Season 3 Episode 11 – Aloha from Alabama Extension!

September 14, 2023

Announcer:

The Alabama Crops Report Podcast, your trusted information source for Alabama agriculture.

Scott Graham:

Hey, everybody. Welcome to another episode of the Alabama Crops Report Podcast. Scott Graham and Amanda Scherer here today. Amanda, how's it going?

Amanda Scherer:

It's going pretty well. We're recording as of June 21st. We've definitely had a wet season so far, so definitely curious to see how this progresses disease-wise for me, as a plant pathologist, and how it impacts insects here in Alabama. But I hear we have some interesting guests on today. It's kind of a treat for our listeners, Scott.

Scott Graham:

Yeah, we do. We've got some colleagues and friends from the University of Hawaii that are on with us today, so we're excited to have them on. We got a big group of folks, but I think we're going to be able to go through it. So, I'll just run through a couple of names and introductions real quick. First, we have Dr. Koon-Hui Wang from Hawaii; a couple of graduate students, Landon Wong, Melanie Pitiki, and Nico Sylvester; and then we've also got Auburn's own Dr. Kathy Lawrence; and a graduate student here at Auburn, Claire Schloemer, as well. So hey, everybody, welcome to the podcast.

Kathy Lawrence:

Good to be with you all.

Scott Graham:

All right, so let's start just real quick. I guess I should mention, this is actually a USDA-funded project that we're going to talk about today, focusing on organic production of sweet potatoes. So Kathy or Koon-Hui, if one of y'all would like to take just a second and kind of tell us how this joint came between Auburn and University of Hawaii?

Kathy Lawrence:

Koon-Hui, go ahead.

Koon-Hui Wang:

Koon-Hui, so hi. So yeah, we are working together because both Alabama and Hawaii, we kind of have a small-scale sweet potato production, and we have a special new type of sweet potato produced in Hawaii. Mostly, we are growing Okinawan sweet potato, but Alabama has other variety, but we are both challenged by lots of new invasive species. Sweet potato is one of the most important vegetable crop produced here. And so, sweet potato is challenged by multiple pests and pathogens. We are seeing a decline in the soil health, and also we grow more decline the crop yield. And so, we thought we want to particularly address some problem, challenge by organic farmers that like to grow sweet potato well in Hawaii as well as Alabama.

Scott Graham:

Thank you. That's interesting. Such a neat collaboration there. And I don't know, Kathy, if you or Claire want to talk from an Alabama perspective for our listeners, what are some of our more challenging pests that we deal with?

Kathy Lawrence:

On the nematode side, in Alabama, we have a lot of root-knot nematodes that attack those poor old sweet potatoes. We also have some reniform, which will, but in our area it's more root-knot. And Koon-Hui has the reniform that really attacks them in Hawaii. Now, Claire, you can tell them about all the insects that we ran into.

Claire Schloemer:

Yeah. So on the insect side, there's a lot of things that like to eat our sweet potatoes, including this complex that we call the WDS complex, which is comprised of wireworms, Diabrotica, which is like flea beetles, and Systena. So it's basically like the larval stages of those pests like to eat our sweet potatoes when they're in the soil.

Scott Graham:

And soil pests certainly can be a challenge to control, particularly when you think about the focus of this grant is organic production on top of that. So that definitely is something that we need some research and answers on. We don't really have a lot of conventional products, let alone organic products for control of those types of things.

Kathy Lawrence:

And in Hawaii, just to let you know, they've found some sweet potato weevils that we don't really seem to have. So I know Landon there has been having a great time with his sweet potato weevils.

Claire Schloemer:

Yeah, so that-

Scott Graham:

Yeah. Landon, would you like to update us a little bit on what you're seeing with sweet potato weevils in Hawaii?

Landon Wong:

Sure, but I think that Dr. Wang Has something to add on the previous question first.

Scott Graham:

Okay.

Koon-Hui Wang:

In Hawaii, besides the sweet potato weevil, that Cylas formicarius, we also have two other new invasive species that came in pretty recently. Rough sweet potato weevil, which is Blosyrus asellus, and West Indian sweet potato weevil, also bore inside the roots of the sweet potato. That will make the roots inedible. So yeah, we have a slightly different type of... So we call this a sweet potato weevil complex between three of them, but pretty challenging, I think.

Kathy Lawrence:

So, they have it much more. They have more complex. Where in our area, I think, Claire, we only found one sweet potato weevil.

Claire Schloemer:

Yeah, we only found a few sweet potato weevils. We were trapping for them using pheromone traps throughout the entire season, but we only found maybe like four or five of them at harvest.

Scott Graham:

Hopefully, we'll keep it that way.

Kathy Lawrence:

Yes.

Claire Schloemer:

Yes, exactly.

Scott Graham:

So, Landon, can you tell us a little bit about the sweet potato weevil from what you found and the challenges of controlling it?

Landon Wong:

Sure. So as Dr. Wang explained, we have Blosyrus asellus, the rough sweet potato weevil, which dwells on the outside of the sweet potato. We have the West Indian sweet potato weevil, which is Euscepes postfasciatus, as well as Cylas formicarius, the standard sweet potato, the common sweet potato weevil that we find in many different localities around the world. While the latter two dwell inside the sweet potato, and the Blosyrus asellus, the rough sweet potato weevil, lives on the outside, they all dwell within the soil. So fortunately for us, their approach to controlling them is fairly similar. So, there are some challenges, given that they're actually inside of the tuber. And so, therefore, in terms of organic management, we need to have biopesticides that can actually go into the sweet potato.

Some of the approaches that we have done are in regards to entomopathogenic nematodes and entomopathogenic fungus. In terms of biopesticides, we use two species of entomopathogenic nematodes, Heterorhabditis indica and Steinernema feltiae. In the lab, these have been shown to cause mortality of around 80% of the sweet potato weevils when tested in Petri dishes. And the dose is about 10 nematodes per larva, which is a very low dose, so this shows there's a very high potential for these when applied into the field.

And we also have been looking at entomopathogenic fungi, which, in other studies, have been shown to be very effective at controlling the sweet potato weevil as well. But we're also looking in particular at their ability to grow as an endophyte, and they may have beneficial properties for the overall growth of the sweet potato as well. Those are just some approaches that we've been using to organically manage the sweet potato weevil and benefit the sweet potatoes.

Scott Graham:

That's interesting stuff there. Just for our listener's sake, an entomopathogenic nematode is just simply a nematode that instead of going after the sweet potatoes, they go after the insects instead.

Kathy Lawrence:

That's correct, that's correct. In Hawaii, they have to grow their own. But here in the United States, we can buy them.

Scott Graham:

So, if you-

Kathy Lawrence:

Claire has bought several different species, and we've watered them in, in the field.

Scott Graham:

So if anybody is interested in getting some here, we can just order them online, and they'll ship them to you, and away you go.

Amanda Scherer:

Kathy, one of the things that you mentioned that I thought was interesting is that in Hawaii, they have more of the reniform nematode, whereas in Alabama, we have more of the root-knot nematode. Koon-Hui, you can also chime in on this, but how can producers, how do they currently manage those two pests? And where do you think the biggest need is in terms of management, in terms of lack of knowledge for producers?

Koon-Hui Wang:

Yeah, sure. So farmers usually, for weevil problems, that has more experience, they will rotate their field from one side to another, not necessarily using cover crop. A few of them start using sunn hemp as a cover crop because sunn hemp produce allelopathic compound that can suppress reniform and root-knot nematodes, and then they'll rotate it. But there are actually many other cover crop that has allelopathic impact against both reniform and root-knot nematodes. And so, in this project, we are testing some of them, including sorghum. Velvet bean is another good potential tropical cover crop that has suppressive effects against nematodes, as well as marigold.

So, we did a trial comparing all of these four cover crops together. We find that irrigation needs is another issue, that the reason why many of our growers doesn't want to adopt cover cropping is they don't want to expend so much irrigation for two or three months without a cash crop. We find that out of these four cover crop, velvet bean seems to be the one that you can just irrigate for the first two to four weeks. When you stop irrigation, the biomass production, it's similar to if you were to water them every week at your cover crop termination. So we also like this, as it promote soil health while growing this different tropical cover crop that can increase soil carbon content. And so, some of the results that Melanie can share with you is the interest in increasing crop soil carbon. So, I will let Melanie cover that.

Melanie Pitiki:

All right. So from all the cover crops that we have tested so far, it turned out that velvet bean seemed to be a versatile cover crop that is not only drought-tolerant, as mentioned by Dr. Wang, from two weeks, eight weeks irrigation timing. And so, it produces an abundant biomass. There is about nine times per acre within two and a half months of growth. This led to it producing the highest total carbon content in the soil out of the other three cover crops that were also tested in this trial.

Velvet bean also accumulated the highest ammonia nitrogen in the soil, which is a form of nitrogen that is available for plant uptake, and that is less likely to leach in high-uptake soils, as in the soil conditions that we have in Hawaii. So, velvet bean is one of the crops that we would want to focus more on in our future experiments.

Koon-Hui Wang:

All right. Could we-

Kathy Lawrence:

And in Alabama, if we grow sunn hemp or a velvet bean, it's a summertime, so it's sweet potato or the cover crop. So Claire has been focusing here on the winter cover crops. If you want to tell them, Claire, your best winter cover crops?

Claire Schloemer:

Sure. Actually, our best winter cover crop was a mix of cover crops. It was Elbon rye, crimson clover, Daikon radish, and wheat. That actually resulted in a big yield benefit. We saw that the yield following using that cover crop mix was over 8,000 pounds per acre, which was a 2,000 pound per acre increase over the fallow, which is pretty impressive. We think that's because the mix is kind of synergistic with the clovers increasing that soil nitrogen, and then our other cover crops, like the rye and the radish, reducing our nematode populations.

Scott Graham:

That's a pretty significant yield bump there.

Amanda Scherer:

Claire, this might be a good question for you. For our listeners, why would you look at a cover crop? Is it mainly they're not a good host for the nematodes? Do you want to talk a little bit about their host range and how that impacts management decisions?

Claire Schloemer:

Sure. If you're a grower that has nematode problems, it's really important to take that into consideration when you're selecting a cover crop, because if you select a cover crop that is a host to the nematode that you have, you could be increasing your populations and creating bigger problems for your following season. But if you

select a cover crop that's not a host, you could have the opportunity to reduce that nematode reproduction, leading to lower populations for your cash crop or sweetpotato season.

Amanda Scherer:

One additional kind of follow-up question to that, just coming from row crops, in cotton and peanuts where I do a lot of my research, producers will utilize not only cover crops but also crop rotation. To manage the peanut root-knot nematode, they'll rotate to cotton. Are there any good crop rotation partners that producers can utilize in Alabama for sweet potatoes?

Kathy Lawrence:

That is more difficult because with our root-knot nematode, they could try to go to peanuts, and that's a sandy soil, and that would help. But if they've got the southern root-knot, incognita, that's going to be those issues. They have to go into that cotton, would be it. So they do have options of cotton or peanut, but they need to know which root-knot they have to be able to do that.

Koon-Hui Wang:

Working in Hawaii, sometimes we're actually rotating sweet potato with corn. That is mainly when they don't have too much root-knot problem because corn is a non-host for reniform. But eventually, they will still develop a root-knot nematode population, and then they have to switch side back for their crop rotation.

Kathy Lawrence:

That's true. Our corn is a great cover crop for reniform fields but not for root-knot.

Scott Graham:

We've talked about using EPNs or entomopathogenic nematodes. We've talked about cover crops. What else? I know we're looking at some, I guess, biological or organic pesticides as well to try to help. Anything we ought to talk about with that?

Kathy Lawrence:

In Alabama, we added Majesty.

Claire Schloemer:

We used a three-way mix of three species of entomopathogenic nematodes, the biological product Majesty. And then, we also used a mycoinsecticide or a fungal insecticide called Beauveria bassiana, but pretty much, we saw that it did not reduce insect damage incidents compared to the untreated plots. So, we would suggest farmers save their money on those products.

Koon-Hui Wang:

Over here in Hawaii, previously, we tried out a crystalline neem product. One product is called Molt-X. We can suppress some certain insect pests in the soil, but we find that if we inject the Molt-X into the irrigation drip line monthly, following after previous cover crop of sunn hemp or velvet bean, we also see there a reduction in the reniform nematode problem, in part because reniform nematode is not challenging nematode to control, because under unfavorable condition, they will survive in an anhydrobiotic stage. But by planting sunn hemp, we will force the reniform nematode to come out from their survival stage. And then, following by neem oil product on propagation or chemigation, we can suppress the worm form of the reniform nematode much easier than it were if we didn't plant the sunn hemp. So, integrated task management approach can also be a effective way to control reniform nematodes.

Scott Graham:

Well, thank you. This has been great information. It's been pretty interesting to hear about the great collaboration between these two universities and the work we're doing. Is there anything else we need to cover? Anything we missed that y'all would like to bring up or talk about?

Kathy Lawrence:

We're doing it again this year, so we'll see if our results turn out the same.

Landon Wong:

I did want to kind of add on to the cover cropping with Melanie's one. One of the interesting findings that we found with our cover cropping studies is that with velvet bean as well as the sorghum, or sorry, sunn hemp, we find that the incidences of Metarhizium and Beauveria infection actually increase when we look at the soil. And so, this might be notable in [inaudible 00:16:50], especially in terms of having a naturally-occurring pressure against our pests that we're trying to control.

Scott Graham:

Interesting. Yeah, that Beauveria bassiana, anyway, is one that we're familiar with over here. It does a good job of controlling some above-ground pests like kudzu bugs and things like that in our soybeans. So it'd be great if we could kind of create an environment to where it's more present for when it's not following the insects, but it's kind of there when the insects show up.

Claire Schloemer:

For sure. We didn't really see that benefit here in our Alabama plots this year, but we applied that product via like a foliar spray. So this year we're going to apply it using a watering can, or more of like a drench treatment, to hopefully get that product more into the soil, which is where those problematic pests are in our sweet potatoes.

Koon-Hui Wang:

If I may add, so also, in addition to what Leonard said, our preliminary data showed us that velvet bean residues also increase the frequency of us baiting one of the entomopathogenic fungi, Metarhizium, in the soil. We used wax on baits to bury them in the soil to trap the fungi, which is also a good fungi. And so, out of the baited cover crops, velvet bean increased the colonization of Metarhizium from the soil. And so, further work could be done on that. And in addition to our plants that Beauveria bassiana then was applied, did not reduce pest damage on the weevil complex that we had. So, focusing on velvet bean and on the use of Metarhizium will be one approach that we will focus more on.

Nico Sylvester:

And then, something I'd like to add is our lab working with Dr. Sipes, we're currently developing an application system for EPNs, particularly for Steinernema feltiae and Heterorhabditis indica. We're using waxworm larvae and mealworm larvae that have been previously infected. So waxworm, we're infecting with H. indica. And then with mealworms, we're infecting with Steinernema feltiae. And then we're taking the cadavers 48 hours after infection, so after they pass, and then we're placing them into glass desiccators and filling that with a saturated solution of potassium chloride. And what that does is that it reduces the relative humidity within the glass desiccator to about 85%, and we hold that for about two weeks.

The purpose of this is that it dries down cadavers, because when you're trying to use the cadavers fresh, or just kind of sitting in room temperature after two weeks, they fall apart really easily. They can easily bust open, and that kind of defeats the purpose of using cadavers, which is to protect the EPNs from desiccating conditions, like direct desiccating, conditions, UV radiation, which can lower the effectiveness of EPNs. Since most EPNs are applied in a spray or a liquid application, you're directly exposing those to desiccating conditions and UV radiation. What we're trying to do is to extend the shelf life of bombs so that growers here in the state of Hawaii can essentially hold onto them for the long term. And they're easier to handle, so they don't end up breaking up in your hand when you're applying them to the field.

Amanda Scherer:

That's very interesting, Nico. I mean, anyone that's worked with biologicals or anything, especially in an organic production as well, know that getting those out in the environment is sometimes the biggest challenge. They'll work very well in vitro or in controlled conditions, but then when they get to the field, that's probably the biggest challenge. So, I'm really curious to see what you guys find with that. That's a really interesting approach to do it. I hadn't heard of that before.

Nico Sylvester:

I think it ends on, we should be getting data towards the end of July. On my field, this came close to harvesting, so we've done those applications. We can't take credit for the use of cadavers. Dr. Shapiro Ilan, back in 2012, did develop that method, but we are building on the method of desiccation for longer shelf-life.

Scott Graham:

All right, awesome. We'll be looking for that, so all right.

Well, we appreciate y'all's time today. Again, I just think very interesting. Glad y'all were able to come on and kind of give this update here. Again, I think it's a very unique collaboration, both in terms of the project and between our two universities. Again, thank y'all. And we'll take a second just to thank our listeners for tuning in. If anybody ever has any questions or comments, please don't hesitate to reach out and let us know.

Announcer:

The Alabama Crops Report Podcast is a production of the Alabama Cooperative Extension System and is sponsored by Alabama Ag Credit.