

# GRDC PODCAST TRANSCRIPT

## Novel solutions for pest management problems

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

[00:00:12] **Sally Maguire** It's estimated the grains industry loses more than \$350 million a year due to insects. That's why GRDC has invested in the Australian Grains Pest Innovation Program, or AGPIP, a joint initiative with the University of Melbourne and Cesar Australia, set up to tackle pest management problems in the grains industry. Hello, I'm Sally Maguire. Certain pests present particularly wicked problems when it comes to control and more novel approaches and solutions are needed. I spoke to Associate Professor Paul Umina from Cesar Australia and the University of Melbourne to get an update on the ground breaking research currently underway.

[00:01:00] **Prof Paul Umina** It's a relatively new initiative investigating novel technologies and management strategies to control insect pests in Australian grain crops. AGPIP's an investment by GRDC and the University of Melbourne that is undertaken in collaboration with Cesar Australia, down here in Melbourne and I guess a little different to many other investments that we are involved in. Much of the research in AGPIP is necessarily blue sky. So essentially we're seeking to develop high impact, sustainable and scientifically tested pest management options for growers.

[00:01:34] **Sally Maguire** So when we talk about this being a blue-sky novel approach to pest management, talk me through some of the projects that you currently have going on at the moment.

[00:01:43] **Prof Paul Umina** Yeah, there are three main research pillars within AGPIP. The first is something that we call endosymbionts. Probably not something that many growers or advisors will have heard of before. Endosymbionts are quite unique bacteria that live inside the cells of many organisms. And one of the most common bacterial symbionts that has been studied to date is something that we call Wolbachia, which is believed to be present in about a third of all species when transferred to mosquitoes or Wolbachia can effectively block RNA virus transmission. So what it essentially can do is block mosquitoes transmitting viruses such as dengue fever from one human to another. So really quite powerful technology. And what we're hoping to do in AGPIP is really bring this new thinking, this new technology, which has mostly been applied in the medical space into agricultural pest management. So, for example, one of the things that we're hoping to do is to be able to block plant virus transmission that occurs through a number of different pest aphids. So two of our targets here are Turnip Yellow virus (TuYV), which is a very important virus in canola that's mostly vectored by a species called the green peach aphid, and the other is Barley Yellow Dwarf virus (BYDV) obviously a really important virus in many cereal crops. In addition, we're exploring other avenues to manipulate these endosymbionts, as ways to suppress the impacts of grain pests. So endosymbionts have an incredible diversity of potential impacts on their host. It goes beyond just virus blocking. It potentially can impact insecticide resistance, host plant preferences and it can even impact the susceptibility of attack by predators and parasitoids, to name just a few. So the opportunities are really quite expansive. The second pillar within AGPIP focuses on insecticide resistance. So our work here I guess is really, to date, focused on risk analysis and developing ways to predict which insecticide groups are at risk of resistance development, as well as identifying those pests in the grains industry that are most of risk at evolving new resistances. So additionally, we're using and utilising new technologies to streamline insecticide resistance diagnostics and to streamline national surveillance programs. And I guess the hope here is that by having these diagnostic tools at the ready and knowledge of where the greatest risks are, the grains industry will be in a position to proactively manage insecticide resistance. So potentially some resistances could be prevented from developing in the first place, or perhaps more likely in other cases, we might be able to put measures in place that will minimise the spread and severity of field resistances. The third research pillar focuses on beneficial insects. I guess our work here is really centered in providing growers with independent up to date information about the off target impacts of insecticides on beneficial insects and mites. So our team have undertaken hundreds of chemical bio assays using insecticides and insecticide rates that are specifically relevant to the grains industry. And we've done this work again using beneficial species that are known to be very important in the Australian grains industry. So this includes species like ladybirds, predatory bugs, lace wings, hover flies, predatory mites, as well as a number of different parasitoid wasps. So it really is a very large effort to be able to generate this type of data.

[00:05:15] **Sally Maguire** Certainly sounds like it. So following on from what you're saying about beneficials, the beneficials chemical toxicity table is something the AGPIP has already put out there. So tell us how that works and how it could be used by growers?

[00:05:31] **Prof Paul Umina** Yeah, look, obviously the use of insecticides and miticides can have adverse impacts on beneficial insect populations, if they're applied at the time when they're present. And of course we know that this can then hinder pest management efforts by removing those beneficial insects such as some of those predators and parasitoids that I mentioned before. And these can obviously play a really important role in pest control. So I guess to assist growers make better choices around the impacts of various chemicals for pest control, we've developed a table that essentially summarises the toxicity of foliar chemical sprays on these beneficial insect groups. So the table, I guess, is really the first of its kind for the grains industry. It was made available to growers in 2022 and an updated version of the table will be made available to download shortly on the Cesar Australia website.

[00:06:25] **Sally Maguire** I just wanted to go back to some of the things that you referenced in your projects that you're working on just around the computer modelling and particularly I guess the endosymbionts and even the resistance prediction work. So can you talk a little bit about how the computer modelling could assist with those projects going forward into the future?

[00:06:47] **Prof Paul Umina** So the computer modelling work that we're doing I guess underpins some of our endosymbiont programs, but it's also something that I talked about in relation to insecticide resistance. Our modelling there has really been about that risk analyses, that I mentioned earlier around how can we better predict which insecticide groups are at risk of resistance development and which specific pests in the grains industry are at risk of evolving new resistances? We obviously already have insecticide resistances in a number of our grains pests already, but of course resistance is not stationary, it's very dynamic and we know that there will be new resistances in the future. And so I guess our modelling efforts really have been centered around how can we better predict what species are likely to evolve resistance based on our current management practices and I guess their genetic composition.

[00:07:39] **Sally Maguire** Is there anything now that growers can be doing to help you along with the work that you're investing in?

[00:07:47] **Prof Paul Umina** Much of our work is undertaken closely with industry, in particular growers and advisors, but also agrichemical companies and commercial insectaries. And we simply couldn't perform the research that we do without the support and assistance from these stakeholders. In 2023, we will be seeking a number of populations of insects from the field. In particular, we are seeking samples of crop aphids, pest caterpillars and in some cases beneficial insects. So if anyone is interested in helping out, please do get in touch with myself. Additionally, we'd love to hear from growers and advisors about the type of tools that they would most benefit from in helping them to manage grain pests. In particular, we're really interested in beneficial insects. There is undoubtedly more and more interest in beneficials. But what information, what resources, what decision aid tools are going to be most useful in helping us take advantage of the opportunities that exists in this space? So again, we'd love to hear from any growers and advisors about the type of tools that they think would be most beneficial in this area.

[00:08:54] **Sally Maguire** So for those growers out there, what are your key take home messages about the future of managing pests in the Australian grains industry?

[00:09:05] **Prof Paul Umina** Ah the future? Look, no doubt there will be considerable challenges in the next decade. At present, pest management in the grains industry is heavily reliant on pesticides and in particular quite cheap I guess

broad spectrum insecticides and the cost and availability of these chemical tools is going to increase in terms of the cost and I guess the availability is probably likely to decrease in the future and that's going to come about through greater chemical regulation and market forces and we're already seeing some of this where obviously are seeing increased consumer demand for healthier alternatives and there are more and more insecticide resistance issues in a number of our key grains, pests. So there are undoubtedly going to be a number of challenges as we move forwards. That being said, I think the future of pest management is still a very bright one. Australian growers are among the most innovative in the world and in my experience, if we can help provide the necessary tools and put the right supports in place, no doubt growers will be able to shift their farm management practices. In addition to the three pillars of AGPIP that I mentioned earlier, all of our research is backed up by an extension and communications pillar. And I guess by doing so, AGPIP is really striving to play its part in supporting growers as they continue to manage insect pests in among the many other farm management decisions that they obviously need to be making.

[00:10:32] **Sally Maguire** Finally, I just wanted to ask you, on that world scale, I've heard this research that you're doing being referred to as ground breaking, but where do you feel like the research that you are doing in particularly in relation to the grains industry, sits in this world landscape, I guess?

[00:10:48] **Prof Paul Umina** I think some of it is pretty new and pretty unique to us. You know, I guess if we look again at the endosymbiont research that we're doing, it's only in the last few years that we've really started to see other labs globally start to explore, I guess, the possibilities of manipulating endosymbionts through that lens of agriculture. As I mentioned, I guess a lot of the effort to date has been centred and a lot of the successes have been centered in the health sector and there's been some huge, huge opportunities that have been exploited there around minimising some really, really important human health diseases like dengue through endosymbionts. But, very few people, and certainly no one here locally in Australia has really started to think about how we can bring that type of technology into the agricultural industry, not just the grains industry but the agricultural industry more broadly. So it is quite blue-sky, it is very innovative and certainly if successful it could be quite transformative. But of course this is really complicated work. It requires a huge team effort and this will be many years in the making.

[00:11:59] **Sally Maguire** That was Associate Professor Paul Umina from Cesar Australia and the University of Melbourne talking about the truly fascinating work that's being done as part of the Australian Grains Pest Innovation Program into finding novel solutions for pest management in the grains industry now and into the future. I'm Sally Maguire. This has been a GRDC podcast. Thanks for listening.