

## Plant Genetic Technologies

### New genes and genetic technologies for agricultural plants

#### Expertise

New genes and genetic technologies for agriculture and food are key to our quest to meet the global challenge of providing enough quality food for a growing population. Our research has a long history of a strong focus on plant genetics and breeding.

Our research and development is concentrated on:

- small grain cereals, especially wheat
- grain legumes
- crops for protected agriculture, especially tomato and cucumber
- the genetics of these crops

Plant scientists, many based in our Plant Breeding Institute, conduct research and develop technologies and products in the GxExM space: Genotype x Environment x Management.

On the genetic aspects of GxExM, our plant breeding researchers have demonstrated expertise in the development and use of molecular genomics to uncover the genetics of plant characteristics, and in using the knowledge and tools to undertake breeding that is quicker and more certain to produce plants containing the desired genotype. We also develop genetic variation and source it from our global partners, providing the raw material for breeding.

The biotic and abiotic aspects of the changing environments and management in GxExM are covered by plant production research.

#### Tools and methodologies used

Our researchers use technologies and methods such as:

- molecular markers and genomics
- advanced chemical analysis of plant composition, and the interaction of plants with their biotic and abiotic environments
- plant phenomics in both controlled environments and in the field
- bioinformatics and data analytics.

#### Industry links

**Improving heat tolerance in wheat:** Our wheat heat tolerance work is now approaching the stage where wheat germplasm and associated genetic knowledge will be suitable for use in wheat breeding efforts.

#### Hybrid wheat for food security:

We are researching hybrid wheat – both the methods to produce hybrids, and also the genetics required so that the hybrids will be successful in commerce.

**Integrated genetic solutions to crown rot in wheat:** We have produced new wheat genetics, combining many sources of resistance by molecular marker assisted breeding and advanced phenotyping. This trait is now in high-yielding lines. These lines, and the marker knowledge are being used by commercial breeders for their product development.



# AgTech and Food: Industry Capabilities

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**National cereal rust control program:** This long-standing and successful program provides great economic benefits to the Australian cereal industries, estimated at many hundreds of millions of dollars each year. We provide surveillance of the pathogens to enable rational genotype selection by the industry, and assistance to cereal breeding industry entities in their resistance breeding, both by information, and advanced starting materials.

**Development of tomato and cucumber hybrids:** Our tomato and cucumber breeding has resulted in release of hybrids into commerce. These are being sold within Australia and overseas.

### Our experts

**Professor Peter Sharp (Research Capability Coordinator):** Develops genetic diversity in wheat using wide crossing and mutagenesis, and these materials flow to disease resistance and grain quality trait screening.

**Dr Kedar Adhikari:** breeds Faba beans, with his released cultivars being a significant presence in the north-west of the Australian cereal growing region.

**Dr Nabil Ahmed:** successful tomato and cucumber breeder, producing hybrids adapted to glasshouse conditions with improved production and taste.

**Professor Margaret Barbour:** leading plant physiologist in plant water and gas exchange with the atmosphere. Uses advanced screening techniques to find the genetic basis of characteristics, to lead to improved crop genotypes and performance.

**Dr Helen Bramley:** plant physiologist working with plant geneticists/breeders to help uncover the basis of stress tolerance and water use efficiency, and to develop rapid screening methods for these traits.

**Dr Philip Davies:** key wheat crown rot researcher, developing new genetic materials that are flowing to commercial breeders.

**Professor Brent Kaiser:** Director, Industrial Transformation Research Hub – Legumes for Sustainable Agriculture. Expert in pulse legumes, and nitrogen fixation and distribution in these and other crops.

**Professor Robert Park:** Director, Cereal rust program. Worldleading researcher in these important diseases. His research spans basic molecular genetics of the cereals and the pathogens, to extension of this knowledge to producers. The knowledge and products of his research are also key inputs to the work of commercial wheat breeders in controlling epidemics of these diseases.

**Dr William (Tam) Salter:** developing new instrumentation that is enabling screening of the capture of carbon and light through crop canopies in the field, in order to find more efficient plant genotypes.

**Dr Rebecca Thistlethwaite:** key wheat heat tolerance researcher, developing screening methods, and advanced genetic materials.

**Professor Richard Trethowan:** top wheat pre-breeder, leading the introduction and management of a wide range of new genetic materials and methods, including hybrids. Produces wheat materials with increased levels and bioavailability of micronutrients.

### For further enquiries contact:

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