

Research Programs

Australian Centre for Plant Functional Genomics: Abiotic Stress and Productivity in Cereals

Research Programs
About the Centre
News & Events
Opportunities
Contact
Search
Links
Home



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The Australian Centre for Plant Functional Genomics ([ACPFG](#)) was established in December 2002. This Centre is a collaboration between our group and researchers working with Professors Peter Langridge, Geoffrey Fincher and Mark Tester from the School of Agriculture

and Wine at the University of Adelaide, Professor German Spangenberg from the Plant Biotechnology Centre at La Trobe University and Professor Kaye Basford from the School of Land and Food Sciences at the University of Queensland.

The ACPFG is funded by the Australian Research Council (ARC), the Grains Research and Development Council (GRDC) and the South Australian Government. The ACPFG also has support from the University of Melbourne, the University of Adelaide, Department of Primary Industries (Vic) and the University of Queensland. Regular interactions between all ACPFG researchers is a feature of the centre, with joint quarterly research meetings and regular travel ensuring that collaborative potential of each research project is optimized.

The aim of the ACPFG is to develop cereal varieties that have increased tolerances to environmental (abiotic) stresses, including drought, temperature, salinity, and mineral deficiencies and toxicities. Working within an integrated functional genomics program, the



University of Melbourne node of the ACPFG uses proteomic and metabolomic technologies to investigate abiotic stress responses and tolerance mechanisms in cereals.

The University of Melbourne node of the ACPFG uses a range of adapted and non-adapted barley and wheat lines to examine the responses of these plants at the protein and metabolite level. These studies allow us to examine the molecular mechanisms of abiotic stress tolerances and identify candidate genes that control the tolerance traits. These genes are then subjected to a suite of functional analyses to determine their function *in planta*. Current projects in the lab include investigations into the mechanisms of boron and salinity tolerance in barley.

Proteomics

The Victorian Centre for Plant Functional Genomics (www.vcpfg.com) is the provider of a platform of key proteomic technologies for use by our group. The University of Melbourne node of the ACPFG utilises ESI-MS/MS (Q-Star, Q-Trap XL, Applied Biosystems) and MALDI-TOF-MS (Voyager-DE STR, Applied Biosystems) instruments, together with a full range of protein separation technologies to perform functional proteomic analyses.

Metabolomics

Metabolomics is a second key platform technology within our group. The University of Melbourne node of the ACPFG uses GC-TOF-MS (Tempus, Thermo Finnigan) and capLC-ESI-MS/MS (Q-Trap XL, Applied Biosystems) instruments to perform both comprehensive and targeted metabolite analyses. The information obtained from these studies is then used to identify stress-related metabolite patterns. This will give new aspects and suggestion for a genetic engineering approach in order in increase stress tolerance in commercial crops.

Bioinformatics

The University of Melbourne node of the ACPFG also includes a bioinformatics program. Research within the bioinformatics program aims to develop methods to improve protein identification from mass spectral analysis of crop plant samples, improve systems for the storage and interrogation of biological data, and develop applications to integrate complex proteomic and metabolomic data

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