Plant Cell Biology Research Centre

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

Research Programs

Cereal Functional Genomics Centre

Staff

Professor Tony Bacic

Director of Centre

Dr Ed Newbigin

Deputy Director of Centre

Honours Students

Ms Joanne Si Wai Ng

Research Fellows

Dr Monika Doblin

Dr Siria Natera

Dr Sarah Wilson

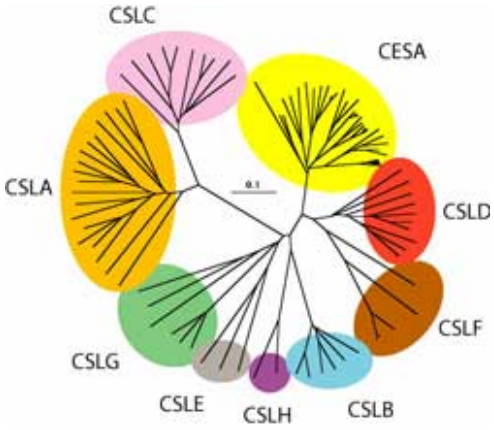
The Cereal Functional Genomics Centre began in 2000 and is a collaboration between our group and the groups led by Professors Geoff Fincher and Peter Langridge from the School of Agriculture and Wine at the University of Adelaide (http://www-genomics.waite.adelaide.edu.au). Core funding for the Centre comes from the Grains Research and Development Corporation and the Universities of Melbourne and Adelaide.

We use the tools and technologies collectively known as genomics to examine the biological processes underlying cell wall biosynthesis in cereals. Cell walls generally play a fundamental role in plant development and are a key component in the resistance of plants to pathogens. Cereal cell walls in particular are an important factor in human and animal nutrition and determine many of the major quality characters of cereal grains. Despite their importance, we know surprisingly little about how the different polysaccharides that make up the wall are made and the mechanisms that regulate their deposition.

The major polysaccharide in all plant cell walls is cellulose, a polymer made up of ß -1,4-linked

glucose units. Non-cellulosic polysaccharides in a cereal cell wall include glucuronoarabinoxylan (GAX), which has a ß -1,4-linked xylan backbone substituted with single arabinose units, and mixed-linkage glucan (MLG), a linear glucan with both ß -1,3- and ß -1,4-linkages. Although GAX and MLG are minor components of the weight of the seed, they exert a surprisingly large influence on grain quality, end-use processing and nutritional value. This is because these polysaccharides tend to form highly viscous aqueous solutions. Cloning the genes involved in GAX and MLG synthesis are major targets of our research program

Synthesis of cellulose requires the products of a large family of genes known as the CESAs. In addition to the CESAs, plant genomes also contain a great many related genes that are collectively known as the cellulose synthase-like or CSLs. It is currently thought that the products of these genes are involved in synthesising the non-cellulosic polysaccharides of the wall, polymers like GAX and MLG. The CSL genes have been classified into 8 subfamilies (CSLA-CSLH) and the accompanying figure shows how these are related to each other and to the CESAs. So far, only the CSLA, CSLC, CSLD, CSLE, CSLF and CSLH subfamilies are known to exist in cereal genomes.



We are investigating the CSL genes of barley through an integrative, multidisciplinary approach that begins with genes and gene sequences (genomics), continues on to the enzymes and proteins involved in barley cell wall synthesis and assembly (enzymology and proteomics), and ends by studying the chemical structures of the polysaccharides themselves. In this way we envisage that the entire process of wall assembly and modification in barley can be defined.

To facilitate collaboration between the groups involved in the Centre, regular meetings are held that are attended by researchers from the two universities and representatives of the Australian cereal industry. In addition, because of a shared interest in the functional genomics of cereals, researchers from the Australian Centre for Plant Functional Genomics also come to these meetings. Frequent exchange visits between the Universities of

Melbourne and Adelaide are an added feature of this Centre's research.

RECENT PUBLICATIONS

Doblin MS, Vergara CE, Read S, Newbigin E and Bacic A (2003) Plant cell wall biosynthesis: making the bricks. In JKC Rose (ed) The Plant Cell Wall. Annual Plant Reviews, Vol. 8. Blackwell Publishing Ltd, pp. 183-222.

Read SM and Bacic T (2002) Plant Biology: Prime time for cellulose. Science 295:59-60.

Doblin MS, De Melis L, Newbigin E, Bacic A and Read SM (2001) Pollen tubes of *Nicotiana alata* express two genes from different ß -glucan synthase families. Plant Physiology 125, 2040-2052.

Created: January 2004 by svgdesign.com.au

Last modified: October 10, 2007

Authorised by: Prof. Antony Bacic & Assoc. Prof. Ed Newbigin

Access: Open

Maintainer: Chris O'Brien, School of Botany