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SPEAKERS

Amy, Stump The Chump, Jamie, Guest

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. Hello, everyone, and welcome to another episode of Two Bees in a Podcast. Today, on our podcast episode we have Dr. Daniel Potter from University of Kentucky. He'll be joining us talking about supporting bees in urban spaces. We'll follow that with a segment on our Five Minute Management related to fungal pathogens of honey bee colonies. And, of course, we'll finish today's episode with our question and answer segment. Hello, everyone, and welcome to another segment of Two Bees in a Podcast. Today, we're joined by Dr. Daniel Potter, who's a professor of urban landscape entomology in the Entomology Department at the University of Kentucky. And the reason he is joining us today is because he has been working recently on the management of pollinators in urban settings and a lot of the science and extension that is associated with that topic. Dr. Potter, thank you so much for joining us on Two Bees in a Podcast.

Guest 01:45

Well, thank you, Jamie. It's a pleasure to be here.

Jamie 01:47

Great. Well, you know, all of our listeners love to hear how the folks we interview got working with bees and pollinators in the first place. So, if you don't mind, could you talk a little bit about your background with entomology and how you ended up on the topic of urban pollinator management?

Guest 02:03

Well, sure. I've been interested in insects since I was about eight years old or so when I terrorize the local populations of butterflies and beetles with my first butterfly net. And I went to college in upstate New York at Cornell University. My dad was a professor there. And I started out in pre pre-medicine, but my grades weren't so good in chemistry and some other subjects. So, I took an entomology class and never realized you could make a living as an entomologist until I took it and it was a wonderful class. And that particular professor became my advisor and certainly, a strong role model for me. Again, my dad was a professor. And so, as a kid, he would bring home some of his graduate students, particularly ones from Africa and other foreign countries, to have Thanksgiving dinner with us. So, I saw him as a role model as well. So, I changed my major to entomology as an undergrad, graduated from Cornell in '74, went to Ohio State for my Ph.D. studying spider mites, and had no idea I'd ever get into urban landscape entomology until I got my position at University of Kentucky. I've been here for 42 years and I'm getting ready to retire next year. I've advised about 48 graduate students over that time, teach horticulture entomology and some other courses. And so, for most of my career, I've studied pest management in urban landscapes, how to deal with grubs in your lawn, Japanese beetles on your roses and so on. Now, as you know, a number of events happened in the -- around 12 years ago, we had the growing awareness of threats to pollinator health globally, the business of Colony Collapse Disorder, the controversies over neonicotinoid insecticides, and then the global decline in other insects, and in North America, in particular, monarch butterflies. So all of these things began to come together. And I realized that studying urban pollinators and urban pollinator protection was very important, both from the standpoint of the land care industries, but also provided a lot of opportunities as a driver to get people to, perhaps, engage in more pollinator-friendly land care practices in their own yards and gardens. So that's a little bit about my backstory. And it's been a real transformation in my program since about 2010 with a much stronger focus on pollinator protection and integrated pest and pollinator management.

Amy 04:43

You have got -- Oh, I'm sure you have a wealth of knowledge as far as urban landscapes and, you know, just being at the University for 40 years. Wow, that's amazing. And congratulations on retiring next year.

Guest 04:55

Thank you.

Amy 04:55

I'm excited for you. So, the way I actually found about you was one of my friends, he's a professional landscaper for one of the theme parks here in Florida. And he listened to one of the talks that you had called bees, pesticides, and politics, challenges and opportunities for sustainable urban landscapes. Now, I know that you've done a lot of research and extension for professional landscapers, for turf managers, for the industry, and just for overall, you know, government scientists, and you've brought a lot of different stakeholders together on integrated pest and pollinator management. So, can you talk a little bit about the needs for some of these industries, you know, and what some of your programs really focused on and how that kind of evolved to where your programs are now?

Guest 05:42

Of course, yes. Most of the stakeholders that I tried to serve through my programming are people like professional arborists, folks that take care of trees, the lawn care industry, golf course superintendents, and then of course, millions of individual homeowners who have yards and gardens and landscapes. These people are charged with protecting valuable plants from, you know, the ravages of some pretty significant insect pests -- emerald ash borers, Japanese beetles, grubs in the lawn and so on. Traditionally, these insects have been managed largely with insecticides. But as we all know, insecticides, not only, at least most of our insecticides are not only toxic to the pests, but they're toxic to the pollinators as well. And as these issues regarding pollinator health have become much more in the public view, it's really been imperative, it's a mandate for this industry to engage in best management practices to protect pollinators while they're managing the pests. I think that my background in working on the applied side, getting to know this industry has been really helpful in presenting a balanced perspective, recognizing that most of these people grow plants for a living and take care of them, they're good people that don't want to harm the environment. But they're sort of between a rock and a hard place as far as how do I protect landscapes, but also not harm our pollinator populations? That's been a really productive area. And I think that the message of integrated pest and pollinator management has been very, very popular in these land care industries. It's been, certainly, the most requested topic for me to speak on for the last 10 years.

Amy 07:36

Dr. Potter, you know what? I was just about to tell you, I used to be an extension agent in Orlando. And I cannot imagine how busy you must be and what your email inbox probably looks like, because I know that there's a huge demand, you know, for homeowners, for professionals, all trying to focus on the same thing, you know, how do we protect pollinators?

Guest 08:00

Yeah, absolutely. And I mean, we get all kinds of interesting questions that are hard to answer. Will protecting my ash trees from emerald ash borers harm pollinators that might come to the trees? What about backyard mosquito control? That's a huge issue. And where does one person's right to, say, manage the Asian Tiger mosquitoes that are biting their grandchildren and the person who has a pollinator garden next door, where do their rights begin? And, you know, these are very difficult questions that are very interesting as well. I think the pollinator, you know, for 40 years, I was preaching at people to reduce their insecticide use and to use more environmentally friendly insecticides to try to tolerate some clover in their backyard. And this pollinator issue, both bees and monarch butterflies, I found it's a very powerful driver for eliciting positive change in the way people view their home landscapes. And then, once the people know what, you know, they recognize that these are, it's important for these things to change into reducing inputs, that helps the industry to provide what people need as well. So, I think we're beginning to make a lot of progress. And the bees and the monarch butterflies have been tremendous drivers toward that. I think much the way pandas and whales and bald eagles, and all of these other iconic, polar bears, iconic symbols for environmental health can help us toward a positive societal change. So, almost like umbrella species, right? That's what you're talking about with pandas and whales, the idea of we can protect pollinators in general, then we've got all these folks who are changing their practices with their own landscape, and there might be other things

that benefit as well. So, you've been mentioning a little bit about pesticides and their impacts on pollinators in urban landscapes. But what are some of the big concerns in urban landscapes beyond pesticides, or in addition to pesticides? Are there other things that folks can be aware of with regard to protecting pollinators? Oh, sure. I mean, I think the public is increasingly aware of the importance of pollinators and also, the fact that pollinators are in peril. And with things like the Million Pollinator Garden Challenge, Operation Pollinator for Golf Courses, and a lot of other, you know, the Monarch Waystation programs and things, there's clearly a lot of opportunities for positive change and for the horticultural industry that grows and sells plants. I mean, pollinator friendly plants are flying off the shelves, and certainly, for the industry that takes care of urban landscapes, things like bee kills are very bad for business. And being able to tell clients and customers that they're managing landscapes in a sustainable way that helps to protect pollinators is good for business. And so, I think it's a win-win all around for the pollinators and also for the industry and for the clientele. One of the projects that I think that we've been involved in that's most important concerns more sustainable lawn care from the standpoint of insect control. And we were very concerned about the overuse of neonicotinoid insecticides on lawns, particularly the possibility that flowering weeds like clover and dandelions might be contaminated. So, we conducted a series of experiments to assess that hazard and determine that it really was, in fact, real, but also found best management practices that could be used by the industry to mitigate the hazard to bees on lawns. Things like mowing off the flowers on the weeks before or after treatment we found would greatly reduce the hazard. We were able to identify a bee friendly alternative for grub control. It's called chlorantraniliprole. I don't know if I can say the trade name here, but it's Acelepryn, and it works as well or better for grub control as neonicotinoids. But we were the first to determine that it's bee friendly in this type of a setting. And so, the industry is transitioning away from the neonicotinoids to this more bee friendly alternative, which can influence, you know, bee conservation on millions of home lawns around the United States. I think that was a very important contribution. Well, I mean, we know, of course, that urbanization results in habitat fragmentation. And, you know, one of the greatest risks to pollinator health is the loss of habitat, flowering resources and also nesting resources. So, one of the focuses in my program has been to identify woody plants. We call it our Trees for Bees project, where a lot of the focus on planting pollinator friendly landscapes has been herbaceous plants, annuals and perennials. The trees have been largely overlooked. So, we did a three-year project looking at about 80 species of woody plants, trees and shrubs, to identify the ones that were real bee magnets. And we've been promoting a lot of those. And what's really nice is that many of those are relatively underutilized plants that are very well adapted, and also relatively pest free. So, we can really make a lot of progress by promoting some of the plants that don't need to be treated for Japanese beetles or caterpillars, and that are also very attractive and that can reduce pesticide use, support pollinators, and also lead to more sustainable landscapes. I'm working on a paper right now dealing with clover lawns, and there's a lot of interest in flowering bee lawns for backyards, or community parks and things like that. My paper deals with micro clover, which blends with turfgrass a little bit better than the common white Dutch clover. And of course, we're promoting at least the tolerance of clover and other, you know, so-called lawn weeds as being very, very good for pollinators. So these are some of the things. We brought a program called Operation Pollinator for Golf Courses to North America, and we implemented that on six golf courses in central Kentucky. And that problem caught on after it was publicized to the golf industry. It's now in place on more than 300 golf courses in North America and growing all the time. So that's another initiative that we've been leaders

on. So, I think it's a combination of trying to reduce the broad-spectrum pesticides that are used in landscapes, and then using the public empathy for pollinators as a way of just reducing overall inputs and creating more sustainable space.

Amy 15:07

So, that actually kind of leads into the next question that I had for you. You know, I have worked with industry, I've worked with arborists, I've worked with professional landscapers, I've also worked with the general public, I've also worked with government entities, and it is sometimes very difficult to get them all to be on the same page. And, you know, you've got Operation Pollinator for Golf Courses. First of all, I guess, how do you do the outreach after you've started these programs? And how do you connect all of these different stakeholders so that they are on the same page?

Guest 15:43

That's a really good question. And I think it starts with knowing your industry. I think one of the things that I've been able to do, again, through decades of working with golf course superintendents and lawn care people and professional tree care people, is I recognize that they have real issues. And there's a need for insecticides, in some cases, to protect plants. And so, you know, I don't preach at them. I try to look at the issues from their perspective, rather than just from the perspective of an academic. And I understand that there are those that would say, "Let's ban all pesticides." I'm not in that camp. My role is to try to find safer pesticides that will control the pests, but will also be compatible with the environment and compatible with pollinators. And if I can provide them with solutions that work for them, that are alternatives, that are better, they'll embrace those alternatives. If you just tell them that they should stop, you know, doing the things that they have to do, I mean, there's a demand for lawn care, and there's a demand for backyard mosquito sprays, and there's the demand for tree care, and sometimes these represent real needs. But if you can start with an understanding of the industry, and really look for ways to change their behavior a little bit at a time, provide them with new tools, that can really help. And I think that's where the experience of starting with pest management, and then getting into pollinator protection later has really been helpful for me and for my graduate students.

Amy 17:31

You couldn't have said it better.

Jamie 17:32

Well, listening to you talk, you've sprinkled in throughout some general recommendations that you would make to urban and other landscape managers. So, I want to see if we can maybe pull all those together and just say, you know, what are things that you tell folks? I know you mentioned a little bit about pesticide, a little bit about planting trees. But let's make a list because I'm curious what your recommendations are. Listeners out there are, no doubt, hungry to hear so that they can change their own practices, but perhaps, work with others in their area to change their practices as well.

Guest 18:01

Well, I think that the most important thing for any homeowner to do is to diversify their landscape with pest-resistant or pest-sprayed plants. Here in Lexington, Kentucky, we have way too many pest

magnets in the landscapes, things like boxwoods that have multiple key pests. We plant a lot of things that are susceptible to Japanese beetles. And some of our lawn grasses are very susceptible to grubs. So, we can really replace a lot of those pest magnets with plants that are pest-free, and in fact, are pollinator magnets. It starts with plant selection, diversify landscapes with pest-resistant plants. Some of those plants don't necessarily have to be native. There are plenty of non-native plants that are not invasive, that are very tolerant of environmental stress. They don't get very many pests. And a lot of those plants are also quite good for pollinators. So, I'm not a person who necessarily ascribes to the old native model of landscaping, although, I do ascribe to avoiding anything that could potentially be invasive. But I think a balance. Diversify. I certainly think we need to start to think about reducing inputs to lawns, which are a big issue. And I think promoting the tolerance of, particularly, clover in lawns, backyards, and educating people about the benefits of these types of sites for connectivity and urban landscapes and helping pollinators. Also, reducing the need for water and chemical inputs is very, very important. So, another thing that we've tried to do is to raise the public's awareness of having a few spontaneous flowering plants in a lawn is not a big deal. I know there are very strong normative pressures in some communities to have uniform monoculture turf grass lawns. But we did the first survey to go out and look at the types of pollinators that visit dandelions and white clover in municipal lawn settings. And we've documented dozens and dozens of different species of bees, butterflies, and other pollinators that visit these, so-called, long weeds. That paper has become one of the most widely shared papers on social media ever published in the Journal of Insect Conservation. And I think just by calling attention to the fact that these, so-called, weeds actually serve a role, we can increase people's tolerance of allowing some flowering spontaneous long weeds or plants like clover or daisies or so on in backyards, at least. And that, again, will help with promoting connectivity and supporting pollinators. If only 10% of all the homeowners in the United States would convert a portion of their backyard to a pollinator habitat, it would make an enormous difference in terms of helping to support urban pollinators in particular. So these are the things we've been trying to promote. But if I were to say the single most important thing it would be to diversify with pest-resistant plants. Now, another thing I try to talk with people about is that not all insecticides are the same. And one of the things that we've focused on for many years is evaluating the pros and cons, the strengths and weaknesses of alternative insecticides, ones that can be used to manage the pests with reduced risk to pollinators. And we have been able to identify a number of products that work equally well, or sometimes even better, that are much less of a hazard to pollinators and the products that were industry standards, say, 10 years ago. And I think that's a big win, too. And then we do a lot of extension teaching as well. We do research, I'm an 80% research scientist, but my students and I talked to tens of thousands of stakeholders every year, where we tried to extend our research in a way that the people would receive it positively and be able to use it.

Amy 22:38

Yeah, I think those are really great points. And something that I did want to mention was, you know, you're talking about diversity in the landscape, and of course, everywhere is going to look different and everywhere, you know, has different plants. Here in Florida, we have something called Florida friendly landscaping, and the number one principle is the right plant in the right place. And so, you know, I wanted to remind our listeners that if they were looking for landscape plants that did well in their areas, they could contact their local extension office, at least here in the United States. We've got extension offices in every state and in just about every county, and so, I would highly encourage everyone to

contact your local extension office, just to see if they have a list of landscape plants that would do well in your area.

Guest 23:22

Yes, I agree. I guess I scrubbed the philosophy that we should emphasize native plants in urban landscapes, but it's okay to include some non-invasive exotic plants, particularly ones that bloom early and late in the growing season, because in Kentucky, most of our native plants bloom during May and June. And some of those non-native plants that are relatively pest-free and not known to be invasive can fill in the seasonal gaps for floral resources and pollen and nectar and can be really valuable in sustaining honey bees and bumble bees and other bees throughout the growing season. So, a little bit of diversity as far as flowering phenology is very important in supporting our pollinators through the whole growing season.

Jamie 24:14

I really agree with both of you completely. You know, there's been a huge push over the last decades of focusing on lawns and well-manicured grasses in the backyard, but with these pollinator plants, these things, employing the strategies that you're talking about, Dr. Potter, it brings diversity to your yard and it brings a lot of people happiness to see all of this, right? And when you've got plants that are blooming throughout the year and you've got butterflies on them all the time, bees on them all the time, you know that you're really doing something that's of value. And I like that idea about connectivity as well. You know, if you're an island in a suburb or a subdivision, and you're the only one planting for pollinators, it's a bit drab, but if you can talk lots of neighbors into doing the same, now we get these patches and you can start having connectivity to these patches and really benefit pollinators a lot in the long-term. Dr. Potter, I think the type of work that you're doing through your research and extension programs with your students is really great and really needed. And it sounds like it's just one of those things that I feel is going to continue to grow, you know, well into the future, as folks continue to look at this issue of pollinator declines and how we can manage to stop that.

Guest 25:21

I think so too, Jamie. It's really an exciting area to be involved with so many opportunities. And I think we are making progress, it might be baby steps, but we are making progress. There are still some big issues that need to be addressed. The backyard mosquito spray issue is one that is sort of above my pay station. I'm not quite sure how to resolve the issues of the problems caused by mosquitoes and how to manage them on individual residences, and protecting pollinators at the same time. Of course, we really need our products we can use to control mosquitoes that don't harm bees. And that's the Holy Grail, along with other pesticides. We have had success in finding insecticides that can control white grubs in the lawn, Japanese beetles, other pests that are not harmful to pollinators. And that's a big win, I think. Certainly, one of the things I'm most proud of is having done the research to identify alternative products that the industry can use to protect people's landscapes, but also do it in a way that's compatible with our pollinators.

Jamie 26:36

Well, Dr. Potter, maybe it's not an appropriate time to retire. Maybe you could stay on again to keep this work up well into the future.

Guest 26:43

Well, I hope to continue to be involved in the community leading insect walks in our local arboretum, or perhaps other types of service activities. Lots of folks in our community are interested in planting monarch butterfly gardens. That's another thing we've done a lot of work on, on how to set up a monarch butterfly garden so the monarchs are more likely to use it. So, I'm looking forward to some volunteer work as an entomologist as well. But I won't miss the paperwork and other academic things that one has to do just to get the funding to do the research, which is always difficult. But working with students and I think working with stakeholders has been just such a pleasure over 42 years.

Jamie 27:32

Dr. Potter, congratulations on a very distinguished, accomplished career. I'm so grateful that you joined us on Two Bees in a Podcast to talk to us about an issue that is so important to us here at University of Florida, as well as our listeners all around the world. You know, we, of course, work with honey bees, specifically, but I always argue anything that you can do for the benefit of pollinators is going to benefit honey bees, and I know our beekeepers out there can really appreciate it. So, Dr. Potter, thank you so much for joining us on Two Bees in a Podcast.

Guest 28:02

Well, thank you for inviting me. It's been a real pleasure and a lot of fun.

Jamie 28:07

Everyone, that was Dr. Daniel Potter who's a professor of Urban Landscape Entomology in the Entomology Department at the University of Kentucky. Thank you for listening to this segment of Two Bees in a Podcast.

Amy 28:26

You're listening to Two Bees in a Pod, brought to you by the University of Florida's Institute of Food and Agricultural Sciences Honey Bee Research and Extension Laboratory. Today, in our Five Minute Management, we are talking about fungal pathogens. Jamie, I think, I don't even know all the fungal pathogens, I think. So, maybe you can just take the next five minutes explaining to us what they are. Ready? Let me know when the timer, let me know when to start.

Jamie 29:08

I'm ready. I'm ready.

Amy 29:09

Ok, and go.

Jamie 29:12

Alright, so there are quite a handful of fungal pathogens that affect honey bee colonies. Some of them, we don't really have in the US, or they're not significant problems in the US, something like Stonebrood right? But there are three fungal pathogens that I do want to discuss. The first of those is Chalkbrood disease. Now, as the name implies, this particular fungus infects and kills the developing brood. And as that fungus takes over the immature bee's body, it turns it, first, to a chalky appearance, hence Chalkbrood, and then, it starts to discolor and become yellow-orange-ish and then brown, and then once the fungal spores are all over the outside of the dead bee's body, it can be almost pepper black in color. So, Chalkbrood kills those developing bees, and a lot of beekeepers always assign a particular sign of disease to this and that's what they call rattle, frame rattle. If you pick up a frame and gently shake it, you can hear those Chalkbrood mummies shaking around in the comb. So, the dead individuals are called Chalkbrood mummies. The adult honey bees tend to be pretty good at removing these individuals from the comb, so when a colony is heavily infested with Chalkbrood, you will often see piles of these mummies on the bottom board of the hive or at the front entrance of the hive or on the ground outside the front entrance of the hive. Chalkbrood is one of those problems I don't see as commonly anymore. Many of the queens that we have produce Chalkbrood-resistant individuals, the more hygienic a bee is, for example, the more likely it is to be able to combat Chalkbrood. So, bees are very hygienic, you tend not to see them in your hives. So, if you have a Chalkbrood problem, a general recommendation is to requeen the colony to get a less susceptible strain in there. Chalkbrood can be spread between colonies as beekeepers move frames around. And it can be promoted by certain in-hive conditions, such as low ventilation or a buildup of moisture in the nest. So, we oftentimes tell folks to keep their bees out of low-lying areas where cool, moist air collects. I don't consider Chalkbrood a major problem, but I have seen it be pretty bad in colonies before. And so, that leaves me about three or so minutes to talk about what really are the bigger fungal issues that bees face. And those are the two *Nosema* diseases. Now, *Nosema* is a single-celled fungus belonging to a group of fungi called microsporidia. And back in the days when I first learned about *Nosema*, it was considered to be a proteus. Now, it is considered as just a subset of fungus, a type of single-cell fungus. And *Nosema* is honestly one of those fungal pathogens that most beekeepers, which most beekeepers are familiar. Amy, there's two species that we have predominantly in the US. That's *Nosema apis* and *Nosema ceranae*. And when I was growing up keeping bees, *Nosema apis* is the one that everyone thought we had, and they discussed it. *Nosema ceranae*, for all accounts and purposes, has nearly completely replaced *Nosema apis*. So, when we look at *Nosema* in our colonies, it's almost always *ceranae*, rather than *apis*. Both *Nosema* pathogens build up in the midgut of the bees. The bees eat something that have the spores in it, the spores go into the bees, and they out-compete the bees for the nutrition that the bees are taking in. So, you get a lot of problems that look like, historically, nutritionally stressed bees. You get colonies that die prematurely with *Nosema apis*. A lot of folks would say that fecal streaking was a very common sign of infection. By that, they meant when an infected bee would fly away from the hive to defecate, the moment they would leave the entrance of the hive, they would defecate, so you get these fecal streaks on the front of the hives. It's questionable whether or not that's an actual sign of infection, but for sure, it doesn't seem to be associated with *Nosema ceranae*. So, there's a lot of research at the moment trying to figure out how bad *Nosema ceranae* is. Some folks think it's terrible. Some research suggests that it's really bad for bees. Other folks suggest that it's only a minor nuisance. I know that in Florida, where we look for it in our colonies, we find it in almost every colony we look. It's a very common problem. But the big question is how bad is it? What does it do to

our colonies? And worse yet, and the most difficult question of all is, how do you control it? There's really only one product labeled for use on the market to combat Nosema, and it's a fumagilin-based product that you mix in sugar water, feed to bees, according to the label, of course, and it's supposed to help against Nosema ceranae. But, you know, I know a lot of commercial beekeepers who think it's a big problem and they treat for it and a lot of commercial beekeepers who don't think it's a big problem and never treat for it. So, it's one of those things that we really need to know a lot more about. But that's the best that I could do in five minutes going through three pathogens that almost every beekeeper in the States is going to encounter at some point, for that matter, a lot of beekeepers around the world.

Amy 34:44

Yeah, well, you were very close. You almost made it in five minutes. You didn't, but that's okay.

Jamie 34:48

Oh, what was the time?

Amy 34:50

You went like 30 seconds over.

Jamie 34:52

You should have stopped me.

Amy 34:54

I'm not going to do that. It was still good information. I think, you know, what we should do is have a segment on it some time, just discussing the three, and, you know, maybe just talk about, well, you've already done it, but talk a little bit more in-depth about, you know, maybe the concerns that beekeepers have versus some of those that don't have that concern at all.

Jamie 35:13

Amy, you're absolutely right. I will tell you that each of these three really needs its own podcast episode because a lot of people get really worked up about Nosema ceranae and Nosema apis. We happen to have an expert here at the UF Honey Bee Research and Extension Laboratory, right? Dr. Cameron Jack is an expert on Nosema, so, we definitely need to go into great detail about these for the benefit of our beekeepers.

Stump The Chump 35:44

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

Amy 35:58

Welcome to the question and answer time. Jamie, we've got three questions. And I'm really excited about you answering these because I've received a lot of emails about all of these recently, for some reason, from multiple people.

Jamie 36:11

Well, good. Hopefully, I can get these questions answered correctly.

Amy 36:15

I hope so too. Okay.

Jamie 36:17

So do our listeners.

Amy 36:19

So, for the first question that we have, you were talking about some of the methods of storing drawn comb after extracting honey. Something that you had mentioned, that you did not mention, I'm sorry, was that they were wondering what your opinion was of using BT, which is *Bacillus thuringiensis*, is that how you say it?

Jamie 36:40

Perfect. Good job. Well done.

Amy 36:41

Thank you. You did not talk about using that, spraying onto combs prior to storage. You know, can you, first of all, I guess, just tell us what that is, why beekeepers would use it, and then what your recommendations are?

Jamie 36:52

Sure. So, *Bacillus thuringiensis*, or more commonly called BT by its acronym, is a ground dwelling bacterium that when an insect eats it, it releases a toxin that kills that insect. Alright, so, it's one of those things, when people talk about BT, they get real nervous, but it's also related, in many ways, to GMO crops and things like that. But specifically, BT in this regard, the toxin produced by BT varieties can vary and so, it can be toxic only to moths or only to beetles or, you know, only to mosquitoes etc. So, as a result, BT has been used as an insecticide for different insects. And so, there is a labelled product called Certan that you can purchase. And it is a BT concoction that, if you follow the label, I believe it has you spraying on the combs. And the idea is if wax moth caterpillars eat the comb, they ingest the BT, which release the toxin, and then ultimately kills the wax moth. So, it's a really environmentally friendly biological control, essentially, of the wax moth. So, there you go.

Amy 38:09

Doesn't it make their stomachs explode or something like that?

Jamie 38:12

It does cause problems in their gut. That's right. It basically causes them gut issues. And so, that's how they die.

Amy 38:18

Interesting. Well, so, the other question I had related to that was that the individual, and this is a separate person, but they were asking, you know, how can it only affect the wax moth larva and not honey bee larva?

Jamie 38:31

So, there are different strains or different varieties of BT, and they all make different toxins. And the toxins turn out to be specific either to beetles or mosquitoes or black flies, caterpillars, moths, etc. And so, I have read refereed manuscripts where people have isolated the toxins for the variety of different BT toxins, and fed them directly to honey bees and were unable to get a response. And so, it looks the evidence strongly suggests the ones, of course, that are working against wax months have no impact on bees, right? Otherwise, it wouldn't be labeled for use in bee colonies. But that's a common question that folks bring up, is well, how do I know it's not going to affect my bees? Or how does it only affect wax moths and not beetles? Well, it's because of the specificity of the toxins. You know, there's been research, a lot of research on BT and it pops up in a lot of different places for various types of insect control.

Amy 39:23

Awesome. Okay, so for the second question, there was a recent publication that came out, and they had this video as, you know, part of their results that showed a honey bee eating a mite from a cell, and I think the might was a female, right? And so, I guess, you know, what's happening in this article? We'll definitely link this article on our show notes on our website so our listeners can read this, but do honey bees eat mites from cells?

Jamie 39:54

Yeah, so I had not seen the video myself. So, like you said, a listener linked a video for us. I went and looked at the video, and we'll make sure to have all this in our show notes, and then I went and read the refereed manuscripts that resulted from the study. It turns out that there are two individuals I know from Oberursel Bee Lab in Germany, Paul Siefert and Bernd Grünewald. And in their laboratory, they were doing a lot of video work on how bees behave, right? And so, we know a lot about bees, we know a lot about their behavior, but frankly, we don't know everything that we think we know. So, basically, they were filming bees, you know, just for a very long time, and then trying to go look at behavior and discover some new insights. And they've got this one segment of the video where an adult worker emerges from her cell with a couple of adult Varroa females on her. And then, another worker bee comes into that cell, starts cleaning the cell, like exactly like what you would expect, the cells get cleaned before the queen comes and lays another egg, and then a second worker comes in and discovers an immature female Varroa. So, we know it's a female because she's got the shape of a female and the size of the female. But we know she's immature because her exoskeleton has not hardened. It hasn't sclerotized, so she's still kind of white in appearance. So, the worker bee that comes in to clean that cell almost flips that mite over and then starts chewing on the underside of the mite. So, the question is, are they consuming this mite purposely, right, for nutritional purposes? Or is this just part of their hygienic behavior? And frankly, it's possible both answers are possibly correct. We know that worker bees exhibit hygienic behavior. We know we have undertaker bees, we know we've got cell cleaner bees that will go in and ready cells after bees have emerged from them. So, it could be simple

cleaning behavior. But, I will tell you, honey bee workers are remarkably energy efficient. We know, for example, when there's pollen dearths, the workers can go and eat the brood to recover the protein that's stored up in the eggs and the young larvae. They'll cannibalize their young.

Amy 42:03

Okay, I didn't know that.

Jamie 42:05

Yeah. Well, I know it's crazy, isn't it? So, I have no doubt that it is possible that during the cleaning process, when they're cleaning cells and getting rid of immature mites that can't survive, I have no doubt that it's within the realm of possibility that worker honey bees can eat them as part of the cleaning process just to take the protein, or maybe they're just attacking them and when the entrails get spilled, they decide they want to eat them. So, I don't know that we know that part with certainty. What I will say, when I read the manuscript and watched the video, it does, certainly, look like they're taking tissues into their bodies from that mite. And again, it could be part of just the hygienic behavior. It could be a part of an effort to recover protein but it is common enough that worker honey bees will cannibalize soft tissues, you know, from eggs and young larvae, again, in certain dearths, and maybe just part of the removal process is all of that with Varroa. So, I look forward to seeing as more light is shed on this particular topic. I guess, what I'm saying at this point is I'm a little afraid to commit one way or another, but it's certainly within the realm of possibility that this worker bee was eating that mite as she's trying to simply remove her from the hive.

Amy 43:24

Yeah, I'm excited to see what future research happens with that.

Jamie 43:28

Amy, I will tell you, when I was a PhD student in South Africa, I did a lot of my work with observation beehives. I learned so much about bees during those three years by just watching them. And I will tell you that there's no doubt in my mind that there are things that we just don't know yet that bees do. Because a lot of folks have just kind of quit watching them. We measure things that aren't at that level. So, I want to applaud my colleagues at the Oberursel Bee Lab in Germany for doing this work and shedding some new insights and behaviors that we need to try to understand.

Amy 44:06

Yes, absolutely. Okay, so for our third question, this person was wondering if a previously mated queen, so, a queen, after she swarms, is it possible for her to go on a new mating flight? And would she, I mean, would she even have a reason to do that?

Jamie 44:23

Yeah, interesting question. So, I have never seen literature evidence that queens will take a mating flight later in their life. Everything that we've seen suggests that they do at the first few weeks of their lives, usually one or two mating flights and that they collect all the semen they'll ever need at that time. So, even if that queen is new this year, let's just, you know, come up with a standard biology of a

colony. You got this colony that swarms, the old queen is gone, let's just forget her. That colony, then, is investing in the production of a new queen. Let's just say that for the sake of argument, this is arbitrarily in April and swarm season in most of temperate world is happening, at least in the northern hemisphere. So they swarm in April, the old queen is gone, you got this new queen, she mates the first two weeks of her life. She's not likely to swarm with that colony until next year's April, right? So, she'll be a year old by the time she goes out with a swarm. So, the questioner is basically asking once that new swarm establishes a home, they find a new nest site and move into it, is there any evidence that that queen will go out and mate again? And there's just no evidence of that at the moment. All the data suggests that she is more than capable of collecting all the semen that she needs upon her first, you know, mating flight period early in her life that she'll never have to do again, even if she's two or three or four years old. Of course, it's less and less likely that they'll be that old, but, nevertheless, that's the spirit of the answer, is that no, there's no evidence currently now. Every time I say there's no evidence, or I've never seen it, people will always look up a referee manuscript and kick it to me. So, what I've discovered with bees is I try my best to not say never. So, you know, it's biology. I wouldn't be surprised if somebody someday didn't show that maybe there was a subsequent mating flight. But I would say the overwhelming evidence suggests now that they mate within the first couple of weeks of their lives and never have to again.

Amy 46:28

I think that's totally fair. And I'm going to go ahead and just, you know, try to promote some of our programs. You do a really good talk on queens and swarms and prevention and queen biology. So, I would encourage everyone to visit our website to check out some of our short courses that we have on some of the topics that you're asking about. Hi, everyone, thanks for listening today. We'd like to give an extra special thank you to our podcast coordinator, Chelsea Baca, and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible.