# GRDC PODCAST TRANSCRIPT

**Going to great depths to avoid rhizoctonia**

[00:00:12] **Hilary Sims** Hi there, I'm Hilary Sims. New research insights suggest that sowing deep with long coleoptile varieties is an effective way to avoid rhizoctonia infections in wheat. It's one of many added benefits of long coleoptile wheats emerging as part of the $12.7 million GRDC investment to provide growers with knowledge and tools to integrate long coleoptile wheats into their farming systems once the genetics become commercially available. In this podcast, we hear all about the rhizoctonia research from two project participants, Dr Jonathan Anderson and Michael Lamond. Jonathan is first up. He's a research scientist at CSIRO based in Perth, Western Australia. For this project, he's providing crop pathology support by monitoring and assessing disease impacts in the field trials. He's also conducting controlled environment studies to better understand the dynamics of disease progression in long coleoptile wheats compared to standard varieties. As Jonathan explains, he's optimistic about the disease avoidance potential of long coleoptile wheats.

[00:01:20] **Dr Jonathan Anderson** I think it has potential to address a number of different issues within farming systems, and particularly around disease, as there's been several laboratories around the world, including us, that have tried for quite some time to find genetic resistance to rhizoctonia and other intractable soil borne diseases of cereals. And that approach has largely been unsuccessful. So this provides a potential new avenue to avoid infection rather than having to resist infection. And if it is successful, then it could be a good example of where prevention, or in this case, avoidance, is better than a cure.

[00:01:56] **Hilary Sims** And Jonathan, why is breeding disease resistant lines for rhizoctonia such a challenge?

[00:02:01] **Dr Jonathan Anderson** So for many diseases, the gold standard method for disease control is choosing and growing disease resistant varieties. However, when it comes to rhizoctonia, breeding new varieties of wheat for resistance rhizoctonia is very complicated. There's a large number of genes which contribute, and each of those genes only contributes a very small effect to resistance. So collecting all of those genes into one variety without also dragging in a whole lot of unwanted traits is very challenging. The use of long coleoptile wheat varieties may provide an alternative mechanism to reduce the impacts of rhizoctonia - this is through avoidance of infection, rather than traditional disease resistance.

[00:02:43] **Hilary Sims** And what observations have you had so far from this long coleoptile wheat research?

[00:02:47] **Dr Jonathan Anderson** Well, so far we're seeing some observations come through that the long coleoptile trait allows the seed to emerge from deeper sowing across a range of different soil types. And this allows the seed be placed lower within that soil profile, potentially below the main source of rhizoctonia inoculum. Rhizoctonia, like many other soil borne diseases, predominantly exist within that top ten centimetres of the soil. So this idea of kind of escaping surface residing diseases was first proposed about 20 years ago by a pathologist at SARDI, Dr David Roget, but at the time the genetics were unavailable to be able to test that theory. So now we have these new long coleoptile wheat genetics developed by Dr Greg Rebetzke at CSIRO and they're allowing us to test some of these theories about can we escape rhizoctonia infection by placing the seed below that band of rhizoctonia inoculum in the soil. So the early observations so far are suggesting that placing the seed below that inoculum protects some of the first seminal roots to emerge from the seed. And this allows the seedling to establish better than if those first roots germinate directly into heavy rhizoctonia inoculum. And so far, we're mostly basing our theories on what's happened below ground on some observations from a handful of trials. But to be able to make agronomic recommendations based on hard scientific facts as we like to do, we would need to do further trials specifically targeting rhizoctonia and other soil borne diseases.

[00:04:20] **Hilary Sims** From the lab to the paddock. Michael Lamond is a CEO of SLR agriculture, based in York in Western Australia, and he joins me now to share his observations and insights from in the field. Before the national long coleoptile wheat project kicked off, Michael and his team held scoping trials across two seasons to test out long coleoptile wheats in WA soils, and noticed they were getting less rhizoctonia when they'd sowm deep. Fast forward to present day, and they are two years into targeted field trials assessing the long coleoptile wheat and rhizoctonia interaction as part of the national four year project. Michael starts by discussing the implications for rhizoctonia infection when sowing shallow dry.

[00:05:06] **Michael Lamond** We seem to get more rhizoctonia when we sow dry. In Western Australia, in some seasons, the majority of the crop can be sown dry and in fact, that's been the case this year in 2024. For the majority of the cereals this year have been sown dry due to the lack of rains in May. And when it finally does rain, the rhizoctonia often causes trouble with emerging seedlings. Now, growers combine seed treatments with liquid in furrow as well as fertiliser in furrow to minimise the impact of rhizoctonia infecting the roots of emerging seedlings. But when we sow dry shallow, we're sowing the seed into the rhizo layer which is generally close to the surface. And what happens is the seedling emerges following rain and the rhizoctonia, the hyphae start to grow pretty well immediately. And they infect the seminal roots - so they're the roots that come from the seed that provide the moisture to the plant from deep down in the profile late in the year. So if there's any impact on those from rhizoctonia, we see that later in the year. But also once the nodal roots start to develop at around about three leaf or the start of tilling of the cereal plant, the rhizoctonia infects the nodal roots as well. And they're the roots that provide all the nutrient supply to the growing seedling. So when we sow dry, we're basically sowing the seed into the rhizo layer where the rhizoctonia inoculum is. In fact, the same occurs, of course, when we're sowing under normal situation shallow and there's moisture. The rhizo, sort of, gets the jump on the seedling because the hyphae are growing for several weeks before the nodal roots develop, they might have already infected the seminal roots, and the final impact can be quite significant on yield.

[00:06:53] **Hilary Sims** And Michael, you have some good trial data now comparing sowing deep into moisture versus sowing shallow dry. What are the main findings so far?

[00:07:03] **Michael Lamond** So the main findings so far, with the work we're doing with long coleoptile wheat in relation to rhizoctonia, is that we are getting less rhizoctonia when we sow deep compared to where we sow shallow. There's a greater difference when you sow deep into moisture compared to sowing shallow dry. So most growers aware, you know, in Western Australia particularly know that when we sow dry, we sow in shallow and that's our greatest risk of getting rhizoctonia. So there's a lot of work that goes into applying fungicides on the seed in furrow liquid and in furrow in the fertiliser to try and combat rhizoctonia. But what we notice is when we sow deep, so this is anywhere between 100mm and 140mm, 150mm into the soil profile into moisture, and we get a germination - we seem to be just escaping the rhizo layer, we're below the rhizoctonia layer where the seed is positioned. So it's simply positioning escape. But we also have noticed that there seems to be less rhizoctonia when we get the nodal root developments close to the surface where the rhizoctonia inoculum is growing, and we think that's just due to timing. We're getting a escape in respect to timing as well, in that we're getting a more advanced plant and more root development below the surface. By the time we get a seasonal break that wets up the surface, and when we do get that nodal root development, we've got a plant that's got a lot of top growth, it's well tillered and then it sends out it's nodal roots. And they push those nodal roots out immediately it rains - within a week you get the nodal roots initiating. Whereas when you say dry you don't get those nodal roots developing until about 3 to 4 weeks after the rain. This is also the case, of course, when we're sowing shallow into moisture, you know, normal conventional situation because the nodal roots don't develop until the start of tilling, which is around 3 to 4 leaf, and by that time the rhizoctonia hyphae are well developed. So those nodal roots are developing in where the hyphae has been established. So we seem to be getting this escape just in timing as well. So it's a beautiful example of just using the positioning of where the seedling is growing in combating the disease. And by doing this, of course, we take the pressure off the fungicide in doing all the heavy lifting on trying to control the rhizo. So we're allowing the plant to do it. And as far as resistance development goes, that's of course, a good thing. You know, we've still a lot of work to go to understand some of the interactions and relationships of how this is happening. But just from our observations in the field, it's very clear that we just get less rhizoctonia infection in the plants when we sow deep.

[00:09:44] **Hilary Sims** Positive and promising insights there for sure. Thank you very much for sharing them with us Michael, and good luck with this year's trial.

[00:09:51] **Michael Lamond** Thanks very much, Hilary.

[00:09:59] **Hilary Sims** That was SLR agriculture CEO, Michael Lamond. And before him was CSIRO research scientist Dr Jonathan Anderson. This four year long coleoptile wheat project, made possible with GRDC investment, is being led by CSIRO along with research partners including the University of Melbourne, New South Wales Department of Primary Industries, Queensland Department of Agriculture and Fisheries, SLR agriculture, Department of Primary Industries and Regional Development, the University of South Australia and EPAG research. More information on this topic can be found in the description box of this podcast or online at GRDC.com.au. I'm Hilary Sims and you've been listening to a GRDC podcast.