

Southern Fruitcast Ep. 17 – Cane Blight and Other Diseases with Dr. Jonathan Oliver

[00:08] Aaron Cato

Thanks for tuning in to the Southern Fruitcast. This podcast aims to cover the people, technology and latest developments in small fruit production in the Southeast.

[00:16] Amanda McWhirt

We are brought to you by the Southern Region Small Fruit Consortium and the University of Arkansas System Division of Agriculture.

[00:23] Aaron Cato

I'm Dr. Aaron Cato, extension specialist for Commercial Fruit and Vegetable IPM at the University of Arkansas.

[00:29] Amanda McWhirt

And I'm Dr. Amanda McWhirt, extension production specialist for fruits and vegetables, also at the University of Arkansas. All right. Welcome back to the Southern Fruitcast today. We have Dr. Jonathan Oliver with us. He is an assistant professor and fruit pathologist at the University of Georgia. His research and extension program focuses on pathogen biology and disease management of fruit crops grown primarily in the southern part of Georgia, including small fruit crops such as blueberries and blackberries. We brought Jonathan on today to discuss his experience working with one of the most serious issues in the Southeast for cane berries, which is cane blight. Jonathan, thanks so much for joining us today.

[01:09] Jonathan Oliver

It's great to be here. Thank you.

[01:10] Amanda McWhirt

So let's go ahead and jump right into cane blight. Could you help our listeners understand better what cane blight is and maybe comment on some other disorders that resemble cane blight?

[01:20] Jonathan Oliver

Yeah, sure. So cane blight is a disease that affects both blackberry and raspberry production, and it's caused by a fungal pathogen. The fungal pathogen has several names, but *Leptosphaeria coniothyrium* is one of the names, and this pathogen actually also causes some disease issues on roses and some ornamentals. But on blackberry, what this pathogen does is it attacks the vascular system of the cane. So basically, once it enters the vascular system, you know, the xylem and the phloem move the water and nutrients up and down in the plant. Basically, it infects and ultimately girdles the vascular system. And this will basically result in the either decline or rapid death once it fully girdles the cane of some of those canes that are infected. And once inside the vascular system, it becomes very difficult to do much about it. So a lot of our prevention is targeted before that point. It usually enters through wounds.

[02:28] Aaron Cato

Okay, so I guess with pretty much every disease we talk about, what's the key point that it's entering the plants, especially blackberries?

[02:37] Jonathan Oliver

Yeah. So I mentioned it enters through wounds. So there's a lot of different opportunities for wounding to occur during blackberry production. So the cane blight pathogen actually doesn't enter the plant very well any other way so there's been a lot of work done trying to inoculate canes with the pathogen and unless there's a wound there, it really won't enter very quickly. But any kind of wound from pruning, herbicide damage, any kind of mechanical damage to the cane, even cold damage, freeze damage, frost damage can be an entry point for the pathogen to enter the cane. And so once it's inside, it causes the trouble. So it really depends on when those events occur. Now, blackberries can even do a lot of self wounding. So if you have thorny blackberries, they can basically bump into one another, the wind can blow them into one another, and those puncture wounds can allow the pathogen to enter. The wind, can rub that cane along the trellis that it's tied to. And that rub wound can be a point of entry. So really it can enter almost any time. But the pathogen is most active during the summer months. We assume that most of the entry is occurring after pruning events.

[03:55] Aaron Cato

So has anyone looked at Paraquat usage and whether or not that's driving some cane blight?

[04:00] Jonathan Oliver

So we haven't looked at that specifically and I'm not sure who who has I know on some other small fruits for sure, injury or injury caused by things like Paraquat can allow for entry of those wound entering pathogens. So for sure, blueberries, for example, similar or similar pathogens can enter through wounds caused by Paraquat. And we've seen some of that. But I Blackberry I don't really know but I imagine it would be a major way it could get in if there was wounding there.

[04:28] Aaron Cato

Yeah, we don't see it too much here in Arkansas, but I think the spots that we did see it this year were instances where the actual trellis was wounding the side of the canes side on some Ponca where I think Amanda, we were looking at it and Amanda said, Well look, every time a plant was injured there, it had grown around the wire like there was a spot where it was wounded around that wire. And I don't know if that's something y'all normally see or what.

[04:52] Jonathan Oliver

We do see that sometimes for sure. And so that that very well could be a point of entry.

[04:58] Amanda McWhirt

Yeah. So definitely a big concern if there's a lot of time points in the entire season when this disease can get into the plants. Do you have any comments on what growers can do culturally to try and prevent issues with cane blight?

[05:11] Jonathan Oliver

So preventing wounding of primocanes is a major thing, of course. And so there's a lot, but there's a lot of pruning that just has to happen in blackberry production. So it's ideal if those wounds, when they do happen for printing, are kept small. And so if instead of getting that cane you know, way overgrow the

trellis, and you have to bring in whoppers to basically clip it to the right height and leaving a large wound behind, it would be better if that cane were basically pruned or tipped, you know, once it reaches the desired height, you know, to kind of keep it at that height and only, you know, if you get it, actually, some work's been done on it, basically pinching off if you can. If in smaller production systems, you can actually pinch off the canes when they're only maybe three or four inches higher than you want, you can basically dramatically reduce the wound and the chances of cane blight infection occurring. Cane blight is a fungus and it's caused by a fungus and it forms spores that spread the pathogen. And those spores are believed to be moved around by rain splash. And so overhead irrigation is a big problem potentially if it's present. And that could basically splash around the spores of the pathogen and allow it to enter wounds. Any kind of rainfall, though, or wetting events that occur after pruning can allow for entry of the pathogen and spread of the pathogen. So growers are advised not to basically prune if they expect rain later that day or really for the next few days. It would be good if those wounds were allowed to kind of heal over for maybe two or three days after they form before any wetness events occur. And so reducing basically reducing moisture would help, even weeds that can grow up, you know, kind of into the into the canopy and kind of cause moisture to hang around longer than it would otherwise. And so that can increase chances of problems with cane blight and generally for blackberry diseases, once the floricanes have produced their fruit and they're no longer needed and they'll eventually naturally senesce, but they're basically just a source of disease carry over to the new primocanes that are coming up. So another thing that growers can do culturally, it's really important for most diseases and especially important for cane blight is to basically prune out those floricanes as soon as possible after harvest, especially if they're in a situation where they've had problems in the past with cane blight to remove any potential disease carryover because once the blight pathogen enters those primocanes, you don't always see symptoms. But once those canes go through the winter and they become floricanes the next year, that's when you'll start to see problems. And so you want to prevent infection of those emerging primocanes. Any kind of nutrient stress or water stress can make the plant more vulnerable to cane blight. It can slow down the healing of wounds that occur and basically prevent the plant from being able to kind of fight off the entry of the disease in the first place. And so all of those things can be done by growers culturally, and they're pretty critical, especially in reducing wounds and reducing water.

[08:34] Aaron Cato

Yeah, one question when we got a lot at the Savannah meeting in the cane berry section was about whether or not you could put the floricanes that you've pruned out back into the soil around the plants. So when you think about cane blight, would this be an issue? Do you think the fungus would be able to move off of those dead floricanes back on the plants?

[08:55] Jonathan Oliver

Definitely. That can be a major issue. So as long as the dead canes are present there and the fungus is on them, it can sporulate and splash up off of those canes. Generally, it would be better once those old canes are pruned out to remove them from the field or burn them or burn them and remove the field. Now, if they have to be kind of you, if you want to mow over those and chop them up into small pieces, that would rapidly speed up the degradation process of those canes and reduce the amount of time that cane blight pathogen is able to hang around and potentially spread back on to the the canes that weren't pruned out. And so that can be done. We would recommend removing them from the field as soon as possible as a pathologist anyway, that's that's what I would say.

[09:42] Aaron Cato

Yeah. Another thing we've been getting a lot of questions about, I guess it kind of goes around with the theme of everybody's year the last couple of years, which is labor, this idea of some kind of mechanically hedging, some of the tops, the primocanes down going especially this time of year. Would that scare you thinking of cane blight? It sounds like it probably would.

[10:00] Jonathan Oliver

It is certainly scary because that can cause not just wounds, but they can be pretty gnarly wounds sometimes when when you go through with those mechanical pruners. But definitely growers do that in Georgia and we see that a lot. So and some growers who do that can kind of seem to be able to get away with it. But it is a concern as far as wounds go. One recommendation, if they are, especially if they're doing that, but really after pruning events in general, would be to try to protect those open wounds that are left behind in some way, probably using a chemical fungicide.

[10:34] Aaron Cato

Okay. I think that leads us right into the next question we were going to ask, which is, you know, what are your recommendations not only just when you should apply fungicide, but maybe also on what types of fungicides seem to work the best to prevent cane blight?

[10:48] Jonathan Oliver

Yeah. So as I just said, really, whenever there's a wound present, it would be good to protect that wound with a fungicide. Really what we recommend is after these major pruning events, when workers go through the field and prune later that day, ideally it would be good to go through and spray a fungicide. That would be some type of broad spectrum fungicide that would provide some protection of those wounds until they can heal over naturally based on some prior work that was done and some basically observations. It looks like spraying something like Pristine, which is a combination fungicide, pyraclostrobin and boscalid or Rally which is myclobutanil, you know, can help protect some of those wounds and because they're sprayed on. And so we recommend those to be sprayed on the same day of pruning. One thing I didn't mention earlier, so we've been talking about cane blight proper, a pathogen that's caused by *leptosphaeria coniothyrium*. However, there are other relatively similar diseases that basically cause cane dieback here in the Southeast. I've had a graduate student in the last few years work on work with some of those different fungal organisms. And what he found is they cause relatively similar symptoms to cane blight. But they're not caused by that particular fungus. And so he did some work basically where we had potted blackberry plants. We cut those blackberry plants. And prior to inoculation of those plants with some of these different fungal organisms that caused dieback, we applied fungicides to determine whether those fungicides could be protective. And in fact, they worked. And some of the ones that were most effective were some of the same things that that we've been recommending for cane blight. So Pristine was one of the best as far as preventing dieback from wounds after pruning and Switch as well was very effective also in that trial work. And so that's that's what kind of what we're basing our recommendations on. But fungicides applied at other times of the season, enormous season like lime sulfers, just other products like Captan, copper fungicides, they may have a little bit of efficacy and they may help to some extent. But really, we really believe that the wounding events are really the critical times for preventing issues with cane blight. And so applications following those with those findings that some of those fungicides I just named are probably our best chances to prevent cane blight issues or cane dieback issues. Again, a relatively similar disease.

[13:23] Aaron Cato

So you talk about pruning and spraying after pruning. And so I think we use the term tipping a lot. And so tipping these especially very tender primocane plant material. So are you saying spray even after tipping events where you're still doing these very soft cuts to the plants?

[13:43] Jonathan Oliver

So it would be less necessary if you're doing some type of tipping where you're not leaving a large wound present there as you might with pruners or loppers or mechanical pruning, that would be less necessary. And so that's why we recommend doing that kind of along and along the season rather than waiting until the canes get so big and these major pruning events do occur. But potentially any wound may be vulnerable to infection. And so I would never say never, but really I'm mostly talking about these major pruning events.

[14:17] Aaron Cato

Okay, that's good. And I think in our region, especially people are around the time that you're tipping people are putting out either Switch, Captan or Pristine in that fruit protection area or late flowering something like that. So it sounds like maybe those fungicides are getting some dual benefit. Hopefully, if there is any issue with tipping at that time.

[14:36] Jonathan Oliver

Very much they could be absolutely.

[14:41] Amanda McWhirt

All right. So in Georgia and some other states, this cane blight diseases is seems to really be driving a lot of your production decision. Do you have comments on other growers across other parts of the southeast and how they might need to be making decisions similar with this disease in mind.

[14:58] Jonathan Oliver

So when I first started at UGA, you know, the conventional wisdom was that Georgia had cane blight and nobody else was having major issues with it. I have heard more reports in recent years of other places throughout the Southeast having more trouble with cane blight. I know they've had, or cane dieback again this similar similar type of disease I know in South Carolina and North Carolina I've heard a little more about it for sure in recent years that they're seeing some similar things. It does for sure drive a lot of our our decisions that are made. As far as disease management here in Georgia, it really probably is the most lethal, I guess, disease of blackberries that we see on a regular basis. And it's probably responsible for shortening the lifespan of our blackberry plantings more than any other issues. So really, after about 5 to 7 years in Georgia, anyway in South Georgia, where I'm located, a lot of our plantings are already starting to go downhill and usually it's because of cane blight or cane dieback. And so really we've we've really tried to emphasize, you know, removing those floricanes as soon as possible after harvest and applying these fungicides after pruning to really try to protect plantings. Because when I, early on, when we find cane blight from maybe a disease report or something submitted to the diagnostic lab in a planting, growers would ask for recommendations for disease control and I would say, well, we can prune out the affected canes. We can prune, you know, maybe cut, remove some of the affected plants and in some growers in extreme cases even wondered about whether they should be basically mowing down all of their canes, basically losing a whole year of production because those primocanes are removed to see if the second year when primocanes reemerge, maybe they'd be okay rather than replanting. I haven't seen any of those types of interventions be successful, frankly, down

here. And so I no longer give those recommendations without a huge disclaimer to say, if you're lucky, it might work, but I've never seen it work. And so most growers, once they find cane blight, especially if they find it in the new primocanes where it's going to basically probably wipe out a lot of their production next season. They're starting to think about replacing that entire block of plants. And that really is, that's the reality for us here. I don't know if that's a reality other places, but it for sure is in South Georgia.

[17:25] Aaron Cato

Yeah, I don't know that we we see it on that scale. It seems maybe in the last couple of years we've seen it more. And that's what I was going to ask you about. The pathogen itself is is this something that's driven more by heat? Because we've, you know, had some pretty seriously hot years. And then, Amanda, I'll tell you on the other side, which is some pretty seriously cold winters.

[17:45] Jonathan Oliver

Okay. Well, that all makes some sense because, of course, because fungi like generally like warmth and wetness. And of course, we have a lot of both in the southeast, the blackberries, from what I see, is, especially when they're getting close to harvest, they have big fruit load on them. They basically need a lot of water at that time. They're moving a lot of water through the plant and so since this disease and these pathogens impact the vascular system of the plant directly, that's often when we'll see kind of these plant collapse occur. And so if the vascular system is even partially girdled, that may be enough to basically keep that that cane from bringing all that fruit, I guess, all the way to ripen. And that cane would just collapse sometimes prior to ripening the fruit. And so for sure we would expect more issues with the, the issues that came by the may already be there would become more obvious in these really hot years and in these hot cases. And whenever we have a lot of rainfall around harvest especially, we've had at least two out of the last three years here in Georgia. That can be a major a major problem for spreading the pathogen as well.

[18:58] Aaron Cato

Okay. Well, I think we've kind of covered cane blight all the way and we're not going to let you get away before we talk about a few of the other Georgian diseases that make their way up our way.

[19:08] Amanda McWhirt

Oh now don't blame Georgia for all these diseases.

[19:10] Aaron Cato

I'll blame them for their, maybe their just nice little petri dish they have down there that showcases what we can get. But orange cane blotch is one that we see from time to time in other areas of the southeast. I think anywhere where it just stays humid or maybe somewhere on the side of a hill where they get a lot of just wetness a lot. But can you talk a little bit about orange cane blotch and maybe give us some insight into the environmental conditions that would likely cause it and maybe what growers could do about it.

[19:37] Jonathan Oliver

Sure, I could talk about orange cane blotch. First of all, I'll defend Georgia slightly and say that we get a lot of our disease issues from Florida so it's not even all Georgia's fault. But anyway, orange cane blotch for sure is an issue for us here in Georgia and blackberry production. It's pretty uncommon to see a planting without at least some blotches caused by this disease. So orange cane blotch is weird, it's

actually caused by an algae. So most plant diseases are caused by either bacteria or fungi or viruses or oomycetes. And so this is like kind of a one oddball algal disease of blackberry. And what we see with orange cane blotch as the name indicates, is this algae will infect the plant. It grows under the plant cuticle and it basically forms these orange blotches on the canes. Initially, it wasn't thought that this was a major problem. We didn't know how much impact it was having. Some work done by a former graduate student with Dr. Phill Brannen did confirm that basically it does reduce yields. So the plants that have these blotches have you form fewer fruit and so it directly impacts yield. And the more blotches you have, the less fruit you have. There is a relationship between, a negative relationship between the number of blotches and yield of the plants. It also actually and it related to cane blight does something else. So these blotches that form as they develop these orange cane blotches will kind of turn white in the center and often they will crack. And when they crack open, this is a wound potentially to again allow these cane blight or cane dieback type organisms to enter into those canes. And we think that may be part of the issue that orange cane blotch is causing for us. It's kind of stacking with the cane blight issues we might already have and allowing additional points of entry for those pathogens. We've done some work in my lab looking at orange cane blotch on blackberry in the last few years and we showed a couple of things through some field work. One was that orange cane blotch seems to have one cycle per year. And so this is kind of critical from a plant disease management standpoint to know how the pathogen is spreading or the lifecycle of the pathogen on the host. So it looks like the way it works on blackberry is that the pathogen infects those primocanes this year. The blotches will initially just be these itty bitty red spots that will get larger and larger as the season goes on. And then in the fall, they become obvious as orange cane blotches. But it's not until those canes go through the winter and they become floricanes that those blotches will actually sporulate. And so the algae will sporulate, here it sporulates in about May through early July, which coincides pretty well with when the new primocanes are emerging. So those floricanes have the blotches on them. Those blotches are forming spores. Those spores, it's an algae, actually can swim and swim through films of water. And so any kind of rain will splash those on to the nearby primocanes. And those primocanes then become infected and the cycle goes on. And so the second thing we showed in addition to showing it had one cycle per year was that it can be well controlled right at that point through a chemical intervention. So phosphinate fungicides, what we used for our trial work was actually ProPhyt applications made during that interval, basically from about May through early July, were sufficient to reduce disease development on those primocanes by about 75 to 90% in our trial work. So basically, you can dramatically reduce the number of blotches that occur. One of the locations where we had major issues with orange cane blotch in the past where we did our trial work, I went out to see that grower earlier this spring and it took us a while to find the orange cane blotch. So he is he has adopted that management strategy of spraying ProPhyt during those times and he has dramatically reduced the amount of disease he has carryover from year to year. So so that's kind of an oddball disease we have. But thankfully, we seem to have figured out some things that can help us control it and hopefully make it less of an issue in the future here on our blackberries.

[24:07] Aaron Cato

Yeah, sounds like I've got it figured out. I'll say here in Arkansas, I guess some of the areas where we don't see it so much, we definitely do see it. It's kind of like the it really the oddball here where we'll get a picture. We're like, well, we know that, but we're not really sure if this is something that's going to drive your management decisions. But we do have growers that spray for it. I think they see a lot of your extension material that comes out and they say, well, I got to have my phosphinates to spray in the year.

And so my question is really, what level of orange cane blotch, like finding it in the field, do you think would make it where a grower would need to add that in as a normal spray every year?

[24:45] Jonathan Oliver

That's that's hard to pin down exactly here definitely you can get it to be a pretty significant issue if you have it. One good thing about spraying the phosphinates, though, during that time interval is it would also provide protection against phytophthora root rot, which we also see on blackberry to some extent. And the, it would really depend on how much issues they're seeing from year to year. I would not say a zero tolerance is necessary. Like I said, there is a relationship between the number of blotches that form and the reduction in yield on the plants. So if they're seeing lots of blotches, then probably during that next season, they definitely need to institute some control. The problem with the orange cane blotch is you don't really see the conspicuous blotches until the fall. And that's what growers use to target control of the disease because they're seeing the blotches now. That's when we should spray, right? But actually the sprays work better to prevent infection of the new primocanes the next year. So if they haven't had problems in the past or have seen very few blotches, you know, may not be as necessary for those growers to be spraying preventatively for it. But once they've seen it, be aware that next year it's going to be spreading to those additional canes. And so, but hard for me to put a number on exactly how to make that decision. Of course.

[25:59] Aaron Cato

Yeah. It's always it always tends to fall somewhere in between. Where do you have it? You should be spraying for it. But if you wait to spray for it until you know you have it, you may lose some.

[26:09] Amanda McWhirt

All right. Let's wrap things up. So we talked about cane blight and orange cane blotch. Outside of these diseases, what are some other things that you see as upcoming issues? Or tell us a little bit about what you've been working on in your research?

[26:23] Jonathan Oliver

Yeah. So one of the things we've we've looked at in recent years is some of the leaf spots that impact blackberry production. And of course, if you get leaf spots sometimes, you know, you won't really see a lot of trouble with them until after harvest. Sometimes growers wonder, why am I spraying for diseases after I've already harvested the fruit for this year? But basically if you lose your if those spots get bad enough, the leaves will literally fall off the plant and you don't have leaves, then your canes are not going to grow very well or be very healthy for next season where you have major league spot issues, you can have you issues with a lot more issues of winter injury and you're not going to have good yields the next year. But one of the leaf spots in particular that we see a lot of is pseudocercospora leaf spot. And so it along with septoria are kind of two major leaf spot diseases that we see now. And we've noticed over the last few years that growers, even those really good growers who are on a pretty good tight management plan and spraying regularly for those leaf spots after harvest, we're seeing a lot more trouble than they had seen in the past. And so what we did is we went out to several plantings across the southern part of Georgia. We isolated the pathogen and we actually looked to see if it was becoming resistant to some of our fungicides. The bad news that we found was that in four out of the five locations we looked at and almost all the isolates we looked at definitely were resistant to Pyraclostrobin, which is one of the important group 11, FRAC code 11 strobilurin type fungicides. That is important for management of several diseases of production, including the leaf spots. In fact, group of 11 fungicides

know Abound, Pristine, Cabrio, Quilt Xcel are all recommended currently for leaf spot control in the Southeastern Cane berry IMP guide. And so that was bad news that we found so much of it. We tried to do some trial work and we're still looking into trying to identify some additional fungicides that may be useful for control of leaf spots. But the only product that's not a QI fungicide that still seems to have pretty good efficacy is propiconazole or Tilt in blackberry production. So we weren't able to identify anything new that would be necessarily useful to help with this fungicide resistance pseudocercospora, but that resistance is out there and it makes me think that if the pseudocercospora is becoming resistant to some of these group 11 fungicides which have been used for a long time. There may be other fungal pathogens out there that are developing resistance. And so that's something we're hoping to look at further in the future, is to see what kind of resistance issues may already be out there that we haven't noticed in the past or weren't aware of.

[29:17] Aaron Cato

Yeah, it definitely seems like you always get people are saying they're making sprays and it's just not going away even when they're on the front end. But so how prevalent do you feel like that resistance is for at least spots right now in Georgia?

[29:29] Jonathan Oliver

Yeah. So like I said, in Georgia, there was a pretty high rate of the isolates we got had this they actually had the mutation that made it makes them resistant to all group 11 fungicides. So this new mutation in the fungal cytochrome B gene but I was actually made aware of the issue really in addition to from our growers, but from some information that came out of North Carolina where growers there using Abound weren't getting great control of leaf spots anymore either. And so it was suggested from some work that was done that maybe there was resistance there as well. And so at least in Georgia and at least some places in North Carolina, I think there is resistance or resistant pseudocercospora and so it may be present elsewhere as well. So growers who have had trouble over the last several years, you know, obtaining good control of leaf spots, it may need to be looked into whether they have some fungicide resistance problems.

[30:25] Aaron Cato

Yeah, we've been using Quilt Xcel around here a lot and it seems to still get pretty good control. We either have cane and leaf rust or something like that pop up. I know it's different, but we usually have a lot of leaf spots that are taken over some right about now, especially when we get into the high heat and just heavy, heavy humidity. But every grower that I've seen that sprayed Quilt Xcel or something similar has done a pretty good job of stopping it from taking over.

[30:53] Jonathan Oliver

So the good thing about Quilt Xcel, so it includes two active ingredients, right? So one is azoxystrobin. And so that is potentially if there is resistance to group 11, that part is not going to work. But the other half is propiconazole, which is basically what I mentioned is found in Tilt. And they still potentially could be getting efficacy from that half even if there was some resistance present. And so that's really why we usually recommend using multiple fungicides, tank mixes, rotations or mixing with some of these multi-site fungicides to kind of reduce the chances that your fungicide is going to lose efficacy. And so Quilt, it may be maybe maintaining efficacy even even if there is some resistance out there.

[31:36] Aaron Cato

It's an easy one to save since it's PHI is so long, so it's not hard to convince people not to use it until the end of the year too much. But yeah, I think that's all we got. Jonathan, we appreciate you coming on. You've definitely shared a lot on some issues that everyone in the southeast is seeing from time to time and others maybe a bit too much, especially with, depending on the environmental conditions for the year. But we appreciate you coming on.

[32:00] Amanda McWhirt

Yeah, absolutely. And we focused on cane berries and we didn't even ask you about blueberry. So we'll have to have you back to talk about blueberry at some point.

[32:07] Aaron Cato

Oh, he just works on blackberries in my eyes, it's fine.

[32:11] Jonathan Oliver

Absolutely. I appreciate it. I appreciate the time you give me to have to speak today. So thank you.