

# CEREAL DISEASES

The Centre for Crop and Disease Management (CCDM), a co-investment by the Grains Research and Development Corporation (GRDC) and Curtin University, is a leading research centre committed to reducing the economic impact of crop disease in the Australian grains industry.

Wheat and barley are dominant cereal crops in Australia and both are significantly impacted by disease, with an estimated combined annual loss of \$800 million\*. Our cereal pathology researchers combine new knowledge on both the pathogen and the host to generate resources for breeders to improve disease resistance of new cultivars to five major diseases:



Yellow spot



Septoria nodorum blotch



Spot form net blotch



Net form net blotch



Powdery mildew

## We're identifying new sources of durable genetic barley powdery mildew resistance

- > By screening exotic barley landraces our researchers identified a new broad-spectrum durable resistance to barley powdery mildew. This has already been made available to breeding companies for introduction into Australian cultivars. In 2020 additional unique and durable resistance genes will be delivered to breeders.



## We're investigating and developing solutions to barley net blotch

- > We're making solid discoveries for net blotch resistance in exotic germplasm, while genome assemblies of different pathotypes help us better understand virulence changes in the pathogen populations and fungicide resistance mechanisms.

## We're making significant inroads towards improved genetic solutions to controlling damaging wheat pathogens

- > We're collaborating globally to identify genetic markers linked to wheat disease resistance and have already discovered a 'master gene' that positively regulates some important disease mechanisms (effectors) in wheat pathogens.
- > We continue to develop powerful new genetic tools to help better understand how fungal pathogens interact with wheat.



Information about  
our key research  
projects over page



"Our genetic research is leading to significant discoveries aimed at helping breeders develop stable solutions to wheat and barley diseases."

Dr Caroline Moffatt, Theme  
Leader, Cereal Diseases

## Benefits for Growers, Agronomists, Breeders, Life Science Companies and Researchers

### Genetic tools and knowledge

Used by breeders for the removal of fungal effector sensitivity genes and introgression of resistance genes in wheat and barley lines.

### Delivering outcomes to breeders

Working together to improve genetic resistance.

### Cost-effective disease management

Through grower adoption of improved cultivars.

### Improved research efficiency

Through development of tools to study host resistance and pathogen virulence.

### Improved research outcomes

From national and global collaborations and access to world-leading expertise on pathogen/plant interactions.



Our CCDM team collecting  
wheat and barley samples from  
across five trial sites in WA.

\*Based on CCDM economist estimates using ABS data  
(with reference to Murray and Brennan 2009-11)





Our barley crew preparing trials to map net blotch in search of resistant genes.

## CASE STUDY: Protecting Australian wheat from fungal threats

In our work to help breeders improve varietal resistance, our researchers took a closer look at two fungal effectors with a known role in yellow (or tan) spot disease – ToxA, already an issue for Australian growers, and ToxB, yet to arrive on our shores but examined as part of a proactive step to determine its potential impact.



Our researchers developed a method to produce large quantities of these effectors in the lab and tested them on a collection of 122 varieties of Australian bread wheat, as well as 16 durum and 20 triticale varieties, to determine sensitivity levels.

The results provided a snapshot of wheat variety sensitivities to ToxA and ToxB, giving breeders valuable information for selecting germplasm that preserves good traits and breeds out effector sensitivity.

## At the CCDM we have four projects targeting each of the major cereal diseases:

### 1. Septoria nodorum blotch (SNB)

AIM: Identify novel fungal effectors, wheat DNA and protein markers to deliver better pre-breeding solutions to enhance SNB resistance in wheat.

### 2. Yellow spot of wheat

AIM: Provide wheat breeders with new knowledge and tools to deliver more resistant varieties and significantly reduce grower costs through improvement in disease resistant varieties.

### 3. Barley net blotches

AIM: Monitor WA net blotch field isolates for changes in virulence to inform resistance gene selection and provide breeders with knowledge and tools to improve cultivar performance for growers.

### 4. Barley powdery mildew

AIM: Deliver durable genetic resistance genes against barley powdery mildew and provide breeders with knowledge and tools to incorporate these into resistant cultivars.



## Want to know more?

Our team is happy to answer your cereal disease questions and we encourage you to get in touch:

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