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EPISODE 217 TRANSCRIPT

Jamie

Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere.

In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

Amy

Welcome to this segment of Two Bees in a Podcast. Today, we are joined by Ron Korkidi, who's a Chief Scientific Officer with ToBe based out of Israel. Today, we are talking about a new technology that they're creating for controlling Varroa. I'm really excited to hear about the new technology and how it works. So, thank you so much, Ron, for joining us today.

Ron Korkidi

Yeah, thank you for having me. You know, it's really exciting to be here on this side of the podcast. I've been listening to this podcast for a few years now. Thank you so much for having me.

Amy

Yeah, so you probably know how this all works. We always begin by asking our guests, you know, tell us a little bit about yourself. How long have you been in the beekeeping world and how you got into the honey bee world?

Ron Korkidi

My name is Ron, and I'm the Chief Science Officer here at ToBe Influencing Innovation, which is a startup company based in Israel. But long before that, like about 15 years ago, I was a biology student here in Israel with a big fascination of growing my own food. You know, I was growing vegetables and chickens with mushrooms. And then I thought, you know, what about bees? Why not make honey as well? So, I began beekeeping in my undergraduate degree and just as a hobby.

And very quickly, I was hooked. You know, that's all I wanted to do. And I already started planning my way of becoming a professional beekeeper. As I expanded for a hobbyist of two or four hives, so managing around 50 and working for a commercial operation.

And then, you know, it didn't take long to realize that successful beekeeping is in large part about Varroa mite control. And in order to truly enjoy what I do, you know, I like to succeed, and keeping dying or unproductive hives was just not enjoyable. The more I worked with bees, the more it became clear that controlling the Varroa, it's not like a technical challenge. It's the main challenge and it's a tough one. And it kind of hit the wall. The labor intensity, the recurring cost, I mean, especially the chronic colony losses made the whole operation just feel unsustainable. And that's when I really began exploring what solutions were out there.

I started with, you know, all the conventional options, obviously. CheckMite, Apistan, amitraz. But I researched the Internet for everything you can find from organic acid to technical solutions. I tried lots of different things, you know, vaporizers and removing brood and drone brood and even living hive untreated in hope for selecting of resistance.

But nothing really worked, and I was working way too hard and still didn't get the result I wanted, which was just strong hives making lots of honey. And I love beekeeping, but that part of beekeeping, the Varroa control was not the fun part for me. You know, which I know it's the same for many beekeepers.

You know, we started the beekeeping because we want to be outdoors. We love the bees. Not many people like dealing with strong chemicals and the chemistry part. So, I was a bit frustrated and I realized that actually I don't want to be a professional beekeeper, but I do want to find a solution for this problem. And that realization hit me in the right time when I was looking for a second degree thesis subject. And that's when I started looking for a research lab focused on bees. And then I met Dr. Vicky Soroker, which I know both of you know, because she was here on the podcast and also your members in college together.

And that's when I joined her lab in the Israeli agriculture research. Vicky, she shares the same passion as me for finding alternative approaches for Varroa control. So, I joined her lab and there we focused on organic non-chemical methods for Varroa control. For over three years, we experimented with everything from organic acid to entomopathogenic fungi to mechanical methods, you know, queen caging and queen replacing and combining it with all kinds of organic acids. And while some of these approaches had promise, they all had significant limitation.

Many of them work, you know, if you're a hobbyist of 10 or 20 hives, you can do it, but they don't scale well for commercial operations and they require too much labor, too many treatments, or they just fail to deliver consistent results.

Jamie

So, Ron, I mean, everything you just said sounds exactly like what so many of us experience, right?

We get into beekeeping, and we have to control Varroa and it's so absolutely annoying to have to do this. And it's interesting that when you were working with Vicky in Israel that you were trying a lot of the essential oils and other things as possible Varroa controls. And I like the way you summarized it, essentially making the statement that while these things can work really well, they often are labor intensive or dosing them is wrong or you don't get the level of control that you want. And it's too much to scale up to commercial beekeepers.

I think that's one of the big issues in the Varroa world is we talk about pesticides and their impacts on bees forever, but it's got to be scalable. Any Varroa control that comes out has to be scalable. And you and your team and your company, you've been working on a new technology for Varroa control. So, could you talk a little bit about the background of this technology and how it evolved?

Ron Korkidi

Sure. So that was around that time when I just finished my master's. I teamed up with a fellow beekeeper, a researcher and a family friend. His name is Dr. Avi Benchimon and he had this idea that was inspired by a common method used here in Israel. This method is mainly for estimating Varroa, and what you do is you take liquid amitraz, you drip it onto strip of paper, you ignite it, insert into the hive, the paper burns releasing amitraz's vapor throughout the colony.

So, here in Israel, as I said, it's the primary way to estimate infestation level. So, before you do this, you place the sticky board at the bottom of the hive, you ignite the smoking paper, and within an hour you can count the mite drop. So, it's very fast, it's not invasive, and it doesn't harm the bees.

Now it's true you don't get the precise mite percentage because you don't know the exact bee count, but you do get a clear sense of whether your colony is in trouble. And this is a well-known bulletproof way to kill Varroa. And if you want to know if your treatment worked, you smoke them once and look at the tray. But the problem is that the smoke doesn't penetrate capped brood, and it has to be done manually hive by hive, and again, not practical at scale. If you were to treat the colony using this method, you would have to repeat this many times for each hive. Very effective and consistent Varroa control, but again, not scalable.

So that challenge sparked the idea, what if we were to optimize this method? Instead of igniting the paper strips by hand, do you control the timing that those in the distribution would the design assistant that deliver precise pulses of vaporized treatment on demand, autonomously. And that's how the idea for Hive Master device was born. It's a response to a practical bottleneck face by the professional beekeepers.

Jamie

Let me ask a follow up there, Ron. So, you mentioned that putting amitraz on a piece of paper and igniting the paper in the hive was a common way for sampling Varroa. How long has that been happening and kind of how was that practice born? That's not something I'd ever heard until I met you. You know, we do alcohol washes and powdered sugar shakes and things like that. So, how long has this been going on in Israel?

Ron Korkidi

I've been in the business for 15 years, and way before, that used to be a treatment for tracheal mites, actually, in the '90s. And then they found out that it's also good for Varroa. It's not an actual treatment for Varroa because it doesn't penetrate sealed brood. So, it was never really a treatment, you know, it's just something that you do, you know, when you replace your queens, you have little brood, you do one smoke.

But in other Eastern European countries, for example in Russia and in Poland, it is a registered product. It's not on paper, it's on tablets. It is round tablets, and it is in use in these countries. Again, usually when it's broodless colonies. You have a broodless colony, you do one smoke and that's it. You get all the Varroa. It's super easy. But again, for brood right places like Israel, it's not so effective as an actual treatment.

Amy

That's really interesting. You know, I was listening to talk about this technology and how you all wanted to make an automated version of this. And so, there's that micropulsing of the vapor. I'm interested to know how the micropulsing works on the product.

Ron Korkidi

Yeah. So, what we did, and this is kind of a long process of a few years and many different versions. But what we did is we designed the system that delivered the treatment in the gas phase, and it's called the Hive Master. And this is a device shaped the size exactly like a standard Langstroth, so it can fit any bee hive, it has, inside, a fan and an engine and a high-tech microcontroller. And it can work by demand or by preprogrammed protocol to release small quantities of gas to the hive.

And the core of the device is the active ingredient cassette or cartridge, which can either be based on active ingredients such as amitraz or fluvalinate, in which case the customer purchases the cartridges from us. And this is actually a new development.

It can also be used with organic compounds, in which case it will be loaded by the beekeeper itself. But we will only produce the device, and the beekeeper will add the organic compound. And there are very good biological and physical reasons why the gas works better than contact-based solution.

First you have even distribution. The gas, it diffuses evenly throughout the hive reaching mites hiding under the bees in tight surfaces and it hits the mite through the respiratory system, which means much higher efficacy when you hit the mite from the inside, right? And also, you have rapid dissipation. So, the gas, it spreads evenly throughout the hive, but it clears very quickly, and that's where you reduce the residue risk and you minimize bee stress. Again, we chose to deliver the gas in short but very high concentration bursts, typically lasting between 30 to 60 seconds.

And from a pharmakinetic standpoint, this approach prevents the development of resistance, and it maximizes efficacy. So, this method has many benefits. The reason for this is the vapor, when it is inhaled by the mite and reaching the internal system, it reaches it faster. When you have contact exposure through the cuticle of the mite. This high peak concentration, it means that the treatment achieved the lethal dose very quickly, disrupting mite metabolism before the defense response. Though they might have no time to adapt. Most arthropods, they adapt by expressing detoxification enzyme like P450. But this system need time, days, weeks to ramp up, and lethal dose delivered in seconds bypass this entirely and it actually creates minimal selective pressure because the resistance is often driven by chronic [inaudible] exposure. Like putting strips, you know, when you expose mites, small amounts, but for a very long time you create chronic [inaudible] exposure and here there is no prolonged contact. Either the mite is exposed and dies or it isn't.

It's this binary outcome that limits evolutionary selection. This logic is also aligned with principles in pest management. You know, resistance evolves more slowly when exposure is acute rather than chronic. It's been observed in agriculture past, but also in antibiotic resistant management, in microbial pathogen. And it also simplifies the gas pulse strategy. It simplifies many aspects in hive management because first treatment can be administrated without repeated hive opening. You have a device inside, you can actually activate it from your phone from outside.

And because exposure is so short and controlled, there is little risk to queen or brood. And this method has a huge benefit for the treatment timeline. While most treatments take two to three months or 6 to 8 weeks, like strips, and the reason why they take so long is because they have a low effectiveness, and the fact that many mites can emerge from one cell and find a different cell to reproduce before they even were in contact with the active, and it makes the standard treatment of strips take too long, which is a major downside because you don't always have six weeks window to treat.

Either the season changes or you need to add supers. So, this is the great disadvantage of just putting context strips in. So, our protocol takes only two weeks. And the reason for that is the sealed brood cycle. Since we cannot penetrate sealed brood, we program the system to work in

specific intervals. So, whenever a mite emerges, it gets knocked out before it manages to find a new cell. This way, we can kill all the mites in one drone brood cycle, which is 14 days. And another benefit of the gas system is the decrease in active compound. We control the exact amount released in every pulse. We are able to adjust the dose so our full treatment use up to 90% less of the active ingredient in other registered products.

Jamie

So, Ron, when I met you and you were talking to me about this micropulsing, you know, this idea of burning something and releasing the gas that's then distributed with a fan through the nest, I thought a couple things.

You know, number one, I thought, well, if this is doing it kind of in a programmed way, will residue show up in honey? Do beekeepers have to turn the system off when they're trying to make honey? Those kinds of things. And the second thing that comes to mind is, you know, when you hang a plastic strip, say of amitraz in the hive, you can work around it, you can put gloves on and move it, etc. per what the label safety precautions state.

But I think about opening up a nest that's just had this micropulse of a chemical push through it. What about beekeepers breathing the air that comes from the hives? Do you have some information on that as well? So, the two questions essentially were then, does it show up in honey? Is that a risk? And number two, what about beekeepers breathing this?

Ron Korkidi

Yeah. So, great questions, and I'll answer first about the beekeeper. So again, since it's programmed, we can program it to work whenever we want. The most effective time to treat is actually at night time when all the bees are inside.

And also, the beekeeper usually isn't around. So, of course, you don't want to open the hive and breathe it. So, again, it's programmed to work at night, so the beekeeper is away. But this whole thing is connected via connectivity to your phone. It doesn't have to be. It can work stand alone, but if you, say, come to your apiary area in the middle of the night because you want to move your hives and you know that the devices are supposed to work, then you can just open your phone, and you just press a button of hold.

You know, just delay the next activation. You do whatever you need to do, and it will keep working tomorrow. Now, you have the technology here and the opportunity to do the program in the way you want. And about the second questions about the residue, of course, this is our responsibility to prove and to show that there are no residues.

So, this method is actually already registered in Israel, and we've done some work of doing residue studies and we did not find any residue in the honey that is designated for safe. So, the

way you treat this, it's like with strips, you use it on the brood and not in the honey supers. So, when you have honey supers on, you're not supposed to activate it unless you work with organic compound, which is permitted. But if you work, for example, with amitraz, then you just don't work while you have supers on.

But since the treatment is so short, only two weeks, it's very easy to find that time window to, you know, press the button, two weeks, start working, finishes, you can raise your supers. It's all right. We've actually done some work here in Israel where we treated with honey supers and we scanned this for analysis and still it was lower than the detected level. So, there isn't reason to think that it will contaminate the honey as well.

Amy

So, Ron, you mentioned this a bit in your previous answer. I'm interested to know what results have come out of this and some of the research that you've done or are currently doing.

Ron Korkidi

Yeah. So, we've been working on this for over five years, and we've conducted a lot of experiments. I'll share just a little bit. We conducted two experiments in the USA. One was actually with you guys with the UF Honey Bee lab with Cameron and Devin. And we had 100 colonies, which were divided into three groups. What was very interesting from the result of this experiment was first, the Hive Master resulted in about 95% efficacy in only two weeks, and it had very low standard deviation, meaning a very consistent treatment for all the bee hives that were treated. 33, as I recall.

But the control group, which was standard registered treatment, had only 50% efficacy. But not only that, it had a huge standard deviation. It means that some hives were treated well, but others weren't treated at all, which is exactly the problem with contact-based treatment, especially when you have suspicion for resistance.

Though in one location, we showed that when you put Hive Master in, in only two weeks you get all of the hives clean, and maybe it means that it overcount the resistance in this location. Additionally, we've been working here in Israel for five years with several commercial beekeepers.

Just last year, we treated over 5000 hives, and we are collecting data every year. And in almost all the cases, hives treated with Hive Master gas system outperformed the control groups that were treated with conventional [inaudible]. This outperformance translates to about 40% loss in reduction. So, it means that if control group had about 30% losses, which is standard here in Israel, the Hive Master group had only 15 to 20% losses, which is extremely significant at a commercial level. And a recent very exciting result that we just had from an experiment here in

Israel show that we did manage to establish a protocol using Hive Master to deliver organic acid vapor, again, in fixed intervals.

And in only 15 days, we were able to achieve 90% efficacy in queen right colonies. Even more exciting than this, recently, actually just last week, I had the opportunity to test this in a completely different environment, and I have to say thank you to Jamie for introducing me to Professor Gan from Burapha University. I just came back from Thailand where we tried the Hive Master in colonies infested with Tropilaelaps. What we saw was really remarkable. The gas treatment caused the Tropilaelaps mites to drop off in large numbers, essentially clearing the hive.

First, it makes biological sense because, you know, Tropilaelaps, they behave a bit differently from Varroa. They spend much less time on adult bees. They move quickly over the combs from cell to cell, and contact strips are much less effective because they rely on mite encountering treated bees.

But with the gas phase treatment, the active ingredients spreads evenly throughout the hive and it's targeting both Tropilaelaps running across the comb and viral clinging on adult bees. So, this result is especially important for beekeepers outside of Asia though Tropilaelaps is not yet establishing the EU or USA, but if and when it does, gas phase delivery could be a practical and effective solution and something that we now have field evidence to support.

Jamie

So, Ron, I'm curious, you know, with all the work that you guys have done, is there anything else you'd like to share?

Ron Korkidi

Yeah, sure. I have, you know, a bit of a broader context because we've talked about, you know, the smoke and the technology of the Varroa treatment, but about the future of technology in beekeeping. You know, rather than treating the Hive Master as a standalone solution, it should be understood within the broader shift towards responsive and data-driven apiculture. Once you introduce an electronic device to the hive, it has the ability to sense and to analyze data from the colony.

It can communicate with the cloud and the beekeeper, giving the beekeeper insight about the whole bee yard or the entire apiary. So, imagine you have in the palm of your hand the ability to know how many bees you have, how strong they are. Are they getting stronger?

Are they getting weaker? Do you need to feed, or can you wait a week? You know, every gallon of fuel or an employee’s work hour is important to make the operation more effective. So, imagine systems that monitor you know, humidity, temperature, population side, even the sound

profile of the hive. And by combining treatment capability with real time monitoring, devices can treat only when necessary, adjusting to seasonal patterns and weather conditions. If it's too cold, maybe we'll delay one treatment or, you know, if there is sudden changes in the colony health, in the future, integrated platforms could automate not just my treatment, but feeding, ventilation, swarming prevention.

And this isn't about replacing beekeepers, you know, it's about making large-scale sustainable beekeeping more manageable, reducing the labor bottlenecks and improving colony health outcomes. Our vision is you have the Hive Master in every hive and delivering the best treatment for the bees and helping beekeepers making beekeeping fun and sustainable. We managed to create this amazing device and technology and we are eager to make it available in America and everywhere in the world. You know, our main challenge is pretty much the tedious and long registration process, but we are moving forward full steam ahead both on the amitraz-based registration and on organic pathway that will not require this whole registration. And yeah, I hope we can find a way to accelerate this process so we can move forward to fulfill our vision.

Amy

So, Ron, I just want to thank you so much for being on our podcast today. I'm excited to see where this product goes and how the technology will evolve through time. You know, as we talked about before we actually pushed record in this episode, a lot can happen in a little bit of time. So, we appreciate having you on the podcast and we're glad you're able to share some of the information that you've been working on.

Ron Korkidi

Thank you so much for having me, and I had a great time. And yeah, I'll see you actually, I'll see you, both of you in Denmark, right? Apimondia.

Amy

We'll see you in Denmark. Jamie, before we get into the outro, I have something kind of funny about this podcast and some of our listeners out there. I want to give a shout out to Zoe Mack, who's in the UK. She is a research technician that's visiting us right now. And apparently what she and her whole lab listen to us.

And they have, there is, I think a student who has, and I'm not going to say an Amy-ism. But apparently, I say I'm really excited a lot. I was trying to figure out like, what part of the episode do I always say I'm really excited or I'm super excited?

And then I realized right before we were about to record this, that this is usually when I say it. I always push record, and I'm like, all right, well, I'm really excited that we got to talk to this person. So, now, I have officially figured it out.

Jamie

OK, so you cannot use the word excited any longer.

Amy

Now, I don't know how I feel. Just kidding. No, But I do, I get excited when we get to talk to different researchers and people doing lots of various things in the apiculture community. And that's the word that I describe, I guess. I don't know, I guess I'm –

Jamie

You're excited.

Amy

Help me think, yeah, help me think of another word now. Anyway, so, you know, back to that episode with Ron, we really wanted to bring him in to talk about all the technology that people are coming up with right now. There's just so much going on, right, as far as what we're testing.

Of course, we talk about Varroa treatments, what that looks like, different methods. And so, you know, this was just kind of one piece of the big puzzle, right? What were your thoughts?

Jamie

Yeah, so some take homes that I had from the interview, just starting at the top, was listening to Ron talk about his entry into beekeeping and how, you know, he got into it. It was exciting, all that stuff. But he found himself constantly trying to work on Varroa, controlling Varroa, controlling Varroa. So, I'll use these compounds. OK, well, I'm not getting great control, or they last so long, or they can't be on during honey flow. So, I'll move to these compounds.

And then when he worked with Vicky Soroker, who's a professor in Israel, you know, he studied other compounds, like literally did the science of looking for new compounds. So, thinking about his struggle, this is often where innovation is born.

So, you know, we have to be company neutral. We are not endorsing companies. Really, the reason he was on today was to talk about this birth of an innovation that I had not heard before. You know, most compounds for Varroa control are delivered through plastic strips or gel or some sort of contact. Now, the mode of action for something like thymol, maybe, we don't know for sure, but it could be, you know, it's volatilization. We know that oxalic acid can be volatile, but thinking about what he and his group has done to kind of pivot towards controlling Varroa with these micropulses of gas from active ingredients that through a fan go throughout the nest was a really interesting concept to me.

And as he alluded to in the interview, he's worked with Cameron Jack at our lab to do some of this research in Florida and then he's doing some of this work around the world. So, this idea of releasing a gas of an active ingredient into the nest was very interesting to me.

And it was neat to me the strategies that they were employing. But of course, I had all these follow-up questions. Well, what about safety to beekeepers? And what about residue levels in honey and all of these things? I like to see novelty in Varroa control efforts. And this was a new thing that I had not considered previously. And it's interesting to me that it was born out of this idea that that's often how Israeli beekeepers just sample Varroa and their colonies to get a sense of how high the loads are. So, that was also interesting.

Amy

So, just because we're talking about this on the podcast, Jamie, you know, there's some research and there are some things that are going around that are being tested and going on around the world, but that is not our endorsement to tell all the beekeepers to go ahead and do that, right?

Jamie

Well, you see that a lot, and I have to sympathize with the beekeepers, right? They're trying to keep their colonies alive and feel like they're not getting adequate control out of the available products. So, we all know stories about off label compound use. This is not just a US thing; it happens around the world. So, what we don't want people to do is hear, oh gosh, this technology, you drip it on a sheet of paper, and you go burn the paper. You don't, you don't do that.

And if you hear what Ron was saying, he's actually doing it the right way, which is, OK, I've got this idea, we've developed this technology around it. Now let's test it. And if it works, let's get it registered. That's the way it's supposed to work. If it becomes a registered product, then a technology like this would be available to use.

And of course, it has to get registered in your particular country. We know we've got listeners all around the world. And so, the take home message is not to run out and try any of these things. You can only use labeled compounds for the control of Varroa and the nest. The label is the law. If you're a listener, you've heard us say that a million times.

Instead, I think the focus here is that next step, thinking about a new way of delivering a compound where Ron and his colleagues are doing the legwork to see if it's efficacious. If it shows up in honey, you know, what does it work against? How does it need to be delivered? All of that stuff, all the R&D, research and development that goes into bringing a new treatment, a new registered treatment to market.

Amy

Absolutely. I would love to hear our listeners' thoughts on this episode and you know how to reach out to us.

Stump the Chump

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

Amy

All right. Welcome back to the question-and-answer segment. Jamie, the first two questions we have today are related to small hive beetles. Yeah, we'll see what you have to say.

Jamie

OK.

Amy

OK. All right, here we go. So, the first question that we have is what do commercial beekeepers use for small hive beetles? It's a very generic question.

Jamie

Yeah, it's a generic question, and I'm going to answer it like the good University of Florida employee that I try to be. I won't say that I am, but that I certainly try to be. They use a lot of the standard methods that one sees in beekeeping catalogs and then maybe a few more.

So, it's no secret that beekeepers, really kind of the world over, and it's not just beekeepers, we all do this in different walks of life, there's no secret that a lot of small beetle control is done with off-label chemicals. And so, you know, I'm not going to go into that. It's not a legal method of small beetle control, but there's many different ways that commercial beekeepers, and it's not just commercial beekeepers, hobbyists and sideliners, and it's not just in the US, it's all around the world. It's many ways that folks have used kind of off label things to control small hive beetles. The danger in that is there's no efficacy data, so you don't know how well it works.

There's no residue data often, so you don't know if the stuff that's being used is showing up in honey or beeswax or pollen or whatever you may be harvesting. And then, of course, even most importantly, there's not great data on the impact of these things on the bees themselves. So, you may think you're getting good beetle control, but it may be coming at a cost.

So, maybe a different way to think about this question rather than what do commercial beekeepers do? It's like what are options available to beekeepers, including commercial beekeepers, to control small beetles? And Amy, this is a global podcast, right? The options available are unique to every country, especially obviously limited to countries that have small beetles.

So, one of the best ways to know those options is to grab an equipment supply catalog for wherever you live. Presumably, if the laws around the world are similar to what we have here in the US, those things that will be listed in the equipment supply catalogs will be the things that are labeled and legal to use for small beetles in the area where you live.

Here in the US, that would include things like traps. There's a number of traps that you can purchase for putting into bee hives that small beetles go into. There are, of course, a lot of different sizes of traps. There have historically been two compounds. One was CheckMite, just coumaphos, and one was GardStar, which is permethrin.

Honestly, and I should have looked this up before answering this question, I'm not sure those are still even available for use against small beetles because very few people use it anyway. But if that is available here in the US, it would probably be in the equipment catalogs. You could check it out, and if someone really needed to know that, I could look it up too.

So, there were those compounds, but really, it's just trapping, trapping, trapping, trapping is where a lot of people find success. And they might use bait in those traps, especially if the traps are one-way traps where beetles can go in but can't come out. So, they might use things like, you know, pollen patties to bait the beetles in, things like that.

But really among some of the best defenses against small beetles would be things like keeping strong colonies, making sure they don't have, you know, runaway Varroa populations or queenless situations where the colonies aren't weak themselves. All of those things go to, you know, really great lengths to help against small hive beetles.

And I will say, there are many labs around the world looking for new strategies to control small beetles. There are things, for example, that are legal to do in other countries that aren't, say, for example, in the US and maybe vice versa. My point about making that last statement is there are a lot of label products out there around the world that might someday be tested and efficacy data generated and safety data that would allow the expansion of some of those products that are elsewhere.

And I think you're just going to see even greater number of small hive beetle controls in the future just because I'm aware of the type of research that's happening behind the scenes to add new active ingredients. So, this short question was what do commercial beekeepers use for small beetles? Well, that's a big, long answer to answer that very short, very focused question.

Amy

All right, outside of the chemical and applying chemicals for small hive beetles, some people will use Swiffer wipes, and they'll use that for small hive beetles. So, this is the second question

of our Q&A today. If someone is using those Swiffer pads, where in the colony should those pads go?

Jamie

Yeah. So, Swiffer and then they put mop pads and other things like that. These are fibrous pads that are often sold for cleaning agents around the house, like some of them are adhered to the bottom of these mops. They're kind of disposable sheets you can put on a mop and then mop your house with. So, beekeepers, and I forget exactly where this was originally suggested.

Beekeepers have shown that if you put a chemical-less, scentless variety of these things into a hive, the bees will kind of ruffle it up as they try to, you know, disassemble it and remove it from the nest. And they noticed that when they did this, small hive beetles were getting stuck in it. So, beetles would go into this fibrous, fluffy stuff that the bees have fluffed up, and they'll get stuck. Their little tarsal segments are like hooks at the end of their feet and they get stuck. And you'll find a lot of them dead in this stuff. Now, I know here in the US, because I was looking this up just last week for another reason, there are brands of these things that are now sold in the equipment supply companies.

And I don't know if it's some of these more commercial settings that realize that, you know, disposable mop towels are being used and they converted them, or if there's these are entrepreneurial bee people who've, you know, made something similar and are selling it.

But nevertheless, there are available versions of this for use in hives. The thing is, Amy, you know, people use them around the world because they go get their version of whatever this thing is in their country. I would suggest you just have to be really careful. You want to make sure it's scentless, right? You know, bees use scent for a lot of things in hives. It needs to be chemical-less, you know, no cleaning agents, things like that in it. It really just needs to be the fibrous tissue because you don't want to be introducing a compound into the nest that could cause a problem for the bees. As long as the bees can ruffle it up, then small hive beetle should be able to get stuck in there.

And so, then the question is where in the colony should they go? I've seen them everywhere. The best way to think about this is where are small beetles normally in the nest? They are normally in cracks and crevices around the periphery of the nest. So, bees are pretty good at being aggressive towards free running small beetles and kind of pushing them away from the brood and the honey.

So, you'll tend to get beetles on the outermost frames of the nest on the bottom board, just up under the lid or up under the inner cover, anywhere maybe between supers if the frames from the uppermost super touch the frames from the lowermost super, you can provide these small cracks where beetles get.

So, really locating these kinds of fibrous sheets under the lids, maybe on the bottom board, maybe between the brood chamber and the honey supers, towards the outer sides, you know, frames one and two and frames nine and ten in a 10-frame box, towards the outermost frames to get them towards the edge of the nest where beetles are more likely to be.

And you know, if you use non chemical varieties, since they're really just fiber sheets, you really just put them in as many places as you feel is necessary to catch beetles. But knowing the beetles are going to be on the periphery of the nest is a good thing. I want to elaborate on something too, Amy, I failed to do this with the first question.

And since we're talking about small hive beetle control still, the second question, I might mention there are other methods people use for small beetles too. Colleagues and I and others have shown that honey bees are pretty good at detecting beetle eggs and young beetle larvae that are in the brood area.

So, they probably use that same hygienic behavior that they use against Varroa, they probably are using that same thing against beetles in the nest. So, using maybe hygienic stock possibly could help. People use nematodes. Nematodes are wormlike creatures that, at least the species in question, nest in the soil, and when small beetles pupate in the soil, these nematodes can go after the beetles and kill the pupating beetles in the soil. So, there's a handful of non-chemical approaches, but most people use traps. A lot of folks are using these kinds of fibrous pads. Those are really just types of traps as well, right? It's just a fibrous trap rather than a plastic trap that beetles go into. You know, all of these things are really good ways to constantly tax adult beetle populations and limit their numbers in the nest.

Amy

Yeah, absolutely. And what we do here at the lab is we just manually remove them.

Jamie

For sure, and you smash them with a hive tool.

Amy

There you go, smash them with a hive tool. I was actually walking down the hall the other day and there was a small hive beetle just walking on the wall.

Jamie

I've had them in my office as well and that's when you know you work in a bee lab, right?

Amy

I know. I just walked by, and I said, oh look, small hive beetle, and just walked away. Probably should have killed it. Sorry.

Jamie

It's like you're fully expected to see it there, right?

Amy

Exactly. All right. So, for the third question that we have, this is a question about bottom boards, and the question is whether you recommend using solid versus screened bottom boards?

Jamie

Wow, what a question. I would have answered it completely different 10 years ago than I'd probably answer it today. All right, why is this a question at all? Well, you know, all hives rest on a bottom board, and that is, like the name implies, a piece of wood, a board that goes on the bottom of the hive. And usually, it's got a lip around the edge on three of the four sides, and that lip holds the boxes. The reason there's not a lip on that fourth side is because the absence of that lip on the bottom board means that it provides that entrance when you stack boxes on top of it.

Bottom boards have historically been solid, meaning that they're just a piece of wood. There's no opening except the opening at the nest entrance. Well, years ago, gosh, Amy, I would think it's probably 25 years ago, probably 20-25 years ago, there was some research done on replacing the solid part of the bottom board with screen mesh for Varroa control purposes.

And the researchers who were doing this, and jumped on the bandwagon and did some of this myself, showed that colonies that had screen bottom boards had fewer Varroa in the nest than colonies on solid bottom boards.

And that's an interesting finding, right? Just changing the bottom board of your hive might be enough to reduce Varroa populations. Keith Delaplane, my former supervisor at University of Georgia, what he did is he did a literature review on all screen bottom board research. And I think he published it in the American Bee Journal over 20 years ago. I think. I hesitate to say that with certainty, but I think he did. I remember looking at that paper or looking at his table or whatever it is he produced and seeing that some papers showed it didn't reduce Varroa numbers, but other papers showed it did. And no paper showed that it increased Varroa numbers. So, you've got to have a bottom board. Why not a screen bottom board, right? If you've got to have one, why not use one? And then it might help against Varroa. So, I think he showed somewhere between a 10 and 14% average reduction in Varroa populations, if I remember correctly.

That means, let's just be conservative, you use a screen bottom board. If you would have used a solid bottom board and you have 3000 mites in your colony and you use a screen bottom board,

you have 2700 mites in your colony, a 10% lower Varroa population. So, I use that information to say, hey, you've got to have a bottom board, make it screened.

Well, fast forward 20-25 years and now I know, you know, Derek Mitchell, who we've had on the podcast and others who've talked about how bees choose nest sites and important characteristics of those nest sites. He told me when he was visiting actually here earlier this year in our laboratory, he made the point that, you know, in summer, bees work to air condition the nest, right?

It's too hot outside, so bees cool it off. What does cool air do? If hot air rises, what does cool air do? It sinks. His point was they're working so hard in screen bottom board colonies to cool the nest and all that cool air is just going right out the bottom of the hive. And I'm like, that's probably true. So, now you're like, what's better? Screen bottom board where you might get some reduced Varroa populations or a solid bottom board where you might help with optimization of nest thermodynamic properties?

And so, let me tell you, Amy, what I've done this year. My colonies are housed in hives on screen bottom boards because I taught it, I preached it, so I did it. And then after talking with Derek, I'm like, man, what do I do? I think, Amy, you can have kind of the best of both worlds. They make bottom boards that are screened, yes, but that underneath those screens, there's a way to close off the opening at the bottom so that it's kind of a solid bottom board and a screen bottom board all in one.

The mites will fall through the screen and fall down, not to the ground, but to this kind of bottom, and they're unable to get back up. And a lot of people market these things as IPM bottom boards. What I did is I just set my hives on old hive lids, so my screen bottom boards are on top of an old hive lid to help reduce that air loss and still get the benefit of a screen bottom board. So, I'm trying to have it both ways but, honestly, I don't know if it's working either way but I'm trying to have it both ways right now.

Amy

Yeah, it'll be interesting to see, you know, some of the research with like, thermoregulation and just seeing what insulation can do for a colony. I'm excited to see what that looks like later on in the research world.

Jamie

Yeah, I think Amy, this screen bottom board thing and this insulation hive thing, I think it's going to be answered in the next decade. I really do. So, you know, my strategy at the moment is just trying to get the best of both worlds and work around the system, even if it's not working. At least in my mind, it feels like it may be.

Amy

Yeah, I think that's fair. All right, everybody, you know what to do. If you've got questions, don't forget to send us an e-mail or message us on one of our social media pages.

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

Jamie

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