



## Identifying soilborne pathogens at harvest

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Soilborne pathogens and nematodes can cause significant yield penalties in cereal crops. Soilborne pathogens can be challenging to identify in season, and once a yield-limiting threshold has been reached, there are few in-season treatment options available.

The key to understanding the risk posed by soil pathogens is testing for the amount of pathogen inoculum and nematode numbers in the fallow period and using this information to inform your management options in the following cropping season. Testing paddocks for soilborne pathogens via the PREDICTA B test will identify the amount of DNA of soilborne pathogens and nematode pests within the area the soil sample was taken. This test acts as a risk assessment tool that can be used to inform agronomic decisions. However, like a lot of agronomic tools, these tests are not perfect. PREDICTA B testing can only tell you the disease burden in the immediate area where the tests have been taken.

When testing is conducted on multiple sites within a paddock at random, the results of the PREDICTA B test will likely show a wide range of variability in pathogen load within a paddock. This will not necessarily give producers a clear assessment of their disease risk level, and highlights the need for strategic sampling to identify a representative level of risk. Regular samples should be conducted in areas where crops have shown symptoms of soilborne pathogens or you suspect the presence of pathogens and/or nematode pests, as well as in paddocks where tight cereal rotations have occurred.

### Understanding the soilborne diseases and nematode pests is the key to effective management.

Identifying symptoms of soilborne diseases this year has been particularly difficult. The prolonged cool, wet weather periods have likely suppressed the disease burden and the visible symptoms of diseases. As a result, it is unlikely that soilborne diseases reached a level resulting in yield penalty in 2021. However, this does not necessarily mean that the amount of pathogen and nematode pests within the paddock have been reduced. While this year's environmental conditions could suppress disease burdens, if diseases are not properly identified and managed in the following season, major losses

to disease could occur. The risk of soilborne disease may also be exacerbated by changes to planned rotations in response to waterlogging, which causes crop loss and missed sowing windows.

Identifying the common soilborne diseases at harvest could be a key to managing the risk in 2022. Visible disease symptoms may be present at harvest that did not necessarily show up during the crop's growing period. Given that there are limited in-season management strategies for soil pathogens knowing what to look for at harvest can play a key role in identifying soil borne pathogens, informing management decisions that can alleviate the disease burden.

This article will detail the common soilborne pathogens in the area, and how to identify them at harvest.

### Common soilborne diseases

#### Take-all



Take-all is a fungal root disease that occurs in wheat and barley in the medium to high rainfall zone. Take-all survives from one season to another on the cereal residue, with cool/wet autumn conditions priming the fungus into action, where it infects the roots of the new season's plants. Thus, the management of Take-all is through limiting the carryover from one cereal to another.

Symptoms to look for at harvest are white heads with shriveled or no grain. These will occur in patches, and if plants are pulled up, the roots will be black and brittle, and crowns and part of the stem may also be black.



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Take-all can be easily misdiagnosed as crown rot, frost damage, copper deficiency and molybdenum deficiency. So, if Take-all is suspected, consult a plant pathologist, or conduct a PREDICTA B test.

Management for take-all is primarily through rotation; reducing grass/cereal back-to-back rotations is critical. You can effectively reduce the Take-all disease load by implementing a break crop or grass-free pasture/summer crop after a cereal crop. It is important to ensure that the cereal break is free of grass weeds and/or cereal volunteers, as these host the pathogen and will increase the disease burden for the following year. In some paddocks which were not accessible for their herbicide sprays, grass weed control may not have been effective. Controlling volunteer grasses and cereals over the fallow period can help alleviate the burden by reducing the green bridge. Some seed, fertiliser or in-furrow applied fungicides such as fluquinconazole are registered for Take-all control.

### Crown rot



GRDC Crown Rot -  
Western Resources



Crown rot is a soilborne fungal disease that survives in cereal stubble and grasses and can cause a significant yield penalty

in a dry spring. It is unlikely to cause large losses in the high rainfall zone, unless access to water during grain filling is severely limiting.

Crown rot at maturity presents as white heads during the early grain filling stage. These heads will contain significantly pinched grains, or no grain at all. Crown rot can be difficult to diagnose, as the symptoms at harvest are similar to Take-all. However, a distinct difference between the two diseases is that Crown rot is likely to be dispersed throughout and entire paddock, whereas Take-all presents in distinct patches. Crown rot symptoms will likely appear in tramlines and around weedy patches at first or if the infection is only mild.

While white heads are intrinsically linked to yield loss, this symptom can be easily misinterpreted as a range of other stresses. If you suspect crown rot in the paddock, check for crown and stem browning, which distinguishes crown rot from Take-all, frost, and nutrient deficiencies. If a plant is infested with crown rot, the base of the stem will be honey brown and may, but not always, have a pinkish hue; this symptom will be present from grain fill through to maturity.

The treatment strategies for Crown rot rely primarily on rotation. The crown rot pathogen will survive on cereal stubble and grass weed residues until it is completely broken down. So, a tight cereal rotation will exacerbate the disease pressure. It is also essential to control grass weeds that will host the disease between seasons. In heavy stubbles, crown rot has the potential to survive over multiple seasons due to its survival rate on minimal levels of stubble. Stubble management and grazing strategies can be utilised to reduce the stubble load and speed up the decomposition. However, this needs to be undertaken with caution, as stubble management through grazing and tillage can spread the disease from hotspots to a broader paddock area.

It should also be noted that there is no in-season fungicidal treatment to eliminate crown rot. However, registered seed treatments such as Rancona Dimension and EverGol Energy can suppress the disease burden. There is a new seed treatment, Tymirium, that is being registered for use in the next few years which reduces whiteheads and limits the yield loss.





### Rhizoctonia root rot



GRDC Rhizoctonia Resources

Rhizoctonia root rot is typically associated with the low to medium rainfall zones of the wheat belt; however, it has been increasingly common in the HRZ, particularly on sandy soils.

Rhizoctonia causes the root tips to rot and spear, reducing the porosity of the roots. The pathogen builds up during the growing season, however, it is the early infestation that tends to cause the most significant damage. The pruning of the roots results in reduced translocation of nutrients and water.

At harvest, Rhizoctonia will present as bare patches where there is an area of complete crop loss or stunted growth. This season Rhizoctonia symptoms are likely to be minimal due to the prolonged periods of paddocks being at field capacity, however, bare patches might be visible in areas where the soil is particularly compact, such as tramlines and tracks.

Rhizoctonia will diminish over the summer period if conditions are cool and wet and grass weeds and volunteers are controlled. However, if conditions are dry, the pathogen will carry over with minimal reduction in the disease load. For this reason, cereal on cereal rotation should be avoided, particularly in dry summers.

Rhizoctonia can live in bare soil if the conditions are right, so stubble management has little to no effect.

Control options for Rhizoctonia are more widely available than the above pathogens. Canola has been shown to reduce the level of Rhizoctonia in the following cereal crop. Fungicides can be used as a part of an IPM strategy to control the products such as Evergol and Uniform.

### Cereal Cyst Nematodes



Whilst uncommon in the great southern region, Cereal Cyst Nematodes (CCN) can cause significant damage. Cereal cyst nematodes damage plant roots causing nutrient and water deficiency. Crop losses can be up to 80% where infestations have gotten out of control.



GRDC Nematode Resources

CCN can present as patches where tillers are stunted, look nutrient-deprived, and water-stressed during the season. At harvest, nematodes can be detected by bare areas within the paddock and areas where the crop growth and crop height have been stunted.

CCN is likely to be detected in paddocks where grassy pastures and cereals have been continually cropped.

Rotation strategies is the key to controlling CCN. Resistant crop types such as lupins and canola, should be rotated with resistant cereal cultivars. If infestations are yield-limiting, it can often take back-to-back break crops to reduce the pathogenic load below a yield-limiting level.

Over the fallow period controlling volunteer grasses, particularly wild oats, is crucial in limiting the presence of CCN. It should be noted that cultivation does not manage nematodes and will likely result in their spread throughout the paddock.



## Root Lesion Nematodes



Root Lesion Nematodes (RLN) are microscopic worm like animals that extract nutrients from roots via a syringe like stylet, pruning roots and browning roots. As a result, plants cannot acquire the nutrient and water needed, causing a loss in yield potential and exacerbating stresses. These nematodes are common across all of WA and can be yield-limiting when numbers are high

enough. RLN numbers can proliferate in areas where nil soil disturbance and minimum tillage has been employed.

Like the above soilborne pathogens, root-lesion nematodes can be challenging to identify in season. Areas of reduced biomass, poor tillering and stunted growth can signify RLN. Infected plants will also have brown lesions, general root browning and thick noodle-like roots.

At harvest time, RLN do not result in any specific above-ground symptoms, so if you come across areas of reduced biomass compared to the rest of the paddock, check the roots for symptoms, and perform a PredictaB test during the fallow period.

Pasture can be very susceptible to RLN, so if a paddock has been rotated out of a pasture phase, it is imperative to monitor the crop for symptoms and check roots if you suspect RLN infestation.

Management for RLN largely relies on planting resistant crop types and cultivars. Unlike the above diseases, there are a limited number of break crops resistant to RLN. Field peas and lupins provide the best break for reducing the nematode numbers.

## Conclusion

Early diagnosis and rotation management are the keys to managing soilborne pathogens and nematode pests. Given that most soilborne pathogens and nematode pests can survive in the soil or on stubble residue from season to season, it is essential to look for symptoms. What may not necessarily be a big problem today can result in significant yield penalties in the future.



## SCF are seeking expressions of interest in the following projects.

Please follow the link to provide feedback/ express interest (and dis-interest! That's just as valuable), or printed versions please scribble some notes or tick the ideas you like, take a photo of it and text it to Kelly: 0409 060 065.

### WOMEN'S PRACTICAL FIELD DAY

Idea: a fast-moving day of lots of hands-on sessions that provide practical skills and knowledge for ladies on the farm. Depth of topics matched to experience of attendees.



### SHEARING SHED/ SHEEP YARD/ CATTLE YARD DESIGN TOUR

Idea: full day tour around SCF area checking out different shearing shed, sheep yard and/or cattle yard designs. Attempt to cover different designs (ie sloped catching pens, saw-tooth boards), materials, budgets (full or partial rebuilds), DIY vs professional installation, surfaces etc.

### OPTIWEIGH IN-Paddock WEIGHING

Idea: to purchase an Optiweigh and test it out on multiple mobs of cattle, with different licks/ incentives and in different positions. Potentially get a walk-over-weighing set up as well and compare pro's and con's of both?

Requirements: cattle farmers willing to try it on their cattle in the paddock and compare to weights collected in the yards. Hosts supply their own lick/molasses.

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