

Episode 155 PROOFED

Fri, Feb 23, 2024 7:49PM • 48:21

SUMMARY KEYWORDS

beekeepers, pollen, bees, nutrition, bee, priya, honey bee, plants, work, beetles, lab, beekeeping, subs, honey bees, started, research, jamie, provide, hive, colonies

SPEAKERS

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

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 00:46

Hello, everybody, and welcome to this episode of Two Bees in a Podcast. Today, I am extremely excited to be introducing Dr. Priya Chakrabarti Basu who is an Assistant Professor in Pollinator Health and Apiculture with the Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology at Mississippi State University. She is also a courtesy faculty at Oregon State University. I'm excited to be introducing Priya because she and I actually met at an Entomological Society Conference in Puerto Rico a couple of years ago. I'm excited to share her work. She's got great research going on. So thank you so much, Priya, for joining us today.

Guest 01:29

Thank you so much, Amy and Jamie, for having me today. I'm excited to talk about our lab and what we do.

Amy 01:36

I know. I can't believe we've had this podcast for three years now, and we haven't had you on.

Jamie 01:42

Shame on us.

Amy 01:43

I know, right? How in the world have we not had you on yet? But I'm glad to finally be able to do that today. But before we get into the interview, I was wondering if you could tell our listeners a little bit about yourself and your beekeeping experience.

Guest 01:58

I originally come from India. So my PhD is from India and a part of it is from England. I studied the impacts of pesticides on white honey bees across India. I also studied the impacts of pesticides on bumble bee gustation in England. And that's how I sort of got into bees. When I started my PhD, bee research wasn't that broadly looked into back in Asia or in India. So this is why what we did was quite unique at that point in time. And then I moved to Oregon State the lab as a postdoc. And eventually, I got this position here about two years ago at Mississippi State University. My beekeeping experience is honestly very limited. I started off as a bee researcher, and only when I started keeping hives for research, I started more and more learning about beekeeping. But it is extremely varied because I had to learn what beekeepers in India did, then I also started working with beekeepers in England, and then I started working with beekeepers in the US. So my beekeeping experience, in that way, if you look at it, it's actually very varied. And it's got sort of like a global perspective into what you do, depending on what type of bees you keep, and where you are located in the world.

Jamie 03:24

So Priya, I'm also excited to have you as part of this interview. I will tell you, we do a little bit of nutrition research, at least we have recently, with some pollen substitute stuff, and everywhere I go and talk about it, people are like, "Well, have you met Priya, she does all this." It's like you have your fingers in all types of honey bee nutrition research. We're going to talk about that coming up. But before we get to that, your lab is brand new, right? And so you get a chance to do what you want to do, you get a chance to kind of get a pulse of the beekeeping industry and determine what it is that they need so you can build your research program around it. Can you tell us a little bit about your lab, the research projects that you undertake, kind of the grand vision that you have? Do you have teaching, research and extension appointments, all that kind of stuff? Could you tell us who you are and what you do now?

Guest 04:17

Our lab is brand new, as you said, and honestly, when I started, it was 2021 August. We were at the very tail end of COVID. So essentially, we were a little struggling when we started because anything we ordered was always out of stock or it had a long waiting list to be delivered. By the time we actually effectively were able to start a lab, it was already May or June in 2022. But I've got some amazing students. I have four graduate students in the lab. I have over 10 undergrads working currently this semester in the lab. I also have a full-time research associate. They are all amazing people, very passionate about everything that we do. I, honestly, have to say these undergrads in the lab, they help move the hives forward. We look at all things related to the different stressors that are affecting honey bees, especially poor nutrition. As you mentioned, we also investigate these different stressors, how are they impacting bees individually? What are their synergistic impacts? And what can we do to mitigate such stress? So essentially, we primarily study poor nutrition, we study pesticide impacts on bees, we study how climate change of the environment is affecting bee nutrition as well as the other aspects of bee health. We also look at how these different stressors are interacting with each other. We use many different techniques such as multi-omics, we used bee physiology, we use basic apicultural practices, bee behavior, neurobiology. So we use many different combinations of both lab and field

efforts in trying to tease apart these different stressors. And my position is very unique. I have a research and teaching appointment. But outreach is also a competency that, even though I do not have directly an extension appointment, I mean, Jamie, you know, right? You and Amy both know, no matter what we do, extension is a part of it being a bee researcher, because we really have to be able to translate our research to our stakeholders.

Amy 06:33

Yeah, definitely. So, part of what we do is in the podcast, especially, is connect beekeepers with research and understanding research, understanding what research is being published, and kind of the process of that as well. So I'd love to talk to you a little bit more and ask you about some of maybe the strengths and challenges that you have come across being a new lab. Jamie, we've, well, I say we, I mean, you've been established here, and the honey bee program has been established here for quite some time. And so it's kind of hard to think about starting brand new and fresh. What are some of your favorite parts, and maybe challenges that you've come across so far?

Guest 07:13

I have to say, Jamie intimidates me. I mean, he runs this massive program, and it's extremely successful. There is, of course, I mean, I'm sure he's started somewhere as we did at some point in time. But, Jamie, you're definitely inspiring when we try to have a bee program. When I started, I definitely had a lot of help from Mississippi State University, from the department, from the college to help me start with the lab. So I got the lab space that I needed, I also got the equipment that I needed to be able to start. The main challenges I was seeing was really starting off at the tail end of COVID because we really couldn't get anything that we were ordering. So here I am trying to envision a lab, sitting in my office, even my printer for my office was on a five-month waiting time. So it was that bad when we started. But honestly, the primary strength that I could think of at this time is the strength of this community at Mississippi State University, how everybody sort of came together and helped me get this lab going. And right now, my lab is supported by these amazing graduate and undergraduate students who really are extremely passionate, extremely enthusiastic about the work that we do. We are excited. I can see where this lab is headed. And I'm really excited for all the potentials and the opportunities that we have.

Jamie 08:52

I love that, Priya, it sounds like you have a big vision for where you guys want to go. And honestly, like in my experience leading a lab, it's the vision that really counts. A lot of people get down into the weeds and they forget that they're working towards something. It sounds like you have that grand vision, you know what direction you want to go, and you're taking the steps necessary to get there. And as I mentioned a little earlier, I'm really super duper excited that you are tackling, among the other things that you discussed, honey bee nutrition and I'll tell you why. When Amy and I talk about it, when you look at the beekeeper data, it's very clear that Varroa, nutrition and queen-related issues are kind of the big issues facing the bee world. A lot of folks work on Varroa control, a lot of folks work on queen quality and things like that, but I would say nutrition, heck, I was giving a talk last night where I made this statement where I said nutrition represents one of the greatest opportunities for improvement in honey bee health management. You're tackling this idea head-on, and so Amy and I are going to ask you a series of questions all related to really big nutritional efforts that you are undertaking. And the first

of those is a nutrition database that you and your team are building. Can you tell us a little bit about that nutrition database, what it is and what it means for beekeepers?

Guest 10:13

Absolutely. We are actually building three different databases. So the first is this giant effort that Ramesh Sagili, from Oregon State, and I started about three years ago. This is the pollen nutrition database that we are building for all bees in North America. It is a citizen science as well as a scientist-driven project. So we have over 54 citizen scientists across US and Canada. We are trying to either hand collect pollen or use honey bee pollen foragers, and collect the pollen from their hind legs. So we are collecting pollen from any plant that is visited by a bee, it could be a honey bee, it could be a bumble bee, it could be any bee species, as long as a bee goes to that plant for collecting pollen, we are trying to collect pollen from those plants. We have initially targeted about 100 plants for the first three years. And this is supported by the USDA average. So we are trying to collect at least pollen from 100 plants. And honestly, I look at it as a lifelong project for me because there are just so many types of plants in the landscape, crops, non-crop forage, polyculture, horticultural plants, ornamental plants, there is this wide variety of plants that we would like to study. So we are looking into the pollen nutrition quality, we want to look at both the macro and micronutrients. So we are looking at proteins, we're looking at lipids, we are looking at phytosterols, amino acids, metabolites. So we really want to look deep into these plants, because honestly, at this point, we do have these incredible planting recommendations from a lot of different sources. But when you look at bees, how much do we really know about the nutritional quality of the plants that we are planting in our habitat? I often tell this, and people laugh at me because if you offer me a bowl of salad versus a bowl of French fries, I will go for the French fries, because I'm attracted to it, not necessarily because it is healthy for me. Similarly, if you're planting something in the habitat, bees may visit it for so many reasons. It could be relatively attractive to them because of the way they look, because of the proximity of the plant to the hive just or maybe because the nectar is too sweet. So there are so many different facets to understanding why your bee is visiting a particular plant. But one important thing that we are lacking in information is having an understanding of the nutritional quality of those plants in the habitat. And we are going to make this database publicly available for anyone and everyone to be able to look through these plants, look at the pollen nutritional quality, and eventually say that, alright, this time of the year, this is what grows in my area. How about I plant a combination of maybe these five different things? This has high proteins, this has high lipids, this has high phytosterols. So as a combination, it can really provide the whole diverse spectrum of both macro and micronutrients to any bees that are visiting in our backyard or in this habitat. So that's the main idea behind the pollen nutrition database. We are also going to study the commercial diets that are available in the market and look at their nutritional quality. Because at the end of the day, if a beekeeper wants to supplement their colonies with these commercial diets during times of pollen dearth in the landscape, we want them to have access to either the diets that are more healthy for the colonies or use a combination of different things to be able to provide a whole diverse spectrum of nutrients to the bees. The second database that I'm working on currently is creating a synology wheel for the beekeepers in the southeast region. I've started with southeast, I'm definitely hoping to expand it to the rest of the US. I have partnered with Dr. Pierre Lau at Stoneville USDA ARS. So what we are doing currently is that we are recruiting beekeepers as our citizen scientists across the southeast. And Jeff has a couple of beekeepers who are helping us collect from Alabama. Jamie, if you know of anyone who would like to join this effort, it would be fantastic for us. So we are requesting that our beekeepers -- we will ship pollen traps to them. All they need to do is trap for

pollen once a month during the same time for 12 calendar months for two days each month during bright sunny days when bees are bringing in pollen. Our students in my lab are color-sorting the pollen, we are staining the pollen with different techniques. And we are trying to not only identify the plant, we are also looking at the pollen nutritional quality of the plants. And this project is supported by Project Apis M. So what we are doing is, essentially, at the end of one year, two year, three years, we are hoping to run this for at least three to four years, we will be able to have some really important data coming from here. Suppose say, for example, say, there's a beekeeper, he has his bees in a particular location in the southeast region. In March, he sees a yellow color pollen coming in that region. Based on our database, he could potentially narrow down to what plants the bee's visiting, what does the pollen look like, and what is the nutritional quality of that pollen. So that is what we want to do. As an offshoot from this database, what we are also building is a palynology database, which will also be freely accessible, easily accessible to everyone. The pollen that we are collecting through the synology wheel project, we are color sorting them, we are imaging them, we are staining them, we are also re-imaging them under the microscope. So essentially, for palynologists, or for bee nutrition enthusiasts, this would be a fantastic database to look at. You know what the different plant pollens look like, essentially, telling us what the bees have access to. So these are primarily the three different databases that we are building.

Amy 10:26

Priya, I have so many -- well, you and I already talked about this before the podcast, but you and I could probably sit down, and if people don't interrupt us, we will go back and forth and just talk forever, right? I'm amazed and I'm so excited for your databases. I think that they're going to be extremely useful for beekeepers. I'm excited to see the results. Also, be careful what you wish for because now I'm just thinking we could collect samples for you here at the lab and take part in that. And I know that we've got Florida beekeepers and other beekeepers in the southeast that are listening to this podcast that would love to take part in helping you sample for pollen.

Guest 17:41

Honestly, one thing I forgot to mention is that when we run this every year, so suppose say, for the beekeeper-driven synology wheel database, suppose say you're collecting your pollen samples during the first week of every month, then, in year two, we shifted to the second week, then, in year three, we shifted to the third week of every month. This way, we are hoping to collect both the major and the minor blooms. And it might even tell us if we are losing plants in the landscape or we are gaining plants in the landscape or what's happening with the synology of these plants?

Amy 18:17

Yeah, definitely. I feel like that's a question that I receive pretty -- I mean, I would say that almost half of the emails that we receive is always, we're wondering what plants our bees are foraging on? That, I think, would be extremely useful for beekeepers. So yeah, thank you for doing that. And I'm excited for your vision and your research.

Guest 18:39

Thank you.

Amy 18:40

All right, so I'm switching gears just a little bit. So this project, and what you have just discussed, covered the United States. You are also involved with nutrition projects, specifically, with COLOSS and COLOSS is the International Colony Loss organization, and you're also working with them. And so I think just as a general overall question, can you talk to us about the COLOSS nutritional survey, what that is, who's involved? And then also for our beekeepers listening, we have beekeepers all over the world that are listening, but how can people get involved, whether they're beekeepers in the United States, whether they're beekeepers in the southeast, or whether they're beekeepers outside the United States? What are your thoughts? And can you tell us about that?

Guest 19:24

Absolutely. I'm so glad you brought that up because with COLOSS, we are really trying to gain an understanding of bee nutrition practices amongst different beekeepers across the world. So even though I am currently trying to gain this understanding in North America, we really have these services that have been distributed to beekeeping groups across the world. We want to understand what does nutrition mean to the beekeepers? What do they think about pure poor nutrition? What do they think about good nutrition? What are the supplementary nutritional practices that they have in their beekeeping practices? So for example, say I'm a beekeeper, I could be based in Canada, I could be based in the US, I could even be based back in India. But for me, what time of the year do I think that my bees are stressed nutritionally? How do I know that they are stressed? What do I think about it? And what do I do? So that's the main crux of that survey. So what do I do if I have to intervene and provide nutritional supplements? It could be proteins, it could be carbohydrates. But what do I feed to the bees? How do I assess nutritional markers in the colony? So this is like a nutrition survey that we're doing. We're trying to gain a better understanding of what our current practices are and how does it change across the different regions? So all of the survey results not only will be distributed to the survey participants, we will also make that publicly available. Because at the end of the day, this will also help people like me, who study bee nutrition understand better what the current general trend is and what can we do to either help beekeepers out or improve on what we know currently. So that's what the survey is about. If there is any beekeeper who would like to participate in the US, I have tried my best to reach out to every state honey bee lab and distribute it. But if you are listening to this, and if you have not received a link to the survey, if you would like to participate, please, please reach out to me. My email is pb1090@mstate.edu. If you reach out to me, I will be very happy to share a link for the survey. We really want your participation because all of this is to help us help you better.

Jamie 22:01

So thanks, Priya, I really appreciate that because it's a very big international effort. And it's going to provide a lot of very useful data, I think, for beekeepers all around the world. And since this podcast has an international audience, I think that that's a very relevant thing to discuss. And so let's transition now to another nutrition-level effort that you are helping to lead, or actually leading this particular one. In the US, there's a group called the Honey Bee Health Coalition that really just kind of exists to address honey bee husbandry-related topics, and you are leading the development of the Honey Bee Health Coalition's guide to honey bee nutrition. And the reason I think this is significant is because the Honey Bee Health Coalition has an amazing Varroa control guide and beekeeping management guide and all kinds of things that are free to beekeepers here and around the world. And it needed a nutrition guide, and you are tackling that effort. I think it's going to have international implications. It's one of those

things that beekeepers everywhere potentially can use. So can you tell us a bit about the history of the guide, your involvement, where it's heading, when it might be produced, all of those types of things?

Guest 23:06

Yes, sure. So thank you, Jamie, for introducing the Honey Bee Health Coalition because they are really doing a fantastic work of bringing in all of the important topics related to honey bee husbandry, apiculture, and how we can tackle the problems. So this guide, it sort of came along when I was talking with Danielle at Project Apis M and Matt Mulica at Honey Bee Health Coalition, we sort of got together and we decided that it was really important that we start building a honey bee nutrition guide. And we have another beekeeper from the US, George Hansen, who also kind of co-led this effort. So what we're essentially looking into, so this will be a multiseried guide. The very first part that we are currently focusing on is just looking at supplementary feeding, and seeing the use of basic work with the pollen supplements and bee nutrition. So you know how complex this entire topic is, not only do we have to deal with the habitat, and what bees have access to in the landscape, we also have to look into, what are the different types of commercial diets and supplementary feeding that we provide to the colonies. So it is multifaceted when we look at it. So the very first part of this guide is going to focus on providing supplementary feeding to the colonies, be it commercial diets or homemade diets or be it sugar supplementation. So this guide currently is going to focus on what are the best practices, what are the different ways we can provide supplemental nutrition to the colony. We are also going to try and cover interviews with beekeepers across the different regions in North America and see what their different beekeeping practices are. Based on that, how do they nutritionally supplement their colonies, what has worked for them, what they would advise, what hasn't worked for them. Working on this guide, it was not only incredibly, I would say intimidating, but also extremely rewarding. I learned so much through this entire process. And I am beginning to appreciate the complexity that bee nutrition overall is, more and more every day. I actually have a reference to a lot of your studies, Jamie, on pollen supplements when I was working on this guide. But I'm hoping that this guide, we will be able to get it ready before the end of this year, because in North America, we have this big meeting coming up in January, American Bee Conference. So we are hoping to have all of this done before it and then we have something ready for the beekeepers in January.

Amy 26:02

Priya, I feel like as you're talking and telling us about your research and everything that you've been involved in, I feel like you're creating this menu, right? A menu for honey bees. I can't help but to think you're the honey bee nutritional coach. And I'm excited. I'm excited for that. So I probably should have introduced you as that, the honey bee nutritional coach.

Guest 26:26

I try my best. I am not a great dietician when it comes to myself, but what do bees need and what they really need to eat.

Amy 26:36

Yeah, absolutely. So I want to switch gears just a little bit. So I know that you've just recently received a new USDA grant. This has to do with evaluating the impacts of climate change on pollen and nectar-producing plants. And so I kind of want to just finish off by asking you about the grant that you received and what your objectives are, and maybe just a little history behind that as well.

Guest 27:02

Sure, this is a very new grant that we received. It's a USDA New Investigator Award that we got from our free pollinator health program. We know that our environment is changing. When we are talking about bee nutrition, we also need to look at it from the plant perspective. A lot of these plants, either they undergo drought stress, or they undergo heat stress, they might even undergo flooding. So what primarily interests us is that when we're talking about bee forage, bees are really dependent on these plants. So if the plants undergo any of these environmental stressors, what is it doing to the plant pollen quality, to the plants' nectar quality, or overall even to the plant health and physiology? Because if bees are dependent on these plants, we really need to make sure that the plants are healthy, and they are providing sufficient resources for the bees. So that is what primarily the project is about. I have a new grad student who's working on this project. We have partnered with plant physiologists here at Mississippi State as well as Oregon State. We are looking at two to three different plants that bees commonly rely on for pollen and nectar. And what we really want to understand is that if we stress out these plants, say, for example, heat stress or drought stress or any other climatic stress, how is it affecting overall plant health and the quality of the pollen and nectar that they're producing? If these plants are able to propagate well with enough resources, only then will bees have access to good quality nutrition in the landscape. So that is what we are also currently looking into.

Jamie 28:47

So Priya, you're clearly involved very heavily in honey bee nutrition. That's great. But I know you've got a few other things happening. You've got some pesticide work. You've even published a children's book on honey bees. Could you tell us briefly about those two things?

Guest 29:01

Sure, Jamie. Our lab also looks at the toxicology. So our primary interest is, what are the different types of pesticides that bees can be exposed to in the landscape, what the field-relevant doses are, how are they interacting with each other? What are the additive or synergistic effects? And we want to work with both groups of stakeholders because we really work at the interface of both crop protection and bee protection. So we work with both groups of stakeholders and we would like to see, what are the safe tank mixes for bees, what are the effects of the pesticides that commonly bees are exposed to, and what can we do to mitigate such stress? And for the honey bee book that actually came along about a year ago, I worked with Macmillan Publishers. They have this amazing series for children. So it's called Neon Squid, and they have a series called Young Zoologist. They have tapped into global experts on individual topics. So they had reached out to me for honey bees, and we worked together to actually build this. It's a pretty cute book. It's called Young Zoologist: Honey Bees. And even though these are like bite-sized sciency nuggets for children, it's actually for both kids and adults. And I truly believe that STEM starts young, and I would like to raise pollinator awareness not only among the older audience, but also among children. So this book is the first step towards raising pollinator awareness, and what can we do to help bees.

Amy 30:43

This is all great information, Priya. I am excited to share with our listeners. So we'll be sure to link your website, and anybody can have access to your email address and all these other projects that you've brought up. I'm super excited to have you, we'll definitely have to have you on again. I feel like this was

just kind of a SparkNotes version of what you do in the lab because I know that there's just so much that you do. We'll have to have you on again, and we're excited to have had you on today. So thank you so much for joining us today.

Guest 31:13

Thank you so much for having me. This was an amazing conversation and thank you both so much for having me.

Jamie 31:20

Thanks, Priya.

Amy 31:36

Well, Jamie, I sound like a broken record. But I really enjoyed having Priya on the podcast, and I am super excited about honey bee nutrition. And to be quite honest, you can teach nutrition, I can teach nutrition, but every time we have a Bee College, I'm like, "Who can teach the nutrition?" I feel like she is the perfect person. So now, we have to have Priya at Bee College speaking about honey bee nutrition, but I'm excited to see where her research goes.

Jamie 32:03

You know, absolutely. She's got a great personality. She's very enthusiastic about her work. And beyond that, she's doing good work. And when you put all of those things together, you really get someone who's exciting to be around, who's very motivated. I know she talked a little bit about things she's doing here in the US, and that we have an international audience for this podcast, but what she's doing is relevant internationally. I think the thing that's impressing me the most is she's addressing nutrition from two angles, both what we provide artificially through our pollen substitute patties and things like that, but also, what bees encounter in the wild. She's looking at nutrition from what can we plant perspective, as well as, what can we provide directly to colonies perspective. The climate change grant, as an example, is very forward-thinking. We all know that climate change, at least in the US, is a very political issue. It should just be a science issue, but it's very political issue. And outside the US, it's less of a problem that way, but beekeepers do their surveys and regularly every year report how weather impacts their bees, well, this is just another way weather impacts their bees. It impacts their forage. Priya and colleagues are addressing all of these issues head-on, while not just doing research, but also providing tools to and for beekeepers, for example, these databases that she discussed. So it's a very well-thought-out strategy to address honey bee nutrition from a research and extension perspective.

Amy 33:49

Yeah, definitely, I'm excited. We're always sharing the Honey Bee Health Coalition information. I think her involvement with the nutrition and survey and having that available, beekeepers can go, I'm happy to share research that all these other great researchers are doing and just providing things that are very practical for beekeepers. So I'm excited to share that information. And hopefully, our listeners will use this information and start using it on a regular basis to change some of their management, whether that's feeding or, as you mentioned, what they're planting during a specific time of year.

Jamie 34:24

Amy, you said something when you were interviewing Priya that was very profound. It was consistent with what you just said here to the audience. You said to Priya, in kind of your introductory comment, that we look for the researchers who are experts in certain topics. We introduce those researchers to the beekeeping world through this podcast, so that the beekeepers know who they can reach out to with specific issues. That's true. That's one of the purposes of this podcast. Now, the world knows among other folks that Priya is another individual that can reach out to with honey bee nutrition-related questions. I'll say, too, while we're talking and recognizing our international audience, Priya is active with this COLOSS nutritional survey, well, COLOSS, the prevention of honey bee colony losses effort, they have a honey bee nutrition branch working group in their organization. It's actively composed of scientists who are working around the clock to study honey bee nutrition. So wherever you are on planet Earth, managing honey bees of any type, nutrition is always a big issue. And it's something when we manage, we have to provide it, or we have to make sure the landscape has ample nutrition available to support the bees. You're right, Amy, we're trying to provide links to beekeepers to those scientists who are on the cutting edge of these types of topics.

Stump The Chump 35:51

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

Amy 36:00

Welcome back to the question and answer segment. Jamie, we've been talking a lot about honey bee nutrition lately. I feel like a couple of months ago, you did the at-home beekeeping series, and that is just an online at-home beekeeping series. That's a collaboration with other land grant universities. There are a couple hundred people who call in and they're just really excited. They're there asking questions. And for the at-home beekeeping series, you talked a lot about the research that Emily Nordyke, who is our previous master's student, did with pollen substitutes. So what we'll do is maybe we'll just spend the next two Q&A segments working and asking questions about honey bee nutrition and pollen subs. What do you think?

Jamie 36:44

I think that's a good idea. Yeah, it's a very hot topic. We've even interviewed Emily on our podcast, we've talked about these topics before. But I do feel like having a couple of Q&As centered around this idea would be good for beekeepers.

Amy 36:56

Awesome, awesome. Okay, so we'll start with the first question. The first one is related to feeding bees pollen subs. Let's say someone wants to feed their bees natural pollen, and I guess, how do you do this? And should they try to trap as much natural pollen as possible? And then what? Do you add it to a pollen patty? What are your recommendations for pollen subs? Just kind of feeding natural pollen or mixing them together?

Jamie 37:25

Yeah, so, I mean, those are all good questions. I'm going to give a little bit of background for our listeners who weren't able to do join the stay-at-home beekeeping seminar I gave a few months ago. The research on pollen subs is actually quite mixed. Sometimes, when scientists would put pollen subs in the colonies, they get a positive response. Sometimes, they get a negative response. Sometimes,

they get a new neutral response. One of the ways that scientists have been able to get consistently positive responses is if they mix natural pollen into the pollen subs, which then begs the question, is it the natural pollen that's doing the work rather than the pollen sub? So we got a question, well, maybe instead of pollen subs, should I just collect as much natural pollen as possible when pollen is flowing in, and then use it later, when I'm feeding these subs? And the answer is, it's possible. There's not a ton of research on feeding colonies just pollen patties. That would be pollen patties made exclusively of pollen. There's more research on feeding pollen, supplements or substitutes, which are these artificial things that are available into which you might mix a little bit of pollen. So what I would argue is that right now, there's not enough research out to make you want to go and collect pollen as much as you can, and then later feed it back in patty form. That said, if you do feed pollen substitutes, especially commercially available pollen substitutes, I do feel that you will get more bang for your buck. If you are mixing natural pollen into those substitutes, and if that's the case, you might actually want to trap pollen during good pollen trapping seasons, freeze it, and mix it into pollen subs later, but I think one of the questions coming up either in this episode or in a later episode is really should I be feeding pollen subs at all? And I'll answer that later. But the point with this question is, should I trap pollen to use it later? More often than not, no, but if you are someone who uses pollen subs a lot, then you might consider trapping pollen and mixing it into your pollen subs because I really do feel it'll improve the impact of the pollen subs in the colony.

Amy 39:44

Yeah, so as we're talking about storing pollen, just natural pollen, bees will take pollen, they turn it into bee bread and they store it. So when you're looking at bee bread, is old bee bread, bee bread that's maybe been there for a while, is that still a viable source? I mean, it's a quality of protein and that's still good. Do you have an answer for that?

Jamie 40:09

Yeah, so, I actually do have an answer for that, serendipitously enough. So I also do the Q&A for the American Bee Journal and I got a question from a beekeeper for the American Bee Journal. It's essentially just like this. In fact, I wonder if it's the same individual asking the question, but they said, the longer that bee bread remains in the hive, does it lose some of its nutritive quality to bees? And the answer is yes. I was able to find a couple of research papers where scientists were looking at the nutritive quality of stored bee bread after six, nine months, a year, and they found that after a year, for sure, the quality of nutrition that bees get out of the bread is definitely lower. And for the most part, bee bread won't be in colonies that long anyway because the bees are eating it in near real-time, or within weeks, or maybe a month or two. But there are certainly circumstances under which there will be bee bread stockpiled in times of dearth. But if it's older than about a year, then it definitely starts -- it's not useless to bees, but it definitely starts providing less and less nutrition to the bees. And the good news is it will ultimately be replaced pretty quickly once a major pollen flow starts.

Amy 41:23

Alright, so for the last question, and this is a question that we receive pretty often, is that do you notice an increase in small hive beetle if you're using pollen subs versus real pollen? And I guess, I'll just add on to that as well. Do you see an increase in small hive beetle, in general, if you're going to feed with different pollen subs?

Jamie 41:45

It's interesting you ask that question. I started studying small hive beetle, gosh, now, let me think, 20 plus years ago, that's hard to imagine. And one of the earliest things that I published with some colleagues is some colleagues of mine found that when you mix -- back in the day, you could feed bees grease patties with sugar in them, and it would coat the bees and be a way to effectively control tracheal mites, and they were mixing antibiotics in there and things like that. Well, we showed that small hive beetles were attracted to that, and then subsequently, were attracted to pollen subs. And as you might imagine, because small hive beetles reproduce on protein, especially pollen, when you provide a pollen sub into a colony, you increase the risk that that colony is going to have a small hive beetle problem. So the best way to administer pollen subs to colonies is in a manner that allows the bees near-complete access to pollen subs, otherwise, you do run the risk of beetles getting into those pollen subs. So what do I mean when I say near-complete access? Well, historically, it is common, if a hive is composed of multiple boxes, for the beekeeper to go to the lowest most box in the hive, the lowest box in the hive, which is usually the brood chamber, take off all the other boxes above it, place the pollen paddy on top of the frames in that lowest box in the hive, and then stack the other boxes back on top of that lowest box. And what that does is it squeezes the pollen patty between the brood chamber it's on and the super that's immediately above it. And when you squeeze the pollen patty that way, you provide a lot of pockets of pollen patty that beetles are unable, sorry, that bees are unable to access but that beetles can access, and you'll get beetles squeezing into those pockets and laying eggs and the next thing you know, there's an explosion of beetle larvae in the hive. So when we administer pollen subs for research purposes, we will often put a rim around that lowest box which raises the super above it so that the bees have complete access to the top and the sides of that pollen patty. So what do I mean by that? Well, there are wooden bound queen excluders, imagine the wooden bound queen excluder without the excluder material. It's just that wooden square that goes on top of the lowest box and that creates a few centimeters gap between the brood chamber and the next super above it. And that gives bees complete access. So a lot of commercial beekeepers won't do this if their beetle numbers are low, right? Because that's an extra thing that you have to put on the hives, which is this wooden frame. When in our case, if we worry about beetles attacking pollen subs, we will definitely put that rim on. The downside of having that rim on is if you use it during a major nectar flow, it increases the space and bees will build burr comb in that area. But if you do it outside of a nectar flow, it's usually not a problem and can be a reasonable way to keep the beetle pressures low on those pollen subs while they're in your hives.

Amy 45:09

Yeah. So the second part of that question is, let's say you do have a ton of small hive beetles. Do you have any thoughts on brewers using fermenting and attracting beetles or anything that may attract the beetles away from the pollen? All right. Sounds good. Well, thank you so much, everybody, for your questions. We've got a list of questions that we'll be having to go through in the next couple of months. So hold off if we haven't answered your question yet. Or, feel free to send up any follow-up emails, messages on Facebook, Instagram, or, I used to say Twitter, but I guess it's now X. So any one of those social media platforms.

Jamie 45:25

Well, in this case, I've never heard a question like this. And it's very insightful from the person who's asking the question because brewer's yeasts can be mixed into pollen subs because some folks

believe that that is a very beneficial ingredient in pollen subs. I'm not going to talk about whether it's beneficial or not. I would say the jury's still out there. But the beekeeper's saying, it sounds like the beekeeper normally mixes brewer's yeast into his or her pollen subs. And so the question is that going to attract more beetles? And the answer is we don't know. It's never been studied. We don't know for sure if brewer's yeast is something that attracts beetles, but they did mention that word fermenting. That's crucial to understanding this question because when small hive beetles work in or around pollen, they can deposit a yeast. That yeast, the scientific name of that yeast is *Kodamaea ohmeri*. So *Kodamaea* is the genus and *ohmeri* is the species. When that yeast touches pollen, it starts to produce some of the components of honey bee alarm pheromone. And researchers at the USDA lab in Gainesville, Florida have shown that can attract beetles to colonies. So the individual here is saying, well, if beetles are attracted to fermentation, if we use brewer's yeast in our pollen patties, and they kind of have a little bit of fermentation, will it attract beetles. So back to the short answer, we don't know. But my suspicion is it certainly won't detract beetles. In the very least, pollen subs are attractive to beetles anyway. So my guess is the smell of any fermenting product in a pollen sub could attract even more beetles. So the jury's out. But, I'd be a little leery of doing that. If I did it, I'd want to make sure and check those hives regularly just to make sure that there's no beetle explosion.

Serra Sowers 47:43

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