# GRDC PODCAST TRANSCRIPT

**AFREN podcast – fungicide rotations**

[00:00:02] **Intro** This podcast is brought to you by the Australian Fungicide Resistance Extension Network.

[00:00:10] **Drew Radford** Hello and welcome to the Australian Fungicide Resistance Extension Network podcast. I’m Drew Radford. In this episode we’re going to discuss the why and how of rotating fungicides to minimise the risk of fungicide resistance in your paddocks. There can often be a temptation to put proper rotation planning into the too hard basket. So we’ll be offering some strategies and useful resources to help you keep on top of your fungicide rotations. To delve into this further, I’m joined by Associate Professor Fran Lopez. He’s the Program Leader for fungicide resistance management at the Centre for Crop and Disease Management at Curtin University. Fran, thanks for your time.

[00:01:01] **Fran Lopez** Oh, hi Drew, thank you very much for having me here.

[00:01:03] **Drew Radford** Fran, let’s start with fundamentals. Why is it so important to rotate fungicides?

[00:01:10] **Fran Lopez** Well, I always want to talk about, you know, GPs and medicine because it’s something that, you know, we understand very well. When GPs decided to prescribe us with an antibiotic when we were healthy, just in case that you catch a bug. And then prescribe the same antibiotic again a couple of more times because you had a throat infection. And once you were fully recovered, give you another prescription for the same antibiotic to avoid further issues in the future, I guess you would probably think that there’s something wrong with your GP and that you are risking antibiotic resistance. The problem is that there’s still people out there in the industry that don’t think that using fungicides in the same way leads exactly to the same outcome. And that is the problem. Something also very important that we need to take into account is that fungicides do not create resistance. So the use of fungicides are not going to lead automatically to resistance. Resistance already exists in nature, and we just select for resistance when we spray fungicides. In nature, resistance is rarely selected because it does not provide an advantage to fungi, right? It’s just something that is sitting there, and when we use fungicides, it’s when we start selecting for it, and then resistance builds up in the paddock, and it becomes a problem because we see the effect. So, the more we spray, the more these resistant individuals increase in abundance. And this obviously creates a big problem. So this is even worse when we don’t rotate fungicides. And this is the whole conversation today about how we use fungicide rotation in order to delay the onset of resistance for as long as possible.

[00:02:43] **Drew Radford** Drilling down a bit further then Fran, how does actively rotating the fungicide specifically control that resistance?

[00:02:50] **Fran Lopez** This is actually a very powerful tool Drew. Resistance is not emerging and being selected for all the fungicides we’ve got in one go, at once. That never happens. It’s impossible, right? And this is just because fungicides belong to different groups. So these groups are called modes of action. And it’s exactly the same as with herbicides or insecticides, we’ve got different modes of actions. And they are classified on the way that they have to inhibit the fungus. For example, fungicides from group three, DMIs, these are the most common fungicides that we use for controlling diseases in Australia in dry land agriculture. So they inhibit cell growth. And other fungicides from groups 7 and 11, these are SDHIs and QoIs, they’re also very popular, they inhibit energy production. Each group inhibits in a different way. So this also means that each mode of action has a specific target within the fungus. So for the fungus to become resistant to all of these modes of action at the same time, it means that it has to modify all of the targets of these fungicides at the same time. This can only happen if we do the wrong thing. So it’s impossible if we do the right thing. But if we do the wrong thing, and we spray a fungicide over and over again, and then once the fungicide stops working, we just jump onto the next fungicide. So that sequential application of different fungicides makes all of those fungicides ineffective in controlling the fungus. I guess, you know, we fancy a particular fungicide for different reasons. For example, a spectrum - cost, withholding period and at that point, after we spray for a long time, the fungicide is not working as well as it was working before. Or there is something better in the market, you know, it has a better spectrum, withholding period is shorter or longer. So we jump into the next fungicide and then we do the same. We burn through it until it doesn’t work. So that’s the only way that actually fungicide resistance can happen to multiple modes of actions of fungicides. It’s using that sequential application in which we use one fungicide until it doesn’t work and then we just jump onto the next one, and then the next one. That’s the only way. So there’s a way of slowing down the process. We just need to rotate those fungicides from different modes of action so that the fungi cannot easily adapt. It’s just about creating a very dynamic environment. This was very hard a few years ago. It’s now an easier task because we have many registrations of several new actives and these are readily accessible.

[00:05:24] **Drew Radford** In simple words then, avoid using say a group N product when your last application was a group N product and likewise don’t spray, you know, another mode of action product A if your last spray was product A.

[00:05:37] **Fran Lopez** Exactly, so avoid you know just spraying sequentially the same fungicides from the same mode of action. But it’s not just spraying. You need to take into account, you know, seed treatments with foliar activity in foliar treatments. So we need to plan ahead for this as well. So our rotation has to take into account those treatments as well. I guess that the role should be something like if it has an effect on the fungus, then rotate it. And also consider the previous year program. We have to avoid repeat applications across the season as well, especially if you are not rotating to a different crop. You should consider the effect of the spray on the stubble from the previous crop. This is because in many cases, the stubble will contain the disease that you are controlling in the past season. So in a scenario of a barley-canola rotation that is quite typical in some regions, this would mean that during your canola season, the barley stubble and whatever disease is in there, net blotch, mildews, scald, you know, is still surviving in the stubble, will receive a free extra shot of whatever fungicides you’re spraying your canola with. So chances are that you go back to your barley rotation, the disease is now a bit more resistant because of that extra shot. A solution to this problem is to improve rotations by separating crops a bit more. Managing stubble is also another solution, but longer rotations are always best.

[00:06:58] **Drew Radford** And rotating fungicides isn’t just for when there’s a resistance risk, is it Fran? This is essential practice.

[00:07:04] **Fran Lopez** That’s absolutely right. There is a resistant risk for any pathogen really, so fungicide rotations will control resistance strains before they start affecting fungicide performance in the paddock. It’s like a safety net, you’re going to slow down the onset of resistance by rotating your chemicals. So you look at it as a way of investing in the future. It takes a long time for new fungicides to be developed and brought in. We need to delay as much as we can the onset of resistance so that we’ve got that extra time available. Nobody wants to lose effective and cheap chemistry. The more we rotate these chemicals at all levels, I’m saying chemicals, but we also have to apply this rotation principle, you know, to crops, to varieties - rotating varieties is very important as well - the longer we are going to be able to use these tools.

[00:07:48] **Drew Radford** Fran, this sounds all very logical and simple in a podcast, but actually on a farm, is it as easy on a farm?

[00:07:59] **Fran Lopez** Absolutely not. Especially if you look at solving the problem with chemistry only. If you look at solving the problem from a chemical point of view and not taking into account those tools that we were talking about, it is not easy. And I would probably go as far as saying that it’s not smart. Just because, you know, we had a number of modes of action available, and in most cases there can be also, you know, problems with availability of supply of this product at given times. There could be also problems with trafficability due to heavy rain. So what I’m trying to say is that you just rely on chemicals, it might be that you will have potential issues, having access to those chemicals. And on top of the logistics, we also got resistance, and reduced sensitivity out there, which is further going to limit the options around fungicides. So we need to be careful on how we design these programs, and we have to make them as resilient as possible. And the only way of achieving that is by introducing as many different agronomic tools as we can. So I guess that the question is probably, what’s the solution, right? Solution is IDM - Integrated Disease Management. And I guess that by now, most of us should be familiar with what IDM represents, right? What it means. So it involves the use of all available agronomic tools, crop rotations, variety selection, green bridge control, sowing time, everything we can in order to minimise disease pressure before we even think about using a fungicide. So the less disease we’ve got in the paddock, the less need for a fungicide, the less fungicide we use, the less resistance develops. So we are investing in the future. And the studies basically show that, you know, it’s also a more economical approach. So we started saying that it’s hard, but after probably all this, you might say that it’s not that hard. It’s actually, you know, simple if you use your tools in the right way.

[00:09:49] **Drew Radford** Fran, what about the economic pressure? You know, there can be a temptation to just buy up one fungicide in bulk, saving time and complexity and possibly also some cash with a bulk purchase.

[00:10:02] **Fran Lopez** Yeah absolutely. This approach would probably encourage resistant pathogens to be selected which could cause significant yield losses in the short term, really, you know, resistance doesn’t take a lot of time to become a problem. And on top of that, you know, you can end up with a tonne of product you know that is not very effective in the shed. So contributing to the onset of resistance could also cause losses to other growers. It’s a social issue. To talk about social issues, it’s not limited by fence boundaries. So you encourage resistance in your paddock, then that problem is going to become a problem to your neighbours. And this problem can be a direct issue, you know, in the way of yield or quality losses, or an indirect issue, in the way of losing a fungicide that was previously effective, and having to replace it with something less economical. We can use an example here, wheat powdery mildew outbreak, resistance outbreak, that happened in the East. So the spread of DMI group 3 and now QoI group 11 resistance means that chemical control and rotation options are limited to a particular crop and disease. Fortunately, two new modes of action have been registered and they are available for controlling this disease. But this is an interesting thing here. Not having good DMI and QoI control means that these new mode of actions are at a higher risk even before being used. By not rotating compounds, not only we burn through, you know, what we have quicker, we also put a risk in our future tools. So the more we rotate, the more we preserve what we’ve got, we can actually access in the future. So it’s a win-win.

[00:11:38] **Drew Radford** So Fran, how do growers and advisors go about planning a fungicide program?

[00:11:44] **Fran Lopez** Well, in agriculture, everything is pretty much about planning ahead, right? I haven’t met a grower not having a plan for the following season. We need to factor in likely disease pressure based on past season rates or the season’s forecast. This is going to give us a very good idea of what is going to be your potential need for fungicides in the season. And you will be able to plan whether you need to actually outsource and how you’re going to spray things, what’s going to be your application, your spray program. If you are aware of fungicides and issues in your area, the obvious thing to do is to be extra careful and get in touch with, for example, an AFREN contact in your region and discuss the options. We’ve got AFREN representatives in all the regions. They’re able to provide the right advice in those cases where resistance is a problem or has been discovered in a particular region. And just to emphasise the whole discussion, always rotate. Rotate fungicides, rotate your crops, rotate your paddocks, rotate your varieties, as I was saying, very important as well. It’s about not giving diseases a stable environment. So it’s about creating a very dynamic environment that is going to make life for diseases to be harder. And for fungicide rotations, use the recommendations in the AFREN management guide. That’s available online, so you can go to the AFREN website and download it from there. So you’ve got recommendations for programs where the different rotation for modes of actions are available for different diseases affecting barley, wheat, canola, chickpeas and lentils. So based on these mode of action rotations, a grower can go and select the products that they’re familiar with, or for example those ones that can access more easily. Because as I was saying earlier, logistics plays a very important role. Particular fungicides might not be available always, so diseases that become more permanent during a season, and then growers going for a particular fungicide, and other growers not having access to the fungicide.

[00:13:46] **Drew Radford** You mentioned at the start there you haven’t met a grower without a plan but things do change as the growing season unfolds though, don’t they?

[00:13:53] **Fran Lopez** Yeah, yeah, that’s actually quite true. I guess you know this is one of the most variable businesses that you can think of. I used to ask my grandpa about you know what he thought you know was best and worst about being a grower. He would tell me that the best thing was to look at a green crop early in the morning. That was for him you know, the most beautiful thing. And the worst thing, to my surprise, has been something that pretty much every grower has actually told me since, it’s weather anxiety. So is it going to be a good season? You know, is there going to be enough rain? Is it going to be conducive to disease? All those things. So growers need to be very flexible, we know that. So, I guess that with fungicides, we need to make sure that we plan for that as well. So we plan for a fungicide rotation, an extra fungicide rotation, in case, you know, disease levels are high. But we also have to take into account the opposite as well. So if the season is not conducive to disease, why is spraying what we had in our program? You know, save those applications that you don’t have to spray, because that will extend the life of those fungicides into the future. The less you spray it, the less we’re going be selecting for resistance, so the longer our fungicides are going to be available. Also, you know, these days we’ve got plenty of tools available that can help by making decisions at particular times. Tools like, for example, you know, the Blackleg CM app, the Mungbean MBM app. These tools are going to be good at assessing yield risk and, you know, also the economic benefit of fungicide applications in particular situations with particular crops. So I guess that, you know, there are tools, we need to be flexible, we have to plan ahead, nothing new, but we need to bring that together with fungicide rotations as well and make sure that our rotations are also flexible.

[00:15:38] **Drew Radford** Well, flexible, you make an important point there and fundamentally Fran, we should emphasise that fungicide use and rotation is still the last resort for disease control, isn’t it?

[00:15:50] **Fran Lopez** Yeah, you’re absolutely right on the money. So fungicides, it’s just one tool. It’s just something that we use as part of integrated disease management. Fungicide rotation is another tool that allows us to slow down the selection of resistance. But before we even spray a fungicide, it is essential that we reduce the disease pressure by doing things in our paddock that are just common sense. Like for example, identifying disease risk and choosing a variety with the right resistance level that is going to help us reduce disease pressure at the very beginning. So that’s the cheapest way of doing this. It comes with seed. So using rotation to separate crops. We were saying earlier that we don’t just use rotation for fungicides, we apply rotation to, for example, separate crops using time and distance. Rotate the paddocks. Manage the stubble and green bridge. These are important factors that are going to encourage disease in following seasons. We reduce the seed carryover by minimising the amount of disease on the stubble and green bridge. So planting clean seed. If our seed’s infected, we’re going have an inoculum right there, the minute that you know that those seeds basically start germinating, planting clean seeds is going to help with this problem. And choosing a time of sowing where we know that disease risk is minimal. So there are different things that we can do before we actually start using fungicides. We should make sure that everybody is aware that fungicides and everything else we use as part of IDM is a tandem practice. They cannot go separate pathways. They have to go together so that they protect each other.

[00:18:02] **Drew Radford** Fran, that’s a really great point of clarity to finish on. Associate Professor Fran Lopez from the Centre for Crop and Disease Management at Curtin University, thank you so much for joining us for this AFREN podcast.

[00:18:16] **Fran Lopez** It was great talking to you today, Drew, thank you.

[00:18:24] **Drew Radford** If you want easy access to more fungicide resistance resources, visit the Australian Fungicide Resistance Extension Network website at afren.com.au. AFREN is a significant investment of the Grains Research and Development Corporation and has produced a Fungicide Resistance Management Guide, fact sheets, recorded webinars, videos and of course, this podcast series. You’ll find them all at afren.com.au. I’m Drew Radford, thanks for joining me.