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EPISODE 212 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, I am excited to be rejoined by Dr. Juliana Rangel, Professor of Apiculture in the Department of Entomology, Interdisciplinary Program in Ecology and Evolutionary Biology at Texas A&M University. Thanks so much for joining us today.

Dr. Juliana Rangel

Thank you, Amy and Jamie. Great to be back.

Amy

Yeah. We are bringing in our guests from the past, so it's a blast from the past, bringing in people and talking about some of their updated research, some of the updated programs. And when I had asked you, what should we really focus on, you said that you had two projects that you really wanted to highlight.

And so that's what we're going to do today. We're going to focus on 2 projects that you've been working on. One topic will be on feral and unmanaged bees in South Texas, where you are, and also another one on your research on honey bee nutrition. But before we get to that, why don't you remind our listeners a little bit about yourself and how you found yourself working with honey bees?

Dr. Juliana Rangel

Sure. So, I'm originally from Columbia, South America. I moved to the US in 1996, so it's been almost 30 years now. I basically just told you my age. So, I moved here with my family after graduating high school and I went to a Community College in San Diego, CA, where my family lives.

And as soon as I graduated, I transferred to the University of California, San Diego, and there was a brand-new assistant professor there. I was looking for research opportunities as a junior. And I basically knocked on a few doors. 2 labs responded.

One was a neurobiology lab working on neurological plasticity in the brain of rats, and the other one was a bee lab. And you probably recognized his name, James Nye. He had just joined UCSD that semester, and I was his first ever student as an undergraduate researcher, and he was studying communication mechanisms and stingless honey bees from Brazil.

And I was in charge of analyzing some sound or vibrational signals that these bees were producing that could potentially be communicating the location of food sources. Just like a waggle dance in Apis bees communicates resource location.

And I really enjoyed working in the lab. And so, he got me to Brazil with him the following year. We did work with a species of stingless honey bee, and I just fell in love with them and their biology, and that's how it all started.

That was in 2001. Then I graduated, and I was applying for grad school and ended up in Ithaca, NY, working with Tom Seeley. But, at the time when I started working with him for my PhD, I was going to be continuing this work with stingless honey bees and communication mechanisms.

This time I was doing some independent work in Costa Rica. I had received the NSF Graduate Research Fellowship to work with stingless honey bees. I worked with them for a couple of years, but things were not moving fast enough for graduate research projects. So, we pivoted and decided to study swarming behavior in Apis mellifera because there were a couple of questions that Tom had not answered yet about decision making and the whole swarming and house hunting process. And so that's how I got started working with honey bees. And I guess that's kind of like the rest is history. I've been working with Apis mellifera since 2006. That's the story.

Jamie

I think you made a wise decision all those days ago when you were trying to choose between honey bee lab and was it a rat lab? You said a mouse lab?

Dr. Juliana Rangel

Yeah, a rat lab. So, I worked in the in the New York science lab actually for money. So that was my job. That's how I made my money when I was an undergrad. So, I actually did stay in that lab as well, working as a lab tech for a couple years. And I remember the PI, Dan Feldman, he was not so sure that I should go into studying bees. He thought, well, you know, it's kind of like a very niche kind of field. Why don't you expand your horizons and try to go for something else, including neuroscience? And then I said, no, you know, I think I found my calling, and I actually I think I did.

Jamie

Juliana, we always ask our guests that question and I'm every time I listen to them tell their story. And now hearing you tell your story, my gosh, that person was like a hair's breath away from not being in the bee world, right? I mean, it's like you could have been in the rats, could have been in neuroscience, but you stuck to it.

Amy

That's hilarious.

Jamie

I don't know who we'd be interviewing now, Amy.

Amy

I know. Seriously.

Dr. Juliana Rangel

Well, you know what's weird is when I applied to grad school, there was one in – not to brag, but I got into every program I applied for, but one of them was at UCLA and it was to study communication in frogs. And so, I could be –

Amy

A frog specialist. That's hilarious.

Jamie

I don't know how many frog podcasts there are out there, but maybe –

Amy

She would be it. She would be it. Jamie, you know, the other fun fact about Juliana, which she didn't share yet, but you were speaking to a group that I had Juliana, and you were talking about how Tom Seeley has been your technician not just once, but twice. And who else in the world can say that? You worked for Tom Seeley and then he did field work for you. That's great.

Dr. Juliana Rangel

He was my research assistant and so I have pictures of him doing, you know, all the dirty work because we needed hands on deck and he kept a very small crew.

It was only one or two people at most, and so he would hire always an undergraduate assistant. When we went to Appledoor Island to do those studies on swarming behavior, it was just an

undergrad and him and I, so it was three of us. So, he was basically working for me on our project. It was a lot of fun.

Jamie

It sounds nice. Well, that segues nicely into this next question, the one that I have for you. As Amy mentioned, we're really going to be talking to you about two broad topics. And I know you do a lot of research, I've seen your senior students and postdocs over the years and seen you talk about your research. But the two parts that we're going to focus on today are feral and unmanaged bee research you do in South Texas and honey bee nutrition. When we were emailing with you behind the scenes about topics, you said, well, here's 2 topics, I could do one or the other or both. I'm absolutely both because we do research on wild honey bees in Africa that kind of mirrors some of what you're doing with feral unmanaged bees in South Texas. And then we've done a lot of work with honey bee nutrition. So, I just want to hear you talk about both. First things first, I'm going to be asking about the feral unmanaged bee work. So, you guys are working with some feral populations or unmanaged populations of honey bees in South Texas. That's all I'll say. So, I'll just ask, could you give our listeners a very broad overview of that research, how it started, all of that stuff before we dive down into what you're finding?

Dr. Juliana Rangel: Yeah, absolutely. So back in the late 1980s, early 1990s, when the Africanized honey bee was coming into Texas, there were some cooperative extension people doing all the swarm trapping of bees to ascertain whether or not they were Africanized. And that's how they found, you know, the first sighting of Africanized bees in Texas in 1990. And so there was this guy Rubik, who kept a log of all of these swarms that he captured, including some going into the area near Victoria, TX, and another nearby town is Sinton. And there's a reserve there called the Welder Wildlife Refuge, or I'm going to refer to it as WWR or the Welder Refuge. It's a large property owned by this wealthy family that owns oil, and they exploit oil there. They also have cattle, but the rest of the property has been set aside for biodiversity research and conservation. So, in the early 2000s, people here at Texas A&M University, including Bob Coulson, Spencer Johnston and their then postdoc, Elise Pinto, whom you might know, she's a professor in Portugal, and Kirsten Baum, she's a professor at Oklahoma State. They were both here, one as a PhD student at the time and one as a postdoc studying this feral population of honey bees at the Welder refuge. They started mapping out all of these feral colonies, and if you ever go there, it's amazing that they managed over the span of about 10 years, basically the whole 2000s, mapping out bees and trees. All these tree cavities that harbor honey bee colonies, they were over the span of, as I said, about 10 years, they mapped over 100 trees. And if you go there, it's scrub brush, Mesquite, thorny bushes, and then in between all of that foliage, then you have these oak trees. You could not see very easily unless you are digging through the brush and then finding these large trees. And they not only scope the territory to find these bee trees, but they map them out. They found their GPS coordinates. And then what they did is they started collecting bee samples in your because this is a preserve, we're not allowed to

go into the colonies and do any destructive sampling. All we can do is take foragers from the entrance of these hives. The idea was to look at the population genetics and see what kind of bees there were. So, at the beginning of the 2000s, most of the bees that they were able to sample were of European descent, both Eastern and Western European. And then toward the end of the 10-year sampling period, most of them were Africanized, which probably wasn't surprising. But then people left Texas A&M, and they stopped working on these bees. And then I got here in 2013 and basically kind of inherited this project and this population and we've been working with it ever since.

Amy

So, Juliana, you know, one of our students, and we interviewed her in a different podcast who is doing work in South Africa, it sounds like, and Jamie, you can chime in as well, it sounds like the spiny, prickly shrubbery is what feral or unmanaged bees kind of always in the thick of this type of flora.

Dr. Juliana Rangel

I guess it depends because, you know, Apis mellifera is in so many latitudes and the altitudes so widely in their native range. It depends. It's probably similar, more like subtropical and/or Mediterranean areas where you find a lot of that kind of thorny bushy landscape. But you know, you can also have native honey bees in the Austrian Alps and very different landscapes. So, they're just everywhere. Yeah, but here we have to sample colonies. Generally, we do it in the summer because that's when we have time. And that implies horrible weather conditions, Very, very, very humid and hot, a lot of mosquitoes and getting through those bushes. It's fun, but it's a lot of work.

Amy

Yeah. So, you said that you inherited this project. So, you've been working on this project and every year you go out in the summer, you sample the forager bees. I assume you're doing kind of the same sampling method that was done previously. I'm wondering recently, what significant findings or results do you have from the study?

Dr. Juliana Rangel

Yeah. So, to put it in a nutshell, for a couple of studies we did again the mitotyping or ascertaining the mitochondrial and genomic DNA ancestry of the bees that we discovered. There was a horrible drought here in Texas in 2011 and presumably, that caused a lot of the bees that had been found before my arrival to disappear. So, when we went back in 2013 and the years after, a lot of the trees were dead, and a lot of the colonies were gone. And so out of the 110 trees that had been mapped, only maybe 70 were still standing. And of those, only maybe 30 to 40 harbored bees. The first study, we basically reported that 98% of the colonies are now

Africanized. So, we've lost most of the European background, although I'm not saying that there aren't any because we only sampled some trees, not all the trees around. So, there could be a lot of colonies that we've missed. That's in the mitochondrial and maternal lineage. In the genomic or nuclear DNA, we found that it's basically still kind of a hybrid swarm that has ancestry from both the European and African descendant DNA. After that, we sampled again. I recruited a graduate student who graduated recently, Myra Dickey, and she basically took on this project and went back a few times looking at the levels of Nosema in these bees. And interestingly, we had done a study of all samples we had in the freezer and there was Nosema apis in this population back in the early 2000s. But then Nosema apis disappeared and then we only found Nosema cerana later on. And then she found kind of the same results that only Nosema cerana is in that population, which is not surprising because that's kind of the case in most populations where Nosema has been studied in the US recently. And we also found low titers of Nosema, which is taken to a lot of other similar studies with unmanaged bees, that they seem to have low levels of pathogen. So, then we wanted to see what's going on with viruses. And so, we went back and collected more bees and looked at the levels of viruses. In both of these studies, what was cool or different was that we all compared that population to the nearest managed population of honey bees, which was difficult to find because as I said, like all that area, it is pretty unpopulated and there are not a lot of people living near there. So, the nearest apiary that we could find was about 30 miles away. The guy keeps bees mostly for queen production. He's Amish, which could be a fun story for later, but he was difficult to communicate with because you would have to leave him a voicemail at the local store because he can't use the phone himself. Anyway, Myra managed to get hold of him later and he was happy to help us by letting us sample his bees. So, we did the Nosema analysis and the virus analysis for both the managed and the Welder population of bees and we found that both the levels of viruses for these bees were below the level of concern for viruses including deformed wing virus, including black queen cell virus. We looked for the 8 most commonly found viruses in in honey bees, chronic bee paralysis virus, Israeli acute paralysis virus, Kashmir bee virus, sac brood virus, and we really didn't detect any of those. Only a few colonies that we sampled from the feral population had any viruses, and those that did had low levels of viruses. So, of the 20 something colonies we sampled, only maybe 3 or 4 had any virus loads and they were low. What we had hypothesized though was the feral or unmanaged bees were going to have significantly lower levels of viruses compared to the managed population. But we didn't find that to be the case. The levels were similar between the wild or unmanaged and the managed population. And all of these studies come with a caveat, like we could have studied more managed populations. The managed population really wasn't close enough to call them similar. When we did the mitotyping for the maternal ancestry of the managed population, we discovered that most of those colonies are not Africanized, which kind of makes sense because the beekeeper is trying to keep his colonies gentle. So, of the colonies that we sampled from him, which were about 25 or so, only about 5 were Africanized. The rest were of the same lineage, C2, so kind of the Italian type of lineage. But yeah, I mean, basically what we found is what's consistent with other studies, that the levels of pathogens in these wild

colonies are low, which leads me to believe that the infestation levels of Varroa are also low. But again, we can't go into these colonies to do all kinds of really cool stuff that we would love to do, like getting Varroa from the brood nest area and see what the infestation level is. But as far as diseases, that's what we've found so far.

Jamie

Yeah, I could ask you questions about this for days because I just am really fascinated by honey bees and what they do in nature when they're not in our white boxes, which is essentially what we're doing in South Africa now. We just go and find wild honey bee populations and have some of the similar constraints. While we could actually go into the colonies, we choose not to. We kind of consider them a wild animal, so we don't, but we do collect at the nest entrance and do some of the stuff that you're talking about. So, your work sounds cool, and it's really neat that you guys have such a legacy series of samples that you can go back to and see things like your Nosema apis, Nosema cerana results, etc. So, I could make the rest of this podcast about this question, but I do want to pivot now to some of your other research. You do so much work, people can go to Google Scholar and see the different types of papers that you've published recently. But you do so much work, and this next series of projects all deal with honey bee nutrition, and you've done some recent work on regulation of macronutrients and pollen that's been collected across different landscapes. And so, I'm assuming you're talking about how honey bees make decisions about choosing certain pollen types based on the macronutrients. Could you elaborate on the background and the story associated with this series of projects?

Dr. Juliana Rangel

Yes, certainly. So, this series of projects was spearheaded by my former PhD student, Pierre Lau, who's now a research entomologist at the USDA Unit of Pollination Ecology at Mississippi. But anyway, he started out looking at the type of pollen that's collected by – and actually, Jamie, you were involved in this project. It was the project on the type of pollen and nectar that's collected by bees in urban environments, because most of the work up until then had been on agricultural pollen collected by bees. And so, he became very intrigued about the nutritional quality of those pollen that were collected by bees in urban environments. And then we partnered up with my colleague here at Texas A&M University. His name is Spencer Beamer, and most bee people may not know him because he has, up until now, not studied bees, but other insects like crickets and fire ants. But he's a nutritional ecologist, and he's been studying nutrient regulation in these other systems for decades. So, he uses something that's called the nutritional geometry framework, or the NGF, to understand animal nutrient regulation. And so, this is kind of like a modeling approach that helps you put an animal's food consumption pattern in a multi-dimensional nutritional space that helps you explore how animals choose to intake different levels of – and you can kind of leave a blank there. And you can say protein or carbohydrate or lipid or any kind of nutrient and the effects of those intakes on the survival or growth or the reproduction or overall health of the individual. So, you can actually – using this framework, you can identify

any species-specific protein or lipid intake targets. The intake targets being like the optimal combination and amount of those macronutrients that animal needs to consume to meet its physiological needs. And so we started doing a series of experiments with Pierre looking at whether or not honey bees actually regulate their intake target when either – we started out with no choice tests to see what their intake target is when you only give them a certain, what we call a "P to L ratio," or a protein to lipid ratio, because we were interested mostly in protein and lipids. So, we ran a series of no choice tests to see what that optimal intake target is, and then we moved on to choice tests where we give them different but complementary diets in an arena where they only have access to those two diets. And then you see whether they just eat them in equal amounts, which means that they're really not regulating their intake, it's just based on the sheer amount of food and they eat them equally, or that they actually regulate their intake. If the two diets vary in their protein to lipid ratio and they eat one more than the other, then it suggests that they're regulating their intake of either protein or lipid in this in our case, right? You could do these studies with, as I said, carbohydrates, or you can actually go, some people are studying in particular, like sterols, for example. So, you could do all these nutritional geometry framework studies with any kind of nutrient that you're looking at. And so, Pierre ran those types of studies both in the field with forager bees in semi-field conditions, I guess, because they were under canopies so that they could only eat the diet that we were giving them, and in the lab with nurse bees, which is interesting because the foragers are the ones that are making the choice of what to eat. But the nurses seem to be also regulating what they eat out of the bee bread that's available to them in the brood nest area. So, it doesn't seem like they're just eating everything and anything in equal amounts. They seem to be regulating what they eat so that they have this optimal intake target.

Amy

Jamie and I, you know, we talk often about honey bee nutrition and how the work is just necessary, you know, to figure out what the bees need, what they're actually taking and whether they're choosing. And if they're choosing it, is it healthy for them or not?

Dr. Juliana Rangel

There was one study from your lab, Jamie, that we use in our presentations from 2019 where you tested how colonies faired when they were given either wildflower pollen or no pollen at all, like no food, negative control, or different protein supplements. And it was interesting to see that bees that were given no food at all, some of those colonies or, actually, those colonies did just as well or it may be as poorly as colonies that were given some of those supplements, which tells me anyway that they may be consuming the food, but it's not necessarily helping them grow in the way that you would hope as a beekeeper.

Jamie

Yeah, for sure. It's not always doing what we're paying for it to do.

Dr. Juliana Rangel

Yeah, I agree that I think there's still a lot to learn about the supplements that we're giving our foods. So, when we did these studies with the no choice test where we gave them only one diet, but we kept, we had several of these tents with different protein to lipid ratios. They prefer a 30 to 20 protein to lipid ratio, which amounts to basically a 1.4 to one protein to lipid ratio. That tells us that the supplements that are out there probably have the wrong ratio of protein to lipid because if you look at the supplements, they have really high protein amounts and really low lipid amounts. Also, the type of lipid might not be the ideal one. So, it seems like the diet should be a little bit more balanced in terms of the protein to lipid ratio. When we did it with nurse bees, which are the ones that feed the young and need to develop their hypopharyngeal glands to feed nutritious food to the brood, their hypopharyngeal glands, which are the major source of brood food, were largest when they ate that 30 to 20 protein to lipid ratio diet. So, it's not only that they prefer it, but that there's a physiological benefit to eating that target ratio.

Amy

Very cool. Sounds like there needs to be, you know, a lot of work on just feeding and protein and what the bees need.

Dr. Juliana Rangel

Yeah. For the nurse bee study, which is coming out soon, actually, they tend to regulate to that 30 to 20 protein to lipid ratio. But we did a kind of range where we went from the protein heavy to the lipid heavy diets. So, it seems like they generally stopped feeding once they hit a protein or lipid threshold. So, we're suggesting that they might have what is known as a strict restraint rule. So, there's a cost of overeating protein or lipid. So, they stop at a point above which they're eating either too much protein or too much lipid. So, they have a tight protein to lipid regulation, but they seem to be more in tune with the amount of lipid they're consuming than protein. So, then that takes us to the new set of studies. We actually, based on these results, got a USDA NIFA grant looking at nutrient regulation in different landscapes. So, now we have a postdoc and a graduate student working on the studies of protein to lipid intake and also elemental analysis, fatty acid analysis, amino acid analysis of pollen collected by bees in agricultural landscapes, in rural landscapes, and in urban landscapes across seasons. So, we're collecting pollen that bees collect in those three landscapes, and we're doing, basically, a whole suite of analysis of nutrient content in all of these pollens to determine whether or not bees are basically – well in the agricultural landscape, it's kind of difficult because if they're in in a monoculture, say almond, they probably only have access to almond. Although, nowadays, they're beginning to plant companion plantings so that the wildflowers and things, bees can eat also while the almond is in bloom. But in the rural and urban environments, we want to see whether they are also kind of

regulating their protein to lipid in overall nutrient intake based on what's available to them in different seasons. So, we're doing it in spring, summer and fall.

Amy

That's great. I'm excited to see what results come out of that. Once you publish, we'll have to have your students on here, the podcast, and, you know, talk to them all about their projects.

Dr. Juliana Rangel

Yeah, absolutely. We had horrible colony losses last year, like a lot of beekeepers. So, the urban site, we have five sites in an urban environment in the Houston area and then five rural sites near the College Station area. We lost most of the colonies that we had in the urban and rural environments. We basically almost lost all the colonies. There are several projects going on. This one is with foragers, similar to Pierre's work, foragers choosing the pollen they collect. And then we basically put pollen traps and collect the pollen and do all of the analysis. And we also do colony growth assessments of those colonies and survivorship of those colonies. But then our postdoc is also doing the laboratory assays with different diets, and we're focusing on different fatty acids. Actually, a lot of other labs are working with sterols. So, we've chosen to focus on different fatty acids and whether or not the nurse bees are regulating their protein to lipid intake, most precisely their specific types of lipids that they're consuming when given a choice.

Amy

Juliana, your group does so much. I mean, every single time I go to beekeeping conference, I always see students with posters and your name is always on there. And you know, you all represent very well at many of the conferences out there. That leads me into my last question as we close here is could you just chat generally about the Texas A&M Honey Bee Program? I know you all have been expanding and so, yeah, we'd love to hear more about that program just in general.

Dr. Juliana Rangel

Yeah, sure. So, when I recruit a new student, I generally ask them what their interests are and see also what type of funding we have. So, I've been lucky for some of these students, I can kind of give them some flexibility in what they can study. Others are kind of more restrained if they're working on a specific grant. So, that's kind of why we have so many types of projects in the lab. We also have a lot of international collaborations that have come across. So, for example, Keegan Nichols, he just passed his candidacy exam. He's studying managed honey bees in Saudi Arabia. So, we got a grant with King Khalid University to try to generate a breeding program for their native honey bee, the Apis mellifera jemenitica, the Saudi bee, because the honey that it produces is more expensive than any other honeys that they produce from other subspecies. And other subspecies don't do as well in Saudi Arabia because of the harsh climatic conditions. So,

they want to breed a Saudi bee that is better equipped to withstand the environmental pressure so that they don't have such high losses because beekeepers in Saudi Arabia are used to having really high mortality over winter. So, the idea is to try to ameliorate that. Another study or another collaboration we have is with New Zealand. So, your former student Ashley Wark, she and I have a grant that was looking at colony physiology and pollination. So, does the size of a colony matter in its pollination output? If you start out as a newly created swarm with the swarm impetus physiology, do you become better per capita at pollinating crops than more established colony? And so that one is also wrapping up. We have my former student, Jordan Twombly Ellis, who is now a postdoc in Sweden. She was studying this very interesting behavior that we call premature hive exiting behavior. So, it's similar to precocious foraging, but in this case, the bees are not even foraging as young bees, but they actually drop dead below the hive. They basically kind of – almost like they sacrifice themselves and fall to the ground instead of staying in the hive. And so, we call that premature hive exiting behavior. We also do some work with Varroa genetics and Varroa behavior. Plus, the ones that I just told you about, right? And the one that I haven't been studying as much lately is reproductive biology, which is actually my favorite topic. So, I'm hoping that at some point I can get back to studying queen and drone reproduction.

Amy

I hope you get back to that as well. Thank you so much for joining us today on this episode.

Dr. Juliana Rangel

No problem, Amy.

Amy

You know, Jamie, Juliana, again, she does so much work and I was really excited to hear about both of her projects. And I know we could have continued. We could have had a full episode for each one of those topics. I know that you have a love for native, unmanaged, wild bees, whatever you want to call them, but what were your thoughts and everything?

Jamie

I like the research, obviously. These two topics are very interesting to me. I love the fact, too, that when she posed it to us in an e-mail behind the scenes, she called them feral, unmanaged bees, right? There are no wild honey bees in North America because honey bees aren't native here. But she's working with unmanaged or feral populations. And I love that, you know, it's almost like a rewilding. It's like honey bees escape our management, go back into the wild. And then you start to wonder, well, what do they do when they get to do what they want to do rather than do what we want them to do, which of course, is the basis for a lot of the research questions we're asking when we do our work in South Africa. So, that was fun. It's neat to see that. I also like the fact that they have, you know, decades of samples because someone was interested in

this years ago, even before Juliana was hired. So, that's cool. I was aware, also, of the nutrition work that she and her team are doing because of the whole lipid and other macronutrient regulation that she was discovering, that it wasn't necessarily protein that bees were just getting and using from the pollen they go after, but also lipids. And that's cool because you've heard me rant, or listeners have heard me rant, that a lot of our works, at least here in Florida, suggest that a lot of the nutritional supplements we've used, nutritional patties, pollen subs more specifically, just don't produce the results that we read on the packet they're supposed to produce. And so, we've got a lot of these questions. It's really cool that Juliana and her team are addressing this because I think these are positive steps towards improving these things so that nutritional patties, pollen subs, and other nutritional supplements potentially could be of more benefit to honey bee colony health.

Stump the Chump

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

Amy

All right. Welcome back to the question-and-answer segment. Jamie, the first question that we have today is about honey production and how to measure honey production. Is there a standard way to measure a colony's honey productivity? I mean, is it by counting the number of frames that are extracted? Is it weighing the frames? Is it weighing the honey? What is it? Is there a standard way?

Jamie

Yeah, it kind of depends on if you're a researcher or a beekeeper. Actually, both groups can do both. When we, you know, in a research community, really want to know how much honey was produced by a colony, we'll actually weigh supers empty when we put them on hives and then weigh them full of honey when we take them off hives. Even that is a little unfair because even if we're putting on a super of pulled combs, bees will still add a little bit of wax to that, right? They'll pull out the combs further, they'll cap it and all of that stuff. So, not everything in the difference between an empty super and a full super of weight, not all of that difference is honey. There's a little bit of wax involved, but for the most part, the difference in those two supers, you know, empty and full would be the weight of the honey produced. And we do that for all supers on a colony. And I've done this in research projects. I've done things that I've wanted to know their productivity of the honey in those colonies. And I've weighed all the supers empty going on, I've weighed all the supers full coming off and I've done that. You can also weigh the super full of honey, extract it, and then weigh the super after extraction. The only catch there is, is extraction doesn't remove all the honey. So, there's a little bit of residual honey left on the combs, but it's negligible. And you know, the difference between those two weights would be the weight of honey. What beekeepers will often do, especially commercial beekeepers, is they'll just know

that the different sizes of boxes have different weights of honey, so they'll be able to say, hey, I brought in 300 medium supers. Therefore, it's this amount of weight of honey that I produced. Or, from a commercial perspective, they tend to weigh in barrels of honey. They know for example 50–55-gallon drum of honey, you know, 600-650 lbs. Every gallon of honey is about 12 lbs. And so, they can just do the math, right? So, a 50-gallon, 55-gallon drum of honey is somewhere between 600 and 650ish pounds of honey. They just know this. And likewise, a 5-gallon bucket, which a lot of hobbyists extract into, you know, they can weigh those empty or multiply 5 times 12 and know that it's about 60 pounds of honey if you fill the bucket. So, a lot of beekeepers will do that. They'll just estimate the volume of honey that they've produced from after extraction and then turn that into gallons and then know that it's 12 pounds to a gallon. For those of you who are international listeners, you'll just have to convert that to liters and kilograms of honey per liter. But I'll let you work on that. I'm still working on the terrible math that we use here in the United States. So, that's how it's often done. You know, you can estimate the number of supers, know that a super produces roughly so many pounds of honey, or you can do it from the volume that you've extracted, figure that out in gallons and multiply that by 12 pounds a gallon. That's generally how people do. But most beekeepers wouldn't do it all the way the experimental way, which is where they weigh all the supers going on and they weigh all the supers coming off. That's kind of something that scientists would do.

Amy

That's so funny. Okay, this is how Amy's brain works. So, when we went to Thailand last year, there was a weight limit on the suitcases that the students had. And for people in – Jamie, is Publix just in the southeast or where is Publix?

Jamie

I think it's principally in the Southeast. I think it's expanding, but I think it's principally in the Southeast.

Amy

So, we have a grocery store here in the Southeast called Publix, and I'm not endorsing them, but I'm just naming that that's the grocery store name. They all have scales, you know, at the entrance. And so we found out that the students, when they were measuring and they were trying to weigh their suitcases, would basically just go and step on the scale and then pick their suitcase up and then they would step on the scale again. So, I thought that was a really creative and smart way, you know, to weigh their suitcases. They just didn't have another place to use a scale. So, now I'm just thinking, you know, talking about the colonies' honey production, like a backyard beekeeper getting a 5-gallon bucket, filling it up, and then going to Publix to step on that scale.

Jamie

Well, you can do that. I think it's funny, I don't know why I would want to weigh going in and out of a grocery store, but I would say, and you talking about all this, Amy, really just flashed in my mind another thing, because I'm sure are some of our listeners out there are in the gadget producing world, there are hive scales that you can purchase and put underneath your hives and you can measure remotely, in real time, like through an app, how much weight gain your hive has experienced. And most of that will be to honey production. Some of it will be to brood production and bee production and wax production. But weight gain will be mostly tied to honey production. So, you can actually know in real time how much weight your colony is gaining via honey production. The folks who manufacture and sell these things say it's a really great way to monitor your honey flow when it starts, things like that because colonies begin gaining lots of weight. So, that's another way that you can measure, you know, honey production. But from the fine tune perspective, in a research world, we measure it, you know, supers going on, supers coming off, figuring out the difference in doing that. And then beekeepers, it's often volume of honey multiplied by what they know the weight of honey is per volume.

Amy

Definitely. All right. That was really a long time for the first question. We've got two more. So, the second question that we have, this person is wondering why, when they put out wet supers or old honey for bees, that there are inevitably dead bees after they're finished feeding. So, when you're putting it out, I assume to feed the other bees, some die.

Jamie

Could be. So, there are a few reasons that beekeepers want to put supers out for robbing. One, it may be that you just have a few frames that you don't need, and you want the bees to collect it themselves and store it. You can put those frames out. More often than not, beekeepers are putting out supers post extraction. This actually goes hand-in-hand, kind of, with this previous question I answered because I made the point that when you extract honey, you don't really get all the honey out of the cells. You can get most of it, but there's still sometimes a little bit of honey on the frames. So, a lot of beekeepers will put what they call these wet supers out in the apiary to allow bees to take the remaining part of the honey, dry, so to speak, those supers, so that those supers can be stored more readily or more easily. That's one reason that beekeepers would be putting out combs that would incite this robbing. Again, the other way would be that you've got frames of honey that you no longer want, or you've got a little bit of residual honey leftover in combs that you took from a hive, and you won't bees to take it out so that you can store these combs easily. But the questioner is saying, when I do this, both in mass, when I set out a lot and lots of bees are there, or even a little bit, when I set out a little bit and maybe only a few bees are there, inevitably I end up with dead bees. Why are the bees dying? Am I putting out some sort of residues that are killing the bees? You're not putting out any residues that are killing the bees. There's just fighting associated with robbing. When you put out honey and there's a lot of bees in the area or even a few bees in the area and they're attracted to it, they will often fight one another

for those resources. It's usually very little bee death proportionate to the number of bees that are actually showing up to collect this. But it can be alarming when you see 10, 15, 20 maybe even 100 bees that have died in the act of trying to dry, so to speak, those frames or those supers for you. So, it's really just related to the robbing. It's principally bees fighting at these sites. It's not you putting out anything toxic. So, I wouldn't be worried about it from that perspective.

Amy

All right. So, the third question that we have, it's asking, does it matter what color queen cups they use for grafting?

Jamie

Amy, I'm kicking myself because I had to answer a similar question for this for the American Bee Journal, and I looked and looked and looked and couldn't quickly put my finger on that question. A similar question was asked, like, what about this brand of queen cup versus this brand of queen cup versus beeswax queen cups? I remember doing quite a thorough literature search and finding a few manuscripts on it where, you know, not all the queen cups were created equal. It did not seem to be related to the color of queen cups within a brand. So, what do I mean by that? Why am I being slow when I say that? Well, lots of manufacturers manufacture plastic queen cups that you can use for grafting queens and producing queens. And within some of those queen brands, like brand X, there may be blue cups or green cups or yellow cups or red cups. So, let's just say there's Brand A that has a blue cup, a red cup, a green cup, and a yellow cup. I don't think there would be any reason to believe that the different color cell cups within a brand would be problematic, but there might be some research out there. And Amy, we're going to have to do a follow-up answer to this question because now I'm going to be so, you know, paranoid. I'm going to go back and read all of my recent American Bee Journal classroom articles to find this. But I know that there's some evidence that bees might prefer beeswax queen cups or certain brands to another depending on the amount of off-gassing. But I would say to specifically answer this question, does color of queen cups matter within a brand? Certainly not. I can't think of any reason that it would. So, I wouldn't worry about that too much, but I will try to go back and find that deep dive that I went into this and maybe elaborate on different queen cup types so that I can discuss this further in a future Q&A.

Amy

Yeah, absolutely. Let's do it. I'll add it to the next Q&A. So, we'll follow up then.

Jamie

Great. Thanks. And I have to go find it.

Amy

All right. Well, you've got a week. All right, everybody. Those are the three questions that we have for our Q&A. Don't forget to send us a message, any questions that you all have. If you have follow-up questions, especially, with some of these episodes, we'd be happy to answer some of those as well. So, don't forget to message us. Send us a message on our e-mail or social media.

Amy

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

Jamie: Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.