The Taproot podcast
Season 3, Episode 6
Date: March 26, 2019
Hosts: Ivan Baxter and Liz Haswell
Guest: Yoselin Benitez-Alfonso
Transcribed by Joe Stormer

[Instrumental theme music]

Ivan Baxter: Hello, everyone. I'm Ivan Baxter, and welcome to the last episode of Season 3 of The Taproot. Or maybe not the last episode - more about that later.

Liz Haswell: And I'm Liz Haswell. Today's guest is Yoselin Benitez-Alfonso, a faculty member at the University of Leeds in the UK. Yoselin studies the communication channels between plant cells called plasmodesmata, and we'll talk about her research into the ways in which these channels are modulated by stress and by development. We'll also discuss how she recently opened a different kind of communication channel – this time with a potential competitor – turning this potential competitor into a collaborator.

Ivan: Be sure to listen all the way to the end, as we are asking for your input for a final episode of Season 3. And with that, let's get on to the discussion.

[Instrumental theme music]

Liz: Okay, so today's guest is Yoselin Benitez-Alfonso. She's a group leader and lecturer at the University of Leeds (in the UK), originally from Cuba. She did her graduate work at the Universidad de Córdoba, Spain, and two post-docs - one at Cold Spring Harbor, and another at the John Innes Centre. She started her independent position at University of Leeds in 2013.

Ivan: So Yoselin, welcome to The Taproot.

Yoselin Benitez-Alfonso: Thank you! And thank you for having me. I'm very

pleased to actually be part of the Taproot community.

Ivan: So today's paper is Gaudioso-Pedraza et al, and it's "Callose-Regulated Symplastic Communication Coordinates Symbiotic Root Nodule Development", and that is in Current Biology, last year 2018. Yoselin, would you like to give us a quick summary of the paper?

Yoselin: Yes, it would be my pleasure. As you know, nodulation occurs in response to symbiotic bacteria in legumes, specifically to nitrogen-fixing bacteria. So we looked at how symplastic communication - which happens through channels that connect cells (named plasmodesmata) - basically organize or coordinate the response of the roots to the symbiotic bacteria; and how these end up producing a new nodule. Our findings were actually pretty surprising (we didn't think that it could be so striking) but what we found was that altering symplastic communication in the positive manner (so improving communications between cells through this pathway) really increased the number of nodules that are formed in the legumes' roots in response to this rhizobial bacteria. At the same time (or basically in parallel) another group in France (we ended up collaborating) were looking at the effect of closing symplastic communication – basically closing the channel to this transport of signals. And what they found was the opposite; when they closed the channel, they found that nodulation was impaired and colonization of the nodules specifically by the bacteria was impaired. As these results came out together; we put our heads together and we created this paper where we prove by both sides that basically symplastic communication is necessary and required for the response of legume roots to symbiotic bacteria.

Liz: That's such a cool story. I've always had a fascination for plasmodesmata, and it seems like a kind of an organelle, in a way.

Yoselin: It is totally an organelle, and one of the most complex.

Liz: Yeah, but we don't know anything about them. Why are they so hard to study, compared to what we know about any other organelle in the plant cell?

Yoselin: What I find intriguing about plasmodesmata [pronounced as "plasmo-

DES-mata”] (or plasmodesmata [pronounced as “plasmodes-MA-ta”], as you like to say) -

Liz: There's two ways to say it, isn't there?

[Laughter]

Yoselin: I say it with my Spanish accent, I hope that everyone likes it. But what is intriguing about plasmodesmata is that they basically communicate to one part of two cells at the same time. And they basically are integrated in these cell wall regions, which are really complex (as you very well know) such a complex natures of polysaccharides and polymers that really regulate very rapidly the mechanical properties of these channels that connect these cells. And intriguingly, there is also a plasma membrane region, an ER region, and all of them is a connection between two different cells. So what I see that is really, really intriguing about plasmodesmata is that neighboring cells keep maintaining their own identity and their own behavior, having this connection that allows basically this passage supposedly (or presumably) by diffusion of a number of molecules - so what determines that basically one cell is different from the other. So that actually is what is intrigues me about plasmodesmata (and what makes them interesting) is that their regulation by the plant we know very little about, because we know that they do regulate plasmodesmata and they transport through the channels; but how they do it and how that is actually linked to all these environmental stresses - to all the developmental niches of the plant - is something that is really fascinating. And I think that what makes it more different from other organelles or structures is the fact that belong and are exposed to these stresses and influences. There is no compartmentalization, in terms of plastids have their own compartments (they're basically their own compartment); or nuclei have their own compartment, or the mitochondria. It's just a little bit more exposed to every single signal from the plant or every single molecule that is there.

Ivan: Is it because it's hard to isolate, as well – you can't just spin out a couple plasmodesmata?

Yoselin: Well, I mean, to actually dissect knowledge about plasmodesmata is quite challenging. Yes, they are difficult to isolate because they are embedded in the cell wall and a part of the membrane region; so how do you isolate proteins that are specific of plasmodesmata? We have several success stories very recently, but it has been really difficult. I was very proud of participating in one of the first plasmodesmata proteome while I was at the John Innes Centre. But really, that came up with a lot of contaminations from other cellular structures, and this is because the nature of plasmodesmata is that they are integrated with all these other cellular structures. Also mutagenesis is really difficult. Again, at Cold Spring Harbor we tried that; it was our first tool to study plasmodesmata - to do direct mutagenesis and look for mutants that were affected in symplastic transport. Very very difficult, because as soon as you really disturb this structure, the plant basically stops growing. So they are so necessary for development, that basically there is lethality coming from any mutant that are really strongly affected in plasmodesmata regions. So naturally we're going around that. [Laughs] When we identified the plasmodesmata proteins, we identified that many times when we didn't even find mutants by direct mutagenesis was because they actually belong to a large family of proteins.

Liz: You sort of described the way in which you and another group contributed to two different sides to the same paper that you published; you got a nice paper in Current Biology. So we had seen a tweet that you put out about this collaboration where you said, "with a bit of trust, your alleged competition can become your friend and an amazing collaborator"; and that was one of the reasons that we invited you here, because we that it was really interesting to think about the kind of role that competition versus collaboration play in the decisions that people make as they're preparing stories and publications. So walk us through the story of how you went from competing to collaborating, and maybe we can talk about some of your thoughts on that.

Yoselin: So basically this was a surprise to us. We started working on this project, as I say, in 2012 before even I joined Leeds; so I was at the John Innes

Centre and I was talking with some colleagues about results with lateral roots, specifically with Giles Oldroyd - one of the people who told me, "Oh, you know, nodulation is something very similar to lateral root formation so basically an organogenesis process." And then it came out – the idea of: okay, it could be very nice to understand symplastic transport control and nodulation versus lateral root – does it follow the same pathway or a different pathway? I managed to recruit a PhD student who was really, really good – Rocío Gaudioso-Pedraza – who is actually the first author of this paper. And she started with me in 2013 working on this project. When she started this project, we were very focused on the symplastic pathway. We were not looking at the infection and the symbiotic part of the story. So we were focused on how the connectivity between cells is established. But we got some reporter lines, we were very, very excited about the fact that we isolated some genes from the *Medicago* that could improve nodule number and we were almost about to publish. And in that moment (that was in 2016), I just asked Rocío, "We need some markers for symbiotic relation, just to prove that basically the nodules that we staining are actually nodules." So Rocío just went through the literature and then she found that David Baker (who is in Toulouse) had produced some markers, so she just wrote to him and asked, "Can I have some marker lines to test if nodulation is due to this ectopical expression of my β-1, 3-glucanase," and David Baker said, "Wait a minute, there is someone in my institute that is working on the same topic." And we were like, "What?" [Laughs] That was in 2016.

Ivan: What was your first thought when you hear that? Was is scared?

Yoselin: Yeah, it was fear [laughs]. It was fear for everything that I had done, basically, already was out there. So I was looking everywhere, what happened. And then I said, "You know, Rocío, go ahead because you've already kind of established this; and told. So lets contact them and, you know, just see what happens." So it happens that they were working on the same topic, but from a completely different angle. Basically, they were looking at callose synthesis (which is the enzyme that basically block plasmodesmata), and the influence

callose synthesis has basically in the establishment of the infection process. And their results were very complementary to the ones that we had. Incredible enough, we just got talking. At the beginning there is always this feeling of "How much can I trust you?", and it ended up to be a wonderful thing that we did. Thank you to Rocío, basically, who initiated these talks and thank you (of course) to Fernanda who was the person who ended up being the collaborator - because she was very open to consider our circumstances (Rocío's circumstances because she was also finishing her PhD, and her own circumstances), and bring the whole story in time together.

Liz: Yeah, so in this case it ended up working out great, right? But it's really hard to know when collaborating is going to help you and where it's gonna hurt you. And so in this paper, are you last author or second-to-last author?

Yoselin: I am second-last author.

Liz: Yeah, so in some places for somebody who's a young person, that's problematic. Were you worried about the fact that you're a young faculty member and now you're going to get a publication where you're not last author?

Yoselin: At that point, we had an argument, basically, Fernanda and I; and we said, "If Rocío ends up (because she is my PhD) to be the first author, then she would be the last author, and vice versa. If the person (the first author who was working on the project her side) was the first author, then I would be the last author. At that point, I'm not that happy but not because of any other thing that is not how people see me from the outside (as second-last author instead of last author), but I am very proud that Rocío got to be the first author in that publication. So I think that we have been both recognized in these terms. And also because the areas of expertise - it hasn't been damaging to me, because our areas of expertise are very complimentary. They are not the same. So Fernanda is well known in her field for symbiotic interactions and nodulation, while I am known in my little field of symplastic communication and plasmodesma regulation. So even when people see the paper, they kind of recognize what are my expertise and her expertise and how we come together to create this story.

Liz: I want to talk about specific examples but I also sort of want to floor the challenge of really even thinking about science as a competition at all. We did actually cover some of the authorship issues in an earlier season of The Taproot when we were talking to . . . who was it, Ivan?

Ivan: Jeff Ross-Ibara.

Liz: But I think there's a broader question that sort of your story brings up which is the role that competition plays in science. Like I think there's kind of this idea, generally; your average person would say, "Competition - it drives science, it drives you to get in and answer questions," and all these examples of people racing to get their data out sooner, but I wonder if that's helpful.

Yoselin: I'm not afraid of competition, specifically because I think that competition is necessary to keep you a *little bit* on your toes. I think that your competitor would be actually the first person that will point to, "There is an issue in your data," or "This hasn't been tested thoroughly." If you're working in something that is attractive, if you're working a topic that is cutting edge and is relevant, there is going to be other people working on the same topic. This is the way of science. When I am not happy is when, instead of using the competition for the good, it's used in the wrongful way - from the standing of researchers.

Ivan: Yeah. I think the bigger problem is that we're incentivizing people to be secretive and be fast, because they feel like they will get more credit if they do it FIRST. And I think that's so damaging because obviously if two people are working on it, it's not that you are the special flower that had the only idea that no one else could think of. Multiple people had the idea, so giving the one group credit for getting there six months faster (for whatever reasons that they did it) is just so damaging to the community.

Yoselin: Yeah, and I have to say that I have seen labs that encourage that, even we see in the same lab where people actually compete (and I've heard stories from other labs saying), that people present in lab meetings hiding the names of

the genes, [laughing] so no other person in the same lab will work on the same genes. I think that is ridiculous. It can get that ridiculous.

Ivan: That is such damaging culture. And that to me is a toxic culture that you should get out of that lab as fast as possible, if that's where you're at. There's just so much wrong with that; that should be such a red flag.

Yoselin: But I have to say, I think that there is also a little bit of blame into journals and into grant providers and fellowship providers, funding places. I think that they, in a certain way, encourage this. For example, the recognition of a paper when they have two last authors or two first authors, is never really there.

Ivan: Absolutely

Yoselin: So I have received absolutely no message from the journal about being corresponding author of that paper, you know. It has been all connection with Fernanda – fair, because Fernanda immediately contacts me and sends me the message. You know, it's fair enough in this case, you know, the interaction that we have. But that tells me that basically, not even the journal recognized me as corresponding author of the paper, you know?

Ivan: Ivan takes a note to contact the people at Journal Management Systems for Plant Direct, because some of it is software; it comes from two places. One is the software (that's just the way that it's set up), but the other one is that you want to have systems where it's clear when you can go to the next step, right? So if it's two corresponding authors, then do you need both of them to click APPROVE before you can submit the paper?

Yoselin: I think yes.

Ivan: Having done multiple papers where I had co-first authors who were traveling like that; we would say, "You finish off submission; I'm good to go" - those kinds of thing.

Yoselin: That is fine, as long as you have authorization. But this is not something for the journal to decide. The journal - the first step is to contact everyone, if you

have the authorization to agree that paper to proceed. Because if not, you're not contributing to this paper; you're not recognized as contributor. I mean, of course we're thinking now on first and last author, but what's to say in the middle? In the middle, everyone get mashed up, and they say, "The reason is that nobody really actually reads that part of individual contribution in the end of the day;" and it's not fair. At the end of the day it's not fair. But that's where competition is actually kind of engaged and really promoted. The fact that we are talking about this topic, it comes from there and it comes from fellowships as well because fellowships are also a way to raise ONE person, ONE researcher that supposedly had that great idea; when this is not true and we know that this is not true. My research is extremely interdisciplinary and cross-disciplinary, and I cannot say that all the ideas that come into my research are all mine; they are my ideas after discussion with my collaborators.

Liz: Yeah, I think that small steps can be valuable. One thing I keep picturing are these young people worrying about showing a poster that somebody's gonna take a picture of. You know, you hear these stories, right? "I presented this, and then three months later, somebody's paper came out on bioRxiv on exactly the same thing as me. Now they discovered it first, even though I know they stole it from my poster," or whatever. It seems like small potatoes, but it's all like an attitude -

Yoselin: All of that is real, yes.

Liz: It's real, that's right, it's real. And it affects people's careers, so my attitude is, I think, very much like yours, which is, "Let's just put it all out there." But I wonder if there are subtleties to that that you would maybe counsel a young person (or a young PI) how they might handle putting their own data out there or protecting their trainees – that kind of thing.

Ivan: I think that's really a key point. I wonder, just to give another example – when you were discussing with Fernanda, did you guys [sic] ever consider trying to do two separate papers -

Yoselin: We did.

Ivan: - back-to-back so you could make it clear what was going on, or was it always a question of, "How do we merge these?"

Yoselin: At the earliest stages of the time that we connected, we did discuss making two separate stories. But I thought and we agreed that it would be so much weaker as two separate stories when, you know, both of the stories were so complementary and so coming to the same final message; that we thought that actually it was much more stronger, made much more sense to publish it together. And you need to find ways to bring the message together because, if not, the message gets diluted. There are too many stories about, I don't know, auxin transport; if all of them could come together, everyone would be kind of more focused on what is the final message and what is the endpoint? Sorry, I know that science doesn't progress like that, but I think that when it happens to progress like that, I think that you do big steps, and not smaller steps. That's my opinion, anyway, it's not the case shared by everyone.

Ivan: I think that it's actually two things. One is that you trust in general in the community that you're willing to put your stuff out there. And you think while there are certainly stories of people who feel like they got scooped because they put something on a poster (and that MIGHT have happened to me; I'm not sure), but there are so many more times when I put something out there and somebody came back with something that was so helpful to me; and I think that those are so much more likely to happen so I think that it's the ghost stories of like "I put something out there and it goes scooped". Probably most of those are not true; probably most of those there was already somebody working on it and realized that they had competition and decided that they should push and not necessarily that they stole it. But then there's the other question, though, is I think the extra step of, "I found out that someone else is doing it; do I actually collaborate with them; do I try and publish together; do I try to go beyond what I was trying to put out there publicly and give somebody who I don't know very well my ideas of where this going, with the hope that we will build a collaboration."

Yoselin: My, again, my philosophy has been always, "Don't fear competition," because I think that believing that can basically damage yourself, as well. So my advice for early careers would be always to put the data out there and trust. [Laughs] I trust everyone; I trust good nature, you know, unless somebody demonstrates the contrary. I trust the person who is coming to see my poster has the good nature to talk to me (if I am presenting an idea that is convenient for him or her) and be able to discuss it and be able to find a way to actually validate the data together, present the data in a way that benefits both. At the moment (again I cannot say that in the future it's not going to happen), I haven't had the bad experience of saying, you know, "Someone really stole my data and now they are publishing out there with the things that they saw in my poster." I might.

[Laughter]

Liz: But that's a lot to ask a trainee to do, though.

Yoselin: I know that it's difficult. I know that it's difficult, and perhaps for a trainee it's always useful to consult their PI or mentor about it.

Liz: To Ivan's greater point, thinking about what's the balance of the benefit of open science (in all the ways that you want to interpret that word) versus the benefit of keeping something to yourself. On balance, open science is always going to win. I say that, but then I think about Jim Watson and how this person with all of these horrible personal traits gets all of this attention and has done for sixty years, because he was the FIRST to get to an idea - even though it was built on the backs of other people's work. And so for a young person to say, "Well, open science is better," I bet Rosalind Franklin wouldn't necessarily agree with that.

Yoselin: Yeah.

Ivan: That's a great point, Liz, because I think Watson shaped this narrative of how the competition pushed them. They got the credit, but we were going to discover the structure of this DNA; that was going to happen. It may have taken longer, but they happened to be at the right time at the right place, and you

could probably say that discovering the structure of DNA two years earlier than they did help humanity because it started this amazing revolution in science two years earlier. But it doesn't mean that they were the only ones to do that.

Yoselin: So believe me; I am not a Christian or a Catholic or anything, but I think everyone gets what they deserve. And the fact that you are talking about it right now tells me that no one got away with it. Still Rosalind Franklin got recognized for her contribution and still [laughing] Jim Watson got fired from Cold Spring Harbor for his comments.

Ivan: If you were a grad student, Yoselin, is there one or two key things that you think you should be thinking about when thinking about competitors or collaborators, that would help a grad student frame that approach?

Yoselin: This is part of the reason that we're in academia. We're in academia because we want to share our research, because for the benefit of all we want to do this. If not, just go to industry. So I hope to never give advice to a grad student that basically, "Avoid competition." I think that they SHOULDN'T avoid competition; I think that competition should be there and it's gonna be beneficial at some point. It's just, basically, use it healthily, and make it in a healthy way - in a way that you also look forward to actually listen to what your competitor has to say. Keep yourself open to the possibility that sometimes you need to collaborate with that competitor to actually get to the point or the core of the story. And don't be scared; there is a lot of ground to cover in science, and there is a place for all of us.

Ivan: I think that's a great place to end it. So we'll wrap it up there. Thank you so much, Yoselin, for joining us.

Yoselin: Thank you.

Ivan: If people want to reach you to give you feedback on the episode, how can they do that?

Yoselin: [Laughs] I use Twitter, I use my Twitter @Benitez_Lab. You can find me there, but I also use WordPress, so you can put BenitezAlfonso.WordPress.com.

Or send me an email if you look online; if you put "Benitez-Alfonso," you'll find my email. I'm happy always to receive feedback.

Ivan: Awesome. Liz, how can people find you?

Liz: You can contact me at @EHaswell.

Ivan: You can find me @BaxterTwi; and you can find The Taproot at @TaprootPodcast. And with that, thank you so much, Yoselin.

Yoselin: Thank you.

[Instrumental theme music]

Liz: Okay, so that concludes our six episode season on busting myths, which brings us to an idea we have for an upcoming show – tentatively titled "Interrogate The Taproot". We'd like to spend some time answering YOUR questions about us, about podcasting - anything you want to know or would like to hear our perspective on.

Ivan: To submit questions, either tweet or DM them to @TaprootPodcast, or email them to Taproot@Plantae.org. We'll do our best to answer. The Taproot is brought to you by the American Society of Plants Biologist and the Plantae website. It is cohosted and edited by Ivan Baxter and Liz Haswell, and produced by Mary Williams and Melanie Binder. We get editing help by ASPB Convirons scholar Juniper Kiss, and social media and blog post writing help by ASPB intern Katie Rogers. We are very excited to have Joe Stormer help us with the transcripts for Season 3. If you like this episode, tell your friends and colleagues, and be sure to subscribe on iTunes or in your podcast player of choice. Thanks for listening.

[Instrumental theme music]