborate on that and what that is? And that's the questioner's question, what is that thin layer of silk?

**Jamie 33:43**

Amy, honey bee silk has actually fascinated me for a long time. It's just that it's one of those things that's been in my head, that says, "Jamie, go read about this thing. Go read about this thing. Go read about it." But I just really never have. So in preparation for the answer of this question, I did read one paper about honey bee silk. They were measuring some of the protein characteristics of the silk. But the thing that popped into my mind all the time about it, it's like, butterflies and moths, or at least specifically moths, they'll make these kinds of silken cocoons and of course, there's the famous silk moth whose cocoons they can unravel and use that silk to make the stuff we think of with silk, silk clothing, things like that. It's fascinating. So then I'm going, "Well gosh, why can't people use bee silk to make fabrics? I wonder what uses bee silk has. Spider silk is said to have all of these tensile and strength characteristics. I wonder about bee silk." I've never really done an in-depth review of bee silk. I need to, but here's what I do know about it. And some of it was summarized in this article that I saw. Now, bees are not moths, so they do not build silken cocoons as thick and as sturdy as that built by a moth. However, they do spin silk. They actually have glands in their heads, they're modified salivary glands in their heads that secrete the silk. And they'll produce a lot of it. It's during that final developmental stage of the larva.

**Amy 35:17**

Right.

**Jamie 35:17**

And so what they'll do is within their capped cell is deposit some of the silk around them. So I've also wondered, why is silk production even necessary in honey bees if the bees capped the cells anyway? I mean, the bees themselves build the structure in which the caterpillars -- gosh, you can hear I'm --

**Amy 35:45**

The moth?

**Jamie 35:45**

I'm messing up terminology because it's so ingrained in me. Because the bees build for themselves the cells in which the larvae develop, so why would the bee need to make silk? And I still don't know the answer to that question. What I do know is that they do produce silk. It likely has a very important function that folks are trying to work out. I did read here that bee silk has been shown to contribute to thermal and mechanical stability of the comb infrastructure of hives.

**Amy 36:17**

That makes sense.

**Jamie 36:18**

Yeah, so maybe the larvae do it to add greater thermoregulatory capability to the combs in the brood nests right where the larvae need to be warm and the pupae need to be warm. Or mechanical stability, so for example, you would even agree with this, that brood comb is much sturdier than just honeycomb. It's very solid. It's got all of that stuff that composes the walls of the cells and a lot of its bee silk. So, it's one of these fascinating topics that I need to read a lot more about. But I will tell you, we do some in vitro rearing of honey bees in the laboratory. That means that when larvae are 12 hours old, we can graft them from hives, put them into plastic dishes that we can then take care of the larvae every day of their life all the way until they pupate and emerge from their petri dishes as an adult. And in this in vitro rearing process, in the absence of wax, we can actually see the silk that the larvae deposit. In fact, if we do this with larvae that will ultimately pupate on a petri dish, they will build something that's not nearly as structurally significant as like a moth cocoon, but they'll build this really thin layer of silk kind of cocoon around themselves and pupate within it. So it's a remarkable structure. I've never seen lectures about it. I've only seen people mention it in passing, myself included. But it's one of those things I need to read more about because it's just cool. And I think it's probably something that would make beekeepers appreciate honey bees even more.

**Amy** 37:55

All right, well, that was what the thin layer of silk is that surrounds a larva. So that's pretty cool. I mean, we should probably just read more about the silk and larva at our lunch and learns with the grad students, so that'd be fun. All right. So for those of you who have questions, these have been awesome questions, and we're excited to answer them. If you have any more questions, please feel free to send them to us via our email or send us a message on social media.

**Serra Sowers** 38:28

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](http://UFhoneybee.com). If you have questions you want answered on air, email them to us at [honeybee@ifas.ufl.edu](mailto: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.