

JUSTIN MCMECHAN_mixdown_02

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SPEAKERS


Ed Zaworski, Brandon Kleinke

B Brandon Kleinke 00:00
I see dead plants podcast shares the stories of people in plants, pests and pathogens and the conflicts among them. Join us as we speak to the folks who are helping the rest of us live healthier, more productive lives through pest management research. We strive to make science accessible. I see dead plants created by the Crop Protection Network and hosted by Ed Zaworski. The Crop Protection Network is a product of Land Grant University.

E Ed Zaworski 00:22
Welcome back to the ice dead plants podcast. I'm your host as always Ed Zaworski and today I'm joined by my special guest, Justin McMeekin. I pronounce that right right. McMakin, I asked you that before

 00:38
now you're alright MC MC. And it's a tough one.

E Ed Zaworski 00:41
Yeah, okay, good. Good. And Justin is a he's at the University of Nebraska and I apologize. But what's your title? There? Is Yeah,

 00:52
crop protection and cropping system specialists. They gave me a mouthful of a title. But yep, that's No, that's good cropping systems.



Ed Zaworski 00:59

That's, that's one of my points that I was going to ask you about. So Justin, just a little bit of background. He got his bachelor's in agronomy at the University of Minnesota. He got his master's in entomology at the University of Nebraska and then a PhD at the University of Nebraska also in entomology, correct? Yep. And then a DPH, which was that concurrent with the PhD?



01:24

It was they were about four months apart and graduation. So it was a really fun, fun time in my life.



Ed Zaworski 01:30

So yeah, this is really interesting to me, because I had to I did a double take when I first saw it, because you know, PhD gpha. Without What, what's going on here? What is it a DPH? Justin? Yeah, it's



01:42

a doctor of plant health program. And so it's a fairly new program. There's a doctor plant medicine program in Florida that's equivalent to this. Very similar, but it's like, like the veterinary medicine, you know, that type of approach. So it's, it's, it's a broad multidisciplinary, program, a lots of courses. But it provides kind of practical, but detailed experience and knowledge in plant pathology and entomology and agronomy, Weed Science, even over natural resources, remote sensing. So, really, and that's where my broad title comes from, as you get trained across all those areas. So they give you a broader title to handle a wider range of issues.



Ed Zaworski 02:24

Man that is, so I honestly didn't know about this program until, you know, reading your, your profile and your background information and that, and now hearing you talk about it, that is a really neat program. I mean, because you I mean, anyone who works in one of these in any one of those fields, you know, you realize quickly as you're doing your work, you need to have at least a little bit of knowledge in you know about weeds about, you know, diseases about insects. So,



02:53

yeah, you're what's really, yeah, it's been fun. There's, there's a number of graduates, I think we're, the program has said 100%, higher rate, everybody who gets out gets hired right away. So but but it creates some challenges, you know, and growers appreciate they like being able

to talk with people that can speak and, you know, different different areas of concern for them. So that's, that's fun. hard for us to remember everything. But, yeah, yeah,

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Ed Zaworski 03:20

no, that's awesome. Um, yeah, so Well, just Justin and I have had a hectic morning here. We had a little pre podcast recording meeting. And we had an ice storm here in Iowa. On my way to work. I encountered a multiple car pile up. So bear with us here, folks. No, I'm just kidding. We've had an interesting morning. But yeah, we're gonna jump in. And today we're gonna be talking about a a new pest in the Midwest, right, just in the Midwest at this point.



03:54

Just in the Midwest. Yeah. Lucky. Yes. Yeah.

E

Ed Zaworski 03:58

And that's soybean gold image. So, yeah, you know, we were talking before this podcast Justin about kind of how it all started. Do you want to you want to give you want to give the story of the first encounter with soybean gold image?



04:16

Yeah, yeah, it predates my time. So and we have some assumptions in that but back in 2011, they saw some orange larvae up in northeast Nebraska and I think in Iowa, just shortly after that, they were on some diseased and damaged plants, hail damage plants, and late in the season, so everybody was kind of like, you know, whatever. It's not doesn't look like it's causing any economic concerns for growers. And, you know, over the course next couple years, other states, South Dakota indicated the presence of a but nobody was really doing any research on it, and we're assuming those larvae the same as the ones we see now. But then 16 and 17 when I arrived Got some reports, all the more than August, and then it was that year 2018 That everything changed for us. You know, instead of getting calls in August, I got them in June, late June and early July. And when we got there, we were finding these larvae on on dead and dying plants. And dare Mueller who's who's in iOS plant pathologist there, we, we had a lot of conversations with, you know, folks from Iowa and South Dakota and Minnesota at the time. And we were really kind of pointing fingers at one another like, Hey, this is a disease issue. And of course, you know, Dr. Mueller is like, no, no, it's it's an insect issue. And so we, we pointed fingers back and forth, and turns out he was right, it appears to be a significant insect issue. We've done the work to try and identify some of the disease, but we didn't know the insect. We just knew this orange larvae was around. And so we caught some adults in Nebraska and sent those off to some leading taxonomists. Dr. Ray Ganya. And Junichi yokel in Japan. And through that work, and the collection of adults, they said, Hey, we we don't this is not known to science. It's a new new species. And so we were, you know, as entomologist excited, and then in the very same breath, terrified, because we, yeah, we just don't have the information. I mean, it was a blank slate to start on. Which, you know, concerning for us and concerning for growers, because the the insect has tremendous potential. It's its name is derived from the plant it's on

and the damage it causes. So even even in its initial phase of being identified, it was already an alarming concern. 63 counties in the first year, and we were really grasping at trying to figure out where it was. So we've learned a lot in three years. And, and we've got a long ways to go. Yeah.

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Ed Zaworski 06:48

So yeah, you were you're kind of segwaying into the first question that I had for it to, to get things going for the listeners. So what is a gall midge?



07:00

Yeah, yeah, man, gall midges. So when we think homage to entomologists, that's a lot of things. I think, around 6000 species identified that are broadly named gall midge. And there's probably anywhere between 80,000 and a million that are out there that we haven't, you know, identified yet. So a really large group of insects that basically, when they feed on the plants, they cause an abnormal growth in the plants, they cause the skull formation, you know, this outgrowth of tissue that's unusual, and they're really small. So, you know, for growers and people that I've worked with, when they look for the adults, you know, I can look for something really small, like we're talking less than this around a 16th of an inch in size. So they're tiny, and people are unlikely to see the adults. But this this Midge, even though it's called soybean Gall, Midge doesn't really form goals. And so it can and does in some places that are in Iowa, and I've seen it here in Nebraska, and up and South Dakota and Minnesota, but more more common, it's causing this black discoloration and decay of the tissue where it feeds. So.

E

Ed Zaworski 08:12

Yeah, gotcha. So and just to kind of go back circle back to goals, I think, you know, like you said, A goal is a strange growth and it's highly variable, right. As far as what, what the goal looks like, I think, one I think the first gall that I ever saw as a kid and before I even knew what it was, was a hackberry. Nipple gall? No, yeah. I almost guarantee most people have seen this. It just it literally looks like its namesake. It looks like a nipple growing out of a leaf. And I remember seeing it as Kid gone. I don't know. I don't know what's going on here. This is not normal. Yeah. So so that I mean, presumably, what you say 6000 Different golf niche species all doing different things to different plants. Right. Exactly. Yeah, there's soybean, they're doing black discoloration. And yeah, it's the swelling of the, of the stem part of what their interact, it's part of their interaction, right.



09:14

Yeah, you know, and soybean oil, which doesn't seem to cause too much for for gall developments, you know, at the base of the plant. So we do, we do see it, but it's not, it's not really common to see that. And there are a lot of species in in the genus it's in. And not a lot of those cars dolls either. So so we taxonomist put things together. But but right, it's sometimes

they don't all cause the same type of symptom. I know when we came up with a common name and goal was included. We were all like but it doesn't really form a goal. But but it fits in the category of insects that do form goals.

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Ed Zaworski 09:53

And you mentioned that you rarely see the adults and that's just because they They just well go into it



10:04

a little bit. Yeah, you know, when we, when we first came across, you know, all these orange larvae everywhere the the first thing we thought as well, there's got to be an adult, you know, in amongst this lifecycle that we should see in the field. And so in the midst of trying to catch the adults, I actually just walked out to a soybean field that was heavily infested laid down in the canopy I get made fun of for this all the time I lay down the canopy, I lay there for like 30 minutes, just staring up, you know, at the vegetation. And never saw a single insect that I would have been interested in that would have would have been to me something like a golf image. And so it was really frustrating. And it's been frustrating. We've tried to sweep net them. And there's some work going on in Iowa now with some sticky traps, but we have to use these cages to essentially collect them. And we have an emergence network to alert growers as a result of that. But they're they hang out apparently on the soil surface. So they don't spend a lot of time up and moving around. And we get some some pretty good numbers of them in Nebraska here. But seeing them is pretty difficult, unless they're in a jar.

E

Ed Zaworski 11:12

So they just kind of emerge and they're gone with the wind, right? Yeah. And they don't live



11:17

very long. So I don't know what the expectations are on people and how long insects live. But this this insect is an adult probably lives for maybe up to five days, probably closer to two to three days. Oh, wow. Yeah. So so very challenging to, you know, when they're constantly emerging and living for such a short period of time. Imagine what the management's like on something like that. It can be can be difficult.

E

Ed Zaworski 11:39

Yeah. Well, folks, if you ever were questioning the dedication of researchers just remember Justin laying down the soybean field for half an hour looking for the soybean Gall, Midge, I will.



11:52

Curiosity.

E

Ed Zaworski 11:55

So, you talked a little bit about this, but how was soybean gommage identified as a pest? Yeah, I know you mentioned you know, this is very common, you know, plant pathologist and entomologist pointing fingers back at each other with new things try to identify what is the problem here. And it's certainly I remember when some of the first samples came into the diagnostic clinic here in Iowa, and I looked at it and I attempted to do isolations. And I wasn't finding anything, which probably was like one of the first Hey, it's it's actually it's you guys. It's that hard to know. But yeah, how go into a little bit about how it was identified as a as the main problem here.



12:35

Yeah, yeah. Well, we actually we leaned on principles and Plant Pathology, we use Koch's postulates, you know, in a broad sense to essentially take infested plants from the field, isolate those larvae, place them on healthy plants, and let them go through an entire cycle, say, hey, the larvae, we're seeing result in this adult and that, you know, organism can then be identified, we learned a couple things in that process, that we put them on clean, healthy plants, that we have to endure a little bit, but mechanically, that they could, in fact, cause injury that way, which, which already kind of leaned away from plant pathology and towards entomology is hey, at least this insect on its own has the capability to do that. We still had a lot of questions in the interactions with with plant pathology, that didn't get addressed and are being addressed. But But that process was, was key. And then in the field, it was apparent based on the distribution of of the injury of plants, those dead and dying plants and the abundance of the larvae that there was a strong correlation between the two where we had a lot of larvae, we had a lot of dead plants. And so it took a couple years to be confident that it was just gommage that was really causing the issues and and I think it were early enough, we we probably should keep an open kind of view towards that area, you know, other discipline interactions with this insect.

E

Ed Zaworski 13:59

Yeah. Just just to go back and reiterate Koch's postulates, folks, that is a very common thing for any kind of new pest that's coming about and it's just basically like Justin explained, you're taking said pest you're putting you're using it usually in a greenhouse setting or a lab setting you're you're reinfesting it with it with that pest to make sure that this pest is the problem and not something else or not an interaction. But that's not to say that there are no interactions. I mean, there's many, many pests. The one that comes to mind for me is soybean cyst nematode, very prevalent here in Iowa as a huge interaction with another with a fungal disease called soybean Sudden Death Syndrome. They kind of work together to break down soybean plant in a way they kind of have a mutual relationship, but I'm not going to go into that today. But yeah, so sorry about that, Justin. But yeah, I just wanted to clarify Koch's postulates. So um, yeah, Where, where's soybean gommage being found to date?





15:05

Yeah. So So initially, we started off with those 63 counties. And I would say that we were in a pretty good state of panic and trying to find where it was the first year because we were kind of caught off guard learning about this in July really, and then having only till about August, September to identify where it might be. So we we went into the next year picked up a number of counties. Right now we sit at 140 counties. So and we're getting really good at finding it in very low numbers. And so some people don't look at the maps of soybean golf edge, and you can find those on a website we have so even gaulish.org that's updated regularly. If we find it in new areas, you'll see that the link for the for the podcast here, yeah, great. You'll see it looks like it's spreading. But But I wouldn't, I wouldn't use the word spread yet. I would use the word new detections and maybe better with a knowledge on on its biology and a little bit on psychology and what makes it tick, we can find it in places, we probably wouldn't have found it. If, with the knowledge we had previously, we can use things like crop scape, which tells us the rotations, the historical rotation in an area. And so we're getting really good at finding it in areas. And that's really important to growers, because as they see their county get highlighted, they're like, oh, man, do I need to do something about this insect? Well, no, it's it's just found. And it's good that we know it's there, we don't want to create a lot of panic, we want to know if it builds, obviously, because that tells us something else. But at some of these places, it is showing up even back in 18 and 19 and has not grown into a major issue. And and we have a lot of research going and using some some really fun statistics to try and figure out what what makes it tick in the landscape. Why why is it an issue here? And not over here? And and as we do that, I think will really start to help clientele make those tough decisions? Do I need to change out management practices for something new in the system?



Ed Zaworski 17:16

Gotcha. So based on what you guys have figured out for, you know, it's kind of optimal, optimal environment and what it likes. Do you think? Do you see it spreading over time? Oh,



17:28

man, you know, this is this is the million dollar billion dollar question depending on where it gets to, right. Yeah. I don't know. You know, we we saw a great show come through last year. Remember that started in Nebraska, I was literally standing in soybean college infested fields, when that showed up, watch to punch through and then watch the news show that thing carry out all the way through Iowa and Illinois and Indiana. And my my first concern is what does this mean for soybean gommage? Did it just to hitch a ride? We haven't detected anything new this past season. I don't think that's surprising. And maybe it couldn't survive that type of weather event. But But I think we should all be looking in those those states. So it's possible. If you look at the environment of Nebraska, and the fact that across Nebraska, we have this nice, nice gradient of moisture related conditions. As you go west, it gets drier that insects right out to the very edges of where soybean are found, you know, the the crop and so I don't see what stops it going east. Right. Yet. It's you know, Aaron Hodgson, Dr. Hutchinson in Iowa has done a great job of surveying really heavily iOS every year, and she's picking up new counties, but just a few. So it's really interesting that it hasn't just punched his way across Iowa in a rapid fashion. And we're glad it hasn't. Because it's not not an easy insect to work with. So I think we'll continue to pick up new counties. I guess the big question I have that I don't know. Is it if it's in those counties, does it mean anything to growers? Is it just a background insect?

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Ed Zaworski 19:10

Right, right. Still, yeah, like, you know, and like, like you've said, I mean, you're still developing knowledge, you're still researching. So? Yeah. All right. Ah, how do you identify the damage of sleeping golden age?



19:28

It's tricky. You know, there, there are some key characteristics when you're scouting that that you can look for but I know yourself as a plant pathologist, you guys are, we can run into a lot of things that could be gommage and end up being a plant pathogen related issue. And so one has to be super careful about the dry by scouting of this insect you got to get down on your hands and knees and look at plants. And we've been caught a couple of times fight top for us one that catches us because, you know, it causes a similar type of death, you look at those plants side by side and you know, somebody like yourself shows two people in a diagnostic clinic, you'll see the differences right away. But the key thing with soybean gommage, is you need to find the larvae. That's, that's number one. And the nice part is just stick to the edge of the field, that's where they are, and most abundant, but that that damage, they show up in the system, they show up, you know, late May May 31, is when pick them up through about mid June, is when the adults start to emerge. And then seven to 10 days after that, you if you're really good at scouting for soybean go and you can start to find them at a boat for 14 to 20 days, it gets easier. And they start to produce this black dark discoloration at the base of the plant around these little fissures that are expansions to the stem. And that progresses and to you know, broader symptoms that are easier to identify eventual death of the plant if it's bad. But But initially, when I'm looking, I'm folding plants over I'm looking like literally at the you know, the first two inches above the soil line for a dark discoloration and then peeling that tissue open. And if it's severe, it almost looks like chemical drift. You know, that's some of these fields can take on that that appearance that looks like a chemical drifted across and killed a bunch of plants. And for growers in Nebraska, you know, sometimes they experienced that year after year after year on the same series of fields. So unfortunate for us, it's a consistent issue in some areas and never seems to alleviate its pressure.

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Ed Zaworski 21:43

So when you're peeling back tissue, you're looking for the larvae. They're pretty distinct learn Correct?



21:53

Oh, they're very distinct. Yeah, and this is a really good point. If you're early, you might see white larvae. And careful, be careful with white larvae. There are a lot of things that are white larvae out there. But you're right, once they get about 12 to 18 days down the road from getting into those plants, they turn orange. And it's these neat little caret Noid things that are in them that make them turn orange, they shared it from a got it from a plant pathogen or fungi at some point, which is neat. But they take on an orange color, and we get a lot more confident that it's soybean gommage. We talked before about white mold damage, totally, you

know, another species, not a pest. So if you hear a white mold, God mentioned your area, you can actually feel kind of good, it's probably feed none. It just feeds on fungi. It has a bit of an orange tinge to it. So I would say if you're finding, you know, orange larvae in a field, say, Hey, do I have white mold? Do I have a history of white mold in this field? Have I had white mold? Where is it in the field? Is it out where white mold is only present and not elsewhere? But but you know, critically send it to somebody like yourself, right? So I go into diagnostic clinics, you guys are excellent at separating these things out really quickly. Yeah, that's a, it's a really important because the the identification is first step, right if you if you miss that step, you can do things and lose a lot of of, you know your your hard earned work in trying to control some it's not a pest if it's like mold damage. And if it's soybean gommage maybe it's just in low numbers, so that you gotta have the right idea to start.

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Ed Zaworski 23:39

Absolutely. We always preach that and integrated pest management and the diagnostic lab, knowing your enemy before you take action is so important, because what you do next, I mean, we talk all the time as pathologists, if you go out and you find a disease that you think is a fungus, but it ends up being a bacteria and then you spray. Right? It's it's no different here. It's no different with damage as far as what is your next step gonna be based on what it is and, and yeah, knowing that there's multiple types of gommage and so, yeah, good, good, good, good. Um, so how does the so we, you know, there's the damage? What does the damage do? How does sweeping gommage cause yield loss and harm to the soybean?



24:27

Yeah, yeah. So So initially when you're you're doing that scouting, you're gonna find that they're feeding on what looks like the flow on mostly these plants. So therefore, what's the flow on flow is this you know, sugar conducting part of the plants moving nutrients to the plant. That's the easy layer to peel off on on soybean that enter harder layer is where the water moves through. And that's that's how that plant cools itself. It's the radiator in our vehicles equivalent. It's our we perspire to stay, you know, cool. That's their cooling mechanism. So golf images in there, wreaking havoc both on how the nutrients flow through the plant initially, and then it starts to feed on the water part of that plant, how it moves water, essentially, it just cuts that plant off from the, from the soil line to what it can get access to. And the plants basically cook themselves and die. If it's bad, and, you know, it's nice to know what number of larvae would take to do that. And those are hard studies to figure out and we're working on that, but it's not easy.

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Ed Zaworski 25:31

But probably like anything else, it probably depends on a lot of different factors. So a ton



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of things weather, you know, you can imagine if it's cool, you know, it might be easier for that plant to survive, you know, not having a full complement of its its tissues that it needs to move stuff around. And so it does that. And standing in a field. If you if you ever stand a field with a

stand around. And so it does that. And standing in a field. If you if you ever stand a field with a lot of gold much pressure, you're gonna see dead plants that are really tiny, you know, and by tiny, I mean like V fi so it's five trifoliolate it's on it. Those I prefer to see and I know it's a farmer, you're like, how do you prefer to see anything with with damage from from damage? Well, those died are really the adjacent plants can compensate. And so they can fill in that that gap if you see plants that are dead and their reproductive stage full tall plants got pods on them even those are the worst, which we do see. Because it's hard to fill in that space and in compensate for that, that dead plant. That's that's got seed in it, but we're not gonna harvest it because it's too small. So So and the insect has other times I've really focused on the bottom of this plant. But we have simulated hail machine that shoots ice at 170 miles an hour. I think Iowa has a similar one a PTO toy. Yeah. Yeah, they're fun.

E

Ed Zaworski 26:51

Yes. Yeah. So machine basically folks that you you feed. You know, you go buy 50 bags of ice and you feed them into this conveyor belt and you have big hose and you're basically simulating hail by blasting ice and plants. It's fun. I've gotten to use it.



27:10

Yeah, we recently built a new one that has like pedo static tubes and, and all kinds of stuff to monitor how it functions. And we put it against gall midge because early on we were saying well Hale, right? And and gall midge likes sleeping gommage likes hail damage plants, the numbers really increase pretty significantly. And there's a current graduate student, Natasha umezu, that's doing the work to understand gall midge interactions with hail, you'll find them all over the plant, then right up to the top of the plant with that those those new points of injury. And so yeah, it's a it's an interesting insect with a lot of lot of neat interactions that it can have.

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Ed Zaworski 27:51

Gotcha. Yeah. All right, just briefly, you know, what, there's a lot of gold mages, right. What? And a lot of them don't cause severe damage, right? To whatever their host is, whatever their host plant is. So what what makes gall midge different? Is it just really aggressive? Is it just where it feeds? Do we know? Yeah, yeah,



28:16

I would say we probably you know, and I say this a lot was saving gum. And if anybody's ever heard me give a talk, we don't know a lot. This this insect. So I've been gone, which is also found on sweet clover. And interestingly enough on sweet clover, it doesn't kill sweet clover. And so, so even within the same species, different hosts react differently to this insect. And, and so that it's complicated. Why, why is that we'd love to know that that might be useful for understanding host plant resistance with soybean government, which is another big area of research that's ongoing with George Graff, here at UNL. And with Iowa, we have lots of studies that go in over there on that. Yeah, why does it do that? I don't know. You know, we we've been trying to figure out where this came from. Why why did it suddenly show up? Across this, you

know, four state area out of the blue? And we have we have a student Rodney car with Dr. Ron avillez here and column Meiklejohn. Look at genetics of this insect, how broad are they? How diverse are they? And so that that work is ongoing. We're getting somewhere, it's pretty interesting, what we're seeing, but I think once we start to figure that stuff out, then we figure out why why is it just not getting along with soybeans? Because you know, as an insect, if I if I was to put on my like, I'm an insect hat for a minute, killing stuff is a bad idea. You know, is it plant pathogen? Same way you kill your hosts, you ruin your home and you gotta move. Right? Right. And so it's best to keep the host alive. And so this suggests, you know, obviously a more new interaction between these these two, you know, organisms, whereas like, you're right, a lot of other things. You know, we were talking about other recalling insects earlier, they don't kill their hosts. And, and so to me, it's just a new association that maybe will calm down over time as the to get to, you know, essentially do battle between one another, you know, plants going to defend itself. Right and we're going to help it through the process of selection if we can, and maybe we'll find more live plants with with Dolman John them in the future that that makes it more manageable. Who knows. I mean, that's that's the years to come, I guess.

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Ed Zaworski 30:30

Gotcha. Well, yeah. If new novels names have ever been more apparent in human history with the pandemic here, it's a similar similar concept, right? Yeah, we I think we touched a little bit on this, but I think we go into a little bit more detail. What conditions are conducive to soybean? gommage? Yeah, yeah. Yeah. What



30:54

do we know? Okay, so if I can tell, I can tell you what the worst case scenario is? Yes. That's, that's the conducive thing. So if we have corn and soybean rotations that rotate back and forth between two fields, meaning each side of the road every other year, there's soybeans present in one of those fields each year. Mitch, really, Goldman's really likes that, because it can just move back and forth. And so adjacent field being the host each year is important, dense vegetation, dense vegetation around the field is pretty critical. And what what is that that could be tall grass, that could be trees, you know, small bushes. I've even seen buildings do it. So just having a farm site with a building present is enough. And once like, Well, okay, why? Now, no garbage won't talk to us, or tell us why it likes those spaces or areas. Darn Yeah, we've a lot of conversations, if it'll ever tell us what it's up to. But what we're gathering from from doing this is that this insect doesn't feed as an adult. So so they you know, that short lifespan, we mentioned is part of that reason, they still need moisture. And so you can imagine, in the morning, where where we have, you know, dense vegetation, we have more water. And so the current understanding is that that improves their survival, they have access to water for longer hours during the day, as they move between fields. And that might be conducive to their survival. But we see spread in the field, like a tree row running perpendicular to a field, they'll go down that tree row quite a long ways, causing that that edge of field effect. And so those two characteristics are key. Putting soybean on soybean depending on, you know, I don't know probably factors we don't understand can also be pretty detrimental. Dr. Hutchins has seen a lot of that in Iowa. And I've tried that in Nebraska and can't seem to so there's two geographic differences that that are really intriguing, but and then and then obviously having a host present when they emerge. So early planting. So if you and I like feel like I'm in a direct fight with the agronomist whenever this comes up, because it's like, we prematurely planted right

like plant early get things in early garbage likes that, you know it, it really does well having those fissures present. And they they are stage dependent. So they don't you know, it's that plant pops out of the ground, it's not immediately susceptible to damage. It takes some time, it's got to have about two trifoliolate on it. And then if you stare at the base of the plant for days on end, you'll notice these little cracks form. That's the fishers. So at Adobe to so so if you plant late, like we did June 1, you can escape soybean golf.

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Ed Zaworski 33:45

So they kind of come out of the ground before there's a host there for them to attack. And they have so long and



33:53

Yeah, that. So the tricky part is they only left for two or three days or maybe up to five, but they emerge for a long period up to 44 days from from a source field. So they can go from May 31 till mid July. Sending a large swath how large slot? Yeah, and we

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Ed Zaworski 34:15

probably so the later you play it, you miss some of them, but maybe not all of them, but maybe good enough to give you some kind of buffer.



34:23

Yeah, we've been doing three years of planning date studies now and Natasha mez use the individual working on that and she's this year, it was pretty clear late plantings had their advantage. But talk to any grower and they know the rule, a quarter bushel loss per day every day in May on a good year just with delayed planting and five eighths of a bushel every day on a good year for soybeans, so they don't want to you know that what they say is you're just telling him you're telling me to set my yield standards lower. And then I'm like, Yes, I know what I'm telling you. It just depends on how you want to do battle with this insect, right? Yes, that's the key.

E

Ed Zaworski 35:00

And, you know, just to just to pause here, I mean, we are segwaying right into my next question about what can growers do, but oh, man, the decisions that girls have to make, I think I've said this before on several podcasts, I mean, you know, we in our own respective fields of entomology or plant pathology or, you know, agronomy, you know, everybody thinks that their piece of the pie is the most important drawers after the yearly struggle is like, alright, well, if I plant early, you know,



35:22

11 33:33

I'll do this, but if I plant late, I'll avoid this. And, you know, it's, it's not easy, folks. So no, it's still it's a brutal decision are on the back. Yeah, yeah, absolutely. Man, man. Yeah. And just just just for our group of disciplines, and then there's the economics and everything else, you know, beyond that, I, they're tough group of people. Yeah.

E Ed Zaworski 35:57

But anyway, you started into it a little bit with the planning date. What else can can growers do? What are some? You know, again, we're still early on here. We don't know everything about this past. But what are some things that we can do to combat? Sweeping damage?

36:14

Yeah, we've we've tried a lot of things. So we have good, good industry partners that have done a lot of work with us to say, okay, of the acute reactive things that we have our pesticides, basically, what what can we do, we do get some response from those just not consistent. So I would say any grower that's going to do battle with gommage, and grab a chemistry and foliar, apply one, and don't expect the same results every time you do that. That's that's a challenge. And there are, as many of us know, side effects too early applications of insecticide we're not normally doing that and soybeans. So this is different to be thinking about that seed treatments have some effect but but are not consistent either. We have an older chemistry, I think we most of us forgot about organophosphate forayed, or thigh net is what growers may know it as and it has a distinct smell to it. So growers probably remember the smell more than the name of that particular chemistry. It seems to work well. It's it's a little pricey to what we're used to but it's it's showing pretty consistent responses. And it fails on occasion. And that's an environmental related things probably. That's the chemistry so to nutshell on chemistries is yes and no, depends. We don't know why it depends yet. But they're just not consistent. Cultural control strategies planning date we mentioned, we've done a few other things Iowa has studies going on tillage, so not not tilling, currently or soybean, but last year soybean so what if this insect overwhelms the soil? What if we just rip that soil up? You know, conservation people are pulling their hair out listening to this conversation. You know, we haven't got a consistent result from that. That's those studies are underway. And then recently, and we were just talking before this, this whole podcast was about hailing a rich tillage, which is in the current year soybeans, so taking soil and pulling it up around the base of the plants to cover those fissures that we talked about. So so much during this doc has to cover those, the results are startling. Now, it's one year and three sites that we did here in Nebraska. And I know Iowa and South Dakota and others are going to try it next year. But but the results were clear, for one year of data and three sites that we could really reduce injury from soybean knowledge as well as the number of larvae that were found. So we just we just covered it, absolutely, adults can't get access to the place they need to lay eggs. Yeah, and then host plant resistance, big, big projects going on that the whole accession lines of soybeans, we have 765 had been tested over three states the last two years. There are some things in there our soybean diversity here in the US has some access to what appears to be some sources of resistance you know, it's hard to say that with two years I think anybody would agree but but there may be some things in there so that that's something to really pay attention to coming out because that's that's like the gold standard I think for managing this and



Ed Zaworski 39:20

it's like we talked about earlier with different hosts and other species of gommage I mean you can you can imagine some of these hosts probably evolved with that said species ago image and eventually over time, you know, there there's certain plants excelled over others and same same deal here. To go back to the rich tilling How is that accomplished? You know, I honestly from my standpoint, I don't think I've ever actually experienced or seen rich tilling so I want to make sure like for our listeners, what is it what does it look like? How is it accomplished with what kind of machinery



39:56

Yeah, yeah, yeah. So yeah, I was not for earlier with a diver, so it was a new thing for us. There's a couple of ways to do it. So you could use an inner row cultivator, which some people have, you need speed, and I imagine one would chew their fingernails off trying to do this to very small beans, the three stage beans, that's when this needs to be done. So even for those that do it, that would be a bit of a shocker to, to rich to beans like that. But it's called Rolling spiders is another method. They're, they're a little tines that essentially move in a pattern. And they pull soil from between the row to the middle of the row, lillingston and a couple other companies have, you know, lots of people, I think Park these and tree lines or scrap them for metal years ago. So they're not really common anymore. And then there are more distinct units that have literally ridging wings on them, and are designed for like furrow irrigation systems, common in the river valley area. And there are a number of companies that produce those. And so if you get into or look up rich tilling or hailing, you'll run across a lot of different items. And we're going to start messing with some of those equipment. Here in Nebraska, but grower stone, this is not anybody listening to this, unless they're already doing it as part of their operation are really shaking their head. Because what the synonymous words that come with healing enriched tillage are tied down your coffee cup, because when you turn at the end of the field, you're going to be coming over these large ridges at the end of the season, that that are not friendly to equipment. And so we're Yeah, we're I'm we're not popular in our our current stretches the soybean garbage but but it is turning back the clock. And really a lot of the strategies ever are old things we used to do. And don't do any more.



Ed Zaworski 41:50

You heard him folks go get that thing out of the tree line and brush some rust off of it.



41:55

Yeah, well, and as we were talking earlier, there's a lot we don't know about that strategy. So I if I was a farmer, I would wait a year or two. If I especially don't have real big issues. Let us learn a little more.



Ed Zaworski 42:07

Absolutely. I'm mostly joking. But But yeah, like, follow at the end of this podcast will. And in the in the show notes. We'll have some links to Justin's research Justin's website so keep

one in the show notes. We'll have some links to Justin's research, Justin's website, so keep following them, folks if you got a soybean garbage problem, but speaking of which are great at segues. What are some areas of current research and and future research that is planned to be done by you and other folks and what's going on out there in the research world? Yeah, yeah, there's

 42:38

a whole team of us. So there's, there's, you know, Aaron Hutchinson, Iowa, you know, Bruce Potter and Bob Cook and Minnesota, Adam, Baron Horst and South Dakota. And then three of us here in Nebraska, Bob, right, Tom Hunt, and myself. And we have it in Missouri, but just in the corner. We are doing a lot of things as quickly as we possibly can. And the research categories are long and broad. And we could probably spend a whole hour discussing all those, there's, I think we did 26 projects in Nebraska this year. So it was it was really it's challenging. One of the main questions and things we just started that I think people need the answer to is how far does this insect Newt move into a new field? Each year? How much injury and yield loss does it cause? What distance does that cover into the field? Because growers are like, Okay, we're coming up with some stuff, how much of this field do I need to treat all of it part of it, not, you know, just a small area along the edge. And so we started that research, we just finished the first year, results were a little surprising, we're probably going to hold those a little close until we get another year shot. And this is an edge past. I mean that that was really clear from the data that came out. But we're constantly trying to match tactics together that we discussed earlier, you know, that cultural chemical, you know, scenario trying to understand biology, the insect at the same time, we've got a lot of soil work going trying to improve our network, you know, in terms of, can we keep the larvae concentrated during the winter so we can get these really accurate responses of first emergence in the spring. You know, pheromones, which are these fancy name for, can we get the insect to go to something, you know, and essentially make it easier to track or identification of pheromones, genetics work we mentioned it is it is a long daunting list that we try our best. And we've done this, we've had roundtables where we sit down with all kinds of clientele, farmers, land managers, consultants, egg coops, industry partners, and we we all came up with a list of things we thought were important and needed to be addressed. And so we're following that list with with our clientele and on occasion getting back to the thing, is this still the right list? And so we're doing our best to address things as, as quickly as possible. But we're, we're about 100 years behind a lot of our other pests, right? And so, and and, and the troubling part is things are just not consistent. We can't, we can't just sit there do a year and say, okay, good. Let's go to publication, you know, and get this out. The next year, it's different. And so we're like, Okay, we have two opposing years now what we need a third year. And so I'd say the most exciting things are host plant resistance, you know, that that is that is our gold standard, it is moving quickly. And there's, there's a mountain of work being done in all these states to try and understand and really build some confidence around what we're seeing. Nebraska, we put in plots, over 4000 plots, 99.9% of those plots were infested with soybean garbage, so it was really an error treatment, which is is terrifying for the growers that had hosted those trials for us, but really useful to us in trying to figure out what what in the genetics of soybeans is going to be useful. And so so that's, that's the push we push as hard as we can on that space.

 Ed Zaworski 46:23

Excellent. That's, that's good, you know, with with disease trials that you hear about all the time, that oh, oh, this this? Well, we tried to do some research this year, but it really just didn't


time, that oh, oh, this this! Well, we tried to do some research this year, but it really just didn't show up as good as the so it's, it's good. It's not good for the growers. Like I said, it's good for the researchers, when you get the past to show up like that. So I'm just Yeah, I mean, you mentioned we're about 100 years behind, just what is it like, as an entomologist, working on a brand spankin new pest like this, like, you know, like, yeah, it's got to be at least part fun part banging your head against the wall sometimes what's what's it like, you

 47:04

You nailed it, it's both of those things that you need is an entomologist, I unlikely in my career, I will ever see a new insect new to science that that causes injury like this to a major crop that we throw, that even even for those that have been here 30 or 40 years, this is the first time this has happened. Like this. Usually their president some other country, we have a lot of information from that country. So it's, it's, it's exciting and terrifying. It's, it's hard for the students that work on this, you know, they they go to write their literature review, which is all the knowledge and there, there really isn't any. And so, I've I've learned and been so grateful to clientele for their patience, you know, they, we we just said, Hey, it's new. And they they said, okay, and they've been experiencing this roller coaster of information with us, which is like degrees of confidence, and then no confidence with the second year of data. You know, so So we've been, we've been riding that roller coaster, and they've been, they've been maintaining their trust with us through that. We've just been been really nice. But it's hard. It's, it's, we're really worried about getting, you know, a biased approach, you know, going down particular rabbit holes, looking for things, you know, so we're trying to maintain that open kind of vision. So it's, it's fun to work on it, I have a passion for helping growers grew up on a farm in Manitoba, Canada. And so I understand, for us, we go home every day, you know, our livelihood is not in protecting, you know, that that particular crop, that's what we do for for our jobs, but for them, that is livelihood, we are we're affecting significant levels of income. And so it's hard. It's hard to have those conversations with people that need answers, and we don't quite have them yet. Yeah, and oh, man.

 Ed Zaworski 49:05

I mean, we've joked around before, on this podcast and other places, like Yeah, we get really excited in our field and oh, a new thing that no one's ever worked on before. But yeah, you know, rarely that's good. Because I mean, you rarely do you hear the other side of Yeah, it's exciting for us, but it's really crummy for the growers and, and yeah, exactly not having the answers for them is, is tough. Yeah. Yeah, we must deal with that party either. So

 49:31
no.

 Ed Zaworski 49:34

Well, it's been it's been great having you on Justin's been great talking about this, this new pest. What are some resources for growers and obviously, you know, we'll put anything in the show notes that you tell us to but but just verbally what what, what can they go check out to

learn more and to keep up to date on this?



49:56

Yeah, I think if we we've learned, you know, anything through our conversation with one things are constantly changing. And so you really need to get to the resources that are being updated. And so soybean gomez.org is this landing place for all these states to drop our information to provide as much real time information as we can. So so if there's somebody on here that's like, well, I'm dealing with this, I don't know when to spray or try and do things, we actually can push a phone call text message and email to those individuals in the spring, when this insect first emerges to say, hey, it's here. And so you can sign on up for that on the website. But But I think getting to places like that, talking to the extension professionals, you know, that are in each state, your state in your area, is really important things are different between Nebraska and Iowa, you know, in terms of what we're seeing. And so you really want that local, you know, more local information that relates to you. And that's what the website, if you go into the contacts, you're gonna see who is my contact for my area. And so that's, that's the place to really check up on regularly. If you get on that get into those notifications, will, will send things like, hey, there's an upcoming event, if you want to attend and talk to one of us, you can go to these events. And most critically in February, we're going to host a webinar series, we did this last year, a three part series, we'll do another one of those. And all of those key players that are working on the homage from the various universities will be there. And we may even do a panel. So that's your chance. Put in your questions join ask, Hey, if we're not addressing it, ask us and amongst a group of us will will formulate a an understanding what we know about it or what we don't need to do.



Ed Zaworski 51:42

Awesome. Well, folks, you got so you got somebody that is looking into this, doing a great job at it. Yeah, before we end, Justin, do you have any acknowledgments you want to make to people working with you? Yeah, go ahead. Yeah, this is your time.



52:01

Yeah. Well, for sure all the other states that are working with us, you know, we wouldn't have a lot of the information we have without, without them digging into this. So Dr. Aaron Hutchinson, Iowa, Bruce Potter in Minnesota, and Bob cook in Minnesota has taken a big role in bio control of this insect. He's leading all that work, Adam Baron Horst in South Dakota, and then the team here in Nebraska, Tom hunt, Bob Ray, and myself, we, the group of us don't do anything without funding. And so, you know, on our on a regional broad level, NCS RP, the North Central soybean research program has pushed in a tremendous amount of funds into this insect, all that genetics work, host plant resistance, you know, monitoring for the insect is all coming as a result of them, not just getting us funding, but doing it early in the process of this insect. North Central IPM, USDA is funding some projects now. In Nebraska, the Nebraska Soybean Board has pumped a tremendous amount of money at a state level into this insect. And so we're super fortunate to have clientele and producers understand that we need to do things, even if it's not blowing away every field everywhere. And so, so that's been helpful. And then within each one of our universities, you know, the support from administration that allows for some flexibility on

this stuff, as has really been a big push. So So yes, special thanks to all those groups. We talk today because of them. So without that, I'd be saying, hey, it's an insect. We don't know anything about it. So the information is courtesy of their their dollars and time.

E

Ed Zaworski 53:44

Absolutely. Well, folks, if you got a soybean garbage problem, I think that you're in great hands here, Justin and all the folks working on it. Like I said, check out your show notes, see what Justin's got going on. You can see what other researchers have going on and what we post there. And I'm sure you'll be able to reach out to Justin, if you have any questions from there. So, Justin, thank you so much for coming on. Sorry about the hectic morning here. It's no problem. And thanks for listening, folks, and we'll see you next time.

B

Brandon Kleinke 54:21

I see dead plants bridges the gap between plant science research and the impact it has on our daily lives. It was brought to you by the Iowa State University integrated pest management program within Extension and Outreach is sponsored in part by the USDA National Institutes for food and agriculture. For more episodes and information on the research covered today, check out IPM to lowa.state.edu. This institution is an equal opportunity provider for the full non discrimination statement or accommodation inquiries. Go to www.extension.iastate.edu backlash diversity backlash exe remember this information is for entertainment purposes only statements made in this podcast should be interpreted within the limited con To the particular research being discussed talk to your local Extension agent or pest management professional before trying anything at home thank you for listening I see dead plants