Episode 125_mixdown PROOFED

Sun, Nov 20, 2022 12:04PM • 50:47

SUMMARY KEYWORDS

beekeepers, colonies, bees, wintering, indoor, label, winter, overwintering, apis, people, bt, defecate, warm, oxalic acid, research, wax moth, varroa, temperature, question, canada

SPEAKERS

Amy, Guest, Serra Sowers, Jamie, 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 00:47
Hello, everyone, welcome to this segment of Two Bees in a Podcast. Today, we have Rosanna Punko, who completed her master's degree in the Department of Entomology at the University of Manitoba in Winnipeg, Canada. She is currently an apiculture inspector for the bee health assurance team in Alberta, Canada. And I'm really excited to have her on today because she just published a paper that honestly, the beekeepers here in Florida probably don't know much about. So she did a paper and it was looking at the epidemiology of Nosema, and the effects of indoor and outdoor wintering on honey bee populations. And so she is in Canada, so I'm really excited to speak to her about the different climates that you all have up there. But Rosanna, thank you so much for joining us today.

Guest 01:38
Thank you for having me.

Amy 01:39
All right. So I got a little ahead of myself talking about the indoor and outdoor wintering of honey bees. But before we get into that, can you tell us just a little bit about yourself and how you got into honey bee research?

Guest 01:52

Yeah, so I grew up in rural Alberta, and I ended up going to do my undergraduate degree at the University of Calgary, and I needed a summer job as most students do. And I ended up working for a commercial beekeeper close to my hometown, that kind of ended up leading me into a government of Alberta job, where I worked on Varroa research projects. And then that led me into my master's research, which I did my paper on.

Jamie 02:25
I always like to hear people's backstories, how they got into bees, it's oftentimes finding it through college or just being a beekeeper themselves. And you and your colleagues did a really interesting series of projects on a topic Amy already highlighted that folks here in Florida aren't so familiar with. And I would argue, around the world, if you keep bees in a warm climate, this might be a foreign concept to them. But you were specifically looking at overwintering colonies indoors, and looking at how that might impact a number of parameters. Of course, you guys were looking at Nosema, etc. We're going to talk about all that forthcoming, but to get our listeners ready for our discussion on your research, could you introduce us to the topic of overwintering colonies indoors? What is it? What does it involve? I've got so many questions around it. What temperature do you use? What humidity? When do you move the colonies in, all that type of stuff?

Amy 03:17
That's so interesting. So I think you just made a point that I've never thought about before, just the fact that you're moving them indoors to keep that constant temperature, which you're trying to keep it a little bit warmer, which is really funny, because four to seven degrees is a little bit warmer at that point. Four to seven degrees Celsius, right? And so then the bees are heating, and they're getting warm to the point where then you have to bring that back down, and you have to make it a little bit cooler. So I don't think I thought about that fine line, like right in between of keeping that constant temperature. So that's pretty interesting. New to me.

Guest 03:17
Yeah, for sure. So indoor returning is typically a colder climate choice. And basically, it's kind of how it sounds, indoors, you move your colonies into a building, and you keep it at around four to seven degrees Celsius, which I looked up is 39 to about 44.5 Fahrenheit. And it's kept dark, and then you have an air circulation and a ventilation system to help move things around. And so in the prairie area, colonies are moved in around late October. So they're kept out pretty late in the year, for here. But that's when temperatures start to get a little bit colder. And then it's around April that they'll take them back out of the buildings. And so the main difficulties with indoor wintering is that you're putting your colonies, a whole lot of them in a building, and they're producing heat and water vapor and carbon dioxide because they're respirating. And so you got to remove all these kinds of byproducts through your ventilation system, bringing out the old air from the inside and taking outside air in. And so, what's the temperature outside? It's kind of always fluctuating. So you need a system that can handle a reasonable variety of outdoor temperatures. Sometimes it is 10 degrees outside, and so you need to be ventilating quite a lot because the heat from your bees is actually making the building too hot, and then they're too active and they're respirating more and that kind of thing. But then when it gets really, really cold, you need to still ventilate the water vapor and the carbon dioxide, but you don't want to lose a lot

of heat, because then you have to heat it again with a furnace. For humidity, it's like 50-70%. But bringing in the cold air, and then sending out the other will reduce the humidity if it gets too high. Yeah. So there was research done, and I also thought that when I first kind of was looking into it, that's a lot warmer than I thought. You'd think maybe closer to zero, or something like that. But the research that was done on it a long, long time ago was looking at how much consumption of energy that the colonies were doing. And so if it's too warm, the colony is super active and they're consuming their food stores, which, if they need to survive a nearly six-month long period, you kind of need them not to consume much, or else you have to feed them, and that costs money. But if it gets really cold, then they're having to be more active just to stay warm. So they're consuming more because they're using more heat, so what they found is that four to seven degrees is like the perfect point where they are conserving as much energy as possible.

Jamie 07:02
I'm going to go a little off-script here. How did people think about or discover doing this in the first place? Right? I mean, I guess in the Canadian winters, especially in colder areas, I guess you get these super cold temperatures and these fluctuations. So maybe the original idea was if we can just stabilize that, we can improve colony survival. You just mentioned also, that there was research done on that some time ago. So like, when did this process start?

Guest 07:27
I'd have to think about it a little bit. But I know that once upon a time when people were getting bees, I wouldn't know what year, but early on when people were having bees, you just had bees, and then they died. And then you bought bees next year. There was no such thing as overwintering at all in Canada. But then, obviously, that was a cost and I think it really started with beekeepers wanting to make it happen. And so they were doing their own experiments, figuring out how much insulation for your outdoor wintering, but even people were wintering their bees in like cold cellars in the ground, if you only had a couple of them. So I think that kind of beekeeper experimentation kind of led people to researchers and actually, investigating it themselves on how to create these systems. There are great books exactly explaining, "Okay, if you have this many colonies per square foot in your building, you need this ventilation system to do this," and just all these things.

Amy 08:35
So I have so many questions about indoor overwintering, just because it's just such a foreign concept. So when the bees actually are placed inside, I don't know, is there an entrance reducer? Are they closed in? Are they able to fly in and out? Like, what does that look like?

Guest 08:52
So there is a little bit of flight, I think because bees will just leave officially if it gets warm. But for the most part, or it's not necessarily they fly, but there'll end up being dead bees on the ground, but it might be even just more from cleaning, if it is warmer, pushing out the dead bees, and so they just fall on the floor, but it's kept dark. So they generally will not, or they use the red light so they shouldn't fly. And then also because it's cold, it kind of induces that clustering behavior where they're not really interested in going anywhere because they're like it's a little too chilly.

Amy 09:28
I know that's how I am when I think it's cold. And that's like 55 degrees Fahrenheit here. So let's talk a little bit about your research. So the project that we've invited you on to speak about today. So you were looking at overwintering colonies and the impacts of Nosema loads and survival. So can you tell us just a little bit more about some of the goals that you had for your research, and then maybe a little bit on the methods of how you conducted your study?

Guest 09:58
So one of the main points of the study was that Nosema ceranae is becoming a lot more prevalent than Nosema apis, worldwide. And so it was important for me to kind of investigate that further because we've been using the seasonal trends of N Apis abundance to kind of time our treatments for fumagillin. And just a reminder, what that seasonality looks like, it's kind of a spring peak that's quite high, and then it drops low in the summer. And then usually, there's a smaller peak in the fall, and then it kind of just builds up slowly over the winter. And so some studies have been looking at, does Nosema ceranae have a similar seasonality? And there's been some mixed reviews, depending on the area. So I kind of wanted to look at it for the Prairie region in particular, just to see what was going on. And so how I ended up doing that was I had 32 colonies that I followed over a two-year period, which was June 2017, to April 2019, which had two winters in it. So that was great. And then I just sampled them every two weeks, except during the winter for Nosema, determined their spore levels, and then I also determined the Nosema species just to confirm what was infecting them in each of the apiaries at two periods. So that was kind of the first part was looking at the seasonality. But then I wanted to take it a little bit further and look at some winter-type related environments. And so winter is pretty stressful for bees. They can't go out and forage, there's no food, and they kind of have to rely on keeping themselves warm. And so it's just really stressful for them. And one of the things that end up also happening is that they're not really able to defecate like they normally would, because they do the cleansing flights where they fly out, and then they defecate, they come back in, but when it's so cold, you just can't do that, or you die. And so what they end up doing is that they store their feces in their abdomens. And then they defecate later. But then if they're infected with Nosema, presumably the spores are just replicating and building up inside of them, which is making the infection worse. And it's possible as well that because they're not able to defecate, eventually, you can't hold it anymore, and they ended up defecating within the colony, which then in the spring, they need to clean that all up so that they can rear their brood and store their honey. And so they're consuming those spores in the feces when they are cleaning. And then that just spreads it throughout the whole colony. And so I wanted to look at winter management as well as the temperatures in different locations to kind of see how that would maybe impact Nosema. And so in Alberta, I looked at Edmonton, which is more central Alberta, but I'm just going to call it the North for simplicity. And then, I had another location called Rainier, which is south of Calgary, Southeastish. And I'll just call that the South. And so in Alberta, we have the Rocky Mountains, that are mostly in the south-southwest side of the province, and we get chinook winds is what we call them, but they're basically a warming wind that comes over. And it makes things a little bit nicer in the winter for the South, and Edmonton gets a little bit of it, but not as much. And so the south gets a lot more warm days, which could enable these cleansing flights to happen potentially in the winter. And so to kind of look at north-south, I basically split those 32 colonies in half. And I had two apiaries in each location

that had half those colonies. So then the next part was the indoor-outdoor wintering. So for the outdoor wintering, wrap them up in a wrap that's insulated. It's kind of like an insulation with some kind of outer layer to kind of protect it from the moisture of the snow. And they can still fly out of those winter wraps. So they're kind of kept nice and warm. And then they can fly out and do their cleansing flights if the temperature is fine. Whereas, we were kind of discussing with indoor wintering, you got a nice stable temperature, but you can't fly. So I was kind of like, which is better? Will these cleansing flights help relieve Nosema and make it better? Or is it that stable temperature that is really better off? I ended up, in addition to the two locations, I had each apiary in each location. One was indoor wintering, and the other was an outdoor wintering. So that kind of covers my winter questions related to Nosema. And then finally, just to kind of see, is Nosema even a problem, I looked at how it affected the colony in terms of its population and survival as well as commercial viability because even if your colony survives, if it has a very little amount of bees, it's not really going to be super productive. And so what I did is I kind of measured adult population once a month from April to September. And then, after winter, I determined whether the colony was dead, so no bees, no queen, or it wasn't viable, which would be less than four frames of bees. From that I looked at the probability of mortality or non-viability after winter, as it was influenced by an average Nosema abundance.

Jamie 15:39
That's a very involved experimental design. You had a lot going on, a north and south region, and then you had outdoor and indoor overwintering of colonies, and both of those locations measured all of these parameters. So could you give us an indication of the results that you found? What were the types of trends that you were seeing in both locations as well as indoor versus outdoor overwintering?

Guest 16:00
Yeah, so when we did the kind of overview of the seasonality of things, we found a slightly different trend than for Nosema apis. And so Nosema ceranae basically had a high spring abundance. We found that it kind of peaked around May. But then it had low levels, basically, for the summer and the fall. And so that was certainly interesting, and I think could impact some stuff. I didn't end up finding that there was a difference, there was no difference between the North and the South. And there could be a couple of reasons for that. But I think it was just that they're not that different, like Edmonton does get a little bit of those warmer days as well. So maybe if it was further north, or in just a different place, then maybe it could have been different, but I didn't find it in this study. So I didn't end up finding a super consistent effective wintering method on Nosema. I didn't really find this interaction with Nosema. But I do have some suspicions. But I did find that there was an increased survival of colonies when wintered indoors compared to outdoors. And also that following winter, their population build-up in the spring was much quicker. So they got to a peak a lot sooner than the outdoor. Eventually outdoor caught up but getting that spring peak a little bit earlier for the population, I think could benefit your honey production because then you have all the bees you need as early as possible.

Jamie 17:35
I do want to ask you a question about that. So you said that survival was better when they were overwintered indoors. So I want to broaden that idea a little bit. So survival was better. Did the colonies

also look better? And based on what you just told me, I have a sneaky suspicion that you'll tell me yes, given that their population build-up was quicker, but more of them survived and they were stronger?

Guest 17:58
Yeah.

Amy 18:00
Okay. So it seems like there are a lot of factors, there are a lot of things that you examine. And so, between overwintering indoors versus outdoors, which method do you think is better for reducing the impact of Nosema infection?

Guest 18:16
So like I said before, we have the indoor, which is like the stable temperatures, but you can't do the cleansing flights, versus outdoors where you can do those cleansing flights. But now you're exposed to all kinds of extreme temperatures from really warm to really cold. And so based on my results, it seems like the mitigation of the temperature stress part through indoor wintering may have affected the impact of Nosema infection on colonies more than any benefits that would have been associated with a cleansing flight. And I think part of the reason for that is that those flight opportunities when it's warm enough that they can get out there, they're kind of random. Sometimes, they come earlier, sometimes they come later. But they're also really short-lived. It could be just two days, so that might not be enough time for them to kind of move into doing those flights. And then even within my study, the two-year period that I was looking at one time in March, there were no days above 10 degrees. But then the other year, there were 11 days. So there's this huge range that is just not reliable enough, I think, to use it as a method for reducing your Nosema abundance.

Jamie 19:34
This is all very interesting again because we're doing this podcast here at the University of Florida. And it's just so foreign to me to think about these temperatures that these bees are encountering where you are in Canada. I know when I'm in Europe and other places around the world where folks are having to overwinter in much colder climates, they talk about the impact of crowding bees on Nosema. What you've outlined is very clear, very straightforward. It kind of reinforces some of the beliefs I had about Nosema. I do want to maybe kind of turn and look a little bit again at this idea of overwintering indoors, though. You've mentioned how it works. You mentioned some of the impacts that you saw on colonies, specifically from the Nosema perspective with overwintering indoors. I just want to ask a little bit about the feasibility associated with it, the size of the rooms that they need, the cost, the resources, the different difficulties. I mean, do you have beekeepers in Canada flocking to this method? Is it something that most do? Is it 50-50? I mean, also, I'm just curious, do you think it would be useful for folks who are not in cold climates, maybe something to allow bees to have a stable winter? I just, broadly am asking you about your thoughts associated with this kind of overall.

Guest 20:48
Yeah, so in Canada, usually we do a survey. And so we kind of know, it is like a number of colonies that are done to one method or another. Some beekeepers do both, that kind of thing, or one or the

other. But in terms of the number of colonies that are put in one method or another, it varies by province. So actually, in Alberta, only about 17% of all colonies are wintered indoors, so quite a small percentage. But in Manitoba, where I did my master's research, it's just two provinces over, and it's more like a 50-50 scenario, which probably is more related to -- it's pretty cold in Alberta, but we get a little bit of chinook. So it's maybe not so terrible. But when I was living in Manitoba, it would just be minus 30 for several weeks with no reprieve. You make it sound so inviting. But it's, overall, I'd say it's not super popular. I know, in Quebec, they do, it's like closer to 70%. I'm not completely sure what the reason is for that, but because I don't think it's not necessarily as cold there but it does vary quite a bit. So in Alberta, it doesn't really seem like it's a huge interest to people. I think it could definitely be cost. I've never really looked into what a building costs, but like you kind of said, it's probably expensive. You need to create a whole structure and have heating and ventilation and all these systems. You'd probably want to have it all properly regulated, so you don't have to go there and change the dial when you think it's too hot. So, that's a lot of systems that are just going to have so much upfront cost. Whereas, compared to just buying winter wraps, there's an upfront cost to that too, but it's, I would assume much, much less. Something else that I think you may not even think about, you do have to drive out to the yards to put your winter wraps on, but if you're going to be moving them into an indoor building, you need to pick them up and carry them away. And so, picking up colonies individually just doesn't seem like a really reasonable thing to do. And so I believe that most people who do indoor wintering have a proper forklift that can navigate rough terrain, and pick up pallets of bees and put them on a truck. But, that's something that gets stuck, that's something that costs more money, that kind of thing. And then there's just also like, this risk and anxiety, I think, surrounding it, that puts people off of it a little bit. Some beekeepers think it's kind of too risky because it's very much all your eggs in one basket, right? If something goes wrong in that building, that's all your colonies, that's all your cost and investment potentially damaged. And so that scares people, whereas, just kind of scattering them about and just hoping for the best just is a little less anxiety-ridden for them. I also think the wintering building is also really much in your control. Whereas, when you think about, "I put my colonies outside, I wrapped them. Mother Nature is just going to do what she wants. And I have no control." So you can kind of just be like, it is what it is. But, when you have them in the building, you're just thinking about everything that could go wrong and that you're the one responsible for what does happen. I know my supervisor, he does his experimental colonies indoors, and he's like, "I'm doing it. He's like even I'm just like, I can't wait to get them out. I can't wait to get them out."

Amy 24:49
Well, the funny thing is, I always kind of joke around saying that beekeepers who have a true winter, they're just hanging out during the winter, right? I mean, not really doing much because they get a break. And that's just obviously not true. There are just so many other things that you have to maintain and think about. So that said, okay, so what are some other further implications of your work for beekeepers?

Guest 25:13
So when I looked at the probability of colony mortality, I did end up finding some interesting results. And so in Canada, in general, and in Alberta, we kind of have this recommendation that you need to treat for your Nosema with fumagillin in the spring and in the fall. And that was based on the Nosema

seasonality. And I think there was this perception that treating in the fall would be the thing that affected your winter mortality the most, you reducing your Nosema going into the winter, that's the period coming right before it. Even that made sense to me. But my results ended up showing that the average spring Nosema abundance actually increased the probability of colony mortality the following winter. And so based on that, I think it's going to be actually that spring treatment. Reducing your Nosema in the spring would actually improve your winter survival. And that kind of makes sense since we found that Nosema abundance was highest in the spring so that's the part where you need to hit it.

Jamie 26:20
It's interesting to hear that you guys are treating with fumagillin. I know a lot of beekeepers do here in the States as well and maybe some other areas around the world. When I first got University of Florida, I could not reduce spore loads with fumagillin. And it was probably related to the period of transition between apis and ceranae. But I do have a question regarding it. So you guys feel like you get reasonable control? And then secondly, I want to ask, based on your study, if you were a beekeeper and had 100 colonies, would you overwinter indoors?

Guest 26:51
So most people do. I don't know how most people feel about the control. But I'll give you a little sneak peek. But part of my master's research, I also did look at fumagillin treatment in the spring and fall and whether it was reducing spore load. And I did find that it was. I did end up doing my treatment, I think, a little too late in the spring so I don't think I really got to see the effects I wanted to. Like, here I found that the peak was kind of in May, and I was treating closer to June just due to setting up the experiment and that kind of thing. But I was like, I do believe that if I could have gotten in there in late April and treated them, I could have knocked it down so much more. And then that would have really affected my population and that kind of thing afterward. So I think fumagillin does work overall, but it is very difficult, depending on the spore load and all those conditions for the indoor wintering. It is a bit of a trade-off. There's this huge expense, and I think there is more work that needs to be done to determine if there really is this interaction between wintering method and Nosema, but I do think that indoor wintering does have several benefits. In my study, I found that mortality was reduced overall and that populations were getting bigger. But even other studies in Canada have shown that when you have colonies that have high levels of parasites or pathogens, they just are more likely to survive if wintered indoors. And so I think with all the things that colonies have to deal with, whether it's Varroa or viruses, or Nosema that indoor wintering just seems to help bring down the stress related to those pathogens.

Amy 28:53
So we're leaning towards a yes.

Guest 28:57
If you can afford it, for sure. For Nosema, I don't know if there's necessarily a benefit for indoor wintering in a non-cold climate. But I have heard it mentioned that in terms of Varroa management, rather than having an indoor building where you're warming it up, obviously, you wouldn't need to do that, but you want to be actually cooling it down so that you could basically create a fake winter that would create a broodless period, which would then help with a little bit of controlling your Varroa

population growth and maybe help with treatment. I don't know if it's necessarily more feasible than, let's say, creating a brood break by just caging the queen, but it is something that other researchers have kind of said could be a potential benefit.

Amy 29:52
All right, well, I'm really excited and happy to hear that there's research going on with indoor and outdoor wintering. Thank you so much, Rosanna, for being on our podcast today and sharing information about your research.

Guest 30:04
It's been a pleasure.

Amy 30:05
All right, everybody that was Rosanna Punko who completed her master's degree in the Department of Entomology at the University of Manitoba in Winnipeg, Canada, and who is currently the apiculture inspector for the Bee Health Assurance team in Alberta, Canada. Thank you for listening to this episode of Two Bees in a Podcast Alright, Jamie, so I mean, after that episode, I feel like I've said this before, but I feel like such a wimp now. I'm just like the bees can survive outdoor wintering, they now have indoor wintering, which is really awesome, but as a beekeeper in Florida, we just don't have to think about those things here in our state. Right? And so what were your thoughts on the episode?

Jamie 31:02
Yeah, first of all, the thing that impresses me is how cold it gets in Canada. We're in Florida where it's warm all the time. It's amazing to me that bees can survive that. Second of all, I only heard about overwintering indoors a few years ago, I don't know, three to four years ago. But man, since I have heard about it, it just comes up and comes up and up in beekeepers' circles, increasingly so. I started to see a lot of papers published on this topic. And I know that it's something that we've heard, maybe because of our proximity to Canada, but I know that they're going to do some research in warmer states in the US. And I've heard of colleagues and other places around the world talk about it. So it really seems to be one of those things that are gaining steam. It's neat to hear Rosanna talk about the temperature range that needed to be met, and that's what was in my mind. But then she talked about, well, you've also got to cycle air out because it can get too warm, the carbon dioxide can get too high. And all that was really fascinating to me. And I couldn't help but think what further implications does this have for overwintering colonies in general? A lot of plants, for example, have to have so many chill hours before they will bloom. What if that's the case for honey bees, even in warm areas? Maybe they need to have a period of cold in order to X, Y, and Z. And so it's really neat to me where this all might be heading in the future.

Amy 32:18
Well, so, I think one of the questions that I had, and you can correct me if I'm wrong, I mean, Nosema is a fungal spore, right? I mean, it's a fungus. Is that right?

Jamie 32:25

That is correct. It's a single-celled fungus.

Amy 32:27
Okay. Well, when we're talking about the temperatures and how being indoors actually decreases the spore count, I was just thinking, usually fungal spores develop in warmer climates, right? I mean, is that true?

Jamie 32:42
They need moderate temperatures and moisture. And of course, that's a very big overgeneralization, right? There are zillions of fungal fungi, they grow all over the place. But in this particular case, of course, the bees have it in their gut, and they're staying in a cluster themselves. So they are staying warm, and even when it's cold outside, so that might confer, but I often describe Nosema, and maybe this is completely your world, but I often describe it almost like the bee version of cholera, right? It just builds up in their system, they're slammed close together, they're defecating right around themselves because they can't get outside and defecate, it ends up in their mouths as they're trying to clean the hive. It spreads a lot like what I think of some human dysentery-related pathogen spreads. So it's a really bad thing. I think the concern I have most about it is how to control it. For every study that shows that the fumagillin as a treatment works, there's a study that shows it didn't. Dr. Cameron Jack, in our own lab, has talked about Nosema a lot and he's seen similar results. So it was really intriguing to me to hear Rosanna talk about the fact that most Canadian beekeepers use fumagillin and believe that it's worth it and see an impact from it. And that's encouraging to me. And then I think about the times in the data sets where that shows that maybe it wasn't efficacious under certain situations. And there's no fallback plan, right? There's nothing behind that to help out. So it's an interesting disease. It was really interesting that Nosema apis was the predominant species right around the time I got hired at UF in around 2006. And now it's completely Nosema ceranae, and that's what everyone around the world talks about. And I don't know, it's just an intriguing thing, this idea of overwintering indoors by itself is interesting, Nosema, by itself, is interesting, you put the two together, and it's really neat to see where research on these topics is headed.

Amy 34:35
Yeah, definitely. So Jamie, I hear that fecal streaking is a sign of Nosema. Is that true?

Jamie 34:42
So that has historically been related to Nosema apis but I've seen some people even call into question does Nosema promote that at all? In fact, in the old days when we used to teach about Nosema, we talked about Nosema apis, and one of the signs of infection, we would always say, is fecal streaking on the face of a hive. The bees get out on the first warm day and the moment they see sunshine, they defecate, so you get this fecal streaking. But like I said, I've seen authors call into question that correlation, if that's really what's causing it. But number two, I have not commonly heard that that is associated with Nosema ceranae. It's not something people usually mention.

Stump The Chump 35:26
It's everybody's favorite game show, Stump the Chump.

Amy 35:36
Hi, everyone. Welcome back to the question and answer segment. So Jamie, the first question we have, this person is asking specifically about Certan, I assume that that's a product for wax moth control. So can you talk a little bit about what it is and what it's supposed to be used for?

Jamie 35:54
I feel a little guilty here, yeah.

Amy 35:55
I have no idea.

Jamie 35:56
Here's the deal, Amy. I think I said it in our last Q&A, you and I have the advantage of being able to see the whole question because people never just ask us a question. They always tell a story. And then they put the question somewhere in that story. And so you and I work to condense the questions, just to kind of spit them out when we're doing this Q&A. But I have the background knowledge of this question, knowing that, essentially, someone was saying, "Well, you guys talk about wax moth control, but never talk about Certan. Why's that?" Okay, so I feel a little guilty not talking about it a lot, but I'm going to be completely honest here. Certan was something that existed when I was keeping bees as a young boy, and then it kind of went off the market for a while. And I guess I just didn't know that it had come back. And so within the last year, I've been made aware that it's back available. And so it's just my lack of familiarity with the product that has kept me from often bringing it up. Now, you and I, Amy, we can't endorse products, we can only talk about them in our position. So I'm going to talk about how this works. And then, basically, at the end, say if this is something you want to try, give it a try. If it's not, that's okay, too. So essentially, here's the idea. Wax moths eat wax and we want to stop that from happening. And if you've heard me talk about wax moth control in the past, I talk about freezing combs, I've talked about para-dichlorobenzene, wax moth crystals, I have talked about stacking combs in sheds that are kind of open that have a lot of light and airflow because wax moths don't like this so they'll try to stay away from those, those kinds of things, or storing combs, storing supers of combs on strong colonies so the bees can keep the wax moths off, the typical things that you guys out there might have heard me talk about with wax moth control. Well, there's this other thing that you can do as well, that this product that's available, at least here in the US, maybe. I know we've got a lot of international listeners as well. So I'm not privy to where all of this is labeled for use. But in the US, you can use a product called Certan. It's also got another name, it's B402. But the premise behind this is that it uses something called Bacillus thuringiensis, which the world knows as BT, and Bacillus is the genus, thuringiensis is the species. It is a species of bacteria that's found in nature that is prominently used to control moth or beetle pests. And there are different strains of BT. And those different strains are better or worse for different insects. So for example, there are some strains that work well against moth caterpillars, there are strains that work well against beetle larvae, and depending on what you're trying to target, that would dictate the strain of BT. And how this works is that BT produces a toxin that kills, in this case, the wax moth, but in other cases, other moths, or beetle larvae, things like that. And so BT would be considered a biological control. You spray this stuff on whatever you're wanting to protect.

And when the target organism eats this stuff, it gets the BT in its body, and then it dies from the toxicity of that compound that the BT produces. And one of the amazing things about BT is that the compound it produces, depending on the strain, is remarkably targeted. In other words, it kills what it kills, but is essentially harmless to what it doesn't kill. So BT use for wax moths in this case is very toxic to wax moths, but does essentially nothing to honey bees. BT strains are used all over to control all sorts of pests, but we're talking specifically about Certain, the product Certan that uses BT. Of course, any product that you use that's labeled for use like this one, you have to follow the label. The label is the law, you have to do what the label says. But the premise behind it is you spray it on the combs, and when you store the combs, if wax moths go in there and caterpillars try to eat it, they're going to eat this stuff and die and you'll get no wax moth damage. Again, you need to follow the label. I have never tested it. But I will tell you, I've read a lot of stuff online since I've had to answer this question a fair amount recently, and it looks like it has a high efficacy when used according to the label. I will tell you as well, I was recently speaking at a bee club, a state bee club here in the United States, for a state outside of Florida. And in the goodie bag, they actually gave us some of this. And so the first thing I did when I came back to the lab is give it to our lab manager, Chris Oster, and said, "Chris, I'd love for you to treat a stack of supers with this product, leave a stack of supers open, and let's just see what wax melts do." And we're going to do that. But it is something that's available for you so you'd need to follow the label. And that's kind of how it works. It's based on the use of BT.

Amy 41:02
Isn't it like the caterpillars eat it and their stomach kind of explodes?

Jamie 41:05
Yeah, basically, it goes into them. And yeah, it causes problems for them. That's exactly right.

Amy 41:10
Very cool. Okay, so the second question we have for today is about Apiguard. And so this beekeeper was using Apiguard, and within two weeks or so it just completely solidifies. So when they put it in, it's a gel. And then it solidifies after a couple of weeks. And so this person is basically wondering, I mean, I guess one, is that a problem? And two, is that a problem and does it still work?

Jamie 41:35
Yeah, okay. I'm only giggling because every time I get questions like this, I feel a little nervous to answer them because I'm not really a formulation chemist. And it gets tricky. Okay. So Apiguard is basically an essential oil or thymol-based product that comes in a gel. So the thymol is impregnated into this gel. This gel is then administered to a colony according to label, the bees get exposed to this gel, there's a little bit of uncertainty, absolute certainty, at least, understanding how this kills Varroa but that only that it does. Maybe the bees get coated in it, maybe their activity with it causes direct exposure to the mites, or maybe it's the scent of this stuff in the colony that causes the problem. We don't exactly know how it works, only that it does. And so my answer to this question is going to be very presumptuous. If the mode of action requires the bees to get into this gel and remove it, in other words, contact it and have it on them and the mites have to contact, then I can imagine a situation where it drying up could be a problem because it removes from the system that potential exposure route. If, on

the other hand, its mode of action is purely odor, then it drying up should not be a big problem. Now, the questioner said, and the current labeled product, I believe, says you administer it one way now and then two weeks later, you come back and apply it again. And so they're essentially saying, After that second application, they're noticing that there's still some dried-up gel in the container. So all you can do is follow the label. If the label says after the second treatment, you take it out in two weeks or whatever the label says, you follow it. If there's product leftover, you're still kind of required to follow the label. This is why we always emphasize that you should do a mite check after treatment to make sure the treatment worked. So what I would say is, it's hard for me to answer this question just right off the bat, because it would depend on how this product works, and the mite loads beforehand, and all these other things. But you can answer that question, for sure, yourself by sampling Varroa populations after treatment to see if you achieved the desired treatment level that you wanted. And that would be a more appropriate way to answer the question, maybe, than me speculating that it would or wouldn't work. My guess is if you open that pack and administered it to a colony today, and two weeks later, there's some in there that's dry, that it was probably gelatinous for a long enough amount of time to achieve maximum efficacy, that it probably did its thing. But the only way to know with certainty is to sample Varroa after you treat to see if the populations were reduced to the level you wanted them to be reduced.

Amy 44:44
Yeah, and another thing I didn't mention when I was reading the question was that this beekeeper is in Florida so it wasn't that they were up north and it got really cold outside and it solidified this gel. They were in pretty mild conditions here in Florida, and it still solidified and that's kind of where the questioner was also coming from as well.

Jamie 45:04
Yeah. So it's no surprise to me that they're in a warm climate and they're getting this kind of reaction, right? Maybe it's just from the heat down here, the time of year they used it. But still, I would argue that you've definitely got to check Varroa populations afterward. And that right there is the best test for, did it matter that this stuff dried or not?

Amy 45:21
Alright, so the third question we have. So Dr. Cameron Jack, we've had him on as a host, we've had him on as a guest, he's just an amazing person. And he was one of your PhD students, and he did a study on oxalic acid. We've had some listeners who have gone through and they've read his first previous study. And so they're wondering, are there any updates on Cameron's oxalic acid study? Is there anything else that's kind of in the works? Or let us know. What's the update? What's going on?

Jamie 45:52
Yeah. So, Dr. Jack, I'll just refer to him as Cameron from henceforth, part of his PhD work was focused on oxalic acid. As you mentioned, Amy, we've had him on this podcast before talking about that OA work. We've already had two papers published, and the first paper paper dealt with using oxalic acid during periods that you create brood breaks in your colonies by caging the queen. So that paper has been published, we can make sure and link to that paper in the show notes so you can read all about it.

He conducted a second study where he showed, the labeled rate, I believe, at the moment, is one gram treatment three times, maybe a week apart or something like that, I forget, again, it doesn't matter what I say, it matters only what's on the label. So if you guys are questioning me, make sure you look at the label. But he also looked at two and four-gram rates and found that essentially, the label rate did not work. It did not give you the desired level of control that you wanted. And instead, two and four grams were definitely the level that achieved the kind of control that you would hope to achieve from OA. Of course, that's not a label rate. I cannot tell people to use that. In fact, I have to tell people not to use it, you have to follow the label, the label rate, etc. But Cameron is trying to build upon that research and develop data that we hope could be used to inform label changes on oxalic acid moving forward. We would like to see its labeled changed to a rate that actually works. And so some of his follow-up studies are looking at that kind of upper level, that four grams and asking, "Well, does this impact bees and colonies if I apply it? Does it impact bees? What level of control can I expect with four grams, seasonally? And then what's the best way to apply it? Would it need to be applied every three days, every five days, every seven days, etc.?" All of those projects and the data analyses are ongoing. So I don't really have results that I can share. But again, I want to stress that that's not currently the label, right? So it would be an illegal application of this product in the colony. What I will reemphasize yet again, is that we're generating these data, Cameron is generating these data for the purpose of, we hope, informing a label modification so that we can know an appropriate dose to use to kill mites, protect bees, and for it to be of beneficial use. And that's what he's doing. And we hope, the moment he has some of these data out and published, we'll have him back on the podcast to elaborate on some of those things that he's testing. But I know a lot of other people are looking at OA in so many different ways, using it on shop towels and all kinds of other ways. And there's just a suite of OA data being published at the moment. But that's kind of Cameron's contribution to these questions surrounding the use of OA.

Amy 45:52
Yeah, for sure. This is a little bit of a different topic. But as far as changing label rates, I mean, what does that process even look like? How long, generally speaking? I mean, it seems like it's going to take forever, right?

Jamie 49:00
Well, we'd heard rumors that they -- they being the folks who change the label -- were open to modifying to, at least, potentially, a two-gram application, but that's currently slowing down. And it basically, among other things, requires the people who hold the license or create the label, the product originator, as it were, to work with the governing body, in this case, the EPA, to inform that label change. And it's not as easy as saying, "Oh, we've got these data. You need to go change that." There's actually a process involved, and they need data beyond even maybe what we're producing. So unfortunately, it takes longer than, I think, any of us want it to but it's just kind of where it is. It's just kind of where it is.

Amy 49:45
All right. Well, there you go. That is the update on Cameron's oxalic acid study. So we're happy that even after his PhD work that he's still with us here at the lab. Fortunate to have him. All right, listeners,

if you have any other questions, we are happy to take them through our email or you can send us a message on any one of our social media pages.

Serra Sowers 50:08
Thank you for listening to Two Bees in a Podcast. For more information and resources on today's episode, check out the Honey Bee Research Lab website at UFhoneybee.com. If you have questions you want answered on air, email them to us at honeybee@ifas.ufl.edu or message us on social media at UF honey bee lab on Instagram, Facebook and Twitter. This episode was hosted by Jamie Ellis and Amy Vu. This podcast is produced and edited by Amy Vu and Serra Sowers. Thanks for listening and see you next week.