# GRDC PODCAST TRANSCRIPT

**Natural enemies: beneficials, insect friends with benefits.**

[00:00:05] **Intro** This is a GRDC podcast.

[00:00:13] **Camilla Plunkett** The Australian Grains Pest Innovation Program or AGPIP is a research development and extension program that looks to address insect pest problems in Australian grain crops. But we know that not all insects in Australian grain crops are pests. Some insects are a grower's friend. Friends with benefits. Hello, I'm Camilla Plunkett. Beneficials collectively refers to all insects that provide benefits to growers. This includes pollinators and natural enemies of pests. In the AGPIP program the focus is on natural enemies and how endosymbionts can be used to enhance their benefits. At the University of Melbourne, Dr Josh Thia from the Pest and Environmental Adaptation Research Group (PEAR-G), is a researcher studying the use of beneficial insects as an alternate pest control option. I caught up with him to find out about good insects in Australian grain crops.

[00:01:23] **Dr Josh Thia, PEAR-G** I like to think of beneficial insects as being the good guys and they're helping us fight the bad guys, which are pests.

[00:01:29] **Camilla Plunkett** Josh, what are some examples of beneficial insects?

[00:01:34] **Dr Josh Thia, PEAR-G** So when you're going through your paddock, keep a lookout for things like ladybirds, parasitic wasps, lace wings, spiders, and there can also be predatory mites. You know, these are a little bit more tricky to spot, but mites can also be good. Just because you see a mite doesn't necessarily mean that it's a bad one, it could actually be a predatory mite. So being able to identify these beneficial insects relative to pest insects is really important because if you have a big population of these beneficials, you may have a lot more pest suppression going on in your paddock than you realise. We're really focusing on the natural enemies in terms of that space of beneficial insects and what we're interested in is firstly looking at the toxicity and impacts of pesticides on beneficial insects and secondly how we can increase the efficacy and the impact of beneficial insects by manipulating their endosymbionts.

[00:02:30] **Camilla Plunkett** Can you tell us about how endosymbionts will work in beneficial insects?

[00:02:35] **Dr Josh Thia, PEAR-G** Endosymbiotic bacteria can have important impacts on the traits of their insect host. And what we're doing is we're borrowing the idea from the endosymbiont pillar in pests and then bring that into the beneficial space. So in the pest side, what we're interested in doing is suppressing the bad guys with endosymbionts. But in the beneficial side, what we're doing is boosting the good guys with endosymbionts. What we're hoping to do is find endosymbionts that confer good traits to the beneficials, so some of these traits might be higher fitness, so a greater reproductive output. So for example, say you've got a beneficial and you can shove an endosymbiont inside it that makes it produce more offspring, then that becomes a much more viable, beneficial insect because you can produce way more of them quicker, faster, whatever, right? The other thing that we might want to do is skew the sex ratio of those beneficials. So for example, in parasitic wasps, parasitoid wasps, it's the females that do all the heavy lifting. They're going around looking for pests and laying their eggs inside those pests and killing them. So if we can increase the number of females, then that's really useful because that means that there are more of these good guys actually doing the work.

[00:03:50] **Camilla Plunkett** Once you've developed the beneficials here in the lab, how will you trial them?

[00:03:54] **Dr Josh Thia, PEAR-G** So what we're really interested in doing at the moment is studying the natural variation of endosymbionts in populations of beneficial insects. So we go out into the field and collect these beneficials or have them sent to us from collaborators, and then we bring those samples back into the lab and screen them for endosymbionts. If we find any interesting endosymbionts, what we then want to do is establish live populations of these insects in the lab so that we can more specifically study the effect of those endosymbiotic bacteria on those insects. And what we hope to do is identify endosymbionts that have specific effects, on these beneficials that are related to reproduction or their efficacy to parasitise or control pests. What we can then do is use various laboratory techniques to manipulate the endosymbionts in other species of beneficials. So we might find an endosymbiont that skews the sex ratio in one species and then moves that into another commercially or economically important species. And that means that we can then change that bacterial composition, change the efficacy or the role that that second species might play in terms of a pest management situation. And then ultimately, we could, for one, release these new strains out into the wild and let them do their job naturally, or we could potentially have them made available on a sort of a commercialised scale whereby we can increase their production in a commercial context, which means that they can then be released into agriculture at greater numbers.

[00:05:31] **Camilla Plunkett** How do you know they are there? What are the signs of good insects in crops?

[00:05:36] **Dr Josh Thia, PEAR-G** Well, I guess a sign that you've got a really healthy, beneficial population is if you just have a lot of them, right? If you walk into your paddock and you can see that there are lots of ladybirds or you can see that there's lots of parasitic wasps buzzing around, or that you look down and you see that a lot of the aphids that are in your crop have been mummified by parasitic wasps, then you know that you've got a good population going and that's the thing that one might want to aim for in a more chemical free agricultural setting, is a diverse and an abundant beneficial insect community.

[00:06:08] **Camilla Plunkett** How do beneficials work on a national level? Because we live in such a big country, there's so many different farming systems and areas and ecosystems. What does the work that you're doing look like on a national level?

[00:06:24] **Dr Josh Thia, PEAR-G** So at the moment we're casting a really wide net. We're not just focusing on one type of crop, we're looking at things like wheat, legumes, and canola, and the beneficials of moths and aphids and also from different parts of Australia, so we're getting samples from Queensland, New South Wales, Victoria, South Australia and WA. The point is, that if we cast this really wide net, we have a greater opportunity to find something interesting. And the other important thing is that different regions might have different sources of diversity of endosymbionts, and there are also different species of beneficial insects that live in different parts of Australia. So the community of beneficial insects that are present on a farmer's property might depend on where you are and what crop you're growing. And so, we need to have this broad perspective about the types of beneficials that are in agriculture and the endosymbionts that they carry before we can start to make decisions exactly about the types of species and endosymbionts that we want to target here in the laboratory.

[00:07:25] **Camilla Plunkett** That sounds amazing. What do you think the future of beneficials looks like? Where's it headed?

[00:07:30] **Dr Josh Thia, PEAR-G** I think beneficials are going to have a really important role in the future. There is this push for reduce pesticide use, not only from the perspective that overuse of pesticide is causing resistance and some really problematic pests to evolve at a very high frequency, but also because there is the need to reduce pesticide use from an environmental and human health perspective. People are a lot more conscious about environmental contamination, and this is especially a broader issue that is occurring overseas, whereby there's legislation happening in other parts of the world which is aimed at reducing the use of pesticide in agriculture. And so for Australia, what we want to be doing is keeping on track with the trends that are happening across the globe and also be conscious about making good decisions here at home as well.

[00:08:23] **Camilla Plunkett** This sounds like such a great project. You must be so proud to be part of this ground-breaking research?

[00:08:29] **Dr Josh Thia, PEAR-G** So our group at the University of Melbourne is super excited to be a part of this work in collaboration with the GRDC and Cesar Australia. Cesar has already led some excellent work in understanding the toxicity of different pesticides on beneficial insects, and at University of Melbourne we're hoping to improve the efficacy of beneficials through endosymbiont manipulation. And what I hope is that this research that we're doing here as part of the AGPIP initiative, leads to a greater reliance on beneficial insects for pest suppression instead of relying on chemical control.

[00:09:03] **Camilla Plunkett** Josh, finally, if you're a grower, how can you get involved?

[00:09:07] **Dr Josh Thia PEAR-G** If you want to help contribute to this really exciting work, we'd love to get parasitoid wasp samples from you, so get in touch with your agronomist or your local grower group and they may be able to help you forward on those samples to us. We'd love to have them.

[00:09:26] **Camilla Plunkett** That was Dr Josh Thia from the University of Melbourne's Pest and Environmental Adaptation Research Group, giving us an insight into the fascinating world of beneficial insects and endosymbionts. For more information, head to the AGPIP website at cesaraustralia.com.au, or check out our show notes for where you can send beneficial samples. This is a GRDC podcast, I'm Camilla Plunkett. Thanks for listening.